Holy Cross, AK – Big Lake
Targeted Brownfields Assessment

Holy Cross, Alaska

Technical Direction Document: 14-08-0001

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Prepared for:

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List of Abbreviations and Acronyms

Acronym	Definition
ADEC	Alaska Department of Environmental Conservation
DRO	Diesel-Range Organics
E & E	Ecology and Environment, Inc.
EMP	Environmental Management Plan
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
GRO	Gasoline-Range Organics
IDW	Investigation-Derived Waste
NOAA	National Oceanic and Atmospheric Administration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEL	Probable Effects Levels
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
ROV	Remotely Operated Vehicle
RRO	Residual-Range Organics
RSL	Regional Screening Level
SQAP	Sampling and Quality Assurance Plan
SQuiRT	Screening Quick Reference Tables
START	Superfund Technical Assessment and Response Team
TBA	Targeted Brownfields Assessment
TEL	Threshold Effects Levels
VOC	Volatile Organic Compound

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1 Introduction

Pursuant to the United States Environmental Protection Agency (EPA) Region 10 Superfund Technical Assessment and Response Team (START) Contract EP-S7-13-07 and Technical Direction Document number 14-08-001, Ecology and Environment, Inc. (E & E) performed a Targeted Brownfields Assessment (TBA) at the Holy Cross, AK – Big Lake site in Holy Cross, Alaska. The EPA's Brownfields Economic Redevelopment Initiative is designed to empower states, cities, tribes, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields sites (EPA 2002).

The purpose of this project is to investigate new and previously identified recognized environmental conditions (RECs) at the site in coordination with stakeholders. Stakeholders consist of the Holy Cross Village Council, City of Holy Cross, Deloycheet Incorporated (an Alaska Native Village Corporation), the Alaska Department of Environmental Conservation (ADEC), the EPA, and the Yukon River Inter-Tribal Watershed Council. The assessment included sampling of specific areas within the site related to RECs and determining whether clean up at the site will be necessary. At each step of the TBA process, the EPA sought input and concurrence with stakeholders, including determining the final outcome of each REC.

The objective of this TBA report is to present the results of the limited site sampling for preliminary site characterization purposes. This report is organized as follows:

- **Section 1 (Introduction):** Authority for performance of this work and summary of report contents.
- **Section 2 (Site Background):** Description of site conditions, history, and site concerns.
- **Section 3 (Recognized Environmental Conditions):** Description of RECs investigated for this TBA.
- **Section 4 (Investigation and Results):** Summary of the field effort and chemicals detected at the site and a comparison of detected chemical concentrations to criteria values.

- **Section 5 (Cleanup Options and Cost Estimate):** Discussion of potential cleanup options and their estimated costs.
- **Section 6 (Findings and Summary):** Summary of site conditions and conclusions drawn based on the information gathered during this investigation.
- **Section 7 (References):** List of references cited throughout the text.

2 Site Background

The following sections describe the site location and background, site history, general environmental setting, historical property use, future uses of the property, and the START site visit.

2.1 Site Description

Site Name	Holy Cross, AK – Big Lake
Site Address	None
Latitude/Longitude	62.193897/-159.775606
Reference Point for Coordinates	Center of Lake
Horizontal Collection Method	Global Positioning System
Horizontal Reference Datum	World Geodetic System 1984
Legal Description	Township 24 North, Range 57 West, Section 5
Parcel Number	Block 26, Parcel E of U.S. Survey No. 732
Acres	4 to 5
Site Owner	Deloycheet Incorporated P.O. Box 228 Holy Cross, AK 99602 (907) 476-7177

2.2 Site Summary

Holy Cross is located in interior Alaska on the west bank of the Walker Slough off the Yukon River (see Figures 2-1 and 2-2), approximately 40 miles northwest of Aniak and 120 miles northeast of Bethel. The Big Lake site is a former dump site that was used from the late 1960s to late 1970s. Big Lake is located on the south side of Holy Cross and occupies approximately 4 to 5 acres of land (see Figure 2-2). In the past, Big Lake reportedly was longer and wider than it is now. The change in size is primarily due to backfilling that occurred on the north end of the lake, where the lake is believed to have once extended north as far as a former City of Holy Cross shop building, and on the west side where construction of a gravel road encroached into the lake. It has been speculated by a member of the Holy Cross Village Council that the lake in its present condition is about half of its original size. (SLR 2009)

A member of the Holy Cross Village Council was interviewed for the Environmental Management Plan (EMP) and said that in the past Big Lake was used for swimming and contained pike and white fish. Beavers and small pike inhabit the lake. The pike are not consumed due to negative public perceptions over water quality. The lake is used for canoe races, ice picking contests, and limited ice skating. One person drowned in the lake and it is not known whether this person's remains were recovered from the lake (SLR 2009). Algae blooms are commonly observed on the east side of the lake in the summer (E & E 2015a).

2.3 Site Ownership

Land on which the site rests is owned by Deloycheet Incorporated, and located on Block 26, Parcel E of U.S. Survey No. 732 (SLR 2009).

2.4 Environmental Setting

Prior to this TBA, the depth of Big Lake was not known, but it had been indicated in the EMP that the lake was shallower in some areas with terraces down to deeper areas of the lake. In an effort to drain the lake, a trench was dug, but the effort was unsuccessful (time period unknown). The trench remains, but there is no known discharge from the lake. Reportedly, the lake was used as a water source during a forest fire. During five days of constant pumping, the lake's water level was lowered less than a foot and recovered within one day. The site is located approximately 0.5 miles west of the Yukon River in an area subject to flooding. (SLR 2009)

2.5 Historical Property Use

Logs were once floated in the lake and used at a sawmill that was formerly located near the lake's northeast shore. Reportedly, this sawmill was pushed into the lake when it became inoperable. It is reported that a safe, copper pipe, bicycles, tires, car parts, soda cans, and a fire hydrant have been removed from the lake. Other items reportedly observed in, or pulled from, Big Lake have included 55-gallon drums, deceased animals, household refuge, vehicles, and batteries. The total amount and distribution of debris in the lake is not known. (SLR 2009)

The main potential contaminant source area for Big Lake is the north end of the lake closest to the former City landfill. This area of the lake is where a majority of dumping activities likely occurred. The south end of Big Lake may also be a contaminant source area as several 55-gallon barrels were observed there. (SLR 2009)

2.6 Nearby Potential Sources

Several sources of hazardous chemicals or contaminants are located near Big Lake. These sources may impact Big Lake through migration via overland flow or via groundwater. These source areas include:

- **The City Shop**. The City of Holy Cross maintenance shop building

(known as "The City Shop") is located immediately to the north of Big Lake (see Figure 2-2). The City Shop was constructed in the 1980s and has been used since that time for storage and maintenance of City-owned equipment. Prior to that, this location was used as a recreation site, sawmill, and landfill. To prepare the land for construction of The City Shop, the area was covered with gravel. It is not clear whether the landfill material was excavated and transported to a new landfill, or whether this material is still in place under the gravel pad placed in this area. (SLR 2009)

Items used at The City Shop that may contain hazardous chemicals are used oil, engine oil, heavy duty coolant, hydraulic oil, transmission fluid, heavy duty motor oil, antifreeze, gasoline, muriatic acid, primer, paint and stain, lead-acid batteries, and dissolved acetylene. Stained soil has been observed inside and outside of The City Shop; most stained soil was reportedly located under equipment or near drums. Contaminants associated with the former landfill may include metals, petroleum products and wastes, paints, solvents, tires, vehicles, construction materials, and general household wastes. (SLR 2009)

- **Sewage Lagoons**. The City of Holy Cross operates a waste water treatment system, including two sewage lagoons, northeast of Big Lake (see Figure 2-2). The eastern, primary lagoon is 1.6 acres and the secondary percolation lagoon is 1 acre. The primary lagoon has a rubber liner. The waste water treatment system operator indicated the lagoons have berms that appear to be constructed above the flood stage of the Yukon River. The river has not flooded the lagoons since they were placed into operation, and the lagoons have not overflowed. The operator stated the water level in the primary lagoon has not been higher then approximately 7 feet below the top of its perimeter dike (E & E 2015a). Based on the lagoon construction details and lack of releases from them, it appears unlikely that they could negatively impact Big Lake.

2.7 Previous Investigations

No previous environmental sampling has been conducted at the lake.

2.8 Projected/Proposed Site Uses

Stakeholders are interested in restoring Big Lake so it can be used for recreational activities, such as swimming, ice skating, fishing, picnicking, and walking. Restoration of Big Lake would benefit the community of Holy Cross by preserving subsistence habitat, protecting the surrounding environment, and providing a recreational site. The Holy Cross Tribal Council is highly supportive of Big Lake's restoration because it is near the location of a new Tribal Facility that is currently under construction. The Holy Cross community is especially interested in using the lake for recreational purposes because fuel costs make it more difficult for people travel to cleaner lakes that are farther away (Holy Cross Village Council 2014).

With regard to potential lake recovery efforts, it should be noted that there reportedly is no space in the city of Holy Cross for land spreading or soil stockpiling as most of the land in the area is within the Yukon River floodplain (E & E 2015a).

3 Recognized Environmental Conditions

Based on the information contained in Section 2, the following items were included as potential or known RECs for this TBA:

- **Contaminated Sediment and Surface Water in Big Lake:** Sediment and surface water in Big Lake may be contaminated as a result of former dumping practices, via migration from contaminants at the former landfill/city shop property, or from the present-day sewage lagoons. Potential contaminants include: metals, polycyclic aromatic hydocarbons (PAHs), volatile organic compounds (VOCs), gasoline-range organics (GRO), diesel-range organics (DRO), residual-range organics (RRO); and possibly chlorinated pesticides and polychlorinated biphenyl (PCBs).
- **Debris in Big Lake:** A variety of items remain in the lake including 55-gallon drums, deceased animals, household refuge, vehicles, bicycles, and batteries and possibly a sawmill. These items represent a physical hazard to recreational users and wildlife and may also contribute to additional release of hazardous chemicals to the lake as they decay. Potential contaminants include: metals, PAHs, VOCs, GRO, DRO, and RRO.

It appears no prior environmental sampling or testing of any kind has been conducted to assess the RECs listed above. As part of this TBA, surface sediment and surface water samples were collected and an underwater camera survey was conducted, in an effort to address on-site RECs.

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4 Investigation and Results

E & E conducted field sampling at the Holy Cross, AK – Big Lake site from June 16 to 19, 2015. Fieldwork was conducted in coordination with the Holy Cross Village Council and the City of Holy Cross.

4.1 Potential Site Contaminants

Several types of contaminants may have been released as a result of debris disposal into Big Lake. These include metals from metal debris and batteries and petroleum-related contaminants from equipment, vehicles, and drums including PAHs, VOCs, GRO, DRO, RRO; and possibly chlorinated pesticides and PCBs.

4.2 Criteria Values

Criteria values to be applied to analytical data obtained under this project are presented in Table 4-1. ADEC and the EPA do not have published cleanup standards for sediment or surface water data. For this reason, sediment results will be compared to EPA soil Regional Screening Levels (RSLs) for direct contact in a residential scenario. Surface water samples will be compared to EPA RSLs for residential tap water ingestion to provide an indication of potential human exposure risk for persons coming into contact with the sediments and waters of Big Lake. RSLs are not cleanup values, though exceedances can provide an indication of the potential need for further assessment or for site cleanup. RSLs are risk-based values derived from equations that combine exposure assumptions with chemical-specific toxicity values. The use of RSLs as criteria values for this TBA provides an extremely conservative indication of human exposure risk given the expected limited use of Big Lake by recreational users.

Sediment and surface water results were additionally compared to values contained in National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRT) to provide an indication of potential risks to aquatic life from exposure to possible contaminants in Big Lake. It should be noted that as with EPA RSLs, NOAA SQuiRT values are not cleanup values, but rather speak to the possibility of negative impacts to biota.

The NOAA SQuiRTs include multiple screening values to help portray a spectrum of concentrations associated with various probabilities of adverse biological effects. This spectrum ranges from presumably nearly non-toxic to

toxic levels. For this TBA, sediment sample results were compared first to NOAA SQuiRT freshwater Threshold Effects Levels (TEL). Contaminants below these levels have a low probability of being toxic, as tested through standard bioassays. However, concentrations exceeding TELs do not necessarily predict toxicity. For this reason, contaminant concentrations in sediment samples were also compared to NOAA SQuiRT freshwater Probable Effects Levels (PELs). Exceedances of these values are more likely to be associated with toxic concentrations. Surface water sample results were compared to NOAA SQuiRT freshwater chronic and acute values.

At the onset of project planning, it was known that the detection limits for some of the analytical methods outlined for this project would not meet the proposed criteria values. Since these criteria values are not cleanup standards and since nearly all criteria values would be met, use of the proposed analytical methods were considered to be appropriate as they would achieve the project objective of providing an indication of lake contamination.

4.3 Analytical Methods

All sediment and surface water samples collected during this TBA were submitted for fixed laboratory analysis. The samples were analyzed by Test America, Inc. in Tacoma, Washington, for the following parameters:

- Metals using EPA Methods 6010C, 6020A, 7470A, and 7071A;
- VOCs using EPA Method 8260;
- PCBs using EPA Method 8082;
- Chlorinated pesticides using EPA Method 8081;
- PAHs using EPA Method 8270;
- GRO using ADEC Method AK-101;
- DRO using ADEC Method AK-102; and
- RRO using ADEC Method AK-103.

Copies of quality assurance/quality control (QA/QC) and data validation memoranda are provided in Appendix F.

4.4 Reporting of Sample Results

The analytical results summary tables provided in this section are a condensed version of the laboratory data provided in Appendix F. Omitted data and the presentation of data in the summary tables are as follows:

- Analytes that were not detected in any samples were omitted from their respective tables.
- All detected concentrations are shown in bold type; a non-detect concentration is shown as the detection limit reported by the laboratory (e.g., 0.66 U).

- The regulatory standards provided in the first column of these tables were used as criteria values in determining whether contamination is present in the samples.
- Analytes detected at concentrations greater than the criteria value were considered a potential concern, and the concentration is shaded.
- Analytes with no comparative criteria levels are listed in the tables, but could not be qualitatively evaluated.

Based on EPA Region 10 policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (i.e., common earth crust metals) is generally used only in mass tracing, which is beyond the scope of this report. Furthermore, these analytes are not associated with toxicity to humans under normal circumstances (EPA 1996). For these reasons, these analytes are not included in the evaluation or discussion, but are provided in the analytical summary tables if they were detected above the instrument detection limit.

4.5 Sampling Design

A judgmental sampling design was used for the Holy Cross, AK – Big Lake site TBA to fulfill project-specific objectives by collecting biased data required for preliminary site characterization. The following subsections describe the types of sampling, analysis, and measurements that were conducted. Samples were collected in accordance with an approved sampling and quality assurance plan (SQAP; E & E 2015b). Photographic documentation of the sample collection event is provided in Appendix A.

When deviations from the SQAP were required, they were noted in the field logbook, recorded on the Sample Plan Alteration Form (Appendix B), and approved by the EPA Task Monitor. Deviations from the SQAP are also detailed below.

A total of 15 samples (including QA/QC samples) were collected during the field event (see Figure 4-1). A description of each sample submitted for fixed laboratory analysis is provided in Table 4-2.

Table 4-3 summarizes the sample coding system used for formulating sample numbers. For example, the sample number BL01SD indicates the following:

- BL stands for the source code (in this case, for the Holy Cross, AK – Big Lake site).
- 01 stands for the sequential number of samples from a given source by matrix (in this case, the first sediment sample).
- SD stands for the sample matrix (in this case, sediment).

The frequencies of exceedance of regulatory criteria values are provided in Table 4-4. Summaries of analytical data are provided in Table 4-5 (sediment samples)

and Table 4-6 (surface water samples).

Investigative activities conducted at the site included an underwater camera survey, and sampling of sediment and surface water from Big Lake. To address the RECs, the following sampling activities were conducted.

4.5.1 Sampling Methodologies

4.5.1.1 Sediment Sampling

Surface sediment samples were collected from 0 to 6 inches below the surface using a dedicated stainless steel spoon. Collected material was placed in a dedicated stainless steel bowl, thoroughly homogenized and placed into a pre-labeled container. The VOC and GRO aliquots were removed using 5-gram Core-N-One™ samplers (or equivalent) prior to homogenization.

4.5.1.2 Surface Water Sampling

Surface water samples were collected by directly dipping the sample container into the water to fill the container.

4.5.2 Sampling of RECs and Analytical Results

Two RECs were identified at the site. These are contaminated sediment and surface water in Big Lake and debris in Big Lake. These RECs were evaluated as a part of the TBA via the following actions.

4.5.2.1 Contaminated Sediment in Big Lake

Five surface sediment samples (BL01SD through BL05SD) were collected from the northern side of Big Lake, at approximate 200-foot intervals (see Figure 4-1). All sediment samples were collected within the first 6 inches of material and within the waters of the lake. Sample locations were biased toward observed debris. Specifically, BL01SD was collected at a location nearest the former sawmill and landfill and near a location that had wood debris (see Photos 1 and 2) and a metal crate in the lake; BL03SD was collected near an empty 5-gallon container that was in the lake (see Photo 9).

The SQAP proposed collecting up to 13 sediment samples from the lake. During the field event, it was determined that proposed locations on the south side of the lake could not be accessed on foot due to marshy conditions on that side of the lake (see Photos 17 and 18). Also, since that side of the lake had no shore (marshy grasses in ~3 feet of water constituted that shoreline), it was not possible to use an available raft to sample that area (see Sample Plan Alteration Form in Appendix B).

Analytical results are presented in Table 4-5 and indicate that six metals (arsenic, cadmium, copper, manganese, nickel, and zinc) exceeded criteria values in sediment samples. Arsenic concentrations exceeded the EPA dermal contact RSL for soil in a residential setting in all samples. All but one location (BL04SD) also exceeded the NOAA SQuiRT freshwater TEL value. However, arsenic concentration did not exceed the NOAA SQuiRT freshwater PEL value.

Cadmium exceeded the NOAA SQuiRT freshwater TEL value in one sample (BL01SD); though this concentration did not exceed the NOAA SQuiRT freshwater PEL value. Copper, manganese, and nickel exceeded NOAA SQuiRT freshwater TEL values in all sediment samples, but these concentrations did not exceed NOAA SQuiRT freshwater PEL values (note: manganese does not have a NOAA SQuiRT freshwater PEL value and there are no EPA residential RSL dermal contact values for these three analytes). Zinc exceeded the NOAA SQuiRT freshwater TEL value in one sample (BL01SD), though this concentration did not likewise exceed the NOAA SQuiRT freshwater PEL value or the EPA residential RSL dermal contact value.

Two PAHs [benzo(a)anthracene and fluoranthene] exceeded criteria values in one sample (BL01SD). These concentrations exceeded the NOAA SQuiRT freshwater TEL values, though they did not exceed the NOAA SQuiRT freshwater PEL values or EPA residential RSL dermal contact values.

No other metals or PAHs and no VOCs, pesticides, PCBs, GRO, DRO, or RRO exceeded regulatory criteria.

4.5.2.2 Contaminated Surface Water in Big Lake

Seven surface water samples (BL01SW, BL02SW, and BL04SW through BL08SW) were collected along the shore of Big Lake (see Figure 4-1). Four of these samples were co-located with sediment sample locations. These co-located pairs were BL01SD/BL01SW, BL02SD/BL02SW, BL04SD/BL04SW, and BL05SD/BL05SW. Samples BL01SW, BL02SW, BL03SW, and BL04SW were mildly turbid due to the generally murky conditions of the lake (see Photos 1, 2, 4, and 6).

Analytical results are presented in Table 4-6 and indicate the presence of barium in all seven surface water samples at concentrations that exceed the NOAA SQuiRT freshwater chronic value; however, the NOAA SQuiRT freshwater acute value and the EPA tap water RSL were not exceeded. No other metals and no VOCs, PAHs, pesticides, PCBs, GRO, DRO, or RRO exceeded regulatory criteria.

4.5.2.3 Debris in Big Lake

An underwater camera survey of Big Lake was conducted by a company subcontracted to the START in order to determine the general depth profile of the lake and the types, volumes, and locations of debris disposed in the lake.

A remotely operated vehicle (ROV) was used to conduct a visual survey of the lake. To provide a systematic assessment, eight transects were established across the lake. These were numbered as A through G (see Figure 4-2). A video survey was conducted along the length of each transect and still images were recorded to document observed debris. The ROV was operated within visual distance of the lake bottom and the ROV followed an internal compass heading to travel the transect line. The lake depths were determined using a portable depth sounder

attached to a small inflatable raft. Depths were recorded at various intervals along the transect lines and at additional locations within the northern and southern ends of the lake. The depth survey revealed that the lake is quite shallow, having a maximum depth of only 12 feet (see Figure 4-2).

The water clarity was good within the first few feet of the lake water's surface, but rapidly degraded with depth to highly murky conditions near the lake bottom. Near the lake bottom, visibility was approximately 12 to 18 inches and it often was difficult to discern the lake bottom from surrounding water due to the lack of color contrast. Attempts to improve the video quality by using lights at various settings from 0 to 100 percent luminosity resulted in only minor differences in overall video quality.

Debris was observed along transects A and B and at other areas in the lake. Figure 4-3 depicts debris locations. Debris noted in and around the perimeter of the lake included wood, a metal box, a metal grate, a plastic and metal cart, a tire, building debris, two plastic buckets, a 5-gallon container, and two 55-gallon drums. The 5-gallon container was empty and unmarked. The drums also were not marked. The drum on the north side of the lake contains some fluid (~1/4 full); it could not be discerned whether the fluid in the drum was rain water or an industrial or petroleum product. The drum on the south side of the lake could not be reached to assess its contents. Due to limited visual conditions, it was not possible to view the entire lake bottom. For this reason, it is expected that not all debris in the lake was successfully located.

Appendix C provides the ROV debris survey report which includes several still images of underwater debris from the ROV video.

4.6 Global Positioning System

Global Positioning System (GPS) coordinates of five TBA sample locations were collected utilizing a Trimble™ Geo XH handheld unit with a Zephyr™ external antenna or a Trimble ProXR™ with a TDC1 data logger. Recorded GPS coordinates by sample point are listed in Appendix D. The coordinates for three sample locations (BL06SW, BL07SW, and BL08SW) were not recorded since these locations could not be accessed by the START due to marshy conditions. These locations were accessed by raft by the START subcontracted underwater video camera survey crew.

4.7 Investigation-Derived Waste

Investigation-derived waste (IDW) generated during the Big Lake TBA sampling event included disposable sampling supplies and disposable personal protection equipment. All disposable IDW was double-bagged in opaque plastic bags and disposed of at the local landfill in Holy Cross, Alaska.

5 Cleanup Options and Cost Estimate

The following preliminary evaluation of cleanup options for the Big Lake site is based on the analytical data gathered during the investigation conducted for this TBA (Section 4). This TBA focused primarily on metals, VOCs, PCBs, chlorinated pesticides, PAHs, GRO, DRO, and RRO as the contaminants of concern at all sample locations. The decision to focus on these contaminants was based on available information and professional judgment. Given this limitation, it is possible that other contaminants could also be present at levels exceeding applicable regulatory criteria.

Samples collected in support of this TBA included sediment and surface water from Big Lake. Laboratory sample results for these samples did not exceed criteria values with the exception of a few metals. The metals exceedances were primarily of NOAA SQuiRT TELs in sediment rather than NOAA SQuiRT PELs which are more likely to be toxic to aquatic life. For this reason, cleanup or remediation of lake sediments or surface water does not appear to be necessary.

Two 55-gallon drums were noted along the shoreline of Big Lake with one being present along the accessible north side of the lake and the other being along the inaccessible south side of the lake. The northern drum contains some unknown fluid. The southern drum's contents could not be assessed. Additionally, one empty 5-gallon container was noted in the lake. Given this, it is expected that there may be other full or partially full containers at locations in the lake that were not viewed during the underwater camera survey.

Features requiring cleanup at Big Lake include the two 55-gallon drums and all debris in and adjacent to the lake. The Holy Cross Tribal Council has indicated it has available staff to conduct debris cleanup, with the exception of characterizing the 55-gallon drums and any newly discovered full or partially full containers. For this reason, this section will focus only on the characterization and potential disposal of the drums/containers. It is estimated that two 5-gallon containers requiring disposal may be discovered during cleanup activities. Changes in site conditions would require a reevaluation of the following discussion. It is recommended that ADEC be consulted prior to conducting any cleanup activities.

Cleanup options are described below, and corresponding rationale are presented in Table 5-1. A summary of estimated costs associated with each option is presented in Table 5-2. Detailed preliminary cost estimates, including notes and assumptions, are provided in Appendix E.

Cleanup options that have been evaluated for this TBA involve removing the drums and containers from the lake and enclosing them in overpack drums or other suitable secondary containers, and disposing of them and their contents at an EPA-approved disposal facility. It is not known at this time whether material in the drums/containers is hazardous which would require a Resource Conservation and Recovery Act (RCRA) Subtitle C disposal facility, or non-hazardous waste that can be disposed at a RCRA Subtitle D disposal facility. Disposal options that were considered for this TBA include transporting the waste off site for landfill disposal to either a Subtitle C or D disposal facility, as appropriate.

Although there may be local resources and equipment available, due to the remote location and safety considerations it is assumed that a boat and other equipment and supplies will need to be mobilized to Holy Cross, Alaska, by an air charter service. For cost estimating purposes, it is assumed that a vehicle and trailer to transport removal equipment, supplies, and workers from the Holy Cross airfield to the removal site at Big Lake can be obtained locally.

The drums/containers will need to be moved from their locations in or adjacent to the lake in order to sample their contents and place each in an overpack drum. The method used to remove the drums and containers will most likely involve using a small workboat equipped with a hoist. The cleanup crew would position the boat at each drum/container, remove it with a hoist and cable, and either hoist it into the boat or affix it to the boat so it can be moved to the shore. Waste hazard characterization to profile container contents and determine the appropriate disposal facility will require a sample of the material to be analyzed using the appropriate laboratory analytical methods for determining toxicity, corrosivity, reactivity, and flammability. Once ashore, the drum/container would be sampled and placed in an overpack drum suitable for transport to an off-site RCRA disposal facility.

As equipment and personnel are demobilized from the site the overpacked waste drums will be loaded onto the cargo aircraft and transported to a licensed waste treatment, storage, and disposal facility. After laboratory analyses of the waste samples are obtained, waste profiles will be developed. In this assessment, the removal actions alternatives evaluated differ in their characterization of the waste as hazardous (Option 1) or non-hazardous (Option 2).

The option of disposing the waste at the local Holy Cross, Alaska, municipal waste disposal facility was evaluated should the sample results indicate the drum/container contents are not hazardous and meet the facility's land disposal criteria. However, due to the logistics of transporting a boat, equipment, and

personnel to the project site via chartered air cargo service to retrieve and sample the drums, it would not be feasible to demobilize from the site and remobilize at a later date after the laboratory results are received and the waste profile is established. Nor would it be feasible to keep personnel on site on standby while waiting for laboratory sample results.

The cost estimate is $57,000 for Option 1 and $56,000 under Option 2. The two options are nearly identical in cost because the major price factors are cargo and personnel air transportation and contractor labor associated with retrieving and sampling the drums/contents. Like many remote Alaska projects, actual contractor costs for the Holy Cross, AK – Big Lake site removal vary depending on the contractor's ability to obtain equipment and supplies locally, and creative use of transportation modes.

The cost estimates included in this section were developed using vendor quotes and estimates, and the TBA project engineer's best professional judgement based on costs at similar sites. The quantities used have been estimated based on analytical data, site observations, and best engineering judgment. The work to be performed is intended to address the known environmental conditions resulting from past practices. Any additional costs incurred as a result of new or differing discoveries would be in addition to the projected estimated costs described in this section. The estimated cost includes an extra 15 percent contingency to allow for unforeseen costs. These estimates do not include additional study/investigation, design, long-term monitoring, five-year reviews, site closeout, etc.

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6 Findings and Summary

Holy Cross is located in interior Alaska on the west bank of the Walker Slough off the Yukon River. The Holy Cross, AK – Big Lake site is a former dump site that was used in the late 1960s to late 1970s. Big Lake is located on the south side of Holy Cross and occupies approximately 4 to 5 acres of land. The lake is located in an area subject to flooding by the Yukon River.

Logs were once floated in the lake for use at a sawmill that was formerly present near the lake's northeast shore. Reportedly, this sawmill was pushed into the lake when it became inoperable. A landfill once operated near the sawmill.

It also is reported that a safe, copper pipe, bicycles, tires, car parts, soda cans, and a fire hydrant have been removed from the lake over time. Other items reportedly observed in, or pulled from, Big Lake include 55-gallon drums, deceased animals, household refuge, vehicles, and batteries. The total amount and distribution of debris in the lake is not known. One person drowned in the lake and it is not known whether this person's remains were recovered from the lake.

For this TBA, the main potential contaminant source area for Big Lake was considered to be the north end of the lake that is located closest to the former landfill and is the area of the lake where a majority of dumping activities likely occurred. The south end of Big Lake also was considered to be a likely contaminant source area as several 55-gallon barrels had been observed there in the past. Prior to this TBA, no environmental sampling work had been conducted at the site and the depth of the lake was not known.

6.1 REC Findings

Two RECs were identified at the site. These are contaminated sediment and surface water in Big Lake and debris in Big Lake. Sediment and surface water in Big Lake could have become contaminated as a result of former dumping practices, via migration from contaminants at the former landfill/city shop property, or from the present-day sewage lagoons. However, based on metals, VOCs, PCBs, chlorinated pesticides, PAHs, GRO, DRO, and RRO analytical results for sediment and surface water samples collected from Big Lake, and the comparison of these results to applicable regulatory standards, cleanup or remediation of lake sediments or surface water does not appear to be necessary.

With regard to debris in Big Lake, it was determined that cleanup is necessary. Features requiring cleanup include two 55-gallon drums present along the shores of the lake and all debris in and adjacent to the lake. The Holy Cross Tribal Council has indicated it has available staff to conduct debris cleanup, with the exception of drums and containers. The drums/containers represent a physical hazard to recreational users and wildlife and may also contribute to additional release of hazardous chemicals to the lake as they decay and, for this reason, require removal.

6.2 Cleanup Options Summary

Cleanup options that were evaluated for this TBA involve:

- Removing the drums and containers from the lake using a boat and hoist,
- Enclosing them in overpack drums or other suitable secondary containers to protect them from leaking and to allow them to be transported,
- Sampling each container to determine appropriate shipping and disposal methods
- Shipping them to EPA-approved disposal facility, and
- Disposing of their contents as either hazardous or non-hazardous waste.

Since it presently is not known whether material in the drums/containers is hazardous, requiring RCRA Subtitle C disposal facility, or non-hazardous waste, that can be disposed at a RCRA Subtitle D disposal facility, costs for disposal at either type of facility were determined. Cleanup Option 1 is for disposal at a RCRA Subtitle C facility while Option 2 is for disposal at a RCRA Subtitle D facility. The cost of Option 1 was determined to be $57,000 and cost of Option 2 was determined to be $56,000. The options have similar costs because the only difference between them is whether or not the material requiring disposal is hazardous or non-hazardous. The cleanup options assume that all equipment and personnel required to complete the cleanup will need to be flown into Holy Cross; however, if some of these items can be obtained in Holy Cross, these costs could be substantially reduced.

7 References

E & E (Ecology and Environment, Inc.). 2015a. Project Logbook, Holy Cross, AK – Big Lake. 2014 to 2015.

_____. 2015b. *Holy Cross, AK – Big Lake, Targeted Brownfields Assessment, Sampling and Quality Assurance Project Plan*. June 2015.

EPA (United States Environmental Protection Agency). 2002. *Brownfields Economic Redevelopment Fact Sheet,* EPA 500-F-00-241.

_____. 1996. *EPA Soil Screening Guidance User's Guide.*

Holy Cross Village Council. 2014. *EPA R10 Targeted Brownfields Assessment Request and Site Eligibility Determination Outline*. April 29, 2014.

SLR (SLR International Corp). 2009. *Environmental Management Plan, Big Lake Former Dump Site, Holy Cross, Alaska.* June 2009.

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Figures

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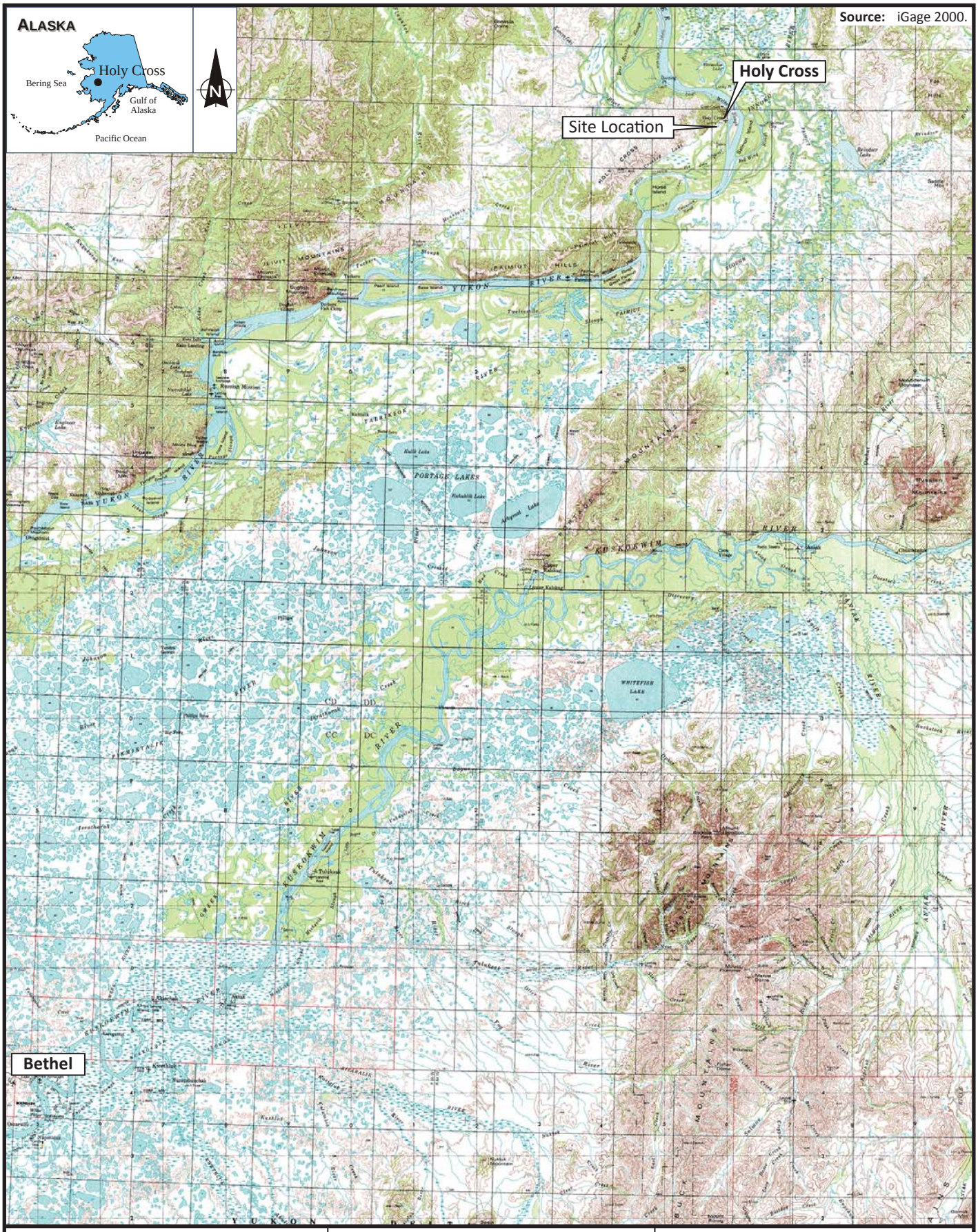


ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BIG LAKE TARGETED BROWNFIELDS ASSESSMENT Holy Cross, Alaska	Figure 2-1 SITE VICINITY MAP		
	0 10 20 Approximate Scale in Miles	Date: 9/24/15	Drawn by: AES	10:START IV\14080001\fig 2-1

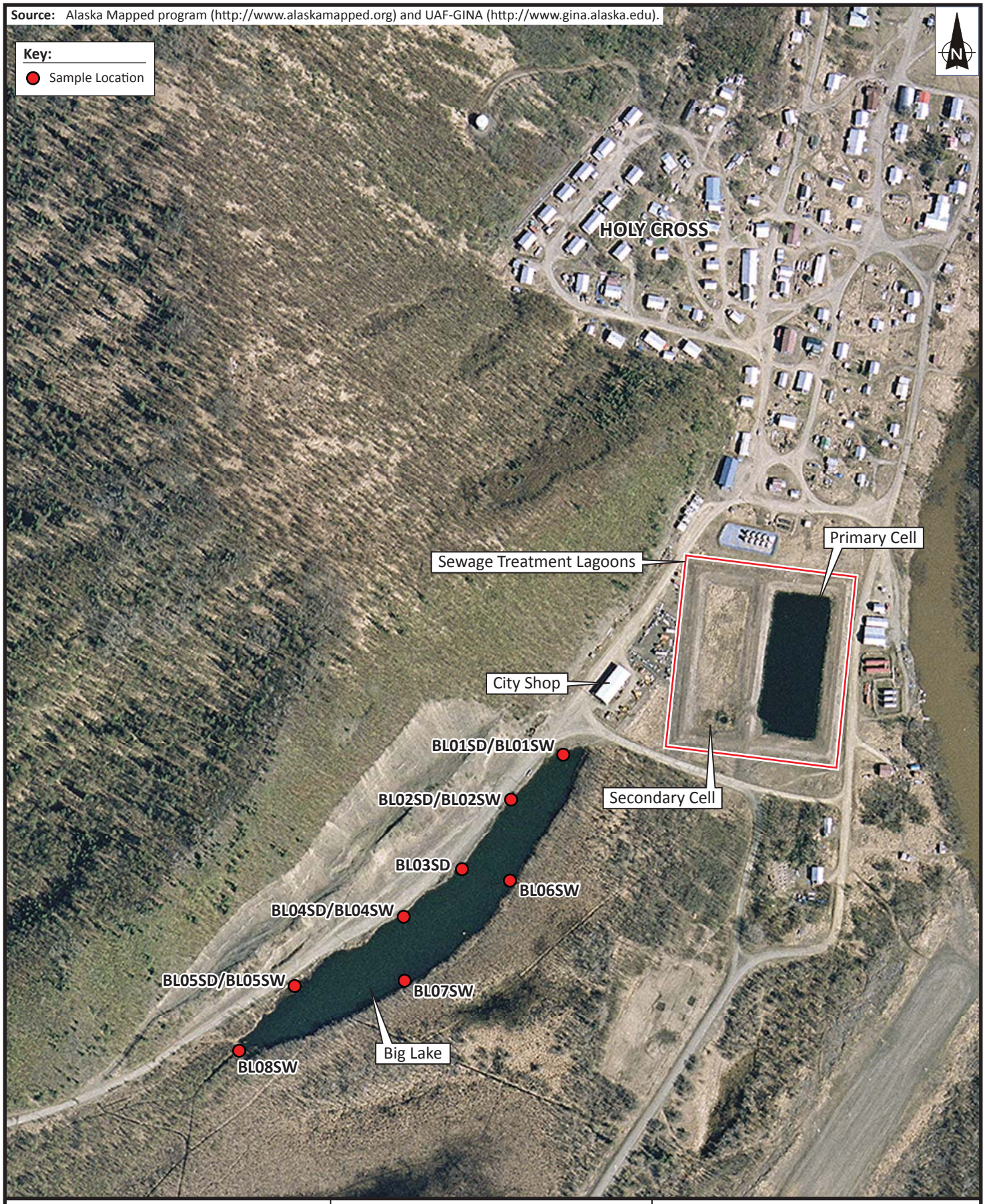
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BIG LAKE
TARGETED BROWNFIELDS ASSESSMENT
Holy Cross, Alaska

Figure 2-2
SITE MAP

0 400 800
Approximate Scale in Feet

Date:	Drawn by:	
9/25/15	AES	10:START IV\14080001\fig 2-2



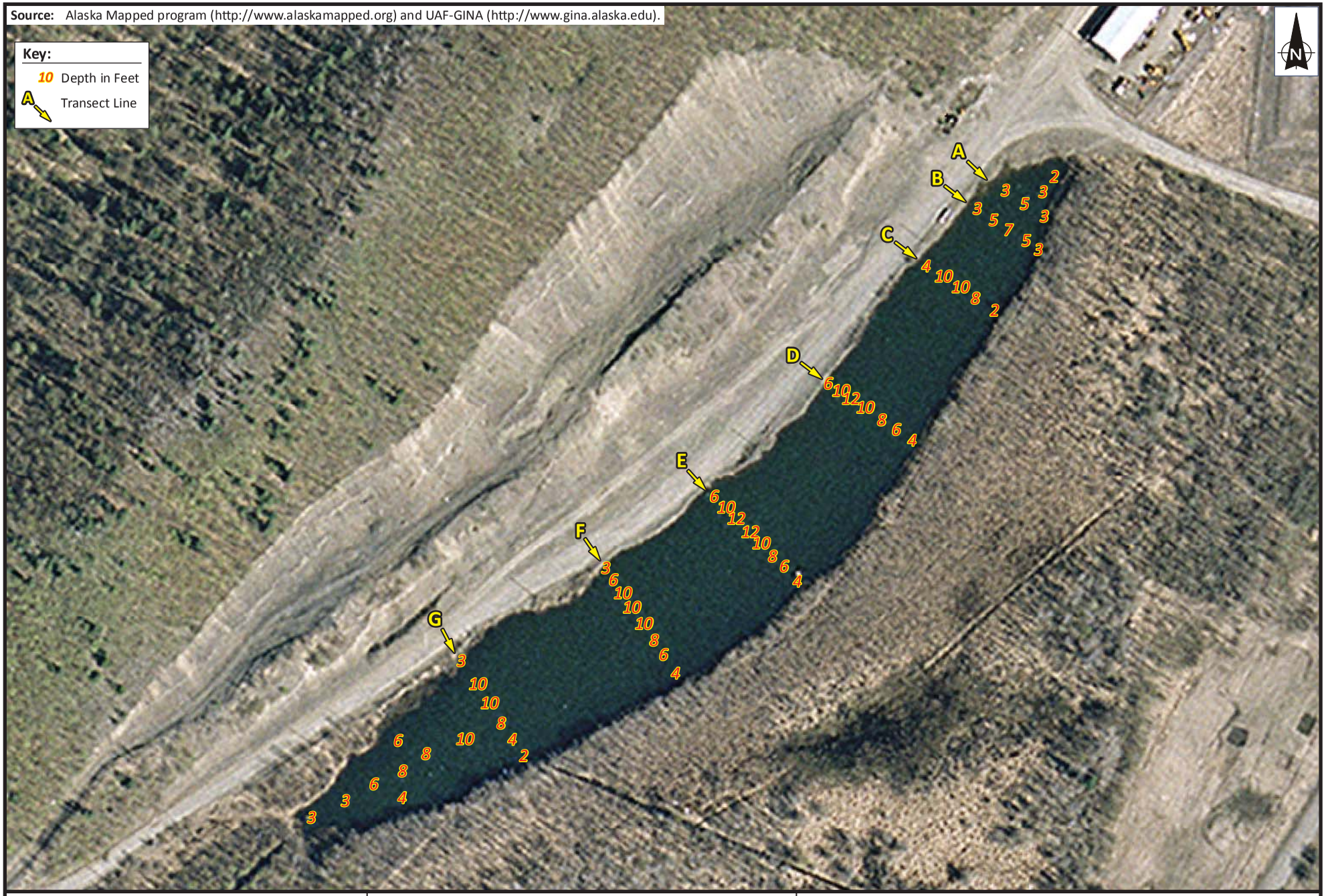
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BIG LAKE
TARGETED BROWNFIELDS ASSESSMENT
Holy Cross, Alaska

Figure 4-1
SAMPLE LOCATION MAP

0 200 400
Approximate Scale in Feet

Date: 9/28/15
Drawn by: AES
10:START IV\14080001\fig 4-1



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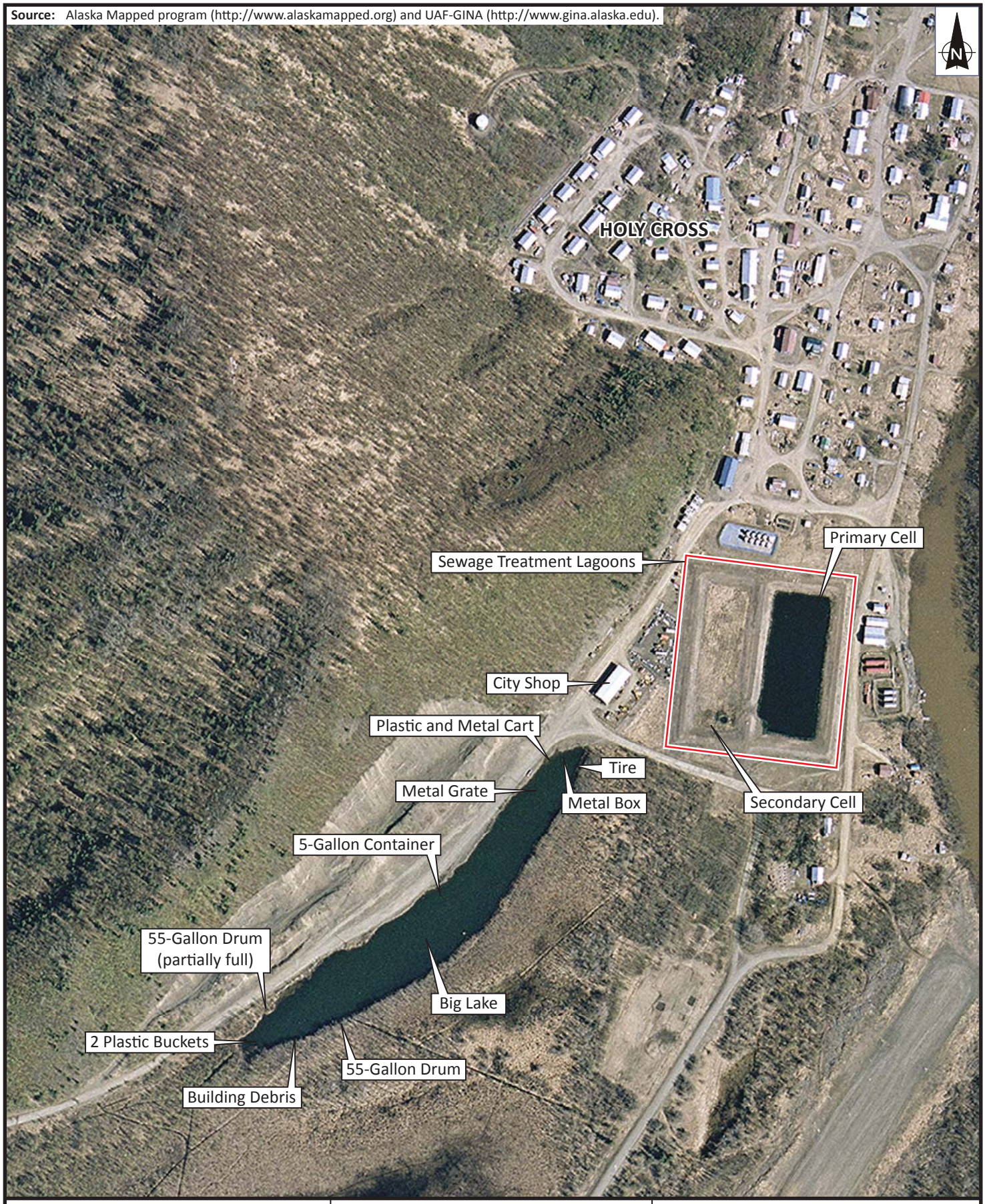
Seattle, Washington

BIG LAKE
TARGETED BROWNFIELDS ASSESSMENT
Holy Cross, Alaska

0 100 200
Approximate Scale in Feet

Figure 4-2
BIG LAKE WATER DEPTHS

Date:	Drawn by:	
9/25/15	AES	10:START IV\14080001\fig 4-2



ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BIG LAKE TARGETED BROWNFIELDS ASSESSMENT Holy Cross, Alaska	Figure 4-3 DEBRIS LOCATIONS		
	0 200 400 Approximate Scale in Feet	Date: 9/28/15	Drawn by: AES	10:START IV\14080001\fig 4-3

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Tables

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Table 4-1 Criteria Values

Analyte Name	CAS Number	Laboratory Reporting Limits		NOAA SQuiRT Freshwater Surface Water (ug/L)		NOAA SQuiRT Freshwater Sediment (ug/Kg)			EPA Residential RSLs			
		Water (ug/L)	Soil/Sediment (ug/Kg)	Acute	Chronic	ARCS TEL	TEL	PEL	Carcinogenic Target Risk - Soil Dermal Contact (ug/Kg)	Noncancer Child Hazard Index - Soil Dermal Contact (ug/Kg)	Carcinogenic Target Risk - Tap Water Ingestion (ug/L)	Noncancer Child Hazard Index - Tap Water Ingestion (ug/L)
Metals												
Aluminum	7429-90-5	189	75000	750	87	25500000	--	--	--	--	--	2000
Antimony (metallic)	7440-36-0	2	3000	88	30	--	--	--	--	--	--	0.8
Arsenic, Inorganic	7440-38-2	5	500	340	150	10798	5900	17000	5100	29000	0.052	0.6
Barium	7440-39-3	10	500	110	3.9	--	--	--	--	--	--	400
Beryllium and compounds	7440-41-7	0.5	500	35	0.66	--	--	--	--	--	--	4
Cadmium	7440-43-9	0.14	200	2	0.25	583	596	3530	--	73000	--	--
Calcium	7440-70-2	1100	55000	--	--	--	--	--	--	--	--	--
Chromium, Total (as Cr+3)	7440-47-3	25	1300		--	36826	37300	90000	--	--	--	3000
Cobalt	7440-48-4	0.5	1000	1500	3	--	--	--	--	--	--	0.6
Copper	7440-50-8	3	2500	13	9	28012	35700	197000	--	--	--	80
Iron	7439-89-6	500	25000	--	1000	188400000	--	--	--	--	--	1400
Lead and Compounds	7439-92-1	2	1500	65	2.5	37000	35000	91300	8100[a]	--	--	--
Magnesium	7439-95-4	1100	55000	--	--	--	--	--	--	--	--	--
Manganese (Water)	7439-96-5	20	1000	2300	80	630000	--	--	--	--	--	48
Mercury (elemental)	7439-97-6	0.2	20	1.4	0.77	--	174	486	--	--	--	--
Nickel Soluble Salts	7440-02-0	15	1000	470	52	19514	18000	36000	--	--	--	40
Potassium	2023695	3300	165000	373000	--	--	--	--	--	--	--	--
Selenium	7782-49-2	5	5000	13-186	5	--	--	--	--	--	--	10
Silver	7440-22-4	0.15	2500	1.6	0.36	--	--	--	--	--	--	10
Thallium (Soluble Salts)	7440-28-0	0.7	5000	110	0.03	--	--	--	--	--	--	0.02
Vanadium, Metallic	7440-62-2	5	1000	280	19	--	--	--	--	--	--	10
Zinc and Compounds	7440-66-6	35	2000	120	120	98000	123000	315000	--	--	--	600
Polychlorinated Biphenyls												
Aroclor 1016	12674-11-2	0.5	10	--	--	--	--	--	23000	1500	1.1	0.14
Aroclor 1221	11104-28-2	0.5	10	--	--	--	--	--	810	--	0.039	--
Aroclor 1232	11141-16-5	0.5	10	--	--	--	--	--	810	--	0.039	--
Aroclor 1242	53469-21-9	0.5	10	--	--	--	--	--	810	--	0.039	--
Aroclor 1248	12672-29-6	0.5	10	--	--	--	--	--	810	--	0.039	--
Aroclor 1254	11097-69-1	0.5	10	--	--	--	60	340	810	420	0.039	--
Aroclor 1260	11096-82-5	0.5	10	--	--	--	--	--	810	--	0.039	--
Aroclor-1262	37324-23-5	0.5	10	--	--	--	--	--	--	--	--	--
Aroclor-1268	11100-14-4	0.5	10	--	--	--	--	--	--	--	--	--

Table 4-1 Criteria Values

Analyte Name	CAS Number	Laboratory Reporting Limits		NOAA SQuiRT Freshwater Surface Water (ug/L)		NOAA SQuiRT Freshwater Sediment (ug/Kg)			EPA Residential RSLs			
		Water (ug/L)	Soil/Sediment (ug/Kg)	Acute	Chronic	ARCS TEL	TEL	PEL	Carcinogenic Target Risk - Soil Dermal Contact (ug/Kg)	Noncancer Child Hazard Index - Soil Dermal Contact (ug/Kg)	Carcinogenic Target Risk - Tap Water Ingestion (ug/L)	Noncancer Child Hazard Index - Tap Water Ingestion (ug/L)
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	83-32-9	0.1	5	1700	5.8	--	6.71	88.9	--	1300000	--	120
Anthracene	120-12-7	0.04	5	13	0.012	10	46.9	245	--	6700000	--	600
Benz[a]anthracene	56-55-3	0.06	10	0.49	0.027	15.72	31.7	385	570	--	0.034	--
Benzo(j)fluoranthene	205-82-3	0.06	10	--	--	--	--	--	1500	--	0.065	--
Benzo[a]pyrene	50-32-8	0.02	5	0.24	0.014	32.4	31.9	782	570	--	0.0034	--
Benzo[b]fluoranthene	205-99-2	0.08	10	--	9.07	--	--	--	570	--	0.034	--
Benzo[k]fluoranthene	207-08-9	0.06	10	--	--	27.2	--	--	5700	--	0.34	--
Chrysene	218-01-9	0.04	5	--	--	26.83	57.1	862	57000	--	3.4	--
Dibenz[a,h]anthracene	53-70-3	0.06	5	--	--	10	6.22	135	57	--	0.0034	--
Dibenzo(a,e)pyrene	192-65-4	0.06	5	--	--	--	--	--	150	--	0.0065	--
Fluoranthene	206-44-0	0.05	5	3980	0.04	31.46	111	2355	--	890000	--	80
Fluorene	86-73-7	0.06	5	70	3.9	10	21.2	144	--	890000	--	80
Indeno[1,2,3-cd]pyrene	193-39-5	0.06	5	--	4.31	17.32	--	--	570	--	0.034	--
Pyrene	129-00-0	0.013	10	--	0.025	44.27	53	875	--	670000	--	60
Pesticides												
Aldrin	309-00-2	0.03	1	1.5	0.017	--	--	--	130	870	0.0046	0.06
alpha-Chlordane	5103-71-9	0.02	1	--	--	--	--	--	--	--	--	--
Carbon disulfide	75-15-0	0.5	20	17	0.92	--	--	--	--	--	--	200
Chlordane	12789-03-6	0.02	1	1.2	0.00215	--	4.5	8.9	5600	36000	0.22	1
cis-1,3-Dichloropropene	10061-01-5	0.5	16	<0.99	<0.055	--	--	--	--	--	--	--
DDD	72-54-8	0.03	2	0.19	0.011	--	3.54	8.51	9500	--	0.32	--
DDE	72-55-9	0.02	2	1050	105	--	1.42	6.75	6700	--	0.23	--
DDT	50-29-3	0.03	2	0.55	0.0005	--	1.19	4.77	22000	48000	0.23	1
delta-BHC	319-86-8	0.05	1	39	2.2	--	--	--	--	--	--	--
Dieldrin	60-57-1	0.03	2	0.24	0.056	--	2.85	6.67	140	1500	0.0049	0.1
Endosulfan I	959-98-8	0.02	1	--	--	--	--	--	--	--	--	--
Endosulfan II	33213-65-9	0.02	2	--	--	--	--	--	--	--	--	--
Endosulfan sulfate	1031-07-8	0.02	2	--	2.22	--	--	--	--	--	--	--
Endrin	72-20-8	0.02	2	0.086	0.036	--	2.67	62.4	--	8700	--	0.6
Endrin aldehyde	7421-93-4	0.2	2	--	0.15	--	--	--	--	--	--	--
Endrin ketone	53494-70-5	0.02	2	--	--	--	--	--	--	--	--	--
gamma-Chlordane	5103-74-2	0.02	1	--	--	--	--	--	--	--	--	--
Heptachlor	76-44-8	0.02	2	0.26	0.0019	--	--	--	510	15000	0.017	1
Heptachlor Epoxide	1024-57-3	0.02	1	0.26	0.0019	--	0.6	2.74	250	380	0.0086	0.026
Hexachlorocyclohexane, Alpha-	319-84-6	0.03	1	39	2.2	--	--	--	360	230000	0.012	16
Hexachlorocyclohexane, Beta-	319-85-7	0.05	1	39	2.2	--	--	--	1300	--	0.043	--
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	0.03	1	0.95	0.08	--	0.94	1.38	5200	22000	0.071	0.6

Table 4-1 Criteria Values

Analyte Name	CAS Number	Laboratory Reporting Limits		NOAA SQuiRT Freshwater Surface Water (ug/L)		NOAA SQuiRT Freshwater Sediment (ug/Kg)			EPA Residential RSLs			
		Water (ug/L)	Soil/Sediment (ug/Kg)	Acute	Chronic	ARCS TEL	TEL	PEL	Carcinogenic Target Risk - Soil Dermal Contact (ug/Kg)	Noncancer Child Hazard Index - Soil Dermal Contact (ug/Kg)	Carcinogenic Target Risk - Tap Water Ingestion (ug/L)	Noncancer Child Hazard Index - Tap Water Ingestion (ug/L)
Methoxychlor	72-43-5	0.1	10	--	0.03	--	--	--	--	150000	--	10
Toxaphene	8001-35-2	1	100	0.73	0.0002	--	0.1	--	2100	--	0.071	--
Petroleum-Related Compounds												
Diesel Range	NA	100	20000	--	--	--	--	--	--	--	--	--
Gasoline Range	NA	50	4000	--	--	--	--	--	--	--	--	--
Residual Range	NA	100	50000	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds												
Acetone	67-64-1	50	100	28000	1500	--	--	--	--	--	--	1800
Benzene	71-43-2	0.2	2	2300	46	--	--	--	--	--	1.4	8
Bromodichloromethane	75-27-4	5	40	11000	--	--	--	--	--	--	1.3	40
Bromoform	75-25-2	0.5	40	23000	320	--	--	--	2900000	580000	9.9	40
Bromomethane	74-83-9	1	140	--	--	--	--	--	--	--	--	2.8
Carbon Tetrachloride	56-23-5	0.2	20	180	9.8	--	--	--	--	--	1.1	8
Chlorobenzene	108-90-7	0.2	40	--	47	--	--	--	--	--	--	40
Chloroform	67-66-3	0.2	40	490	1.8	--	--	--	--	--	2.5	20
Chloromethane	74-87-3	0.3	100	--	--	--	--	--	--	--	--	--
Cumene	98-82-8	0.5	2	--	--	--	--	--	--	--	--	200
Cyclohexane	110-82-7	10	100	--	--	--	--	--	--	--	--	--
Dibromo-3-chloropropane, 1,2-	96-12-8	2	10	--	--	--	--	--	--	--	0.031	0.4
Dibromochloromethane	124-48-1	1	20	11000	--	--	--	--	27000	580000	0.93	40
Dibromoethane, 1,2-	106-93-4	0.2	16	--	--	--	--	--	--	--	0.039	18
Dibromomethane (Methylene Bromide)	74-95-3	0.2	60	11000	--	--	--	--	27000	--	--	20
Dichlorobenzene, 1,2-	95-50-1	0.3	40	260	0.7	--	--	--	--	--	--	180
Dichlorobenzene, 1,4-	106-46-7	0.3	60	180	9.4	--	--	--	--	--	14	140
Dichlorodifluoromethane	75-71-8	0.4	40	--	--	--	--	--	--	--	--	400
Dichloroethane, 1,1-	75-34-3	0.2	40	830	47	--	--	--	--	--	14	400
Dichloroethane, 1,2-	107-06-2	0.2	16	8800	100	--	--	--	--	--	0.86	12
Dichloroethylene, 1,1-	75-35-4	0.1	20	450	25	--	--	--	--	--	--	100
Dichloroethylene, 1,2-cis-	156-59-2	0.2	2	11000	590	--	--	--	--	--	--	4
Dichloroethylene, 1,2-trans-	156-60-5	0.2	40	11600	1160	--	--	--	--	--	--	40
Dichloropropane, 1,2-	78-87-5	0.2	2	23000	5700	--	--	--	--	--	2.2	180
Ethyl Chloride	75-00-3	5	2	--	--	--	--	--	--	--	--	--
Ethylbenzene	100-41-4	0.2	2	130	7.3	--	--	--	--	--	7.1	200
Hexanone, 2-	591-78-6	20	60	1800	99	--	--	--	--	--	--	10
Methyl Acetate	79-20-9	0.5	60	--	--	--	--	--	--	--	--	2000
Methyl Ethyl Ketone (2-Butanone)	78-93-3	10	60	240000	14000	--	--	--	--	--	--	1200
Methyl tert-Butyl Ether (MTBE)	1634-04-4	1	2	--	10000	--	--	--	--	--	43	--
Methylene Chloride	75-09-2	5	25	26000	98.1	--	--	--	--	--	13	12

Table 4-1 Criteria Values

Analyte Name	CAS Number	Laboratory Reporting Limits		NOAA SQuiRT Freshwater Surface Water (ug/L)		NOAA SQuiRT Freshwater Sediment (ug/Kg)			EPA Residential RSLs			
		Water (ug/L)	Soil/Sediment (ug/Kg)	Acute	Chronic	ARCS TEL	TEL	PEL	Carcinogenic Target Risk - Soil Dermal Contact (ug/Kg)	Noncancer Child Hazard Index - Soil Dermal Contact (ug/Kg)	Carcinogenic Target Risk - Tap Water Ingestion (ug/L)	Noncancer Child Hazard Index - Tap Water Ingestion (ug/L)
Styrene	100-42-5	5	40	--	32	--	--	--	--	--	--	400
Tetrachloroethane, 1,1,2,2-	79-34-5	1	40	2100	111	--	--	--	--	--	0.39	40
Tetrachloroethylene	127-18-4	3	20	830	45	--	--	--	--	--	37	12
Toluene	108-88-3	2	40	120	9.8	--	--	--	--	--	--	160
Trichlorobenzene, 1,2,3-	87-61-6	2	40	--	8	--	--	--	--	23000	--	1.6
Trichlorobenzene, 1,2,4-	120-82-1	1	40	70	24	--	--	--	--	--	2.7	20
Trichloroethane, 1,1,1-	71-55-6	3	40	200	11	--	--	--	--	--	--	4000
Trichloroethane, 1,1,2-	79-00-5	1	12	5200	500	--	--	--	--	--	1.4	8
Trichloroethylene	79-01-6	3	2	<440	<21	--	--	--	--	--	1.2	1
Vinyl Chloride	75-01-4	1	16	--	930	--	--	--	--	--	0.021	6
Xylene, m,p-	179601-23-1	1	2	--	--	--	--	--	--	--	--	400
Xylene, o-	95-47-6	3	2	--	350	--	--	--	--	--	--	400
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5	60	--	--	--	--	--	--	--	--	6000
1,3-Dichlorobenzene	541-73-1	0.3	2	630	38	--	--	--	--	--	--	--
1,4-Dioxane	123-91-1	5	60	--	--	--	--	--	23000	870000	0.78	60
4-Methyl-2-pentanone	108-10-1	15	60	2200	170	--	--	--	--	--	--	160
Methylcyclohexane	108-87-2	5	60	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	10061-02-6	1	10	0.99	0.055	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	3	40	11000	--	--	--	--	--	--	--	600

Note:

a Value provided is for lead acetate.

Key:

-- = No associated cleanup level
ARCS = Assessment and Remediation of Contaminated Sediments
CAS = Chemical Abstracts Service
EPA = United States Environmental Protection Agency
NA= Not applicable
NOAA = National Oceanic and Atmospheric Administration
PEL = Probable Effects Level
RSL = Regional Screening Level
SQuiRT = Screening Quick Reference Tables
TEL = Threshold Effects Level
ug/Kg = Micrograms per kilogram
ug/L = Micrograms per liter

Table 4-2 Sample Collection Summary

EPA Sample Number	Sample Location Number	Date	Time	Depth (inches bgs)	Sampler	Metals	VOCs	PCBs	Pesticides/PAHs	DRO/RRO	GRO	Description
Sediment Samples												
15244101	BL01SD	6/17/2015	9:40	0-6	START	X	X	X	X	X	X	Fine silt collected for GRO and VOC aliquots, remaining sample aliquots are of dark grey, gravelly, silty material, wet, no odor. MS/MSD.
15244102	BL02SD	6/17/2015	10:17	0-6	START	X	X	X	X	X	X	Gravel with some organics and very fine sediment, wet, no odor.
15244103	BL03SD	6/17/2015	11:30	0-6	START	X	X	X	X	X	X	Dark brown, silt with organics and rocks, wet, no odor.
15244104	BL04SD	6/17/2015	12:10	0-6	START	X	X	X	X	X	X	Dark brown, fine silt with organics and rocks, wet, no odor.
15244105	BL05SD	6/17/2015	4:30	0-6	START	X	X	X	X	X	X	Sample not described.
Surface Water Samples												
15244116	BL01SW	6/17/2015	2:40	--	START	X	X	X	X	X	X	Co-located with BL01SD. Mildly cloudy, no odor.
15244117	BL02SW	6/17/2015	3:10	--	START	X	X	X	X	X	X	Co-located with BL02SD. Slightly turbid, no odor.
15244119	BL04SW	6/17/2015	3:15	--	START	X	X	X	X	X	X	Co-located with BL04SD. Mildly turbid, no odor.
15244120	BL05SW	6/18/2015	12:30	--	START	X	X	X	X	X	X	Co-located with BL05SD. Mildly cloudy, no odor. MS/MSD.
15244121	BL06SW	6/17/2015	2:40	--	START	X	X	X	X	X	X	South side of Big Lake.
15244122	BL07SW	6/17/2015	3:35	--	START	X	X	X	X	X	X	South side of Big Lake.
15244118	BL08SW	6/17/2015	4:00	--	START	X	X	X	X	X	X	Southwest end of Big Lake.
QA/QC Samples												
15244123	TB01WT	6/17/2015	2:00	--	START	--	X	--	--	--	X	Trip blank.
15244124	TB02WT	6/17/2015	2:10	--	START	--	X	--	--	--	X	Trip blank.
15244114	TB01SD	NP	NP	--	Test America	--	--	--	--	--	X	Trip blank.

Key:

-- = Not anlayzed
bgs = below ground surface
DRO = Diesel range organics
EPA = United States Environmental protection agency
GRO = Gasoline range organics
MS/MSD = Matrix spike/matrix spike duplicate
NP = Not provided
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
RRO = Residual range organics
VOCs = Volatile organic compounds

Table 4-3 Sample Coding

Digits	Description	Code	Example
1,2	Source Code	BL	Big Lake
		TB	Trip Blank
3,4	Consecutive Number	01	First number of source code
5,6	Matrix Code	SD	Sediment
		SW	Surface Water
		WT	Water

Table 4-4 Frequency of Criteria Value Exceedances

Analyte	Range of Detected Concentrations	Frequency of Detection	Frequency of Exceedance of Criteria Values	Criteria Value Source	Criteria Value
Sediment					
Metals (mg/kg)					
Arsenic	5.5 – 11	5/5	5/5	a	5.1
Cadmium	0.31 – 0.6	3/5	1/5	b	0.583
Copper	35 J – 50 J	5/5	5/5	b	28.012
Manganese	890 – 1500	5/5	5/5	b	630
Nickel	22 – 37	5/5	5/5	b	18
Zinc	75 – 100	5/5	1/5	b	98
Polycyclic Aromatic Hydrocarbons (µg/kg)					
Benzo(a)anthracene	21 J	1/5	1/5	b	15.72
Fluoranthene	48 J	1/5	1/5	b	31.46
Surface Water					
Metals (mg/L)					
Barium	0.011 – 0.013	7/7	7/7	c	0.0039

Notes:

a- EPA Residential RSL Carcinogenic Target Risk – Soil Dermal Contact.
b- NOAA SQuiRT Freshwater Sediment ARCS TEL.
c- NOAA SQuiRT Freshwater Surface Water.

Key:

mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.
µg/kg = micrograms per kilogram.
ARCS = Assessment and Remediation of Contaminated Sediments.
EPA = United States Environmental Protection Agency.
J = The associated numerical value is an estimated quantity because the reported concentration is less than the sample quantitation limit or because quality control criteria limits were not met.
NOAA = National Oceanic and Atmospheric Administration.
RSL = Regional Screening Level.
SQuiRT = Screening Quick Reference Tables.

Table 4-5 Sediment Analytical Sample Results Summary

EPA Sample ID Station Location Description Sample Depth (inches)	Applicable Criteria Value	15244101 BL01SD 0-6	15244102 BL02SD 0-6	15244103 BL03SD 0-6	15244104 BL04SD 0-6	15244105 BL05SD 0-6
Petroleum Products (mg/kg)						
Diesel Range Organics	--	27 U	**37 J**	36 JQ	**230 J**	**300 J**
Residual Range Organics	--	63 JQ	**170 J**	81 JQ	**990 J**	**2000 J**
Gasoline Range Organics	--	1.5 JQ	2.6 JQ	13 U	41 U	23 U
Metals (mg/kg)						
Aluminum	25500[a]	**14000**	**11000**	**12000**	**9000**	**9800**
Antimony	--	**0.29**	**0.26**	**0.32**	0.47 JQ	**0.49**
Arsenic	5.1[b]	**9.9**	**11**	**10**	**5.5**	**6.2**
Barium	--	**110**	**71**	**84**	**91**	**95**
Beryllium	--	**0.74**	**0.45**	**0.49**	0.4 JQ	**0.45**
Cadmium	0.583[a]	**0.6**	**0.35**	**0.31**	0.43 JQ	0.39 JQ
Calcium	--	**9700 J**	**4300 J**	**4100 J**	**7200 J**	**7000 J**
Chromium	36.826[a]	**35**	**28**	**26**	**18**	**19**
Cobalt	--	**20**	**15**	**16**	**10**	**13**
Copper	28.012[a]	**50 J**	**39 J**	**48 J**	**35 J**	**35 J**
Iron	188400[a]	**32000**	**30000 J**	**31000**	**22000**	**25000**
Lead	8.1[b]	**7.1**	**6.4**	**6.3**	**5.6**	**7.2**
Magnesium	--	**8500**	**7500**	**7200**	**5200**	**5200**
Manganese	630[a]	**1500**	**1100**	**910**	**920**	**890**
Mercury	0.174[c]	**0.052**	0.018 JQ	**0.055**	0.047 JQ	**0.075**
Nickel	18[a]	**37**	**28**	**31**	**22**	**24**
Potassium	--	**820**	**580**	**760**	**780**	**920**
Silver	--	0.092 JQ	0.089 JQ	0.068 JQ	0.087 JQ	0.067 JQ
Sodium	--	**120**	70 JQ	78 JQ	320 U	97 JQ
Vanadium	--	**60**	**48**	**43**	**39**	**38**
Zinc	98[a]	**100**	**75**	**79**	**76**	**75**

Table 4-5 Sediment Analytical Sample Results Summary

EPA Sample ID Station Location Description Sample Depth (inches)	Applicable Criteria Value	15244101 BL01SD 0-6	15244102 BL02SD 0-6	15244103 BL03SD 0-6	15244104 BL04SD 0-6	15244105 BL05SD 0-6
Polychlorinated Biphenyls (mg/kg)						
Aroclor-1260	810000[b]	0.0048 JQ	0.013 U	0.02 U	0.044 U	0.027 U
Semivolatile Organic Compounds (µg/kg)						
2-Methylnaphthalene	--	4.7 JQ	6.4 U	2.6 JQ	22 U	13 U
Acenaphthene	6.71[c]	2.2 JQ	6.4 U	9.7 U	22 U	13 U
Anthracene	10[a]	3.1 JQ	0.99 JQ	9.7 U	22 U	13 U
Benzo[a]anthracene	15.72[a]	**21 J**	13 U	19 U	45 U	27 U
Benzo[a]pyrene	31.9[c]	**18 J**	6.4 U	9.7 U	22 U	13 U
Benzo[b]fluoranthene	570[b]	**26 J**	2.2 JQ	19 U	45 U	27 U
Benzo[g,h,i]perylene	--	9.3 JQ	13 U	19 U	45 U	27 U
Benzo[k]fluoranthene	27.2[a]	12 JQ	13 U	19 U	45 U	27 U
Chrysene	26.83[a]	**26 J**	2.7 JQ	9.7 U	22 U	13 U
Dibenz(a,h)anthracene	6.22[c]	4.2 JQ	6.4 U	9.7 U	22 U	13 U
Fluoranthene	31.46[a]	**48 J**	2.6 JQ	2 JQ	4.9 JQ	2.4 JQ
Fluorene	10[a]	2.8 JQ	0.86 JQ	9.7 U	22 U	13 U
Indeno[1,2,3-cd]pyrene	17.32[a]	**11**	6.4 U	9.7 U	22 U	13 U
Phenanthrene	--	**36 J**	4.9 JQ	11 JQ	32 JQ	7.6 JQ
Pyrene	44.27[a]	**35 J**	3 JQ	3.8 JQ	9.6 JQ	4.7 JQ
Volatile Organic Compounds (µg/kg)						
1,2,3-Trichlorobenzene	23000[d]	66 U	22 JQ	130 U	410 U	230 U
1,2,4-Trichlorobenzene	--	66 U	13 JQ	130 U	410 U	230 U
1,2,4-Trimethylbenzene	--	27 JQ	73 U	130 U	410 U	230 U
1,2-Dibromo-3-Chloropropane	--	330 U	16 JQ	660 U	2000 U	1100 U
1,3,5-Trimethylbenzene	--	11 JQ	73 U	130 U	410 U	230 U
4-Isopropyltoluene	--	66 U	22 JQ	52 JQ	410 U	120 JQ
Ethylbenzene	--	19 JQ	73 U	130 U	410 U	230 U
Methylene Chloride	--	41 U	46 U	83 U	220 JQ	68 JQ
m-Xylene & p-Xylene	--	**75**	73 U	130 U	410 U	230 U

Table 4-5 Sediment Analytical Sample Results Summary

EPA Sample ID Station Location Description Sample Depth (inches)	Applicable Criteria Value	15244101 BL01SD 0-6	15244102 BL02SD 0-6	15244103 BL03SD 0-6	15244104 BL04SD 0-6	15244105 BL05SD 0-6
n-Butylbenzene	--	14 JQ	73 U	130 U	410 U	230 U
N-Propylbenzene	--	9.9 JQ	73 U	130 U	410 U	230 U
o-Xylene	--	46 JQ	73 U	130 U	410 U	230 U
Toluene	--	35 JQ	**150**	32 JQ	250 JQ	83 JQ
trans-1,2-Dichloroethene	--	8.9 JQ	21 JQ	130 U	410 U	24 JQ

Notes:

a NOAA SQuiRT Freshwater Sediment ARCS TEL.

b EPA Residential RSL Carcinogenic Target Risk - Soil Dermal Contact.

c NOAA SQuiRT Freshwater Sediment TEL.

d EPA Residential RSL Noncancer Child Hazard Index - Soil Dermal Contact.

Bold type indicates the sample result is above the Reporting Limit.

Shaded cell with underlined and bolded type designates value above applicable cleanup standard.

Key:

-- = Not Available

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram.

ARCS = Assessment and Remediation of Contaminated Sediments

EPA = United States Environmental Protection Agency.

ID = Identification.

J = The associated numerical value is an estimated quantity because the reported concentration is less than the sample quantitation limit or because quality control criteria limits were not met.

NOAA = National Oceanic and Atmospheric Administration

Q = Detected concentration is below the method reporting limit but is above the method quantitation limit.

RSL = Regional Screening Level

SQuiRT = Screening Quick Reference Tables

TEL = Threshold Effects Level

U = The analyte was not detected at or above the reported value.

Table 4-6 Surface Water Analytical Sample Results Summary

EPA Sample ID Station Location Description	Applicable Criteria Value	15244116 BL01SW	15244117 BL02SW	15244119 BL04SW	15244120 BL05SW	15244121 BL06SW	15244122 BL07SW	15244118 BL08SW
Petroleum Products (mg/L)								
Diesel Range Organics	--	0.075 JQ	0.088 JQ	0.06 JQ	0.059 JQ	0.094 JQ	0.07 JQ	0.063 JQ
Residual Range Organics	--	0.054 JQ	**0.11**	0.082 JQ	0.062 JQ	**0.11**	**0.11**	0.09 JQ
Metals (mg/L)								
Barium	0.0039[a]	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.011**
Calcium	--	**15**	**16**	**15**	**15**	**15**	**15**	**15**
Iron	1[a]	0.5 U	0.5 U	0.5 U	0.5 U	0.19 JQ	0.5 U	0.5 U
Lead	0.00025[a]	0.002 U	0.002 U	0.00022 JQ	0.00033 JQ	0.002 U	0.002 U	0.002 U
Magnesium	--	**1.8**	**1.9**	**1.8**	**1.8**	**1.8**	**1.9**	**1.8**
Manganese	0.048[b]	**0.019**	**0.02**	**0.027**	**0.022**	**0.043**	**0.021**	**0.022**
Potassium	--	2 JQ	2.1 JQ	2 JQ	2 JQ	2 JQ	2.1 JQ	2 JQ
Silver	0.00036[a]	0.002 U	0.002 U	0.002 U	0.002 U	0.00036 JQ	0.00025 JQ	0.002 U
Sodium	--	1 JQ	1.1 JQ	1 JQ	1 JQ	1 JQ	1.1 JQ	1.1 JQ
Zinc	0.12[a]	0.035 U	0.015 JQ	0.022 JQ	0.021 JQ	0.035 U	0.035 U	0.035 U
Semivolatile Organic Compounds (µg/L)								
Chrysene	3.4[c]	0.021 U	0.02 U	0.02 U	0.019 U	0.0057 JQ	0.019 U	0.019 U

Notes:

a NOAA SQuiRT Freshwater Surface Water - Chronic

b EPA Residential RSL Noncancer Child Hazard Index - Tap Water

c EPA Residential RSL Carcinogenic Target Risk - Tap Water

Bold type indicates the sample result is above the Reporting Limit.

Shaded cell with underlined and bolded type designates value above applicable cleanup standard.

Key:

-- = Not Available

µg/L = micrograms per liter

EPA = United States Environmental Protection Agency

ID = Identification.

J = The associated numerical value is an estimated quantity because the reported concentration is less than the sample quantitation limit or because quality control criteria limits were not met.

mg/L = milligrams per liter

NOAA = National Oceanic and Atmospheric Adiministration.

Q = Detected concentration is below the method reporting limit but is above the method quantitation limit.

RSL = Regional Screening Level

SQuiRT = Screening Quick Reference Tables

U = The analyte was not detected at or above the reported value.

Table 5-1 Cleanup Options and Rationale

Cleanup Option	Rationale
Option 1– Removal of drums and containers from lake. Disposal off-site as hazardous waste.	In this removal alternative, the drums and other containers will be removed from the lake and placed into overpack drums, and transported to a hazardous waste treatment, storage, and disposal facility pending transportation for permanent disposal. The contents of the containers will be sampled in order to characterize the material and establish a waste profile for disposal. Waste will be disposed as hazardous waste at a Subtitle C landfill.
Option 2 – Removal of drums and containers from lake. Disposal off-site as non-hazardous waste.	In this removal alternative, the drums and other containers will be removed from the lake and placed into overpack drums, and transported to a hazardous waste treatment, storage, and disposal facility pending transportation for permanent disposal. The contents of the containers will be sampled in order to characterize the material and establish a waste profile for disposal. Waste will be disposed as non-hazardous waste at a Subtitle D landfill.

Table 5-2 Cleanup Options Preliminary Cost Estimates

Cleanup Option	Description	Estimated Cost
Option 1	Excavation and Backfill of Contaminated Soil	$37,640
	Laboratory Analyses and Disposal	$4,450
	Removal Oversight	$5,010
	Subtotal	**$47,100**
	Indirect Costs – Design, Project Management, Construction Management	$3,250
	Removal Contingency (+15%)	$7,065
	Total (rounded to nearest $1,000)	**$57,000**
Option 2	Excavation and Backfill of Contaminated Soil	$37,640
	Laboratory Analyses and Disposal	$3,380
	Removal Oversight	$5,010
	Subtotal	**$46,030**
	Indirect Costs – Design, Project Management, Construction Management	$3,176
	Construction Contingency (+10%)	$6,905
	Total (rounded to nearest $1,000)	**$56,000**

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A Photographic Documentation

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Photo 1 Wood debris in north end of Big Lake.

Direction: *East* *Date: 6/17/15* *Time: 09:31*

Photo 2 Wood debris in north end of Big Lake.

Direction: *West* *Date: 6/17/15* *Time: 09:32*

Photo 3 Setting up underwater camera.

Direction: *South* *Date: 6/17/15* *Time: 09:32*

Photo 4 Sample BL01SD collected from the north end of Big Lake.

Direction: *East* *Date: 6/17/15* *Time: 10:00*

Photo 5 Location of sediment sample BL01SD.

Direction: *East* *Date: 6/17/15* *Time: 10:05*

Photo 6 Sample BL02SD.

Direction: *Southeast* *Date: 6/17/15* *Time: 10:50*

Photo 7 Location of sediment sample BL02SD.

Direction: *Southeast* *Date: 6/17/15* *Time: 10:50*

Photo 8 Sample BL03SD.

Direction: *Southeast* *Date: 6/17/15* *Time: 11:30*

Photo 9 Location of sediment sample BL03SD. Note 5-gallon orange bucket in view. Bucket is empty.

Direction: *Southeast* *Date: 6/17/15* *Time: 11:30*

Photo 10 Sample BL04SD.

Direction: *Southeast* *Date: 6/17/15* *Time: 12:30*

Photo 11 Collecting sample BL01SW from north end of Big Lake.

Direction: *South* *Date: 6/17/15* *Time: 14:37*

Photo 12 Sample BL01SW.

Direction: *East* *Date: 6/17/15* *Time: 14:44*

Photo 13 Sample BL06SW.

Direction: *East*	*Date: 6/17/15*	*Time: 14:49*

Photo 14 Sample BL04SW.

Direction: *East*	*Date: 6/17/15*	*Time: 15:25*

Photo 15 Sample BL05SD.

Direction: *South*	*Date: 6/17/15*	*Time: 16:31*

Photo 16 Big Lake facing south.

Direction: *South*	*Date: 6/18/15*	*Time: 12:37*

Photo 17 Big Lake facing southwest and showing marshy edge of lake.

Direction: *Southeast* *Date: 6/18/15* *Time: 12:38*

Photo 18 Big Lake showing south side of lake.

Direction: *East* *Date: 6/18/15* *Time: 12:40*

Photo 19 Photo of Big Lake at mid-lake.

Direction: *Northeast* *Date: 6/18/15* *Time: 12:44*

Photo 20 Photo of Big Lake at mid-lake.

Direction: *Southeast* *Date: 6/18/15* *Time: 12:44*

TDD Number: 14-08-0001
Photographed by: Linda Ader

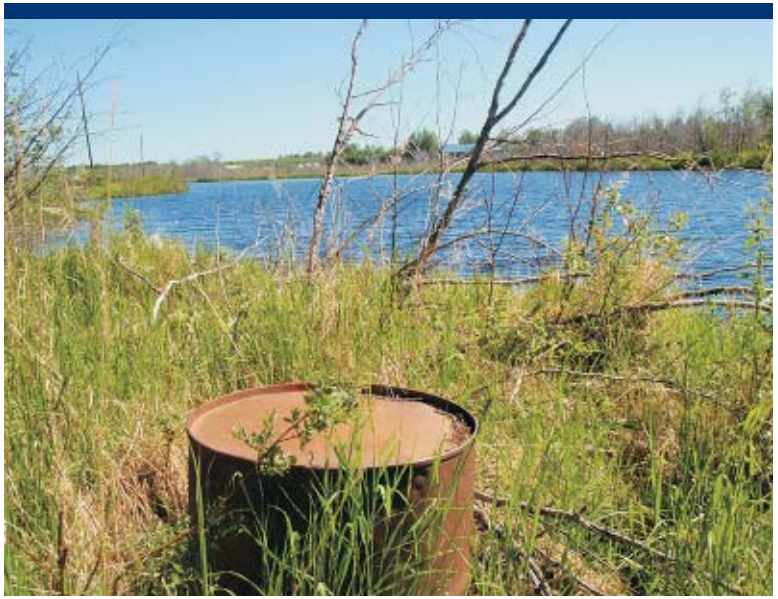

Photo 21 Photo of rusted 55-gallon drum on southwest shore of Big Lake.

Direction: *Northeast* *Date: 6/18/15* *Time: 12:48*

Photo 22 View of Big Lake from south end of lake.

Direction: *Northeast* *Date: 6/18/15* *Time: 12:48*

B Sample Plan Alteration Form

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SAMPLE PLAN ALTERATION FORM

Project Name and Number: Holy Cross, AK – Big Lake
TDD 14-08-0001

Material to be Sampled:

Surface sediment from Big Lake

Measurement Parameters:

Collect surface sediment using stainless steel spoons and bowls for VOCs, GRO, DRO/RRO, PCBs, pesticides, metals, and PAHs analysis.

Standard Procedure for Field Collection and Laboratory Analysis (cite references):

Aquatic sediment sampling (E & E SOP ENV 3.8) and laboratory analysis for VOCs, GRO, DRO/RRO, PCBs, pesticides, metals, and PAHs [E & E Sampling and Quality Assurance Plan for the Holy Cross, AK - Big Lake, June 2015].

Reason for Change in Field Procedure or Analytical Variation:

The sampling plan called for sampling a total of 13 sediment locations. A site visit was not performed prior to field work due to the remote location of the site. During the field event, it was determined that proposed locations on the south side of the lake could not be accessed on foot due to marshy conditions on that side of the lake. Also, since that side of the lake had no shore (marshy grasses in ~3 feet of water constituted that shoreline), it was not possible to use the available raft to sample these areas.

In addition, the bank on north side of the lake along the road primarily consisted of steeply-sloped rock rubble with very little sediment. For this reason, sufficient sample material to allow analysis of the full proposed analytical suite was not available. The laboratory was instructed to prioritize analysis of material in 8-oz jars as follows until all available sample material had been used: PAHs, metals, PCBs, pesticides, then DRO/RRO. All VOC aliquots were collected. At some sample points, GRO aliquots could not be collected.

Variation from Field or Analytical Procedure:

Only 5 of 13 proposed sediment samples were collected. A reduced analytical suite will be applied to most samples.

Special Equipment, Materials, or Personnel Required:

None.

CONTACT	APPROVED SIGNATURE	DATE
Initiator: Linda Ader	Linda E Ader	7/1/2015
START TL: Linda Ader	Linda E Ader	7/1/2015
EPA TM: Brandon Perkins	Brandon Perkins	7/1/2015
EPA QA Manager : Vacant		07/07/2015

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C Big Lake Remotely Operated Vehicle Debris Survey

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Big Lake Remotely Operated Vehicle Debris Survey

Holy Cross, Alaska

June 2015

Prepared for:

ecology and environment, inc.

720 Third Avenue, Ste 1700

Seattle, WA 98104

Prepared by:

HIGH TIDE ENVIRONMENTAL

180 E Hygrade Ln

Wasilla, AK 99654

Introduction:

A remotely operated vehicle (ROV) survey was conducted at Big Lake in Holy Cross, Alaska from 16-17 June 2015. The intent of the survey was to search for underwater debris and determine the depth profile of the lake to aid in potential future cleanup and restoration efforts. Big Lake appears to have been partially filled along part of the western shore and northern edge and is a known dump site for various forms of debris in the community over the past several decades. Gaining insight into the extent of debris and the depth at which it is located is useful for future cleanup plans while understanding the depth profile assists in both future sampling and cleanup plans.

Methods:

A VideoRay Pro 4 ROV was used to conduct the visual survey. Seven transects were established across the lake and are shown in figure 1. Video was gathered along the entire length of the transect and still images were taken when necessary to document debris. The ROV was operated within visual distance of the bottom and followed an internal compass heading to fly a route to the far shore. Upon reaching the far shore, the ROV was brought to the surface and pulled back to the start location by its tether. A GoPro Hero 3 external high definition (HD) camera was attached to the ROV on the first day in order to gather HD imagery, but this technique was discontinued on the second day due to poor video footage given the exceptionally low water clarity.

Depth was determined by a portable depth sounder attached to a small raft. Depths were recorded at various distances from shore at each transect and at locations off-transect at the southern end of the lake using a laser range finder. Depths are presented in figures 2 through 4.

Results and Discussion:

The poor water clarity was the major limiting factor for the ROV surveys. This lack of clarity was likely due to dense aggregations of phytoplankton in the water column due to the time of year. The water clarity actually appeared quite good from surface observations as there was no sign of turbidity due to suspended sediment from surface runoff. ROV video in very shallow depths was decent, but it degraded rapidly after the first few feet and was near zero at bottom depths of six to twelve feet. At these depths, visibility was approximately 12-18 inches and it was often difficult to distinguish the bottom at all due to the lack of contrast with the color of the water. In fact, in many instances the bottom was detected by accidentally slamming the ROV into it and at one point this impact damaged a portion of the ROV where the manipulator and skids are attached. Attempts to improve the video quality by using the lights at various levels from 0 to 100% made only minor differences in overall video quality. Based on work in other areas of Alaska during phytoplankton blooms, it is often possible to get decent video below the photic zone. This results in working in complete blackout conditions where lights are used, but the video footage is typically much better when the influence of the sun passing through the water column is removed. Unfortunately, the depths at Big Lake were all in the photic zone and visibility was poor on all transects. A survey in early spring or fall would likely allow for the best water clarity.

Despite the poor water clarity, debris was observed along transects A and B. Locations and descriptions of the debris in these areas are provided in figures 5 through 10. Debris at the southern end of Big Lake was observed from a raft both on the shoreline (one drum) and in shallow water and is shown in figure 11.

The process for gathering depth data worked well and results are presented in figures 2 through 4. Prior to this survey, there was no idea of the depth of the lake. Because of this, the sort of recovery techniques that could be used for removing debris could not be determined. While it is possible that some deeper spots may exist, it seems unlikely that they would be more than a foot or two deeper than the maximum depth of 12 feet recorded on sonar for this survey. The depth profile along much of the western shore of Big Lake indicated that it was likely filled in the past.

Video files from the ROV for all of the transects are located on the flash drive included with this report. Questions can be directed to Chris Hoffman at 907-354-3132 or Chris@hightidealaska.com .

Figures:

Figure 1. Transects A-G with start locations (at the letters) and approximate track and end locations. Transect A had a side portion to cover the shallow end of the lake where debris was noted from shoreline observations.

Figure 2. Overall image of Big Lake depths.

Figure 3. Close up view of depths at the north end of Big Lake.

Figure 4. Close up view of depths at the central and southern portions of Big Lake.

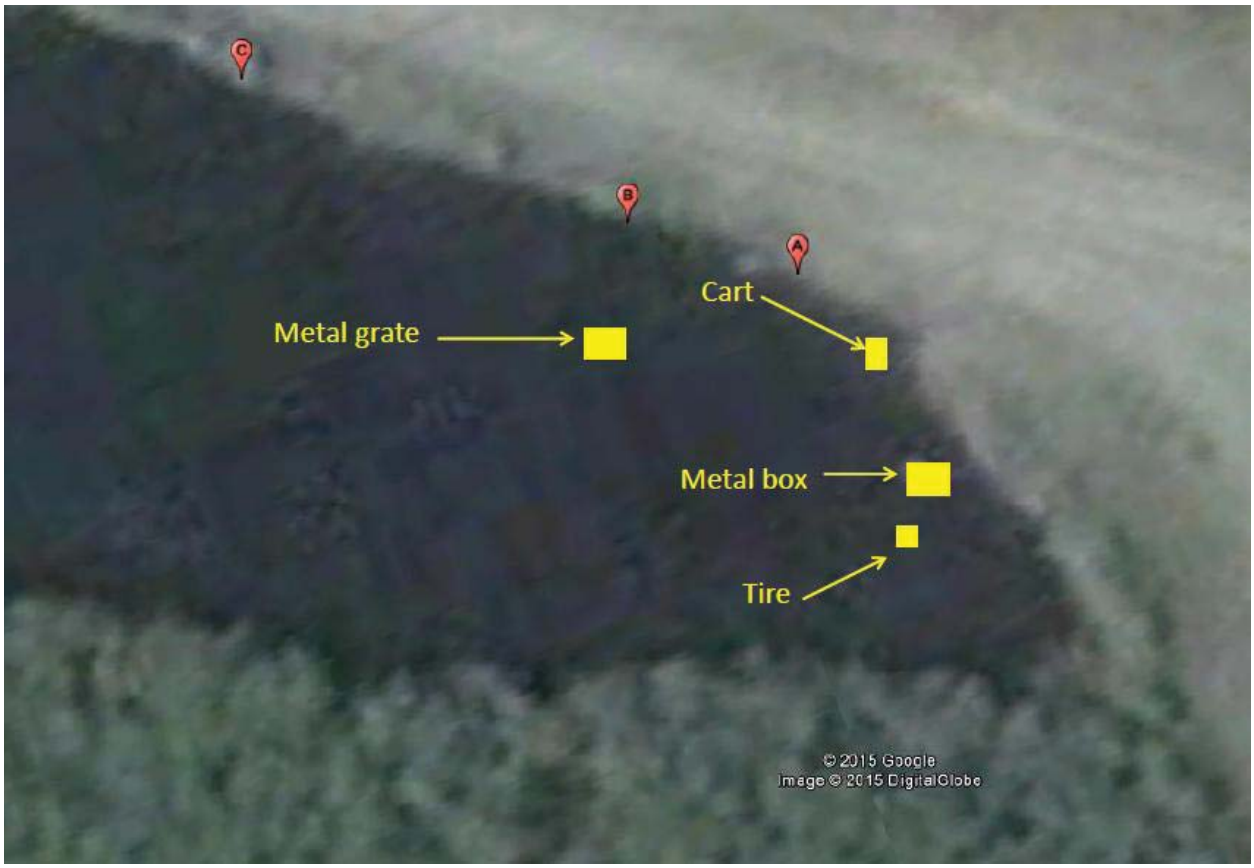

Figure 5. Debris at the north end of the lake. The metal grate was located on transect B while the rest was located on a side portion of transect A or from a shoreline survey.

Figure 6. Submerged cart.

Figure 7. Tire.

Transect 8. Top of large metal box, roughly 4 feet by four feet.

Transect 9. Unidentified object (bottom left) at the north end of the lake.

Figure 10. Metal grate along transect B. Size is estimated to be roughly 3 feet by 6 feet.

Figure 11. Debris at the south end of Big Lake as noted by a shoreline survey on a raft.

D Global Positioning System Coordinates

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Appendix D - Global Positioning System Sample Coordinates

Sample Location	Latitude	Longitude
BL01SD/BL01SW	62.195114	-159.774411
BL02SD/BL02SW	62.194785	-159.775182
BL03SD	62.194280	-159.775893
BL04SD/BL04SW	62.193929	-159.776768
BL05SD/BL05SW	62.193413	-159.778397
BL06SW	62.193867	-159.775164
BL07SW	62.193387	-159.776378
BL08SW	62.192918	-159.778718

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E Cleanup Options Cost Spreadsheets

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Cleanup Option 1: Container Removal and Off-Site Disposal as Hazardous Waste
Targeted Brownfields Assessment
Big Lake, Holy Cross, Alaska

Notes and Assumptions:
1. Assume vehicle and trailer available for temporary rental at Site.
2. Assume field duration of 2 days, exclusive of travel and mobilization.
3. Assume drum and container locations accessible by boat, and drums and containers can be reached by laborers from surface, without the need for divers.
4. Assume no cargo or passenger flight delays.
5. Assume all equipment and supplies can be transported in a single trip, not exceeding 7,000 pounds outbound, 9,000 pounds return trip.
6. Assume all removal work can be accomplished in two full working days on site with crew of four personnel.

ITEM	QTY	UNIT	LABOR	EQUIP	MTRL	UNIT TOTAL	TOTAL	REFERENCE AND NOTES
Direct Capital Costs								
Removal of Drums/Containers and Contents								
Mobilization & Demobilization of Equipment & Personnel	1	each				$20,086.26	$20,086	Vendor Estimate and Engineering Estimate (Round trip travel for 4 workers)
Per Diem + Lodging	14	day				$255.00	$3,570	
Labor - Removal of containers, Overpacking, Sampling, and Cargo Loading	16	day				$649.00	$10,384	Vendor quote (4 workers for 4 days at 10 hours per day and including additional travel time)
Rental equipment-transported	4	day				$450.00	$1,800	Vendor published rate (boat hoist)
Rental equipment-local	1	each				$1,000.00	$1,000	Engineering Estimate
Equipment ODCs	1	each				$800.00	$800	Engineering Estimate (overpacks, drum liners, sampling supplies)
						Subtotal:	$37,640	
Disposal of Drums/Containers and Contents								
Profile Fee	1	each				$250.00	$250	Vendor quote
Off-site Disposal	2	ton				$585.00	$1,170	Vendor quote
Transportation from Site to Off-Site Disposal	1	load				$850.00	$850	Engineering Estimate
Lab Analysis, TCLP, Soil (RCRA metals, VOC, SVOC, PCBs, pH, flashpoint)	4	each				$545.00	$2,180	Engineering Estimate (BOA Rate)
						Subtotal:	$4,450	
Removal Oversight								
Labor, per diem, travel	1	each				$5,010.00	$5,010	Engineering Estimate
						Subtotal:	$5,010	
				Direct Capital Costs Subtotal:			$47,100	
				Removal Contingency (15%):			$7,065	EPA FS Guidance
				Direct Capital Costs Total:			**$54,165**	
Indirect Capital Costs								
Project Management (6%)							$3,250	EPA FS Guidance
				Indirect Capital Costs Total:			**$3,250**	
					Total Capital Costs:		**$57,000**	

References:
EPA 2000, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER Directive 9355.0-75 (EPA FS Guidance).

Key:
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl

Cleanup Option 2: Container Removal and Off-Site Disposal as Non-Hazardous Waste
Targeted Brownfields Assessment
Big Lake, Holy Cross, Alaska

Notes and Assumptions:
1. Assume vehicle and trailer available for temporary rental at Site.
2. Assume field duration of 2 days, exclusive of travel and mobilization.
3. Assume drum and container locations accessible by boat, and drums and containers can be reached by laborers from surface, without the need for divers.
4. Assume no cargo or passenger flight delays.
5. Assume all equipment and supplies can be transported in a single trip, not exceeding 7,000 pounds outbound, 9,000 pounds return trip.
5. Assume all removal work can be accomplished in two full working days on site with crew of four personnel.

ITEM	QTY	UNIT	LABOR	EQUIP	MTRL	UNIT TOTAL	TOTAL	REFERENCE AND NOTES
Direct Capital Costs								
Removal of Drums/Containers and Contents								
Mobilization & Demobilization of Equipment & Personnel	1	each				$20,086.26	$20,086	Vendor Estimate and Engineering Estimate (Round trip travel for 4 workers)
Per Diem + Lodging	14	day				$255.00	$3,570	
Labor - Removal of containers, Overpacking, Sampling, and Cargo Loading	16	day				$649.00	$10,384	Vendor quote (4 workers for 4 days at 10 hours per day and including additional travel time)
Rental equipment-transported	4	day				$450.00	$1,800	Vendor published rate (boat hoist)
Rental equipment-local	1	each				$1,000.00	$1,000	Engineering Estimate
Equipment ODCs	1	each				$800.00	$800	Engineering Estimate (overpacks, drum liners, sampling supplies)
						Subtotal:	$37,640	
Disposal of Drums/Containers and Contents								
Profile Fee	1	each				$250.00	$250	Vendor quote
Off-site Disposal	2	ton				$50.00	$100	Vendor quote
Transportation from Site to Off-Site Disposal	1	load				$850.00	$850	Engineering Estimate
Lab Analysis, TCLP, Soil (RCRA metals, VOC, SVOC, PCBs, pH, flashpoint)	4	each				$545.00	$2,180	Engineering Estimate (BOA Rate)
						Subtotal:	$3,380	
Removal Oversight								
Labor, per diem, travel	1	each				$5,010.00	$5,010	Engineering Estimate
						Subtotal:	$5,010	
				Direct Capital Costs Subtotal:			$46,030	
				Removal Contingency (15%):			$6,905	EPA FS Guidance
				Direct Capital Costs Total:			**$52,935**	
Indirect Capital Costs								
Project Management (6%)							$3,176	EPA FS Guidance
				Indirect Capital Costs Total:			**$3,176**	
					Total Capital Costs:		**$56,000**	

References:
EPA 2000, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER Directive 9355.0-75 (EPA FS Guidance).

Key:
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl

F

Sample Results and Data Validation Memoranda

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51018

EPA R10 Lab (MEL) COC (LAB COPY)

DateShipped: 6/19/2015

CarrierName: Ravn Air

AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A

Cooler #:

No: 10-061815-153421-0009

Account Number FILL IN

Contact Name: Linda Ader

Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244120		Water/ START	Grab	DRO/RRO(21)	3 (HCl), 4 (HCl), 5 (HCl), 6 (HCl), 7 (HCl), 8 (HCl) (6)	BL05SW	06/18/2015 12:30	

580-51018 Chain of Custody

Sample(s) to be used for Lab QC: 15244120 Tag 3, 15244120 Tag 4, 15244120 Tag 5, 15244120 Tag 6, 15244120 Tag 7, 15244120 Tag 8

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: DRO/RRO=DRO/RRO

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	[signature] B. HE	6/19/15 10:00am	[signature] TA-AN	6/19/15 15:20	Amc. T. 5.9°C
	[signature]	6/19/15 15:39	[signature] Teresa	6/20/15 10:45	Iviet 4.8 C

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/19/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-153013-0008
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244120		Water/ START	Grab	Pest/PAH(21)	36 (< 6 C), 37 (< 6 C), 38 (< 6 C), 39 (< 6 C), 40 (< 6 C), 41 (< 6 C) (6)	BL05SW	06/18/2015 12:30	

Sample(s) to be used for Lab QC: 15244120 Tag 36, 15244120 Tag 37, 15244120 Tag 38, 15244120 Tag 39, 15244120 Tag 40, 15244120 Tag 41

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader R&E	6/19/15 10:10		6/19/15 15:20	Ave-T: 5.9°C
		6/19/15 16:05		6/20/15 0645	Intact 3.8

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/19/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-153518-0010
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244120		Water/ START	Grab	GRO(21), VOAs(21)	10 (HCl), 11 (HCl), 12 (HCl), 13 (HCl), 14 (HCl), 15 (HCl), 16 (HCl), 17 (HCl), 18 (HCl), 19 (HCl), 20 (HCl), 21 (HCl), 22 (HCl), 23 (HCl), 24 (HCl), 25 (HCl), 26 (HCl), 27 (HCl) (18)	BL05SW	06/18/2015 12:30	
15244124		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	TB02WT	06/17/2015 14:10	

Sample(s) to be used for Lab QC: 15244120 Tag 27

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key: GRO=GRO, VOAs=Volatiles (VOAs), PAH/M+/PCB/Pest/DRO=PAH/Metals/PCB/Pest/DRO/RRO (TAT 21 Days)

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader B&E	6/19/15 1050	TA-AN	6/19/15 15:20	Amc. T. 3.4°C
			TaSee	6/20 1045	Intact 3.6

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-092816-0003
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244121		Water/ START	Grab	DRO/RRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21)	A (HCl), B (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (7)	BL06SW	06/17/2015 14:40	

Cooler/TB Dig/IR cor 2.1 unc 3.9
Cooler Dscl 3 BLU/wht @ Lab
Wet/Packs 2 Packing ISO BMe
LC

Special Instructions:

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Analysis Key: DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader EE	6/18/15 10:35am	Dmhl TA-AW	6/19/15 13:15	Amc. T. 10.9° C
			Zeeh K-	6/20/15 10:4	intact 5.9

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-093237-0004
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244122		Water/ START	Grab	DRO/RRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21)	A (HCl), B (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (7)	BL07SW	06/17/2015 15:35	

Cooler/TB Dig/IR cor/al unc 5.9
Cooler Dsc Lab/Client @ Lab
Wet/Packs Packing Box
2C Pest

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Special Instructions:

Analysis Key: DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Zak Al B&B	6/18/15 10:30	TA-ANC	6/19/15 13:15	Anc.T: 10.0°C
			Zak Tx Seca	6/20/15	Initial 5.5/6.2

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-093650-0005
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244118		Water/ START	Grab	DRO/RRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21)	A (HCl), B (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (7)	BL08SW	06/17/2015 16:00	

Special Instructions:

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Analysis Key: DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader BEE	6/18/15 10:35		6/19/15 1315	Anc-T: 4.7
		6/18/15 14:10		6/20/15 1045	Intact 5.4

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-084334-0001
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244116		Water/ START	Grab	DRO/RRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21)	A (HCl), B (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (7)	BL01SW	06/17/2015 14:40	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
SAMPLES FOR LAB	[signature] / START	6/18/15 C 1030	[signature] TA-AN	6/19/15 13:15	Amc. T. 5.7°C
	[signature]	6/19/15 14:47	[signature]	6/20 1045	Intact

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-093749-0006
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244116		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL01SW	06/17/2015 14:40	
15244117		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL02SW	06/17/2015 15:10	
15244118		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL08SW	06/17/2015 16:00	
15244119		Water/ START	Grab	DRO/RRO(21), GRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21), VOAs(21)	A (HCl), B (HCl), C (HCl), D (HCl), E (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C), K (HCl), L (HCl), M (HCl) (13)	BL04SW	06/17/2015 15:15	
15244121		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL06SW	06/17/2015 14:40	
15244122		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL07SW	06/17/2015 15:35	
15244123		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	TB01WT	06/17/2015 14:00	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: GRO=GRO, VOAs=Volatiles (VOAs), DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	[signature] FRE	6/18/15 10:30	[signature]	6/19/15 13:15	Amb. T.: 11.1°C
			[signature]	6/20/15 10:45	Iced 6.1°C

07/27/2015

EPA R10 Lab (MEL) COC (LAB COPY)

DateShipped: 6/19/2015

CarrierName: Ravn Air

AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A

Cooler #:

No: 10-061815-153518-0010

Account Number FILL IN

Contact Name: Linda Ader

Contact Phone: 206-406-3411

07/27/2015

2A Remarks

Sample Identifier	~~CLP Sample No.~~	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244101	For 8oz. jars, use following order of priority until all material is used! PAHs, metals, PCBs, Pesticides, DRO, RRO, ↓	Sediment/ START	Grab	GRO(21), VOAs(21), PAH/M+/PCB/Pest/DRO(21)	B (MeOH), E (0 C), F (0 C), G (0 C), H (< 6 C), I (< 6 C), J (< 6 C), K (< 6 C), L (< 6 C) (9)	BL01SD	06/17/2015 09:40	
15244102		Sediment/ START	Grab	PAH/M+/PCB/Pest/DRO(21), GRO(21), VOAs(21)	43 (< 6 C), B (MeOH), E (0 C), F (0 C), G (0 C), H (< 6 C) (6)	BL02SD	06/17/2015 10:17	
15244103		Sediment/ START	Grab	PAH/M+/PCB/Pest/DRO(21), GRO(21), VOAs(21)	45 (< 6 C), B (MeOH), E (0 C), F (0 C), G (0 C), H (< 6 C), I (< 6 C) (7)	BL03SD	06/17/2015 11:30	
15244104		Sediment/ START	Grab	VOAs(21), PAH/M+/PCB/Pest/DRO(21)	E (0 C), F (0 C), G (0 C), H (< 6 C), I (< 6 C) (5)	BL04SD	06/17/2015 12:10	
15244105		Sediment/ START	Grab	VOAs(21), PAH/M+/PCB/Pest/DRO(21)	E (0 C), F (0 C), G (0 C), H (< 6 C), I (< 6 C) (5)	BL05SD	06/17/2015 16:30	
15244114		Sediment/ Test America	Grab	GRO(21)	A (MeOH) (1)	TB01SD		

Sample(s) to be used for Lab QC: 15244101 Tag B, 15244101 Tag E, 15244101 Tag F, 15244101 Tag G, 15244101 Tag H, 15244101 Tag I, 15244101 Tag J, 15244101 Tag K, 15244101 Tag L, 15244120 Tag 10, 15244120 Tag 11, 15244120 Tag 12, 15244120 Tag 13, 15244120 Tag 14, 15244120 Tag 15, 15244120 Tag 16, 15244120 Tag 17, 15244120 Tag 18, 15244120 Tag 19, 15244120 Tag 20, 15244120 Tag 21, 15244120 Tag 22, 15244120 Tag 23, 15244120 Tag 24, 15244120 Tag 25, 15244120 Tag 26, 15244120 Tag 27

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key: GRO=GRO, VOAs=Volatiles (VOAs), PAH/M+/PCB/Pest/DRO=PAH/Metals/PCB/Pest/DRO/RRO (TAT 21 Days)

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader	6/19/15 [illegible]	Dirk TA-AN	6/19/15 15:20	Amc T. 3.4°C
			Zach Ravn	6/20/15 1510 45	Intact 3.6

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/19/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-153518-0010
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244120		Water/ START	Grab	GRO(21), VOAs(21)	10 (HCl), 11 (HCl), 12 (HCl), 13 (HCl), 14 (HCl), 15 (HCl), 16 (HCl), 17 (HCl), 18 (HCl), 19 (HCl), 20 (HCl), 21 (HCl), 22 (HCl), 23 (HCl), 24 (HCl), 25 (HCl), 26 (HCl), 27 (HCl) (18)	BL05SW	06/18/2015 12:30	
15244124		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	TB02WT	06/17/2015 14:10	

Sample(s) to be used for Lab QC: 15244120 Tag 27

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key: GRO=GRO, VOAs=Volatiles (VOAs), PAH/M+/PCB/Pest/DRO=PAH/Metals/PCB/Pest/DRO/RRO (TAT 21 Days)

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader BDE	6/19/15 1000	TA-AN	6/19/15 1520	Amc. T. 3.4°C
			TaSee	6/20 1045	Intact 3.6

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-093749-0006
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244116		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL01SW	06/17/2015 14:40	
15244117		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL02SW	06/17/2015 15:10	
15244118		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL08SW	06/17/2015 16:00	
15244119		Water/ START	Grab	DRO/RRO(21), GRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21), VOAs(21)	A (HCl), B (HCl), C (HCl), D (HCl), E (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C), K (HCl), L (HCl), M (HCl) (13)	BL04SW	06/17/2015 15:15	
15244121		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL06SW	06/17/2015 14:40	
15244122		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	BL07SW	06/17/2015 15:35	
15244123		Water/ START	Grab	GRO(21), VOAs(21)	C (HCl), D (HCl), E (HCl), K (HCl), L (HCl), M (HCl) (6)	TB01WT	06/17/2015 14:00	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: GRO=GRO, VOAs=Volatiles (VOAs), DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader EcE	6/18/15 10:32am		6/19/15 13:15	Amb. T.: 11.1°C
				6/20/15 10:45	Instant 6.1°C

EPA R10 Lab (MEL) COC (LAB COPY)
DateShipped: 6/19/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-152240-0007
Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244120		Water/ START	Grab	ICP-AES(21), GC-ECD(21)	28 (HNO3 pH<2), 29 (HNO3 pH<2), 30 (< 6 C), 31 (< 6 C), 32 (< 6 C), 33 (< 6 C), 34 (< 6 C), 35 (< 6 C) (8)	BL05SW	06/18/2015 12:30	

Sample(s) to be used for Lab QC: 15244120 Tag 28, 15244120 Tag 29, 15244120 Tag 30, 15244120 Tag 31, 15244120 Tag 32, 15244120 Tag 33, 15244120 Tag 34, 15244120 Tag 35

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Linda Ader E & E	6/19/15 10:00 am	Dwight TA - AN	6/19/15 15:20	Amc T. 5.1°C
			Todd K TA Sea	6/20 1045	Intact 3.6

EPA R10 Lab (MEL) COC (LAB COPY)

DateShipped: 6/18/2015
CarrierName: Ravn Air
AirbillNo:

CHAIN OF CUSTODY RECORD

Project Code: BFP-008A
Cooler #:

No: 10-061815-092226-0002

Account Number FILL IN
Contact Name: Linda Ader
Contact Phone: 206-406-3411

07/27/2015

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
15244117		Water/ START	Grab	DRO/RRO(21), ICP-AES(21), GC-ECD(21), Pest/PAH(21)	A (HCl), B (HCl), F (HNO3 pH<2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (7)	BL02SW	06/17/2015 15:10	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: DRO/RRO=DRO/RRO, ICP-AES=Metals ICP-AES + Hg CVAAS, GC-ECD=PCBs, Pest/PAH=Pest/PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
		6/18/15 10:30am		6/19/15 1345	Arc-T: 6.0°C
		6/19/15 14:30		6/20 1045	Intact

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ecology and environment, inc.
Global Environmental Specialists

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Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington

SUBJ: **Organic Data Quality Assurance Review, Holy Cross-AK Big Lake Site, Holy Cross, Alaska**

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 5 soil and 7 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Analysis for Diesel Range Organics (DRO) and Residual Range Organics (RRO), both silica-gel treated and untreated (ADEC Methods AK-102 and AK-103) was performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2B and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244101	15244102	15244103
15244104	15244105			

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were maintained at < 6°C. The samples were collected on June 17 and 18, 2015, extracted by July 14, 2015, and analyzed by July 3, 2015, therefore meeting QC criteria of less than 7 days between collection and extraction for water samples, less than 14 days between collection and extraction for soil samples, and less than 40 days between extraction and analysis.

2. **Initial Calibration: Acceptable.**

Calculations were verified as correct. All relative percent differences (RPDs) were within the laboratory control limits.

3. **Continuing Calibration: Satisfactory.**

Calculations were verified as correct. All percent differences (%Ds) were within the laboratory

control limits except one low surrogate calibration result; no actions were taken based on this outlier.

4. Error Determination: Not Performed.

Samples necessary for bias and precision determination were not provided to the laboratory. All samples were flagged RND (Recovery Not Determined) and PND (Precision Not Determined), although the flags are not found on the Form I's.

5. Blanks: Satisfactory.

A method blank was analyzed for each extraction batch for each matrix and analysis system. Diesel- and motor oil-range TPHs were not detected in any blank except DRO (6.22 mg/kg) in the soil method blank (associated with samples 15244101 through 15244105); positive sample results less than five times the blank result were qualified as not detected (U).

6. System Monitoring Compounds (SMC): Satisfactory.

All recoveries of the SMCs were greater than 10% and within QC criteria except one slightly low recovery in one method blank; no actions were taken based on one SMC outlier in one method blank.

7. Performance Evaluation Samples: Not Provided.

Performance evaluation samples were not provided to the laboratory.

8. Matrix and Blank Spikes: Satisfactory.

Matrix and blank spike results were within QC limits except low water sample DRO recoveries in blank spikes and a low soil DRO matrix spike duplicate recovery; associated results were qualified as estimated quantities (J or UJ) with a likely low bias.

9. Duplicates: Satisfactory.

Duplicate results were acceptable except the soil matrix spike RRO result; associated positive sample results in sample 15244120 were qualified as estimated (J) and have an unknown bias.

10. Quantitation and Quantitation Limits: Acceptable.

Sample concentrations were correctly calculated.

11. Laboratory Contact: Not Required.

No laboratory contact was required.

12. Overall Assessment of Data for Use

From the laboratory narrative - the Diesel Range Organics (DRO) concentration reported for the following samples is primarily due to the presence of discrete peaks: 15244102, 15244103, 15244104, and 15244105. The following sample contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15244105. The following samples contained a hydrocarbon pattern in the diesel range; however, the

elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15244118, 15244119, and 15244121. Associated positive sample results were qualified as estimated quantities (J).

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Directive "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (EPA/540/G-90/004) and the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1 Date Sampled: 06/17/2015 1440
Client Matrix: Water Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51044.D
Dilution:	1.0			Initial Weight/Volume:	949.7 mL
Analysis Date:	06/30/2015 1803			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1000			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.075	J Q	0.023	0.11
RRO (nC25-nC36)	0.054	J Q	0.033	0.11

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	62		50 - 150
n-Triacontane-d62	70		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51046.D
Dilution:	1.0			Initial Weight/Volume:	927.1 mL
Analysis Date:	06/30/2015 1821			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1000			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.088	J LQ	0.024	0.11
RRO (nC25-nC36)	0.11		0.033	0.11

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	69		50 - 150
n-Triacontane-d62	77		50 - 150

JMW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51048.D
Dilution:	1.0			Initial Weight/Volume:	1045.1 mL
Analysis Date:	06/30/2015 1839			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1000			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.063	J tmQ	0.021	0.096
RRO (nC25-nC36)	0.090	J Q	0.030	0.096

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	58		50 - 150
n-Triacontane-d62	65		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4 Date Sampled: 06/17/2015 1515
Client Matrix: Water Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51050.D
Dilution:	1.0			Initial Weight/Volume:	918.3 mL
Analysis Date:	06/30/2015 1857			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1000			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.060	J tm Q	0.024	0.11
RRO (nC25-nC36)	0.082	J Q	0.034	0.11

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	57		50 - 150
n-Triacontane-d62	65		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244120

Lab Sample ID: 580-51018-5 Date Sampled: 06/18/2015 1230
Client Matrix: Water Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193949	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193872	Lab File ID:	ZZ51293.D
Dilution:	1.0			Initial Weight/Volume:	985.9 mL
Analysis Date:	07/03/2015 1002			Final Weight/Volume:	1 mL
Prep Date:	07/02/2015 1110			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.059	J F1 MW Q	0.022	0.10
RRO (nC25-nC36)	0.062	J F2 MW Q	0.031	0.10

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	72		50 - 150
n-Triacontane-d62	65		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51054.D
Dilution:	1.0			Initial Weight/Volume:	1050.3 mL
Analysis Date:	06/30/2015 1933			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1000			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.094	J MW Q	0.021	0.095
RRO (nC25-nC36)	0.11		0.030	0.095

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	64		50 - 150
n-Triacontane-d62	76		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7 Date Sampled: 06/17/2015 1535
Client Matrix: Water Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193558	Instrument ID:	TAC017
Prep Method:	3510C	Prep Batch:	580-193443	Lab File ID:	ZZ51058.D
Dilution:	1.0			Initial Weight/Volume:	1049.3 mL
Analysis Date:	06/30/2015 2009			Final Weight/Volume:	1 mL
Prep Date:	06/29/2015 1004			Injection Volume:	1 uL

Analyte	Result (mg/L)	Qualifier	MDL	RL
DRO (nC10-<nC25)	0.070	J	0.021	0.095
RRO (nC25-nC36)	0.11		0.030	0.095

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	73		50 - 150
n-Triacontane-d62	81		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193562	Instrument ID:	TAC017
Prep Method:	3546	Prep Batch:	580-193461	Lab File ID:	ZZ51015.D
Dilution:	1.0			Initial Weight/Volume:	10.260 g
Analysis Date:	06/30/2015 1327			Final Weight/Volume:	10 mL
Prep Date:	06/29/2015 1130			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
DRO (nC10-<nC25)		~~26~~	~~J~~ U Q	8.1	27 U
RRO (nC25-nC36)		63	J Q	15	66

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	78		50 - 150
n-Triacontane-d62	86		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193562	Instrument ID:	TAC017
Prep Method:	3546	Prep Batch:	580-193461	Lab File ID:	ZZ50993.D
Dilution:	1.0			Initial Weight/Volume:	10.912 g
Analysis Date:	06/30/2015 1002			Final Weight/Volume:	10 mL
Prep Date:	06/29/2015 1130			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
DRO (nC10-<nC25)		37	~~Z B~~ J	7.2	24
RRO (nC25-nC36)		170	~~Z~~ J	13	59

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	59		50 - 150
n-Triacontane-d62	68		50 - 150

JW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244103**

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193562	Instrument ID:	TAC017
Prep Method:	3546	Prep Batch:	580-193461	Lab File ID:	ZZ50995.D
Dilution:	1.0			Initial Weight/Volume:	10.088 g
Analysis Date:	06/30/2015 1020			Final Weight/Volume:	10 mL
Prep Date:	06/29/2015 1130			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
DRO (nC10-<nC25)		36	J B Q	12	41
RRO (nC25-nC36)		81	J Z Q	22	100

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	76		50 - 150
n-Triacontane-d62	82		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193562	Instrument ID:	TAC017
Prep Method:	3546	Prep Batch:	580-193461	Lab File ID:	ZZ51001.D
Dilution:	1.0			Initial Weight/Volume:	10.822 g
Analysis Date:	06/30/2015 1114			Final Weight/Volume:	10 mL
Prep Date:	06/29/2015 1130			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
DRO (nC10-<nC25)		230	~~Z B~~ J	25	83
RRO (nC25-nC36)		990	~~Z~~ J	46	210

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	70		50 - 150
n-Triacontane-d62	83		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244105**

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

AK102 & 103 Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analysis Method:	AK102 & 103	Analysis Batch:	580-193562	Instrument ID:	TAC017
Prep Method:	3546	Prep Batch:	580-193461	Lab File ID:	ZZ51003.D
Dilution:	1.0			Initial Weight/Volume:	10.095 g
Analysis Date:	06/30/2015 1132			Final Weight/Volume:	10 mL
Prep Date:	06/29/2015 1130			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
DRO (nC10-<nC25)		300	~~Z B~~ J	17	55
RRO (nC25-nC36)		2000	~~Z~~ J	30	140

Surrogate	%Rec	Qualifier	Acceptance Limits
o-Terphenyl	54		50 - 150
n-Triacontane-d62	77		50 - 150

MW 7-30-15

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MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington MW

SUBJ: **Organic Data Quality Assurance Review,**
Holy Cross-AK Big Lake Site, Holy Cross, Alaska

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 6 soil and 9 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Analysis for Gasoline Range Organics (ADEC Method AK-101) analyses was performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2B and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244123	15244124	15244101
15244102	15244103	15244104	15244105	15244114

Data Qualifications:

1. **Sample Holding Times: Satisfactory.**

The samples were maintained and received within the QC limits of < 6°C. The samples were collected on June 17 and 18, 2015, and were analyzed by July 8, 2015, therefore generally meeting QC criteria of less than 14 days between collection and analysis for soil and preserved water samples; samples that exceeded holding time limits were qualified as estimated quantities (J or UJ) with a likely low bias.

2. **Initial Calibration: Acceptable.**

Calculations were verified as correct. All relative percent differences (RPDs) were less than or equal to the laboratory control limits.

3. **Continuing Calibration: Acceptable.**

Calculations were verified as correct. All percent differences were less than or equal to the

laboratory control limits.

4. Error Determination: Not Performed.

Samples necessary for bias and precision determination were not provided to the laboratory. All samples were flagged RND (Recovery Not Determined) and PND (Precision Not Determined), although the flags are not found on the Form I's.

5. Blanks: Acceptable.

A method blank was analyzed at the required frequency of every 12 hours for each matrix, preparation technique, and analysis system. Gasoline-range organics were not detected in any blank.

6. System Monitoring Compounds (SMC): Acceptable.

All recoveries of the SMCs were greater than 10% and within QC criteria.

7. Performance Evaluation Samples: Not Provided.

Performance evaluation samples were not provided to the laboratory.

8. Matrix and Blank Spikes: Acceptable.

Matrix and blank spike results were within laboratory QC limits.

9. Duplicates: Acceptable.

Laboratory duplicate results were within laboratory QC limits.

10. Quantitation and Quantitation Limits: Acceptable.

Sample quantitation and sample quantitation limits were correctly calculated.

12. Laboratory Contact: Not Required.

No laboratory contact was required.

13. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the site-specific sampling plan Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Directive "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (EPA/540/G-90/004) and the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 1709			Injection Volume:	5 mL
Prep Date:	07/03/2015 1709			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	106		50 - 150
4-Bromofluorobenzene (Surr)	93		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 1741			Injection Volume:	5 mL
Prep Date:	07/03/2015 1741			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	~~ND~~	~~H~~	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	100		50 - 150
4-Bromofluorobenzene (Surr)	94		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 1815			Injection Volume:	5 mL
Prep Date:	07/03/2015 1815			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	103		50 - 150
4-Bromofluorobenzene (Surr)	94		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 1847			Injection Volume:	5 mL
Prep Date:	07/03/2015 1847			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	103		50 - 150
4-Bromofluorobenzene (Surr)	95		50 - 150

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 1953			Injection Volume:	5 mL
Prep Date:	07/03/2015 1953			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND		0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	83		50 - 150
4-Bromofluorobenzene (Surr)	94		50 - 150

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 2026			Injection Volume:	5 mL
Prep Date:	07/03/2015 2026			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	~~ND~~	~~H~~	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	99		50 - 150
4-Bromofluorobenzene (Surr)	94		50 - 150

7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 2059			Injection Volume:	5 mL
Prep Date:	07/03/2015 2059			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	100		50 - 150
4-Bromofluorobenzene (Surr)	95		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244123**

Lab Sample ID: 580-51018-8
Client Matrix: Water

Date Sampled: 06/17/2015 1400
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 2132			Injection Volume:	5 mL
Prep Date:	07/03/2015 2132			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	100		50 - 150
4-Bromofluorobenzene (Surr)	95		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244124**

Lab Sample ID: 580-51018-9
Client Matrix: Water

Date Sampled: 06/17/2015 1410
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-193957	Instrument ID:	SEA006
Prep Method:	5030B		N/A	Initial Weight/Volume:	5 mL
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/03/2015 2205			Injection Volume:	5 mL
Prep Date:	07/03/2015 2205			Result Type:	PRIMARY

Analyte	Result (mg/L)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10	ND	H	0.015	0.050 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	101		50 - 150
4-Bromofluorobenzene (Surr)	94		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	5.349 g
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2242			Injection Volume:	5 mL
Prep Date:	06/25/2015 1526			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		1.5	J Q	0.82	6.6

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	100		50 - 150
4-Bromofluorobenzene (Surr)	91		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244102**

Lab Sample ID: 580-51018-11
Client Matrix: Solid

% Moisture: 22.7

Date Sampled: 06/17/2015 1017
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	4.227 g
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2038			Injection Volume:	5 mL
Prep Date:	06/25/2015 1526			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		2.6	J Q	0.91	7.3

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	109		50 - 150
4-Bromofluorobenzene (Surr)	90		50 - 150

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244103**

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	4.573 g
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2109			Injection Volume:	5 mL
Prep Date:	06/25/2015 1526			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		ND		1.7	13 U

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	106		50 - 150
4-Bromofluorobenzene (Surr)	89		50 - 150

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	3.362 g
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2140			Injection Volume:	5 mL
Prep Date:	06/25/2015 1526			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		ND MW		5.1	41 U

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	106		50 - 150
4-Bromofluorobenzene (Surr)	87		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244105

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	3.531 g
Dilution:	1.0			Final Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2211			Injection Volume:	5 mL
Prep Date:	06/25/2015 1526			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		ND	U	2.8	23

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	105		50 - 150
4-Bromofluorobenzene (Surr)	89		50 - 150

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244114**

Lab Sample ID: 580-51018-15
Client Matrix: Solid

Date Sampled: 06/17/2015 0001
Date Received: 06/20/2015 1045

AK101 Alaska - Gasoline Range Organics (GC)

Analysis Method:	AK101	Analysis Batch:	580-194318	Instrument ID:	TAC056
Prep Method:	5035	Prep Batch:	580-194328	Initial Weight/Volume:	25 g
Dilution:	1.0			Final Weight/Volume:	25 mL
Analysis Date:	07/08/2015 1802			Injection Volume:	5 mL
Prep Date:	06/25/2015 1527			Result Type:	PRIMARY

Analyte	DryWt Corrected: N	Result (mg/Kg)	Qualifier	MDL	RL
Gasoline Range Organics (GRO)-C6-C10		7.9		0.50	4.0

Surrogate	%Rec	Qualifier	Acceptance Limits
Trifluorotoluene (Surr)	119		50 - 150
4-Bromofluorobenzene (Surr)	91		50 - 150

MW 7/30/15

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington

SUBJ: **Organic Data Quality Assurance Review,**
Holy Cross-AK Big Lake Site, Holy Cross, Alaska

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 5 soil and 7 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Semivolatile Organic Compound (SVOC) analysis (EPA Method 8270) was performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2B and/or 4 Data Validation Electronic and/or Manual Process (S2/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244101	15244102	15244103
15244104	15244105			

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were maintained and received within the QC limits of < 6°C. The samples were collected on June 17 and 18, 2015, were extracted on June 24 or 30, 2015, and were analyzed by July 7, 2015, therefore meeting holding time criteria of less than 7 days between collection and extraction (14 days for soil) and less than 40 days between extraction and analysis.

2. **Tuning: Acceptable.**

Tuning was performed at the beginning of each 12-hour analysis sequence. All results were within QC limits.

3. **Initial Calibration: Acceptable.**

All average Relative Response Factors (RRFs) were within the QC limits. All Relative Standard Deviations (RSDs) were within the QC limits.

4. **Continuing Calibration: Acceptable.**

All RRFs were within the QC limits. All % differences were within the QC limits.

5. Blanks: Acceptable.

A method blank was analyzed for each 20 sample batch per matrix. There were no detections in any method blank.

6. System Monitoring Compounds (SMCs): Acceptable.

All SMC recoveries were within QC limits.

7. Matrix Spike (MS)/Matrix Spike Duplicate (MSD) Analysis: Satisfactory.

All spike analyses were performed per SDG or per matrix per concentration level, whichever was more frequent. All recoveries were within the QC limits except several outliers in the soil MS and MSD; positive results for acenaphthylene, acenaphthene, phenanthrene, fluoranthene, pyrene, benzo(a) anthracene, and chrysene in sample 15244101 were qualified as estimated quantities (J).

8. Duplicate Analysis: Satisfactory.

Blank spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All spike duplicate results were within QC limits except the several soil matrix spike outliers (phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, and benzo(a)pyrene; associated positive results in sample 15244101 were qualified as estimated quantities (J)) and the water benzo[a]pyrene blank spike result. The water sample positive benzo(a)pyrene results were qualified as estimated quantities (J).

9. Internal Standards: Acceptable.

All internal standards (IS) were within $\pm$ 30 seconds of the continuing calibration IS retention times. All area counts were within 50 % to 200 % of the continuing calibration area counts.

10. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

11. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

12. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A018.D
Dilution:	1.0			Initial Weight/Volume:	951 mL
Analysis Date:	07/07/2015 1526			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0076	0.021
2-Methylnaphthalene	ND		0.0063	0.027
1-Methylnaphthalene	ND		0.0063	0.021
Acenaphthylene	ND		0.0063	0.021
Acenaphthene	ND		0.0063	0.021
Fluorene	ND		0.0063	0.021
Phenanthrene	ND		0.0063	0.021
Anthracene	ND		0.0063	0.021
Fluoranthene	ND		0.0063	0.021
Pyrene	ND		0.0063	0.021
Benzo[a]anthracene	ND		0.0063	0.021
Chrysene	ND		0.0063	0.021
Benzo[b]fluoranthene	ND		0.0063	0.021
Benzo[k]fluoranthene	ND		0.0063	0.021
Benzo[a]pyrene	ND		0.0063	0.021
Indeno[1,2,3-cd]pyrene	ND		0.0063	0.021
Dibenz(a,h)anthracene	ND		0.0063	0.021
Benzo[g,h,i]perylene	ND		0.0063	0.021

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	95		64 - 150

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A019.D
Dilution:	1.0			Initial Weight/Volume:	998.8 mL
Analysis Date:	07/07/2015 1611			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0072	0.020
2-Methylnaphthalene	ND		0.0060	0.026
1-Methylnaphthalene	ND		0.0060	0.020
Acenaphthylene	ND		0.0060	0.020
Acenaphthene	ND		0.0060	0.020
Fluorene	ND		0.0060	0.020
Phenanthrene	ND		0.0060	0.020
Anthracene	ND		0.0060	0.020
Fluoranthene	ND		0.0060	0.020
Pyrene	ND		0.0060	0.020
Benzo[a]anthracene	ND		0.0060	0.020
Chrysene	ND		0.0060	0.020
Benzo[b]fluoranthene	ND		0.0060	0.020
Benzo[k]fluoranthene	ND		0.0060	0.020
Benzo[a]pyrene	ND		0.0060	0.020
Indeno[1,2,3-cd]pyrene	ND		0.0060	0.020
Dibenz(a,h)anthracene	ND		0.0060	0.020
Benzo[g,h,i]perylene	ND		0.0060	0.020

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	96		64 - 150

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3 Date Sampled: 06/17/2015 1600
Client Matrix: Water Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A020.D
Dilution:	1.0			Initial Weight/Volume:	1053.6 mL
Analysis Date:	07/07/2015 1633			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0068	0.019
2-Methylnaphthalene	ND		0.0057	0.025
1-Methylnaphthalene	ND		0.0057	0.019
Acenaphthylene	ND		0.0057	0.019
Acenaphthene	ND		0.0057	0.019
Fluorene	ND		0.0057	0.019
Phenanthrene	ND		0.0057	0.019
Anthracene	ND		0.0057	0.019
Fluoranthene	ND		0.0057	0.019
Pyrene	ND		0.0057	0.019
Benzo[a]anthracene	ND		0.0057	0.019
Chrysene	ND		0.0057	0.019
Benzo[b]fluoranthene	ND		0.0057	0.019
Benzo[k]fluoranthene	ND		0.0057	0.019
Benzo[a]pyrene	ND		0.0057	0.019
Indeno[1,2,3-cd]pyrene	ND		0.0057	0.019
Dibenz(a,h)anthracene	ND		0.0057	0.019
Benzo[g,h,i]perylene	ND		0.0057	0.019

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	93		64 - 150

7/30

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244119

Lab Sample ID: 580-51018-4 Date Sampled: 06/17/2015 1515
Client Matrix: Water Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A021.D
Dilution:	1.0			Initial Weight/Volume:	1025.6 mL
Analysis Date:	07/07/2015 1655			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0070	0.020
2-Methylnaphthalene	ND		0.0059	0.025
1-Methylnaphthalene	ND		0.0059	0.020
Acenaphthylene	ND		0.0059	0.020
Acenaphthene	ND		0.0059	0.020
Fluorene	ND		0.0059	0.020
Phenanthrene	ND		0.0059	0.020
Anthracene	ND		0.0059	0.020
Fluoranthene	ND		0.0059	0.020
Pyrene	ND		0.0059	0.020
Benzo[a]anthracene	ND		0.0059	0.020
Chrysene	ND		0.0059	0.020
Benzo[b]fluoranthene	ND		0.0059	0.020
Benzo[k]fluoranthene	ND		0.0059	0.020
Benzo[a]pyrene	ND		0.0059	0.020
Indeno[1,2,3-cd]pyrene	ND		0.0059	0.020
Dibenz(a,h)anthracene	ND		0.0059	0.020
Benzo[g,h,i]perylene	ND		0.0059	0.020

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	93		64 - 150

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A022.D
Dilution:	1.0			Initial Weight/Volume:	1037.2 mL
Analysis Date:	07/07/2015 1717			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0069	0.019
2-Methylnaphthalene	ND		0.0058	0.025
1-Methylnaphthalene	ND		0.0058	0.019
Acenaphthylene	ND		0.0058	0.019
Acenaphthene	ND		0.0058	0.019
Fluorene	ND		0.0058	0.019
Phenanthrene	ND		0.0058	0.019
Anthracene	ND		0.0058	0.019
Fluoranthene	ND		0.0058	0.019
Pyrene	ND		0.0058	0.019
Benzo[a]anthracene	ND		0.0058	0.019
Chrysene	ND		0.0058	0.019
Benzo[b]fluoranthene	ND		0.0058	0.019
Benzo[k]fluoranthene	ND		0.0058	0.019
Benzo[a]pyrene	ND		0.0058	0.019
Indeno[1,2,3-cd]pyrene	ND		0.0058	0.019
Dibenz(a,h)anthracene	ND		0.0058	0.019
Benzo[g,h,i]perylene	ND		0.0058	0.019

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	90		64 - 150

MW 7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A025.D
Dilution:	1.0			Initial Weight/Volume:	1044.7 mL
Analysis Date:	07/07/2015 1823			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0069	0.019
2-Methylnaphthalene	ND		0.0057	0.025
1-Methylnaphthalene	ND		0.0057	0.019
Acenaphthylene	ND		0.0057	0.019
Acenaphthene	ND		0.0057	0.019
Fluorene	ND		0.0057	0.019
Phenanthrene	ND		0.0057	0.019
Anthracene	ND		0.0057	0.019
Fluoranthene	ND		0.0057	0.019
Pyrene	ND		0.0057	0.019
Benzo[a]anthracene	ND		0.0057	0.019
Chrysene	0.0057	JQ	0.0057	0.019
Benzo[b]fluoranthene	ND		0.0057	0.019
Benzo[k]fluoranthene	ND		0.0057	0.019
Benzo[a]pyrene	ND		0.0057	0.019
Indeno[1,2,3-cd]pyrene	ND		0.0057	0.019
Dibenz(a,h)anthracene	ND		0.0057	0.019
Benzo[g,h,i]perylene	ND		0.0057	0.019

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	90		64 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7 Date Sampled: 06/17/2015 1535
Client Matrix: Water Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194108	Instrument ID:	TAC023
Prep Method:	3520C	Prep Batch:	580-193154	Lab File ID:	0707A026.D
Dilution:	1.0			Initial Weight/Volume:	1053.4 mL
Analysis Date:	07/07/2015 1845			Final Weight/Volume:	2.0 mL
Prep Date:	06/24/2015 1926			Injection Volume:	1 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.0068	0.019
2-Methylnaphthalene	ND		0.0057	0.025
1-Methylnaphthalene	ND		0.0057	0.019
Acenaphthylene	ND		0.0057	0.019
Acenaphthene	ND		0.0057	0.019
Fluorene	ND		0.0057	0.019
Phenanthrene	ND		0.0057	0.019
Anthracene	ND		0.0057	0.019
Fluoranthene	ND		0.0057	0.019
Pyrene	ND		0.0057	0.019
Benzo[a]anthracene	ND		0.0057	0.019
Chrysene	ND		0.0057	0.019
Benzo[b]fluoranthene	ND		0.0057	0.019
Benzo[k]fluoranthene	ND		0.0057	0.019
Benzo[a]pyrene	ND		0.0057	0.019
Indeno[1,2,3-cd]pyrene	ND		0.0057	0.019
Dibenz(a,h)anthracene	ND		0.0057	0.019
Benzo[g,h,i]perylene	ND		0.0057	0.019

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	92		64 - 150

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-193855	Instrument ID:	TAC023
Prep Method:	3550B	Prep Batch:	580-193625	Lab File ID:	0702A028.D
Dilution:	1.0			Initial Weight/Volume:	10.355 g
Analysis Date:	07/02/2015 2125			Final Weight/Volume:	10 mL
Prep Date:	06/30/2015 1229			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Naphthalene		~~ND~~		2.6	13
2-Methylnaphthalene		4.7	J	1.6	6.6
1-Methylnaphthalene		~~ND~~		2.0	13
Acenaphthylene		~~ND~~	~~F1~~	0.65	6.6
Acenaphthene		2.2	J ~~F1~~	1.0	6.6
Fluorene		2.8	J	0.83	6.6
Phenanthrene		36	~~F1 F2~~	2.0	13
Anthracene		3.1	J	0.98	6.6
Fluoranthene		48	F1 F2	1.1	6.6
Pyrene		35	F1 F2	2.0	13
Benzo[a]anthracene		21	F1 F2	2.0	13
Chrysene		26	F1 F2	1.2	6.6
Benzo[b]fluoranthene		26	~~F2~~	2.0	13
Benzo[k]fluoranthene		12	J	2.0	13
Benzo[a]pyrene		18	~~F2~~	1.2	6.6
Indeno[1,2,3-cd]pyrene		11		1.2	6.6
Dibenz(a,h)anthracene		4.2	J	1.2	6.6
Benzo[g,h,i]perylene		9.3	J	2.0	13

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	90		42 - 151

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244102**

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-193855	Instrument ID:	TAC023
Prep Method:	3550B	Prep Batch:	580-193625	Lab File ID:	0702A031.D
Dilution:	1.0			Initial Weight/Volume:	10.146 g
Analysis Date:	07/02/2015 2231			Final Weight/Volume:	10 mL
Prep Date:	06/30/2015 1229			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Naphthalene		ND		2.5	13
2-Methylnaphthalene		ND		1.5	6.4
1-Methylnaphthalene		ND		1.9	13
Acenaphthylene		ND		0.62	6.4
Acenaphthene		ND		0.98	6.4
Fluorene		0.86	J	0.80	6.4
Phenanthrene		4.9	J	1.9	13
Anthracene		0.99	J	0.94	6.4
Fluoranthene		2.6	J	1.1	6.4
Pyrene		3.0	J	1.9	13
Benzo[a]anthracene		ND		1.9	13
Chrysene		2.7	J	1.1	6.4
Benzo[b]fluoranthene		2.2	J	1.9	13
Benzo[k]fluoranthene		ND		1.9	13
Benzo[a]pyrene		ND		1.2	6.4
Indeno[1,2,3-cd]pyrene		ND		1.2	6.4
Dibenz(a,h)anthracene		ND		1.1	6.4
Benzo[g,h,i]perylene		ND		1.9	13

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	66		42 - 151

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244103**

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194026	Instrument ID:	TAC023
Prep Method:	3550B	Prep Batch:	580-193625	Lab File ID:	0706A007.D
Dilution:	1.0			Initial Weight/Volume:	10.659 g
Analysis Date:	07/06/2015 1136			Final Weight/Volume:	10 mL
Prep Date:	06/30/2015 1229			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Naphthalene		ND		3.9	19
2-Methylnaphthalene		2.6	J	2.3	9.7
1-Methylnaphthalene		ND		2.9	19
Acenaphthylene		ND		0.95	9.7
Acenaphthene		ND		1.5	9.7
Fluorene		ND		1.2	9.7
Phenanthrene		11	J	2.9	19
Anthracene		ND		1.4	9.7
Fluoranthene		2.0	J	1.7	9.7
Pyrene		3.8	J	2.9	19
Benzo[a]anthracene		ND		2.9	19
Chrysene		ND		1.7	9.7
Benzo[b]fluoranthene		ND		2.9	19
Benzo[k]fluoranthene		ND		2.9	19
Benzo[a]pyrene		ND		1.8	9.7
Indeno[1,2,3-cd]pyrene		ND		1.8	9.7
Dibenz(a,h)anthracene		ND		1.7	9.7
Benzo[g,h,i]perylene		ND		2.9	19

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	102		42 - 151

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194026	Instrument ID:	TAC023
Prep Method:	3550B	Prep Batch:	580-193625	Lab File ID:	0706A008.D
Dilution:	1.0			Initial Weight/Volume:	10.023 g
Analysis Date:	07/06/2015 1158			Final Weight/Volume:	10 mL
Prep Date:	06/30/2015 1229			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Naphthalene		ND		9.0	45
2-Methylnaphthalene		ND		5.4	22
1-Methylnaphthalene		ND		6.7	45
Acenaphthylene		ND		2.2	22
Acenaphthene		ND		3.5	22
Fluorene		ND		2.8	22
Phenanthrene		32	J	6.7	45
Anthracene		ND		3.3	22
Fluoranthene		4.9	J	3.9	22
Pyrene		9.6	J	6.7	45
Benzo[a]anthracene		ND		6.7	45
Chrysene		ND		4.0	22
Benzo[b]fluoranthene		ND		6.7	45
Benzo[k]fluoranthene		ND		6.7	45
Benzo[a]pyrene		ND		4.2	22
Indeno[1,2,3-cd]pyrene		ND		4.1	22
Dibenz(a,h)anthracene		ND		4.0	22
Benzo[g,h,i]perylene		ND		6.7	45

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	83		42 - 151

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244105**

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8270D SIM Semivolatile Organic Compounds (GC/MS SIM)

Analysis Method:	8270D SIM	Analysis Batch:	580-194026	Instrument ID:	TAC023
Prep Method:	3550B	Prep Batch:	580-193625	Lab File ID:	0706A009.D
Dilution:	1.0			Initial Weight/Volume:	10.266 g
Analysis Date:	07/06/2015 1220			Final Weight/Volume:	10 mL
Prep Date:	06/30/2015 1229			Injection Volume:	1 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Naphthalene		ND		5.4	27 U
2-Methylnaphthalene		ND		3.2	13
1-Methylnaphthalene		ND		4.0	27
Acenaphthylene		ND		1.3	13
Acenaphthene		ND		2.1	13
Fluorene		ND		1.7	13
Phenanthrene		7.6	J Q	4.0	27
Anthracene		ND		2.0	13 U
Fluoranthene		2.4	J Q	2.3	13
Pyrene		4.7	J Q	4.0	27
Benzo[a]anthracene		ND		4.0	27 U
Chrysene		ND		2.4	13
Benzo[b]fluoranthene		ND		4.0	27
Benzo[k]fluoranthene		ND		4.0	27
Benzo[a]pyrene		ND		2.5	13
Indeno[1,2,3-cd]pyrene		ND		2.5	13
Dibenz(a,h)anthracene		ND		2.4	13
Benzo[g,h,i]perylene		ND		4.0	27

Surrogate	%Rec	Qualifier	Acceptance Limits
Terphenyl-d14	87		42 - 151

MW 7-30-15

ecology and environment, inc.
Global Environmental Specialists

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MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Holy Cross-AK Big Lake Site, Holy Cross, Alaska**

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 5 soil and 7 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Target Analyte List (TAL) metals analyses (EPA Methods 6010C, 6020A, 7470A, and 7471A) were performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244101	15244102	15244103
15244104	15244105			

Data Qualifications:

1. Sample Holding Times: Acceptable.

All liquid samples were preserved to a pH < 2. The samples were maintained at < 6°C. The samples were collected on June 17 and 18, 2015, and were analyzed by July 15, 2015, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Satisfactory.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks that affected sample results except selenium (0.345 mg/kg) in the soil method blank; associated sample results less than five times the method blank result were qualified as not detected (U).

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Satisfactory.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike and spike duplicate recoveries were within the QC limits except copper (low recoveries) in the soil spike analyses. Copper soil results were qualified as estimated quantities (J or UJ) with a likely low bias.

9. Duplicate Analysis: Satisfactory.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits except calcium in the soil duplicate analysis. Positive calcium results in the soil samples were qualified as estimated quantities (J) and have a likely unknown bias.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: 15244116

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method: 6010C
Prep Method: 3005A
Dilution: 1.0
Analysis Date: 07/10/2015 1337
Prep Date: 07/10/2015 0647

Analysis Batch: 580-194560
Prep Batch: 580-194493

Instrument ID: TAC047
Lab File ID: 194443 475 482 493.a
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5 U
Calcium	15	B	0.023	1.1
Iron	ND		0.18	0.50 U
Magnesium	1.8		0.13	1.1
Potassium	2.0	J Q	0.15	3.3
Sodium	1.0	J Q	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method: 6020A
Prep Method: 3005A
Dilution: 5.0
Analysis Date: 07/10/2015 1607
Prep Date: 07/10/2015 0647

Analysis Batch: 580-194648
Prep Batch: 580-194493

Instrument ID: SEA044
Lab File ID: 054SMPL.D
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020 U
Arsenic	ND		0.0014	0.0050 U
Barium	0.012		0.00027	0.0060
Beryllium	ND		0.00051	0.0020 U
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	ND		0.00017	0.0020
Manganese	0.019		0.0018	0.010
Nickel	ND		0.0020	0.015 U
Selenium	ND		0.0015	0.0050
Silver	ND		0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	ND		0.0095	0.035

7470A Mercury (CVAA)

Analysis Method: 7470A
Prep Method: 7470A
Dilution: 1.0
Analysis Date: 07/15/2015 1033
Prep Date: 07/14/2015 1919

Analysis Batch: 580-194954
Prep Batch: 580-194856

Instrument ID: TAC104
Lab File ID: 194846-TAC104-FCW
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020 U

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2 Date Sampled: 06/17/2015 1510
Client Matrix: Water Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method:	6010C	Analysis Batch:	580-194560	Instrument ID:	TAC047
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	194443 475 482 493.a
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1341			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5
Calcium	16	B	0.023	1.1
Iron	ND		0.18	0.50
Magnesium	1.9		0.13	1.1
Potassium	2.1	J	0.15	3.3
Sodium	1.1	J	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method:	6020A	Analysis Batch:	580-194648	Instrument ID:	SEA044
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	055SMPL.D
Dilution:	5.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1614			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020
Arsenic	ND		0.0014	0.0050
Barium	0.012		0.00027	0.0060
Beryllium	ND		0.00051	0.0020
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	ND		0.00017	0.0020
Manganese	0.020		0.0018	0.010
Nickel	ND		0.0020	0.015
Selenium	ND		0.0015	0.0050
Silver	ND		0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	0.015	J	0.0095	0.035

7470A Mercury (CVAA)

Analysis Method:	7470A	Analysis Batch:	580-194954	Instrument ID:	TAC104
Prep Method:	7470A	Prep Batch:	580-194856	Lab File ID:	194846-TAC104-FCW
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/15/2015 1035			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1919				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244118

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method:	6010C	Analysis Batch:	580-194560	Instrument ID:	TAC047
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	194443 475 482 493.a
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1344			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5 U
Calcium	15	B	0.023	1.1
Iron	ND		0.18	0.50 U
Magnesium	1.8		0.13	1.1
Potassium	2.0	J Q	0.15	3.3
Sodium	1.1	J Q	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method:	6020A	Analysis Batch:	580-194648	Instrument ID:	SEA044
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	056SMPL.D
Dilution:	5.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1621			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020 U
Arsenic	ND		0.0014	0.0050 U
Barium	0.011		0.00027	0.0060
Beryllium	ND		0.00051	0.0020 U
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	ND		0.00017	0.0020
Manganese	0.022		0.0018	0.010
Nickel	ND		0.0020	0.015 U
Selenium	ND		0.0015	0.0050
Silver	ND		0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	ND		0.0095	0.035

7470A Mercury (CVAA)

Analysis Method:	7470A	Analysis Batch:	580-194954	Instrument ID:	TAC104
Prep Method:	7470A	Prep Batch:	580-194856	Lab File ID:	194846-TAC104-FCW
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/15/2015 1056			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1919				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020 U

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method: 6010C
Prep Method: 3005A
Dilution: 1.0
Analysis Date: 07/10/2015 1348
Prep Date: 07/10/2015 0647

Analysis Batch: 580-194560
Prep Batch: 580-194493

Instrument ID: TAC047
Lab File ID: 194443 475 482 493.a
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5 U
Calcium	15	B	0.023	1.1
Iron	ND		0.18	0.50 U
Magnesium	1.8		0.13	1.1
Potassium	2.0	J Q	0.15	3.3
Sodium	1.0	J Q	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method: 6020A
Prep Method: 3005A
Dilution: 5.0
Analysis Date: 07/10/2015 1629
Prep Date: 07/10/2015 0647

Analysis Batch: 580-194648
Prep Batch: 580-194493

Instrument ID: SEA044
Lab File ID: 057SMPL.D
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020 U
Arsenic	ND		0.0014	0.0050 U
Barium	0.013		0.00027	0.0060
Beryllium	ND		0.00051	0.0020 U
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	0.00022	J Q	0.00017	0.0020
Manganese	0.027		0.0018	0.010
Nickel	ND		0.0020	0.015 U
Selenium	ND		0.0015	0.0050
Silver	ND		0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	0.022	J Q	0.0095	0.035

7470A Mercury (CVAA)

Analysis Method: 7470A
Prep Method: 7470A
Dilution: 1.0
Analysis Date: 07/15/2015 1045
Prep Date: 07/14/2015 1919

Analysis Batch: 580-194954
Prep Batch: 580-194856

Instrument ID: TAC104
Lab File ID: 194846-TAC104-FCW
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020 U

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5 Date Sampled: 06/18/2015 1230
Client Matrix: Water Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method:	6010C	Analysis Batch:	580-194560	Instrument ID:	TAC047
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	194443 475 482 493.a
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1313			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5 U
Calcium	15	B	0.023	1.1
Iron	ND		0.18	0.50 U
Magnesium	1.8		0.13	1.1
Potassium	2.0	J Q	0.15	3.3
Sodium	1.0	J Q	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method:	6020A	Analysis Batch:	580-194648	Instrument ID:	SEA044
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	046SMPL.D
Dilution:	5.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1508			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020 U
Arsenic	ND		0.0014	0.0050 U
Barium	0.012		0.00027	0.0060
Beryllium	ND		0.00051	0.0020 U
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	0.00033	J Q	0.00017	0.0020
Manganese	0.022		0.0018	0.010
Nickel	ND		0.0020	0.015 U
Selenium	ND		0.0015	0.0050
Silver	ND		0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	0.021	J Q	0.0095	0.035

7470A Mercury (CVAA)

Analysis Method:	7470A	Analysis Batch:	580-194954	Instrument ID:	TAC104
Prep Method:	7470A	Prep Batch:	580-194856	Lab File ID:	194846-TAC104-FCW
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/15/2015 1023			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1919				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020 U

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6 Date Sampled: 06/17/2015 1440
Client Matrix: Water Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method:	6010C	Analysis Batch:	580-194560	Instrument ID:	TAC047
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	194443 475 482 493.a
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1351			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5
Calcium	15	B	0.023	1.1
Iron	0.19	J	0.18	0.50
Magnesium	1.8		0.13	1.1
Potassium	2.0	J	0.15	3.3
Sodium	1.0	J	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method:	6020A	Analysis Batch:	580-194648	Instrument ID:	SEA044
Prep Method:	3005A	Prep Batch:	580-194493	Lab File ID:	058SMPL.D
Dilution:	5.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/10/2015 1636			Final Weight/Volume:	50 mL
Prep Date:	07/10/2015 0647				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020
Arsenic	ND		0.0014	0.0050
Barium	0.012		0.00027	0.0060
Beryllium	ND		0.00051	0.0020
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	ND		0.00017	0.0020
Manganese	0.043		0.0018	0.010
Nickel	ND		0.0020	0.015
Selenium	ND		0.0015	0.0050
Silver	0.00036	J	0.00015	0.0020
Thallium	ND		0.00071	0.0050
Vanadium	ND		0.0049	0.020
Zinc	ND		0.0095	0.035

7470A Mercury (CVAA)

Analysis Method:	7470A	Analysis Batch:	580-194954	Instrument ID:	TAC104
Prep Method:	7470A	Prep Batch:	580-194856	Lab File ID:	194846-TAC104-FCW
Dilution:	1.0			Initial Weight/Volume:	50 mL
Analysis Date:	07/15/2015 1047			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1919				

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020

7/27/2015

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7 Date Sampled: 06/17/2015 1535
Client Matrix: Water Date Received: 06/20/2015 1045

6010C Metals (ICP)-Total Recoverable

Analysis Method: 6010C Analysis Batch: 580-194560 Instrument ID: TAC047
Prep Method: 3005A Prep Batch: 580-194493 Lab File ID: 194443 475 482 493.a
Dilution: 1.0 Initial Weight/Volume: 50 mL
Analysis Date: 07/10/2015 1354 Final Weight/Volume: 50 mL
Prep Date: 07/10/2015 0647

Analyte	Result (mg/L)	Qualifier	MDL	RL
Aluminum	ND		0.19	1.5 U
Calcium	15	B	0.023	1.1
Iron	ND		0.18	0.50 U
Magnesium	1.9		0.13	1.1
Potassium	2.1	J Q	0.15	3.3
Sodium	1.1	J Q	0.55	2.0

6020A Metals (ICP/MS)-Total Recoverable

Analysis Method: 6020A Analysis Batch: 580-194648 Instrument ID: SEA044
Prep Method: 3005A Prep Batch: 580-194493 Lab File ID: 059SMPL.D
Dilution: 5.0 Initial Weight/Volume: 50 mL
Analysis Date: 07/10/2015 1643 Final Weight/Volume: 50 mL
Prep Date: 07/10/2015 0647

Analyte	Result (mg/L)	Qualifier	MDL	RL
Antimony	ND		0.00040	0.0020 U
Arsenic	ND		0.0014	0.0050 U
Barium	0.012		0.00027	0.0060
Beryllium	ND		0.00051	0.0020 U
Cadmium	ND		0.00014	0.0020
Chromium	ND		0.00071	0.0020
Cobalt	ND		0.00016	0.0020
Copper	ND		0.0030	0.010
Lead	ND		0.00017	0.0020
Manganese	0.021		0.0018	0.010
Nickel	ND		0.0020	0.015 U
Selenium	ND		0.0015	0.0050 U
Silver	0.00025	J Q	0.00015	0.0020
Thallium	ND		0.00071	0.0050 U
Vanadium	ND		0.0049	0.020
Zinc	ND		0.0095	0.035

7470A Mercury (CVAA)

Analysis Method: 7470A Analysis Batch: 580-194954 Instrument ID: TAC104
Prep Method: 7470A Prep Batch: 580-194856 Lab File ID: 194846-TAC104-FCW
Dilution: 1.0 Initial Weight/Volume: 50 mL
Analysis Date: 07/15/2015 1049 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1919

Analyte	Result (mg/L)	Qualifier	MDL	RL
Mercury	ND		0.000041	0.00020 U

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	580-195013	Instrument ID:	TAC047
Prep Method:	3050B	Prep Batch:	580-194829	Lab File ID:	194829 900 865.asc
Dilution:	1.0			Initial Weight/Volume:	1.2698 g
Analysis Date:	07/15/2015 1224			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1535				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		14000		11	81
Calcium		9700	J F1 MV	5.6	59
Iron		32000		6.0	27
Magnesium		8500		8.5	59
Potassium		820		17	180
Sodium		120		47	110

6020 Metals (ICP/MS)

Analysis Method:	6020	Analysis Batch:	580-194965	Instrument ID:	SEA103
Prep Method:	3050B	Prep Batch:	580-194829	Lab File ID:	087SAMP.D
Dilution:	10			Initial Weight/Volume:	1.2698 g
Analysis Date:	07/15/2015 1348			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1535				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Arsenic		9.9		0.19	0.54
Antimony		0.29		0.045	0.21
Barium		110		0.084	0.54
Beryllium		0.74		0.038	0.21
Cadmium		0.60		0.020	0.21
Chromium		35		0.068	0.54
Cobalt		20		0.020	0.21
Copper		50	J F1 MV	0.11	0.43
Lead		7.1		0.052	0.54
Manganese		1500		0.18	1.1
Nickel		37		0.087	0.54
Selenium		1.3 U	B MV	0.22	1.1
Silver		0.092	J Q	0.013	0.21
Thallium		~~ND~~ MV		0.14	0.43 U
Vanadium		60		0.51	2.1
Zinc		100		1.2	5.4

7471A Mercury (CVAA)

Analysis Method:	7471A	Analysis Batch:	580-194518	Instrument ID:	TAC103
Prep Method:	7471A	Prep Batch:	580-194455	Lab File ID:	194455-TAC103-FCW
Dilution:	1.0			Initial Weight/Volume:	0.8813 g
Analysis Date:	07/09/2015 1750			Final Weight/Volume:	50 mL
Prep Date:	07/09/2015 1449				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.052		0.0056	0.019

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	580-195013	Instrument ID:	TAC047
Prep Method:	3050B	Prep Batch:	580-194829	Lab File ID:	194829 900 865.asc
Dilution:	1.0			Initial Weight/Volume:	1.1255 g
Analysis Date:	07/15/2015 1250			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1535				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		11000		11	86
Calcium		4300	J	6.0	63
Iron		30000		6.4	29
Magnesium		7500		9.1	63
Potassium		580		18	190
Sodium		70	J Q	50	110

6020 Metals (ICP/MS)

Analysis Method:	6020	Analysis Batch:	580-194965	Instrument ID:	SEA103
Prep Method:	3050B	Prep Batch:	580-194829	Lab File ID:	094SAMP.D
Dilution:	10			Initial Weight/Volume:	1.1255 g
Analysis Date:	07/15/2015 1416			Final Weight/Volume:	50 mL
Prep Date:	07/14/2015 1535				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Arsenic		11		0.21	0.57
Antimony		0.26		0.048	0.23
Barium		71		0.090	0.57
Beryllium		0.45		0.040	0.23
Cadmium		0.35		0.022	0.23
Chromium		28		0.072	0.57
Cobalt		15		0.022	0.23
Copper		39	J	0.11	0.46
Lead		6.4		0.055	0.57
Manganese		1100		0.20	1.1
Nickel		28		0.093	0.57
Selenium		~~1.0~~	~~J B~~ MW	0.23	1.1 U
Silver		0.089	J Q	0.014	0.23
Thallium		~~ND~~ MW		0.15	0.46 U
Vanadium		48		0.54	2.3
Zinc		75		1.3	5.7

7471A Mercury (CVAA)

Analysis Method:	7471A	Analysis Batch:	580-194518	Instrument ID:	TAC103
Prep Method:	7471A	Prep Batch:	580-194455	Lab File ID:	194455-TAC103-FCW
Dilution:	1.0			Initial Weight/Volume:	0.6901 g
Analysis Date:	07/09/2015 1800			Final Weight/Volume:	50 mL
Prep Date:	07/09/2015 1449				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.018	J Q	0.0067	0.022

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244103**

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

6010C Metals (ICP)

Analysis Method: 6010C Analysis Batch: 580-195013 Instrument ID: TAC047
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 194829 900 865.asc
Dilution: 1.0 Initial Weight/Volume: 1.5209 g
Analysis Date: 07/15/2015 1254 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		12000		13	100
Calcium		4100	J	7.0	75
Iron		31000		7.6	34
Magnesium		7200		11	75
Potassium		760		22	220
Sodium		78	J Q	59	140

6020 Metals (ICP/MS)

Analysis Method: 6020 Analysis Batch: 580-194965 Instrument ID: SEA103
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 095SAMP.D
Dilution: 10 Initial Weight/Volume: 1.5209 g
Analysis Date: 07/15/2015 1420 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Arsenic		10		0.24	0.68
Antimony		0.32		0.057	0.27
Barium		84		0.11	0.68
Beryllium		0.49		0.047	0.27
Cadmium		0.31		0.026	0.27
Chromium		26		0.085	0.68
Cobalt		16		0.026	0.27
Copper		48	J	0.13	0.54
Lead		6.3		0.065	0.68
Manganese		910		0.23	1.4
Nickel		31		0.11	0.68
Selenium		~~1.2~~	~~J B~~ MW	0.27	1.4 U
Silver		0.068	J Q	0.016	0.27
Thallium		~~ND~~ MW		0.18	0.54 U
Vanadium		43		0.64	2.7
Zinc		79		1.5	6.8

7471A Mercury (CVAA)

Analysis Method: 7471A Analysis Batch: 580-194518 Instrument ID: TAC103
Prep Method: 7471A Prep Batch: 580-194455 Lab File ID: 194455-TAC103-FCW
Dilution: 1.0 Initial Weight/Volume: 0.6181 g
Analysis Date: 07/09/2015 1803 Final Weight/Volume: 50 mL
Prep Date: 07/09/2015 1449

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.055		0.012	0.040

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

6010C Metals (ICP)

Analysis Method: 6010C Analysis Batch: 580-195013 Instrument ID: TAC047
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 194829 900 865.asc
Dilution: 1.0 Initial Weight/Volume: 1.4026 g
Analysis Date: 07/15/2015 1256 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		9000	J	32	240
Calcium		7200		17	180
Iron		22000		18	80
Magnesium		5200		25	180
Potassium		780		51	530
Sodium		~~ND~~		140	320 U

6020 Metals (ICP/MS)

Analysis Method: 6020 Analysis Batch: 580-194965 Instrument ID: SEA103
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 096SAMP.D
Dilution: 10 Initial Weight/Volume: 1.4026 g
Analysis Date: 07/15/2015 1424 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Arsenic		5.5		0.58	1.6
Antimony		0.47	JQ	0.13	0.64
Barium		91		0.25	1.6
Beryllium		0.40	JQ	0.11	0.64
Cadmium		0.43	JQ	0.061	0.64
Chromium		18		0.20	1.6
Cobalt		10		0.061	0.64
Copper		35	J	0.31	1.3
Lead		5.6		0.15	1.6
Manganese		920		0.54	3.2
Nickel		22		0.26	1.6
Selenium		~~1.4~~	LB	0.65	3.2 U
Silver		0.087	JQ	0.038	0.64
Thallium		~~ND~~		0.42	1.3 U
Vanadium		39		1.5	6.4
Zinc		76		3.6	16

7471A Mercury (CVAA)

Analysis Method: 7471A Analysis Batch: 580-194518 Instrument ID: TAC103
Prep Method: 7471A Prep Batch: 580-194455 Lab File ID: 194455-TAC103-FCW
Dilution: 1.0 Initial Weight/Volume: 0.7250 g
Analysis Date: 07/09/2015 1806 Final Weight/Volume: 50 mL
Prep Date: 07/09/2015 1449

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.047	JQ	0.022	0.074

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244105**

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

6010C Metals (ICP)

Analysis Method: 6010C Analysis Batch: 580-195013 Instrument ID: TAC047
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 194829 900 865.asc
Dilution: 1.0 Initial Weight/Volume: 1.3561 g
Analysis Date: 07/15/2015 1259 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		9800		20	150
Calcium		7000	J	11	110
Iron		25000		11	51
Magnesium		5200		16	110
Potassium		920		33	340
Sodium		97	J Q	89	200

6020 Metals (ICP/MS)

Analysis Method: 6020 Analysis Batch: 580-194965 Instrument ID: SEA103
Prep Method: 3050B Prep Batch: 580-194829 Lab File ID: 097SAMP.D
Dilution: 10 Initial Weight/Volume: 1.3561 g
Analysis Date: 07/15/2015 1429 Final Weight/Volume: 50 mL
Prep Date: 07/14/2015 1535

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Arsenic		6.2		0.37	1.0
Antimony		0.49		0.086	0.41
Barium		95		0.16	1.0
Beryllium		0.45		0.071	0.41
Cadmium		0.39	J Q	0.039	0.41
Chromium		19		0.13	1.0
Cobalt		13		0.039	0.41
Copper		35	J	0.20	0.82
Lead		7.2		0.098	1.0
Manganese		890		0.35	2.0
Nickel		24		0.17	1.0
Selenium		~~4.3~~	~~J B~~	0.41	2.0 U
Silver		0.067	J Q	0.025	0.41
Thallium		~~ND~~		0.27	0.82 U
Vanadium		38		0.97	4.1
Zinc		75		2.3	10

7471A Mercury (CVAA)

Analysis Method: 7471A Analysis Batch: 580-194518 Instrument ID: TAC103
Prep Method: 7471A Prep Batch: 580-194455 Lab File ID: 194455-TAC103-FCW
Dilution: 1.0 Initial Weight/Volume: 0.7368 g
Analysis Date: 07/09/2015 1808 Final Weight/Volume: 50 mL
Prep Date: 07/09/2015 1449

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.075		0.014	0.045

MW 7-30-15

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington

SUBJ: **Organic Data Quality Assurance Review,**
Holy Cross-AK Big Lake Site, Holy Cross, Alaska

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 5 soil and 9 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Volatile Organic Compound (VOC) analysis (EPA Method 8260) was performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2B and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244123	15244124	15244101
15244102	15244103	15244104	15244105	

Data Qualifications:

1. **Sample Holding Times: Satisfactory.**

The samples were maintained and received within the QC limits of < 6°C. The samples were collected on June 17 and 18, 2015, and were analyzed by July 9, 2015, therefore generally meeting QC criteria of less than 14 days between collection and analysis for soil and preserved water samples; samples that exceeded holding time limits (15244121, 15244122, 15244123 and 15244124) were qualified as estimated quantities (J or UJ) with a likely low bias. Samples 15244116, 15244117, 15244118, 15244119, 15244120, 15244121, 15244122, 15244123 and 15244124 were initially analyzed on an instrument that was not calibrated for tetrachloroethene. The samples were re-analyzed for tetrachloroethene outside of holding time and were qualified as estimated quantities (J or UJ) with a likely low bias.

2. **Tuning: Acceptable.**

Tuning was performed at the beginning of each 12-hour analysis sequence. All results were within QC limits.

3. **Initial Calibration: Satisfactory.**

All average Relative Response Factors (RRFs) were within the QC limits except vinyl chloride, bromomethane, and chloroethane associated with samples 15244101 through 15244105 and chloroethane associated with samples 15244116 through 15244124; associated positive sample results were qualified as estimated quantities (J) with a likely low bias and sample quantitation limits were rejected (R). All Relative Standard Deviations (RSDs) were within the QC limits.

4. Continuing Calibration: Satisfactory.

All RRFs were within the QC limits except chloroethane and bromomethane associated with samples 15244101 through 15244103 and chloroethane associated with samples 15244104, 15244105, and 15244116 through 15244124; associated positive sample results were qualified as estimated quantities (J) with a likely low bias and sample quantitation limits were rejected (R). All % differences were within the QC limits except low recoveries for dichlorodifluoromethane, chloromethane, and chloroethane associated with samples 15244101 through 15244105 and a low recovery for chloroethane and high recoveries for 1,1-dichloroethane, 2,2-dichloropropane, 1,1,1-trichloroethane, carbon tetrachloride, 1,1,1,2-tetrachloroethane, 1,1,2,2,-tetrachloroethane, and hexachlorobutadiene associated with samples 15244116 through 15244124. No actions were taken based on the high recovery outliers as they were not detected in any associated samples. Positive results and sample quantitation limits for the low recovery outliers were qualified as estimated (J or UJ) with a likely low bias.

5. Blanks: Satisfactory.

A method blank was analyzed for each 20 sample batch per matrix. There were no detections in any method blank except 1,2,3-trichlorobenzene (4.22 ug/kg), ethylbenzene (2.60 ug/kg), m&p-xylenes (4.68 ug/kg), naphthalene (7.82 ug/kg), tetrachloroethene (5.39 ug/kg), toluene (3.47 ug/kg), and the TIC 1,2,3-trimethylbenzene (2.9 ug/kg) in the June 30, 2015, soil method blank. Associated sample results less than 5 times the blank contamination (10 times for common laboratory contaminants) were qualified as not detected (U).

6. System Monitoring Compounds (SMCs): Acceptable.

All SMC recoveries were within QC limits except a high recovery of dibromofluoromethane in sample 15244123 (tetrachloroethene only); no actions were taken since tetrachloroethene was not detected in the sample.

7. Matrix Spike (MS)/Matrix Spike Duplicate (MSD) Analysis: Satisfactory.

MS and MSD analyses were performed per SDG or per matrix per concentration level, whichever was more frequent. 1,1,2-Trichloroethane, 1,2,3-trichloropropane, 1,2-dibromoethane, 1,3-dichloropropane, chloroethane and trichlorofluoromethane had low recoveries associated with sample 15244122; associated positive results and sample quantitation limits were qualified as estimated quantities (J or UJ) in sample 15244122 with a likely low bias. Several analytes in the soil and water MS/MSD and water blank spike analyses had recoveries greater than QC limits; no actions were taken as none of these analytes were detected in the original samples.

8. Duplicate Analysis: Satisfactory.

Laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits except chloroethane in the water blank spike duplicate; positive water chloroethane results were qualified as estimated quantities (J) with a likely unknown bias.

9. Internal Standards: Acceptable.

All internal standards were within $\pm$ 30 seconds of the continuing calibration internal standard retention times. All area counts were within 50 % to 200 % of the continuing calibration area counts.

10. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

11. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

12. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222579.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2211			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2211				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	*	0.48	2.0
1,1,1-Trichloroethane	ND	*	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	*	0.24	1.0
1,1,2-Trichloroethane	ND		0.24	1.0
1,1-Dichloroethane	ND		0.44	2.0
1,1-Dichloroethene	ND		0.33	2.0
1,1-Dichloropropene	ND	*	0.50	3.0
1,2,3-Trichlorobenzene	ND		0.32	2.0
1,2,3-Trichloropropane	ND		0.41	2.0
1,2,4-Trichlorobenzene	ND		0.23	1.0
1,2,4-Trimethylbenzene	ND		0.50	3.0
1,2-Dibromo-3-Chloropropane	ND		0.40	2.0
1,2-Dibromoethane	ND		0.15	1.0
1,2-Dichlorobenzene	ND	*	0.35	2.0
1,2-Dichloroethane	ND		0.16	1.0
1,2-Dichloropropane	ND		0.18	1.0
1,3,5-Trimethylbenzene	ND		0.50	3.0
1,3-Dichlorobenzene	ND		0.44	2.0
1,3-Dichloropropane	ND		0.15	1.0
1,4-Dichlorobenzene	ND		0.39	2.0
2,2-Dichloropropane	ND	*	0.68	3.0
2-Chlorotoluene	ND	*	0.52	3.0
4-Chlorotoluene	ND		0.46	2.0
4-Isopropyltoluene	ND		0.53	3.0
Benzene	ND		0.42	2.0
Bromobenzene	ND	*	0.42	2.0
Bromochloromethane	ND		0.29	2.0
Bromodichloromethane	ND		0.30	2.0
Bromoform	ND		0.21	1.0
Bromomethane	ND		0.27	5.0
Carbon tetrachloride	ND	*	0.55	3.0
Chlorobenzene	ND	*	0.42	2.0
Chloroethane	ND		0.40	5.0
Chloroform	ND		0.17	1.0
Chloromethane	ND		0.64	5.0
cis-1,2-Dichloroethene	ND		0.21	1.0
cis-1,3-Dichloropropene	ND	*	0.20	1.0
Dibromochloromethane	ND		0.20	1.0
Dibromomethane	ND		0.14	1.0
Dichlorodifluoromethane	ND		0.31	2.0
Ethylbenzene	ND		0.51	3.0
Hexachlorobutadiene	ND		0.49	2.0
Isopropylbenzene	ND		0.30	2.0
Methyl tert-butyl ether	ND		0.17	1.0
Methylene Chloride	ND		1.3	5.0
m-Xylene & p-Xylene	ND		0.13	3.0

MW 7-20-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222579.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2211			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2211				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.26	2.0
n-Butylbenzene	ND		0.63	3.0
N-Propylbenzene	ND		0.57	3.0
o-Xylene	ND		0.49	2.0
sec-Butylbenzene	ND		0.53	3.0
Styrene	ND		0.62	5.0
t-Butylbenzene	ND		0.53	3.0
Toluene	ND		0.44	2.0
trans-1,2-Dichloroethene	ND		0.24	1.0
trans-1,3-Dichloropropene	ND		0.16	1.0
Trichloroethene	ND		0.51	3.0
Diisopropyl ether	ND		0.12	1.0
Trichlorofluoromethane	ND		0.63	3.0
Vinyl chloride	ND		0.22	1.0
Ethyl t-butyl ether	ND		0.34	5.0
Tert-amyl methyl ether	ND		0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	101		70 - 120
4-Bromofluorobenzene (Surr)	102		75 - 120
Dibromofluoromethane (Surr)	100		85 - 115
Toluene-d8 (Surr)	105		85 - 120
Trifluorotoluene (Surr)	99		70 - 136

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222579.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2211			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2211				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194396	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359534.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/09/2015 2232			Final Weight/Volume:	5 mL
Prep Date:	07/09/2015 2232				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	~~H~~	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	85		70 - 120
4-Bromofluorobenzene (Surr)	94		75 - 120
Dibromofluoromethane (Surr)	93		85 - 115
Toluene-d8 (Surr)	86		85 - 120
Trifluorotoluene (Surr)	102		70 - 136

7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: 5030B
Dilution: 1.0
Analysis Date: 07/01/2015 2241
Prep Date: 07/01/2015 2241

Analysis Batch: 580-193774
Prep Batch: N/A

Instrument ID: TAC003
Lab File ID: MS222580.D
Initial Weight/Volume: 10 mL
Final Weight/Volume: 10 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	*	0.48	2.0
1,1,1-Trichloroethane	ND	*	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	*	0.24	1.0
1,1,2-Trichloroethane	ND		0.24	1.0
1,1-Dichloroethane	ND		0.44	2.0
1,1-Dichloroethene	ND		0.33	2.0
1,1-Dichloropropene	ND	*	0.50	3.0
1,2,3-Trichlorobenzene	ND		0.32	2.0
1,2,3-Trichloropropane	ND		0.41	2.0
1,2,4-Trichlorobenzene	ND		0.23	1.0
1,2,4-Trimethylbenzene	ND		0.50	3.0
1,2-Dibromo-3-Chloropropane	ND		0.40	2.0
1,2-Dibromoethane	ND		0.15	1.0
1,2-Dichlorobenzene	ND	*	0.35	2.0
1,2-Dichloroethane	ND		0.16	1.0
1,2-Dichloropropane	ND		0.18	1.0
1,3,5-Trimethylbenzene	ND		0.50	3.0
1,3-Dichlorobenzene	ND		0.44	2.0
1,3-Dichloropropane	ND		0.15	1.0
1,4-Dichlorobenzene	ND		0.39	2.0
2,2-Dichloropropane	ND	*	0.68	3.0
2-Chlorotoluene	ND	*	0.52	3.0
4-Chlorotoluene	ND		0.46	2.0
4-Isopropyltoluene	ND		0.53	3.0
Benzene	ND		0.42	2.0
Bromobenzene	ND	*	0.42	2.0
Bromochloromethane	ND		0.29	2.0
Bromodichloromethane	ND	*	0.30	2.0
Bromoform	ND		0.21	1.0
Bromomethane	ND		0.27	5.0
Carbon tetrachloride	ND	*	0.55	3.0
Chlorobenzene	ND	*	0.42	2.0
Chloroethane	ND		0.40	5.0
Chloroform	ND		0.17	1.0
Chloromethane	ND		0.64	5.0
cis-1,2-Dichloroethene	ND		0.21	1.0
cis-1,3-Dichloropropene	ND		0.20	1.0
Dibromochloromethane	ND		0.20	1.0
Dibromomethane	ND		0.14	1.0
Dichlorodifluoromethane	ND		0.31	2.0
Ethylbenzene	ND		0.51	3.0
Hexachlorobutadiene	ND		0.49	2.0
Isopropylbenzene	ND		0.30	2.0
Methyl tert-butyl ether	ND		0.17	1.0
Methylene Chloride	ND		1.3	5.0
m-Xylene & p-Xylene	ND		0.13	3.0

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222580.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2241			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2241				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.26	2.0
n-Butylbenzene	ND		0.63	3.0
N-Propylbenzene	ND		0.57	3.0
o-Xylene	ND		0.49	2.0
sec-Butylbenzene	ND		0.53	3.0
Styrene	ND		0.62	5.0
t-Butylbenzene	ND		0.53	3.0
Toluene	ND		0.44	2.0
trans-1,2-Dichloroethene	ND		0.24	1.0
trans-1,3-Dichloropropene	ND		0.16	1.0
Trichloroethene	ND		0.51	3.0
Diisopropyl ether	ND		0.12	1.0
Trichlorofluoromethane	ND		0.63	3.0
Vinyl chloride	ND		0.22	1.0
Ethyl t-butyl ether	ND		0.34	5.0
Tert-amyl methyl ether	ND		0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	101		70 - 120
4-Bromofluorobenzene (Surr)	101		75 - 120
Dibromofluoromethane (Surr)	100		85 - 115
Toluene-d8 (Surr)	103		85 - 120
Trifluorotoluene (Surr)	100		70 - 136

7-2015

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222580.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2241			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2241				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359512.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2159			Final Weight/Volume:	5 mL
Prep Date:	07/08/2015 2159				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	H	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	99		70 - 120
4-Bromofluorobenzene (Surr)	106		75 - 120
Dibromofluoromethane (Surr)	105		85 - 115
Toluene-d8 (Surr)	100		85 - 120
Trifluorotoluene (Surr)	94		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: 5030B
Dilution: 1.0
Analysis Date: 07/01/2015 2308
Prep Date: 07/01/2015 2308

Analysis Batch: 580-193774
Prep Batch: N/A

Instrument ID: TAC003
Lab File ID: MS222581.D
Initial Weight/Volume: 10 mL
Final Weight/Volume: 10 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND		0.48	2.0
1,1,1-Trichloroethane	ND		0.58	3.0
1,1,2,2-Tetrachloroethane	ND		0.24	1.0
1,1,2-Trichloroethane	ND		0.24	1.0
1,1-Dichloroethane	ND		0.44	2.0
1,1-Dichloroethene	ND		0.33	2.0
1,1-Dichloropropene	ND		0.50	3.0
1,2,3-Trichlorobenzene	ND		0.32	2.0
1,2,3-Trichloropropane	ND		0.41	2.0
1,2,4-Trichlorobenzene	ND		0.23	1.0
1,2,4-Trimethylbenzene	ND		0.50	3.0
1,2-Dibromo-3-Chloropropane	ND		0.40	2.0
1,2-Dibromoethane	ND		0.15	1.0
1,2-Dichlorobenzene	ND		0.35	2.0
1,2-Dichloroethane	ND		0.16	1.0
1,2-Dichloropropane	ND		0.18	1.0
1,3,5-Trimethylbenzene	ND		0.50	3.0
1,3-Dichlorobenzene	ND		0.44	2.0
1,3-Dichloropropane	ND		0.15	1.0
1,4-Dichlorobenzene	ND		0.39	2.0
2,2-Dichloropropane	ND		0.68	3.0
2-Chlorotoluene	ND		0.52	3.0
4-Chlorotoluene	ND		0.46	2.0
4-Isopropyltoluene	ND		0.53	3.0
Benzene	ND		0.42	2.0
Bromobenzene	ND		0.42	2.0
Bromochloromethane	ND		0.29	2.0
Bromodichloromethane	ND		0.30	2.0
Bromoform	ND		0.21	1.0
Bromomethane	ND		0.27	5.0
Carbon tetrachloride	ND		0.55	3.0
Chlorobenzene	ND		0.42	2.0
Chloroethane	ND		0.40	5.0
Chloroform	ND		0.17	1.0
Chloromethane	ND		0.64	5.0
cis-1,2-Dichloroethene	ND		0.21	1.0
cis-1,3-Dichloropropene	ND		0.20	1.0
Dibromochloromethane	ND		0.20	1.0
Dibromomethane	ND		0.14	1.0
Dichlorodifluoromethane	ND		0.31	2.0
Ethylbenzene	ND		0.51	3.0
Hexachlorobutadiene	ND		0.49	2.0
Isopropylbenzene	ND		0.30	2.0
Methyl tert-butyl ether	ND		0.17	1.0
Methylene Chloride	ND		1.3	5.0
m-Xylene & p-Xylene	ND		0.13	3.0

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222581.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2308			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2308				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.26	2.0
n-Butylbenzene	ND		0.63	3.0
N-Propylbenzene	ND		0.57	3.0
o-Xylene	ND		0.49	2.0
sec-Butylbenzene	ND		0.53	3.0
Styrene	ND		0.62	5.0
t-Butylbenzene	ND		0.53	3.0
Toluene	ND		0.44	2.0
trans-1,2-Dichloroethene	ND		0.24	1.0
trans-1,3-Dichloropropene	ND		0.16	1.0
Trichloroethene	ND		0.51	3.0
Diisopropyl ether	ND		0.12	1.0
Trichlorofluoromethane	ND		0.63	3.0
Vinyl chloride	ND		0.22	1.0
Ethyl t-butyl ether	ND		0.34	5.0
Tert-amyl methyl ether	ND		0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	101		70 - 120
4-Bromofluorobenzene (Surr)	102		75 - 120
Dibromofluoromethane (Surr)	101		85 - 115
Toluene-d8 (Surr)	102		85 - 120
Trifluorotoluene (Surr)	100		70 - 136

7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222581.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2308			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2308				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3 Date Sampled: 06/17/2015 1600
Client Matrix: Water Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359513.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2226			Final Weight/Volume:	5 mL
Prep Date:	07/08/2015 2226				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	~~H~~	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	97		70 - 120
4-Bromofluorobenzene (Surr)	87		75 - 120
Dibromofluoromethane (Surr)	111		85 - 115
Toluene-d8 (Surr)	101		85 - 120
Trifluorotoluene (Surr)	95		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: 15244119

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222582.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2335			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2335				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND		0.48	2.0
1,1,1-Trichloroethane	ND		0.58	3.0
1,1,2,2-Tetrachloroethane	ND		0.24	1.0
1,1,2-Trichloroethane	ND		0.24	1.0
1,1-Dichloroethane	ND		0.44	2.0
1,1-Dichloroethene	ND		0.33	2.0
1,1-Dichloropropene	ND		0.50	3.0
1,2,3-Trichlorobenzene	ND		0.32	2.0
1,2,3-Trichloropropane	ND		0.41	2.0
1,2,4-Trichlorobenzene	ND		0.23	1.0
1,2,4-Trimethylbenzene	ND		0.50	3.0
1,2-Dibromo-3-Chloropropane	ND		0.40	2.0
1,2-Dibromoethane	ND		0.15	1.0
1,2-Dichlorobenzene	ND		0.35	2.0
1,2-Dichloroethane	ND		0.16	1.0
1,2-Dichloropropane	ND		0.18	1.0
1,3,5-Trimethylbenzene	ND		0.50	3.0
1,3-Dichlorobenzene	ND		0.44	2.0
1,3-Dichloropropane	ND		0.15	1.0
1,4-Dichlorobenzene	ND		0.39	2.0
2,2-Dichloropropane	ND		0.68	3.0
2-Chlorotoluene	ND		0.52	3.0
4-Chlorotoluene	ND		0.46	2.0
4-Isopropyltoluene	ND		0.53	3.0
Benzene	ND		0.42	2.0
Bromobenzene	ND		0.42	2.0
Bromochloromethane	ND		0.29	2.0
Bromodichloromethane	ND		0.30	2.0
Bromoform	ND		0.21	1.0
Bromomethane	ND		0.27	5.0
Carbon tetrachloride	ND		0.55	3.0
Chlorobenzene	ND		0.42	2.0
Chloroethane	ND		0.40	5.0
Chloroform	ND		0.17	1.0
Chloromethane	ND		0.64	5.0
cis-1,2-Dichloroethene	ND		0.21	1.0
cis-1,3-Dichloropropene	ND		0.20	1.0
Dibromochloromethane	ND		0.20	1.0
Dibromomethane	ND		0.14	1.0
Dichlorodifluoromethane	ND		0.31	2.0
Ethylbenzene	ND		0.51	3.0
Hexachlorobutadiene	ND		0.49	2.0
Isopropylbenzene	ND		0.30	2.0
Methyl tert-butyl ether	ND		0.17	1.0
Methylene Chloride	ND		1.3	5.0
m-Xylene & p-Xylene	ND		0.13	3.0

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222582.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2335			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2335				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND		0.26	2.0
n-Butylbenzene	ND		0.63	3.0
N-Propylbenzene	ND		0.57	3.0
o-Xylene	ND		0.49	2.0
sec-Butylbenzene	ND		0.53	3.0
Styrene	ND		0.62	5.0
t-Butylbenzene	ND		0.53	3.0
Toluene	ND		0.44	2.0
trans-1,2-Dichloroethene	ND		0.24	1.0
trans-1,3-Dichloropropene	ND		0.16	1.0
Trichloroethene	ND		0.51	3.0
Diisopropyl ether	ND		0.12	1.0
Trichlorofluoromethane	ND		0.63	3.0
Vinyl chloride	ND		0.22	1.0
Ethyl t-butyl ether	ND		0.34	5.0
Tert-amyl methyl ether	ND		0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	100		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	100		85 - 115
Toluene-d8 (Surr)	102		85 - 120
Trifluorotoluene (Surr)	101		70 - 136

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222582.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/01/2015 2335			Final Weight/Volume:	10 mL
Prep Date:	07/01/2015 2335				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359514.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2252			Final Weight/Volume:	5 mL
Prep Date:	07/08/2015 2252				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	ND	U	0.75	3.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	96		70 - 120
4-Bromofluorobenzene (Surr)	102		75 - 120
Dibromofluoromethane (Surr)	106		85 - 115
Toluene-d8 (Surr)	98		85 - 120
Trifluorotoluene (Surr)	95		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222586.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0125			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0125				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	F1 *	0.48	2.0
1,1,1-Trichloroethane	ND	F1 *	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	F1 *	0.24	1.0
1,1,2-Trichloroethane	ND		0.24	1.0
1,1-Dichloroethane	ND		0.44	2.0
1,1-Dichloroethene	ND	F1	0.33	2.0
1,1-Dichloropropene	ND	F1 *	0.50	3.0
1,2,3-Trichlorobenzene	ND	F1	0.32	2.0
1,2,3-Trichloropropane	ND	F1	0.41	2.0
1,2,4-Trichlorobenzene	ND	F1	0.23	1.0
1,2,4-Trimethylbenzene	ND	F1	0.50	3.0
1,2-Dibromo-3-Chloropropane	ND	F1	0.40	2.0
1,2-Dibromoethane	ND	F1	0.15	1.0
1,2-Dichlorobenzene	ND	F1 *	0.35	2.0
1,2-Dichloroethane	ND	F1	0.16	1.0
1,2-Dichloropropane	ND	F1	0.18	1.0
1,3,5-Trimethylbenzene	ND	F1	0.50	3.0
1,3-Dichlorobenzene	ND		0.44	2.0
1,3-Dichloropropane	ND		0.15	1.0
1,4-Dichlorobenzene	ND	F1	0.39	2.0
2,2-Dichloropropane	ND	F1 *	0.68	3.0
2-Chlorotoluene	ND	F1 *	0.52	3.0
4-Chlorotoluene	ND		0.46	2.0
4-Isopropyltoluene	ND	F1	0.53	3.0
Benzene	ND	F1	0.42	2.0
Bromobenzene	ND	F1 *	0.42	2.0
Bromochloromethane	ND		0.29	2.0
Bromodichloromethane	ND	F1 *	0.30	2.0
Bromoform	ND	F1	0.21	1.0
Bromomethane	ND		0.27	5.0
Carbon tetrachloride	ND	F1 *	0.55	3.0
Chlorobenzene	ND	F1 *	0.42	2.0
Chloroethane	ND		0.40	5.0
Chloroform	ND	F1	0.17	1.0
Chloromethane	ND		0.64	5.0
cis-1,2-Dichloroethene	ND	F1	0.21	1.0
cis-1,3-Dichloropropene	ND	F1 *	0.20	1.0
Dibromochloromethane	ND	F1	0.20	1.0
Dibromomethane	ND	F1	0.14	1.0
Dichlorodifluoromethane	ND		0.31	2.0
Ethylbenzene	ND	F1	0.51	3.0
Hexachlorobutadiene	ND	F1	0.49	2.0
Isopropylbenzene	ND	F1	0.30	2.0
Methyl tert-butyl ether	ND	F1	0.17	1.0
Methylene Chloride	ND		1.3	5.0
m-Xylene & p-Xylene	ND		0.13	3.0

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222586.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0125			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0125				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND	F1	0.26	2.0
n-Butylbenzene	ND	F1	0.63	3.0
N-Propylbenzene	ND	F1	0.57	3.0
o-Xylene	ND	F1	0.49	2.0
sec-Butylbenzene	ND	F1 *	0.53	3.0
Styrene	ND		0.62	5.0
t-Butylbenzene	ND	F1	0.53	3.0
Toluene	ND	F1 *	0.44	2.0
trans-1,2-Dichloroethene	ND		0.24	1.0
trans-1,3-Dichloropropene	ND	F1 *	0.16	1.0
Trichloroethene	ND	F1	0.51	3.0
Diisopropyl ether	ND		0.12	1.0
Trichlorofluoromethane	ND		0.63	3.0
Vinyl chloride	ND		0.22	1.0
Ethyl t-butyl ether	ND	F1	0.34	5.0
Tert-amyl methyl ether	ND	F1	0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	111		70 - 120
4-Bromofluorobenzene (Surr)	101		75 - 120
Dibromofluoromethane (Surr)	104		85 - 115
Toluene-d8 (Surr)	103		85 - 120
Trifluorotoluene (Surr)	97		70 - 136

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222586.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0125			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0125				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359515.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2318			Final Weight/Volume:	5 mL
Prep Date:	07/08/2015 2318				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	~~U F1~~	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	75		70 - 120
4-Bromofluorobenzene (Surr)	107		75 - 120
Dibromofluoromethane (Surr)	91		85 - 115
Toluene-d8 (Surr)	101		85 - 120
Trifluorotoluene (Surr)	105		70 - 136

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222583.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0003			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0003				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	*H	0.48	2.0
1,1,1-Trichloroethane	ND	*H	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	*H	0.24	1.0
1,1,2-Trichloroethane	ND	H	0.24	1.0
1,1-Dichloroethane	ND	H	0.44	2.0
1,1-Dichloroethene	ND	H	0.33	2.0
1,1-Dichloropropene	ND	*H	0.50	3.0
1,2,3-Trichlorobenzene	ND	H	0.32	2.0
1,2,3-Trichloropropane	ND	H	0.41	2.0
1,2,4-Trichlorobenzene	ND	H	0.23	1.0
1,2,4-Trimethylbenzene	ND	H	0.50	3.0
1,2-Dibromo-3-Chloropropane	ND	H	0.40	2.0
1,2-Dibromoethane	ND	H	0.15	1.0
1,2-Dichlorobenzene	ND	*H	0.35	2.0
1,2-Dichloroethane	ND	H	0.16	1.0
1,2-Dichloropropane	ND	H	0.18	1.0
1,3,5-Trimethylbenzene	ND	H	0.50	3.0
1,3-Dichlorobenzene	ND	H	0.44	2.0
1,3-Dichloropropane	ND	H	0.15	1.0
1,4-Dichlorobenzene	ND	H	0.39	2.0
2,2-Dichloropropane	ND	H *	0.68	3.0
2-Chlorotoluene	ND	*H	0.52	3.0
4-Chlorotoluene	ND	H	0.46	2.0
4-Isopropyltoluene	ND	H	0.53	3.0
Benzene	ND	H	0.42	2.0
Bromobenzene	ND	*H	0.42	2.0
Bromochloromethane	ND	H	0.29	2.0
Bromodichloromethane	ND	*H	0.30	2.0
Bromoform	ND	H	0.21	1.0
Bromomethane	ND	H	0.27	5.0
Carbon tetrachloride	ND	* H	0.55	3.0
Chlorobenzene	ND	* H	0.42	2.0
Chloroethane	ND	H	0.40	5.0
Chloroform	ND	H	0.17	1.0
Chloromethane	ND	H	0.64	5.0
cis-1,2-Dichloroethene	ND	H	0.21	1.0
cis-1,3-Dichloropropene	ND	* H	0.20	1.0
Dibromochloromethane	ND	H	0.20	1.0
Dibromomethane	ND	H	0.14	1.0
Dichlorodifluoromethane	ND	H	0.31	2.0
Ethylbenzene	ND	H	0.51	3.0
Hexachlorobutadiene	ND	H	0.49	2.0
Isopropylbenzene	ND	H	0.30	2.0
Methyl tert-butyl ether	ND	H	0.17	1.0
Methylene Chloride	ND	H	1.3	5.0
m-Xylene & p-Xylene	ND	H	0.13	3.0

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222583.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0003			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0003				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND	H	0.26	2.0
n-Butylbenzene	ND	H	0.63	3.0
N-Propylbenzene	ND	H	0.57	3.0
o-Xylene	ND	H	0.49	2.0
sec-Butylbenzene	ND	*H	0.53	3.0
Styrene	ND	H	0.62	5.0
t-Butylbenzene	ND	H	0.53	3.0
Toluene	ND	*H	0.44	2.0
trans-1,2-Dichloroethene	ND	H	0.24	1.0
trans-1,3-Dichloropropene	ND	*H	0.16	1.0
Trichloroethene	ND	H	0.51	3.0
Diisopropyl ether	ND	H	0.12	1.0
Trichlorofluoromethane	ND	H	0.63	3.0
Vinyl chloride	ND	H	0.22	1.0
Ethyl t-butyl ether	ND	H	0.34	5.0
Tert-amyl methyl ether	ND	H	0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	104		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	101		85 - 115
Toluene-d8 (Surr)	101		85 - 120
Trifluorotoluene (Surr)	100		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222583.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0003			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0003				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359516.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/08/2015 2344			Final Weight/Volume:	5 mL
Prep Date:	07/08/2015 2344				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	ND	H	0.75	3.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	97		70 - 120
4-Bromofluorobenzene (Surr)	104		75 - 120
Dibromofluoromethane (Surr)	103		85 - 115
Toluene-d8 (Surr)	98		85 - 120
Trifluorotoluene (Surr)	94		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193840	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222609.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 1641			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 1641				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	H	0.48	2.0
1,1,1-Trichloroethane	ND	H	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	H	0.24	1.0
1,1,2-Trichloroethane	ND	H *	0.24	1.0
1,1-Dichloroethane	ND	H	0.44	2.0
1,1-Dichloroethene	ND	H	0.33	2.0
1,1-Dichloropropene	ND	H	0.50	3.0
1,2,3-Trichlorobenzene	ND	H	0.32	2.0
1,2,3-Trichloropropane	ND	H *	0.41	2.0
1,2,4-Trichlorobenzene	ND	H	0.23	1.0
1,2,4-Trimethylbenzene	ND	H	0.50	3.0
1,2-Dibromo-3-Chloropropane	ND	H	0.40	2.0
1,2-Dibromoethane	ND	H *	0.15	1.0
1,2-Dichlorobenzene	ND	H	0.35	2.0
1,2-Dichloroethane	ND	H	0.16	1.0
1,2-Dichloropropane	ND	H	0.18	1.0
1,3,5-Trimethylbenzene	ND	H	0.50	3.0
1,3-Dichlorobenzene	ND	H	0.44	2.0
1,3-Dichloropropane	ND	H *	0.15	1.0
1,4-Dichlorobenzene	ND	H	0.39	2.0
2,2-Dichloropropane	ND	H ^	0.68	3.0
2-Chlorotoluene	ND	H	0.52	3.0
4-Chlorotoluene	ND	H	0.46	2.0
4-Isopropyltoluene	ND	H	0.53	3.0
Benzene	ND	H	0.42	2.0
Bromobenzene	ND	H	0.42	2.0
Bromochloromethane	ND	H	0.29	2.0
Bromodichloromethane	ND	H	0.30	2.0
Bromoform	ND	H	0.21	1.0
Bromomethane	ND	H	0.27	5.0
Carbon tetrachloride	ND	H ^	0.55	3.0
Chlorobenzene	ND	H	0.42	2.0
Chloroethane	ND	H *	0.40	5.0
Chloroform	ND	H	0.17	1.0
Chloromethane	ND	H	0.64	5.0
cis-1,2-Dichloroethene	ND	H	0.21	1.0
cis-1,3-Dichloropropene	ND	H	0.20	1.0
Dibromochloromethane	ND	H	0.20	1.0
Dibromomethane	ND	H	0.14	1.0
Dichlorodifluoromethane	ND	H	0.31	2.0
Ethylbenzene	ND	H	0.51	3.0
Hexachlorobutadiene	ND	H	0.49	2.0
Isopropylbenzene	ND	H	0.30	2.0
Methyl tert-butyl ether	ND	H	0.17	1.0
Methylene Chloride	ND	H	1.3	5.0
m-Xylene & p-Xylene	ND	H	0.13	3.0

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193840	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222609.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 1641			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 1641				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND	H	0.26	2.0
n-Butylbenzene	ND	H	0.63	3.0
N-Propylbenzene	ND	H	0.57	3.0
o-Xylene	ND	H	0.49	2.0
sec-Butylbenzene	ND	H	0.53	3.0
Styrene	ND	H	0.62	5.0
t-Butylbenzene	ND	H	0.53	3.0
Toluene	ND	H	0.44	2.0
trans-1,2-Dichloroethene	ND	H	0.24	1.0
trans-1,3-Dichloropropene	ND	H	0.16	1.0
Trichloroethene	ND	H	0.51	3.0
Diisopropyl ether	ND	H	0.12	1.0
Trichlorofluoromethane	ND	H *	0.63	3.0
Vinyl chloride	ND	H	0.22	1.0
Ethyl t-butyl ether	ND	H	0.34	5.0
Tert-amyl methyl ether	ND	H	0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	97		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	99		85 - 115
Toluene-d8 (Surr)	106		85 - 120
Trifluorotoluene (Surr)	103		70 - 136

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193840	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222609.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 1641			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 1641				

Tentatively Identified Compounds **Number TIC's Found: 1**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
1066-40-6	Silanol, trimethyl-	7.60	180	~~TJTJN~~ NJ

MW 7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359517.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/09/2015 0010			Final Weight/Volume:	5 mL
Prep Date:	07/09/2015 0010				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	ND	H	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	94		70 - 120
4-Bromofluorobenzene (Surr)	105		75 - 120
Dibromofluoromethane (Surr)	94		85 - 115
Toluene-d8 (Surr)	112		85 - 120
Trifluorotoluene (Surr)	90		70 - 136

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244123**

Lab Sample ID: 580-51018-8
Client Matrix: Water

Date Sampled: 06/17/2015 1400
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: 5030B
Dilution: 1.0
Analysis Date: 07/02/2015 0030
Prep Date: 07/02/2015 0030

Analysis Batch: 580-193774
Prep Batch: N/A

Instrument ID: TAC003
Lab File ID: MS222584.D
Initial Weight/Volume: 10 mL
Final Weight/Volume: 10 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	* H	0.48	2.0
1,1,1-Trichloroethane	ND	* H	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	* H	0.24	1.0
1,1,2-Trichloroethane	ND	H	0.24	1.0
1,1-Dichloroethane	ND	H	0.44	2.0
1,1-Dichloroethene	ND	H	0.33	2.0
1,1-Dichloropropene	ND	* H	0.50	3.0
1,2,3-Trichlorobenzene	ND	H	0.32	2.0
1,2,3-Trichloropropane	ND	H	0.41	2.0
1,2,4-Trichlorobenzene	ND	H	0.23	1.0
1,2,4-Trimethylbenzene	ND	H	0.50	3.0
1,2-Dibromo-3-Chloropropane	ND	H	0.40	2.0
1,2-Dibromoethane	ND	H	0.15	1.0
1,2-Dichlorobenzene	ND	* H	0.35	2.0
1,2-Dichloroethane	ND	H	0.16	1.0
1,2-Dichloropropane	ND	H	0.18	1.0
1,3,5-Trimethylbenzene	ND	H	0.50	3.0
1,3-Dichlorobenzene	ND	H	0.44	2.0
1,3-Dichloropropane	ND	H	0.15	1.0
1,4-Dichlorobenzene	ND	H	0.39	2.0
2,2-Dichloropropane	ND	H *	0.68	3.0
2-Chlorotoluene	ND	* H	0.52	3.0
4-Chlorotoluene	ND	H	0.46	2.0
4-Isopropyltoluene	ND	H	0.53	3.0
Benzene	ND	H	0.42	2.0
Bromobenzene	ND	* H	0.42	2.0
Bromochloromethane	ND	H	0.29	2.0
Bromodichloromethane	ND	* H	0.30	2.0
Bromoform	ND	H	0.21	1.0
Bromomethane	ND	H	0.27	5.0
Carbon tetrachloride	ND	* H	0.55	3.0
Chlorobenzene	ND	* H	0.42	2.0
Chloroethane	ND	H	0.40	5.0
Chloroform	ND	H	0.17	1.0
Chloromethane	ND	H	0.64	5.0
cis-1,2-Dichloroethene	ND	H	0.21	1.0
cis-1,3-Dichloropropene	ND	* H	0.20	1.0
Dibromochloromethane	ND	H	0.20	1.0
Dibromomethane	ND	H	0.14	1.0
Dichlorodifluoromethane	ND	H	0.31	2.0
Ethylbenzene	ND	H	0.51	3.0
Hexachlorobutadiene	ND	H	0.49	2.0
Isopropylbenzene	ND	H	0.30	2.0
Methyl tert-butyl ether	ND	H	0.17	1.0
Methylene Chloride	ND	H	1.3	5.0
m-Xylene & p-Xylene	ND	H	0.13	3.0

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244123**

Lab Sample ID: 580-51018-8
Client Matrix: Water

Date Sampled: 06/17/2015 1400
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222584.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0030			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0030				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND	H	0.26	2.0 UJ
n-Butylbenzene	ND	H	0.63	3.0
N-Propylbenzene	ND	H	0.57	3.0
o-Xylene	ND	H	0.49	2.0
sec-Butylbenzene	ND	* H	0.53	3.0
Styrene	ND	H	0.62	5.0
t-Butylbenzene	ND	H	0.53	3.0
Toluene	ND	* H	0.44	2.0
trans-1,2-Dichloroethene	ND	H	0.24	1.0
trans-1,3-Dichloropropene	ND	* H	0.16	1.0
Trichloroethene	ND	H	0.51	3.0
Diisopropyl ether	ND	H	0.12	1.0
Trichlorofluoromethane	ND	H	0.63	3.0
Vinyl chloride	ND	H	0.22	1.0
Ethyl t-butyl ether	ND	H	0.34	5.0
Tert-amyl methyl ether	ND	H	0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	107		70 - 120
4-Bromofluorobenzene (Surr)	100		75 - 120
Dibromofluoromethane (Surr)	103		85 - 115
Toluene-d8 (Surr)	95		85 - 120
Trifluorotoluene (Surr)	100		70 - 136

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244123**

Lab Sample ID: 580-51018-8
Client Matrix: Water

Date Sampled: 06/17/2015 1400
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222584.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0030			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0030				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244123**

Lab Sample ID: 580-51018-8
Client Matrix: Water

Date Sampled: 06/17/2015 1400
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359518.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/09/2015 0036			Final Weight/Volume:	5 mL
Prep Date:	07/09/2015 0036				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	~~H~~	0.75	3.0 UJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	108		70 - 120
4-Bromofluorobenzene (Surr)	101		75 - 120
Dibromofluoromethane (Surr)	118	X	85 - 115
Toluene-d8 (Surr)	99		85 - 120
Trifluorotoluene (Surr)	93		70 - 136

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244124**

Lab Sample ID: 580-51018-9
Client Matrix: Water

Date Sampled: 06/17/2015 1410
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: 5030B
Dilution: 1.0
Analysis Date: 07/02/2015 0058
Prep Date: 07/02/2015 0058

Analysis Batch: 580-193774
Prep Batch: N/A

Instrument ID: TAC003
Lab File ID: MS222585.D
Initial Weight/Volume: 10 mL
Final Weight/Volume: 10 mL

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND	*H	0.48	2.0
1,1,1-Trichloroethane	ND	*H	0.58	3.0
1,1,2,2-Tetrachloroethane	ND	*H	0.24	1.0
1,1,2-Trichloroethane	ND	H	0.24	1.0
1,1-Dichloroethane	ND	H	0.44	2.0
1,1-Dichloroethene	ND	H	0.33	2.0
1,1-Dichloropropene	ND	*H	0.50	3.0
1,2,3-Trichlorobenzene	ND	H	0.32	2.0
1,2,3-Trichloropropane	ND	H	0.41	2.0
1,2,4-Trichlorobenzene	ND	H	0.23	1.0
1,2,4-Trimethylbenzene	ND	H	0.50	3.0
1,2-Dibromo-3-Chloropropane	ND	H	0.40	2.0
1,2-Dibromoethane	ND	H	0.15	1.0
1,2-Dichlorobenzene	ND	*H	0.35	2.0
1,2-Dichloroethane	ND	H	0.16	1.0
1,2-Dichloropropane	ND	H	0.18	1.0
1,3,5-Trimethylbenzene	ND	H	0.50	3.0
1,3-Dichlorobenzene	ND	H	0.44	2.0
1,3-Dichloropropane	ND	H	0.15	1.0
1,4-Dichlorobenzene	ND	H	0.39	2.0
2,2-Dichloropropane	ND	H*	0.68	3.0
2-Chlorotoluene	ND	*H	0.52	3.0
4-Chlorotoluene	ND	H	0.46	2.0
4-Isopropyltoluene	ND	H	0.53	3.0
Benzene	ND	H	0.42	2.0
Bromobenzene	ND	*H	0.42	2.0
Bromochloromethane	ND	H	0.29	2.0
Bromodichloromethane	ND	*H	0.30	2.0
Bromoform	ND	H	0.21	1.0
Bromomethane	ND	H	0.27	5.0
Carbon tetrachloride	ND	*H	0.55	3.0
Chlorobenzene	ND	*H	0.42	2.0
Chloroethane	ND	H	0.40	5.0
Chloroform	ND	H	0.17	1.0
Chloromethane	ND	H	0.64	5.0
cis-1,2-Dichloroethene	ND	H	0.21	1.0
cis-1,3-Dichloropropene	ND	*H	0.20	1.0
Dibromochloromethane	ND	H	0.20	1.0
Dibromomethane	ND	H	0.14	1.0
Dichlorodifluoromethane	ND	H	0.31	2.0
Ethylbenzene	ND	H	0.51	3.0
Hexachlorobutadiene	ND	H	0.49	2.0
Isopropylbenzene	ND	H	0.30	2.0
Methyl tert-butyl ether	ND	H	0.17	1.0
Methylene Chloride	ND	H	1.3	5.0
m-Xylene & p-Xylene	ND	H	0.13	3.0

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Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244124**

Lab Sample ID: 580-51018-9
Client Matrix: Water

Date Sampled: 06/17/2015 1410
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222585.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0058			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0058				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Naphthalene	ND	H	0.26	2.0
n-Butylbenzene	ND	H	0.63	3.0
N-Propylbenzene	ND	H	0.57	3.0
o-Xylene	ND	H	0.49	2.0
sec-Butylbenzene	ND	* H	0.53	3.0
Styrene	ND	H	0.62	5.0
t-Butylbenzene	ND	H	0.53	3.0
Toluene	ND	* H	0.44	2.0
trans-1,2-Dichloroethene	ND	H	0.24	1.0
trans-1,3-Dichloropropene	ND	* H	0.16	1.0
Trichloroethene	ND	H	0.51	3.0
Diisopropyl ether	ND	H	0.12	1.0
Trichlorofluoromethane	ND	H	0.63	3.0
Vinyl chloride	ND	H	0.22	1.0
Ethyl t-butyl ether	ND	H	0.34	5.0
Tert-amyl methyl ether	ND	H	0.29	5.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	111		70 - 120
4-Bromofluorobenzene (Surr)	103		75 - 120
Dibromofluoromethane (Surr)	103		85 - 115
Toluene-d8 (Surr)	99		85 - 120
Trifluorotoluene (Surr)	98		70 - 136

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Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244124**

Lab Sample ID: 580-51018-9
Client Matrix: Water

Date Sampled: 06/17/2015 1410
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193774	Instrument ID:	TAC003
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	MS222585.D
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0058			Final Weight/Volume:	10 mL
Prep Date:	07/02/2015 0058				

Tentatively Identified Compounds **Number TIC's Found: 0**

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Tentatively Identified Compound		None	

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Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244124**

Lab Sample ID: 580-51018-9
Client Matrix: Water

Date Sampled: 06/17/2015 1410
Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-194263	Instrument ID:	TAC036
Prep Method:	5030B	Prep Batch:	N/A	Lab File ID:	hp359519.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	07/09/2015 0103			Final Weight/Volume:	5 mL
Prep Date:	07/09/2015 0103				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Tetrachloroethene	~~ND~~	~~H~~	0.75	3.0 VJ

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	103		70 - 120
4-Bromofluorobenzene (Surr)	101		75 - 120
Dibromofluoromethane (Surr)	105		85 - 115
Toluene-d8 (Surr)	96		85 - 120
Trifluorotoluene (Surr)	91		70 - 136

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C Analysis Batch: 580-193607 Instrument ID: TAC001
Prep Method: 5035 Prep Batch: 580-193241 Lab File ID: F3015013.D
Dilution: 1.0 Initial Weight/Volume: 5.349 g
Analysis Date: 06/30/2015 1732 Final Weight/Volume: 5 mL
Prep Date: 06/25/2015 1542

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		6.2	66
1,1,1-Trichloroethane		ND		9.2	66
1,1,2,2-Tetrachloroethane		ND		3.8	16
1,1,2-Trichloroethane		ND		4.6	20
1,1-Dichloroethane		ND		6.9	66
1,1-Dichloroethene		ND		8.0	33
1,1-Dichloropropene		ND		8.7	66
1,2,3-Trichlorobenzene		ND		5.1	66
1,2,3-Trichloropropane		ND		19	66
1,2,4-Trichlorobenzene		ND		6.4	66
1,2,4-Trimethylbenzene		27	J	3.9	66
1,2-Dibromo-3-Chloropropane		ND		4.3	330
1,2-Dibromoethane		ND		5.6	26
1,2-Dichlorobenzene		ND		20	66
1,2-Dichloroethane		ND		5.4	26
1,2-Dichloropropane		ND		3.9	20
1,3,5-Trimethylbenzene		11	J	4.8	66
1,3-Dichlorobenzene		ND		17	98
1,3-Dichloropropane		ND		9.0	66
1,4-Dichlorobenzene		ND		18	98
2,2-Dichloropropane		ND		7.9	66
2-Chlorotoluene		ND		5.6	66
4-Chlorotoluene		ND		4.9	66
4-Isopropyltoluene		ND		4.6	66
Benzene		ND		5.7	26
Bromobenzene		ND		3.9	66
Bromochloromethane		ND		7.5	66
Bromodichloromethane		ND		2.3	66
Bromoform		ND		11	66
Bromomethane		ND		22	230
Carbon tetrachloride		ND		6.2	33
Chlorobenzene		ND		16	66
Chloroethane		ND		26	660
Chloroform		ND		6.9	66
Chloromethane		ND		17	160
cis-1,2-Dichloroethene		ND		8.0	66
cis-1,3-Dichloropropene		ND		3.0	26
Dibromochloromethane		ND		4.6	33
Dibromomethane		ND		21	98
Dichlorodifluoromethane		ND		11	66
Diisopropyl ether		ND		5.7	66
Ethyl t-butyl ether		ND		8.5	66
Ethylbenzene		19	J B	3.3	66
Hexachlorobutadiene		ND		30	130
Isopropylbenzene		ND		4.3	66
Methyl tert-butyl ether		ND		9.8	66

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Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244101

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015013.D
Dilution:	1.0			Initial Weight/Volume:	5.349 g
Analysis Date:	06/30/2015 1732			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Methylene Chloride		ND		19	41
m-Xylene & p-Xylene		75	B	4.9	66
Naphthalene		13	J B	5.7	66
n-Butylbenzene		14	J	5.7	66
N-Propylbenzene		9.9	J	4.3	66
o-Xylene		46	J	4.9	66
sec-Butylbenzene		ND		4.6	66
Styrene		ND		3.9	66
t-Butylbenzene		ND		5.1	66
Tert-amyl methyl ether		ND		5.9	66
Tetrachloroethene		ND	F1	8.7	33
Toluene		35	J B	4.3	66
trans-1,2-Dichloroethene		8.9	J	6.2	66
trans-1,3-Dichloropropene		ND	F1	11	66
Trichloroethene		ND		5.1	39
Trichlorofluoromethane		ND		9.7	66
Vinyl chloride		ND		12	26

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	106		71 - 136
4-Bromofluorobenzene (Surr)	101		70 - 120
Dibromofluoromethane (Surr)	97		75 - 132
Toluene-d8 (Surr)	103		80 - 120
Trifluorotoluene (Surr)	88		65 - 140

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Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015013.D
Dilution:	1.0			Initial Weight/Volume:	5.349 g
Analysis Date:	06/30/2015 1732			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Tentatively Identified Compounds **Number TIC's Found: 1**

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
	Unknown	6.69	55000	

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method: 8260C Analysis Batch: 580-193607 Instrument ID: TAC001
Prep Method: 5035 Prep Batch: 580-193241 Lab File ID: F3015016.D
Dilution: 1.0 Initial Weight/Volume: 4.227 g
Analysis Date: 06/30/2015 1904 Final Weight/Volume: 5 mL
Prep Date: 06/25/2015 1542

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		6.9	73
1,1,1-Trichloroethane		ND		10	73
1,1,2,2-Tetrachloroethane		ND		4.2	18
1,1,2-Trichloroethane		ND		5.1	22
1,1-Dichloroethane		ND		7.7	73
1,1-Dichloroethene		ND		8.9	36
1,1-Dichloropropene		ND		9.7	73
1,2,3-Trichlorobenzene		22	J	5.6	73
1,2,3-Trichloropropane		ND		21	73
1,2,4-Trichlorobenzene		13	J	7.1	73
1,2,4-Trimethylbenzene		ND		4.4	73
1,2-Dibromo-3-Chloropropane		16	J	4.7	360
1,2-Dibromoethane		ND		6.2	29
1,2-Dichlorobenzene		ND		22	73
1,2-Dichloroethane		ND		6.0	29
1,2-Dichloropropane		ND		4.4	22
1,3,5-Trimethylbenzene		ND		5.3	73
1,3-Dichlorobenzene		ND		19	110
1,3-Dichloropropane		ND		10	73
1,4-Dichlorobenzene		ND		20	110
2,2-Dichloropropane		ND		8.7	73
2-Chlorotoluene		ND		6.2	73
4-Chlorotoluene		ND		5.5	73
4-Isopropyltoluene		22	J	5.1	73
Benzene		ND		6.4	29
Bromobenzene		ND		4.4	73
Bromochloromethane		ND		8.4	73
Bromodichloromethane		ND		2.6	73
Bromoform		ND		12	73
Bromomethane		ND		24	260
Carbon tetrachloride		ND		6.9	36
Chlorobenzene		ND		18	73
Chloroethane		ND		29	730
Chloroform		ND		7.7	73
Chloromethane		ND		18	180
cis-1,2-Dichloroethene		ND		8.9	73
cis-1,3-Dichloropropene		ND		3.3	29
Dibromochloromethane		ND		5.1	36
Dibromomethane		ND		24	110
Dichlorodifluoromethane		ND		12	73
Diisopropyl ether		ND		6.4	73
Ethyl t-butyl ether		ND		9.5	73
Ethylbenzene		ND		3.6	73
Hexachlorobutadiene		ND		33	150
Isopropylbenzene		ND		4.7	73
Methyl tert-butyl ether		ND		11	73

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015016.D
Dilution:	1.0			Initial Weight/Volume:	4.227 g
Analysis Date:	06/30/2015 1904			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Methylene Chloride		ND		21	46
m-Xylene & p-Xylene		ND		5.5	73
Naphthalene		39	J B	6.4	73
n-Butylbenzene		ND		6.4	73
N-Propylbenzene		ND		4.7	73
o-Xylene		ND		5.5	73
sec-Butylbenzene		ND		5.1	73
Styrene		ND		4.4	73
t-Butylbenzene		ND		5.6	73
Tert-amyl methyl ether		ND		6.6	73
Tetrachloroethene		ND		9.7	36
Toluene		150	B	4.7	73
trans-1,2-Dichloroethene		21	J	6.9	73
trans-1,3-Dichloropropene		ND		13	73
Trichloroethene		ND		5.6	44
Trichlorofluoromethane		ND		11	73
Vinyl chloride		ND		13	29

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	104		71 - 136
4-Bromofluorobenzene (Surr)	100		70 - 120
Dibromofluoromethane (Surr)	91		75 - 132
Toluene-d8 (Surr)	103		80 - 120
Trifluorotoluene (Surr)	89		65 - 140

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015016.D
Dilution:	1.0			Initial Weight/Volume:	4.227 g
Analysis Date:	06/30/2015 1904			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Tentatively Identified Compounds **Number TIC's Found: 3**

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
	Unknown	6.69	45000	T J
79-20-9	Acetic acid, methyl ester	6.72	57000	T J N
110-54-3	Hexane	7.97	13000	T J N

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Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244103

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015017.D
Dilution:	1.0			Initial Weight/Volume:	4.573 g
Analysis Date:	06/30/2015 1935			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		13	130
1,1,1-Trichloroethane		ND		19	130
1,1,2,2-Tetrachloroethane		ND		7.6	33
1,1,2-Trichloroethane		ND		9.3	40
1,1-Dichloroethane		ND		14	130
1,1-Dichloroethene		ND		16	66
1,1-Dichloropropene		ND		18	130
1,2,3-Trichlorobenzene		ND		10	130
1,2,3-Trichloropropane		ND		38	130
1,2,4-Trichlorobenzene		ND		13	130
1,2,4-Trimethylbenzene		ND		8.0	130
1,2-Dibromo-3-Chloropropane		ND		8.6	660
1,2-Dibromoethane		ND		11	53
1,2-Dichlorobenzene		ND		39	130
1,2-Dichloroethane		ND		11	53
1,2-Dichloropropane		ND		8.0	40
1,3,5-Trimethylbenzene		ND		9.6	130
1,3-Dichlorobenzene		ND		35	200
1,3-Dichloropropane		ND		18	130
1,4-Dichlorobenzene		ND		36	200
2,2-Dichloropropane		ND		16	130
2-Chlorotoluene		ND		11	130
4-Chlorotoluene		ND		9.9	130
4-Isopropyltoluene		52	J	9.3	130
Benzene		ND		12	53
Bromobenzene		ND		8.0	130
Bromochloromethane		ND		15	130
Bromodichloromethane		ND		4.6	130
Bromoform		ND		22	130
Bromomethane		ND		44	460
Carbon tetrachloride		ND		13	66
Chlorobenzene		ND		32	130
Chloroethane		ND		53	1300
Chloroform		ND		14	130
Chloromethane		ND		33	330
cis-1,2-Dichloroethene		ND		16	130
cis-1,3-Dichloropropene		ND		6.0	53
Dibromochloromethane		ND		9.3	66
Dibromomethane		ND		43	200
Dichlorodifluoromethane		ND		22	130
Diisopropyl ether		ND		12	130
Ethyl t-butyl ether		ND		17	130
Ethylbenzene		ND		6.6	130
Hexachlorobutadiene		ND		60	270
Isopropylbenzene		ND		8.6	130
Methyl tert-butyl ether		ND		20	130

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Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244103

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015017.D
Dilution:	1.0			Initial Weight/Volume:	4.573 g
Analysis Date:	06/30/2015 1935			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Methylene Chloride		ND		38	83
m-Xylene & p-Xylene		17	J B	9.9	130
Naphthalene		25	J B	12	130
n-Butylbenzene		ND		12	130
N-Propylbenzene		ND		8.6	130
o-Xylene		ND		9.9	130
sec-Butylbenzene		ND		9.3	130
Styrene		ND		8.0	130
t-Butylbenzene		ND		10	130
Tert-amyl methyl ether		ND		12	130
Tetrachloroethene		ND		18	66
Toluene		32	J B	8.6	130
trans-1,2-Dichloroethene		ND		13	130
trans-1,3-Dichloropropene		ND		23	130
Trichloroethene		ND		10	80
Trichlorofluoromethane		ND		20	130
Vinyl chloride		ND		24	53

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	104		71 - 136
4-Bromofluorobenzene (Surr)	102		70 - 120
Dibromofluoromethane (Surr)	93		75 - 132
Toluene-d8 (Surr)	99		80 - 120
Trifluorotoluene (Surr)	89		65 - 140

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244103

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193607	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	F3015017.D
Dilution:	1.0			Initial Weight/Volume:	4.573 g
Analysis Date:	06/30/2015 1935			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Tentatively Identified Compounds **Number TIC's Found: 2**

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
	Unknown	6.71	160000	T J
110-54-3	Hexane	7.97	21000	T J N

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244104

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115008.D
Dilution:	1.0			Initial Weight/Volume:	3.362 g
Analysis Date:	07/01/2015 1600			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		39	410
1,1,1-Trichloroethane		ND		57	410
1,1,2,2-Tetrachloroethane		ND		23	100
1,1,2-Trichloroethane		ND		29	120
1,1-Dichloroethane		ND		43	410
1,1-Dichloroethene		ND		50	200
1,1-Dichloropropene		ND		54	410
1,2,3-Trichlorobenzene		ND		32	410
1,2,3-Trichloropropane		ND		120	410
1,2,4-Trichlorobenzene		ND		40	410
1,2,4-Trimethylbenzene		ND		24	410
1,2-Dibromo-3-Chloropropane		ND		26	2000
1,2-Dibromoethane		ND		35	160
1,2-Dichlorobenzene		ND		120	410
1,2-Dichloroethane		ND		34	160
1,2-Dichloropropane		ND		24	120
1,3,5-Trimethylbenzene		ND		30	410
1,3-Dichlorobenzene		ND		110	610
1,3-Dichloropropane		ND		56	410
1,4-Dichlorobenzene		ND		110	610
2,2-Dichloropropane		ND		49	410
2-Chlorotoluene		ND		35	410
4-Chlorotoluene		ND		31	410
4-Isopropyltoluene		ND		29	410
Benzene		ND		36	160
Bromobenzene		ND		24	410
Bromochloromethane		ND		47	410
Bromodichloromethane		ND		14	410
Bromoform		ND		66	410
Bromomethane		ND		140	1400 UR
Carbon tetrachloride		ND		39	200
Chlorobenzene		ND		100	410
Chloroethane		ND		160	4100 UR
Chloroform		ND		43	410 J
Chloromethane		ND		100	1000
cis-1,2-Dichloroethene		ND		50	410
cis-1,3-Dichloropropene		ND		18	160
Dibromochloromethane		ND		29	200
Dibromomethane		ND		130	610
Dichlorodifluoromethane		ND		66	410 J
Diisopropyl ether		ND		36	410
Ethyl t-butyl ether		ND		53	410
Ethylbenzene		ND		20	410
Hexachlorobutadiene		ND		180	810
Isopropylbenzene		ND		26	410
Methyl tert-butyl ether		ND		61	410

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244104

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115008.D
Dilution:	1.0			Initial Weight/Volume:	3.362 g
Analysis Date:	07/01/2015 1600			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Methylene Chloride		220	J Q	120	250
m-Xylene & p-Xylene		ND		31	410
Naphthalene		ND		36	410
n-Butylbenzene		ND		36	410
N-Propylbenzene		ND		26	410
o-Xylene		ND		31	410
sec-Butylbenzene		ND		29	410
Styrene		ND		24	410
t-Butylbenzene		ND		32	410
Tert-amyl methyl ether		ND		37	410
Tetrachloroethene		ND MW		54	200
Toluene		250	J B MW Q	26	410
trans-1,2-Dichloroethene		ND		39	410
trans-1,3-Dichloropropene		ND		71	410
Trichloroethene		ND		32	240
Trichlorofluoromethane		ND		60	410
Vinyl chloride		ND MW		72	160 MW R

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	110		71 - 136
4-Bromofluorobenzene (Surr)	97		70 - 120
Dibromofluoromethane (Surr)	96		75 - 132
Toluene-d8 (Surr)	101		80 - 120
Trifluorotoluene (Surr)	91		65 - 140

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115008.D
Dilution:	1.0			Initial Weight/Volume:	3.362 g
Analysis Date:	07/01/2015 1600			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Tentatively Identified Compounds **Number TIC's Found: 1**

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
	Unknown	6.68	220000	

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244105

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115009.D
Dilution:	1.0			Initial Weight/Volume:	3.531 g
Analysis Date:	07/01/2015 1631			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		22	230
1,1,1-Trichloroethane		ND		32	230
1,1,2,2-Tetrachloroethane		ND		13	57
1,1,2-Trichloroethane		ND		16	68
1,1-Dichloroethane		ND		24	230
1,1-Dichloroethene		ND		28	110
1,1-Dichloropropene		ND		30	230
1,2,3-Trichlorobenzene		ND		18	230
1,2,3-Trichloropropane		ND		65	230
1,2,4-Trichlorobenzene		ND		22	230
1,2,4-Trimethylbenzene		ND		14	230
1,2-Dibromo-3-Chloropropane		ND		15	1100
1,2-Dibromoethane		ND		19	91
1,2-Dichlorobenzene		ND		68	230
1,2-Dichloroethane		ND		19	91
1,2-Dichloropropane		ND		14	68
1,3,5-Trimethylbenzene		ND		16	230
1,3-Dichlorobenzene		ND		60	340
1,3-Dichloropropane		ND		31	230
1,4-Dichlorobenzene		ND		61	340
2,2-Dichloropropane		ND		27	230
2-Chlorotoluene		ND		19	230
4-Chlorotoluene		ND		17	230
4-Isopropyltoluene		120	J	16	230
Benzene		ND		20	91
Bromobenzene		ND		14	230
Bromochloromethane		ND		26	230
Bromodichloromethane		ND		8.0	230
Bromoform		ND		37	230
Bromomethane		ND		76	800
Carbon tetrachloride		ND		22	110
Chlorobenzene		ND		56	230
Chloroethane		ND		90	2300
Chloroform		ND		24	230
Chloromethane		ND		57	570
cis-1,2-Dichloroethene		ND		28	230
cis-1,3-Dichloropropene		ND		10	91
Dibromochloromethane		ND		16	110
Dibromomethane		ND		75	340
Dichlorodifluoromethane		ND		37	230
Diisopropyl ether		ND		20	230
Ethyl t-butyl ether		ND		30	230
Ethylbenzene		ND		11	230
Hexachlorobutadiene		ND		100	460
Isopropylbenzene		ND		15	230
Methyl tert-butyl ether		ND		34	230

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244105

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115009.D
Dilution:	1.0			Initial Weight/Volume:	3.531 g
Analysis Date:	07/01/2015 1631			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Methylene Chloride		68	J	65	140
m-Xylene & p-Xylene		ND		17	230
Naphthalene		ND		20	230
n-Butylbenzene		ND		20	230
N-Propylbenzene		ND		15	230
o-Xylene		ND		17	230
sec-Butylbenzene		ND		16	230
Styrene		ND		14	230
t-Butylbenzene		ND		18	230
Tert-amyl methyl ether		ND		20	230
Tetrachloroethene		ND		30	110
Toluene		83	J	15	230
trans-1,2-Dichloroethene		24	J	22	230
trans-1,3-Dichloropropene		ND		40	230
Trichloroethene		ND		18	140
Trichlorofluoromethane		ND		34	230
Vinyl chloride		ND		40	91

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dichloroethane-d4 (Surr)	111		71 - 136
4-Bromofluorobenzene (Surr)	98		70 - 120
Dibromofluoromethane (Surr)	95		75 - 132
Toluene-d8 (Surr)	101		80 - 120
Trifluorotoluene (Surr)	84		65 - 140

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244105**

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8260C Volatile Organic Compounds by GC/MS

Analysis Method:	8260C	Analysis Batch:	580-193750	Instrument ID:	TAC001
Prep Method:	5035	Prep Batch:	580-193241	Lab File ID:	G0115009.D
Dilution:	1.0			Initial Weight/Volume:	3.531 g
Analysis Date:	07/01/2015 1631			Final Weight/Volume:	5 mL
Prep Date:	06/25/2015 1542				

Tentatively Identified Compounds **Number TIC's Found: 1**

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
110-54-3	Hexane	7.97	28000	~~JN~~ NJ

7/27/2015

ecology and environment, inc.
Global Environmental Specialists

720 Third Avenue, Suite 1700
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: July 30, 2015

TO: Linda Ader, START-IV Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-IV Chemist, E & E, Seattle, Washington MW

SUBJ: **Organic Data Quality Assurance Review,**
Holy Cross-AK Big Lake Site, Holy Cross, Alaska

REF: TDD: 14-08-0001 PAN: 1004530.0005.013.01

The data quality assurance review of 5 soil and 7 water samples collected from the Holy Cross-AK Big Lake site located in Holy Cross, Alaska, has been completed. Analysis for Chlorinated Pesticides (EPA Method 8081) and Polychlorinated Biphenyls (PCBs - EPA Method 8082) was performed by Test America, Inc., Tacoma, WA. All sample analyses were evaluated following EPA's Stage 2B and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

15244116	15244117	15244118	15244119	15244120
15244121	15244122	15244101	15244102	15244103
15244104	15244105			

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on June 17 and 18, 2015, extracted by July 30, 2015, and were analyzed by July 21, 2015, therefore meeting QC criteria of less than 7 days between collection and water sample extraction (14 days for soils) and less than 40 days between extraction and analysis.

2. Instrument Performance: Acceptable.

The surrogate retention time percent difference between the initial calibration standards and the remaining standards and samples was ≤ 0.3% for capillary column analyses.

3. Initial and Continuing Calibration: Acceptable.

All initial calibration relative standard deviations (RSDs) were within QC limits. All continuing calibration % differences (% D) were within QC limits except some high recovery outliers (no actions were taken based on these outliers as there were no detections in the associated samples) and two low Aroclor 1268 recoveries and one toxaphene low recovery (no actions were taken as there were no associated samples).

4. Error Determination: Not Provided.

Samples necessary for bias and precision determination were not provided to the laboratory. All samples were flagged RND (Recovery Not Determined) and PND (Precision Not Determined), although the flags are not found on the Form I's.

5. Blanks: Satisfactory.

A method blank was prepared at the required frequency of every time samples were extracted for each matrix and for each concentration level, or every 20 samples, whichever is greater, and for each analytical system. No target analytes were detected in any blanks except endrin aldehyde (0.881 ug/L) associated with the water samples; no actions were taken as endrin aldehyde was not detected in any water samples.

6. Performance Evaluation Samples: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. System Monitoring Compounds (SMCs): Acceptable.

All recoveries of the SMCs were within the established control limits.

8. Blank and Matrix Spikes: Acceptable.

Recoveries of all spiked analytes were within the appropriate control limits.

9. Duplicates: Acceptable.

Relative Percent Differences (RPDs) of all spiked analytes were within the required control limits.

10. Compound Identification: Acceptable.

All positive results were dual-column confirmed with differences between the columns less than 25%.

11. Target Compound Quantitation and Quantitation Limits: Acceptable.

Sample results and quantitation limits were correctly calculated.

12. Laboratory Contact

No laboratory contact was required.

13. Overall Assessment

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	975.5 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0013			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0031	0.010
alpha-BHC	ND		0.0027	0.010
beta-BHC	ND		0.0015	0.021
delta-BHC	ND		0.0031	0.010
gamma-BHC (Lindane)	ND		0.0031	0.010
4,4'-DDD	ND		0.0031	0.021
4,4'-DDE	ND		0.0011	0.021
4,4'-DDT	ND		0.0031	0.021
Dieldrin	ND		0.0031	0.021
Endosulfan I	ND		0.0031	0.021
Endosulfan II	ND		0.0031	0.021
Endosulfan sulfate	ND		0.0031	0.021
Endrin	ND		0.0031	0.021
Endrin aldehyde	ND		0.0010	0.051
Heptachlor	ND		0.0031	0.010
Heptachlor epoxide	ND		0.0031	0.010
Methoxychlor	ND		0.0031	0.10
Endrin ketone	ND		0.0031	0.021
Toxaphene	ND		0.28	1.0
alpha-Chlordane	ND		0.0031	0.010
gamma-Chlordane	ND		0.0011	0.010

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	91		45 - 123
DCB Decachlorobiphenyl	98		33 - 133

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2
Client Matrix: Water

Date Sampled: 06/17/2015 1510
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1020.8 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0030			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0029	0.0098
alpha-BHC	ND		0.0025	0.0098
beta-BHC	ND		0.0015	0.020
delta-BHC	ND		0.0029	0.0098
gamma-BHC (Lindane)	ND		0.0029	0.0098
4,4'-DDD	ND		0.0029	0.020
4,4'-DDE	ND		0.0011	0.020
4,4'-DDT	ND		0.0029	0.020
Dieldrin	ND		0.0029	0.020
Endosulfan I	ND		0.0029	0.020
Endosulfan II	ND		0.0029	0.020
Endosulfan sulfate	ND		0.0029	0.020
Endrin	ND		0.0029	0.020
Endrin aldehyde	ND		0.00098	0.049
Heptachlor	ND		0.0029	0.0098
Heptachlor epoxide	ND		0.0029	0.0098
Methoxychlor	ND		0.0029	0.098
Endrin ketone	ND		0.0029	0.020
Toxaphene	ND		0.26	0.98
alpha-Chlordane	ND		0.0029	0.0098
gamma-Chlordane	ND		0.0011	0.0098

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	85		45 - 123
DCB Decachlorobiphenyl	89		33 - 133

MW 7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3
Client Matrix: Water

Date Sampled: 06/17/2015 1600
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1051.2 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0048			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0029	0.0095
alpha-BHC	ND		0.0025	0.0095
beta-BHC	ND		0.0014	0.019
delta-BHC	ND		0.0029	0.0095
gamma-BHC (Lindane)	ND		0.0029	0.0095
4,4'-DDD	ND		0.0029	0.019
4,4'-DDE	ND		0.0010	0.019
4,4'-DDT	ND		0.0029	0.019
Dieldrin	ND		0.0029	0.019
Endosulfan I	ND		0.0029	0.019
Endosulfan II	ND		0.0029	0.019
Endosulfan sulfate	ND		0.0029	0.019
Endrin	ND		0.0029	0.019
Endrin aldehyde	ND		0.00095	0.048
Heptachlor	ND		0.0029	0.0095
Heptachlor epoxide	ND		0.0029	0.0095
Methoxychlor	ND		0.0029	0.095
Endrin ketone	ND		0.0029	0.019
Toxaphene	ND		0.26	0.95
alpha-Chlordane	ND		0.0029	0.0095
gamma-Chlordane	ND		0.0010	0.0095

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	87		45 - 123
DCB Decachlorobiphenyl	95		33 - 133

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	971.7 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0105			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0031	0.010
alpha-BHC	ND		0.0027	0.010
beta-BHC	ND		0.0015	0.021
delta-BHC	ND		0.0031	0.010
gamma-BHC (Lindane)	ND		0.0031	0.010
4,4'-DDD	ND		0.0031	0.021
4,4'-DDE	ND		0.0011	0.021
4,4'-DDT	ND		0.0031	0.021
Dieldrin	ND		0.0031	0.021
Endosulfan I	ND		0.0031	0.021
Endosulfan II	ND		0.0031	0.021
Endosulfan sulfate	ND		0.0031	0.021
Endrin	ND		0.0031	0.021
Endrin aldehyde	ND		0.0010	0.051
Heptachlor	ND		0.0031	0.010
Heptachlor epoxide	ND		0.0031	0.010
Methoxychlor	ND		0.0031	0.10
Endrin ketone	ND		0.0031	0.021
Toxaphene	ND		0.28	1.0
alpha-Chlordane	ND		0.0031	0.010
gamma-Chlordane	ND		0.0011	0.010

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	83		45 - 123
DCB Decachlorobiphenyl	97		33 - 133

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	938.3 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0122			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0032	0.011
alpha-BHC	ND		0.0028	0.011
beta-BHC	ND		0.0016	0.021
delta-BHC	ND		0.0032	0.011
gamma-BHC (Lindane)	ND		0.0032	0.011
4,4'-DDD	ND		0.0032	0.021
4,4'-DDE	ND		0.0012	0.021
4,4'-DDT	ND		0.0032	0.021
Dieldrin	ND		0.0032	0.021
Endosulfan I	ND		0.0032	0.021
Endosulfan II	ND		0.0032	0.021
Endosulfan sulfate	ND		0.0032	0.021
Endrin	ND		0.0032	0.021
Endrin aldehyde	ND		0.0011	0.053
Heptachlor	ND		0.0032	0.011
Heptachlor epoxide	ND		0.0032	0.011
Methoxychlor	ND		0.0032	0.11
Endrin ketone	ND		0.0032	0.021
Toxaphene	ND		0.29	1.1
alpha-Chlordane	ND		0.0032	0.011
gamma-Chlordane	ND		0.0012	0.011

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	88		45 - 123
DCB Decachlorobiphenyl	103		33 - 133

7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6
Client Matrix: Water

Date Sampled: 06/17/2015 1440
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1035.2 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0357			Injection Volume:	1 uL
Prep Date:	06/23/2015 1758			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0029	0.0097
alpha-BHC	ND		0.0025	0.0097
beta-BHC	ND		0.0014	0.019
delta-BHC	ND		0.0029	0.0097
gamma-BHC (Lindane)	ND		0.0029	0.0097
4,4'-DDD	ND		0.0029	0.019
4,4'-DDE	ND		0.0011	0.019
4,4'-DDT	ND		0.0029	0.019
Dieldrin	ND		0.0029	0.019
Endosulfan I	ND		0.0029	0.019
Endosulfan II	ND		0.0029	0.019
Endosulfan sulfate	ND		0.0029	0.019
Endrin	ND		0.0029	0.019
Endrin aldehyde	ND		0.00097	0.048
Heptachlor	ND		0.0029	0.0097
Heptachlor epoxide	ND		0.0029	0.0097
Methoxychlor	ND		0.0029	0.097
Endrin ketone	ND		0.0029	0.019
Toxaphene	ND		0.26	0.97
alpha-Chlordane	ND		0.0029	0.0097
gamma-Chlordane	ND		0.0011	0.0097

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	88		45 - 123
DCB Decachlorobiphenyl	102		33 - 133

7/30/15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-193563	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1052.4 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0415			Injection Volume:	1 uL
Prep Date:	06/23/2015 1758			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
Aldrin	ND		0.0029	0.0095
alpha-BHC	ND		0.0025	0.0095
beta-BHC	ND		0.0014	0.019
delta-BHC	ND		0.0029	0.0095
gamma-BHC (Lindane)	ND		0.0029	0.0095
4,4'-DDD	ND		0.0029	0.019
4,4'-DDE	ND		0.0010	0.019
4,4'-DDT	ND		0.0029	0.019
Dieldrin	ND		0.0029	0.019
Endosulfan I	ND		0.0029	0.019
Endosulfan II	ND		0.0029	0.019
Endosulfan sulfate	ND		0.0029	0.019
Endrin	ND		0.0029	0.019
Endrin aldehyde	ND		0.00095	0.048
Heptachlor	ND		0.0029	0.0095
Heptachlor epoxide	ND		0.0029	0.0095
Methoxychlor	ND		0.0029	0.095
Endrin ketone	ND		0.0029	0.019
Toxaphene	ND		0.26	0.95
alpha-Chlordane	ND		0.0029	0.0095
gamma-Chlordane	ND		0.0010	0.0095

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	84		45 - 123
DCB Decachlorobiphenyl	99		33 - 133

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-195465	Instrument ID:	TAC034
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.473 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/21/2015 1904			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Aldrin		ND		0.29	1.3 U
alpha-BHC		ND		0.36	1.3
beta-BHC		ND		0.42	1.3
delta-BHC		ND		0.19	1.3
gamma-BHC (Lindane)		ND		0.39	1.3
4,4'-DDD		ND		0.19	2.6
4,4'-DDE		ND		0.18	2.6
4,4'-DDT		ND		0.20	2.6
Dieldrin		ND		0.15	2.6
Endosulfan I		ND		0.13	1.3
Endosulfan II		ND		0.22	2.6
Endosulfan sulfate		ND		0.24	2.6
Endrin		ND		0.21	2.6
Endrin aldehyde		ND		0.26	2.6
Heptachlor		ND		0.60	2.6
Heptachlor epoxide		ND		0.0039	1.3
Methoxychlor		ND		0.34	13
Endrin ketone		ND		0.34	2.6
Toxaphene		ND		30	130
alpha-Chlordane		ND		0.17	1.3
gamma-Chlordane		ND		0.17	1.3

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	54		35 - 129
DCB Decachlorobiphenyl	67		60 - 128

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244102**

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-195465	Instrument ID:	TAC034
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.116 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/21/2015 2047			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Aldrin		ND		0.28	1.3 U
alpha-BHC		ND		0.35	1.3
beta-BHC		ND		0.41	1.3
delta-BHC		ND		0.19	1.3
gamma-BHC (Lindane)		ND		0.38	1.3
4,4'-DDD		ND		0.19	2.6
4,4'-DDE		ND		0.18	2.6
4,4'-DDT		ND		0.19	2.6
Dieldrin		ND		0.15	2.6
Endosulfan I		ND		0.13	1.3
Endosulfan II		ND		0.22	2.6
Endosulfan sulfate		ND		0.24	2.6
Endrin		ND		0.21	2.6
Endrin aldehyde		ND		0.25	2.6
Heptachlor		ND		0.59	2.6
Heptachlor epoxide		ND		0.0038	1.3
Methoxychlor		ND		0.33	13
Endrin ketone		ND		0.33	2.6
Toxaphene		ND		29	130
alpha-Chlordane		ND		0.17	1.3
gamma-Chlordane		ND		0.17	1.3 U

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	52		35 - 129
DCB Decachlorobiphenyl	66		60 - 128

VW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244103**

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-195465	Instrument ID:	TAC034
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.476 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/21/2015 2105			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Aldrin		ND		0.44	2.0
alpha-BHC		ND		0.54	2.0
beta-BHC		ND		0.64	2.0
delta-BHC		ND		0.29	2.0
gamma-BHC (Lindane)		ND		0.59	2.0
4,4'-DDD		ND		0.29	3.9
4,4'-DDE		ND		0.28	3.9
4,4'-DDT		ND		0.30	3.9
Dieldrin		ND		0.23	3.9
Endosulfan I		ND		0.20	2.0
Endosulfan II		ND		0.34	3.9
Endosulfan sulfate		ND		0.36	3.9
Endrin		ND		0.32	3.9
Endrin aldehyde		ND		0.39	3.9
Heptachlor		ND		0.91	3.9
Heptachlor epoxide		ND		0.0059	2.0
Methoxychlor		ND		0.51	20
Endrin ketone		ND		0.51	3.9
Toxaphene		ND		45	200
alpha-Chlordane		ND		0.26	2.0
gamma-Chlordane		ND		0.26	2.0

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	43		35 - 129
DCB Decachlorobiphenyl	86		60 - 128

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244104**

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-195465	Instrument ID:	TAC034
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.159 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/21/2015 2122			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Aldrin		ND		0.98	4.4
alpha-BHC		ND		1.2	4.4
beta-BHC		ND		1.4	4.4
delta-BHC		ND		0.65	4.4
gamma-BHC (Lindane)		ND		1.3	4.4
4,4'-DDD		ND		0.65	8.8
4,4'-DDE		ND		0.62	8.8
4,4'-DDT		ND		0.67	8.8
Dieldrin		ND		0.52	8.8
Endosulfan I		ND		0.45	4.4
Endosulfan II		ND		0.76	8.8
Endosulfan sulfate		ND		0.82	8.8
Endrin		ND		0.72	8.8
Endrin aldehyde		ND		0.87	8.8
Heptachlor		ND		2.1	8.8
Heptachlor epoxide		ND		0.013	4.4
Methoxychlor		ND		1.1	44
Endrin ketone		ND		1.1	8.8
Toxaphene		ND		100	440
alpha-Chlordane		ND		0.59	4.4
gamma-Chlordane		ND		0.59	4.4

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	52		35 - 129
DCB Decachlorobiphenyl	66		60 - 128

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244105**

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8081B Organochlorine Pesticides (GC)

Analysis Method:	8081B	Analysis Batch:	580-195465	Instrument ID:	TAC034
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.357 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/21/2015 2139			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Aldrin		ND		0.59	2.7
alpha-BHC		ND		0.74	2.7
beta-BHC		ND		0.87	2.7
delta-BHC		ND		0.40	2.7
gamma-BHC (Lindane)		ND		0.80	2.7
4,4'-DDD		ND		0.39	5.3
4,4'-DDE		ND		0.38	5.3
4,4'-DDT		ND		0.41	5.3
Dieldrin		ND		0.32	5.3
Endosulfan I		ND		0.27	2.7
Endosulfan II		ND		0.46	5.3
Endosulfan sulfate		ND		0.49	5.3
Endrin		ND		0.44	5.3
Endrin aldehyde		ND		0.53	5.3
Heptachlor		ND		1.2	5.3
Heptachlor epoxide		ND		0.0080	2.7
Methoxychlor		ND		0.69	27
Endrin ketone		ND		0.69	5.3
Toxaphene		ND		61	270
alpha-Chlordane		ND		0.36	2.7
gamma-Chlordane		ND		0.36	2.7

Surrogate	%Rec	Qualifier	Acceptance Limits
Tetrachloro-m-xylene	51		35 - 129
DCB Decachlorobiphenyl	67		60 - 128

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244116**

Lab Sample ID: 580-51018-1 Date Sampled: 06/17/2015 1440
Client Matrix: Water Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	975.5 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0013			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.017	0.51
PCB-1221	ND		0.030	0.51
PCB-1232	ND		0.015	0.51
PCB-1242	ND		0.014	0.51
PCB-1248	ND		0.014	0.51
PCB-1254	ND		0.015	0.51
PCB-1260	ND		0.040	0.51

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	104	^	38 - 121
Tetrachloro-m-xylene	91		26 - 124

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244117**

Lab Sample ID: 580-51018-2 Date Sampled: 06/17/2015 1510
Client Matrix: Water Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1020.8 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0030			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.017	0.49
PCB-1221	ND		0.028	0.49
PCB-1232	ND		0.015	0.49
PCB-1242	ND		0.014	0.49
PCB-1248	ND		0.014	0.49
PCB-1254	ND		0.015	0.49
PCB-1260	ND		0.038	0.49

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	94	^	38 - 121
Tetrachloro-m-xylene	85		26 - 124

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244118**

Lab Sample ID: 580-51018-3 Date Sampled: 06/17/2015 1600
Client Matrix: Water Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1051.2 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0048			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.016	0.48
PCB-1221	ND		0.028	0.48
PCB-1232	ND		0.014	0.48
PCB-1242	ND		0.013	0.48
PCB-1248	ND		0.013	0.48
PCB-1254	ND		0.014	0.48
PCB-1260	ND		0.037	0.48

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	100	^	38 - 121
Tetrachloro-m-xylene	87		26 - 124

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244119**

Lab Sample ID: 580-51018-4
Client Matrix: Water

Date Sampled: 06/17/2015 1515
Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	971.7 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0105			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.017	0.51
PCB-1221	ND		0.030	0.51
PCB-1232	ND		0.015	0.51
PCB-1242	ND		0.014	0.51
PCB-1248	ND		0.014	0.51
PCB-1254	ND		0.015	0.51
PCB-1260	ND		0.040	0.51

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	102	^	38 - 121
Tetrachloro-m-xylene	83		26 - 124

7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244120**

Lab Sample ID: 580-51018-5
Client Matrix: Water

Date Sampled: 06/18/2015 1230
Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	938.3 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0122			Injection Volume:	1 uL
Prep Date:	06/23/2015 1723			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.018	0.53
PCB-1221	ND		0.031	0.53
PCB-1232	ND		0.016	0.53
PCB-1242	ND		0.015	0.53
PCB-1248	ND		0.015	0.53
PCB-1254	ND		0.016	0.53
PCB-1260	ND		0.042	0.53

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	108	^	38 - 121
Tetrachloro-m-xylene	88		26 - 124

MW 7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244121**

Lab Sample ID: 580-51018-6 Date Sampled: 06/17/2015 1440
Client Matrix: Water Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1035.2 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0357			Injection Volume:	1 uL
Prep Date:	06/23/2015 1758			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.016	0.48
PCB-1221	ND		0.028	0.48
PCB-1232	ND		0.014	0.48
PCB-1242	ND		0.014	0.48
PCB-1248	ND		0.014	0.48
PCB-1254	ND		0.014	0.48
PCB-1260	ND		0.038	0.48

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	107	^	38 - 121
Tetrachloro-m-xylene	88		26 - 124

MW 7-30-15

Client: Ecology and Environment, Inc.

Job Number: 580-51018-1

Client Sample ID: **15244122**

Lab Sample ID: 580-51018-7
Client Matrix: Water

Date Sampled: 06/17/2015 1535
Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193656	Instrument ID:	TAC034
Prep Method:	3510C	Prep Batch:	580-193019	Initial Weight/Volume:	1052.4 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/01/2015 0415			Injection Volume:	1 uL
Prep Date:	06/23/2015 1758			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
PCB-1016	ND		0.016	0.48
PCB-1221	ND		0.028	0.48
PCB-1232	ND		0.014	0.48
PCB-1242	ND		0.013	0.48
PCB-1248	ND		0.013	0.48
PCB-1254	ND		0.014	0.48
PCB-1260	ND		0.037	0.48

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	105	^	38 - 121
Tetrachloro-m-xylene	84		26 - 124

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: **15244101**

Lab Sample ID: 580-51018-10 Date Sampled: 06/17/2015 0940
Client Matrix: Solid % Moisture: 26.7 Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193822	Instrument ID:	TAC045
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.473 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0307			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
PCB-1016		ND		0.00065	0.013
PCB-1221		ND		0.0044	0.014
PCB-1232		ND		0.0029	0.014
PCB-1242		ND		0.0027	0.013
PCB-1248		ND		0.0021	0.014
PCB-1254		ND		0.0012	0.013
PCB-1260		0.0048	J	0.0017	0.013

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	76		50 - 140
Tetrachloro-m-xylene	63		45 - 135

7/30/15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244102

Lab Sample ID: 580-51018-11 Date Sampled: 06/17/2015 1017
Client Matrix: Solid % Moisture: 22.7 Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193822	Instrument ID:	TAC045
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.116 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0357			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
PCB-1016		ND		0.00064	0.013
PCB-1221		ND		0.0043	0.014
PCB-1232		ND		0.0028	0.014
PCB-1242		ND		0.0027	0.013
PCB-1248		ND		0.0020	0.014
PCB-1254		ND		0.0012	0.013
PCB-1260		ND		0.0017	0.013

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	79		50 - 140
Tetrachloro-m-xylene	66		45 - 135

7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244103

Lab Sample ID: 580-51018-12 Date Sampled: 06/17/2015 1130
Client Matrix: Solid % Moisture: 51.5 Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193822	Instrument ID:	TAC045
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.476 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0414			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
PCB-1016		ND		0.00098	0.020
PCB-1221		ND		0.0067	0.022
PCB-1232		ND		0.0043	0.022
PCB-1242		ND		0.0041	0.020
PCB-1248		ND		0.0031	0.022
PCB-1254		ND		0.0018	0.020
PCB-1260		ND		0.0026	0.020

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	78		50 - 140
Tetrachloro-m-xylene	64		45 - 135

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244104

Lab Sample ID: 580-51018-13 Date Sampled: 06/17/2015 1210
Client Matrix: Solid % Moisture: 77.8 Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193822	Instrument ID:	TAC045
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.159 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0431			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
PCB-1016		ND	*	0.0022	0.044
PCB-1221		ND	*	0.015	0.049
PCB-1232		ND	*	0.0097	0.049
PCB-1242		ND	*	0.0093	0.044
PCB-1248		ND	*	0.0071	0.049
PCB-1254		ND	*	0.0040	0.044
PCB-1260		ND	*	0.0058	0.044

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	70		50 - 140
Tetrachloro-m-xylene	72		45 - 135

MW 7-30-15

Client: Ecology and Environment, Inc. Job Number: 580-51018-1

Client Sample ID: 15244105

Lab Sample ID: 580-51018-14 Date Sampled: 06/17/2015 1630
Client Matrix: Solid % Moisture: 63.9 Date Received: 06/20/2015 1045

8082A Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analysis Method:	8082A	Analysis Batch:	580-193822	Instrument ID:	TAC045
Prep Method:	3550B	Prep Batch:	580-193641	Initial Weight/Volume:	10.357 g
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	07/02/2015 0447			Injection Volume:	1 uL
Prep Date:	06/30/2015 1442			Result Type:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
PCB-1016		ND		0.0013	0.027
PCB-1221		ND		0.0091	0.029
PCB-1232		ND		0.0059	0.029
PCB-1242		ND		0.0056	0.027
PCB-1248		ND		0.0043	0.029
PCB-1254		ND		0.0024	0.027
PCB-1260		ND		0.0035	0.027

Surrogate	%Rec	Qualifier	Acceptance Limits
DCB Decachlorobiphenyl	67		50 - 140
Tetrachloro-m-xylene	61		45 - 135

MW 7-30-15