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2016 Groundwater Monitoring and Well Installation Report
Alaska Airlines Kotzebue Facility

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ACRONYMS

±	plus or minus
°C	degrees Celsius
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AOC	area of concern
AS	Alaska Airlines, Inc.
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	chain of custody
COPCs	contaminants of potential concern
CSM	conceptual site model
DRO	diesel-range organics
ft	feet
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organics
LOD	Limit of detection
LOQ	Limit of quantitation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mS/cm	millisiemens per centimeter
mV	millivolts
PAH	polynuclear aromatic hydrocarbon
PID	photoionization detector
PVC	polyvinyl chloride
RI	remedial investigation
SGS	SGS North America, Inc.
SLR	SLR International Corporation
UST	underground storage tank

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1. INTRODUCTION

At the request of Alaska Airlines, Inc. (AS), SLR International Corporation (SLR) has completed a groundwater investigation at the AS airport terminal facility (Site) located at the Ralph Wein Memorial Airport in Kotzebue, Alaska. The Site is identified by Alaska Department of Environmental Conservation (ADEC) file number 410.26.005. The investigation included decommissioning and installation of monitoring wells, and groundwater monitoring.

1.1 SITE SETTING

Kotzebue, Alaska is located on the Baldwin Peninsula in Kotzebue Sound, on a three-mile-long spit near the Kobuk and Noatak rivers (Figure 1). Kotzebue is approximately 550 air miles northwest of Anchorage, Alaska.

The airport was constructed in 1950 and is located in Kotzebue, at 66º 53' 4.8" N latitude and 162º 35' 54.78" W longitude. The airport was built on gravel fill material that was placed on top of arctic tundra. The ground surface at the airport is generally level and sits at an elevation of approximately 11.5 feet (ft) above mean sea level. Municipal utilities, including potable water and sewers, serve the airport area.

The AS terminal is located on Alaska Department of Transportation and Public Facilities lease Lots E, F, and G, Block 1, and includes a two-story terminal building (Figure 2), a fueling area, and a cargo storage area to the west of the terminal building.

1.2 REGIONAL AND LOCAL GEOLOGY

The Kotzebue area is underlain by continuous permafrost with a near-surface soil layer that freezes and thaws annually (i.e., an “active layer”). The active layer is typically less than 2 ft thick beneath undeveloped areas and seasonal thaw water depths of up to 10 ft may be present in developed areas such as beneath the AS terminal facility. Suprapermafrost groundwater (i.e., water above the permafrost layer) exists beneath the airport area and has been observed at between 2 to 5 ft below ground surface (bgs). The direction of water flow beneath the AS terminal facility was estimated to be to the northwest based on suprapermafrost groundwater elevations measured in 2015 (SLR, 2015) and to the east based on measurements in 2000 (URS, 2001). The specific flow gradients are difficult to determine because of the transient nature of the suprapermafrost water.

The airport is bordered by surface water with Kotzebue Sound located to the west and Kotzebue Lagoon to the east. Groundwater beneath the airport is not used as a drinking water source because permafrost conditions limit the quantity of available water and the suprapermafrost water in the area is of brackish quality (Maul Foster & Alongi, Inc. and SLR Alaska, 2003). Water for domestic use is piped to Kotzebue from Vortac and Devil’s Lakes located more than one mile east and upgradient of the airport (U.S. Geological Survey, 1995).

1.3 SITE HISTORY

Areas of concern (AOCs) at the Site include fuel storage tanks and other operation-related features identified during the February 2000 remedial investigation (RI; URS, 2001). The four AOCs identified during the RI are summarized as:

- A former 550-gallon diesel underground storage tank (UST) removed in 1994;
- A former 10,000-gallon Jet A UST used to supply fuel to an aircraft refueling hydrant system and the terminal building heating system;
- The area to the southwest of the AS terminal; and
- A former heating oil aboveground storage tank (AST) and fuel line that was used during construction of the AS terminal building in the mid-1980s.

1.3.1 2000 REMEDIAL INVESTIGATION

The Remedial Investigation (RI) completed in 2000 consisted of drilling and sampling 28 soil borings (TB-1 through TB-28) and installation of three monitoring wells (MW-1, MW-2, and MW-3). The purpose of the RI was to assess potential soil and water impacts at the four AOCs. Concurrent with the RI, the Jet A UST was removed and four soil samples from the tank excavation were submitted for laboratory analysis.

Results from the 2000 RI for the four AOCs indicated:

- **Former 550-gallon Gasoline UST:** Alaska Department of Environmental Conservation (ADEC) soil cleanup levels were exceeded only for xylenes from boring TB-1. Monitoring well MW-1 contained concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), gasoline-range organics (GRO), and diesel-range organics (DRO) that exceeded the ADEC groundwater cleanup standards.
- **Area Southwest of Terminal Building:** Petroleum hydrocarbons were detected only in samples from TB-13; however, all petroleum hydrocarbon concentrations were below ADEC soil cleanup standards. The only reported exceedance of groundwater cleanup levels was reported for benzene in the sample from MW-2.
- **Former 10,000-gallon Jet A UST:** Concentrations of detected compounds were below ADEC soil cleanup levels for all soil samples from soil borings, TB-12, TB-20, TB-22, and TB-24 drilled at the former Jet A UST, associated fuel line, and hydrant system.
- **Former Heating Oil AST:** DRO was reported below the soil cleanup level for all soil samples collected in the vicinity of the abandoned fuel line. GRO was also reported below the cleanup level in one soil sample from boring TB-21, near the location of the former heating oil AST. A single groundwater sample from monitoring well MW-3 contained benzene, GRO, and DRO at concentrations above the ADEC groundwater cleanup levels.

1.3.2 2002 REMEDIAL INVESTIGATION

An additional RI was conducted in 2002 to further characterize the Site and develop a conceptual site model (CSM) to evaluate the risks associated with impacted soil and water (Maul Foster & Alongi, Inc. and SLR Alaska, 2003). Activities completed during the 2002 field investigation included: drilling four soil borings (SB-1, SB-2, WP-1, and WP-2); collecting and testing soil samples from each boring; installing two water well points (WP-1 and WP-2); measuring depths to water in the well points and existing onsite monitoring wells (MW-1, MW-2, and MW-3); collecting and testing suprapermafrost water samples from the new well points and existing monitoring wells; and collecting air samples from four locations within the AS terminal building.

Results from the 2002 investigation indicated the following:

The soil and suprapermafrost water samples collected from the borings and well points near the former Jet A UST contained petroleum hydrocarbons. With the exception of DRO, all concentrations were below the ADEC cleanup standards.

Soil sample results from boring SB-1, located near the former heating oil AST, indicated that GRO and xylenes were present at concentrations exceeding the ADEC soil cleanup standard and confirmed the 2000 RI results. Because boring SB-1 is located on the eastern boundary of the Site and there are no known onsite gasoline sources in this area, the source of the gasoline may be at the Bering Air terminal located to the east (Figure 2).

The water sample collected from MW-2, near the former Jet A fuel hydrant, contained petroleum hydrocarbon compounds but at concentrations below the ADEC groundwater cleanup standards.

The results from four indoor air samples showed that detectable BTEX concentrations were present at each sample location. The benzene concentrations in each sample exceeded U.S. Environmental Protection Agency (EPA) Region 9 ambient air preliminary remediation goal. However, it is unlikely that air sample results were representative of volatile hydrocarbons solely migrating from the subsurface into the building airspace as other potential sources were noted (e.g., aircraft exhaust or incidental fuel on clothing).

Contaminants of potential concern (COPCs) included:

- Soil: GRO, toluene, ethylbenzene, and xylenes; and
- Groundwater: GRO and benzene.

No COPCs were identified with regard to inhalation of vapors emitted from the subsurface to indoor air.

1.3.3 2010 GROUNDWATER SAMPLING

The Site was revisited in 2010, but only monitoring well MW-2 was sampled. Monitoring well MW-1 was not found and monitoring well MW-3 was found to be broken. Analytical results from the October 2010 sampling event indicated a decrease in GRO and BTEX concentrations, and

increase in DRO concentrations since 2002 in the wells sampled. Decommissioning and replacement of monitoring wells MW-1 and MW-3 was recommended along with additional groundwater sampling at the Site (SLR, 2010).

1.3.4 2015 GROUNDWATER SAMPLING, WELL REPLACEMENT, AND AIR SAMPLING QUESTIONNAIRE

The most recent monitoring event was completed in 2015 and included replacement of two monitoring wells (MW-1 and MW-3), collection of soil samples for waste characterization during installation of the replacement wells, and collection of groundwater samples from monitoring wells. Additionally, groundwater flow direction was determined from available monitoring wells and an *ADEC Building Survey and Indoor Air Sampling Questionnaire* was completed for the terminal building. The results of the 2015 investigation are presented in the *2015 Groundwater Monitoring Report* (SLR, 2015) and are summarized below:

- Soil waste characterization results: GRO and DRO were reported above the method limit of detection (LOD) but below ADEC Method Two soil cleanup levels for the Arctic Zone and the migration to groundwater for the Under 40 inch Precipitation Zone.
- Groundwater monitoring results: Exceedances of groundwater cleanup levels were reported for GRO in MW-3R and benzene and DRO in MW-1R, MW-2, and MW-3R. Polynuclear aromatic hydrocarbons (PAHs) did not exceed groundwater cleanup levels.
- The groundwater flow direction was inferred to be to the northwest with a gradient of 0.0015 ft/ft. The groundwater flow direction is shown on Figure 2.

No ambient indoor air volatile hydrocarbon contamination was detected during screening using a photoionization detector (PID). However, potential sources of volatile hydrocarbon were identified in the garage area and included heavy equipment exhaust, drums containing used oil and glycol (drums were in good condition and sealed), and a fuel oil powered boiler; no potential sources were found in the terminal or office areas.

1.4 PROJECT OBJECTIVES

The objectives for the 2016 activities were based on findings and recommendations presented in the *2015 Groundwater Monitoring Report* (SLR, 2015) and comments from the ADEC. The 2016 objectives included:

- Decommission and replace monitoring well MW-1R located within the footprint of the planned terminal building expansion;
- Install and develop three new monitoring wells, MW-4, MW-5, and MW-6 to evaluate the extent of impacted groundwater;
- Collect one soil sample per boring during installation of the four wells listed above and submit for laboratory analysis of GRO, DRO, BTEX, and PAHs; and

- Collect groundwater samples from existing monitoring wells MW-2 and MW-3R, replacement well MW-1R2, and new wells MW-4, MW-5, and MW-6. Analyze samples for GRO, DRO, and BTEX as part of annual monitoring event.

2. REGULATORY CRITERIA

The applicable regulatory criteria for groundwater at the Site are described in this section.

2.1 GROUNDWATER

Groundwater cleanup levels for contaminated sites are specified in Title 18 of the Alaska Administrative Code (AAC), Chapter 75, *Oil and Other Hazardous Substances Pollution Control*, a revised as of November 6, 2016 (ADEC, 2016b). While groundwater cleanup levels do not apply to suprapermafrost groundwater, they are used as guidelines to discuss the magnitude of hydrocarbon contamination at this site. A summary of the groundwater cleanup levels listed in the regulation for constituents detected at the Site are provided below.

- GRO, 2.2 milligrams per liter (mg/L);
- DRO, 1.5 mg/L;
- Benzene, 0.0046 mg/L;
- Toluene, 1.1 mg/L;
- Ethylbenzene, 0.015 mg/L, and
- Xylenes, 0.19 mg/L.

2.2 SOIL

The relevant applicable soil cleanup levels for the Site, located in the Arctic Zone, are contained in Method Two (Tables B1 and B2) of 18 AAC 75. The most stringent of the direct contact or outdoor inhalation pathway cleanup levels apply to this Arctic Zone site. For reference, "migration to groundwater" cleanup levels are also given (in parentheses). The applicable soil cleanup levels are:

- GRO, 1,400 (300) milligrams per kilogram (mg/kg);
- DRO, 12,500 (250) mg/kg;
- Benzene, 16 (0.022) mg/kg;
- Toluene, 200 (6.5) mg/kg;
- Ethylbenzene, 72 (0.13) mg/kg; and
- Total xylenes, 57 (1.5) mg/kg.

The cleanup levels for individual PAHs are not listed, but the applicable cleanup levels for these compounds will be the most stringent of the Method Two Arctic Zone pathways for direct contact, outdoor inhalation, or migration to groundwater and are listed in Table 1.

3. FIELD ACTIVITIES

Activities at the Site in 2016 included the decommissioning and replacement of one monitoring well and installation of three new monitoring wells, followed by a groundwater sampling event. The field activities were conducted in accordance with ADEC *Field Sampling Guidance* (ADEC, 2016a) and SLR's Health and Safety Plan. All work described in this section was completed or overseen by SLR Associate Geologist Ben Siwiec, who met the ADEC definition of a "qualified environmental professional" 18 AAC 75.325 (ADEC, 2016b).

3.1 SOIL BORINGS, SCREENING, AND SAMPLING

SLR oversaw the installation and collection soil samples from soil borings that were completed as monitoring wells. A total of four borings (MW-1R2, MW-4, MW-5, and MW-6) were drilled by Drake Construction of Kotzebue, Alaska using a solid-stemmed auger. SLR coordinated the location of underground utilities prior to commencement of subsurface activities. The locations of pre-existing monitoring wells and new monitoring wells are shown on Figure 2. Borings ranged from 6 to 8 ft bgs.

Monitoring well MW-1R2 was installed as a replacement for monitoring well MW-1R, which was located in the proposed terminal building expansion area. MW-1R2 and MW-4 are located as close as possible to, but not within, the footprint of the proposed expansion (Figure 2).

Soil was recovered from each boring for field soil classification and soil screening. The results of soil classification and screening were used to determine the interval for laboratory analysis as described in Section 4.1. Soil samples were submitted for laboratory analysis of potential contaminants (listed in Section 3.4) to evaluate for the presence of petroleum-hydrocarbon impacts.

3.2 MONITORING WELLS

Monitoring well MW-1R was decommissioned and replaced with monitoring well MW-1R2. New monitoring wells MW-4, MW-5, and MW-6 were installed. Monitoring wells were decommissioned, installed, and developed consistent with ADEC-recommended practices in order to prevent the wells from becoming pathways for surficial contaminants (ADEC, 2013), as described in Section 4.2.

3.3 GROUNDWATER SAMPLING

SLR conducted a single groundwater sampling event for the Site in 2016. This sampling included all onsite groundwater monitoring wells (MW-1R2, MW-2, MW-3R, MW-4, MW-5, and MW-6). Groundwater samples were collected from the monitoring wells consistent with the industry-standard methods using low-flow or conventional sampling methodology, as discussed in Section 4.3. Results of groundwater samples submitted for laboratory analyses shown in the following section were used to evaluate groundwater impacts at the Site.

3.4 ANALYTICAL SAMPLING PROGRAM

Soil and groundwater samples were submitted to SGS North America, Inc. (SGS), in Anchorage, Alaska, an ADEC-approved laboratory. Analyses were performed by the following methods:

- GRO/BTEX by Alaska Method 101/EPA Method 8021B; and
- DRO by Alaska Method 102;
- PAHs (soil) by USEPA Method 8270C SIM (10% of samples collected); and
- Percent moisture (soil) by EPA Method 2540G.

3.5 SAMPLE HANDLING

Procedures used to maintain the integrity of soil and groundwater samples collected for laboratory analysis began at the time of collection and continued until analysis.

A bound field logbook, sample collection forms, and field logs were maintained to document the 2015 soil removal and sampling activities. Samples were assigned a unique identifier using project specific nomenclature. Field notes written in ink provided a record of information such as field staff, sample locations, field screening results, site observations, and work directives.

At the time of collection, sample containers appropriate for the specified analysis were filled and sealed. A blind sample designation was assigned to replicate samples and the collection time for these samples corresponded with the collection time of the primary sample. A trip blank was included in each cooler that contained samples to be analyzed for volatiles (i.e. GRO and BTEX). Labels indicating sample identification, date, time and the sampler's initials were affixed to the sample containers.

Chain of custody (COC) forms were completed as the samples were packaged into coolers for transport to the laboratory. Trip blanks, temperature blanks, and frozen gel ice packs were added to each cooler as required. The samples were maintained at a temperature of approximately 4 degrees Celsius (ºC) from the time of collection until arrival at the laboratory. Samples delivered by SLR personnel directly to SGS with sufficient time to allow for sample extraction within the holding time requirements of the test methods.

3.6 QUALITY ASSURANCE AND QUALITY CONTROL

All field activities were documented in a bound project field logbook. Field duplicate samples were collected throughout the sampling period at a frequency of 10 percent of the total number of samples collected during the sampling event. A minimum of one duplicate sample was collected from each media (i.e., one groundwater duplicate and one soil duplicate). To ensure complete laboratory blindness, duplicates were given false sample names on the label and COC. Duplicate sample identification was documented in the field logbook and on field forms, in connection with the primary sample identification.

Trip blanks for volatile contaminant analysis accompanied the sample containers from the laboratory to the field, to the sample sites as samples were collected, and remained in the coolers as they were transported back to the laboratory. Trip blanks were noted on the COCs for the relevant coolers.

SLR completed an ADEC Laboratory Data Review Checklist and data quality assurance review consistent with ADEC guidance for each analytical report.

4. FIELD PROCEDURES

Sample collection, sample preservation, COC documentation, and delivery to the analytical laboratory was performed in accordance with standard industry practices. This section includes summaries of applicable field procedures that were followed during site activities including monitoring well decommissioning and replacement and groundwater and soil sampling.

4.1 SOIL SCREENING AND SAMPLING

Soil was retrieved from borings for field screening and collection of analytical samples. Soil was collected for screening potential sampling every 2 ft from the surface to the water table. Retrieval of soil from borings entailed:

- Removal of the solid stem drill auger from the boring;
- Insertion of hand auger tool into boring, advancing the hand auger 0.5 ft;
- Removal of the hand auger and collection of soil sample from the hand auger drum; and
- Reinsertion of the solid stem auger to continue drilling.

The hand auger was decontaminated between analytical samples, as described in Section 4.4.

Soil collected from the borings was logged on a field form consistent with American Society for Testing and Materials (ASTM) D2488 S*tandard Practice for Description and Identification of Soil* and screened for the presence of petroleum hydrocarbon impacts.

4.1.1 SCREENING

Soil screening consisted of visual and olfactory observations and evaluation of total volatile hydrocarbons using a PID and the heated headspace method consistent with ADEC *Field Sampling Guidance* (ADEC, 2016a). Heated headspace procedures are as follows:

- Calibrate the PID with 10 electron volt lamps according to the manufacturer's specifications and requirements.
- Partially fill (one-third to one-half) a re-sealable polyethylene bag with freshly uncovered soil and seal quickly.
- In a heated space, allow headspace vapors to develop in the bag for at least 10 minutes but no longer than one hour.
- Shake or agitate containers for 15 seconds at the beginning and end of the headspace development period to assist volatilization. Temperatures of the headspace must be warmed to at least 40 degrees Fahrenheit (approximately 4.5 ºC).
- After headspace development, insert the instrument sampling probe to a point about one-half the headspace depth. The container opening must be minimized and care must be taken to avoid uptake of water droplets and soil particulates.
- After probe insertion, record the highest meter reading in the field record or log book.

Screening results are included on boring logs in Appendix B.

4.1.2 SAMPLING

One soil sample was collected from the interval in each boring identified by field screening as having the greatest potential petroleum hydrocarbon impacts, or from the zone immediately above the water table if no impacts were identified. All soil samples were analyzed for DRO, GRO, and BTEX and one sample (from the boring interval with the highest level of petroleum hydrocarbon impacts observed at the Site) was selected for analyses of PAHs.

Soil samples for laboratory analysis were collected as soon as possible after the auger bucket emerged from the boring to avoid loss of volatile compounds. Samples were collected directly from the hand auger drum using new stainless steel spoons and were placed directly into laboratory-supplied containers. Sample information was recorded on boring logs and is available in Appendix B.

A new clean pair of nitrile gloves were donned to collect each sample and/or handle sampling equipment.

4.2 MONITORING WELLS

The field procedures used for decommissioning, installation, and development of monitoring wells are described in the following sections.

4.2.1 DECOMMISSIONING

Decommissioning of MW-1R was completed by removing the surface vault by hand with a shovel, then using the drill rig to lift the well casing out of the ground by wrapping a chain around it. Due to the shallow depth of the well (and short casing and screen; about 6 ft), the well was removed in one motion. Bentonite chips were poured into the open hole to a depth of 1 foot below ground surface and hydrated. As the surrounding area is surfaced with gravel, no pavement patching was necessary. The Site was regraded using gravel from the surrounding area.

4.2.2 INSTALLATION

New monitoring wells were constructed in a manner consistent with ADEC *Monitoring Well Guidance* (ADEC, 2013). The well casings consist of 2-inch diameter schedule-40 polyvinyl chloride (PVC). The well screens consist of a slotted 2-inch diameter schedule-40 PVC pipe with 0.010-inch slots. All risers and screens used threaded connections. A compression-fit end plug was fitted to the bottom of each screen. No primers or glues were used. The wells were constructed as follows:

- Screens and risers were placed into the boring;
- The annular space around screen was filled with Colorado silica sand (10/20) to between 1 and 2 ft above the screen;

- A well seal of ⅜-inch bentonite chips was poured into the boring above the sand pack to a depth of between 1 and 1.5 ft and hydrated;
- Clean gravel was placed over the well seal to a depth of about 1 foot;
- A 6-inch diameter steel flush-mount vault-style monument was installed over each well, and the remaining exterior annular space was backfilled with clean gravel. For wells installed in paved areas, hot asphalt was packed around the monument. Care was taken to leave the monument covers slightly below grade to avoid damage from snow plowing activities in the winter.

4.2.3 DEVELOPMENT

Monitoring wells were developed in accordance with ADEC *Monitoring Well Guidance* (ADEC, 2013). Wells were developed at least 24 hours after installation. Wells were surged and purged using Waterra tubing, valve, and surge block. Surging was performed by moving the surge block up and down through the screened interval for a period of time (between 4 and 10 minutes). Purging was performed after surging. Where possible, five well volumes were purged; however, very slow recharge in some wells prevented purging the desired volumes. In cases of slow recharge, after purging the well dry, the well was allowed to recharge. Periods of time the well was allowed to recharge ranged from 1 hour to overnight. Following recharge, the well was purged dry again, repeating the process as many times as practical.

4.3 GROUNDWATER SAMPLING

SLR used low-flow purging and sampling techniques to collect groundwater samples from monitoring wells, where possible. Where well recharge was too slow to allow purging and sampling using a peristaltic pump, the well was purged completely dry and the sample was collected from the recharge water. The procedures for these methods are described in the sections below.

No submersible pumps were used; therefore no decontamination of pumps was necessary. New, disposable tubing was used for each well. Clean nitrile gloves were donned by field staff handling sampling equipment, and new gloves were donned for each well.

Samples were collected directly into laboratory-supplied sample containers appropriate for the required analyses. Samples were placed in a chilled cooler as soon as possible after collection. Sample and cooler temperatures were maintained at approximately 4 °C ± 2°C throughout transport to the laboratory. Each sample and trip blank was documented on the COC form.

Water quality parameters and other sampling information were documented on field data sheets and in the field logbook provided in Appendix B.

4.3.1 LOW-FLOW PURGING AND SAMPLING METHODOLOGY

Low-flow purging and sampling methodology was conducted using a peristaltic pump. Groundwater sample collection by low-flow methods was conducted according to EPA *Standard*

Operating Procedure for Low-Stress (Low Flow)/Minimal Drawdown Ground-Water Sample Collection (EPA, 2010).

Depth to water was measured prior purging. A low-flow purge rate of less than 0.5 liters per minute was used to minimize drawdown of the water column. Water quality parameters were measured at regular intervals during purging using a YSI 556 meter and recorded on the field water sampling data sheet (Appendix B). Purging was considered complete once water quality parameters had stabilized with three successive, discrete measurements of temperature and three other parameters within the following criteria:

- pH, standard units: plus or minus (±) 0.1;
- Specific Conductance, millisiemens per centimeter (mS/cm): ± 3%;
- DO, mg/L: ± 10%;
- ORP, millivolts (mV): ± 10; and
- Temperature, degrees Celsius (°C): ± 3%

4.3.2 ALTERNATIVE PURGING AND SAMPLING METHODOLOGY

Although it was SLR's preference was to use the low-flow methodology, recharge in some wells was insufficient to use the low-flow method (typically where the well recharges at less than 0.1 liters per minute). In these cases the well was purged dry and left to recharge. When sufficient water had recharged into the well, the peristaltic pump was reinstalled and water was pumped directly into the sample containers without purging or collection of water quality parameters. After the sample containers were filled, an additional aliquot of water was collected for a single reading of water quality parameters with the YSI 556 meter. The method was noted on the field forms and field notebook (Appendix B).

4.4 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Non-disposable sampling equipment was cleaned off-site prior to use and after use at each sampling location. Decontamination consisted of a wash with potable water with Alconox® detergent, or equivalent, followed by a deionized water rinse. Water generated during decontamination of sampling equipment was treated in the same manner as purge water generated while sampling the monitoring wells.

4.5 INSTRUMENT CALIBRATION

Field instruments were calibrated according to manufacturer specifications prior to use, daily. Calibration information was recorded on calibration field forms (Appendix B).

4.6 WASTE MANAGEMENT

Wastes generated during the field event included disposable sampling equipment, well purge and decontamination water, and soil cuttings. Disposable sampling material was disposed of as

non-oily waste. Purge water was filtered through a granulated activated carbon filter and discharged to the ground at the Site. Soil cuttings were kept to a minimum and were containerized at each boring site and transported back to Anchorage, pending sample results. No hazardous waste was generated.

5. ANALYTICAL RESULTS AND CONCEPTUAL SITE MODEL

This section provides a summary of field and analytical results.

5.1 SOIL SAMPLING RESULTS

GRO was detected at concentrations above the LOD in soils from three of the four borings (at 1.6 to 3.2 mg/kg) but below the most stringent ADEC cleanup level of 300 mg/kg. GRO was not detected in the sample from MW-4 (MW4-2.5) (Table 1).

DRO was detected in soils from each of the four borings. Concentrations did not exceed the Human Health cleanup level for the Arctic Zone of 12,500 mg/kg; however, the concentration of DRO in sample MW5-2 (410 mg/kg) exceeded the ADEC Migration to Groundwater soil cleanup level of 250 mg/kg. Concentrations in the other three samples ranged from 28.5 to 116 mg/kg (Table 1).

BTEX compounds were detected in samples from each of the four borings but did not exceed the most stringent cleanup levels (i.e., Migration to Groundwater). All BTEX detections were between the LOD and the lower Limit of Quantitation (LOQ) and as such were flagged with a “J” in Table 1.

Only sample MW5-2 and its duplicate MW5-9 were sampled for PAHs. No PAHs were detected except chrysene and pyrene, both at levels between the LOD and the lower LOQ (Table 1).

All soil sample laboratory data are presented in Table 1 and Appendix C.

5.2 GROUNDWATER SAMPLING RESULTS

GRO was detected in water from five of the six wells (at 0.111 to 1.07 mg/L), all below the ADEC cleanup level of 2.2 mg/L. GRO was not detected at MW-4.

DRO was detected in groundwater from all six wells at concentrations ranging from 0.353 to 6.49 mg/L. DRO concentrations exceeded the ADEC cleanup level of 1.5 mg/L at 5 of 6 wells with concentrations ranging from 1.59 mg/L at MW-2 to 6.49 mg/L at MW-3R.

BTEX compounds were detected in groundwater samples from all six wells. Benzene was detected above the ADEC cleanup level of 0.0046 mg/L at five of the six wells with concentrations ranging from 0.0104 mg/L at MW-3R to 0.0487 mg/L at MW-1R2. Benzene was detected at a concentration of 0.00162 mg/L in MW-4. Ethylbenzene was detected in each well except for MW-4 and exceeded the ADEC cleanup level of 0.015 mg/L in one well, MW-3R with a concentration of 0.0507 mg/L. No other BTEX compounds exceeded the ADEC cleanup levels.

All water sample laboratory data are presented in Table 2 and Appendix C.

5.3 LABORATORY DATA QUALITY

The discrete sample data was reviewed in accordance with the ADEC Environmental Laboratory Data and Quality Assurance Requirements Technical Memorandum (ADEC, 2009). Appendix C presents a Data Quality Assessment, ADEC Laboratory Data Review Checklist, and the SGS Analytical Data Reports. All results were found to be of good quality and usable for the intended purpose. No data was rejected.

5.4 CONCEPTUAL SITE MODEL

A CSM provides a way to describe how people, animals, and plants may come in contact with contaminants. Health risks to humans and the environment cannot exist unless chemicals detected at a given site have the ability to cause an adverse effect and come into contact with a human or ecological receptor. The presence of potentially complete pathways alone, however, does not imply the existence of unacceptable risks.

The CSM for this report has been prepared following ADEC guidance (ADEC, 2010) and present exposure pathways for chemicals of potential concern, routes of migration, and potential current and future receptors. ADEC Human Health scoping forms and graphical representations are provided in Appendix D.

There are no residents at the Alaska Airlines Terminal in Kotzebue. The facility has restricted access which precludes recreational activities. The facility property is fully developed with asphalt, gravel and concrete surfaces, and the terminal building. It is heavily used every day as an active airport facility and provides no ecological habitat. The lack of habitat and access restrictions eliminates any potential for subsistence activities. The only potential receptors at the facility are indoor and outdoor commercial workers, construction workers, and site visitors. There is no residential use at or near the airport, but residential use was considered for development of the CSM.

Potential exposure media include groundwater, soil, and outdoor air. Potentially complete pathways include exposure to groundwater, soil, and indoor and outdoor air to site commercial workers, construction workers, and site visitors or trespassers. Indoor and outdoor air pathways, although complete, are considered insignificant due to low concentrations of volatiles. For soil, out, and indoor air, the pathway is insignificant due to low soil concentrations.

6. DISCUSSION AND CONCLUSIONS

One monitoring well was decommissioned, three new monitoring wells were installed (MW-4, MW-5, and MW-6), and one replacement monitoring well (MW-1R2) was installed on October 4 and 5, 2016 by SLR field staff. The four newly installed wells were developed on October 6, 2016. Groundwater samples were collected from all six monitoring wells on October 3, 6, and 7, 2016.

With the exception of DRO at MW-5, all DRO, GRO, BTEX, and PAH concentrations in soil samples collected from borings MW-1R, MW-4, MW-5, and MW-6, were below the ADEC Method Two soil cleanup level for migration to groundwater (Table 1). The DRO concentration at MW-5 was below the Human Health soil cleanup level for the Arctic Zone but exceeded the Migration to Groundwater cleanup level. MW-5 is located near a former aboveground oil storage tank, next to an active aboveground oil storage tank, and near the current location of the facility's dumpster.

At MW-1R2 and MW-1R, GRO, DRO, and benzene concentrations in groundwater decreased since 2000 relative to historical results from lost monitoring well MW-1. At MW-2, GRO and benzene concentrations decreased between 2000 and 2015, and then increased slightly between 2015 and 2016. DRO concentrations at MW-2 increased between 2000 and 2010, and then decreased between 2010 and 2016. At MW-3R, GRO, DRO, and benzene concentrations have decreased since 2015. Historical groundwater analytical results are summarized below and presented in Table 3.

At new monitoring well MW-4, GRO, DRO, and benzene were detected at concentrations below ADEC groundwater cleanup levels. DRO and benzene concentrations at new wells MW-5 and MW-6 each exceeded their respective groundwater cleanup levels.

mg/L	CLEANUP LEVEL	MW-1 2000	MW-1R 2015	MW-1R2 2016	MW-2 2000	MW-2 2002	MW-2 2010	MW-2 2015	MW-2 2016
GRO	2.2	59	1.9	0.175	0.830	0.559	0.100	0.092	0.177
DRO	1.5	6.6	3.22	1.73	0.240	1.01	6.70	2.29	1.59
Benzene	0.0046	0.785	0.024	0.0487	0.036	0.0300	0.0234	0.013	0.037

mg/L	CLEANUP LEVEL	MW-3 2000	MW-3R 2015	MW-3R 2016	MW-4 2016	MW-5 2016	MW-6 2016
GRO	2.2	6.2	3.1	1.07	ND	0.267	0.122
DRO	1.5	3.3	11.1	6.49	0.353	5.84	1.72
Benzene	0.0046	0.180	0.0553	0.0104	0.00162	0.0316	0.0238

The 2016 groundwater results were generally consistent with previous monitoring events (Table 3). As shown in the table above, contaminant concentration trends in wells at the Site are generally decreasing. Of the three new monitoring wells installed, monitoring well MW-4, located

on the northwest boundary of the Site had no contaminant concentrations exceeding regulatory levels.

As discussed in the *Groundwater Monitoring Report, Ralph Wien Memorial Airport, Kotzebue. Alaska* (Shannon and Wilson, 2014), multiple plumes exist across the airport facility and off the AS lease property. As a result, identifying the provenance of groundwater contamination at the Site or the surrounding properties is difficult. However, the decreasing concentration trends observed on the AS lease property suggest a stable or decreasing plume with no current active source impacting water quality.

SLR recommends continued monitoring of the decreasing concentration trends at the AS Terminal Building property in 2017.

7. REFERENCES

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LIMITATIONS

The services described in this work product were performed in accordance with generally accepted professional consulting principles and practices. No other representations or warranties, expressed or implied, are made. These services were performed consistent with our agreement with our client. This work product is intended solely for the use and information of our client unless otherwise noted. Any reliance on this work product by a third party is at such party's sole risk.

Opinions and recommendations contained in this work product are based on conditions that existed at the time the services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. The data reported and the findings, observations, and conclusions expressed are limited by the scope of work. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this work product.

The purpose of an environmental assessment is to reasonably evaluate the potential for, or actual impact of, past practices on a given site area. In performing an environmental assessment, it is understood that a balance must be struck between a reasonable inquiry into the environmental issues and an appropriate level of analysis for each conceivable issue of potential concern. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation can be thorough enough to exclude the presence of hazardous materials at a given site. If hazardous conditions have not been identified during the assessment, such a finding should not therefore be construed as a guarantee of the absence of such materials on the site, but rather as the result of the services performed within the scope, practical limitations, and cost of the work performed.

Environmental conditions that are not apparent may exist at the site. Our professional opinions are based in part on interpretation of data from a limited number of discrete sampling locations and therefore may not be representative of the actual overall site environmental conditions.

The passage of time, manifestation of latent conditions, or occurrence of future events may require further study at the site, analysis of the data, and/or reevaluation of the findings, observations, and conclusions in the work product.

This work product presents professional opinions and findings of a scientific and technical nature. The work product shall not be construed to offer legal opinion or representations as to the requirements of, nor the compliance with, environmental laws rules, regulations, or policies of federal, state or local governmental agencies.

FIGURES

N

0 0.25 0.5 1 1.5 2 Miles

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY.
ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

SLR

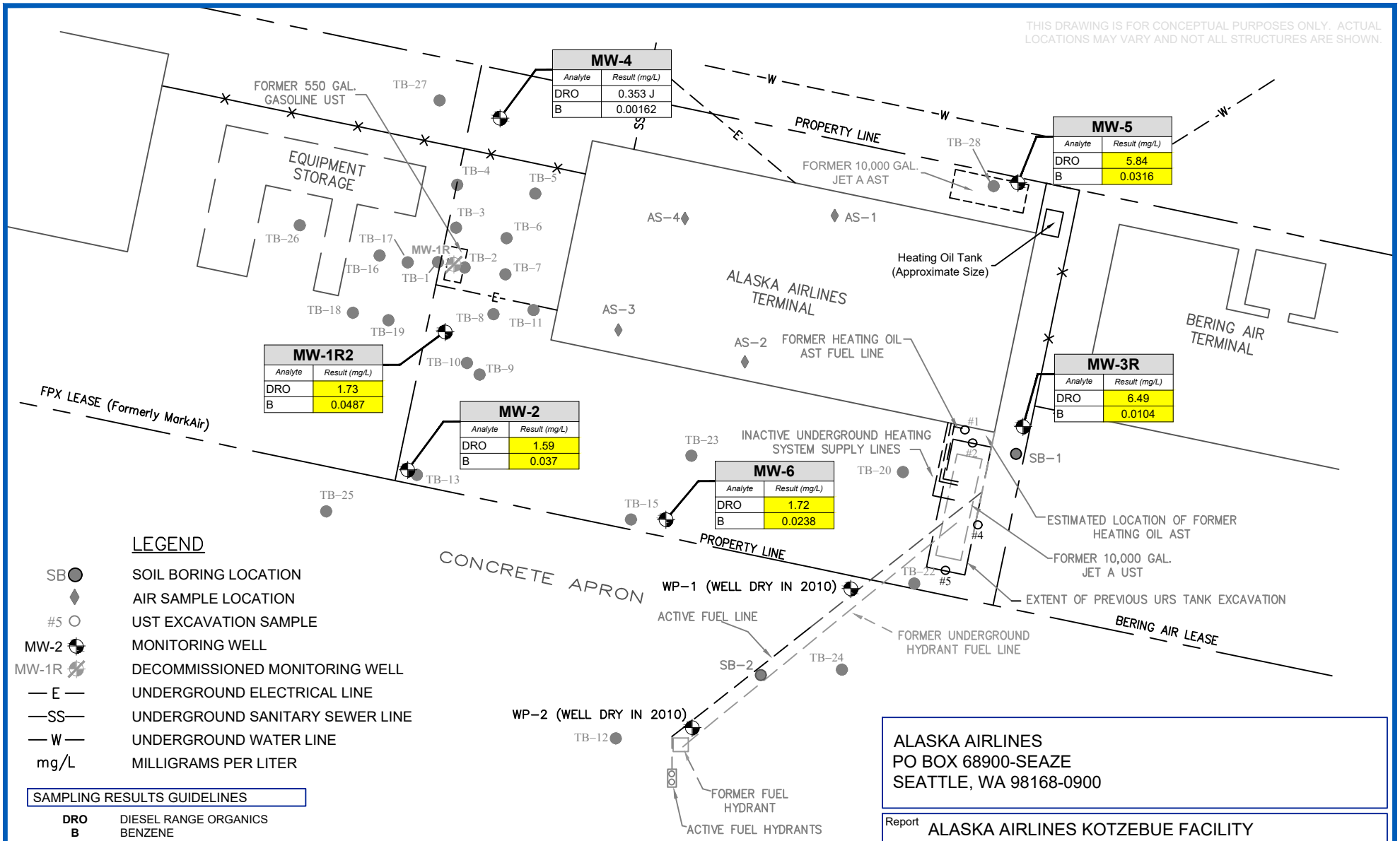
Client
ALASKA AIRLINES
PO BOX 68900
SEATTLE, WA 98168-0900

Report
ALASKA AIRLINES KOTZEBUE FACILITY
2016 GROUNDWATER MONITORING AND
WELL INSTALLATION REPORT
KOTZEBUE, ALASKA

Drawing
SITE LOCATION MAP

Drawing	December 2016	Scale	1 in = 1 miles
File Name	F1 Kotzebue GW RPT_16.mxd	Project No.	105.00104.16004

Fig. No. 1


THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.
MW-4
Analyte | Result (mg/L)
DRO | 0.353 J
B | 0.00162
MW-5
Analyte | Result (mg/L)
DRO | 5.84
B | 0.0316
MW-3R
Analyte | Result (mg/L)
DRO | 6.49
B | 0.0104
MW-1R2
Analyte | Result (mg/L)
DRO | 1.73
B | 0.0487
MW-2
Analyte | Result (mg/L)
DRO | 1.59
B | 0.037
MW-6
Analyte | Result (mg/L)
DRO | 1.72
B | 0.0238
FORMER 550 GAL. GASOLINE UST
EQUIPMENT STORAGE
PROPERTY LINE
FORMER 10,000 GAL. JET A AST
Heating Oil Tank (Approximate Size)
ALASKA AIRLINES TERMINAL
BERING AIR TERMINAL
FORMER HEATING OIL AST FUEL LINE
FPX LEASE (Formerly MarkAir)
INACTIVE UNDERGROUND HEATING SYSTEM SUPPLY LINES
ESTIMATED LOCATION OF FORMER HEATING OIL AST
FORMER 10,000 GAL. JET A UST
EXTENT OF PREVIOUS URS TANK EXCAVATION
CONCRETE APRON
WP-1 (WELL DRY IN 2010)
ACTIVE FUEL LINE
FORMER UNDERGROUND HYDRANT FUEL LINE
BERING AIR LEASE
WP-2 (WELL DRY IN 2010)
FORMER FUEL HYDRANT
ACTIVE FUEL HYDRANTS
TB-1 TB-2 TB-3 TB-4 TB-5 TB-6 TB-7 TB-8 TB-9 TB-10 TB-11 TB-12 TB-13 TB-15 TB-16 TB-17 TB-18 TB-19 TB-20 TB-22 TB-23 TB-24 TB-25 TB-26 TB-27 TB-28
AS-1 AS-2 AS-3 AS-4
MW-1R
SB-1 SB-2
#1 #2 #3 #4 #5
LEGEND
SB SOIL BORING LOCATION
AIR SAMPLE LOCATION
#5 UST EXCAVATION SAMPLE
MW-2 MONITORING WELL
MW-1R DECOMMISSIONED MONITORING WELL
E UNDERGROUND ELECTRICAL LINE
SS UNDERGROUND SANITARY SEWER LINE
W UNDERGROUND WATER LINE
mg/L MILLIGRAMS PER LITER
SAMPLING RESULTS GUIDELINES
DRO DIESEL RANGE ORGANICS
B BENZENE
J RESULT IS AN ESTIMATION
NOTES
DRO AND BENZENE SAMPLE RESULT EXCEEDANCES ARE HIGHLIGHTED IN YELLOW.
SCALE: 1" = 40'
WHEN PLOTTED AT 8.5 X 11 PAGE SIZE
0 40' 80' 120'
N
SLR
ALASKA AIRLINES
PO BOX 68900-SEAZE
SEATTLE, WA 98168-0900
Report ALASKA AIRLINES KOTZEBUE FACILITY 2016 GROUNDWATER MONITORING AND WELL INSTALLATION REPORT KOTZEBUE, ALASKA
Drawing SITE DETAIL AND MONITORING WELL LOCATIONS
Date December 2016
File Name F2 Kotzebue GW RPT_16
Scale 1" = 40'
Project No. 105.00104.16004
Fig. No. 2

TABLES

Table 1 - 2016 Soil Boring Sampling Results
Wein Memorial Airport, Kotzebue, Alaska

Compound in milligrams per kilogram (mg/kg)	Screening Criteria		Sample Locations[3]										Trip Blank	
	18 AAC 75 Arctic Zone[1]	18 AAC 75 Migration to Groundwater[2]	MW1R2-4.5 05-Oct-16 1166058009		MW4-2.5 05-Oct-16 1166058011		**Primary:** MW5-2 05-Oct-16 1166058012		**Duplicate:** MW5-9 05-Oct-16 1166058013		MW6-4 05-Oct-16 1166058010		TB-2 05-Oct-16 1166058014	
Fuels (AK101 and AK102)														
Gasoline Range Organics	**1400**	**300**	3.17	J	[2.36]	ND	1.6	J	1.8	J	3.2	J	[1.25]	ND
Diesel Range Organics	**12500**	**250**	28.5	=	116	=	**388**	=	**410**	=	88.7	J	--	
BTEX (SW8021)														
Benzene	**16**	**0.022**	0.0116	J	[0.0118]	ND	[0.0133]	ND	[0.0127]	ND	0.0138	J	[0.0062]	ND
Toluene	**200**	**6.5**	0.0225	J	0.0156	J	0.0223	J	0.0243	J	0.0429	J	[0.0124]	ND
Ethylbenzene	**72**	**0.13**	[0.034]	ND	[0.0236]	ND	0.017	J	0.0197	J	[0.0405]	ND	[0.0124]	ND
o-Xylene	--	--	[0.034]	ND	[0.0236]	ND	0.0197	J	0.0172	J	[0.0405]	ND	[0.0124]	ND
P & M -Xylene	--	--	[0.068]	ND	[0.0471]	ND	0.0644	J	0.0572	J	[0.081]	ND	[0.0249]	ND
Total Xylenes[4]	**57**	**1.5**	[0.102]	ND	[0.0707]	ND	0.0841	J	0.0744	J	[0.1215]	ND	[0.0373]	ND
Polynuclear Aromatic Hydrocarbons SIM (SM8270D)														
1-Methylnaphthalene	**68**	**0.41**	--		--		[0.052]	ND	[0.052]	ND	--		--	
2-Methylnaphthalene	**420**	**1.3**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Acenaphthene	**6300**	**37**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Acenaphthylene	**3100**	**18**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Anthracene	**31000**	**390**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Benzo(a)Anthracene	**2.7**	**0.28**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Benzo[a]pyrene	**0.28**	**0.27**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Benzo[b]Fluoranthene	**2.8**	**2.7**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Benzo[g,h,i]perylene	**3100**	**15000**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Benzo[k]fluoranthene	**28**	**27**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Chrysene	**280**	**82**	--		--		0.0752	J	0.065	J	--		--	
Dibenzo[a,h]anthracene	**0.28**	**287**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Fluoranthene	**4200**	**590**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Fluorene	**4200**	**36**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Indeno[1,2,3-c,d] pyrene	**2.8**	**8.8**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Naphthalene	**42**	**0.038**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Phenanthrene	**3100**	**39**	--		--		[0.052]	ND	[0.052]	ND	--		--	
Pyrene	**3100**	**87**	--		--		[0.052]	ND	0.0322	J	--		--	
Percent Solids (SM21 2540G)														
Total Solids	--	--	94	=	96.6	=	95.6	=	95.5	=	87.6	=	--	

Notes:

1 - The cleanup level corresponds to the most stringent of direct contact or inhalation of soil as listed in 18 AAC 75.341, Tables B1 and B2, Method Two cleanup levels for the Arctic Zone (ADEC, November 6, 2016).

2 - The cleanup level corresponds to Migration to Groundwater as listed in 18 AAC 75.341, Tables B1 and B2, Method Two cleanup levels for Under 40 Inch Zone (ADEC, November 6, 2016).

3 - The field sample identification number, date collected, and laboratory sample identification number are provided.

4 - Total values were the summation of detected compounds only. If compounds were not detected, then the highest LOD was listed.

Data Flags

ND	Nondetect, LOD is presented in brackets to the left
J	The analyte was positively identified, but the result was between the LOQ and DL; the quantitation was an estimate.
=	A detected compound [concentration listed in column to the left]

Abbreviations

--	Not applicable or screening criteria does not exist for this compound	LOD	Limit of Detection
AAC	Alaska Administrative Code	LOQ	Limit of Quantitation
ADEC	Alaska Department of Environmental Conservation	mg/kg	milligrams per kilogram
DL	Detection Limit		

Table 2 - 2016 Groundwater Monitoring
Wein Memorial Airport, Kotzebue, Alaska

Compound in milligrams per liter (mg/L)	Screening Criteria	Sample Locations[2]														Trip Blanks	
	18 AAC 75, Table C Groundwater Cleanup Levels[1]	100316MW2 03-Oct-16 1166058002		100316MW3R 03-Oct-16 1166058001		100616MW4 06-Oct-16 1166058005		**Primary** 100616MW6 06-Oct-16 1166058003		**Duplicate:** 100616MW9 06-Oct-16 1166058004		100716MW1R2 07-Oct-16 1166058006		100716MW5 07-Oct-16 1166058007		TBW1 03-Oct-16 1166058008	
Fuels (AK101 and AK102)																	
Gasoline Range Organics	2.2	0.177	=	1.07	=	[0.05]	ND	0.122	=	0.111	=	0.175	=	0.267	=	[0.05]	ND
Diesel Range Organics	1.5	**1.59**	=	**6.49**	=	0.353	J	**1.72**	=	1.4	=	**1.73**	=	**5.84**	=	--	--
BTEX (SW8021B)																	
Benzene	0.0046	**0.037**	=	**0.0104**	=	0.00162	=	**0.0238**	=	**0.0237**	=	**0.0487**	=	**0.0316**	=	[0.00025]	ND
Toluene	1.1	0.00075	J	[0.0005]	ND	[0.0005]	ND	0.00072	J	0.00039	J	0.00143	=	0.00211	=	[0.0005]	ND
Ethylbenzene	0.015	0.0056	=	**0.0507**	=	[0.0005]	ND	0.00348	=	0.00339	=	0.00264	=	0.00353	=	[0.0005]	ND
o-Xylene	--	[0.0005]	ND	0.0114	=	[0.0005]	ND	0.0006	J	0.00052	J	0.00122	=	0.003	=	[0.0005]	ND
P & M -Xylene	--	0.00361	=	0.0797	=	[0.001]	ND	0.00439	=	0.00421	=	0.00648	=	0.00849	=	[0.001]	ND
Total Xylenes	0.19	0.00411	=	0.0911	=	[0.0015]	ND	0.00499	=	0.0047	=	0.0079	=	0.01149	=	[0.0015]	ND

Notes:
1 - This is the primary cleanup level for groundwater and corresponds to values listed in 18 AAC 75.345 Table C (ADEC, November 6, 2016).
2 - The field sample identification number, date collected and laboratory sample identification number are provided.
3 - Total values were the summation of detected compounds only. If compounds were not detected, then the highest LOD was listed.

Data Flags

ND	nondetect, LOD is presented in brackets to the left
J	reported value was between the laboratory DL and LOQ
Q	The quantitation was an estimate due to quality control failure. Where applicable, a "H", "L", or "N" was used to indicate possible high, low, or unknown bias.
M	The quantitation was an estimate due to matrix interference. Where applicable, a "+" or "-" was used to indicate possible high or low bias.
=	A detected compound [concentration listed in column to the left]

Abbreviations

--	Not applicable or screening criteria does not exist for this compound	LOQ	Limit of Quantitation
AAC	Alaska Administrative Code	LV	low volume
ADEC	Alaska Department of Environmental Conservation	mg/L	milligrams per liter
DL	Detection Limit	PAH	Polynuclear Aromatic Hydrocarbons
LOD	Limit of Detection	SIM	Selective Ion Monitoring

Bold and shaded - The value exceeds the primary screening criteria, 18 AAC 75 Table C.

Table 3 - Historical Groundwater Results
Wein Memorial Airport, Kotzebue, Alaska

Sample Location	Sample Date	AK101	AK102	BTEX USEPA Method 8021B				PAHs USEPA Method 8270D[B]					
		Gasoline Range Organics	Diesel Range Organics	Benzene	Toluene	Ethylbenzene	Xylenes	Phenanthrene	Pyrene	Chrysene	Naphthalene	1-Methylnaphthlene	2-Methylnaphthlene
ADEC Ground Water Cleanup Levels[A]		**2.2**	**1.5**	**0.0046**	**1.1**	**0.015**	**0.19**	**0.17**	**0.12**	**0.002**	**0.0017**	**0.011**	**0.036**
MW-1*	7/22/2000	**59**	**6.6**	**0.785**	**3**	**1.55**	**14.5**	--	--	--	--	--	--
MW-2	7/22/2000	0.830	0.240	**0.036**	0.0014	0.017	0.01	--	--	--	--	--	--
MW-3	7/22/2000	**6.2**	**3.3**	**0.180**	0.032	**0.2**	**1.2**	--	--	--	--	--	--
MW-2	9/13/2002	0.559	1.01	**0.0300**	0.00136	0.00814	0.00815	--	--	--	--	--	--
Duplicate of MW-2	9/13/2002	0.605	0.381	**0.0331**	0.00160	0.00901	0.00895	--	--	--	--	--	--
WP-1	9/13/2002	0.228	0.223	**0.0115**	<0.0005	<0.0005	0.00163	--	--	--	--	--	--
WP-2	9/13/2002	0.0526	**1,990**	0.00168	<0.0005	0.00067	0.00513	--	--	--	--	--	--
MW-2	10/7/2010	0.100	**6.70** H	**0.0234**	0.000810 J	0.00137 J	0.00162 J	0.0000896	0.000205	0.000182	0.000115	0.0000742	0.0000693
Duplicate of MW-2	10/7/2010	0.0910 J	**11.8** H	**0.0215**	ND	0.00115 J	0.00113 J	0.0000630 J	0.000155	0.000149	0.0000954 J	0.0000534	0.0000504 J
MW-1R	10/1/2015	1.9	**3.22**	**0.0245**	0.0032 J	**0.0688**	**0.363**	ND	ND	ND	**0.315**	0.00524	0.00628
MW-2	10/1/2015	0.074	1.47	**0.013**	ND	0.00081 J	0.00096 J	--	--	--	--	--	--
Duplicate of MW-2	10/1/2015	0.0923	**2.29**	**0.0129**	ND	0.00078 J	0.00096 J	--	--	--	--	--	--
MW-3R	10/1/2015	**3.1**	**11.1**	**0.0553**	ND	**0.245**	**0.809**	ND	ND	ND	**0.0017**	0.000266	ND
MW-1R2	10/7/2016	0.175	**1.73**	**0.0487**	0.00143	0.00264	0.0077	--	--	--	--	--	--
MW-2	10/3/2016	0.177	**1.59**	**0.0370**	0.000750 J	0.00560	0.00361	--	--	--	--	--	--
MW-3R	10/3/2016	1.07	**6.49**	**0.0104**	ND	**0.0507**	0.0911	--	--	--	--	--	--
MW-4	10/6/2016	ND	0.353 J	0.00162	ND	ND	ND	--	--	--	--	--	--
MW-5	10/7/2016	0.267	**5.84**	**0.0316**	0.00143	0.00353	0.01149	--	--	--	--	--	--
MW-6	10/6/2016	0.122	**1.72**	**0.0238**	0.000720 J	0.00348	0.00499	--	--	--	--	--	--
Duplicate of MW-6	10/6/2016	0.111	1.40	**0.0237**	0.000390 J	0.00339	0.00473	--	--	--	--	--	--

Notes:

[A] ADEC Cleanup Levels (18 AAC 70) as revised on November 6, 2016.

[B] PAHs not presented in this table were not detected in ground water samples

* Duplicate samples were averaged

All units in mg/L

Abbreviations:

-- - not analyzed

< - less than

BTEX - benzene, toluene, ethylbenzene, and xylenes

H - Result is biased high due to heavier hydrocarbons contributing to middle distillate range.

J - estimated value

mg/L - milligrams per liter

N/A - not applicable

ND - not detected at or above [Limit of Quantitation]

PAH - polynuclear aromatic hydrocarbons

USEPA - Environmental Protection Agency

APPENDIX A

PHOTOGRAPH LOG

Photo 1: Decommissioning monitoring well MW-1R using drill rig and winch line. 10/5/2016

Photo 2: Drilling boring for monitoring well MW-4. 10/5/2016

SLR	Monitoring Well Installation and Groundwater Sampling Alaska Airlines Terminal Kotzebue, Alaska
SITE PHOTOGRAPHS October 2016	Job No: 105.00104.16004

Photo 3: Drilling boring for monitoring well MW-5. 10/5/2016

Photo 4: Installing monitoring well casing at replacement well MW-1R2. 10/5/2016

Photo 5: Groundwater sampling equipment set up at monitoring well MW-6. 10/6/2016

Photo 6: Monitoring well MW-5 site after installation. Well is installed in gravel between asphalt of the parking area and cement pad next to dumpster. 10/7/2016

APPENDIX B

FIELD FORMS AND LOGS

Groundwater Sampling Form

Site/Client Name: Alaska Airlines Kotzebue	**Well ID:** MW-2
Project # : 105.00104.16004	Sample ID: 100316MW2
Sampled By: Ben Siwica	Sample Time: 1713 Sample Date: 10/3/16
Weather Conditions: Cloudy, 40s light wind	Duplicate ID: —
Sampling Method: ☒ Low Flow ☐ Other_____	MS/MSD ☐ Yes ☒ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: _____ ft BGS to _____ ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information BS 10/3/16

Depth to Water (ft BTOC): 2.83	Tubing/Pump Depth (ft. BTOC): 5
Total Depth (ft BTOC): 7.05	Purge Start Time (24-hr) 1631
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) 1712
Product Thickness (ft) NA	Total Purge Time (min) 41

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume (gal)	Temp (°C) (± 3 %)	Specific Conductance (µS/cm^c) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max____ft)
1640	0.25	1	2.90	1.205	0.60	6.12	-56.4	10.95	2.99	
1644	0.25	2	2.70	1.420	0.58	6.26	-70.1	9.33	2.99	
1648	0.25	3	2.64	1.883	0.57	6.44	-87.1	4.18	2.99	
1652	0.25	4	2.55	2.293	0.60	6.59	-98.7	2.17	2.99	
1656	0.25	5	2.54	2.477	0.55	6.70	-93.8	1.14	2.99	
1700	0.25	5.8	2.50	2.606	0.55	6.77	-93.1	1.35	2.99	
1704	0.25	6.8	2.50	2.705	0.57	6.83	-91.9	3.53	2.99	
1708	0.25	7.8	2.52	2.754	0.55	6.87	-87.9	0.66	2.99	
1712	0.25	8.8	2.53	2.782	0.52	6.90	-87.8	0.47	2.99	
2.7 gal total										
Parameter Stable (Check applicable)			✓	✓	✓	✓	✓	✓		

Sample Color: Light yellow **Sample Odor:** faint hydrocarbon **Sheen:** no

Analytical Sampling

Analyses	Check Applicable	Comments
DRO	✓	
GRO	✓	
BTEX	✓	

Notes:

Equipment: Pump Type Peristaltic Tubing (Type/Length) Teflon-lined Bailer Type —

Water Level Meter Slope Indicator Mod 51453 Multi-Parameter Meter (Make/SN#) YSI 556 07L100513

Turbidity Meter (Make/SN#) LaMotte 2020e 14728 Filter Lot # —

Purge Water Handling: ☐ Discharged to surface ☐ Containerized ☒ Treated (how?) filtered through GAC

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

SLR

Groundwater Sampling Form

Site/Client Name: Alaska Air Kotzebue	**Well ID:** MW-3R
Project #: 105.00104.16004	Sample ID: 100316MW3R
Sampled By: Ben Simec	Sample Time: 1555 Sample Date: 10/3/16
Weather Conditions: Cloudy, 40's 11 wind	Duplicate ID: —
Sampling Method: ☒ Low Flow ☐ Other_____	MS/MSD ☐ Yes ☒ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: 0.9 ft BGS to 5.9 ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC): 3.38	Tubing/Pump Depth (ft. BTOC): 4.5
Total Depth (ft BTOC): 5.48	Purge Start Time (24-hr) 1519
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) 1554
Product Thickness (ft) NA	Total Purge Time (min) 35

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume ~~(gal)~~ liters	Temp (°C) (± 3 %)	Specific Conductance (µS/cm°) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max___ft)
1534	0.2	2	5.01	0.785	1.62	6.23	-33.5	18.6	3.59	
1538	0.2	2.5	4.99	0.783	1.16	6.33	-42.2	13.8	3.60	
1542	0.2	3	4.96	0.782	1.23	6.39	-39.5	16.1	3.60	
1546	0.2	3.5	4.98	0.781	1.30	6.50	-41.2	3.92	3.60	
1550	0.2	4.2	4.95	0.780	1.29	6.52	-42.3	3.33	3.60	
1554	0.2	5	4.93	0.780	1.28	6.54	-43.3	3.26	3.60	
1.6 gal total										
Parameter Stable (Check applicable)			✓	✓	✓	✓	✓	✓		

Sample Color: Very light tan/clear **Sample Odor:** light hydrocarbon **Sheen:** No

Analytical Sampling

Analyses	Check Applicable	Comments
DRO	✓	
GRO	✓	
BTEX	✓	

Notes:

Equipment: Pump Type peristaltic Tubing (Type/Length) teflon-lined Bailer Type —

Water Level Meter Slope Indicator Model 71453 Multi-Parameter Meter (Make/SN#) YSI 556 07L100513

Turbidity Meter (Make/SN#) LaMotte 2020e 14728 Filter Lot # —

Purge Water Handling: ☐ Discharged to surface ☐ Containerized ☒ Treated (how?) Filtered Through GAC

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

Boring Log

CLIENT & SITE NAME: Alaska Air Kotzebue	**BORING ID:** MW-1R2
Project # : 105.00104.16004	Logged By: Ben Siwiec
Start Date/Time: 0935 10/5/16	Drilling Contractor: Drake Construction
Completion Date/Time: 10/5/16 0954	Driller's Name (License [y/n]): Bob

BOREHOLE DETAIL

Drill Method: ☐ HSA ☐ Direct Push ☐ Rotary (mud/air) ☐ Sonic ☒ Other: Solid stem auger

Rig (Make/Model): Texoma 500

Sampling Method: Hand auger / disposable spoon

Borehole diameter (in.): 6

Borehole Total Depth (ft bgs): 7.55

Water Level (ft bgs): about 5 Date/Time: 10/5/16

WELL DETAIL

Completed as Well: ☐ No ☒ Yes, Temporary ☐ Yes, Extraction ☒ Yes, Permanent (if YES, complete a well log)

Well ID: MW-1R2

Water Level in well (ft bgs): 4.12 Date/Time: 10/6/16 1035

LOCATION SKETCH

DRILLING LOG

GRAVEL (3 – 0.08 in)	SAND (0.08 – 0.003 in)	SILT (< 0.003 in)	CLAY (no grains visible)	HIGH ORGANIC (< 50% mineral soil)
GW GP GM GC	SW SP SM SC	ML	CL OL MH CH OH	PT

Drive Interval	Blow Counts (per 6") or Drill Effort	Recovery (% or ft)	USCS CODE /Lithology Sketch	PID PPM (in situ)	Depth ft bgs	Description
					0	Interval – primary MATERIAL TYPE; secondary material type; color; % coarse material; % fine material; grain angularity; moisture; sheen/stain; odor; consistency; unit type (e.g., overburden / fill / native / other); **Sample ID** (if applicable).
						0-2" Asphalt pavement
						2"-30" Gravelly sand, SP, light brown, BS 10/5/16 dry
						PID HH: 0.0 2.5 at ___ ft bgs
					2.5	2.5-5 Gravelly sand, SP, light brown, dry
					4.5	PID HH: 0.7 4.5 at ___ ft bgs
						5- saturated – mud
						7.5 - TD
						PID HH: ___ at ___ ft bgs
						PID HH: ___ at ___ ft bgs

Notes: (indicate IDW containerization and disposal methods; PID model). HH = heated headspace screening

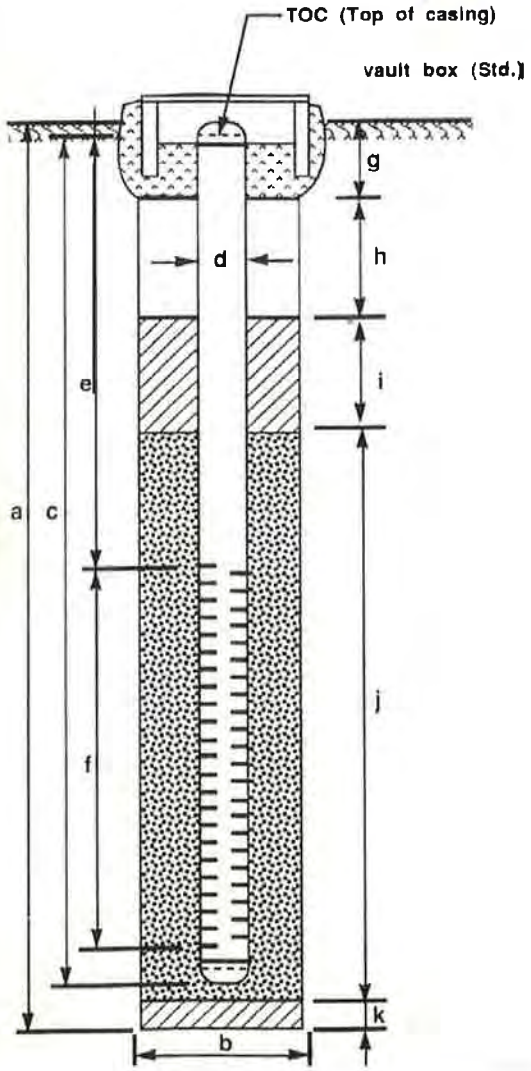
Headspace samples collected at 2.5 ft and 4.5 ft.

Analytical Sample MW1R2-4.5 collected at 0954

FLUSH MOUNTED WELL COMPLETION DETAILS

PROJECT NUMBER 105.00104.16004
PROJECT NAME Alaska Air Kotzebue
BORING/WELL# MW-1R2
INSTALLATION DATE 10/5/16
WELL OWNER (1) Alaska Airlines
WELL COMPLETION METHOD (2) SS
SITE NAME: Kotzebue Airport

TOP OF CASING ELEV:
GROUND SURFACE ELEV:
NORTH COORD (3)
EAST COORD (3)
GEOHYDROLOGIC ZONE (4) W
WELL TYPE (5) Monitoring Well
SOLE SOURCE AQUIFER (6)



EXPLORATORY BORING

a. Borehole total depth 7.55 bgs ft
b. Borehole diameter 6 in.
Drilling method Solid stem auger

WELL CONSTRUCTION

c. Screen and casing riser length 6.95 ft
Material PVC sch 40
d. Inside diameter 2 in.
e. Depth to top of screen 4.55 ft bgs
f. Screen length 2.8 ft
Perforated interval from 4.55 to 7.35 ft bgs
Perforation type Slotted
Perforation size 0.010 in.
g. Surface seal — to — ft bgs
Seal material —
h. Backfill 0.6 to 1.2 ft bgs
Backfill material Native soil
i. Seal 1.2 to 2.8 ft bgs
Seal material 5/8" Bentonite chips
j. Filter pack 2.8 to 7.55 ft bgs
Pack material 10/20 Silica sand
k. Bottom seal — to — ft bgs
Seal material —
l. Monument Burial depth 0.1 ft bgs
(if applicable)

Form prepared by Ben Siwiec
Date 10/6/16

Remarks: 1/3 bag of sand
2/3 bag of bentonite
Top of casing riser is 0.4 ft bgs.

Well Development Form

Site / Client Name: Alaska Air Kotzebue	**Well ID:** MW-1R2
Project #: 105.00104.16004	Developed By: Ben Swiec
Date (mm/dd/yy): 10/6/16	

Well Information

Well Installation Date (mm/dd/yy): 10/5/16	Filter Pack: ☒ Poured Sand; ☐ Pre-Packed; ☐ Natural
Date Last Developed (mm/dd/yy): —	Filter Pack (top to bottom)(ft bgs): 2.8 to 7.55
Wellbore Diameter (in): 6	Well Sounding Depth: 6.95 BTOC
Well Diameter (in): 2	Measured Depth to Water (ft. bgs): 3.72 BTOC
Well Depth Upon Completion (ft. bgs): 7.55 (borehole)	Water Column Thickness in Well (ft): 3.23
Screen (top to bottom)(ft bgs): 4.55 to 7.35	Time of Gauging: 10/6/16 1035

Development Method and Equipment

☐ Mechanical Surging ☐ Over-Pumping	Drill Rig Used (y/n): NO Rig type:
☒ Surging/Pumping ☐ High Pressure Jetting	Pump Type/Capacity (gpm): Waterra by hand
☐ Other (describe):	Depth of Pump or Airlift Line (ft bgs): 3.7-7
	Surge Block Length/Type: Waterra Valve/Surge block

Purge Volume Calculations (if required)

(a) Volume of Water in Filter Pack = Saturated Thickness of Filter Pack x Table 1 Value (gal): 1.27

(b) Volume of Water in Well Casing = Height of Water Column x Table 2 Value (gal): 0.53

(c) Minimum Purge Volume = [(a) + (b)] x Number of Desired Casing Volumes (gal): 9

Surging Information

Surge Interval (ft bgs)	Surge Start Time	Surge Finish Time
Surge only ~~10~~ 3.7 to 7	1053	1203
to		
Purge with Waterra - 1118 to 1126, well dry. Approx 1.5 liters produced		
Purge with to Waterra - 1430 to 1431 until well dry. Approx 1-1.5 liters Produced.		
Purge with to Waterra ~~1420~~ 1720 until dry Approx 1.5 liters produced		

Purging and Water Quality Parameters*

Time	Purge Volume (gal)	Temp (°C)	Specific Conductance (µS/cm°)	DO (mg/L)	ORP (mV)	pH	Turbidity (NTU) and/or Color	Measured Depth to Water (ft BTOC)	Total Drawdown (ft)	Sediment In Discharge Water (y/n)
1129								6.93		
1134								6.80		
1428								4.48	purged dry at 1430	
1718								4.30		
Total purged (in 3 purgings until dry): 4.5 liters / 1.2 gal										

Fluids added during development (y/n) (type/volume): NO

IDW Management (container type and date sealed, treatment, disposal): filtered through GAC filter and discharged to Surface.

Notes: TOC is 0.4 ft BGS

*Consult project Work Plan for p[parameters to be monitored during development

Table 1 – Volume of Water in Filter Pack per Foot (30% porosity assumed)

Well Diameter (in)	Borehole Diameter (in)				
	2	4	6	8	10
1	0.037	0.184	0.428	0.771	1.212
2	-	0.147	0.392	0.734	1.175
4	-	-	0.245	0.587	1.028

Table 2 – Volume of Water in Well per Foot

Well Diameter (in)	Volume of Water per Foot (gal)
1	0.41
2	0.163
4	0.653

SLR

Groundwater Sampling Form

Site/Client Name: Alaska Air Kotzebue	**Well ID:** MW-1R2
Project # : 105.00104.16004	Sample ID: 100716MW1R2
Sampled By: Ben Sivia	Sample Time: 1000 Sample Date: 10/7/16
Weather Conditions: Clear, windy, ~36°	Duplicate ID: —
Sampling Method: ☐ Low Flow ☒ Other_____	MS/MSD ☐ Yes ☒ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: 4.55 ft BGS to 7.35 ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC): 3.37	Tubing/Pump Depth (ft. BTOC): ~~6.8~~ 6.2 10/7/16
Total Depth (ft BTOC): 6.95	Purge Start Time (24-hr) NA
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) NA
Product Thickness (ft) NA	Total Purge Time (min) NA

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume (gal)	Temp (°C) (± 3 %)	Specific Conductance (µS/cm°) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max___ft)
1005			4.04	1.448	35.17	6.83	-60.0	37.6		
Due to extremely slow recharge this well was purged dry on 10/6/16 and sampled on 10/7/16 from water that recharged overnight without purge. Field parameters were collected in a cup after filling sample containers										
Parameter Stable (Check applicable)										

Sample Color: Clear	**Sample Odor:** No	**Sheen:** No

Analytical Sampling

Analyses	Check Applicable	Comments
DRO /RRO	✓	
GRO /BTEX	✓	

Notes:

Equipment: Pump Type Peristaltic Tubing (Type/Length) teflon-lined HDPE Bailer Type NA
Water Level Meter Slope Indicator 51453 Multi-Parameter Meter (Make/SN#) YSI 556 07L100513
Turbidity Meter (Make/SN#) LaMotte 2020e 14728 Filter Lot # NA

Purge Water Handling: ☒ Discharged to surface ☐ Containerized ☒ Treated (how?) filtered through GAC and discharged

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

SLR

Boring Log

CLIENT & SITE NAME: Alaska Air Kotzebue	**BORING ID:** MW-4
Project # : 105.00104.16004	Logged By: Ben Swire
Start Date/Time: 10/5/16 1140	Drilling Contractor: Drake Construction
Completion Date/Time: 10/5/16 1200	Driller's Name (License [y/n]): Bob

BOREHOLE DETAIL

Drill Method: ☐ HSA ☐ Direct Push ☐ Rotary (mud/air) ☐ Sonic ☒ Other: Solid Stem Auger

Rig (Make/Model): Texoma 500

Sampling Method: Hand auger / disposable spoon

Borehole diameter (in.): 6

Borehole Total Depth (ft bgs): 7.90

Water Level (ft bgs): about 4.5 Date/Time: 10/5/16

WELL DETAIL

Completed as Well: ☐ No ☐ Yes, Temporary ☐ Yes, Extraction ☒ Yes, Permanent (if YES, complete a well log)

Well ID: MW-4

Water Level in well (ft bgs): 3.97 Date/Time: 10/6/16 1800

LOCATION SKETCH

DRILLING LOG

GRAVEL (3 – 0.08 in)	SAND (0.08 – 0.003 in)	SILT (< 0.003 in)	CLAY (no grains visible)	HIGH ORGANIC (< 50% mineral soil)
GW GP GM GC	SW SP SM SC	ML	CL OL MH CH OH	PT

Drive Interval	Blow Counts (per 6") or Drill Effort	Recovery (% or ft)	USCS CODE /Lithology Sketch	PID PPM (in situ)	Depth ft bgs	Description
					0	0-2.5" Asphalt pavement 2.5"-30" Gravelly sand, SP, light brown, dry PID HH: 0.5 at 2.5 ft bgs
					2.5	2.5'-4' Sand, SP, light brown, dry PID HH: 0.0 at 4 ft bgs
					4	4- Silty Sand, SM, light brown, dry 4.5 - Water, all muddy below here. PID HH: ___ at ___ ft bgs
						7.90 TD PID HH: ___ at ___ ft bgs

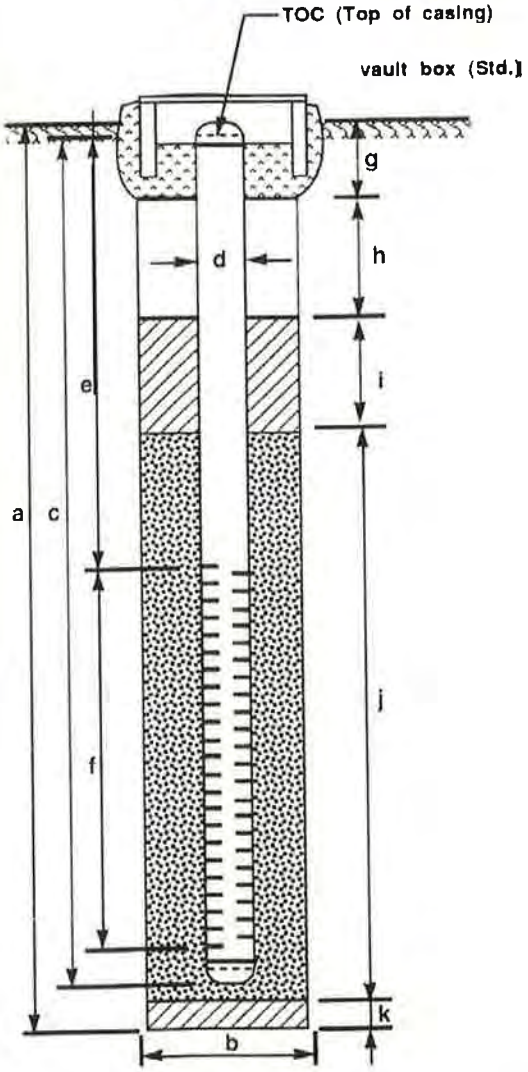
Notes: (indicate IDW containerization and disposal methods; PID model). HH = heated headspace screening

Analytical sample MW4-2.5 collected at 1145. - at 2.5 ft bgs.

FLUSH MOUNTED WELL COMPLETION DETAILS

PROJECT NUMBER 105.00104.16004
PROJECT NAME Alaska Air Kotzebue
BORING/WELL# MW-4
INSTALLATION DATE 10/5/16
WELL OWNER (1) Alaska Airlines
WELL COMPLETION METHOD (2) SS
SITE NAME: Kotzebue Airport

TOP OF CASING ELEV:
GROUND SURFACE ELEV:
NORTH COORD (3)
EAST COORD (3)
GEOHYDROLOGIC ZONE (4) W
WELL TYPE (5) Monitoring well
SOLE SOURCE AQUIFER (6)



EXPLORATORY BORING

a. Borehole total depth 7.90 ft bgs
b. Borehole diameter 6 in.
Drilling method Solid Stem auger

WELL CONSTRUCTION

c. Screen and casing riser length 7.30 ft
Material PVC - sch 40
d. Inside diameter 2 in.
e. Depth to top of screen 3.90 ft bgs
f. Screen length 3.8 ft
Perforated interval from 3.90 to 7.70 ft bgs
Perforation type Slotted
Perforation size 0.010 in.
g. Surface seal ~~~ to ft bgs
Seal material ~~~
h. Backfill 0.6 to 1.5 ft bgs
Backfill material Native soil
i. Seal 1.5 to 3.2 ft bgs
Seal material 3/8" bentonite chips
j. Filter pack 3.2 to 7.9 ft bgs
Pack material 10/20 Silica Sand
k. Bottom seal ~~~ to ft bgs
Seal material ~~~
l. Monument Burial depth NA ft bgs
(if applicable)

Form prepared by Ben Simec
Date 10/6/16

Remarks: Used 13/4 bags of sand
Used 2/3 bag of bentonite.
Top of casing riser is 0.4 ft bgs.

Well Development Form

Site / Client Name: Alaska Air Kotsebue	**Well ID:** MW-4
Project #: 105.00104.16004	Developed By: Ben Siwiec
Date (mm/dd/yy): 10/6/16	

Well Information

Well Installation Date (mm/dd/yy): 10/5/16	Filter Pack: ☒ Poured Sand; ☐ Pre-Packed; ☐ Natural
Date Last Developed (mm/dd/yy): —	Filter Pack (top to bottom)(ft bgs): 3.2 to 7.9
Wellbore Diameter (in): 6	Well Sounding Depth: 7.30 BTOC / 7.70 BGS
Well Diameter (in): 2	Measured Depth to Water (ft. bgs): 3.57 BTOC
Well Depth Upon Completion (ft. bgs): 7.90 (borehole)	Water Column Thickness in Well (ft): 3.73
Screen (top to bottom)(ft bgs): 3.9 to 7.7	Time of Gauging: 1800

Development Method and Equipment

☐ Mechanical Surging ☐ Over-Pumping	Drill Rig Used (y/n): No Rig type:
☒ Surging/Pumping ☐ High Pressure Jetting	Pump Type/Capacity (gpm): Waterra by hand
☐ Other (describe):	Depth of Pump or Airlift Line (ft bgs): 3.6 to 7.3
	Surge Block Length/Type: Waterra valve/surge block

Purge Volume Calculations (if required)

(a) Volume of Water in Filter Pack = Saturated Thickness of Filter Pack x Table 1 Value (gal):

(b) Volume of Water in Well Casing = Height of Water Column x Table 2 Value (gal):

(c) Minimum Purge Volume = [(a) + (b)] x Number of Desired Casing Volumes (gal):

Surging Information

Surge Interval (ft bgs) btoc	Surge Start Time	Surge Finish Time
Surge 3.6 to 7.3	1812 to 1816	
Purge 3.6 to 7.3	1819 to 1840	7.5 gal total.
to		
to		
to		

Purging and Water Quality Parameters*

Time	Purge Volume (gal)	Temp (°C)	Specific Conductance (µS/cm°)	DO (mg/L)	ORP (mV)	pH	Turbidity (NTU) and/or Color	Measured Depth to Water (ft BTOC)	Total Drawdown (ft)	Sediment in Discharge Water (y/n)
1842	7.5						brown	4.25		Yes
	Field parameters not collected as they were collected immediately after development as part of sampling/purging.									

Fluids added during development (y/n) (type/volume): No

IDW Management (container type and date sealed, treatment, disposal): Filtered through GAC filter and discharged to surface.

Notes: TOC is 0.4 ft bgs.

*Consult project Work Plan for parameters to be monitored during development

Table 1 – Volume of Water in Filter Pack per Foot (30% porosity assumed)

Well Diameter (in)	Borehole Diameter (in)				
	2	4	6	8	10
1	0.037	0.184	0.428	0.771	1.212
2	-	0.147	0.392	0.734	1.175
4	-	-	0.245	0.587	1.028

Table 2 – Volume of Water in Well per Foot

Well Diameter (in)	Volume of Water per Foot (gal)
1	0.41
2	0.163
4	0.653

SLR

Groundwater Sampling Form

Site/Client Name: Alaska Air Kotzebue	**Well ID:** MW-4
Project # : 105.CC104.16004	Sample ID: 100616MW4
Sampled By: Ben Swift	Sample Time: 1940 Sample Date: 10/6/16
Weather Conditions: Cloudy, windy, 40's	Duplicate ID: —
Sampling Method: ☒ Low Flow ☐ Other_____	MS/MSD ☐ Yes ☒ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: 3.4 ft BGS to 7.7 ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC): 3.75 @1856	Tubing/Pump Depth (ft. BTOC): 5.3
Total Depth (ft BTOC): 7.30	Purge Start Time (24-hr) 1857
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) 1937
Product Thickness (ft) NA	Total Purge Time (min) 40

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume ~~(gal)~~ Liters	Temp (°C) (± 3 %)	Specific Conductance (µS/cm°) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max____ft)
1912	0.22	2.5	3.29	624	2.27	6.45	71.2	106.8	3.85	0.10
1919	0.22	4	3.14	607	1.72	6.69	36.8	93.6	3.85	0.10
1922	0.22	4.7	3.09	605	1.60	6.82	26.5	64.9	3.85	0.10
1925	0.22	5.4	3.07	605	1.47	6.87	21.4	58.3	3.85	0.10
1928	0.22	6	3.06	604	1.36	6.91	16.2	53.6	3.85	0.10
1931	0.22	6.6	3.06	603	1.46	6.93	11.5	45.7	3.85	0.10
1934	0.22	7.3	3.06	602	1.41	6.95	6.5	41.4	3.85	0.10
1937	0.22	8	3.06	601	1.44	6.95	1.6	40.5	3.85	0.10
Total gallons purged= 2.5										
Parameter Stable (Check applicable)			✓	✓	✓	✓	✓			

Sample Color: Clear	**Sample Odor:** No	**Sheen:** No

Analytical Sampling

Analyses	Check Applicable	Comments
DRO / RRO	✓	
GRO / BTEX	✓	

Notes:

Equipment: Pump Type Peristaltic Tubing (Type/Length) teflon lined HDPE Bailer Type NA

Water Level Meter Slope Indicator 51453 Multi-Parameter Meter (Make/SN#) YSI 556 07L100513

Turbidity Meter (Make/SN#) La Motte 2020e 14728 Filter Lot # NA

Purge Water Handling: ☒ Discharged to surface ☐ Containerized ☒ Treated (how?) Filtered through GAC and discharged

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

SLR

Boring Log

CLIENT & SITE NAME: Alaska Air Kotzebue	**BORING ID:** MW-5
Project #: 105.00104.16004	Logged By: Ben Siwiec
Start Date/Time: 10/5/16 1227	Drilling Contractor: Drake Construction
Completion Date/Time: 10/5/16 1237	Driller's Name (License [y/n]): Bub

BOREHOLE DETAIL

Drill Method: ☐ HSA ☐ Direct Push ☐ Rotary (mud/air) ☐ Sonic ☒ Other: Solid stem auger

Rig (Make/Model): Texoma 500

Sampling Method: Hand auger / disposable spoon

Borehole diameter (in.): 6

Borehole Total Depth (ft bgs): 6.70

Water Level (ft bgs): 4 Date/Time: 10/5/16

WELL DETAIL

Completed as Well: ☐ No ☐ Yes, Temporary ☐ Yes, Extraction ☒ Yes, Permanent (if YES, complete a well log)

Well ID: MW-5

Water Level in well (ft bgs): 4.15 Date/Time: 10/7/16 0830

LOCATION SKETCH

DRILLING LOG

GRAVEL (3 – 0.08 in)	SAND (0.08 – 0.003 in)	SILT (< 0.003 in)	CLAY (no grains visible)	HIGH ORGANIC (< 50% mineral soil)
GW GP GM GC	SW SP SM SC	ML	CL OL MH CH OH	PT

Drive Interval	Blow Counts (per 6") or Drill Effort	Recovery (% or ft)	USCS CODE /Lithology Sketch	PID PPM (in situ)	Depth ft bgs	Description
					0	0-2 Gravelly sand, SP, light brown, dry PID HH: 10.2 at 2 ft bgs
					2	2-4 Gravelly sand, SP, light brown, dry PID HH: 5.0 at 4 ft bgs
					4	4- Gravelly sand, SP, brown saturated PID HH: ___ at ___ ft bgs
						6.7 TD PID HH: ___ at ___ ft bgs

Description
Interval – primary MATERIAL TYPE; secondary material type; color; % coarse material; % fine material; grain angularity; moisture; sheen/stain; odor; consistency; unit type (e.g., overburden / fill / native / other); **Sample ID** (if applicable).

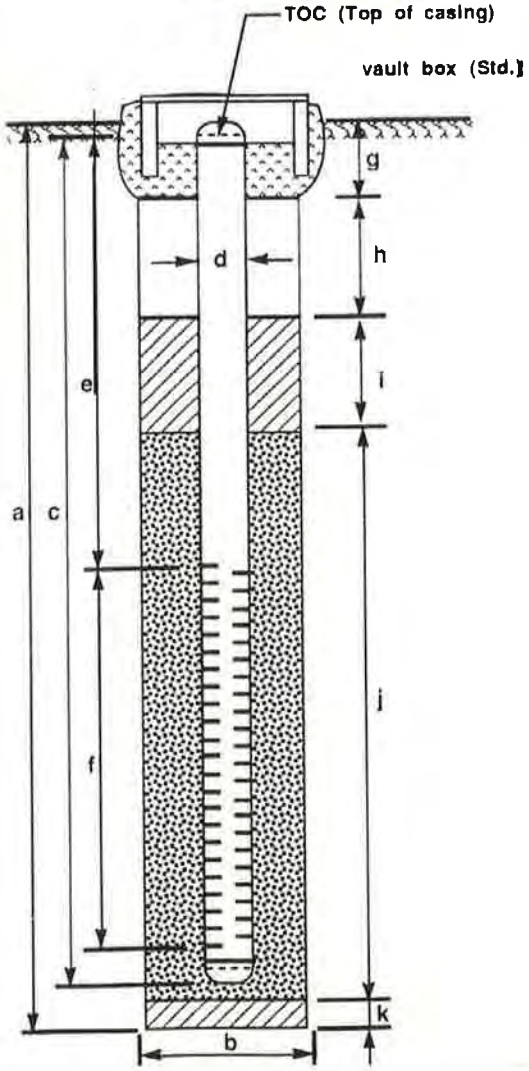
Notes: (indicate IDW containerization and disposal methods; PID model). HH = heated headspace screening

Analytical sample MW5-2 collected at 1230.
Duplicate: MW5-9

FLUSH MOUNTED WELL COMPLETION DETAILS

PROJECT NUMBER 105.00104.16004
PROJECT NAME Alaska Air Kotzebue
BORING/WELL# MW-5
INSTALLATION DATE 10/5/16
WELL OWNER (1) Alaska Airlines
WELL COMPLETION METHOD (2) SS
SITE NAME: Kotzebue Airport

TOP OF CASING ELEV:
GROUND SURFACE ELEV:
NORTH COORD (3)
EAST COORD (3)
GEOHYDROLOGIC ZONE (4) W
WELL TYPE (5) Monitoring Well
SOLE SOURCE AQUIFER (6)



EXPLORATORY BORING

a. Borehole total depth 6.70 ft bgs
b. Borehole diameter 6 in.
Drilling method Solid stem auger

WELL CONSTRUCTION

c. Screen and casing riser length 6.10 ft **
Material PVC - Sch 40
d. Inside diameter 2 in.
e. Depth to top of screen ~~2.3~~ 2.7 ft bgs
f. Screen length 3.8 ft
Perforated interval from 2.7 to 6.5 ft bgs
Perforation type Slotted
Perforation size 0.010 in.
g. Surface seal ____ to ____ ft bgs
Seal material ____
h. Backfill 0.6 to 1 ft bgs
Backfill material Native soil
i. Seal 1 to 2 ft bgs
Seal material 3/8" bentonite chips
j. Filter pack 2 to 6.7 ft bgs
Pack material 10/20 Silica Sand
k. Bottom seal ____ to ____ ft bgs
Seal material ____
l. Monument Burial depth NA ft bgs
(if applicable)

Form prepared by Ben Swite
Date 10/7/16

Remarks:

Rev. Jan 2016

Well Development Form

Site / Client Name: Alaska Air Kotzebue	**Well ID:** MW-5
Project #: 105.00104.16004	Developed By: Ben Swirec
Date (mm/dd/yy): 10/7/16	

Well Information

Well Installation Date (mm/dd/yy): 10/5/16	Filter Pack: ☒ Poured Sand; ☐ Pre-Packed; ☐ Natural
Date Last Developed (mm/dd/yy): —	Filter Pack (top to bottom)(ft bgs): 2 to 6.7
Wellbore Diameter (in): 6	Well Sounding Depth: 6.10 BTOC
Well Diameter (in): 2	Measured Depth to Water (ft. bgs): 3.75 BTOC
Well Depth Upon Completion (ft. bgs): 6.7 To (borehole)	Water Column Thickness in Well (ft): 2.35
Screen (top to bottom)(ft bgs): 2.7 to 6.5	Time of Gauging: 0830

Development Method and Equipment

☐ Mechanical Surging ☐ Over-Pumping	Drill Rig Used (y/n): No Rig type: —
☒ Surging/Pumping ☐ High Pressure Jetting	Pump Type/Capacity (gpm): Waterra by hand
☐ Other (describe):	Depth of Pump or Airlift Line (ft bgs): 3.75 - 6.1
	Surge Block Length/Type: Waterra valve/surge block

Purge Volume Calculations (if required)

(a) Volume of Water in Filter Pack = Saturated Thickness of Filter Pack x Table 1 Value (gal) :

(b) Volume of Water in Well Casing = Height of Water Column x Table 2 Value (gal) :

(c) Minimum Purge Volume = [(a) + (b)] x Number of Desired Casing Volumes (gal):

Surging Information

Surge Interval (ft bgs) BTOC	Surge Start Time	Surge Finish Time
Surge only 6.1 to 3.75	0839-0843	
Purge only to	0845 - 0849	0.4 gallons
to		
to		
to		

Purging and Water Quality Parameters*

Time	Purge Volume (gal)	Temp (°C)	Specific Conductance (µS/cm°)	DO (mg/L)	ORP (mV)	pH	Turbidity (NTU) and/or Color	Measured Depth to Water (ft BTOC)	Total Drawdown (ft)	Sediment in Discharge Water (y/n)
0849	- after	purging	dry					dry		
0900								6.05		
0910								5.99	recharge rate 0.006 L/m	
0920								5.93	recharge rate 0.006 L/m	
1455								4.56		
	Total purged = 0.4 gallons									

Fluids added during development (y/n) (type/volume): No

IDW Management (container type and date sealed, treatment, disposal): filtered through GAC filter and discharged to surface.

Notes: TOC is 0.4 ft bgs

*Consult project Work Plan for parameters to be monitored during development

Table 1 – Volume of Water in Filter Pack per Foot (30% porosity assumed)

Well Diameter (in)	Borehole Diameter (in)				
	2	4	6	8	10
1	0.037	0.184	0.428	0.771	1.212
2	-	0.147	0.392	0.734	1.175
4	-	-	0.245	0.587	1.028

Table 2 – Volume of Water in Well per Foot

Well Diameter (in)	Volume of Water per Foot (gal)
1	0.41
2	0.163
4	0.653

Groundwater Sampling Form

Site/Client Name: Alaska Air Kotzebue	**Well ID:** MW-5
Project #: 105.00104.16004	Sample ID: 100716MW5
Sampled By: Ben Sinner	Sample Time: 1505 Sample Date: 10/7/16
Weather Conditions: Clear, windy, 40's	Duplicate ID:
Sampling Method: ☐ Low Flow ☒ Other_____	MS/MSD ☐ Yes ☒ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: 2.1 ft BGS to 6.5 ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC): 4.56	Tubing/Pump Depth (ft. BTOC): 5.60
Total Depth (ft BTOC): 6.10	Purge Start Time (24-hr) NA
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) NA
Product Thickness (ft) NA	Total Purge Time (min) NA

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume (gal)	Temp (°C) (± 3 %)	Specific Conductance (µS/cm°) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max____ft)
~~1500~~			~~3.80~~	~~645~~	~~21.50~~	~~8.67~~	~~-101~~	~~BS~~	10/7/16	
1510			4.41	642	8.95	7.90	-74.0	44.1		
Parameter Stable (Check applicable)										

Well was purged dry earlier today (0920). Sample collected from recharge water without further purge. Field parameters collected after sample containers filled.

Sample Color: Clear-cloudy	**Sample Odor:** No	**Sheen:** No

Analytical Sampling

Analyses	Check Applicable	Comments
DRO/RRO	✓	
GRO/BTEX	✓	

Notes:

Equipment: Pump Type Peristaltic Tubing (Type/Length) teflon-lined HDPE Bailer Type NA
Water Level Meter Slope Indicator 51453 Multi-Parameter Meter (Make/SN#) YSI 556 07L600513
Turbidity Meter (Make/SN#) La Motte 2020e 14728 Filter Lot # NA

Purge Water Handling: ☒ Discharged to surface ☐ Containerized ☒ Treated (how?) Filtered through GAC and discharged.

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

SLR

Boring Log

CLIENT & SITE NAME: Alaska Air Kotzebue	**BORING ID:** MW-6
Project #: 105.00104.16004	Logged By: Ben Swier
Start Date/Time: 10/5/16 1055	Drilling Contractor: Drake Construction
Completion Date/Time: 10/5/16 1109	Driller's Name (License [y/n]): Bob

BOREHOLE DETAIL

Drill Method: ☐ HSA ☐ Direct Push ☐ Rotary (mud/air) ☐ Sonic ☒ Other: Solid stem auger

Rig (Make/Model): Texoma 500

Sampling Method: Hand auger/Disposable spoon

Borehole diameter (in.): 6

Borehole Total Depth (ft bgs): 7.54

Water Level (ft bgs): 4 Date/Time: 10/5/16

WELL DETAIL

Completed as Well: ☐ No ☐ Yes, Temporary ☐ Yes, Extraction ☒ Yes, Permanent (if YES, complete a well log)

Well ID: MW-6 BS

Water Level in well (ft bgs): ~~7.54~~ 3.54 Date/Time: 1530 10/6/16

LOCATION SKETCH

DRILLING LOG

GRAVEL (3 – 0.08 in)	SAND (0.08 – 0.003 in)	SILT (< 0.003 in)	CLAY (no grains visible)	HIGH ORGANIC (< 50% mineral soil)
GW GP GM GC	SW SP SM SC	ML	CL OL MH CH OH	PT

Drive Interval	Blow Counts (per 6") or Drill Effort	Recovery (% or ft)	USCS CODE /Lithology Sketch	PID PPM (in situ)	Depth ft bgs	Description
					0	0-2.5" - Asphalt pavement 2.5"-30" - Gravelly sand, SP, light brown, dry PID HH: 0.9 at 2.5 ft bgs
					2.5	Gravelly sand, SP, light brown, dry PID HH: 1.6 at 4 ft bgs
					4	Gravelly sand, SP brown, saturated PID HH: ___ at ___ ft bgs
						TD: 7.54 PID HH: ___ at ___ ft bgs

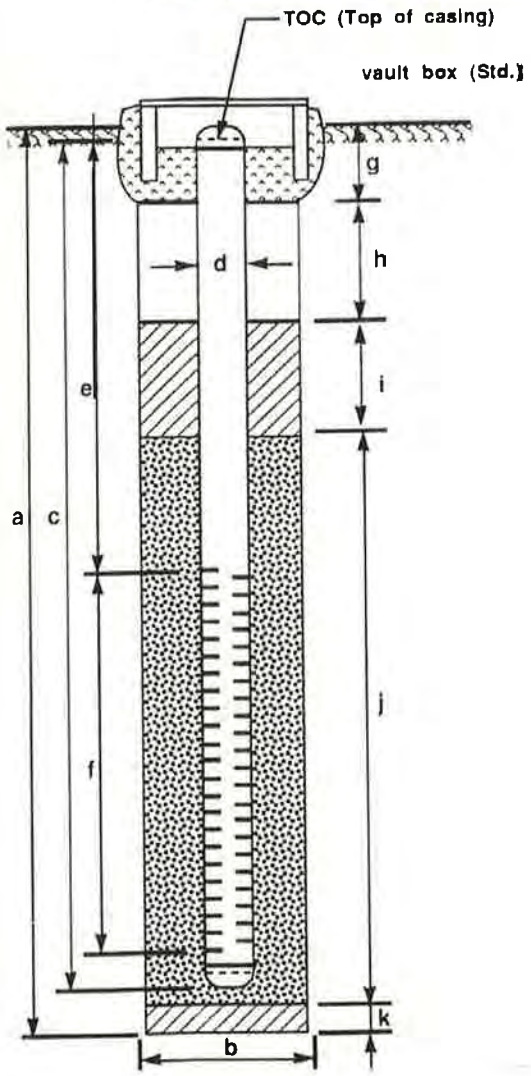
Notes: (indicate IDW containerization and disposal methods; PID model). HH = heated headspace screening

Analytical sample MW6-4 collected at 1105 @ 4 ft bgs

FLUSH MOUNTED WELL COMPLETION DETAILS

PROJECT NUMBER 105.00104.16004
PROJECT NAME Alaska Air Kotzebue
BORING/WELL# MW6
INSTALLATION DATE 10/5/16
WELL OWNER (1) Alaska Airlines
WELL COMPLETION METHOD (2) SS
SITE NAME: Kotzebue Airport

TOP OF CASING ELEV:
GROUND SURFACE ELEV:
NORTH COORD (3)
EAST COORD (3)
GEOHYDROLOGIC ZONE (4) W
WELL TYPE (5) Monitoring Well
SOLE SOURCE AQUIFER (6)



EXPLORATORY BORING

a. Borehole total depth 7.54 ft bgs
b. Borehole diameter 6 in.
Drilling method Solid stem auger

WELL CONSTRUCTION

c. Screen and casing riser length 7.01 ft
Material PVC - sch 40
d. Inside diameter 2 in.
e. Depth to top of screen 3.54 ft bgs
f. Screen length 3.8 ft
Perforated interval from 3.8 to 7.34 ft bgs
Perforation type Slotted
Perforation size 0.010 in.
g. Surface seal ~~to~~ ft bgs
Seal material
h. Backfill 0.53 to 1.0 ft bgs
Backfill material Native Soil
i. Seal 1.0 to 2.2 ft bgs
Seal material 3/8" bentonite chips
j. Filter pack 2.2 to 7.54 ft bgs
Pack material 10/20 Silica Sand
k. Bottom seal ~~to~~ ft bgs
Seal material
l. Monument Burial depth NA ft bgs
(if applicable)

Form prepared by Ben Siwiec
Date 10/6/16

Remarks: 2/3 bag of sand
1/2 bag of bentonite
Top of casing riser is 0.33 ft bgs

Well Development Form

Site / Client Name: Alaska Air Kotzebue	**Well ID:** MW-6
Project #: 105.00104.16004	Developed By: Ben Swiec
Date (mm/dd/yy): 10/6/16	

Well Information

Well Installation Date (mm/dd/yy): 10/5/16	Filter Pack: ☒ Poured Sand; ☐ Pre-Packed; ☐ Natural
Date Last Developed (mm/dd/yy): —	Filter Pack (top to bottom)(ft bgs): 2.2 to 7.54
Wellbore Diameter (in): 6	Well Sounding Depth: 7.01 BTOC
Well Diameter (in): 2	Measured Depth to Water (ft. bgs): 3.26 BTOC
Well Depth Upon Completion (ft. bgs): 7.54 (boring)	Water Column Thickness in Well (ft): 3.75
Screen (top to bottom)(ft bgs): 3.54 to 7.34	Time of Gauging: 1530

Development Method and Equipment

☐ Mechanical Surging ☐ Over-Pumping	Drill Rig Used (y/n): No Rig type: —
☒ Surging/Pumping ☐ High Pressure Jetting	Pump Type/Capacity (gpm): Waterra by hand
☐ Other (describe):	Depth of Pump or Airlift Line (ft bgs): 3.2-7
	Surge Block Length/Type: Waterra valve/surge block

Purge Volume Calculations (if required)

(a) Volume of Water in Filter Pack = Saturated Thickness of Filter Pack x Table 1 Value (gal):

(b) Volume of Water in Well Casing = Height of Water Column x Table 2 Value (gal):

(c) Minimum Purge Volume = [(a) + (b)] x Number of Desired Casing Volumes (gal):

Surging Information

Surge Interval (ft bgs)	Surge Start Time	Surge Finish Time
Surge only 3.2 to 7	1156	1200
Purge only – purged to until dry	1203	1205 2L produced
Purge only purged to until dry	1210	1218 2L produced.
Purge only purged to until dry	1322	1324 2L produced
Purge only – until dry	1419 to 1418	3.5L produced.

Purging and Water Quality Parameters*

Time	Purge Volume (gal)	Temp (°C)	Specific Conductance (µS/cm°)	DO (mg/L)	ORP (mV)	pH	Turbidity (NTU) and/or Color	Measured Depth to Water (ft BTOC)	Total Drawdown (ft)	Sediment in Discharge Water (y/n)
1219								6.72		
1224								6.07		
1229								5.52		
1318								3.70		
1417								3.55 – purged down to dry.		
Total purged (in 4 purgings until dry):								9.5 liters / 2.5 gallons		

Fluids added during development (y/n) (type/volume): No

IDW Management (container type and date sealed, treatment, disposal): filtered through GAC filter and discharged to surface.

Notes: TOC is 0.33 ft below TOC

*Consult project Work Plan for p[parameters to be monitored during development

Table 1 – Volume of Water in Filter Pack per Foot (30% porosity assumed)

Well Diameter (in)	Borehole Diameter (in)				
	2	4	6	8	10
1	0.037	0.184	0.428	0.771	1.212
2	-	0.147	0.392	0.734	1.175
4	-	-	0.245	0.587	1.028

Table 2 – Volume of Water in Well per Foot

Well Diameter (in)	Volume of Water per Foot (gal)
1	0.41
2	0.163
4	0.653

Groundwater Sampling Form

Site/Client Name: Alaska Air Kotzebue	**Well ID:** MW-6
Project # : 105.00104.16004	Sample ID: 100616MW6
Sampled By: Ben Smith	Sample Time: 1647 Sample Date: 10/6/16
Weather Conditions: Partly cloudy, windy, 40's	Duplicate ID: 100616MW9
Sampling Method: ☒ Low Flow ☐ Other_____	MS/MSD ☐ Yes ☐ No Trip Blank Required: ☒ Yes ☐ No

Well Information

Well Type: ☒ Permanent ☐ Temporary	Well Diameter 2 in.	Screen Interval: 3.54 ft BGS to 7.34 ft BGS
Well Condition: ☒ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☒ No; If yes, _____ ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC): 3.49	Tubing/Pump Depth (ft. BTOC): 5.5
Total Depth (ft BTOC): 7.01	Purge Start Time (24-hr) 1534
Depth to Product (ft. BTOC) NA	Purge End Time (24-hr) 1645
Product Thickness (ft) NA	Total Purge Time (min) 71

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ = _____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4" – 0.653 gal/ft	6" – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (liter/ minute)	Purge Volume (gal) liter	Temp (°C) (± 3 %)	Specific Conductance (µS/cm°) (± 3%)	DO (mg/L) (± 10%)	pH (± 0.1)	ORP (mV) (± 10mV)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max____ft)
1616	0.1	3	3.70	1704	1.87	6.57	88.1	51.7	4.49	1.09
1621	0.1	3.8	3.63	1695	1.57	6.67	86.1	45.8	4.48	1.08
1630	0.1	4.7	3.58	1687	1.42	6.76	80.7	36.6	4.56	1.10
1635	0.1	5	3.45	1687	1.23	6.77	80.4	26.4	4.51	1.11
1640	0.1		3.45	1685	1.07	6.79	78.7	27.8	4.51	1.11
1645	0.1	6.5	3.40	1684	1.19	6.80	77.6	18.5	4.51	1.11
Total gallons purge water: 1.75										
Parameter Stable (Check applicable)			✓	✓		✓	✓			

Sample Color: Clear	**Sample Odor:** No	**Sheen:** No

Analytical Sampling

Analyses	Check Applicable	Comments
DRO/RRO	✓	
GRO/BTEX	✓	

Notes:

Equipment: Pump Type Peristaltic Tubing (Type/Length) Teflon-lined HDPE Bailer Type NA
Water Level Meter Slope Indicator 51453 Multi-Parameter Meter (Make/SN#) YSI 556 07L100513
Turbidity Meter (Make/SN#) LaMotte 2020e 14728 Filter Lot # NA

Purge Water Handling: ☒ Discharged to surface ☐ Containerized ☒ Treated (how?) Filtered through GAC and discharged

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

SLR

PID Calibration Log

Calibration Date: 10/4/16	Calibration Time: 1135	Calibration By: Ben Siwiec		
Instrument: MiniRAE 2000	Serial #: 11109	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range?
Meter Response: Bump check - Good		0.0	106	(yes) / no
Notes: Slow to return to 0 after cal gas check.				

Calibration Date: 10/5/16	Calibration Time: 1527	Calibration By: Ben Siwiec		
Instrument: ~~10/5/16~~ MiniRAE 2000	Serial #: 11109	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range?
Meter Response: Bump check- good		0.0	98.6	(yes) / no
Notes:				

Calibration Date: 10/6/16	Calibration Time: 1316	Calibration By: Ben Siwiec		
Instrument: ~~10/6/16~~ MiniRAE 2000	Serial #: 11109	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range?
Meter Response: Bump check- good		0.0	106	(yes) / no
Notes:				

Calibration Date: 10/7/16	Calibration Time: 1030	Calibration By: Ben Siwiec		
Instrument: MiniRAE 2000	Serial #: 11109	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range?
Meter Response: Good - bump check		0.0	97.6	yes / no
Notes:				

Calibration Date:	Calibration Time:	Calibration By:		
Instrument	Serial #	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range?
Meter Response				yes / no
Notes:				

Calibration Date:	Calibration Time:	Calibration By:		
Instrument	Serial #	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range
Meter Response				yes / no
Notes:				

Calibration Date:	Calibration Time:	Calibration By:		
Instrument	Serial #	Zero Gas: ambient air	Span Gas 1: isobutylene (100 ppm)	Calibration with Acceptable Range
Meter Response				yes / no
Notes:				

Water Parameter Meter Calibration Log

SLR

Date: 10/3/16 Time: 1436 Calibration By: Ben Siwiec

Meter Manufacturer and Identification #: YSI 556 07L100513

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00	7.01	TP1	8/10/16	11/2017	7.27	7.01	± 0.10
	4.00	4.00	16AIR	8/17/16	1/12/18	3.83	4.00	± 0.10
	10.00	10.06	TS2	7/9/16	8/2017	10.01	10.03	± 0.10
Sp Cond (mS/cm)	1.413	1.413	TP1	08/10/16	11/2017	1.335	1.413	± 10%
ORP (mV)	240	240	9232		9/2020	236.3	240.0	---
DO*	—	—	—	—	—	92.0	98.8	± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)

* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

Date: 10/6/16 Time: 1003 Calibration By: Ben Siwiec

Meter Manufacturer and Identification #: YSI 556 07L100513

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00	7.03	TP1	8/10/16	11/2017	7.03	7.03	± 0.10
	4.00	4.00	16AIR	8/17/16	1/12/18	4.02	4.00	± 0.10
	10.00	10.11	TS2	7/9/16	8/2017	10.11	10.11	± 0.10
Sp Cond (mS/cm)	1.413	1.413	TP1	8/10/16	11/2017	1.427	1.413	± 10%
ORP (mV)	240	240	9232		9/2020	239.5	240.0	---
DO*	—	—	—	—	—	95.1	97.8	± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)

* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

Date: 10/7/16 Time: 0939 Calibration By: Ben Siwiec

Meter Manufacturer and Identification #: YSI 556 07L100513

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00	7.03	TP1	8/10/16	11/2017	7.01	7.03	± 0.10
	4.00	4.00	16AIR	8/17/16	1/12/18	4.01	4.00	± 0.10
	10.00	10.11	TS2	7/9/16	8/2017	10.11	10.11	± 0.10
Sp Cond (mS/cm)	1.413	1.413	TP1	8/10/16	11/2017	1.401	1.413	± 10%
ORP (mV)	240	240	9232		9/2020	238.0	240.0	---
DO*	—	—	—	—	—	97.2	98.0	± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)

* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

Turbidimeter Calibration Log

Calibration Date 10/3/16	Calibration Time 1500	Calibration By Ben Siwiec		
Instrument Make/Model LaMotte 2020e	Serial # 14728	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		10 NTU	100 NTU	
Bump Check ☐ or Calibration ☒ Notes:		Bump check result or post-calibration reading: 10.44	Bump check result or post-calibration reading: 103.9	(yes) no

Calibration Date 10/6/16	Calibration Time 1015	Calibration By Ben Siwiec		
Instrument Make/Model La Motte 2020e	Serial # 14728	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		10 NTU	100 NTU	
Bump Check ☒ or Calibration ☐ Notes:		Bump check result or post-calibration reading: 10.18	Bump check result or post-calibration reading: 104.5	(yes) no

Calibration Date 10/7/16	Calibration Time 0945	Calibration By Ben Siwiec		
Instrument Make/Model LaMotte 2020e	Serial # 14728	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		10 NTU	100 NTU	
Bump Check ☒ or Calibration ☐ Notes:		Bump check result or post-calibration reading: 10.55	Bump check result or post-calibration reading: 102.7	(yes) no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		____ NTU	____ NTU	
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		____ NTU	____ NTU	
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1	Cal Fluid #2	Within Acceptable Range?
		____ NTU	____ NTU	
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Note: A bump check can verify the instrument is in proper calibration if the instrument reads an accurate value for a calibration solution (without performing a full calibration). In the event a bump check does not indicate the instrument is properly calibrated, a calibration will be performed, per manufacturer instructions.

APPENDIX C

DATA QUALITY ASSESSMENT

ADEC LABORATORY DATA REVIEW CHECKLIST

SGS ANALYTICAL DATA REPORTS

Report

LABORATORY DATA
QUALITY ASSURANCE REVIEW

GROUNDWATER MONITORING AND SOIL INVESTIGATION
ALASKA AIRLINES KOTZEBUE FACILITY 2016

KOTZEBUE, ALASKA

November 2016

Prepared by: Jennifer McLean
Reviewed by: Ben Siwiec

SLR International Corporation
2700 Gambell Street, Suite 200
Anchorage, AK 99503

SLR Project Number 105.00104.16004

ACRONYMS AND ABBREVIATIONS

%	percent
AAC	Alaska Administrative Code
AK	Alaska
ADEC	Alaska Department of Environmental Conservation
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
CCV	continuing calibration verification
COC	chain of custody
DL	detection limit
DRO	diesel range organics
EDDs	electronic data deliverable
EPA	Environmental Protection Agency
GRO	gasoline range organics
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
mg/L	milligrams per liter
mg/Kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
PAH	polynuclear aromatic hydrocarbons
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
QA	quality assurance
QAR	quality assurance review
QC	quality control
QCS	quality control sample
RPD	relative percent difference
SDG	sample delivery group
SIM	selective ion monitoring
SLR	SLR International Corporation
SGS	SGS North America, Inc.
SM	Standard Methods
SVOCs	semi-volatile organic compounds
UCL	upper control limit
VOCs	volatile organic compounds

Introduction

This report summarizes a review of analytical data for groundwater and soil samples collected from October 3, 2016 through October 7, 2016, at Kotzebue, Alaska. Samples were collected by SLR International Corporation (SLR). SGS North America, Inc (SGS) provided analytical support to the project. SGS maintains a current Alaska Department of Environmental Conservation (ADEC) Contaminated Sites approval number (UST-005) for analytical methods of interest, as applicable. Table 1 provides a summary of the work order, sample receipt, analytical methods, and analytes.

Table 1 Sample Receipt, Method, and Analyte Summary

SDG	Date Collected	Date Received by Laboratory	Temp. Blank	Matrix	Analytical Method	Analyte
1166058	10/3-7/2016	10/10/2016	2.6°C	GW	SW8021B	BTEX
					AK101	GRO
					AK102	DRO
			3.0°C	soil	SW8021B	BTEX
					AK101	GRO
					AK102	DRO
					SW8270D	PAH SIM

Acronyms:
°C – degrees Celsius
AK – Alaska
BTEX – benzene, toluene, ethylbenzene, and xylenes
DRO – diesel range organics
GRO – gasoline range organics
GW - groundwater
PAH – polynuclear aromatic hydrocarbons
SDG – sample delivery group
SIM – selective ion monitoring

The laboratory final report was provided as a Level II deliverable, and included documentation of the delivery group chain-of-custody (COC) and sample receipt condition. An Microsoft Access compatible electronic data deliverable (EDD) for the report were also provided. The PDF laboratory report and the EDD are provided electronically as Attachment 2.

Quality Assurance Program

A quality assurance (QA) program was followed for this project that addressed project administration, sampling, quality control, and data review. SLR adhered to required and established sampling and COC protocols. The select laboratory maintains an internal quality assurance program and standard operating procedures.

The analytical data was reviewed for consistency with any project specific requirements (Method Statement, April 2016), *ADEC Technical Memorandum, Environmental Laboratory Data and Quality Assurance* (ADEC 2009a) requirements, analytical method criteria and laboratory criteria. An ADEC Laboratory Data Review Checklist was completed for the SDG, and is included as Attachment 1 to this Quality Assurance Review (QAR). A review for any anomalies to the project requirements for precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS) are noted in this QAR, and any data qualifications discussed.

The data review included the following, as applicable:

- Reviewing COC records for completeness, signatures, and dates;
- Identifying any sample receipt or preservation anomalies that could impact data quality;
- Verifying that quality control (QC) blanks (e.g,. field blanks, equipment blanks, trip blanks, etc.); were properly prepared, identified, and analyzed;
- Evaluating whether laboratory reporting limits met project goals;
- Reviewing calibration verification recoveries, to include confirming that the laboratory did not identify any Continuing Calibration Verification (CCV) recoveries or other calibration related criteria as being outside applicable acceptance limits;
- Reviewing the case narrative for any discussion of any internal standard recoveries outside of acceptance limits. Internal standard performance was not otherwise presented in the report or in the electronic data deliverable and was reviewed only from the case narrative;
- Verifying that surrogate analyses were within recovery acceptance limits;
- Verifying that Laboratory Control Samples (LCS), Laboratory Control Sample Duplicates (LCSD), Matrix Spike (MS), and Matrix Spike Duplicate (MSD) recoveries were within acceptance limits;
- Evaluating the result relative percent difference (RPD) between primary and duplicate field samples, LCS/LCSD, MS/MSD, and laboratory duplicates; and
- Providing an overall assessment of laboratory data quality and qualifying sample results as necessary.

Data Qualifications

As part of the quality assurance review, qualifiers (i.e. flags) were applied to data as determined necessary based on specified criteria, or professional judgement. In all cases, the basis for qualification and the applied data flag are discussed in this QAR. Table 2 provides a list of potential qualifiers (i.e., flags). These data flags were appended to the data as appropriate.

Table 2 Data Qualifiers

Qualifier	Definition
Q	One or more laboratory quality control criteria (e.g., LCS recovery, surrogate spike recovery) failed. Where applicable, an "H", "L", or "N" was appended to indicate positive, negative, or unknown bias, respectively.
J	The analyte was positively identified but the result was outside the calibration range, between the limit of quantitation (LOQ) and the detection limit (DL); the quantitation was an estimate.
M	The concentration was an estimate due to a sample matrix quality control failure. Where applicable, an "H", "L", or "N" was appended to indicate positive, negative, or unknown bias, respectively.
B	Blank contamination: The analyte was positively identified in the blank (e.g., trip blank, method blank, equipment blank, etc.) associated with the sample and the concentration reported for the sample was less than five times that of the blank (ten times for metals and common laboratory contaminants methylene chloride and acetone).
P	Sample preservation requirements were not satisfied.

A discussion of the project data quality relative to PARCCS goals and summary of any anomalies or failures requiring data qualifiers follows.

Data Validation

Data Packages

The data package was checked for transcription errors, omissions, or other anomalies. No issues were noted with regards to the data package.

Sample Receipt

The sample receipt documentation was checked for anomalies. No issues were noted with regards to the receipt of the samples.

Preservation (Chemical and Temperature)

Samples were appropriately preserved and were submitted to SGS. No issues were noted in regard to sample preservation.

Holding Times

Analytical holding times were satisfied for all sample results.

Laboratory Method Blanks

Laboratory method blanks were analyzed at the appropriate frequencies. Analytes were not detected in any method blanks at or above the Limit of Detection (LOD).

Trip Blanks
Trip blanks were included in each cooler containing volatile organic compounds (VOCs) and analyzed at appropriate frequencies. Analytes were not detected in the trip blanks at or above the LOD.

Reporting Limits
For non-detect results, LODs were compared to applicable cleanup levels for the site. For groundwater samples, LODs were compared to 18 AAC 75.345, Method Two, Table C, Groundwater Cleanup Levels (ADEC, November 6, 2016). For soil samples, LODs were compared to 18 AAC 75.341, Method Two for the Arctic Zone, Tables B1 and B2 (ADEC, November 6, 2016). For reference only, for soil samples, LODs were also compared to 18 AAC 75.341, Method Two, Migration to Groundwater, Tables B1 and B2 (ADEC, November 6, 2016). All results of non-detected analytes had LODs at or below applicable cleanup levels and reference levels.

Continuous Calibration Verifications (CCVs)
CCVs were analyzed at the appropriate frequencies. CCV data was included only in the EDD, but not in the case narrative. All CCV recoveries were within acceptable limits as reviewed in the EDD.

Internal Standards
No internal standards were noted in the case narrative as outside of acceptance limits. Internal standard performance criteria were considered met.

Surrogate Recovery Results
Surrogate analysis was performed at the required frequencies. All surrogate recoveries were within analytical method and SGS percent recovery acceptance limits, except as noted in Table 3.

Table 3 Surrogate Recovery Exceedances and Affected Data

Sample ID	Lab ID	Method (Analyte)	Surrogate	Sur. Rec. (%)	LCL-UCL (%)	Result (mg/L)	Flag
100316MW3R	1166058001	SW8021B (BTEX)	1,4-difluorobenzene	50	77-115	varied	QL[1]

Notes:
1 – The surrogate recovery exceedance was likely due to matrix interference; therefore, the bias to the analyte result was considered minimal. All data is considered usable as qualified.
Abbreviations:
LCL – lower control limit
UCL – upper control limit

Laboratory Control Samples and Laboratory Control Duplicate Samples
LCS and LCSDs were analyzed at the appropriate frequencies. All LCS and LCSD recoveries and RPDs were within acceptable limits.

Matrix Spike and Matrix Spike Duplicate Samples

LCS/LCSD and MS/MSD pairs were analyzed at the appropriate frequencies. All MS/MSD percent recoveries and RPDs were within acceptable limits.

Field Duplicates

The field duplicate sample frequency is presented in Table 4. Parent Sample and Field Duplicate pairs are presented in Table 5. The frequency satisfied the requirement of one per 10 samples or less per matrix and analyte. Field duplicates were submitted blind to the laboratory. All parent sample/field duplicate pairs had RPDs within acceptable limits for all analytes.

Table 4 Field Duplicate Frequency, Methods, and Analyes

Matrix	Analytical Method	Analyte	Number of Primary Samples	Number of Field Duplicates
Groundwater	SW8021B	BTEX	6	1
	AK101	GRO	6	1
	AK102	DRO	6	1
Soil	SW8021B	BTEX	4	1
	AK101	GRO	4	1
	AK102	DRO	4	1
	SW8270D	PAH SIM	1	1

Table 5 Field Duplicate Identification

Matrix	Parent Sample ID	Duplicate Sample ID	All RPDs acceptable (Y/N)
Groundwater	100616MW6	100616MW9	Y
Soil	MW5-2	MW5-9	Y

Laboratory Duplicate Samples

Laboratory duplicates were analyzed at appropriate frequencies. All duplicate RPDs were within acceptable limits.

Overall Assessment

Precision, Accuracy, Representativeness, Comparability, Completeness, and Sensitivity Summary

- Precision: Precision goals were met.
- Accuracy: Overall project accuracy goals were met, except as noted in the Surrogate Recovery section.
- Representativeness: Representativeness goals were met. The samples were collected from planned locations in accordance with the Work Plan.
- Comparability: Comparability goals were considered acceptable. SGS laboratory provided analytical support for all methods.
- Completeness: Completeness goals were met. The data were 100% complete with respect to analysis because no data were rejected.
- Sensitivity: Sensitivity goals were considered met.

This data were considered of good quality and acceptable for use. No data were rejected.

References

- Alaska Department of Environmental Conservation (ADEC), 18 AAC 75, Oil and Other Hazardous Substances Pollution Control (November 6, 2016).

- ADEC, Technical Memorandum – 06-002, Environmental Laboratory Data and Quality Assurance Requirements (ADEC, March 2009).

- USEPA Document 530/SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, fourth edition (USEPA, November 1991).

- Standard Methods for the Examination of Water and Wastewater, 21st Edition, (2005).

Attachments

Attachment 1 – ADEC Data Review Checklist
Attachment 2 – Laboratory Deliverable

Attachment 1

ADEC Data Review Checklist

Attachment 2
Laboratory Deliverable

(Data package and electronic file)

Laboratory Data Review Checklist

Completed by: Jennifer McLean

Title: Project Scientist Date: November 18, 2016

CS Report Name: Alaska Airlines Kotzebue Airport GW Monitoring and Soil Investigation Report Date: October 21, 2016

Consultant Firm: SLR International Corporation

Laboratory Name: SGS North America, Inc. Laboratory Report Number: 1166058

ADEC File Number: NA ADEC RecKey Number: NA

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐ Yes ☐ No ☒ NA (Please explain.) Comments:

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   b. Correct analyses requested?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

None were noted.

e. Data quality or usability affected? (Please explain.)
Comments:

No impact.

4. Case Narrative
a. Present and understandable?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

Surrogate recovery exceedance was noted.

c. Were all corrective actions documented?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

None were taken.

d. What is the effect on data quality/usability according to the case narrative?
Comments:

No impact.

5. Samples Results
a. Correct analyses performed/reported as requested on COC?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

b. All applicable holding times met?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

For groundwater samples, LODs were compared to 18 AAC 75.345, Method Two, Table C, Groundwater Cleanup Levels (ADEC, November 6, 2016).
For soil samples, LODs were compared to 18 AAC 75.341, Method Two for the Arctic Zone, Tables B1 and B2 (ADEC, November 6, 2016). For reference only, for soil samples, LODs were also compared to Method Two, Migration to Groundwater, Tables B1 and B2 (ADEC, November 6, 2016).

e. Data quality or usability affected?
Comments:

No impact.

6. QC Samples
a. Method Blank
i. One method blank reported per matrix, analysis and 20 samples?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. All method blank results less than PQL?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iii. If above PQL, what samples are affected?
Comments:

Not applicable.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

v. Data quality or usability affected? (Please explain.)
Comments:

No impact.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?
Comments:

Not applicable.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

No impact.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

For BTEX, for sample 100316MW3R, 1,4-difluorobenzene had a surrogate recovery of 50% (limits of 77-115%).

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

BTEX results for sample 100316MW3R were qualified, "QL," and should be considered estimated with potential low bias.

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

The surrogate recovery exceedance was likely due to matrix interference; therefore, the bias to the analyte result was considered minimal. All data is considered usable as qualified.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iii. All results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

v. Data quality or usability affected? (Please explain.)

Comments:

No impact..

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Submitted blind to lab?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

100616MW9 was a duplicate of 100616MW6.
MW5-9 was a duplicate of MW5-2.

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No impact.

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

Disposal or dedicated sampling equipment was used for collection of all samples.

i. All results less than PQL?

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

Laboratory Report of Analysis

To: SLR Alaska-Anchorage
2700 Gambell St. Suite 200
Anchorage, AK 99503
(907)222-1112

Report Number: **1166058**

Client Project: **Kotzebue Groundwater/Soil**

Dear Ben Siwiec,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Justin at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Justin Nelson Date
Project Manager
Justin.Nelson@sgs.com

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Case Narrative

SGS Client: **SLR Alaska-Anchorage**
SGS Project: **1166058**
Project Name/Site: **Kotzebue Groundwater/Soil**
Project Contact: **Ben Siwiec**

Refer to sample receipt form for information on sample condition.

100316MW3R (1166058001) PS

8021B - Surrogate recovery for 1,4-difluorobenzene (50.4%) does not meet QC criteria due to matrix interference.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Report of Manual Integrations

Laboratory ID	Client Sample ID	Analytical Batch	Analyte	Reason
8270D SIM (PAH)				
1166058012	MW5-2	XMS9698	Chrysene	BLC
1166058013	MW5-9	XMS9698	Chrysene	BLC

Manual Integration Reason Code Descriptions

Code	Description
O	Original Chromatogram
M	Modified Chromatogram
SS	Skimmed surrogate
BLG	Closed baseline gap
RP	Reassign peak name
PIR	Pattern integration required
IT	Included tail
SP	Split peak
RSP	Removed split peak
FPS	Forced peak start/stop
BLC	Baseline correction
PNF	Peak not found by software

All DRO/RRO analysis are integrated per SOP.

Print Date: 10/21/2016 7:46:14AM

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

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SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

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Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
100316MW3R	1166058001	10/03/2016	10/10/2016	Water (Surface, Eff., Ground)
100316MW2	1166058002	10/03/2016	10/10/2016	Water (Surface, Eff., Ground)
100616MW6	1166058003	10/06/2016	10/10/2016	Water (Surface, Eff., Ground)
100616MW9	1166058004	10/06/2016	10/10/2016	Water (Surface, Eff., Ground)
100616MW4	1166058005	10/06/2016	10/10/2016	Water (Surface, Eff., Ground)
100716MW1R2	1166058006	10/07/2016	10/10/2016	Water (Surface, Eff., Ground)
100716MW5	1166058007	10/07/2016	10/10/2016	Water (Surface, Eff., Ground)
TBW1	1166058008	10/03/2016	10/10/2016	Water (Surface, Eff., Ground)
MW1R2-4.5	1166058009	10/05/2016	10/10/2016	Soil/Solid (dry weight)
MW6-4	1166058010	10/05/2016	10/10/2016	Soil/Solid (dry weight)
MW4-2.5	1166058011	10/05/2016	10/10/2016	Soil/Solid (dry weight)
MW5-2	1166058012	10/05/2016	10/10/2016	Soil/Solid (dry weight)
MW5-9	1166058013	10/05/2016	10/10/2016	Soil/Solid (dry weight)
TB-2	1166058014	10/05/2016	10/10/2016	Soil/Solid (dry weight)

Method	Method Description
8270D SIM (PAH)	8270 PAH SIM Semi-Volatiles GC/MS
AK101	AK101/8021 Combo.
SW8021B	AK101/8021 Combo.
AK101	AK101/8021 Combo. (S)
SW8021B	AK101/8021 Combo. (S)
AK102	Diesel Range Organics (S)
AK102	DRO Low Volume (W)
SM21 2540G	Percent Solids SM2540G

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Detectable Results Summary

Client Sample ID: **100316MW3R**
Lab Sample ID: 1166058001
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	6.49	mg/L
Benzene	10.4	ug/L
Ethylbenzene	50.7	ug/L
Gasoline Range Organics	1.07	mg/L
o-Xylene	11.4	ug/L
P & M -Xylene	79.7	ug/L

Client Sample ID: **100316MW2**
Lab Sample ID: 1166058002
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	1.59	mg/L
Benzene	37.0	ug/L
Ethylbenzene	5.60	ug/L
Gasoline Range Organics	0.177	mg/L
P & M -Xylene	3.61	ug/L
Toluene	0.750J	ug/L

Client Sample ID: **100616MW6**
Lab Sample ID: 1166058003
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	1.72	mg/L
Benzene	23.8	ug/L
Ethylbenzene	3.48	ug/L
Gasoline Range Organics	0.122	mg/L
o-Xylene	0.600J	ug/L
P & M -Xylene	4.39	ug/L
Toluene	0.720J	ug/L

Client Sample ID: **100616MW9**
Lab Sample ID: 1166058004
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	1.40	mg/L
Benzene	23.7	ug/L
Ethylbenzene	3.39	ug/L
Gasoline Range Organics	0.111	mg/L
o-Xylene	0.520J	ug/L
P & M -Xylene	4.21	ug/L
Toluene	0.390J	ug/L

Client Sample ID: **100616MW4**
Lab Sample ID: 1166058005
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	0.353J	mg/L
Benzene	1.62	ug/L

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Detectable Results Summary

Client Sample ID: **100716MW1R2**
Lab Sample ID: 1166058006
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	1.73	mg/L
Benzene	48.7	ug/L
Ethylbenzene	2.64	ug/L
Gasoline Range Organics	0.175	mg/L
o-Xylene	1.22	ug/L
P & M -Xylene	6.48	ug/L
Toluene	1.43	ug/L

Client Sample ID: **100716MW5**
Lab Sample ID: 1166058007
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	5.84	mg/L
Benzene	31.6	ug/L
Ethylbenzene	3.53	ug/L
Gasoline Range Organics	0.267	mg/L
o-Xylene	3.00	ug/L
P & M -Xylene	8.49	ug/L
Toluene	2.11	ug/L

Client Sample ID: **MW1R2-4.5**
Lab Sample ID: 1166058009
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	28.5	mg/Kg
Benzene	11.6J	ug/Kg
Gasoline Range Organics	3.17J	mg/Kg
Toluene	22.5J	ug/Kg

Client Sample ID: **MW6-4**
Lab Sample ID: 1166058010
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	88.7J	mg/Kg
Benzene	13.8J	ug/Kg
Gasoline Range Organics	3.20J	mg/Kg
Toluene	42.9J	ug/Kg

Client Sample ID: **MW4-2.5**
Lab Sample ID: 1166058011
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	116	mg/Kg
Toluene	15.6J	ug/Kg

Client Sample ID: **MW5-2**
Lab Sample ID: 1166058012
Polynuclear Aromatics GC/MS
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Chrysene	75.2J	ug/Kg
Diesel Range Organics	388	mg/Kg
Ethylbenzene	17.0J	ug/Kg
Gasoline Range Organics	1.60J	mg/Kg
o-Xylene	19.7J	ug/Kg
P & M -Xylene	64.4J	ug/Kg
Toluene	22.3J	ug/Kg

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Detectable Results Summary

Client Sample ID: **MW5-9**
Lab Sample ID: 1166058013

Polynuclear Aromatics GC/MS

Semivolatile Organic Fuels

Volatile Fuels

Parameter	Result	Units
Chrysene	65.0J	ug/Kg
Pyrene	32.2J	ug/Kg
Diesel Range Organics	410	mg/Kg
Ethylbenzene	19.7J	ug/Kg
Gasoline Range Organics	1.80J	mg/Kg
o-Xylene	17.2J	ug/Kg
P & M -Xylene	57.2J	ug/Kg
Toluene	24.3J	ug/Kg

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Results of **100316MW3R**

Client Sample ID: **100316MW3R**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058001
Lab Project ID: 1166058

Collection Date: 10/03/16 15:55
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	6.49		0.620	0.186	mg/L	1		10/13/16 01:30
Surrogates								
5a Androstane (surr)	94.2		50-150		%	1		10/13/16 01:30

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 01:30
Container ID: 1166058001-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 242 mL
Prep Extract Vol: 1 mL

Results of **100316MW3R**

Client Sample ID: **100316MW3R**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058001
Lab Project ID: 1166058

Collection Date: 10/03/16 15:55
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.07		0.100	0.0310	mg/L	1		10/16/16 13:12
Surrogates								
4-Bromofluorobenzene (surr)	95.2		50-150		%	1		10/16/16 13:12

Batch Information

Analytical Batch: VFC13384
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/16/16 13:12
Container ID: 1166058001-A

Prep Batch: VXX29776
Prep Method: SW5030B
Prep Date/Time: 10/15/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	10.4		0.500	0.150	ug/L	1		10/17/16 16:49
Ethylbenzene	50.7		1.00	0.310	ug/L	1		10/17/16 16:49
o-Xylene	11.4		1.00	0.310	ug/L	1		10/17/16 16:49
P & M -Xylene	79.7		2.00	0.620	ug/L	1		10/17/16 16:49
Toluene	0.500 U		1.00	0.310	ug/L	1		10/17/16 16:49
Surrogates								
1,4-Difluorobenzene (surr)	50.4	*	77-115		%	1		10/17/16 16:49

Batch Information

Analytical Batch: VFC13389
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/17/16 16:49
Container ID: 1166058001-A

Prep Batch: VXX29789
Prep Method: SW5030B
Prep Date/Time: 10/17/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100316MW2**

Client Sample ID: **100316MW2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058002
Lab Project ID: 1166058

Collection Date: 10/03/16 17:13
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1.59		0.588	0.176	mg/L	1		10/13/16 01:51
Surrogates								
5a Androstane (surr)	90.9		50-150		%	1		10/13/16 01:51

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 01:51
Container ID: 1166058002-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 255 mL
Prep Extract Vol: 1 mL

Results of **100316MW2**

Client Sample ID: **100316MW2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058002
Lab Project ID: 1166058

Collection Date: 10/03/16 17:13
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.177		0.100	0.0310	mg/L	1		10/16/16 13:31
Surrogates								
4-Bromofluorobenzene (surr)	92.6		50-150		%	1		10/16/16 13:31

Batch Information

Analytical Batch: VFC13384
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/16/16 13:31
Container ID: 1166058002-A

Prep Batch: VXX29776
Prep Method: SW5030B
Prep Date/Time: 10/15/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	37.0		0.500	0.150	ug/L	1		10/16/16 13:31
Ethylbenzene	5.60		1.00	0.310	ug/L	1		10/16/16 13:31
o-Xylene	0.500 U		1.00	0.310	ug/L	1		10/16/16 13:31
P & M -Xylene	3.61		2.00	0.620	ug/L	1		10/16/16 13:31
Toluene	0.750 J		1.00	0.310	ug/L	1		10/16/16 13:31
Surrogates								
1,4-Difluorobenzene (surr)	91.7		77-115		%	1		10/16/16 13:31

Batch Information

Analytical Batch: VFC13384
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/16/16 13:31
Container ID: 1166058002-A

Prep Batch: VXX29776
Prep Method: SW5030B
Prep Date/Time: 10/15/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100616MW6**

Client Sample ID: **100616MW6**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058003
Lab Project ID: 1166058

Collection Date: 10/06/16 16:47
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1.72		0.615	0.184	mg/L	1		10/13/16 02:12
Surrogates								
5a Androstane (surr)	93.3		50-150		%	1		10/13/16 02:12

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 02:12
Container ID: 1166058003-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 244 mL
Prep Extract Vol: 1 mL

Results of **100616MW6**

Client Sample ID: **100616MW6**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058003
Lab Project ID: 1166058

Collection Date: 10/06/16 16:47
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.122		0.100	0.0310	mg/L	1		10/18/16 15:43
Surrogates								
4-Bromofluorobenzene (surr)	85.6		50-150		%	1		10/18/16 15:43

Batch Information

Analytical Batch: VFC13392
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 15:43
Container ID: 1166058003-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	23.8		0.500	0.150	ug/L	1		10/18/16 15:43
Ethylbenzene	3.48		1.00	0.310	ug/L	1		10/18/16 15:43
o-Xylene	0.600	J	1.00	0.310	ug/L	1		10/18/16 15:43
P & M -Xylene	4.39		2.00	0.620	ug/L	1		10/18/16 15:43
Toluene	0.720	J	1.00	0.310	ug/L	1		10/18/16 15:43
Surrogates								
1,4-Difluorobenzene (surr)	85.9		77-115		%	1		10/18/16 15:43

Batch Information

Analytical Batch: VFC13392
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 15:43
Container ID: 1166058003-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100616MW9**

Client Sample ID: **100616MW9**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058004
Lab Project ID: 1166058

Collection Date: 10/06/16 16:47
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1.40		0.615	0.184	mg/L	1		10/13/16 02:32
Surrogates								
5a Androstane (surr)	93.5		50-150		%	1		10/13/16 02:32

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 02:32
Container ID: 1166058004-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 244 mL
Prep Extract Vol: 1 mL

Results of **100616MW9**

Client Sample ID: **100616MW9**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058004
Lab Project ID: 1166058

Collection Date: 10/06/16 16:47
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.111		0.100	0.0310	mg/L	1		10/18/16 16:02
Surrogates								
4-Bromofluorobenzene (surr)	89.7		50-150		%	1		10/18/16 16:02

Batch Information

Analytical Batch: VFC13392
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 16:02
Container ID: 1166058004-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	23.7		0.500	0.150	ug/L	1		10/18/16 16:02
Ethylbenzene	3.39		1.00	0.310	ug/L	1		10/18/16 16:02
o-Xylene	0.520	J	1.00	0.310	ug/L	1		10/18/16 16:02
P & M -Xylene	4.21		2.00	0.620	ug/L	1		10/18/16 16:02
Toluene	0.390	J	1.00	0.310	ug/L	1		10/18/16 16:02
Surrogates								
1,4-Difluorobenzene (surr)	89.7		77-115		%	1		10/18/16 16:02

Batch Information

Analytical Batch: VFC13392
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 16:02
Container ID: 1166058004-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100616MW4**

Client Sample ID: **100616MW4**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058005
Lab Project ID: 1166058

Collection Date: 10/06/16 19:40
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	0.353	J	0.605	0.181	mg/L	1		10/13/16 02:53
Surrogates								
5a Androstane (surr)	85.5		50-150		%	1		10/13/16 02:53

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 02:53
Container ID: 1166058005-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 248 mL
Prep Extract Vol: 1 mL

Results of **100616MW4**

Client Sample ID: **100616MW4**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058005
Lab Project ID: 1166058

Collection Date: 10/06/16 19:40
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0500 U		0.100	0.0310	mg/L	1		10/18/16 16:21
Surrogates								
4-Bromofluorobenzene (surr)	82.9		50-150		%	1		10/18/16 16:21

Batch Information

Analytical Batch: VFC13392
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 16:21
Container ID: 1166058005-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	1.62		0.500	0.150	ug/L	1		10/18/16 16:21
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		10/18/16 16:21
o-Xylene	0.500 U		1.00	0.310	ug/L	1		10/18/16 16:21
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		10/18/16 16:21
Toluene	0.500 U		1.00	0.310	ug/L	1		10/18/16 16:21
Surrogates								
1,4-Difluorobenzene (surr)	87.2		77-115		%	1		10/18/16 16:21

Batch Information

Analytical Batch: VFC13392
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 16:21
Container ID: 1166058005-A

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100716MW1R2**

Client Sample ID: **100716MW1R2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058006
Lab Project ID: 1166058

Collection Date: 10/07/16 10:00
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1.73		0.605	0.181	mg/L	1		10/13/16 03:14
Surrogates								
5a Androstane (surr)	94		50-150		%	1		10/13/16 03:14

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 03:14
Container ID: 1166058006-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 248 mL
Prep Extract Vol: 1 mL

Results of **100716MW1R2**

Client Sample ID: **100716MW1R2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058006
Lab Project ID: 1166058

Collection Date: 10/07/16 10:00
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.175		0.100	0.0310	mg/L	1		10/19/16 19:52
Surrogates								
4-Bromofluorobenzene (surr)	107		50-150		%	1		10/19/16 19:52

Batch Information

Analytical Batch: VFC13394
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/19/16 19:52
Container ID: 1166058006-A

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	48.7		0.500	0.150	ug/L	1		10/19/16 19:52
Ethylbenzene	2.64		1.00	0.310	ug/L	1		10/19/16 19:52
o-Xylene	1.22		1.00	0.310	ug/L	1		10/19/16 19:52
P & M -Xylene	6.48		2.00	0.620	ug/L	1		10/19/16 19:52
Toluene	1.43		1.00	0.310	ug/L	1		10/19/16 19:52
Surrogates								
1,4-Difluorobenzene (surr)	93.1		77-115		%	1		10/19/16 19:52

Batch Information

Analytical Batch: VFC13394
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/19/16 19:52
Container ID: 1166058006-A

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **100716MW5**

Client Sample ID: **100716MW5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058007
Lab Project ID: 1166058

Collection Date: 10/07/16 15:05
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	5.84		0.600	0.180	mg/L	1		10/13/16 03:35
Surrogates								
5a Androstane (surr)	93.7		50-150		%	1		10/13/16 03:35

Batch Information

Analytical Batch: XFC12946
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/13/16 03:35
Container ID: 1166058007-D

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/16 10:30
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Results of **100716MW5**

Client Sample ID: **100716MW5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058007
Lab Project ID: 1166058

Collection Date: 10/07/16 15:05
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.267		0.100	0.0310	mg/L	1		10/19/16 20:11
Surrogates								
4-Bromofluorobenzene (surr)	102		50-150		%	1		10/19/16 20:11

Batch Information

Analytical Batch: VFC13394
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/19/16 20:11
Container ID: 1166058007-A

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	31.6		0.500	0.150	ug/L	1		10/19/16 20:11
Ethylbenzene	3.53		1.00	0.310	ug/L	1		10/19/16 20:11
o-Xylene	3.00		1.00	0.310	ug/L	1		10/19/16 20:11
P & M -Xylene	8.49		2.00	0.620	ug/L	1		10/19/16 20:11
Toluene	2.11		1.00	0.310	ug/L	1		10/19/16 20:11
Surrogates								
1,4-Difluorobenzene (surr)	82.1		77-115		%	1		10/19/16 20:11

Batch Information

Analytical Batch: VFC13394
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/19/16 20:11
Container ID: 1166058007-A

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **TBW1**

Client Sample ID: **TBW1**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058008
Lab Project ID: 1166058

Collection Date: 10/03/16 15:55
Received Date: 10/10/16 09:20
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0500 U		0.100	0.0310	mg/L	1		10/14/16 19:59
Surrogates								
4-Bromofluorobenzene (surr)	73.8		50-150		%	1		10/14/16 19:59

Batch Information

Analytical Batch: VFC13375
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/14/16 19:59
Container ID: 1166058008-A

Prep Batch: VXX29773
Prep Method: SW5030B
Prep Date/Time: 10/14/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.250 U		0.500	0.150	ug/L	1		10/14/16 19:59
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		10/14/16 19:59
o-Xylene	0.500 U		1.00	0.310	ug/L	1		10/14/16 19:59
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		10/14/16 19:59
Toluene	0.500 U		1.00	0.310	ug/L	1		10/14/16 19:59
Surrogates								
1,4-Difluorobenzene (surr)	88.7		77-115		%	1		10/14/16 19:59

Batch Information

Analytical Batch: VFC13375
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/14/16 19:59
Container ID: 1166058008-A

Prep Batch: VXX29773
Prep Method: SW5030B
Prep Date/Time: 10/14/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **MW1R2-4.5**

Client Sample ID: **MW1R2-4.5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058009
Lab Project ID: 1166058

Collection Date: 10/05/16 09:54
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):94.0
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	28.5		21.0	6.52	mg/Kg	1		10/17/16 11:09
Surrogates								
5a Androstane (surr)	95.9		50-150		%	1		10/17/16 11:09

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/17/16 11:09
Container ID: 1166058009-A

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/16 18:20
Prep Initial Wt./Vol.: 30.334 g
Prep Extract Vol: 1 mL

Results of **MW1R2-4.5**

Client Sample ID: **MW1R2-4.5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058009
Lab Project ID: 1166058

Collection Date: 10/05/16 09:54
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):94.0
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	3.17	J	6.81	2.04	mg/Kg	1		10/18/16 02:31
Surrogates								
4-Bromofluorobenzene (surr)	89.3		50-150		%	1		10/18/16 02:31

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 02:31
Container ID: 1166058009-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 09:54
Prep Initial Wt./Vol.: 20.491 g
Prep Extract Vol: 26.2256 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	11.6	J	34.0	10.9	ug/Kg	1		10/18/16 02:31
Ethylbenzene	34.0	U	68.1	21.2	ug/Kg	1		10/18/16 02:31
o-Xylene	34.0	U	68.1	21.2	ug/Kg	1		10/18/16 02:31
P & M -Xylene	68.0	U	136	40.8	ug/Kg	1		10/18/16 02:31
Toluene	22.5	J	68.1	21.2	ug/Kg	1		10/18/16 02:31
Surrogates								
1,4-Difluorobenzene (surr)	83.3		72-119		%	1		10/18/16 02:31

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 02:31
Container ID: 1166058009-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 09:54
Prep Initial Wt./Vol.: 20.491 g
Prep Extract Vol: 26.2256 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW6-4**

Client Sample ID: **MW6-4**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058010
Lab Project ID: 1166058

Collection Date: 10/05/16 11:05
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):87.6
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	88.7	J	113	35.0	mg/Kg	1		10/17/16 11:19
Surrogates								
5a Androstane (surr)	104		50-150		%	1		10/17/16 11:19

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/17/16 11:19
Container ID: 1166058010-A

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/16 18:20
Prep Initial Wt./Vol.: 30.382 g
Prep Extract Vol: 5 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW6-4**

Client Sample ID: **MW6-4**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058010
Lab Project ID: 1166058

Collection Date: 10/05/16 11:05
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):87.6
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	3.20 J		8.10	2.43	mg/Kg	1		10/18/16 03:28
Surrogates								
4-Bromofluorobenzene (surr)	84.1		50-150		%	1		10/18/16 03:28

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 03:28
Container ID: 1166058010-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 11:05
Prep Initial Wt./Vol.: 19.323 g
Prep Extract Vol: 27.4053 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	13.8 J		40.5	13.0	ug/Kg	1		10/18/16 03:28
Ethylbenzene	40.5 U		81.0	25.3	ug/Kg	1		10/18/16 03:28
o-Xylene	40.5 U		81.0	25.3	ug/Kg	1		10/18/16 03:28
P & M -Xylene	81.0 U		162	48.6	ug/Kg	1		10/18/16 03:28
Toluene	42.9 J		81.0	25.3	ug/Kg	1		10/18/16 03:28
Surrogates								
1,4-Difluorobenzene (surr)	85.2		72-119		%	1		10/18/16 03:28

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 03:28
Container ID: 1166058010-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 11:05
Prep Initial Wt./Vol.: 19.323 g
Prep Extract Vol: 27.4053 mL

Results of **MW4-2.5**

Client Sample ID: **MW4-2.5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058011
Lab Project ID: 1166058

Collection Date: 10/05/16 11:45
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):96.6
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	116		103	32.0	mg/Kg	1		10/17/16 11:28
Surrogates								
5a Androstane (surr)	107		50-150		%	1		10/17/16 11:28

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/17/16 11:28
Container ID: 1166058011-A

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/16 18:20
Prep Initial Wt./Vol.: 30.074 g
Prep Extract Vol: 5 mL

Results of **MW4-2.5**

Client Sample ID: **MW4-2.5**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058011
Lab Project ID: 1166058

Collection Date: 10/05/16 11:45
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):96.6
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	2.36 U		4.71	1.41	mg/Kg	1		10/18/16 03:47
Surrogates								
4-Bromofluorobenzene (surr)	84		50-150		%	1		10/18/16 03:47

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 03:47
Container ID: 1166058011-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 11:45
Prep Initial Wt./Vol.: 28.508 g
Prep Extract Vol: 25.9677 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	11.8 U		23.6	7.54	ug/Kg	1		10/18/16 03:47
Ethylbenzene	23.6 U		47.1	14.7	ug/Kg	1		10/18/16 03:47
o-Xylene	23.6 U		47.1	14.7	ug/Kg	1		10/18/16 03:47
P & M -Xylene	47.1 U		94.3	28.3	ug/Kg	1		10/18/16 03:47
Toluene	15.6 J		47.1	14.7	ug/Kg	1		10/18/16 03:47
Surrogates								
1,4-Difluorobenzene (surr)	85.2		72-119		%	1		10/18/16 03:47

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 03:47
Container ID: 1166058011-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 11:45
Prep Initial Wt./Vol.: 28.508 g
Prep Extract Vol: 25.9677 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW5-2**

Client Sample ID: **MW5-2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058012
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.6
Location:

Results by **Polynuclear Aromatics GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1-Methylnaphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
2-Methylnaphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Acenaphthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Acenaphthylene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Benzo(a)Anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Benzo[a]pyrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Benzo[b]Fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Benzo[g,h,i]perylene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Benzo[k]fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Chrysene	75.2	J	104	31.1	ug/Kg	4		10/14/16 14:26
Dibenzo[a,h]anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Fluorene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Indeno[1,2,3-c,d] pyrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Naphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Phenanthrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Pyrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:26
Surrogates								
2-Fluorobiphenyl (surr)	79.4		46-115		%	4		10/14/16 14:26
Terphenyl-d14 (surr)	94.5		58-133		%	4		10/14/16 14:26

Batch Information

Analytical Batch: XMS9698
Analytical Method: 8270D SIM (PAH)
Analyst: S.G
Analytical Date/Time: 10/14/16 14:26
Container ID: 1166058012-A

Prep Batch: XXX36508
Prep Method: SW3550C
Prep Date/Time: 10/12/16 14:15
Prep Initial Wt./Vol.: 22.717 g
Prep Extract Vol: 5 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW5-2**

Client Sample ID: **MW5-2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058012
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.6
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	388		104	32.4	mg/Kg	1		10/17/16 11:38
Surrogates								
5a Androstane (surr)	117		50-150		%	1		10/17/16 11:38

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/17/16 11:38
Container ID: 1166058012-A

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/16 18:20
Prep Initial Wt./Vol.: 30.044 g
Prep Extract Vol: 5 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW5-2**

Client Sample ID: **MW5-2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058012
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.6
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.60 J		5.32	1.60	mg/Kg	1		10/18/16 00:17
Surrogates								
4-Bromofluorobenzene (surr)	83.8		50-150		%	1		10/18/16 00:17

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 00:17
Container ID: 1166058012-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 12:30
Prep Initial Wt./Vol.: 25.667 g
Prep Extract Vol: 26.1185 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	13.3 U		26.6	8.51	ug/Kg	1		10/18/16 00:17
Ethylbenzene	17.0 J		53.2	16.6	ug/Kg	1		10/18/16 00:17
o-Xylene	19.7 J		53.2	16.6	ug/Kg	1		10/18/16 00:17
P & M -Xylene	64.4 J		106	31.9	ug/Kg	1		10/18/16 00:17
Toluene	22.3 J		53.2	16.6	ug/Kg	1		10/18/16 00:17
Surrogates								
1,4-Difluorobenzene (surr)	86.6		72-119		%	1		10/18/16 00:17

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 00:17
Container ID: 1166058012-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 12:30
Prep Initial Wt./Vol.: 25.667 g
Prep Extract Vol: 26.1185 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **MW5-9**

Client Sample ID: **MW5-9**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058013
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.5
Location:

Results by **Polynuclear Aromatics GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1-Methylnaphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
2-Methylnaphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Acenaphthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Acenaphthylene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Benzo(a)Anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Benzo[a]pyrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Benzo[b]Fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Benzo[g,h,i]perylene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Benzo[k]fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Chrysene	65.0	J	104	31.1	ug/Kg	4		10/14/16 14:46
Dibenzo[a,h]anthracene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Fluoranthene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Fluorene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Indeno[1,2,3-c,d] pyrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Naphthalene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Phenanthrene	52.0	U	104	31.1	ug/Kg	4		10/14/16 14:46
Pyrene	32.2	J	104	31.1	ug/Kg	4		10/14/16 14:46
Surrogates								
2-Fluorobiphenyl (surr)	80.9		46-115		%	4		10/14/16 14:46
Terphenyl-d14 (surr)	93.1		58-133		%	4		10/14/16 14:46

Batch Information

Analytical Batch: XMS9698
Analytical Method: 8270D SIM (PAH)
Analyst: S.G
Analytical Date/Time: 10/14/16 14:46
Container ID: 1166058013-A

Prep Batch: XXX36508
Prep Method: SW3550C
Prep Date/Time: 10/12/16 14:15
Prep Initial Wt./Vol.: 22.746 g
Prep Extract Vol: 5 mL

Results of **MW5-9**

Client Sample ID: **MW5-9**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058013
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.5
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	410		104	32.1	mg/Kg	1		10/17/16 11:48
Surrogates								
5a Androstane (surr)	112		50-150		%	1		10/17/16 11:48

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Analyst: NRO
Analytical Date/Time: 10/17/16 11:48
Container ID: 1166058013-A

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/16 18:20
Prep Initial Wt./Vol.: 30.315 g
Prep Extract Vol: 5 mL

Results of **MW5-9**

Client Sample ID: **MW5-9**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058013
Lab Project ID: 1166058

Collection Date: 10/05/16 12:30
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):95.5
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.80	J	5.06	1.52	mg/Kg	1		10/18/16 04:06
Surrogates								
4-Bromofluorobenzene (surr)	79.7		50-150		%	1		10/18/16 04:06

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/18/16 04:06
Container ID: 1166058013-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 12:30
Prep Initial Wt./Vol.: 27.092 g
Prep Extract Vol: 26.2096 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	12.7	U	25.3	8.10	ug/Kg	1		10/18/16 04:06
Ethylbenzene	19.7	J	50.6	15.8	ug/Kg	1		10/18/16 04:06
o-Xylene	17.2	J	50.6	15.8	ug/Kg	1		10/18/16 04:06
P & M -Xylene	57.2	J	101	30.4	ug/Kg	1		10/18/16 04:06
Toluene	24.3	J	50.6	15.8	ug/Kg	1		10/18/16 04:06
Surrogates								
1,4-Difluorobenzene (surr)	84.8		72-119		%	1		10/18/16 04:06

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/18/16 04:06
Container ID: 1166058013-B

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 12:30
Prep Initial Wt./Vol.: 27.092 g
Prep Extract Vol: 26.2096 mL

Print Date: 10/21/2016 7:46:19AM

J flagging is activated

Results of **TB-2**

Client Sample ID: **TB-2**
Client Project ID: **Kotzebue Groundwater/Soil**
Lab Sample ID: 1166058014
Lab Project ID: 1166058

Collection Date: 10/05/16 09:54
Received Date: 10/10/16 09:20
Matrix: Soil/Solid (dry weight)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.25	U	2.49	0.747	mg/Kg	1		10/17/16 23:58
Surrogates								
4-Bromofluorobenzene (surr)	87.4		50-150		%	1		10/17/16 23:58

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 10/17/16 23:58
Container ID: 1166058014-A

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 09:54
Prep Initial Wt./Vol.: 50.212 g
Prep Extract Vol: 25 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	6.20	U	12.4	3.98	ug/Kg	1		10/17/16 23:58
Ethylbenzene	12.4	U	24.9	7.77	ug/Kg	1		10/17/16 23:58
o-Xylene	12.4	U	24.9	7.77	ug/Kg	1		10/17/16 23:58
P & M -Xylene	24.9	U	49.8	14.9	ug/Kg	1		10/17/16 23:58
Toluene	12.4	U	24.9	7.77	ug/Kg	1		10/17/16 23:58
Surrogates								
1,4-Difluorobenzene (surr)	85.5		72-119		%	1		10/17/16 23:58

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 10/17/16 23:58
Container ID: 1166058014-A

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/05/16 09:54
Prep Initial Wt./Vol.: 50.212 g
Prep Extract Vol: 25 mL

Method Blank

Blank ID: MB for HBN 1745503 [SPT/10020]
Blank Lab ID: 1358227

Matrix: Soil/Solid (dry weight)

QC for Samples:
1166058009, 1166058010, 1166058011, 1166058012, 1166058013

Results by **SM21 2540G**

Parameter	Results	LOQ/CL	DL	Units
Total Solids	100			%

Batch Information

Analytical Batch: SPT10020
Analytical Method: SM21 2540G
Instrument:
Analyst: RJA
Analytical Date/Time: 10/11/2016 6:54:00PM

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Duplicate Sample Summary

Original Sample ID: 1166058011
Duplicate Sample ID: 1358228
QC for Samples:
1166058009, 1166058010, 1166058011, 1166058012

Analysis Date: 10/11/2016 18:54
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	96.6	96.7	%	0.08	(< 15)

Batch Information

Analytical Batch: SPT10020
Analytical Method: SM21 2540G
Instrument:
Analyst: RJA

Print Date: 10/21/2016 7:46:23AM

Duplicate Sample Summary

Original Sample ID: 1166058012
Duplicate Sample ID: 1358229
QC for Samples:
1166058012, 1166058013

Analysis Date: 10/11/2016 18:54
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	95.6	95.7	%	0.03	(< 15)

Batch Information

Analytical Batch: SPT10020
Analytical Method: SM21 2540G
Instrument:
Analyst: RJA

Print Date: 10/21/2016 7:46:23AM

Duplicate Sample Summary

Original Sample ID: 1166075030
Duplicate Sample ID: 1358230
QC for Samples:
1166058013

Analysis Date: 10/11/2016 18:54
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	90.6	90.6	%	0.04	(< 15)

Batch Information

Analytical Batch: SPT10020
Analytical Method: SM21 2540G
Instrument:
Analyst: RJA

Print Date: 10/21/2016 7:46:23AM

Method Blank

Blank ID: MB for HBN 1745789 [VXX/29773]
Blank Lab ID: 1359222

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058008

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	78.6	50-150		%

Batch Information

Analytical Batch: VFC13375
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/14/2016 9:52:00AM

Prep Batch: VXX29773
Prep Method: SW5030B
Prep Date/Time: 10/14/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29773]
Blank Spike Lab ID: 1359225
Date Analyzed: 10/14/2016 18:45

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29773]
Spike Duplicate Lab ID: 1359226
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058008

Results by **AK101**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	1.00	1.17	117	1.00	1.03	103	(60-120)	13.10	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	87.9	88	0.0500	81.2	81	(50-150)	8.00	

Batch Information

Analytical Batch: **VFC13375**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29773**
Prep Method: **SW5030B**
Prep Date/Time: **10/14/2016 06:00**
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1745789 [VXX/29773]
Blank Lab ID: 1359222

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058008

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	91.1	77-115		%

Batch Information

Analytical Batch: VFC13375
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/14/2016 9:52:00AM

Prep Batch: VXX29773
Prep Method: SW5030B
Prep Date/Time: 10/14/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29773]
Blank Spike Lab ID: 1359223
Date Analyzed: 10/14/2016 18:26

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29773]
Spike Duplicate Lab ID: 1359224
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058008

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	109	109	100	113	113	(80-120)	3.70	(< 20)
Ethylbenzene	100	112	112	100	117	117	(75-125)	4.20	(< 20)
o-Xylene	100	110	110	100	115	115	(80-120)	4.30	(< 20)
P & M -Xylene	200	224	112	200	234	117	(75-130)	4.30	(< 20)
Toluene	100	113	113	100	118	118	(75-120)	4.00	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	97.5	98	50	97.5	98	(77-115)	0.00	

Batch Information

Analytical Batch: **VFC13375**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29773**
Prep Method: **SW5030B**
Prep Date/Time: **10/14/2016 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1745901 [VXX/29776]
Blank Lab ID: 1359319

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058001, 1166058002

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	87.5	50-150		%

Batch Information

Analytical Batch: VFC13384
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/16/2016 10:06:00AM

Prep Batch: VXX29776
Prep Method: SW5030B
Prep Date/Time: 10/15/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29776]
Blank Spike Lab ID: 1359322
Date Analyzed: 10/16/2016 09:28

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29776]
Spike Duplicate Lab ID: 1359323
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058001, 1166058002

Results by **AK101**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	1.00	1.08	108	1.00	0.958	96	(60-120)	12.40	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	99.5	100	0.0500	96.4	96	(50-150)	3.10	

Batch Information

Analytical Batch: **VFC13384**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29776**
Prep Method: **SW5030B**
Prep Date/Time: **10/15/2016 06:00**
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1745901 [VXX/29776]
Blank Lab ID: 1359319

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058001, 1166058002

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	85	77-115		%

Batch Information

Analytical Batch: VFC13384
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/16/2016 10:06:00AM

Prep Batch: VXX29776
Prep Method: SW5030B
Prep Date/Time: 10/15/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29776]
Blank Spike Lab ID: 1359320
Date Analyzed: 10/16/2016 09:09

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29776]
Spike Duplicate Lab ID: 1359321
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058001, 1166058002

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	108	108	100	109	109	(80-120)	0.90	(< 20)
Ethylbenzene	100	108	108	100	109	109	(75-125)	0.87	(< 20)
o-Xylene	100	101	101	100	105	105	(80-120)	3.10	(< 20)
P & M -Xylene	200	205	103	200	212	106	(75-130)	3.10	(< 20)
Toluene	100	116	116	100	113	113	(75-120)	3.10	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	95.1	95	50	96	96	(77-115)	0.86	

Batch Information

Analytical Batch: **VFC13384**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29776**
Prep Method: **SW5030B**
Prep Date/Time: **10/15/2016 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1746024 [VXX/29788]
Blank Lab ID: 1359782

Matrix: Soil/Solid (dry weight)

QC for Samples:
1166058009, 1166058010, 1166058011, 1166058012, 1166058013, 1166058014

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	1.25U	2.50	0.750	mg/Kg
Surrogates				
4-Bromofluorobenzene (surr)	84.2	50-150		%

Batch Information

Analytical Batch: VFC13387
Analytical Method: AK101
Instrument: Agilent 7890 PID/FID
Analyst: ST
Analytical Date/Time: 10/17/2016 11:39:00PM

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/17/2016 12:30:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29788]
Blank Spike Lab ID: 1359785
Date Analyzed: 10/17/2016 21:25

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29788]
Spike Duplicate Lab ID: 1359786
Matrix: Soil/Solid (dry weight)

QC for Samples: 1166058009, 1166058010, 1166058011, 1166058012, 1166058013, 1166058014

Results by **AK101**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	12.5	12.4	99	12.5	12.6	101	(60-120)	1.80	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	1.25	89.9	90	1.25	88.3	88	(50-150)	1.80	

Batch Information

Analytical Batch: **VFC13387**
Analytical Method: **AK101**
Instrument: **Agilent 7890 PID/FID**
Analyst: **ST**

Prep Batch: **VXX29788**
Prep Method: **SW5035A**
Prep Date/Time: **10/17/2016 00:30**
Spike Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL
Dupe Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL

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Method Blank

Blank ID: MB for HBN 1746024 [VXX/29788]
Blank Lab ID: 1359782

Matrix: Soil/Solid (dry weight)

QC for Samples:
1166058009, 1166058010, 1166058011, 1166058012, 1166058013, 1166058014

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	6.25U	12.5	4.00	ug/Kg
Ethylbenzene	12.5U	25.0	7.80	ug/Kg
o-Xylene	12.5U	25.0	7.80	ug/Kg
P & M -Xylene	25.0U	50.0	15.0	ug/Kg
Toluene	12.5U	25.0	7.80	ug/Kg
Surrogates				
1,4-Difluorobenzene (surr)	84.7	72-119		%

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Instrument: Agilent 7890 PID/FID
Analyst: ST
Analytical Date/Time: 10/17/2016 11:39:00PM

Prep Batch: VXX29788
Prep Method: SW5035A
Prep Date/Time: 10/17/2016 12:30:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29788]
Blank Spike Lab ID: 1359783
Date Analyzed: 10/17/2016 20:47

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29788]
Spike Duplicate Lab ID: 1359784
Matrix: Soil/Solid (dry weight)

QC for Samples: 1166058009, 1166058010, 1166058011, 1166058012, 1166058013, 1166058014

Results by **SW8021B**

	Blank Spike (ug/Kg)			Spike Duplicate (ug/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	1250	1210	97	1250	1170	94	(75-125)	2.90	(< 20)
Ethylbenzene	1250	1210	97	1250	1180	94	(75-125)	2.50	(< 20)
o-Xylene	1250	1180	94	1250	1150	92	(75-125)	2.30	(< 20)
P & M -Xylene	2500	2440	97	2500	2380	95	(80-125)	2.20	(< 20)
Toluene	1250	1210	97	1250	1170	93	(70-125)	3.40	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	1250	88.6	89	1250	91.5	92	(72-119)	3.20	

Batch Information

Analytical Batch: **VFC13387**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890 PID/FID**
Analyst: **ST**

Prep Batch: **VXX29788**
Prep Method: **SW5035A**
Prep Date/Time: **10/17/2016 00:30**
Spike Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL
Dupe Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL

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Matrix Spike Summary

Original Sample ID: 1166058012
MS Sample ID: 1359787 MS
MSD Sample ID: 1359788 MSD

Analysis Date: 10/18/2016 0:17
Analysis Date: 10/17/2016 22:04
Analysis Date: 10/17/2016 22:23
Matrix: Soil/Solid (dry weight)

QC for Samples: 1166058009, 1166058010, 1166058011, 1166058012, 1166058013, 1166058014

Results by **SW8021B**

		Matrix Spike (ug/Kg)			Spike Duplicate (ug/Kg)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	13.3U	2552	2343	92	2552	2249	88	75-125	4.30	(< 20)
Ethylbenzene	17.0J	2552	2291	90	2552	2228	87	75-125	2.80	(< 20)
o-Xylene	19.7J	2552	2218	86	2552	2123	83	75-125	4.50	(< 20)
P & M -Xylene	64.4J	5094	4623	90	5094	4446	86	80-125	4.00	(< 20)
Toluene	22.3J	2552	2280	89	2552	2218	86	70-125	2.50	(< 20)
Surrogates										
1,4-Difluorobenzene (surr)		2552	2228	87	2552	2280	89	72-119	2.20	

Batch Information

Analytical Batch: VFC13387
Analytical Method: SW8021B
Instrument: Agilent 7890 PID/FID
Analyst: ST
Analytical Date/Time: 10/17/2016 10:04:00PM

Prep Batch: VXX29788
Prep Method: AK101 Extraction (S)
Prep Date/Time: 10/17/2016 12:30:00AM
Prep Initial Wt./Vol.: 25.67g
Prep Extract Vol: 25.00mL

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Method Blank

Blank ID: MB for HBN 1746025 [VXX/29789]
Blank Lab ID: 1359789

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058001

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	88.4	77-115		%

Batch Information

Analytical Batch: VFC13389
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/17/2016 10:48:00AM

Prep Batch: VXX29789
Prep Method: SW5030B
Prep Date/Time: 10/17/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29789]
Blank Spike Lab ID: 1359790
Date Analyzed: 10/17/2016 12:03

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29789]
Spike Duplicate Lab ID: 1359791
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058001

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	108	108	100	115	115	(80-120)	6.50	(< 20)
Ethylbenzene	100	109	109	100	116	116	(75-125)	6.50	(< 20)
o-Xylene	100	96.4	96	100	112	112	(80-120)	14.60	(< 20)
P & M -Xylene	200	197	99	200	227	114	(75-130)	14.10	(< 20)
Toluene	100	118	118	100	119	119	(75-120)	1.40	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	93.5	94	50	94.5	95	(77-115)	1.00	

Batch Information

Analytical Batch: **VFC13389**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29789**
Prep Method: **SW5030B**
Prep Date/Time: **10/17/2016 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1746123 [VXX/29795]
Blank Lab ID: 1360073

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058003, 1166058004, 1166058005

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	80.8	50-150		%

Batch Information

Analytical Batch: VFC13392
Analytical Method: AK101
Instrument: Agilent 7890 PID/FID
Analyst: ST
Analytical Date/Time: 10/18/2016 10:39:00AM

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29795]
Blank Spike Lab ID: 1360076
Date Analyzed: 10/18/2016 11:36

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29795]
Spike Duplicate Lab ID: 1360077
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058003, 1166058004, 1166058005

Results by **AK101**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	1.00	0.895	90	1.00	0.877	88	(60-120)	2.10	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	95.9	96	0.0500	85.7	86	(50-150)	11.30	

Batch Information

Analytical Batch: **VFC13392**
Analytical Method: **AK101**
Instrument: **Agilent 7890 PID/FID**
Analyst: **ST**

Prep Batch: **VXX29795**
Prep Method: **SW5030B**
Prep Date/Time: **10/18/2016 06:00**
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1746123 [VXX/29795]
Blank Lab ID: 1360073

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058003, 1166058004, 1166058005

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	84.6	77-115		%

Batch Information

Analytical Batch: VFC13392
Analytical Method: SW8021B
Instrument: Agilent 7890 PID/FID
Analyst: ST
Analytical Date/Time: 10/18/2016 10:39:00AM

Prep Batch: VXX29795
Prep Method: SW5030B
Prep Date/Time: 10/18/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29795]
Blank Spike Lab ID: 1360074
Date Analyzed: 10/18/2016 11:16

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29795]
Spike Duplicate Lab ID: 1360075
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058003, 1166058004, 1166058005

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	90.7	91	100	89.8	90	(80-120)	1.10	(< 20)
Ethylbenzene	100	93.1	93	100	89.8	90	(75-125)	3.60	(< 20)
o-Xylene	100	92.0	92	100	87.4	87	(80-120)	5.10	(< 20)
P & M -Xylene	200	186	93	200	180	90	(75-130)	2.90	(< 20)
Toluene	100	88.8	89	100	90.0	90	(75-120)	1.40	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	91.5	92	50	95.4	95	(77-115)	4.20	

Batch Information

Analytical Batch: **VFC13392**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890 PID/FID**
Analyst: **ST**

Prep Batch: **VXX29795**
Prep Method: **SW5030B**
Prep Date/Time: **10/18/2016 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1746212 [VXX/29803]
Blank Lab ID: 1360329

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058006, 1166058007

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	104	50-150		%

Batch Information

Analytical Batch: VFC13394
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/19/2016 11:55:00AM

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29803]
Blank Spike Lab ID: 1360332
Date Analyzed: 10/19/2016 12:51

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29803]
Spike Duplicate Lab ID: 1360333
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058006, 1166058007

Results by **AK101**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	1.00	0.932	93	1.00	1.10	110	(60-120)	16.50	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	111	111	0.0500	113	113	(50-150)	2.20	

Batch Information

Analytical Batch: **VFC13394**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29803**
Prep Method: **SW5030B**
Prep Date/Time: **10/19/2016 06:00**
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1746212 [VXX/29803]
Blank Lab ID: 1360329

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058006, 1166058007

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	89.7	77-115		%

Batch Information

Analytical Batch: VFC13394
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 10/19/2016 11:55:00AM

Prep Batch: VXX29803
Prep Method: SW5030B
Prep Date/Time: 10/19/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [VXX29803]
Blank Spike Lab ID: 1360330
Date Analyzed: 10/19/2016 12:32

Spike Duplicate ID: LCSD for HBN 1166058 [VXX29803]
Spike Duplicate Lab ID: 1360331
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058006, 1166058007

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	106	106	100	104	104	(80-120)	1.80	(< 20)
Ethylbenzene	100	109	109	100	105	105	(75-125)	3.10	(< 20)
o-Xylene	100	107	107	100	104	104	(80-120)	3.00	(< 20)
P & M -Xylene	200	219	110	200	212	106	(75-130)	3.30	(< 20)
Toluene	100	108	108	100	106	106	(75-120)	1.80	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	101	101	50	103	103	(77-115)	1.60	

Batch Information

Analytical Batch: **VFC13394**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29803**
Prep Method: **SW5030B**
Prep Date/Time: **10/19/2016 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1745504 [XXX/36506]
Blank Lab ID: 1358233

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1166058001, 1166058002, 1166058003, 1166058004, 1166058005, 1166058006, 1166058007

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	0.300U	0.600	0.180	mg/L
Surrogates				
5a Androstane (surr)	92.1	60-120		%

Batch Information

Analytical Batch: XFC12945
Analytical Method: AK102
Instrument: HP 7890A FID SV E F
Analyst: NRO
Analytical Date/Time: 10/14/2016 3:39:00AM

Prep Batch: XXX36506
Prep Method: SW3520C
Prep Date/Time: 10/12/2016 10:30:31AM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [XXX36506]
Blank Spike Lab ID: 1358234
Date Analyzed: 10/12/2016 23:47

Spike Duplicate ID: LCSD for HBN 1166058 [XXX36506]
Spike Duplicate Lab ID: 1358235
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1166058001, 1166058002, 1166058003, 1166058004, 1166058005, 1166058006, 1166058007

Results by **AK102**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	20	20.1	100	20	20.0	100	(75-125)	0.23	(< 20)
Surrogates									
5a Androstane (surr)	0.4	113	113	0.4	110	110	(60-120)	2.90	

Batch Information

Analytical Batch: **XFC12946**
Analytical Method: **AK102**
Instrument: **HP 7890A FID SV E F**
Analyst: **NRO**

Prep Batch: **XXX36506**
Prep Method: **SW3520C**
Prep Date/Time: **10/12/2016 10:30**
Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

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Method Blank

Blank ID: MB for HBN 1745531 [XXX/36508]
Blank Lab ID: 1358428

Matrix: Soil/Solid (dry weight)

QC for Samples:
1166058012, 1166058013

Results by **8270D SIM (PAH)**

Parameter	Results	LOQ/CL	DL	Units
1-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
2-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
Acenaphthene	2.50U	5.00	1.50	ug/Kg
Acenaphthylene	2.50U	5.00	1.50	ug/Kg
Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo(a)Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo[a]pyrene	2.50U	5.00	1.50	ug/Kg
Benzo[b]Fluoranthene	2.50U	5.00	1.50	ug/Kg
Benzo[g,h,i]perylene	2.50U	5.00	1.50	ug/Kg
Benzo[k]fluoranthene	2.50U	5.00	1.50	ug/Kg
Chrysene	2.50U	5.00	1.50	ug/Kg
Dibenzo[a,h]anthracene	2.50U	5.00	1.50	ug/Kg
Fluoranthene	2.50U	5.00	1.50	ug/Kg
Fluorene	2.50U	5.00	1.50	ug/Kg
Indeno[1,2,3-c,d] pyrene	2.50U	5.00	1.50	ug/Kg
Naphthalene	2.50U	5.00	1.50	ug/Kg
Phenanthrene	2.50U	5.00	1.50	ug/Kg
Pyrene	2.50U	5.00	1.50	ug/Kg
Surrogates				
2-Fluorobiphenyl (surr)	97.3	46-115		%
Terphenyl-d14 (surr)	97.5	58-133		%

Batch Information

Analytical Batch: XMS9698
Analytical Method: 8270D SIM (PAH)
Instrument: SVA Agilent 780/5975 GC/MS
Analyst: S.G
Analytical Date/Time: 10/14/2016 1:24:00PM

Prep Batch: XXX36508
Prep Method: SW3550C
Prep Date/Time: 10/12/2016 2:15:41PM
Prep Initial Wt./Vol.: 22.5 g
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [XXX36508]
Blank Spike Lab ID: 1358429
Date Analyzed: 10/14/2016 13:44

Spike Duplicate ID: LCSD for HBN 1166058 [XXX36508]
Spike Duplicate Lab ID: 1358436
Matrix: Soil/Solid (dry weight)

QC for Samples: 1166058012, 1166058013

Results by **8270D SIM (PAH)**

	Blank Spike (ug/Kg)			Spike Duplicate (ug/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1-Methylnaphthalene	22.2	19.2	87	22.2	18.6	84	(43-111)	3.10	(< 20)
2-Methylnaphthalene	22.2	18.5	83	22.2	18.2	82	(39-114)	1.90	(< 20)
Acenaphthene	22.2	21.9	99	22.2	21.0	94	(44-111)	4.50	(< 20)
Acenaphthylene	22.2	18.3	82	22.2	18.0	81	(39-116)	1.70	(< 20)
Anthracene	22.2	19.4	87	22.2	18.8	84	(50-114)	3.50	(< 20)
Benzo(a)Anthracene	22.2	19.7	89	22.2	19.0	86	(54-122)	3.40	(< 20)
Benzo[a]pyrene	22.2	21.3	96	22.2	21.0	95	(50-125)	1.60	(< 20)
Benzo[b]Fluoranthene	22.2	20.5	92	22.2	19.6	88	(53-128)	4.40	(< 20)
Benzo[g,h,i]perylene	22.2	21.7	98	22.2	21.0	95	(49-127)	3.20	(< 20)
Benzo[k]fluoranthene	22.2	21.3	96	22.2	20.2	91	(56-123)	5.30	(< 20)
Chrysene	22.2	21.7	98	22.2	21.0	95	(57-118)	3.00	(< 20)
Dibenzo[a,h]anthracene	22.2	22.2	100	22.2	21.9	98	(50-129)	1.70	(< 20)
Fluoranthene	22.2	20.1	90	22.2	19.6	88	(55-119)	2.50	(< 20)
Fluorene	22.2	20.0	90	22.2	19.5	88	(47-114)	2.50	(< 20)
Indeno[1,2,3-c,d] pyrene	22.2	22.0	99	22.2	21.5	97	(49-130)	2.00	(< 20)
Naphthalene	22.2	18.6	84	22.2	18.4	83	(38-111)	0.99	(< 20)
Phenanthrene	22.2	18.6	84	22.2	18.1	81	(49-113)	3.00	(< 20)
Pyrene	22.2	21.1	95	22.2	20.5	92	(55-117)	2.90	(< 20)
Surrogates									
2-Fluorobiphenyl (surr)	22.2	95.5	96	22.2	93.7	94	(46-115)	1.90	
Terphenyl-d14 (surr)	22.2	97.5	98	22.2	96.3	96	(58-133)	1.20	

Batch Information

Analytical Batch: **XMS9698**
Analytical Method: **8270D SIM (PAH)**
Instrument: **SVA Agilent 780/5975 GC/MS**
Analyst: **S.G**

Prep Batch: **XXX36508**
Prep Method: **SW3550C**
Prep Date/Time: **10/12/2016 14:15**
Spike Init Wt./Vol.: 22.2 ug/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 22.2 ug/Kg Extract Vol: 1 mL

Method Blank

Blank ID: MB for HBN 1745549 [XXX/36510]
Blank Lab ID: 1358478

Matrix: Soil/Solid (dry weight)

QC for Samples:
1166058009, 1166058010, 1166058011, 1166058012, 1166058013

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	87.5	60-120		%

Batch Information

Analytical Batch: XFC12971
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: NRO
Analytical Date/Time: 10/17/2016 10:59:00AM

Prep Batch: XXX36510
Prep Method: SW3550C
Prep Date/Time: 10/12/2016 6:20:33PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Blank Spike Summary

Blank Spike ID: LCS for HBN 1166058 [XXX36510]
Blank Spike Lab ID: 1358479
Date Analyzed: 10/17/2016 09:59

Spike Duplicate ID: LCSD for HBN 1166058 [XXX36510]
Spike Duplicate Lab ID: 1358480
Matrix: Soil/Solid (dry weight)

QC for Samples: 1166058009, 1166058010, 1166058011, 1166058012, 1166058013

Results by **AK102**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	167	166	100	167	139	84	(75-125)	17.80	(< 20)
Surrogates									
5a Androstane (surr)	3.33	108	108	3.33	93.2	93	(60-120)	14.80	

Batch Information

Analytical Batch: **XFC12971**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **NRO**

Prep Batch: **XXX36510**
Prep Method: **SW3550C**
Prep Date/Time: **10/12/2016 18:20**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

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CHAIN OF CUSTODY RECORD

1166058

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Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page 1 of 1

Section 1

CLIENT: SLR Alaska	
CONTACT: Ben Siwiec	PHONE #: (907)264-6953
PROJECT NAME: Kotz GW and SW	Project/ PWSID/ PERMIT#: 105.00104.16004
REPORTS TO: Stan Stagel	E-MAIL: SStagel@slrconsulting.com bsiwiec@slrconsulting.com
INVOICE TO: SLR Alaska	QUOTE #: P.O. #:

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Pres: Type: Comp / Grab / MI (Multi-incremental)	GRO/BTEX AK101/8021B (HCl)	DRO AK102 (HCl)	GRO/BTEX AK101/8021B (Methanol)	DRO AK102 (None)	PAHs 8270C SIM	REMARKS/ LOC ID
1	AE 100316 MW3R	10/3/16	1555	W	5		X	X				
2	AE 100316 MW2	10/3/16	1713	W	5		X	X				
3	AE 100616 MW6	10/6/16	1647	W	5		X	X				
4	AE 100616 MW9	10/6/16	1647	W	5		X	X				
5	AE 100616 MW4	10/6/16	1940	W	5		X	X				
6	AE 100716 MW1R2	10/7/16	1000	W	5		X	X				
7	AE 100716 MW5	10/7/16	1505	W	5		X	X				
8	AC TBW1	10/3/16	1555		3		X	X				

Section 5

	Date	Time	Received By:
Relinquished By: (1)	10/7/16	1700	
Relinquished By: (2)			
Relinquished By: (3)			
Relinquished By: (4)	10/10/16	9:20	Received For Laboratory By:

Section 4

DOD Project? Yes No

Cooler ID:

Data Deliverable Requirements: LVL2-ADEC, standard TAT

Requested Turnaround Time and/or Special Instructions: 5+1

Temp Blank °C: 2.6 D6

or Ambient [ ]

(See attached Sample Receipt Form)

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

(See attached Sample Receipt Form)

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

SGS

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CHAIN OF CUSTODY RECORD

1166058

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page ___ of ___

Section 1

CLIENT: SLR Alaska

CONTACT: Ben Siwiec — PHONE #: (907)264-6953

PROJECT NAME: Kotz GW and Soil — Project/ PWSID/ PERMIT#: 105.00104.16004

REPORTS TO: Stan Flagel — E-MAIL: SFlagel@slrconsulting.com; bsiwiec@slrconsulting.com

INVOICE TO: SLR Alaska — QUOTE #: — P.O. #:

Section 3 — Preservative

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Pres: Type: Comp Grab MI (Multi-incremental)	GRO/BTEX AK101/8021B (HCl)	DRO AK102 (HCl)	GRO/BTEX AK101/8021B (Methanol)	DRO AK102 (None)	PAHs 8270C SIM	REMARKS/ LOC ID
(9) A-B	MW1R2-4.5	10/5/16	0954	S	2				X	X		
(10) A-B	MW6-4	10/5/16	1105	S	2				X	X		
(11) A-B	MW4-2-5	10/5/16	1145	S	2				X	X		
(12) A-B	MW5-2	10/5/16	1230	S	2				X	X	X	
(13) A-B	MW5-9	10/5/16	1230	S	2				X	X	X	
(14) A	TB-2	10/5/16	0954									

Section 5

	Date	Time	
Relinquished By: (1) DRS	10/7/16	1700	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	10/10/16	9:20	Received For Laboratory By:

Section 4

DOD Project? Yes No

Data Deliverable Requirements: LVL2-ADEC, standard TAT

Cooler ID: ___

Requested Turnaround Time and/or Special Instructions:

Temp Blank °C: 2.6 (2.6) or Ambient [ ] 3.0 (3.0)

(See attached Sample Receipt Form)

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

(See attached Sample Receipt Form)

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

SGS

1166058

Returned Bottles Inventory

Name of individual returning bottles: Ben Siwicc

Date Received: 10/10/16

Client Name: SLR Alaska

Received by: JRP

Project Name: Katz GW and Soil

SGS PM: JAN

HDPE/Nalgene:	1-L					
	500-ml					
	250-ml or 8-oz					
	125-ml or 4-oz					
	60-ml or 2-oz					
	other					
amber glass:	1-L					
	500-ml					
	250-ml or 8-oz	2				
	125-ml or 4-oz with or without septa	2				
	40-ml VOA vial	4				
	other					
Subtotal:		8				

Note: Returned bottles (regardless of size/pres.) are billed back at $4/bottle ***unless otherwise quoted***.

Amount to Invoice Client $: 32

WO#: 1166058

SGS

e-SAMPLE RECEIPT FORM

1166058

Review Criteria	Y/N (yes/no)	Exceptions Noted below
		☐ exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Y	1F-1B
COC accompanied samples?	Y	
☐ **exemption permitted if chilled & collected <8hrs ago or chlling not required (i.e., waste, oil)		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Y	Cooler ID: 1 @ 2.6 °C Therm ID: D6
	Y	Cooler ID: 2 @ 3.0 °C Therm ID: D6
	Y	Cooler ID: @ °C Therm ID:
	Y	Cooler ID: @ °C Therm ID:
	Y	Cooler ID: @ °C Therm ID:
*If >6°C, were samples collected <8 hours ago?	Y	
If <0°C, were sample containers ice free?	Y	
If samples received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "**COOLER TEMP**" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
		Note: Refer to form F-083 "Sample Guide" for hold times.
Were samples received within hold time?	Y	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Y	
**Note: If times differ <1hr, record details & login per COC.		
Were analyses requested unambiguous?	Y	
		☐ ***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Y	
IF APPLICABLE		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Y	
Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Y	
Were all soil VOAs field extracted with MeOH+BFB?	Y	

Note to Client: Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition
1166058001-A	HCL to pH < 2	OK
1166058001-B	HCL to pH < 2	OK
1166058001-C	HCL to pH < 2	OK
1166058001-D	HCL to pH < 2	OK
1166058001-E	HCL to pH < 2	OK
1166058002-A	HCL to pH < 2	OK
1166058002-B	HCL to pH < 2	OK
1166058002-C	HCL to pH < 2	OK
1166058002-D	HCL to pH < 2	OK
1166058002-E	HCL to pH < 2	OK
1166058003-A	HCL to pH < 2	OK
1166058003-B	HCL to pH < 2	OK
1166058003-C	HCL to pH < 2	OK
1166058003-D	HCL to pH < 2	OK
1166058003-E	HCL to pH < 2	OK
1166058004-A	HCL to pH < 2	OK
1166058004-B	HCL to pH < 2	OK
1166058004-C	HCL to pH < 2	OK
1166058004-D	HCL to pH < 2	OK
1166058004-E	HCL to pH < 2	OK
1166058005-A	HCL to pH < 2	OK
1166058005-B	HCL to pH < 2	OK
1166058005-C	HCL to pH < 2	OK
1166058005-D	HCL to pH < 2	OK
1166058005-E	HCL to pH < 2	OK
1166058006-A	HCL to pH < 2	OK
1166058006-B	HCL to pH < 2	OK
1166058006-C	HCL to pH < 2	OK
1166058006-D	HCL to pH < 2	OK
1166058006-E	HCL to pH < 2	OK
1166058007-A	HCL to pH < 2	OK
1166058007-B	HCL to pH < 2	OK
1166058007-C	HCL to pH < 2	OK
1166058007-D	HCL to pH < 2	OK
1166058007-E	HCL to pH < 2	OK
1166058008-A	HCL to pH < 2	OK
1166058008-B	HCL to pH < 2	OK
1166058008-C	HCL to pH < 2	OK
1166058009-A	No Preservative Required	OK
1166058009-B	Methanol field pres. 4 C	OK
1166058010-A	No Preservative Required	OK
1166058010-B	Methanol field pres. 4 C	OK
1166058011-A	No Preservative Required	OK
1166058011-B	Methanol field pres. 4 C	OK
1166058012-A	No Preservative Required	OK
1166058012-B	Methanol field pres. 4 C	OK
1166058013-A	No Preservative Required	OK
1166058013-B	Methanol field pres. 4 C	OK
1166058014-A	Methanol field pres. 4 C	OK

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM- The container was received damaged.
FR- The container was received frozen and not usable for Bacteria or BOD analyses.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

APPENDIX D

CONCEPTUAL SITE MODEL

SCOPING AND GRAPHIC FORMS

Print Form

Human Health Conceptual Site Model
Scoping Form

Site Name: Alaska Airlines Terminal, Kotzebue, Alaska

File Number: 410.26.005

Completed by: Ben Siwiec, SLR

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☒ USTs
- ☒ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☐ Other:

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☒ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☐ Air
- ☐ Sediment
- ☒ Groundwater
- ☐ Surface water
- ☐ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☐ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☐ Subsistence harvester (i.e. gathers wild foods)
- ☐ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Two soil contaminants, Chrysene and Pyrene, were detected, although at levels below the laboratory limit of quantitation.

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Only suprapermafrost water which is seasonally frozen exists in the ground at the site. It is not a source of drinking water. Kotzebue draws drinking water from lakes over 1 mile away and up-gradient.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

No surface water is near the site. The nearest surface water body is Kotzebue Sound, which is about 1000 feet west.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☐

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

This site is located in the secure area of an airport and in the paved parking lot for the airport. Hunting, fishing, and harvesting are not possible at the site.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Benzene, toluene, ethylbenzene, and xylenes have all been detected in the soil, although all at levels below the laboratory level of quantitation. All soil concntration are below 1/10 human health limits in Table B1

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☒

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Pathway complete but insignficant . All volatile concentrations are below 1/10 the human health screening level.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

Construction activities will occur at this site, which may encounter suprapermafrost water in the ground during the thawed season.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Alaska Airlines Terminal, Kotzebue, Alaska

Completed By: Ben Siwiec, SLR

Date Completed: 11/29/2016

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1)

Check the media that could be directly affected by the release.

(2)

For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.

Media / **Transport Mechanisms**

- [x] **Surface Soil (0-2 ft bgs)**
  - Direct release to surface soil — *check soil*
  - [x] Migration to subsurface — *check soil*
  - [x] Migration to groundwater — *check groundwater*
  - [x] Volatilization — *check air*
  - [ ] Runoff or erosion — *check surface water*
  - [ ] Uptake by plants or animals — *check biota*
  - [ ] Other (list):
- [x] **Subsurface Soil (2-15 ft bgs)**
  - Direct release to subsurface soil — *check soil*
  - [x] Migration to groundwater — *check groundwater*
  - [x] Volatilization — *check air*
  - [ ] Uptake by plants or animals — *check biota*
  - [ ] Other (list):
- [x] **Ground-water**
  - Direct release to groundwater — *check groundwater*
  - [x] Volatilization — *check air*
  - [ ] Flow to surface water body — *check surface water*
  - [ ] Flow to sediment — *check sediment*
  - [ ] Uptake by plants or animals — *check biota*
  - [ ] Other (list):
- [ ] **Surface Water**
  - Direct release to surface water — *check surface water*
  - [ ] Volatilization — *check air*
  - [ ] Sedimentation — *check sediment*
  - [ ] Uptake by plants or animals — *check biota*
  - [ ] Other (list):
- [ ] **Sediment**
  - Direct release to sediment — *check sediment*
  - [ ] Resuspension, runoff, or erosion — *check surface water*
  - [ ] Uptake by plants or animals — *check biota*
  - [ ] Other (list):

(3)

Check all exposure media identified in (2).

(4)

*Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5)

Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.

Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
[x] soil	[x] Incidental Soil Ingestion	I	I	I	I			
	[x] Dermal Absorption of Contaminants from Soil	I	I	I	I			
	[ ] Inhalation of Fugitive Dust							
[x] groundwater	[ ] Ingestion of Groundwater							
	[x] Dermal Absorption of Contaminants in Groundwater		C/F		C/F			
	[ ] Inhalation of Volatile Compounds in Tap Water							
[x] air	[x] Inhalation of Outdoor Air	I	I	I	I			
	[x] Inhalation of Indoor Air	I	I	I	I			
	[ ] Inhalation of Fugitive Dust							
[ ] surface water	[ ] Ingestion of Surface Water							
	[ ] Dermal Absorption of Contaminants in Surface Water							
	[ ] Inhalation of Volatile Compounds in Tap Water							
[ ] sediment	[ ] Direct Contact with Sediment							
[ ] biota	[ ] Ingestion of Wild or Farmed Foods							

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