2014 Semi-Annual Groundwater Monitoring
Fire Station No. 4
4350 MacInnes Street
Anchorage, Alaska

February 2015

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska Method
bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
COC	Contaminant of Concern
CSM	Conceptual Site Model
cy	Cubic yard
DQO	Data Quality Objective
DRO	Diesel Range Organics
Emerald	Emerald Alaska
EPA	Environmental Protection Agency
GRO	Gasoline Range Organics
IDW	Investigation Derived Waste
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LDRC	Laboratory Data Review Checklist
LNAPL	Light Non Aqueous Phase Liquid
LOQ	Limit of Quantitation
MOA	Municipality of Anchorage
MS/MSD	Matrix Spike/Matrix Spike Duplicate
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mV	Millivolts
NTU	Nephelometric Turbidity Unit
ORC-A	Oxygen-Releasing Compound - Advanced
ORP	Oxidation-Reduction Potential
PAH	Polynuclear Aromatic Hydrocarbons
ppm	Parts per million
SGS	SGS North America Inc. of Anchorage, Alaska
TestAmerica	TestAmerica Laboratories, Inc. of Anchorage, Alaska
UST	Underground Storage Tank

2014 SEMI-ANNUAL GROUNDWATER MONITORING
FIRE STATION NO. 4
4350 MACINNES STREET
ANCHORAGE, ALASKA

1.0 INTRODUCTION

This report presents the results of Shannon & Wilson's semi-annual groundwater monitoring activities performed at Fire Station No. 4, located at 4350 MacInnes Street in Anchorage, Alaska. The Alaska Department of Environmental Conservation's (ADEC) Hazard ID for the site is 23660, and the ADEC File Number is 2100.26.315. A release from underground storage tanks (UST) was documented at the site when the tanks were removed in 1994.

The project purpose is to progress towards a Cleanup Complete with or without Institutional Controls (CC/IC) designation from the ADEC. In a letter dated November 22, 2013, the ADEC requested semi-annual groundwater sampling. The project objective was to comply with the ADEC's requests to evaluate groundwater contaminant trends.

Authorization to proceed with this project was received from Mr. Jon Clark of the Municipality of Anchorage (MOA) on January 15, 2014 in the form of Purchase Order No. 20140079. The project tasks were conducted in general accordance with our January 30, 2014 ADEC-approved work plan.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Location and Description

Fire Station No. 4 is located at the northwest corner of the Tudor Road and MacInnes Street intersection in Anchorage, Alaska at 4350 MacInnes Street, as shown in Figure 1. A 500-gallon No. 1 and No. 2 diesel UST and a 1,000-gallon gasoline UST were excavated from the site in 1994. The approximate limits of the 1994 UST excavation are shown in Figure 2.

2.2 Background

The July 14, 1994 *Fire Station No. 4 Gasoline and Diesel UST Closure* report by Hart Crowser documented the June 1994 removal of a 500-gallon No. 1 and No. 2 diesel UST and a 1,000-gallon gasoline UST from the site. Note that at the time of the UST excavation, the fire station building was located to the south of the excavation. Excavation soil samples, collected from 8 to 13 feet below ground surface (bgs), contained up to 10,000 milligrams per kilogram (mg/kg)

gasoline range organics (GRO), 8,500 mg/kg diesel range organics (DRO), 16 mg/kg benzene, and 2,416 mg/kg total benzene, toluene, ethylbenzene, and xylenes (BTEX). The soil within the excavation consisted of gravelly sand fill to 6 feet bgs, underlain by sandy silt. Groundwater was encountered at 13 feet bgs. The approximate location of the 1994 excavation is shown in Figure 2. A passive vent system with a riser was installed in the excavation prior to backfilling with clean gravel.

Four monitoring wells, Wells MW-1, MW-2, MW-3, and MW-4, were installed as part of the July 1994 remedial investigation at the locations shown in Figure 2. The results were presented in Hart Crowser's September 9, 1994 *Remedial Site Investigation, Fire Station No. 4, Anchorage, Alaska*. Well MW-1 was installed in the former excavation and contained 1.87 feet of light non-aqueous phase liquid (LNAPL). The soil in the borings for Wells MW-2, MW-3, and MW-4 consisted of granular fill material to 8 feet bgs underlain by slightly silty to silty sand. Groundwater samples collected from Wells MW-2, MW-3, and MW-4 contained low or no detections of GRO, DRO, and BTEX. The groundwater flow direction was determined to be towards the north-northeast.

Corrective action initiated in January 1995 consisted of installing Recovery Wells RW-1 and RW-2 in the former UST excavation location, shown on Figure 2, and recovering product with PetroTrap passive hydrocarbon skimmers. Hart Crowser's June 1995 *Corrective Action Start Up Report, Anchorage Fire Department Station No. 4, Anchorage, Alaska* documents hydrocarbon fingerprinting conducted in 1995 which identified the product in Wells MW-1 and RW-1 as a mixture of No. 1 and No. 2 diesel fuel. Hart Crowser initially estimated that the volume of LNAPL in the subsurface was less than 500 to 1,000 gallons, but then revised their estimate to 60 to 125 gallons of LNAPL in their August 28, 1995 letter to the MOA. Approximately 27 gallons of LNAPL was recovered between 1994 and 1997.

Groundwater sampling and LNAPL thickness measurements were conducted quarterly in 1995 and 1996 and continued semiannually in 1997 and 1998. Groundwater flow direction from 1995 to 1998 was towards the northeast. An exception was the August 6, 1996 flow determination that indicated an east-northeast flow direction. However, the groundwater measurements were taken after a rainfall event and the relative elevation of groundwater in Well MW-3, located in an unpaved area, was higher than usual compared to the wells in paved areas. During this period, the LNAPL thickness measured in Well MW-1 ranged from 0.23 foot to 2.7 feet. The maximum LNAPL thickness of 2.7 feet in Well MW-1 was measured in January 1995, and LNAPL was not measured above 1 foot in Well MW-1 after March 1995. During the last groundwater sampling event of this period, conducted on October 7, 1998, 0.75 foot of LNAPL was measured in Well MW-1. Dissolved-phase concentrations of DRO and BTEX reported in Wells MW-2, MW-3, and MW-4 remained either not detected or less than ADEC cleanup levels. Note that the

groundwater samples were not tested for GRO. Groundwater sampling results from 1994 through 1998 were stable and did not indicate migration of contaminants away from the vicinity of the former excavation.

The groundwater monitoring wells were next sampled on May 25, 2004 and September 18, 2006 with results presented in Hart Crowser *Groundwater Monitoring* reports dated July 22, 2004 and November 22, 2006. The PetroTrap passive skimmers were determined to be no longer usable and were removed on May 25, 2004. Well MW-1 contained 0.07 foot of LNAPL in May 2004 and no LNAPL, but a heavy sheen, in September 2006. An analytical sample was collected from Well MW-1 for the first time in September 2006 and contained concentrations of GRO (103 mg/L), DRO (159 mg/L), benzene (2.65 mg/L), toluene (15.7 mg/L), ethylbenzene (4.16 mg/L), and xylenes (14.0 mg/L) greater than ADEC cleanup levels. Groundwater samples collected from Wells MW-2, MW-3, and MW-4 in May 2004 and September 2006 did not contain detectable concentrations of GRO, DRO, or BTEX. The monitoring wells were resurveyed in 2004, and groundwater flow direction was shown to be towards the northeast, which was consistent with previous findings.

Hart Crowser's May 14, 2007 *Remedial Action Report for AFD Station #4* documented additional contaminated soil and groundwater removal from the former UST area. The site monitoring wells and recovery wells were decommissioned during the 2007 remedial action. During the excavation at the former UST excavation area, approximately 230 cubic yards (cy) of granular fill material with headspace readings less than 15 parts per million (ppm) were removed from the ground surface to a depth of about 7.5 feet bgs. This soil was later used as backfill. Gray, sandy silt was observed from 7.5 to 12 feet bgs. Groundwater was encountered at 8.5 feet bgs during the excavation. The headspace results from 8.5 feet to 12 feet bgs ranged from 200 ppm to 580 ppm. Approximately 45 cy of soil with headspace results greater than 15 ppm were removed from the former UST area and stored on a liner. This soil was later transported to Alaska Soil Recycling for disposal. A "sump" was excavated to a depth of 14 feet bgs in the eastern portion of the excavation to facilitate contaminated groundwater pumping. Approximately 275 gallons of LNAPL and groundwater emulsion were pumped from the sump and eventually disposed by Emerald Alaska Inc. (Emerald). After pumping contaminated groundwater, 100 pounds of Oxygen Releasing Compound Advanced® (ORC-A) were placed in the excavation. Soil was backfilled to just above the groundwater interface, and an additional 50 pounds of ORC-A were placed into the smear zone before backfilling the rest of the excavation. Of the six confirmation samples collected from the smear zone in the excavation sidewalls (8 to 8.5 feet bgs), only one sample contained concentrations of target analytes greater than ADEC cleanup levels. Sample S2-SW, collected from the southern sidewall of the 2007 excavation at

the location shown in Figure 2, contained 2,350 mg/kg DRO and 7.49 mg/kg ethylbenzene. The sample was located under the existing building foundation, which prevented further excavation.

Also in 2007, the Anchorage Fire Department expanded the Fire Station No. 4 building to the north such that an apparatus bay is now located partially over the former UST excavation, and a dormitory area is located north of the apparatus bay. According to Hart Crowser's *Remedial Action Report for AFD Station #4* (May 14, 2007), the primary exposure pathway of concern at that time was vapor intrusion – the upward migration of fuel vapors from the subsurface contaminated soil and groundwater into the new apparatus bay and dormitory portions of the building. As engineering controls to mitigate vapor intrusion, Hart Crowser recommended installing a 15-mil vapor barrier under the foundation of the apparatus bay section of the new building and air scrubbers in the apparatus bays. We understand the vapor barrier and air scrubbers were installed as planned.

Shannon & Wilson's December 2008 report, *Monitoring Well Installation, Anchorage Fire Department Station No. 4, 4350 MacInnes Street, Anchorage, Alaska*, documents our July 2008 installation of Well B1MW near the southern edge of the 2007 excavation footprint at the location shown in Figure 2. Groundwater was encountered at about 11 feet bgs at the time of drilling. Soil boring samples from 8 to 10 feet and 10 to 11 feet were submitted for analysis. The soil samples contained up to 1,110 mg/kg GRO, 15.1 mg/kg benzene, 146 mg/kg toluene, 67.8 mg/kg ethylbenzene, and 303 mg/kg xylenes, which exceed the current most stringent ADEC Method Two cleanup levels. DRO was not detected in the soil boring samples. Primary and duplicate groundwater samples collected from Well B1MW contained concentrations of up to 128 mg/L GRO, 5.75 mg/L DRO, 23.5 mg/L benzene, 33.7 mg/L toluene, 4.97 mg/L ethylbenzene, and 15.7 mg/L xylenes, which are greater than ADEC Table C cleanup levels. With the exception of the DRO concentration, these concentrations are greater than the September 2006 sample collected from Well MW-1, located about 9 feet northwest of Well B1MW. Concentrations of polynuclear aromatic hydrocarbons (PAH) in the soil and groundwater samples were less than ADEC cleanup levels. The soil in the boring consisted of brown, slightly silty, gravelly sand from the ground surface to 7 feet bgs, and gray, silty sand from 7 to 15 feet bgs.

Wells B2MW through B4MW were installed by Shannon & Wilson at the locations shown on Figure 2 between February 22, 2013 and April 15, 2013 to evaluate of the nature and extent of groundwater contamination downgradient of the former USTs. Also, in March and April 2013, groundwater samples were collected from Wells B2MW, B3MW, and B4MW. The results of the well installation and groundwater sampling events are provided in our September 2013 report, *Additional Site Characterization, Fire Station No. 4, 4350 MacInnes Street, Anchorage, Alaska.* GRO concentrations were not detected in the project soil samples and BTEX concentrations were

either non-detect or were measured at concentrations less than ADEC Method 2 cleanup levels. The analytical soil samples were not tested for DRO. An analytical groundwater sample was not collected from Well B1MW due to the presence of 0.03 foot of LNAPL in the well. DRO was detected in the water sample from Well B2MW at a concentration of 1.81 mg/L, which is greater than the ADEC Table C cleanup level of 1.5 mg/L. GRO, benzene, and ethylbenzene were also detected in the sample from Well B2MW, but at concentrations less the ADEC Table C cleanup levels. Target analytes were not detected in the water samples from Wells B3MW and B4MW. Groundwater flow direction was calculated to be towards the northwest which was a variance from previous findings.

2.3 Project Description

Project activities consisted of collecting samples from Wells B1MW and B2MW during February and July 2014, conducting LNAPL recovery, laboratory analysis of groundwater samples, managing investigation derived waste (IDW) and reporting. Note Wells B3MW and B4MW were not included in the 2014 sampling program due to previous analytical results less than ADEC Table C cleanup levels.

Analytical testing of the project samples was conducted by SGS North America Inc. (SGS) and TestAmerica Laboratories, Inc. (TestAmerica). Emerald disposed of the IDW. SGS, TestAmerica, and Emerald are based in Anchorage, Alaska and were subcontracted to Shannon & Wilson.

3.0 FIELD ACTIVITIES

The field activities were conducted in general accordance with our January 30, 2014 ADEC-approved work plan. Field work was led by ADEC-qualified personnel, as defined by 18 Alaska Administrative Code (AAC) 75.990. Field notes are provided in Appendix A.

3.1 Groundwater Elevations and Flow Direction

Depth to groundwater was measured in four monitoring wells (Wells B1MW through B4MW) on February 26, 2014 and July 30, 2014 using a product/water interface probe (Well B1MW) and electronic water-level indicator (the remaining wells). Measurements were taken with respect to the top of the well casings and depths were determined to an accuracy of 0.01 foot. The water-level indicator and product/water interface probe were decontaminated prior to insertion in each well. The February 2014 and July 2014 water levels are listed in Tables 1 and 2, respectively.

As shown on Figure 2, the groundwater flow direction in February 2014 was towards the east-northeast. These results are consistent with historical data. A uniform groundwater flow direction was not apparent during the July 2014 sampling event.

3.2 Groundwater Sampling and LNAPL Recovery

This section summarizes groundwater sampling and LNAPL recovery for the February 2014 and July 2014 sampling events.

3.2.1 February 2014 Groundwater Sampling

Primary and field duplicate analytical groundwater samples were collected from Well B2MW on February 26, 2014. A groundwater sample was not collected from Well B1MW due to approximately 0.01 foot of LNAPL measured in the well.

Well B2MW was purged and sampled using a low-flow technique to reduce the effects of stagnant well casing water on chemical concentrations and to obtain a groundwater sample that is representative of the surrounding water-bearing formation. The well was purged and sampled with a submersible pump and disposable tubing. The pump inlet was set at approximately 1.5 feet below the water surface to accommodate drawdown. A pump rate of about 0.1 liter per minute was used with a goal of limiting the sustained water drawdown to a maximum of 0.1 meter (4 inches), although actual drawdown ranged from 0.44 feet to 0.54 feet. During the purging process, field personnel monitored water quality parameters (temperature, specific conductance, pH, oxidation-reduction potential [ORP], and turbidity), purge volume, and drawdown which were recorded at 3 to 5-minute intervals.

The groundwater sample from Well B2MW was collected when four of the five the water quality parameters stabilized. Stabilization criteria comprised three successive readings of: pH within 0.1 unit, temperature within 3 percent (minimum 0.2 degree Celsius), specific conductance within 3 percent, ORP within 10 millivolts (mV), and turbidity within 10 percent or three consecutive readings of less than 10 nephelometric turbidity units (NTU). The final water quality parameters are listed on Table 1.

The analytical sample was collected by transferring water directly from the pump tubing into laboratory-supplied containers. A field duplicate sample (Sample B5MW) was collected from Well B2MW and submitted blind to SGS. The samples were placed into a chilled cooler for transport to SGS. The purge water was contained in one 5-gallon bucket and stored onsite.

3.2.2 February 2014 LNAPL Recovery

Using a product/water interface probe, 0.01 foot of LNAPL was measured in Well B1MW. A 3-inch by 1-inch piece of absorbent pad was lowered into the well to absorb the product. After removing the absorbent pad, the product/water interface probe was placed in the well and measurable LNAPL was no longer present. Well B1MW was monitored at 24 hour intervals over the next three days. Free-product was not encountered in the well during that time.

3.2.3 July 2014 Groundwater Sampling

During the July 2014 sampling event, analytical groundwater samples were collected from Wells B1MW and B2MW. Depth to water measurements were recorded for each on-site well prior to purging Wells B1MW and B2MW. Wells B1MW and B2MW were purged and sampled using low-flow techniques as described above until one hour of effort had been expended and at least one well volume was removed from each well. The final water quality parameters are listed in Table 2.

A field duplicate sample (Sample B5MW) was collected from Well B2MW and submitted blind to TestAmerica. The samples were placed into a chilled cooler for transport to TestAmerica. The purge water was contained in one 5-gallon bucket and stored onsite.

3.2.4 July 2014 LNAPL Recovery

Measurable LNAPL was not measured in Well B1MW during the July 2014 sampling event. The oil/water interface probe was slowly lowered into the well casing and, based on the tone emitted from the instrument, the probe encountered only water. The oil/water interface probe was cleaned with Alconox soap and rinsed with deionized water. The oil/water interface probe was then lowered into the well a second time to confirm the absence of LNAPL. A hydrocarbon odor was noted during the purging and sampling process although a sheen was not observed on the purge water.

4.0 LABORATORY ANALYSIS

The February 2014 groundwater samples were delivered to SGS using chain-of-custody procedures. The samples were tested on a standard 10 business day turn-around-time. Two groundwater samples, including one duplicate, were submitted to SGS for analysis of GRO by Alaska Method (AK) 101; DRO by AK 102; and benzene, ethylbenzene, toluene, and xylenes (BTEX) by Environmental Protection Agency (EPA) 8021B. A water trip blank accompanied the sample cooler and was analyzed for GRO and BTEX.

The July 2014 groundwater samples were delivered to TestAmerica using chain-of-custody procedures. The samples were tested on a standard 10 business day turn-around-time. Three groundwater samples, including one duplicate, were submitted to TestAmerica for analysis of GRO by AK 101, DRO by AK 102, and BTEX by EPA 8021B. A water trip blank accompanied the sample cooler and was analyzed for GRO and BTEX.

Under the sample numbering scheme used for this project, a typical analytical sample number is 17628-B2MW for groundwater samples. The "17628" indicates the Shannon & Wilson job number, and the "B2MW" designations represent the sample identification numbers. For brevity in the text of this report, the "17628" prefix is omitted.

5.0 DISCUSSION OF RESULTS

The groundwater results were compared to applicable cleanup levels listed in the Oil and Other Hazardous Substances Pollution Control Regulations. Groundwater criteria are based on Table C, 18 AAC 75 (April 2012). The cleanup levels and analytical results for the February 2014 and July 2014 groundwater samples collected for this project are provided in Tables 3 and 4, respectively.

5.1 Groundwater Analytical Results

One groundwater sample (Sample B2MW) and one field duplicate sample (Sample B5MW) were submitted for laboratory analysis during the February 2014 sampling event and two groundwater samples (Samples B1MW and B2MW) and one field duplicate sample (Sample B5MW) were submitted for laboratory testing during the July 2014 sampling event.

5.1.1 February 2014 Groundwater Samples

One groundwater sample (Sample B2MW) and one field duplicate sample (Sample B5MW) were submitted for laboratory analysis during the February 2014 sampling event. With the exception of an estimated (J-flagged) concentration of benzene detected in the field duplicate Sample B5MW, concentrations of GRO, DRO, and BTEX were not detected in the project samples.

5.1.2 July 2014 Groundwater Samples

As shown on Table 4, GRO (138 mg/L), DRO (18.1 mg/L), benzene (7.69 mg/l), toluene (29.7 mg/L), ethylbenzene (2.40 mg/L), and xylenes (15.6 mg/L) concentrations were measured in Sample B1MW at levels exceeding the ADEC Table C cleanup criteria. Benzene was detected in the field duplicate sample from Well B2WW (Sample B5MW), but at a concentration less than the ADEC Table C cleanup level. Target analytes were not detected in Sample B2MW.

5.2 Quality Assurance Summary

The project laboratories implement on-going quality assurance/quality control procedures to evaluate conformance to ADEC data quality objectives (DQO). Internal laboratory controls to assess data quality for this project include surrogates, method blanks, and laboratory control sample/laboratory control sample duplicates (LCS/LCSD) to determine precision, accuracy, and matrix bias. If a DQO was not met, the project laboratory provides a brief narrative concerning the problem in the case narrative of their laboratory report (See Appendix B).

One groundwater field duplicate set (Samples B2MW and B5MW) was collected during the each of the February and July 2014 sampling events to assess precision of the sampling and analysis process using the calculated relative percent difference (RPD). The RPDs between the field primary/duplicate could not be calculated due to non-detect results for one or more target analytes.

One laboratory-supplied trip blank accompanied the sample containers during transport to and from the project during each of the February and July 2014 sampling events. GRO was not detected in the February 2014 water trip blank. However, GRO and DRO were detected in the method blanks at estimated (J-flagged) concentrations of 0.185 mg/L and 0.0413 mg/L, respectively (SGS Work Order 1140708). Potentially impacted results are flagged "B" in Table 3 with further detail provided in the LRDC.

For the July 2014 sampling event, concentrations of GRO, toluene, ethylbenzene, and xylenes were measured in the water trip blank and GRO and DRO concentrations were measured in the method blank (TestAmerica Work Order 230-229-1). Potentially impacted results are flagged "B" in Table 4 with further detail provided in the LRDC. Because the GRO, toluene, ethylbenzene, and xylenes concentrations reported in Sample B1MW are greater than 10 times the concentrations reported in the method and/or trip blanks, the results are considered unaffected.

Shannon & Wilson reviewed the SGS and TestAmerica deliverables and completed the ADEC's Laboratory Data Review Checklist (LDRC) for each data package which are included in Appendix B. Quality control discrepancies and the impact to data quality/usability are described in further detail in the LDRC. In our opinion, no non-conformances that would adversely impact data usability for the objectives of this project were noted. Based on this quality assurance summary, we find the project data to be complete and usable to support the intended data uses.

6.0 INVESTIGATION DERIVED WASTE

IDW for this project consisted of two 5-gallon buckets of purge water (one 5-gallon bucket from each of the February and July 2014 sampling events) and one 5-gallon bucket containing a fuel saturated absorbent pad. Shannon & Wilson coordinated with the ADEC to dispose of the IDW. With approval from the ADEC, the February 2014 purge water was discharged to the ground surface at the project site on March 21, 2014. On September 23, 2014 Shannon & Wilson transported the July 2014 IDW to Emerald's Anchorage facility for processing and disposal. A copy of the waste manifest is provided in Appendix C.

The disposable sampling materials and absorbent pad were disposed as unregulated solid waste.

7.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was prepared to identify known and potential exposure pathways associated with contamination detected at the subject site. The CSM was developed using the ADEC's *Policy Guidance on Developing Conceptual Site Models* (October 2010), and the ADEC's Human Health CSM Graphic and Scoping Forms. The CSM forms are included in Appendix D. This section provides a summary of our current understanding of contaminant sources, extent of impacted media, and potential exposure pathways. The narrative includes descriptions of site-specific considerations that increase or decrease the viability of each pathway at this site.

7.1 Contaminant Sources

The presumed contaminant source is the former 500-gallon No. 1 and No. 2 diesel UST and a 1,000-gallon gasoline UST previously located beneath the apparatus bay at Fire Station No. 4. For the purpose of this project, contaminants of concern (COC) are defined as compounds that have been measured at concentrations greater than the most stringent ADEC soil or groundwater levels listed in 18 AAC 75. The compounds that currently meet this criterion are GRO, DRO, benzene, toluene, ethylbenzene, and xylenes.

7.2 Extent of Contamination

In February 2014, approximately 0.01 foot of LNAPL was measured in source area Well B1MW, which is located along the southern edge of the 2007 excavation footprint. LNAPL was not encountered during the July 2014 sampling event. The analytical groundwater sample collected from Well B1MW in July 2014 contained concentrations of GRO, DRO, and BTEX above the ADEC Table C cleanup level. Target analytes were either not detected or were detected at concentrations less than the ADEC Table C cleanup levels in downgradient Well B2MW during

the February and July 2014 sampling events suggesting impacted soil and groundwater is localized in the vicinity of the source area and the groundwater plume is stable.

7.3 Exposure Pathways

Discussions of the potential exposure pathways are provided below. The narrative includes descriptions of site-specific considerations that increase or decrease the viability of each pathway at this Property. Note this CSM reflects only the known, documented COCs, and should be revised as warranted if additional site assessment is conducted.

7.3.1 Soil – Direct Contact

Petroleum hydrocarbons are the primary COCs in subsurface soil, and have the potential to impact receptors through incidental soil ingestion. The human receptors for this potentially complete exposure pathway include future on-site commercial workers, site visitors, and construction workers. The Property is currently being used for a fire station and dormitory, and it is assumed that it will continue to be used for these purposes. Therefore, on-site residential exposure is a potentially complete pathway in the future. Even though direct contact with subsurface soil is considered a potentially complete pathway, the potential exposure to impacted soil is presently mitigated by the asphalt pavement that functions as a cap over the potentially impacted subsurface soil. Furthermore, target COC concentrations from Borings B1MW through B4MW do not exceed ADEC Method Two direct contact cleanup levels or maximum allowable concentrations. Therefore, remaining soil contamination may not pose an unacceptable risk to human health and the environment. The dermal contact exposure route is not complete as GRO, DRO, and BTEX are not listed on the Appendix B table of the ADEC's policy document.

7.3.2 Groundwater

ADEC guidance stipulates that ingestion of groundwater be considered a potentially complete exposure pathway unless a groundwater use determination is conducted in accordance with 18 AAC 75.350, and that determination finds that the groundwater is not "currently of reasonable expected future source of drinking water." Because a "350 determination" has not been conducted. Therefore, ingestion and inhalation of COCs in groundwater are potentially complete exposure pathways for future commercial workers, site visitors, and trespassers. However, the property is currently connected to municipal water services, which mitigates this risk.

We understand a drinking water well may be present on the 4240 McInnes Street parcel located adjacent north of the Property. According to Anchorage Water and Wastewater Utility, the 4240 McInnes Street parcel was connected to municipal water services in October 1965. It is

unknown if a private water well exists on the parcel or if it is in use. It is assumed that the residential structure on the parcel utilizes municipal-supplied water which mitigates the risk associated with the groundwater exposure pathway,

7.3.3 Air

Volatile hydrocarbon constituents, benzene in particular, have the potential to impact receptors through indoor and outdoor air inhalation. Benzene and xylene concentrations measured in B1MW soil samples exceed the ADEC Method Two outdoor inhalation cleanup levels. The presence of volatile analyte concentrations in soil within the top 15 feet bgs creates a potentially complete outdoor exposure pathway for current and/or future residents, commercial workers, site visitors, trespassers, and construction workers.

Due to the proximity of the structure to the former UST source area, the indoor air (vapor intrusion) pathway is potentially complete for current and/or future residents, commercial workers, site visitors, trespassers, and construction workers. Although the current (July 2014) groundwater concentrations exceed the ADEC commercial target levels for indoor air, this risk associated with this pathway is mitigated by the vapor barrier and air scrubbers installed during construction.

7.3.4 Other

Other impacted media, including surface water, sediment, and biota, were not identified at the Property. Based on the commercial/industrial site use, ecological receptors were not considered for this assessment.

7.4 CSM Summary

Multiple complete or potentially complete exposure pathways have been identified at the site. Exposure to impacted soil is currently mitigated by the pavement surface. Also, target COC concentrations from Borings B1MW through B4MW do not exceed ADEC Method Two direct contact cleanup levels or maximum allowable concentrations. The groundwater ingestion pathway is potentially complete for future commercial workers and site visitors, although the site is currently connected to municipal water services. The outdoor air exposure pathway is potentially complete for current and future commercial workers, site visitors, and trespassers. In addition, the indoor air pathway is potentially complete for current site workers/residents, site visitors, and trespassers.

It is noted that changes in the site use or other site conditions may affect the viability of potential exposure pathways. In particular, the CSM will need to be re-evaluated and revised as necessary if construction occurs at the site, a change in land use occurs, or additional information is obtained regarding either the previously-documented contaminated media and/or potential on-site sources.

8.0 SUMMARY AND CONCLUSIONS

Project activities at Fire Station No. 4 consisted of collecting analytical groundwater samples from select on-site wells in February and July 2014, LNAPL recovery, laboratory testing of the analytical groundwater samples, and IDW disposal.

During February 2014 sampling, approximately 0.01 foot of LNAPL was measured in source area Well B1MW. The February 2014 LNAPL thickness measured in Well B1MW is within the historical range that was measured in Well MW-1 from 2004 to 2006, which was located about 9 feet to the northwest of Well B1MW prior to decommissioning in 2007. LNAPL was not measured in Well B1MW during the July 2014 sampling event. The analytical groundwater sample from Well B1MW collected in July 2014 contained concentrations of GRO, DRO, and BTEX that exceed ADEC Table C cleanup levels. Note that only one other groundwater sample has been collected from Well B1MW since it was installed in July 2008. The July 2014 analytical results are similar to the July 2008 analytical results.

Benzene was measured in downgradient Well B2MW during the February and July 2014 sampling events, but at concentrations less than the ADEC Table C cleanup level. Well B2MW continues to exhibit target analyte concentrations less than the ADEC Table C cleanup level suggesting that the source area LNAPL is localized and is not migrating downgradient.

If future groundwater sampling events are required, we recommend re-surveying the monitoring wells to enable accurate determination of groundwater flow direction.

9.0 CLOSURE/LIMITATIONS

This report was prepared for the exclusive use of the Municipality of Anchorage (MOA), herein referred to as the Client, and their representatives. The findings we have presented within this report are based on the limited sampling and analyses that we conducted. They should not be construed as definite conclusions regarding the project site's groundwater conditions. It is possible that our tests missed higher levels, although our intention was to sample in accordance with our ADEC-approve work plan. As a result, the sampling and analyses performed can only provide you with our professional judgment as to the environmental characteristics of this site, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon

& Wilson, Inc. The data presented in this report should be considered representative of the time of our site assessment. Changes in site conditions can occur over time, due to natural forces or human activity. In addition, changes in government codes, regulations, or laws may occur. Because of such changes beyond our control, our observations and interpretations may need to be revised.

Copies of documents that may be relied upon by our client are limited to the printed copies (also known as hard copies) that are signed or sealed by Shannon & Wilson with a wet, blue ink signature. Files provided in electronic media format are furnished solely for the convenience of the client. Any conclusion or information obtained or derived from such electronic files shall be at the user's sole risk. If there is a discrepancy between the electronic files and hard copies, or you question the authenticity of the report, please contact the undersigned.

Shannon & Wilson has prepared the document in Appendix E, Important Information About Your Geotechnical/Environmental Report, to clarify the use and limitations of our reports. You are advised that various state and federal agencies (ADEC, EPA, etc.) may require the reporting of this information. Shannon & Wilson does not assume the responsibility for reporting these findings and therefore has not, and will not, disclose the results of this study unless specifically requested and authorized by you, or as required by law.

We appreciate the opportunity to be of service. Please contact Mr. Tim Terry, C.P.G or the undersigned at (907) 561-2120 with any questions or comments concerning the contents of this report.

Sincerely,

SHANNON & WILSON, INC.

Jennifer Simmons
Environmental Scientist

Matthew Hemry, P.E.
Vice President

TABLE 1
FEBRUARY 2014 WELL SAMPLING LOG

	Monitoring Well Number			
	B1MW	**B2MW**	**B3MW**	**B4MW**
Water Level Measurement Data				
Date Water Level Measured	2/26/2014	2/26/2014	2/26/2014	2/26/2014
Time Water Level Measured	15:43	13:01	12:56	12:50
Surveyed Measuring Point Elevation (feet)	99.68	98.41	98.83	99.59
Measured Depth to LNAPL (feet below TOC)	10.96	no LNAPL	no LNAPL	no LNAPL
Measured Depth to Water (feet below TOC)	10.97	9.90	10.33	10.98
Product Thickness (feet)	0.01	0.00	0.00	0.00
Water Level Elevation (feet)	88.72*	88.51	88.50	88.61
Purging/Sampling Data				
Date Sampled	-	2/26/2014	-	-
Time Sampled	-	14:45	-	-
Measured Depth to Water (feet below TOC)	-	9.90	-	-
Total Depth of Well Below (feet below TOC)	-	15.24	-	-
Water Column in Well (feet)	-	5.34	-	-
Gallons per Foot	-	0.16	-	-
Water Column Volume (gallons)	-	0.85	-	-
Total Volume Pumped (gallons)	-	1.5	-	-
Purging Method	-	SP	-	-
Sampling Method	-	SP	-	-
Diameter of Well Casing	2-inch	2-inch	2-inch	2-inch
Water Quality Data				
Temperature, ^{o}C	-	4.26	-	-
Specific Conductance, µS/cm	-	766	-	-
pH, standard units	-	5.30	-	-
Oxidation Reduction Potential, mV	-	192.9	-	-
Turbidity, NTU	-	14.56	-	-
Remarks	Not sampled due to 0.01 foot of LNAPL		Depth to water only	Depth to water only

Notes:

Survey conducted by Shannon & Wilson on April 30, 2013. Elevations are relative an to arbitrary on-site benchmark.

Water quality parameters were measured with a YSI-556 instrument and Hach turbidimeter.

* = groundwater elevation corrected for product thickness; specific gravity of diesel fuel is assumed to be 0.86

\- = not applicable or not measured

^{o}C = degrees Celsius

µS/cm = microsiemens per centimeter

mV = Millivolts

NTU = Nephelometric Turbidity Unit

SP = Submersible pump

TOC = Top of Casing

LNAPL = Light non-aqueous phase liquid

TABLE 2
JULY 2014 WELL SAMPLING LOG

	Monitoring Well Number			
	B1MW	**B2MW**	**B3MW**	**B4MW**
Water Level Measurement Data				
Date Water Level Measured	7/30/2014	7/30/2014	7/30/2014	7/30/2014
Time Water Level Measured	10:46	10:45	10:44	10:41
Surveyed Measuring Point Elevation (feet)	99.68	98.41	98.83	99.59
Measured Depth to LNAPL (feet below TOC)	no LNAPL	no LNAPL	no LNAPL	no LNAPL
Measured Depth to Water (feet below TOC)	7.70	6.62	6.83	7.88
Water Level Elevation (feet)	91.98	91.79	92.00	91.71
Purging/Sampling Data				
Date Sampled	7/30/2014	7/30/2014	-	-
Time Sampled	14:35	12:30	-	-
Measured Depth to Water (feet below TOC)	7.70	6.62	-	-
Total Depth of Well Below (feet below TOC)	14.35	15.2	-	-
Water Column in Well (feet)	6.65	8.58	-	-
Gallons per Foot	0.16	0.16	-	-
Water Column Volume (gallons)	1.06	1.37	-	-
Total Volume Pumped (gallons)	1.5	1.5	-	-
Purging Method	SP	SP	-	-
Sampling Method	SP	SP	-	-
Diameter of Well Casing	2-inch	2-inch	2-inch	2-inch
Water Quality Data				
Temperature, ^{o}C	18.56	20.81	-	-
Specific Conductance, µS/cm	1,059	367	-	-
pH, standard units	6.48	6.24	-	-
Oxidation Reduction Potential, mV	-72.6	-110.1	-	-
Turbidity, NTU	17.4	18.60	-	-
Remarks	Hydrocarbon odor		Depth to water only	Depth to water only

Notes:

Survey conducted by Shannon & Wilson on April 30, 2013. Elevations are relative an to arbitrary on-site benchmark.

Water quality parameters were measured with a YSI-556 instrument and Hach turbidimeter.

- = not applicable or not measured
^{o}C = degrees Celsius
µS/cm = microsiemens per centimeter
mV = Millivolts
NTU = Nephelometric Turbidity Unit
SP = Submersible pump
TOC = Top of Casing
LNAPL = Light non-aqueous phase liquid

TABLE 3
FEBRUARY 2014 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Parameter Tested	Method*	Cleanup Level**	Sample ID Number^ and Water Depth in Feet BTOC (See Table 1, Figure 2, and Appendix B)		
			Monitoring Wells		Quality Control
			B2MW	B5MW~	WTB
			9.90	9.90	-
Gasoline Range Organics (GRO) - mg/L	AK 101	2.2	<0.100 B	<0.100 B	<0.100 B
Diesel Range Organics (DRO) - mg/L	AK 102	1.5	<0.638 B	<0.792 B	-
Aromatic Volatile Organics (BTEX)					
Benzene - mg/L	EPA 8021B	0.005	<0.000250	**0.000150 J**	<0.000250
Toluene - mg/L	EPA 8021B	1.0	<0.000500	<0.000500	<0.000500
Ethylbenzene - mg/L	EPA 8021B	0.7	<0.000500	<0.000500	<0.000500
Xylenes - mg/L	EPA 8021B	10	<0.00150	<0.00150	<0.00150

Notes:

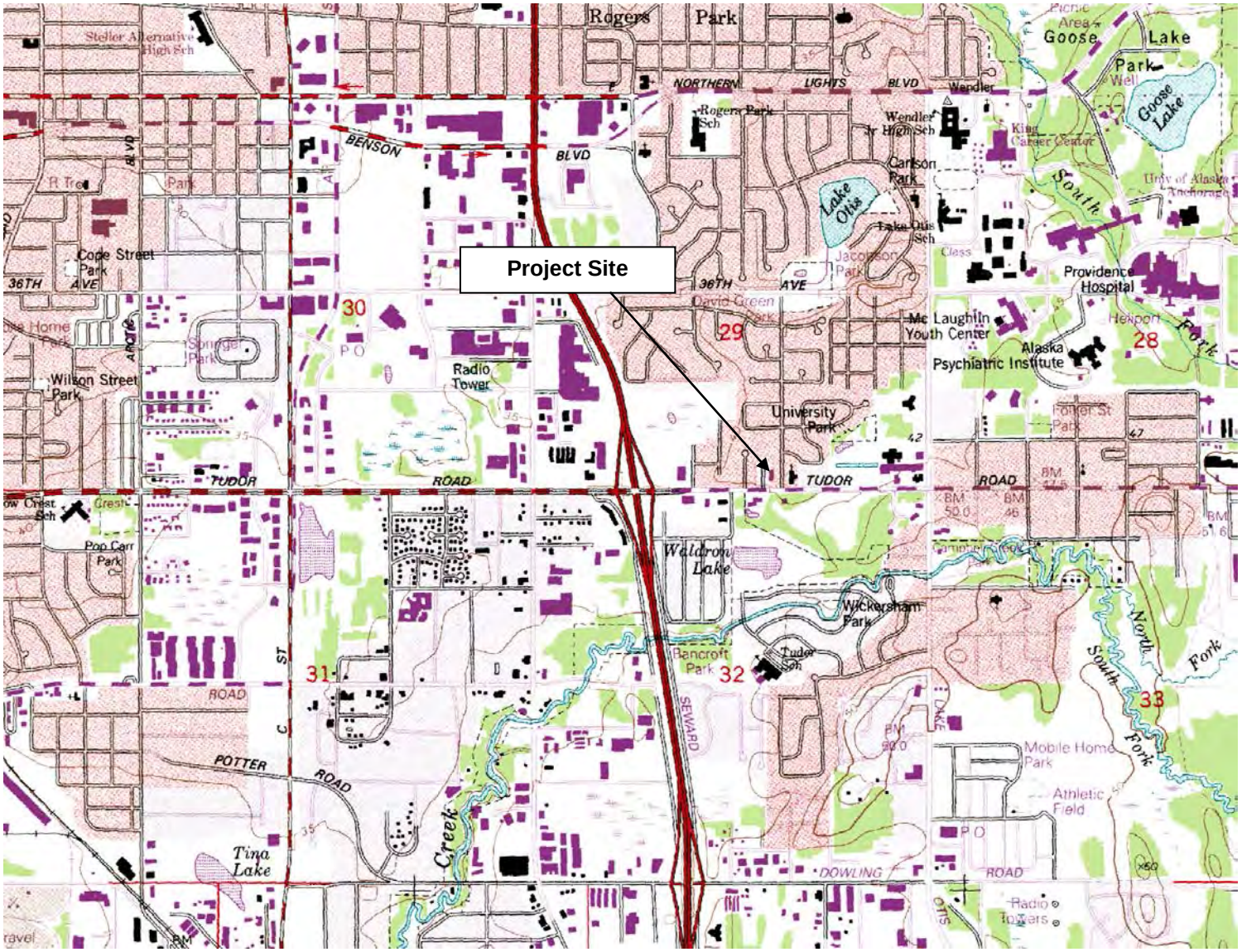
*	= See Appendix B for compounds tested, methods, and laboratory reporting limits
**	= Groundwater cleanup levels are listed in Table C, 18 AAC 75.345 (April 2012)
^	= Sample ID number preceded by "17628-" on the chain of custody form
~	= Field duplicate of preceding sample
WTB	= Water trip blank
mg/L	= Milligrams per liter
J	= Concentration is an estimate less than the laboratory's limit of quantitation (LOQ). See the SGS laboratory report for details.
<0.000250	= Analyte not detected; laboratory limit of detection of 0.000250 mg/L
0.000150	= Analyte detected
B	= Analyte concentration potentially affected by method blank contamination. See the ADEC Laboratory Data Review Checklist (LDRC) for details.
BTOC	= Below top of casing
-	= Not applicable or sample not tested for this analyte

TABLE 4
JULY 2014 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Parameter Tested	Method*	Cleanup Level**	Sample ID Number^ and Water Depth in Feet BTOC (See Table 2, Figure 3, and Appendix B)			
			Monitoring Well			Quality Control
			B1MW	B2MW	B5MW~	TBW
			7.70	6.62	6.62	-
Gasoline Range Organics (GRO) - mg/L	AK 101	2.2	**138**	<0.0500 B	<0.0500 B	<0.0500 B
Diesel Range Organics (DRO) - mg/L	AK 102	1.5	**18.1**	<0.424 B	<0.420 B	-
Aromatic Volatile Organics (BTEX)						
Benzene - mg/L	EPA 8260B	0.005	**7.69**	<0.000500	**0.000701**	<0.000500
Toluene - mg/L	EPA 8260B	1.0	**29.7**	<0.00100	<0.00383 B	**0.00227**
Ethylbenzene - mg/L	EPA 8260B	0.7	**2.40**	<0.00100	<0.00100 B	**0.000327 J**
Xylenes - mg/L	EPA 8260B	10	**15.6**	<0.00100	<0.00316 B	**0.00211**

Notes:

*	= See Appendix B for compounds tested, methods, and laboratory reporting limits
**	= Groundwater cleanup levels are listed in Table C, 18 AAC 75.345 (April 2012)
^	= Sample ID number preceded by "17628-" on the chain of custody form
~	= Field duplicate of preceding sample
-	= Not applicable or sample not tested for this analyte
TBW	= Water trip blank
mg/L	= Milligrams per liter
J	= Concentration is an estimate less than the laboratory's limit of quantitation (LOQ). See the TestAmerica laboratory report for details.
138	= Reported concentration exceeds the ADEC Table C cleanup level
<0.000500	= Analyte not detected; laboratory limit of detection of 0.000500 mg/L
0.000701	= Analyte detected
B	= Analyte concentration potentially affected by method and/or trip blank contamination. See the ADEC Laboratory Data Review Checklist (LDRC) for details.
BTOC	= Below top of casing



Elevation in Meters
Contour Interval 5 Meters
Taken from Anchorage A-8 NW Quadrangle
U.S. Geological Survey (1994)

0 2,000 4,000

Approximate Scale in Feet

N

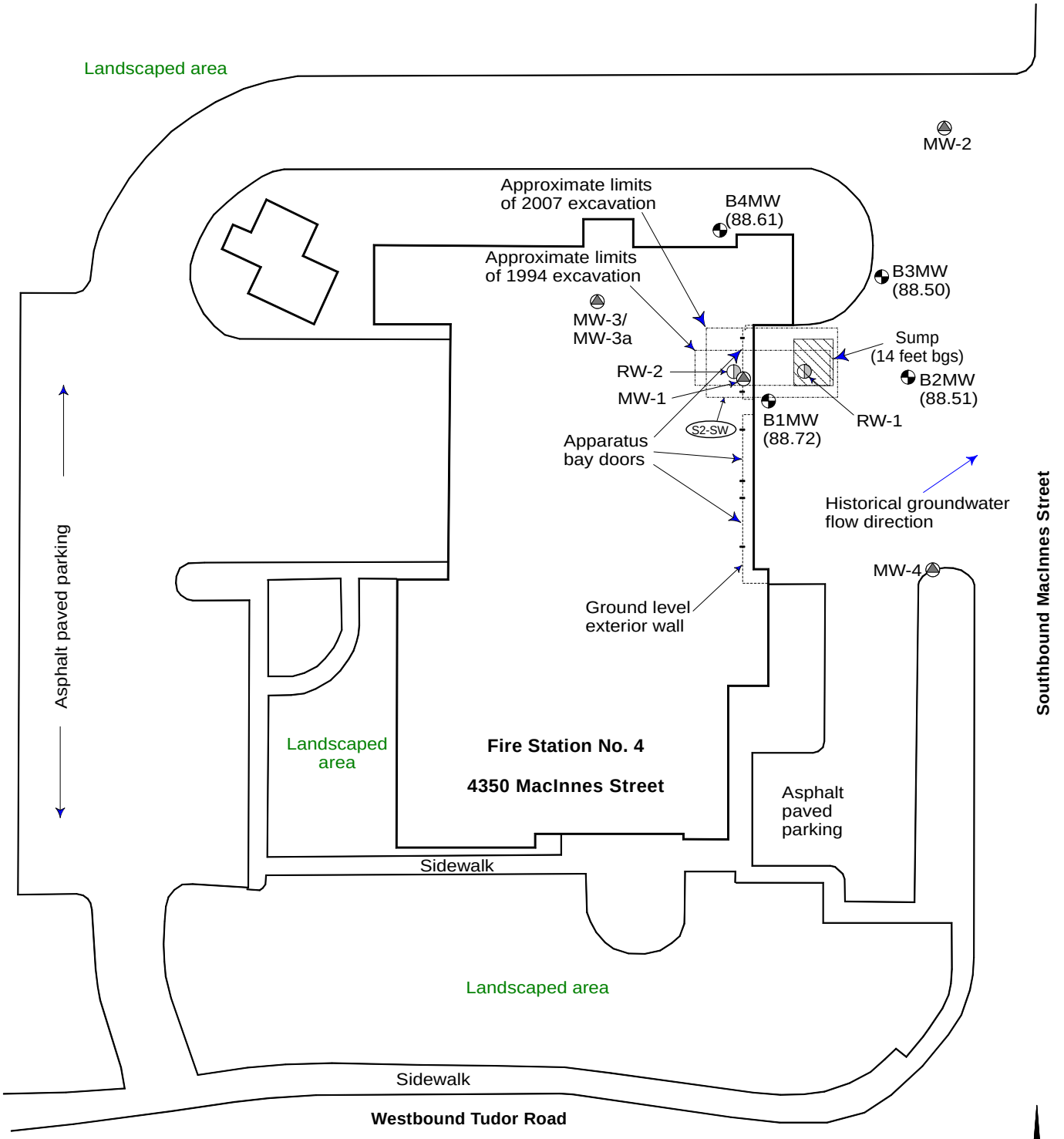
4350 MacInnes Street
Anchorage, Alaska

VICINITY MAP

February 2015 32-1-17628-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1



LEGEND

B1MW (88.72) — Approximate location of Monitoring Well B1MW. Shannon & Wilson installed Well B1MW in 2008, Wells B2MW and B3MW on February 22, 2013, and Well B4MW on April 15, 2013. Approximate groundwater elevation based on February 26, 2014 water level measurements and level-loop survey.

MW-3 — Approximate former location of Monitoring Well MW-3, installed by HartCrowser in 1994 and decommissioned in 2007.

RW-2 — Approximate former location of Recovery Well RW-2, installed by HartCrowser in 1995 and decommissioned in 2007.

S2-SW — Approximate location of Soil Sample S2-SW, collected from the 2007 excavation by HartCrowser at a depth of 8 to 8.5 feet below ground surface and containing 2,350 mg/kg DRO and 7.49 mg/kg ethylbenzene.

N

0 40 80

APPROXIMATE SCALE IN FEET

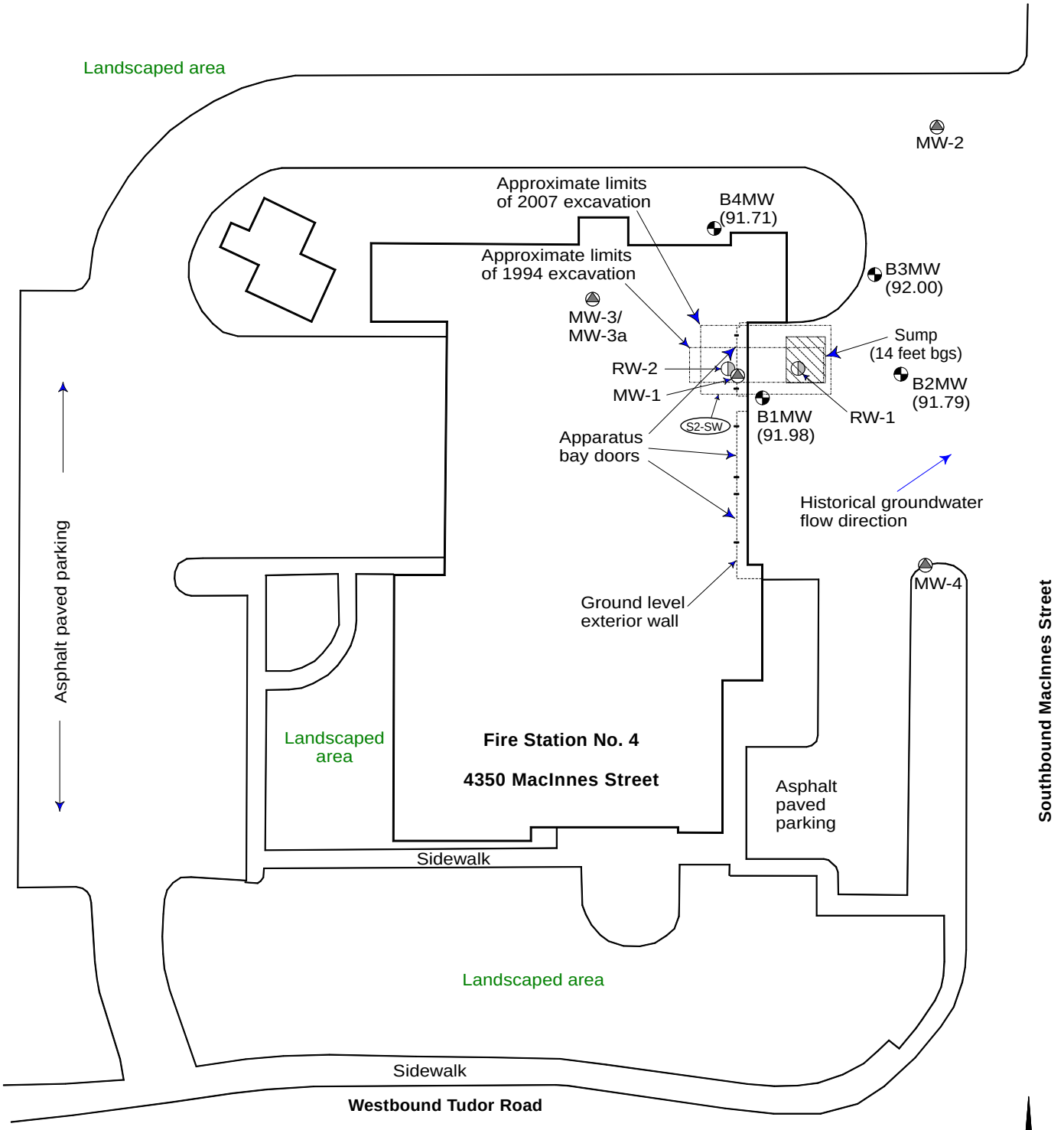
4350 MacInnes Street
Anchorage, Alaska

SITE PLAN - FEBRUARY 2014 WATER LEVEL ELEVATIONS

February 2015 32-1-17628-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 2



LEGEND

B1MW (91.98) — Approximate location of Monitoring Well B1MW. Shannon & Wilson installed Well B1MW in 2008, Wells B2MW and B3MW on February 22, 2013, and Well B4MW on April 15, 2013. Approximate groundwater elevation based on July 30, 2014 water level measurements and level-loop survey.

MW-3 — Approximate former location of Monitoring Well MW-3, installed by HartCrowser in 1994 and decommissioned in 2007.

RW-2 — Approximate former location of Recovery Well RW-2, installed by HartCrowser in 1995 and decommissioned in 2007.

S2-SW — Approximate location of Soil Sample S2-SW, collected from the 2007 excavation by HartCrowser at a depth of 8 to 8.5 feet below ground surface and containing 2,350 mg/kg DRO and 7.49 mg/kg ethylbenzene.

0 40 80
APPROXIMATE SCALE IN FEET

4350 MacInnes Street
Anchorage, Alaska

SITE PLAN - JULY 2014
WATER LEVEL ELEVATIONS

February 2015 32-1-17628-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 3

APPENDIX A

FIELD NOTES

MOA FS No 4

2/25/2014 32-1-17628

908 * JDS calls Fire Cpt Blake Lindsee
247-5004 to discuss renovations
sampling. Blake not in, get
transferred to Chief Mike
Davidson. Mike gets call
will call JDS back

937 Mike Davidson (Chief cell 230-4960)
says tomorrow will be fine
Requests we start at 930 because
shift change at 9 is too busy.
Mike asks that prior to initiating
tasks, we knock on door and let the
personnel know we are here and
where we are working in case
they need to move trucks. Mike

asks that the buckets be stored under the fuel tank canopy. Mike also asks that we let him/personnel know when are done working at the site and when we are coming to dispose of the water/pads.

JDS

32-1-17628 Fire Station #4 2/26/14
DSP

Cloudy, 20's-30's

940 DSP to FS#4 to sample wells B1MW and B2MW and to recover product from B1MW

945 DSP on-site, checked in w/ firemen

1040 Finish loading wells

~~WELL DATA~~ TIME

Well B1MW is filed w/ ice up to monument Lid. Well cap intact

Wells B2MW, B3MW contained frozen sand up to monument lid. Well cap may be intact?

Well B4MW monument is jacked above ground 2". Well cap loose. dirt above well cap. Well may be compromised. Rate in the Rain

17628 Fire Station 4 DSP 2/26/14

1140 DSP back to Office to get torch.

Well	DTW	time	
B4MW	10.98	1250	
B3MW	10.33	1256	
B2MW	9.90	1301	
B1MW	10.94	1306	No product but strong hc odor on interface probe.

disregard B1MW measurement. Used 15:43 measurement

1309 Begin sampling @ B2MW Well stabilized.

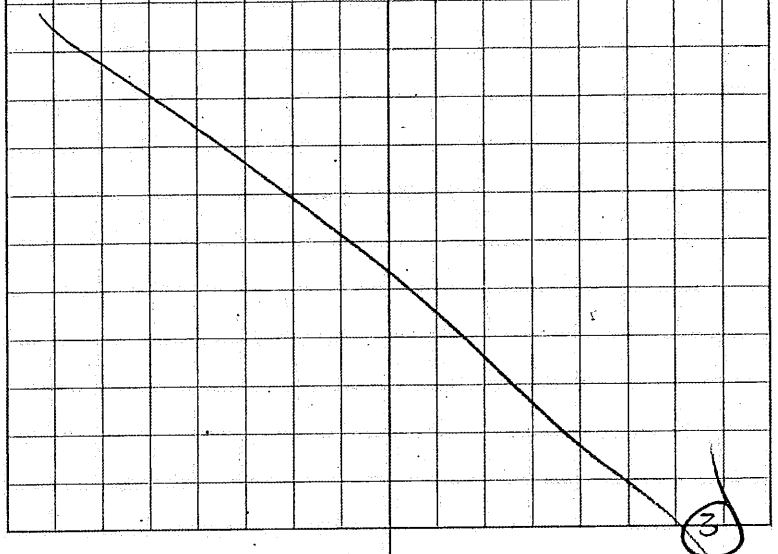
1521 Begin sampling B1MW. lowered pump in well to sample and check DTW. Measured 0.01 ft of product. pulled out pump and remeasured.

15:43 DTP = 10.96 DTW = 10.97

(2)

1628 Fire Station 4 2/26/19 DSP

15:50	lowered one absorbant pad and remeasured.
15:53	DTW = 10.97 No product.
1645	Packed up gear placed 2 IDW buckets under fuel tank canopy. checked out w/ firemen
1650	DSP to office.



Rite in the Rain

FS #4 2/27/14

1430	DSP to site to recover product from B/MW
1438	DSP on-site
1441	DTW = 10.97 in B/MW no product measured.
1445	DSP off-site
1455	DSP back at office.

Rite in the Rain

17626

Fire station 4

2/28/14

DSP

1430	DSP to site to check B/MW for product
1434	DSP onsite, checked in w/ firemen.
1443	DTW = 11.00 No product
1450	DSP offsite
1455	DSP arrives @ office.

LOW-FLOW WATER SAMPLING LOG

Shannon & Wilson, Inc.

Job No: 32-1-17628 Location: Fire Station #4 Weather: 20's, overcast
Well No.: B2MW
Date: 2/26/14 Time Started: 13:24 Time Completed: 15:15
Develop Date: — Develop End Time: — (24 hour break)

INITIAL GROUNDWATER LEVEL DATA

Time of Depth Measurement: 1301 Date of Depth Measurement: 2/26/14
Measuring Point (MP): (Top of PVC Casing) / Top of Steel Protective Casing / Other: —
Diameter of Casing: 2" Well Screen Interval: —
Total Depth of Well Below MP: 15.24 Product Thickness, if noted: —
Depth-to-Water (DTW) Below MP: 9.90
Water Column in Well: 5.34 (Total Depth of Well Below MP - DTW Below MP)
Gallons per foot: 0.16
Gallons in Well: 0.85 (Water Column in Well x Gallons per foot)

3x = 2.55

PURGING DATA

Date Purged: 2/26/14 Time Started: 1351 Time Completed: 1440
Three Well Volumes: 2.55 (Gallons in Well x 3)
Gallons Purged: 5.7L = 1.51 gal Depth of Pump (generally 2 ft from bottom): 1.5 ft below water surface
Max. Drawdown (generally 0.3 ft): 0.63 Pump Rate: ~0.1
DTW: 9.79 ft w/ pump in well @ 1343
Well Purged Dry: Yes ☐ No ☒ (If yes, use Well Purged Dry Log)

Time: (varied flow)	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
1356	1.5	0.3	10.42	0.63	3.90	719		5.34	212.5	85.23
1401	2.1	0.1	10.33	0.54	3.52	726		5.30	211.0	72.89
1406	2.6	0.1	10.28	0.49	3.55	726		5.26	210.4	72.74
1409	2.9	0.1	10.27	0.48	3.65	732		5.26	207.6	71.36
1412	3.2	0.1	10.24	0.45	3.68	739		5.256	204.7	57.99
1415	3.5	0.1	10.24	0.45	3.61	748		5.26 ✓	204.7 ✓	54.89

SAMPLING DATA

Odor: Slight HC odor ?? Color: very light brown to clear
Sample Designation: 17628-B2MW Time / Date: 1445 2/26/14
QC Sample Designation: 17628-BSMW Time / Date: 1515 2/26/14
QA Sample Designation: — Time / Date: —
Evacuation Method: Bladder Pump / Submersible Pump / Other: —
Sampling Method: Bladder Pump / Submersible Pump / Other: —
Water Quality Instruments Used/Manufacturer/Model Number YSI-556, Hach turbidimeter
Calibration Info (Time, Ranges, etc) calibrated 9:00 am 2/26/14
Remarks:

Sampling Personnel: DSP

WELL CASING VOLUMES (GAL/FT): 1" = 0.04 2" = 0.16 4" = 0.65
ANNULAR SPACE VOLUME (GAL/FT): 4" casing and 2" well = 0.23

LOW-FLOW WATER SAMPLING LOG

Shannon & Wilson, Inc.

Continued from previous page

Job No: 17628 Location: PS #4 Site:

Well No.: B2 MW

Date: 2/26/14

Time:	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
1419	3.9	0.1	10.24	0.45	3.71	754		5.26	202.9	47.96
1422	4.2	0.1	10.23	0.44	3.80	759		5.26	201.1	41.76
1425	4.5	0.1	10.23	0.44	3.94	762		5.28	198.8	35.56
1426	4.8	0.1	10.26	0.47	4.09	764		5.27	197.5	31.35
1431	5.1	0.1	10.25	0.46	4.28	765		5.32	193.5	23.50
1434	5.4	0.1	10.27	0.46	4.26	768		5.32	193.1	21.15
1437	5.7	0.1	-	-	4.26	766		5.30	192.9	14.56
					✓	✓		✓	✓	
					4 of 5	stable				

STABILIZATION PARAMETERS

	Interval (minutes)	Pump Rate (mL/min):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
ADEC ay 2010)	3 to 5	100 to 150	<0.0328	±3% or ±0.2	±3%	±10%	±0.1	±10	±10%
EPA n. 2010)	5	50	<0.3	±3%	±3%	±10% or <0.5	±0.1	±10	±10% or <5 NTU

EPA guidance requires all parameters to stabilize for 3 consecutive readings before sampling. If not stable within 2 hours, collect sample.

ADEC guidance requires 3 parameters (4 if using temperature) to stabilize for 3 consecutive readings before sampling.

LOW-FLOW WATER SAMPLING LOG

Shannon & Wilson, Inc.

Job No: 32-1-17628 Location: Fire Station 4 Weather: 20, overcast
Well No.: BMW
Date: 2/26/14 Time Started: 15:20 Time Completed: _____
Develop Date: — Develop End Time: — (24 hour break)

INITIAL GROUNDWATER LEVEL DATA

Time of Depth Measurement: 1306 Date of Depth Measurement: 2/26/14
Measuring Point (MP): (Top of PVC Casing) / Top of Steel Protective Casing / Other: _____
Diameter of Casing: 2" Well Screen Interval: —
Total Depth of Well Below MP: 14.91 Product Thickness, if noted: NA
Depth-to-Water (DTW) Below MP: 10.94
Water Column in Well: 3.97 (Total Depth of Well Below MP - DTW Below MP)
Gallons per foot: 0.16
Gallons in Well: 0.64 (Water Column in Well x Gallons per foot)

PURGING DATA

Date Purged: 2/26/14 Time Started: _____ Time Completed: _____
Three Well Volumes: 1.91 (Gallons in Well x 3)
Gallons Purged: _____ Depth of Pump (generally 2 ft from bottom): 1.6 ft below ▽
Max. Drawdown (generally 0.3 ft): _____ Pump Rate: _____

Well Purged Dry: Yes ☐ No ☐ (If yes, use Well Purged Dry Log)

Time:	Gallons:	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)

SAMPLING DATA

Odor: _____ Color: _____
Sample Designation: _____ Time / Date: _____
QC Sample Designation: _____ Time / Date: _____
QA Sample Designation: _____ Time / Date: _____

Evacuation Method: Bladder Pump / Submersible Pump / Other: _____
Sampling Method: Bladder Pump / Submersible Pump / Other: _____

Water Quality Instruments Used/Manufacturer/Model Number _____

Calibration Info (Time, Ranges, etc) _____

Remarks: 10.87 = DTP 10.88 = DTW @ 1540 w/ Pump in well
10.96 = DTP 10.97 = DTW @ 1543 no pump in well.
Sampling Personnel: after product removal DTW = 10.97 @ 15:53

WELL CASING VOLUMES (GAL/FT): 1" = 0.04 2" = 0.16 4" = 0.65
ANNULAR SPACE VOLUME (GAL/FT): 4" casing and 2" well = 0.23

17628 FS #4 3/21/14

DSP

Approval to dump IDW on an upaved portion of the site was recieved from Katrina Chambers on 3/21/14

DSP discharged purged water on 3/21/14.

1 single 3" X 1" piece of absorbent pad (saturated in fuel) was discarded as unregulated MSW.

Rite in the Rain

32-1-17628

Josh Baris
398-6153

7/30/14 - GW SAMP @ FIRE STATION No. 4
JHT

9 - MOB truck

10 - JHT to FS #4 to sample Wells B1MW + B2MW - possible product recovery from B1MW

10:10 - Check in w/ Fire Station

10 15 - LOCATE WELLS

OPEN ALL FOR DEPTH TO WATER

	TIME	DTW	DTP	
B1MW	1046	7.70	-	STRONG ODOR
B2MW	1045	6.62	-	- SAND + BENTONITE IN
B3 MW	1044	6.83	-	- MONUMENTS
B4MW	1041	7.88	-	- ↓

- NOT SURE IF OIL/WATER INTERFACE PROBE IS WORKING CORRECTLY
When in decon water - doesn't respond to water

11:00 - SET UP ON B2MW
START PURGE @ 11:25

1230 - collect sample B2MW

1235 - collect sample B5MW

12:40 - DECON EQUIP.
close B3MW + B4MW

12:55 - EAT - SET UP ON B1MW

13:10 - START @ B1MW

1435 - collect sample B1MW

1445 - Clean up; Check in w/ Fire Fighters

1455 - Put 5-gall purge water by dumpster on S side of FS

Scale: 1 square =

32-1-17628 7/30/14 Firestation No. 4 Pg 2 of 2

1500 - HEAD TO TEST AMERICA

1537 - DROP SAMPLES OFF
HEAD BACK TO STW

1600 - BACK @ SW - DEMOB

Scale: 1 square =

Shannon & Wilson, Inc.

LOW-FLOW WATER SAMPLING LOG

Job No: 32-1-17628 Location: Fire Station No 4 Weather: SUNNY ; 80

Well No.: B1 MW

Date: 7/30/14 Time Started: 1310 Time Completed: 1445

Develop Date: — Develop End Time: — (24 hour break)

INITIAL GROUNDWATER LEVEL DATA

Time of Depth Measurement: 1046 Date of Depth Measurement: 7/30/14

Measuring Point (MP): Top of PVC Casing / Top of Steel Protective Casing / Other: —

Diameter of Casing: 2" Well Screen Interval: —

Total Depth of Well Below MP: 94.35 Product Thickness, if noted: —

Depth-to-Water (DTW) Below MP: 7.70

Water Column in Well: 6.65 (Total Depth of Well Below MP - DTW Below MP)

Gallons per foot: 0.16

Gallons in Well: 1.06 (Water Column in Well x Gallons per foot)

PURGING DATA

Date Purged: 7/30 Time Started: 1333 Time Completed: 1433

Three Well Volumes: 3.18 (Gallons in Well x 3)

~~Gallons~~ LITERS Purged: 4.0 Depth of Pump (generally 2 ft from bottom): ~1.5 ft below DTW

Max. Drawdown (generally 0.3 ft): 26.35 Pump Rate: ~.1

DTW w/ PUMP 7.68 @ 1326

Well Purged Dry: Yes ☐ No ☐ (If yes, use Well Purged Dry Log)

Time:	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
1338	.5	.1	8.0	.32	16.81	1.006		6.70	-65.5	28.4
1343	1.0	.1	8.0	.32	18.27	0.994		6.54	-41.5	29.0
1352	1.5	.1	8.01	.33	18.56	1.001		6.50	-53.8	25.8
1357	2	.1	8.01	.33	18.91	1.004		6.48	-49.5	16.7
1402	2.5	.1	8.01	.33	19.22	1.011		6.48	-41.9	27.3
1407	3	.1	8.01	.33	19.47	1.031		6.47	-43.5	18.0

SAMPLING DATA

Odor: STRONG HC ODOR Color: CLEAR

Sample Designation: 17628-B1MW Time / Date: 1435 7/30/14

QC Sample Designation: — Time / Date:

QA Sample Designation: — Time / Date:

Evacuation Method: Bladder Pump / ~~Submersible Pump~~ / Other:

Sampling Method: Bladder Pump / Submersible Pump / Other:

Water Quality Instruments Used/Manufacturer/Model Number YSI-556 ; HACH TURBIDITY

Calibration Info (Time, Ranges, etc) CALIBRATED 7/29/14 2pm

Remarks:

Sampling Personnel: JHT

WELL CASING VOLUMES (GAL/FT): 1" = 0.04 2" = 0.16 4" = 0.65

ANNULAR SPACE VOLUME (GAL/FT): 4" casing and 2" well = 0.23

Shannon & Wilson, Inc.

LOW-FLOW WATER SAMPLING LOG

Continued from previous page

Job No: 32-1-17628 Location: FIRESTATION No. 4 Site: —

Well No.: 131MW

Date: 7/30/14

Time:	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
1412	3.5	.1	8.01	.33	19.19	1.046		6.46	-55.0	15.3
1417	4.0	.1	8.02	.34	19.19	1,058		6.47	-62.3	14.5
1422	4.5	.1	8.03	.35	18.65	1,060		6.48	-71.5	17.4
1427	5	.1	8.03	.35	18.54	1.059		6.48	-73.1	16.3
1433	5.5	.1	8.03	.35	18.56	1.059		6.48	-72.0	17.4

STABILIZATION PARAMETERS

	Interval (minutes)	Pump Rate (mL/min):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
ADEC (May 2010)	3 to 5	100 to 150	<0.0328	±3% or ±0.2	±3%	±10%	±0.1	±10	±10%
EPA (Jan. 2010)	5	50	<0.3	±3%	±3%	±10% or <0.5	±0.1	±10	±10% or <5 NTU

EPA guidance requires all parameters to stabilize for 3 consecutive readings before sampling. If not stable within 2 hours, collect sample.

ADEC guidance requires 3 parameters (4 if using temperature) to stabilize for 3 consecutive readings before sampling.

4.0 = 1 well volume

Shannon & Wilson, Inc.

LOW-FLOW WATER SAMPLING LOG

Job No: 32-1-17628 Location: FIRE STATION No. 4 Weather: SUNNY ; 75

Well No.: B2MW

Date: 7/30/14 Time Started: 11:00 Time Completed: 12:50

Develop Date: — Develop End Time: — (24 hour break)

INITIAL GROUNDWATER LEVEL DATA

Time of Depth Measurement: 1045 Date of Depth Measurement: 7/30/14

Measuring Point (MP): Top of PVC Casing / Top of Steel Protective Casing / Other: —

Diameter of Casing: 2" Well Screen Interval: —

Total Depth of Well Below MP: 15.20 Product Thickness, if noted: —

Depth-to-Water (DTW) Below MP: 6.62

Water Column in Well: 8.58 (Total Depth of Well Below MP - DTW Below MP)

Gallons per foot: 0.16

Gallons in Well: 1.37 (Water Column in Well x Gallons per foot)

3x = 4.11

PURGING DATA

Date Purged: 7/30/14 Time Started: 11:25 Time Completed: 12:28

Three Well Volumes: 4.11 (Gallons in Well x 3)

Gallons Purged: 5.2 L = 1.48 Depth of Pump (generally 2 ft from bottom): ~1.0 ft below water surface

Max. Drawdown (generally 0.3 ft): 0.23 Pump Rate: ~ 0.1

DTW = 6.58 w/ pump in well @ 11:25

Well Purged Dry: Yes ☐ No ☒ (If yes, use Well Purged Dry Log)

Time:	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
11:28	.3	.1	6.68	.10	17.06	0.355		6.03	-120.1	57.8
11:33	.6	.1	6.76	.18	17.86	0.392		5.93	-114.8	73.1
11:36	.9	.1	6.80	.22	18.42	0.363		5.99	-118.1	62.5
11:41	1.2	.13	6.82	.24	19.14	0.354		6.12	-124.0	68.0
11:45	1.5	.13	6.83	.25	19.53	0.357		6.16	-119.3	71.2
11:48	1.8	.1	6.82	.24	19.74	0359		6.18	-120.1	74.3

SAMPLING DATA

Odor: NONE Color: Clear

Sample Designation: 17628-B2MW Time / Date: 1230 7/30/14

QC Sample Designation: 17628-B5MW Time / Date: 1205 7/30/14

QA Sample Designation: — Time / Date: —

Evacuation Method: Bladder Pump / Submersible Pump / Other: _____

Sampling Method: Bladder Pump / Submersible Pump / Other: _____

Water Quality Instruments Used/Manufacturer/Model Number YSI-556 ; HACH Turbidity

Calibration Info (Time, Ranges, etc) Calibrated on 7/29/14 - 2 pm

Remarks: _____

Sampling Personnel: JHT

WELL CASING VOLUMES (GAL/FT): 1" = 0.04 2" = 0.16 4" = 0.65

ANNULAR SPACE VOLUME (GAL/FT): 4" casing and 2" well = 0.23

1 gal = 3.785 L

1.37 gal = 5.185 L

Shannon & Wilson, Inc.

LOW-FLOW WATER SAMPLING LOG

Continued from previous page

Job No: 32-1-17628 Location: FIRESTATION No. 4 Site:

Well No.: B2 MW

Date: 7/30/14

Time:	~~Gallons:~~ L	Pump Rate (L/min):	DTW (ft BMP):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
11:51	2.1	.1	6.82	.24	20.07	0.361		6.18	-130.8	63.0
11:56	2.6	.1	6.82	.24	20.166	0.363		6.21	-139.1	55.3
12:01	3.1	.1	6.80	.22	20.84	0.366		6.22	-105.4	52.9
12:06	3.6	.1	6.81	.23	20.00	0.368		6.24	-107.2	36.0
12:11	4.1	.1	6.81	.23	19.53	0.366		6.21	-104.9	31.1
12:16	4.6	.1	6.81	.23	20.10	0.366		6.23	-122.5	24.9
12:21	5.1	.1	6.81	.23	20.69	0.367		6.24	-109.5	21.6
12:26	5.6	.1	6.81	.23	20.81	0.367		6.24	-110.1	18.6
						✓		✓		

STABILIZATION PARAMETERS

	Interval (minutes)	Pump Rate (mL/min):	Drawdown (ft):	Temp: (°C)	Sp. Cond.: (uS/cm)	DO: (mg/L)	pH: (S.U.)	ORP: (mV)	Turb: (NTU)
ADEC (May 2010)	3 to 5	100 to 150	<0.0328	±3% or ±0.2	±3%	±10%	±0.1	±10	±10%
EPA (Jan. 2010)	5	50	<0.3	±3%	±3%	±10% or <0.5	±0.1	±10	±10% or <5 NTU

EPA guidance requires all parameters to stabilize for 3 consecutive readings before sampling. If not stable within 2 hours, collect sample.

ADEC guidance requires 3 parameters (4 if using temperature) to stabilize for 3 consecutive readings before sampling.

NEED 5.2 = 1 well volume

32-1-17628/17629 MOA FS#4/FS#7 9/23/14

1113 JDS to Fire Station #7 to pickup IDW for disposal at Emerald

1122 JDS arrives Fire Station #7. look for 5-gal bucket of purge water but dont see it. JDS calls Jesse- Jesse says it is in the fenced area in southeast portion of property. JDS finds it, secure gate with broken lock. Note an alarm is ~~sounding~~ going off in the fmr FS#7 building. Will tell TMT

1130 JDS to Fire Station #4 to pick up IDW

1146 JDS arrives at Fire Station #4. check in with fire station staff. JDS rings door bell but no answer. Proceed to NW corner of building by AST to get purge water in 5-gallon bucket

1154 JDS to emerald to drop off IDW

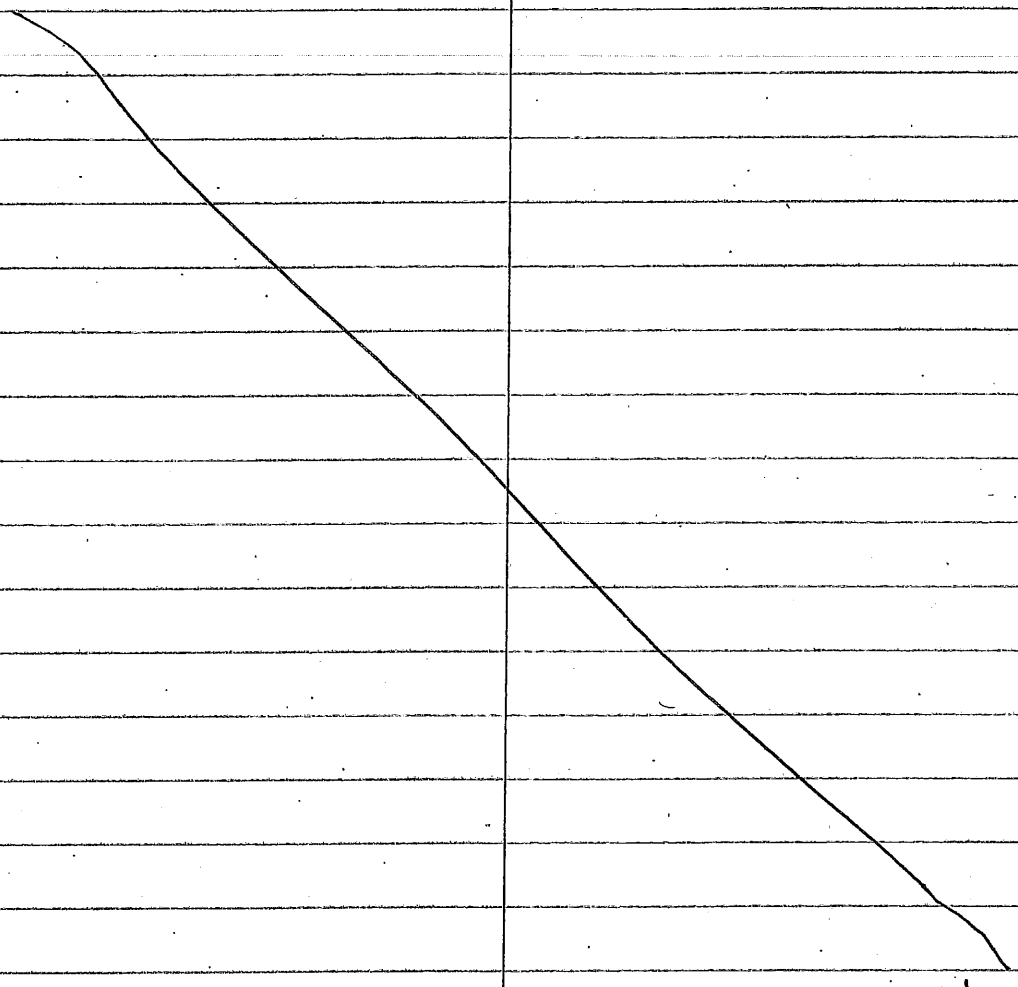
1/2

32-1-17628/17629 MOA PS# 9/#7 9/23/14

1159 JDS arrives at Emerald
drop off IDW/ sign manifests

1214 JDS to SW office
fuel first

1247 JDS arrives at SW



2/2

APPENDIX B

RESULTS OF ANALYTICAL TESTING BY SGS NORTH AMERICA INC.

AND TESTAMERICA LABORATORIES, INC.

OF ANCHORAGE, ALASKA AND

ADEC LABORATORY DATA REVIEW CHECKLISTS

Laboratory Report of Analysis

To: Shannon & Wilson, Inc.
5430 Fairbanks St. Suite 3
Anchorage, AK 99518
(907)561-2120

Report Number: **1140708**

Client Project: **17628 Fire Station #4**

Dear Jennifer Simmons,

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 five 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 Steve 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.

SGS North America
Environmental Services – Alaska Division
Project Manager

Steven Crupi
2014.03.14
17:53:43 -08'00'

Steve Crupi Date
Project Manager
steven.crupi@sgs.com

Print Date: 03/14/2014 8:35:57AM

Case Narrative

SGS Client: **Shannon & Wilson, Inc.**
SGS Project: **1140708**
Project Name/Site: **17628 Fire Station #4**
Project Contact: **Jennifer Simmons**

Refer to sample receipt form for information on sample condition.

17628-B5MW (1140708002) PS

AK102 - The pattern is consistent with a weathered middle distillate.

LCS for HBN 1507961 [VXX/25661 (1200728) LCS

8021B - LCS 1,4-Difluorobenzene (surrogate) recovery does not meet QC criteria (biased high) all associated samples met QC criteria..

LCSD for HBN 1507961 [VXX/2566 (1200730) LCSD

8021B - LCSD 1,4-Difluorobenzene (surrogate) recovery does not meet QC criteria (biased high) all associated samples met QC criteria..

*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

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. If you have any questions regarding this report, or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343. All work is provided under SGS general terms and conditions (<http://www.sgs.com/terms_and_conditions.htm>), unless other written agreements have been accepted by both parties.

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: 1020A, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035B, 6020, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040B, 9045C, 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	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
17628-B2MW	1140708001	02/26/2014	02/27/2014	Water (Surface, Eff., Ground)
17628-B5MW	1140708002	02/26/2014	02/27/2014	Water (Surface, Eff., Ground)
17628-WTB	1140708003	02/26/2014	02/27/2014	Water (Surface, Eff., Ground)

Method	Method Description
AK101	AK101/8021 Combo.
SW8021B	AK101/8021 Combo.
AK102	Diesel Range Organics (W)

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Detectable Results Summary

Client Sample ID: **17628-B2MW**
Lab Sample ID: 1140708001
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	0.597J	mg/L
Gasoline Range Organics	0.0436J	mg/L

Client Sample ID: **17628-B5MW**
Lab Sample ID: 1140708002
Semivolatile Organic Fuels
Volatile Fuels

Parameter	Result	Units
Diesel Range Organics	0.792	mg/L
Benzene	0.150J	ug/L
Gasoline Range Organics	0.0452J	mg/L

Client Sample ID: **17628-WTB**
Lab Sample ID: 1140708003
Volatile Fuels

Parameter	Result	Units
Gasoline Range Organics	0.0441J	mg/L

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Results of **17628-B2MW**

Client Sample ID: **17628-B2MW**
Client Project ID: **17628 Fire Station #4**
Lab Sample ID: 1140708001
Lab Project ID: 1140708

Collection Date: 02/26/14 14:45
Received Date: 02/27/14 09:02
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	0.597	J	0.638	0.191	mg/L	1		03/07/14 14:09
Surrogates								
5a Androstane	76.5		50-150		%	1		03/07/14 14:09

Batch Information

Analytical Batch: XFC11247
Analytical Method: AK102
Analyst: HM
Analytical Date/Time: 03/07/14 14:09
Container ID: 1140708001-D

Prep Batch: XXX30691
Prep Method: SW3520C
Prep Date/Time: 03/05/14 09:40
Prep Initial Wt./Vol.: 940 mL
Prep Extract Vol: 1 mL

Print Date: 03/14/2014 8:36:00AM

Results of **17628-B2MW**

Client Sample ID: **17628-B2MW**
Client Project ID: **17628 Fire Station #4**
Lab Sample ID: 1140708001
Lab Project ID: 1140708

Collection Date: 02/26/14 14:45
Received Date: 02/27/14 09:02
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	0.0436	J	0.100	0.0310	mg/L	1		03/06/14 12:06
Surrogates								
4-Bromofluorobenzene	81.4		50-150		%	1		03/06/14 12:06

Batch Information

Analytical Batch: VFC11798
Analytical Method: AK101
Analyst: HM
Analytical Date/Time: 03/06/14 12:06
Container ID: 1140708001-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
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		03/06/14 12:06
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:06
o-Xylene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:06
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		03/06/14 12:06
Toluene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:06
Surrogates								
1,4-Difluorobenzene	110		77-115		%	1		03/06/14 12:06

Batch Information

Analytical Batch: VFC11798
Analytical Method: SW8021B
Analyst: HM
Analytical Date/Time: 03/06/14 12:06
Container ID: 1140708001-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Results of **17628-B5MW**

Client Sample ID: **17628-B5MW**
Client Project ID: **17628 Fire Station #4**
Lab Sample ID: 1140708002
Lab Project ID: 1140708

Collection Date: 02/26/14 15:15
Received Date: 02/27/14 09:02
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	0.792		0.686	0.206	mg/L	1		03/07/14 14:19
Surrogates								
5a Androstane	95.4		50-150		%	1		03/07/14 14:19

Batch Information

Analytical Batch: XFC11247
Analytical Method: AK102
Analyst: HM
Analytical Date/Time: 03/07/14 14:19
Container ID: 1140708002-D

Prep Batch: XXX30691
Prep Method: SW3520C
Prep Date/Time: 03/05/14 09:40
Prep Initial Wt./Vol.: 875 mL
Prep Extract Vol: 1 mL

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Results of **17628-B5MW**

Client Sample ID: **17628-B5MW**
Client Project ID: **17628 Fire Station #4**
Lab Sample ID: 1140708002
Lab Project ID: 1140708

Collection Date: 02/26/14 15:15
Received Date: 02/27/14 09:02
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	0.0452	J	0.100	0.0310	mg/L	1		03/06/14 12:25
Surrogates								
4-Bromofluorobenzene	83.6		50-150		%	1		03/06/14 12:25

Batch Information

Analytical Batch: VFC11798
Analytical Method: AK101
Analyst: HM
Analytical Date/Time: 03/06/14 12:25
Container ID: 1140708002-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.150	J	0.500	0.150	ug/L	1		03/06/14 12:25
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:25
o-Xylene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:25
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		03/06/14 12:25
Toluene	0.500	U	1.00	0.310	ug/L	1		03/06/14 12:25
Surrogates								
1,4-Difluorobenzene	110		77-115		%	1		03/06/14 12:25

Batch Information

Analytical Batch: VFC11798
Analytical Method: SW8021B
Analyst: HM
Analytical Date/Time: 03/06/14 12:25
Container ID: 1140708002-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 03/14/2014 8:36:00AM

Results of **17628-WTB**

Client Sample ID: **17628-WTB**
Client Project ID: **17628 Fire Station #4**
Lab Sample ID: 1140708003
Lab Project ID: 1140708

Collection Date: 02/26/14 10:00
Received Date: 02/27/14 09:02
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	0.0441	J	0.100	0.0310	mg/L	1		03/06/14 11:29
Surrogates								
4-Bromofluorobenzene	81.6		50-150		%	1		03/06/14 11:29

Batch Information

Analytical Batch: VFC11798
Analytical Method: AK101
Analyst: HM
Analytical Date/Time: 03/06/14 11:29
Container ID: 1140708003-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
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		03/06/14 11:29
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		03/06/14 11:29
o-Xylene	0.500	U	1.00	0.310	ug/L	1		03/06/14 11:29
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		03/06/14 11:29
Toluene	0.500	U	1.00	0.310	ug/L	1		03/06/14 11:29
Surrogates								
1,4-Difluorobenzene	112		77-115		%	1		03/06/14 11:29

Batch Information

Analytical Batch: VFC11798
Analytical Method: SW8021B
Analyst: HM
Analytical Date/Time: 03/06/14 11:29
Container ID: 1140708003-B

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 03/06/14 08:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 03/14/2014 8:36:00AM

Method Blank

Blank ID: MB for HBN 1507961 [VXX/25661]
Blank Lab ID: 1200727

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1140708001, 1140708002, 1140708003

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0413J	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene	82.4	50-150		%

Batch Information

Analytical Batch: VFC11798
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: HM
Analytical Date/Time: 3/6/2014 9:55:01AM

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 3/6/2014 8:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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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 1140708 [VXX25661]
Blank Spike Lab ID: 1200729
Date Analyzed: 03/06/2014 10:51

Spike Duplicate ID: LCSD for HBN 1140708 [VXX25661]
Spike Duplicate Lab ID: 1200731
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1140708001, 1140708002, 1140708003

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	0.857	86	1.00	0.872	87	(60-120)	1.80	(< 20)
Surrogates									
4-Bromofluorobenzene	0.0500	90.3	90	0.0500	84.5	85	(50-150)	6.60	

Batch Information

Analytical Batch: **VFC11798**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **HM**

Prep Batch: **VXX25661**
Prep Method: **SW5030B**
Prep Date/Time: **03/06/2014 08:00**
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 1507961 [VXX/25661]
Blank Lab ID: 1200727

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1140708001, 1140708002, 1140708003

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	111	77-115		%

Batch Information

Analytical Batch: VFC11798
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: HM
Analytical Date/Time: 3/6/2014 9:55:01AM

Prep Batch: VXX25661
Prep Method: SW5030B
Prep Date/Time: 3/6/2014 8:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1140708 [VXX25661]
Blank Spike Lab ID: 1200728
Date Analyzed: 03/06/2014 10:33

Spike Duplicate ID: LCSD for HBN 1140708 [VXX25661]
Spike Duplicate Lab ID: 1200730
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1140708001, 1140708002, 1140708003

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	111	111	100	109	109	(80-120)	1.50	(< 20)
Ethylbenzene	100	104	104	100	102	102	(75-125)	2.10	(< 20)
o-Xylene	100	104	104	100	104	104	(80-120)	0.27	(< 20)
P & M -Xylene	200	208	104	200	206	103	(75-130)	0.84	(< 20)
Toluene	100	105	105	100	102	102	(75-120)	2.20	(< 20)
Surrogates									
1,4-Difluorobenzene	50	117	117	* 50	116	116	* (77-115)	0.75	

Batch Information

Analytical Batch: **VFC11798**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **HM**

Prep Batch: **VXX25661**
Prep Method: **SW5030B**
Prep Date/Time: **03/06/2014 08:00**
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 1507667 [XXX/30691]
Blank Lab ID: 1200528

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1140708001, 1140708002

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	0.185J	0.600	0.180	mg/L
Surrogates				
5a Androstane	95.1	60-120		%

Batch Information

Analytical Batch: XFC11247
Analytical Method: AK102
Instrument: HP 6890 Series II FID SV D F
Analyst: HM
Analytical Date/Time: 3/7/2014 1:39:00PM

Prep Batch: XXX30691
Prep Method: SW3520C
Prep Date/Time: 3/5/2014 9:40:00AM
Prep Initial Wt./Vol.: 1000 mL
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1140708 [XXX30691]
Blank Spike Lab ID: 1200529
Date Analyzed: 03/07/2014 13:49

Spike Duplicate ID: LCSD for HBN 1140708 [XXX30691]
Spike Duplicate Lab ID: 1200530
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1140708001, 1140708002

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	5	4.52	90	5	4.57	91	(75-125)	0.96	(< 20)
Surrogates									
5a Androstane	0.1	106	106	0.1	108	108	(60-120)	1.70	

Batch Information

Analytical Batch: **XFC11247**
Analytical Method: **AK102**
Instrument: **HP 6890 Series II FID SV D F**
Analyst: **HM**

Prep Batch: **XXX30691**
Prep Method: **SW3520C**
Prep Date/Time: **03/05/2014 09:40**
Spike Init Wt./Vol.: 5 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 5 mg/L Extract Vol: 1 mL

SGS North America Inc.
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t 907.562.2343 f 907.561.5301 www.us.sgs.com

1140708

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN-OF-CUSTODY RECORD

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2255 S.W. Canyon Road
Portland, OR 97201-2498
(503) 223-6147

1200 17th Street, Suite 1024
Denver, Co 80202
(303) 825-3800

Laboratory SGS
Attn: Steve Crupi

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	GRO (AK101)	BTEX (8021B)	DRO (AK102)				Total Number of Containers	Remarks/Matrix
17628-B2MW	①A-E	1445	2/26/14		X	X	X	X				5	Groundwater
17628-B5MW	②A-E	1515	↓		X	X	X	X				5	"
17628-WTB	③A-C	1000				X	X					1box	trip blank.

Project Information	Sample Receipt
Project Number: 17628	Total Number of Containers
Project Name: Fire Station #4	COC Seals/Intact? Y/N/NA
Contact: Jennifer Simmons Dane Palmer	Received Good Cond/Cold 1.8° #241
Ongoing Project? Yes ☒ No ☐	Delivery Method:
Sampler: Dane Palmer	(attach shipping bill, if any)

Instructions	
Requested Turnaround Time:	Standard
Special Instructions:	

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 902	Signature: Time:	Signature: Time:
Printed Name: Dane Palmer Date: 2/27/14	Printed Name: Date:	Printed Name: Date:
Company: SWI	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time:	Signature: Time:	Signature: Time: 0902
Printed Name: Date:	Printed Name: Date:	Printed Name: Justin A. Nelson Date: 2/27/14
Company:	Company:	Company: SGS - Anchorage

Distribution: White - w/shipment - returned to Shannon & Wilson w/ laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. 30106

SGS

1140708

SAMPLE RECEIPT FORM

Review Criteria:	Condition:	Comments/Action Taken:
Were **custody seals** intact? Note # & location, if applicable. COC accompanied samples?	Yes No (N/A) (Yes) No N/A	
Temperature blank compliant* (i.e., 0-6°C after CF)? * *Note: Exemption permitted for chilled samples collected less than 8 hours ago.* Cooler ID: 1 @ 1.8° w/ Therm.ID: 241 Cooler ID: ~~@ w/ Therm.ID:~~ Cooler ID: @ ~~w/ Therm.ID:~~ Cooler ID: @ w/ Therm.ID: Cooler ID: @ w/ Therm.ID: JM 2/24 *Note: If non-compliant, use form FS-0029 to document affected samples/analyses.* If samples are 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." **If temperature(s) <0°C, were all sample containers ice free?**	(Yes) No N/A Yes No (N/A)	
Delivery method (specify all that apply): (Client) USPS Alert Courier C&D Delivery ~~AK Air~~ Lynden Carlile ERA PenAir FedEx UPS NAC Other: → *For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?*	Note ABN/ tracking # See Attached or (N/A) Yes No (N/A)	
→ For samples received with payment, note amount ($) and cash / check / CC (**circle one**) or note: → For samples **received in FBKS**, ANCH staff will verify all criteria are reviewed.		(N/A) SRF Initiated by: (N/A)
Were samples received within hold time? *Note: Refer to form F-083 "Sample Guide" for hold time information.* Do samples **match COC*** (i.e., sample IDs, dates/times collected)? * *Note: Exemption permitted if times differ <1hr; in that case, use times on COC.* Were analyses requested unambiguous?	(Yes) No N/A (Yes) No N/A (Yes) No N/A	
Were samples in **good condition** (no leaks/cracks/breakage)? Packing material used (specify all that apply): (Bubble Wrap) Separate plastic bags Vermiculite Other:	(Yes) No N/A	
Were all VOA vials **free of headspace** (i.e., bubbles ≤6 mm)? Were all soil VOAs **field extracted** with MeOH+BFB?	(Yes) No N/A Yes No (N/A)	
Were **proper containers** (type/mass/volume/preservative*) used? * *Note: Exemption permitted for waters to be analyzed for metals.* Were **Trip Blanks** (i.e., VOAs, LL-Hg) in cooler with samples?	(Yes) No N/A (Yes) No N/A	
For **special handling** (e.g., "MI" or foreign soils, lab filter, limited volume, Ref Lab), were bottles/paperwork flagged (e.g., sticker)?	Yes No (N/A)	
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was **pH verified and compliant**? If pH was adjusted, were bottles flagged (i.e., stickers)?	(Yes) No N/A Yes No (N/A)	
For **RUSH/SHORT Hold Time**, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	Yes No (N/A)	
For **SITE-SPECIFIC QC, e.g. BMS/BMSD/BDUP**, were containers / paperwork flagged accordingly?	Yes No (N/A)	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	Yes No (N/A)	SRF Completed by: JM PM = (N/A)
Was **PEER REVIEW** of ***sample numbering/labeling completed?***	Yes No (N/A)	Peer Reviewed by: (N/A)
Additional notes (if applicable):		

Note to Client: *Any "no" circled above indicates non-compliance with standard procedures and may impact data quality.*

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1140708001-A	HCL to pH < 2	OK			
1140708001-B	HCL to pH < 2	OK			
1140708001-C	HCL to pH < 2	OK			
1140708001-D	HCL to pH < 2	OK			
1140708001-E	HCL to pH < 2	OK			
1140708002-A	HCL to pH < 2	OK			
1140708002-B	HCL to pH < 2	OK			
1140708002-C	HCL to pH < 2	OK			
1140708002-D	HCL to pH < 2	OK			
1140708002-E	HCL to pH < 2	OK			
1140708003-A	HCL to pH < 2	OK			
1140708003-B	HCL to pH < 2	OK			
1140708003-C	HCL to pH < 2	OK			

Container Condition Glossary

OK - The container was received at an acceptable pH for the analysis requested.

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.

BU - The container was received with headspace greater than 6mm.

LABORATORY DATA REVIEW CHECKLIST

Completed by: Dane Palmer
Title: Environmental Engineer, E.I.T.
Date: March 20, 2014

CS Report Name: Semi-Annual Groundwater Monitoring, Fire Station No. 4, 4350 MacInnes Street, Anchorage, Alaska
Laboratory Report Date: March 14, 2014

Consultant Firm: Shannon & Wilson, Inc.

Laboratory Name: SGS North America Inc.
Laboratory Report Number: 1140708

ADEC File Number: 2100.26.315
ADEC RecKey Number: *NA*
(**NOTE**: ***NA*** = not applicable; Text in *italics* added by Shannon & Wilson, Inc.)

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: *The cooler temperature was 1.8° C.*

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: *The laboratory noted that the samples were in good condition.*

d. If there were any discrepancies, were they documented? – For example, incorrect sample containers/preservation, sample temperature outside acceptance range, insufficient or missing samples, etc.? **Yes / No / NA** (please explain)
Comments: *No discrepancies were documented by the laboratory.*

e. Data quality or usability affected? Please explain. **NA**
Comments: *A sample temperature of 1.8° C is within acceptable range according to the project laboratory. No ice was present in the sample bottles.*

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: *LCS/LCSD recoveries for 1,4-Difluorobenzene (surrogate for Method SW 8260B) did not meet QC criteria (biased high) all associated samples met QC criteria.*

c. Were corrective actions documented? **Yes / No / NA** (please explain)
Comments:

d. What is the effect on data quality/usability, according to the case narrative? **NA**
Comments: *Project samples were not affected since sample surrogate recoveries were within laboratory limits.*

5. Sample 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 LOQs less than the Cleanup Level or the minimum required detection level for the project? **Yes / No / NA** (please explain)
Comments:

e. Data quality or usability affected? Please explain. **NA**
Comments:

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 LOQ? **Yes / No / NA** (please explain)
Comments: *Estimated concentrations of GRO (0.0413 J mg/L) and DRO (0.185 J mg/L) were detected in the method blank at concentrations below the laboratory LOQ. The samples associated with the method blank detections are "B" flagged when the reported sample concentration is within 10x the reported method blank concentration. If both the sample and method blank concentrations are reported at levels less than the LOQ, the sample concentration is reported as non-detect at the LOQ. If the reported sample concentration is greater than the LOQ and less than 5x the method blank concentration, the sample concentration is reported as non-detect at the detected sample concentration. If the sample concentration is greater than 5x the method blank concentration and less than or equal to 10x the method blank concentration, the sample concentration is reported at the detected sample concentration. If the sample concentration is greater than 10x the method blank concentration, the sample is reported at the detected concentration and is not flagged*

iii. If above LOQ, what samples are affected? ***NA***
Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
Yes / No / NA (please explain)
Comments: *Potentially impacted samples are flagged with a "B" in Table 3.*

v. Data quality or usability affected? Please explain. **Yes**
Comments: *Each of the affected sample results are less than the ADEC cleanup level; therefore the affected data is acceptable for the purposes of this report.*

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: *The 1,4-Difluorobenzene (EPA 8021B) surrogate recovery did not meet QC criteria (biased high).*

iv. Precision – All relative percent differences (RPDs) 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? **NA**
Comments: *Each project sample is potentially affected.*

vi. Do the affected samples(s) have data flags? If so, are the data flags clearly defined? **Yes / No / NA** (please explain)
Comments:

vii. Data quality or usability affected? Please explain. **No**
Comments: *Project sample surrogate recoveries were within QC goals. Therefore, the project samples are not impacted.*

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:

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:

iv. Data quality or usability affected? Please explain. **No**
Comments:

d. Trip Blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.)
Water and Soil

i. One trip blank reported per matrix, analysis and cooler? (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 stating why must be entered below.) **Yes / No / NA** (please explain)
Comments: *The samples were stored and transported in one cooler.*

iii. All results less than LOQ? **Yes / No / NA** (please explain)
Comments: *Although less than the LOQ, GRO was detected in the trip blank at an estimated (J-flagged) concentration of 0.0441mg/L. The samples associated with the trip blank detections are "B" flagged when the reported sample concentration is within 10x the reported trip blank concentration. If both the sample and trip blank concentrations are reported at levels less than the LOQ, the sample concentration is reported as non-detect at the LOQ. If the reported sample concentration is greater than the LOQ and less than 5x the trip blank concentration, the sample concentration is reported as non-detect at the detected sample concentration. If the sample concentration is greater than 5x the trip blank concentration and less than or equal to 10x the trip blank concentration, the sample concentration is reported at the detected sample concentration. If the sample concentration is greater than 10x the trip blank concentration, the sample is reported at the detected concentration and is not flagged. Note that because the trip blank concentration and the method blank concentration are reported at levels less than the LOQ, the trip blank concentration is reported as non-detect at the LOQ.*

iv. If above LOQ, what samples are affected? **NA**
Comments**:**

v. Data quality or usability affected? Please explain. **NA**
Comments: *Each of the affected sample results are less than the ADEC cleanup level; therefore the affected data is acceptable for the purposes of this report.*

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
Yes / No / NA (please explain)
Comments: *A water duplicate sample designated MW-5 was collected from Well MW-2.*

ii. Submitted blind to the lab? **Yes / No / NA** (please explain)
Comments:

iii. Precision – All relative percent differences (RPDs) less than specified DQOs?
(Recommended: 30% for water, 50% for soil) **Yes / No / NA** (please explain)
Comments:

iv. Data quality or usability affected? Please explain. **NA**
Comments:

f. Decontamination or Equipment Blank
Yes / No / NA (please explain)
Comments: *Equipment blanks were not part of the work plan scope.*

i. All results less than LOQ? **Yes / No / NA** (please explain)
Comments:

ii. If above LOQ, what samples are affected? **NA**
Comments:

iii. Data quality or usability affected? Please explain.
Comments: *The data is usable. Dedicated disposable tubing was used and the pump was decontaminated.*

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab-specific, etc.)

a. Defined and appropriate? **Yes / No / NA** (please explain)
Comments: *A key is provided on page 3 of the laboratory report.*

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Anchorage
2000 West International Airport Road
Suite A10
Anchorage, AK 99502-1119
Tel: (907)563-9200

TestAmerica Job ID: 230-229-1
Client Project/Site: MOA FS No.4

For:
Shannon & Wilson
5430 Fairbanks Street
Suite 3
Anchorage, Alaska 99518-1263

Attn: Jennifer Simmons

Authorized for release by:
8/6/2014 5:13:01 PM

Steve Crupi, Project Manager II
(253)248-4961
steve.crupi@testamericainc.com

Table of Contents

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
E	Result exceeded calibration range.

GC Semi VOA

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 230-229-1

Laboratory: TestAmerica Anchorage

Narrative

Job Narrative
230-229-1

Receipt
The samples were received on 7/30/2014 3:37 PM. The samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 8.8º C.

GC/MS VOA
Method AK101: The method blank for batch 873 contained Gasoline Range Organics (GRO) above the method detection limit. Since the blank concentration was less than the reporting limit (RL), reanalysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC Semi VOA
Method AK102: The method blank for batch 860 contained Diesel Range Organics (DRO) above the method detection limit. Since the blank concentration was less than the reporting limit (RL), re-extraction and re-analysis of samples were not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Client Sample ID: 17628-B1MW — Lab Sample ID: 230-229-1

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Benzene - DL	7690		50.0	6.40	ug/L	100		8260B	Total/NA
Ethylbenzene - DL	2400		100	5.04	ug/L	100		8260B	Total/NA
Xylenes, Total - DL	15600		100	25.0	ug/L	100		8260B	Total/NA
o-Xylene - DL	4230		100	5.09	ug/L	100		8260B	Total/NA
m,p-Xylene - DL	11400		200	8.46	ug/L	100		8260B	Total/NA
Toluene - DL2	29700		1000	56.6	ug/L	1000		8260B	Total/NA
Gasoline Range Organics (GRO) -C6-C10 - DL	138000	B	5000	846	ug/L	100		AK101	Total/NA
C10-C25	18.1	B	0.410	0.123	mg/L	1		AK102	Total/NA

Client Sample ID: 17628-B2MW — Lab Sample ID: 230-229-2

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Gasoline Range Organics (GRO) -C6-C10	19.4	J B	50.0	8.46	ug/L	1		AK101	Total/NA
C10-C25	0.312	J B	0.424	0.127	mg/L	1		AK102	Total/NA

Client Sample ID: 17628-B5MW — Lab Sample ID: 230-229-3

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Benzene	0.701		0.500	0.0640	ug/L	1		8260B	Total/NA
Ethylbenzene	0.526	J	1.00	0.0504	ug/L	1		8260B	Total/NA
Toluene	3.83		1.00	0.0566	ug/L	1		8260B	Total/NA
Xylenes, Total	3.16		1.00	0.250	ug/L	1		8260B	Total/NA
m,p-Xylene	3.16		2.00	0.0846	ug/L	1		8260B	Total/NA
Gasoline Range Organics (GRO) -C6-C10	37.3	J B	50.0	8.46	ug/L	1		AK101	Total/NA
C10-C25	0.357	J B	0.420	0.126	mg/L	1		AK102	Total/NA

Client Sample ID: 17628-TBW — Lab Sample ID: 230-229-4

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Ethylbenzene	0.327	J	1.00	0.0504	ug/L	1		8260B	Total/NA
Toluene	2.27		1.00	0.0566	ug/L	1		8260B	Total/NA
Xylenes, Total	2.11		1.00	0.250	ug/L	1		8260B	Total/NA
m,p-Xylene	2.11		2.00	0.0846	ug/L	1		8260B	Total/NA
Gasoline Range Organics (GRO) -C6-C10	31.6	J B	50.0	8.46	ug/L	1		AK101	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 17628-B1MW
Date Collected: 07/30/14 14:35
Date Received: 07/30/14 15:37

Lab Sample ID: 230-229-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	7690		50.0	6.40	ug/L			08/01/14 14:17	100
Ethylbenzene	2400		100	5.04	ug/L			08/01/14 14:17	100
Xylenes, Total	15600		100	25.0	ug/L			08/01/14 14:17	100
o-Xylene	4230		100	5.09	ug/L			08/01/14 14:17	100
m,p-Xylene	11400		200	8.46	ug/L			08/01/14 14:17	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*57.8 - 139*		*08/01/14 14:17*	*100*
Dibromofluoromethane (Surr)	*106*		*35.8 - 145*		*08/01/14 14:17*	*100*
Toluene-d8 (Surr)	*100*		*38.6 - 147*		*08/01/14 14:17*	*100*

Method: 8260B - Volatile Organic Compounds (GC/MS) - DL2

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	29700		1000	56.6	ug/L			08/04/14 21:40	1000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*57.8 - 139*		*08/04/14 21:40*	*1000*
Dibromofluoromethane (Surr)	*96*		*35.8 - 145*		*08/04/14 21:40*	*1000*
Toluene-d8 (Surr)	*100*		*38.6 - 147*		*08/04/14 21:40*	*1000*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	138000	B	5000	846	ug/L			08/01/14 14:17	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*80 - 120*		*08/01/14 14:17*	*100*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*08/04/14 21:40*	*1000*
Dibromofluoromethane (Surr)	*106*		*72.7 - 135*		*08/01/14 14:17*	*100*
Dibromofluoromethane (Surr)	*96*		*72.7 - 135*		*08/04/14 21:40*	*1000*
Toluene-d8 (Surr)	*100*		*72.4 - 121*		*08/01/14 14:17*	*100*
Toluene-d8 (Surr)	*100*		*72.4 - 121*		*08/04/14 21:40*	*1000*

Method: AK102 - DRO

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C25	18.1	B	0.410	0.123	mg/L		07/31/14 10:16	08/04/14 18:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*91*		*50 - 150*	*07/31/14 10:16*	*08/04/14 18:36*	*1*

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Client Sample ID: 17628-B2MW
Date Collected: 07/30/14 12:30
Date Received: 07/30/14 15:37

Lab Sample ID: 230-229-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500	0.0640	ug/L			08/01/14 13:45	1
Ethylbenzene	ND		1.00	0.0504	ug/L			08/01/14 13:45	1
Toluene	ND		1.00	0.0566	ug/L			08/01/14 13:45	1
Xylenes, Total	ND		1.00	0.250	ug/L			08/01/14 13:45	1
o-Xylene	ND		1.00	0.0509	ug/L			08/01/14 13:45	1
m,p-Xylene	ND		2.00	0.0846	ug/L			08/01/14 13:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*96*		*57.8 - 139*		*08/01/14 13:45*	*1*
Dibromofluoromethane (Surr)	*107*		*35.8 - 145*		*08/01/14 13:45*	*1*
Toluene-d8 (Surr)	*100*		*38.6 - 147*		*08/01/14 13:45*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	**19.4**	**J B**	50.0	8.46	ug/L			08/01/14 13:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*96*		*80 - 120*		*08/01/14 13:45*	*1*
Dibromofluoromethane (Surr)	*107*		*72.7 - 135*		*08/01/14 13:45*	*1*
Toluene-d8 (Surr)	*100*		*72.4 - 121*		*08/01/14 13:45*	*1*

Method: AK102 - DRO

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C25	**0.312**	**J B**	0.424	0.127	mg/L		07/31/14 10:16	08/04/14 20:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*97*		*50 - 150*	*07/31/14 10:16*	*08/04/14 20:13*	*1*

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Client Sample ID: 17628-B5MW
Date Collected: 07/30/14 12:35
Date Received: 07/30/14 15:37

Lab Sample ID: 230-229-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.701		0.500	0.0640	ug/L			08/01/14 01:33	1
Ethylbenzene	0.526	J	1.00	0.0504	ug/L			08/01/14 01:33	1
Toluene	3.83		1.00	0.0566	ug/L			08/01/14 01:33	1
Xylenes, Total	3.16		1.00	0.250	ug/L			08/01/14 01:33	1
o-Xylene	ND		1.00	0.0509	ug/L			08/01/14 01:33	1
m,p-Xylene	3.16		2.00	0.0846	ug/L			08/01/14 01:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*57.8 - 139*		*08/01/14 01:33*	*1*
Dibromofluoromethane (Surr)	*100*		*35.8 - 145*		*08/01/14 01:33*	*1*
Toluene-d8 (Surr)	*100*		*38.6 - 147*		*08/01/14 01:33*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	37.3	J B	50.0	8.46	ug/L			08/01/14 01:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*80 - 120*		*08/01/14 01:33*	*1*
Dibromofluoromethane (Surr)	*100*		*72.7 - 135*		*08/01/14 01:33*	*1*
Toluene-d8 (Surr)	*100*		*72.4 - 121*		*08/01/14 01:33*	*1*

Method: AK102 - DRO

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C25	0.357	J B	0.420	0.126	mg/L		07/31/14 10:16	08/04/14 20:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*100*		*50 - 150*	*07/31/14 10:16*	*08/04/14 20:45*	*1*

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Client Sample ID: 17628-TBW
Date Collected: 07/30/14 00:00
Date Received: 07/30/14 15:37

Lab Sample ID: 230-229-4
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500	0.0640	ug/L			08/01/14 02:05	1
Ethylbenzene	**0.327**	**J**	1.00	0.0504	ug/L			08/01/14 02:05	1
Toluene	**2.27**		1.00	0.0566	ug/L			08/01/14 02:05	1
Xylenes, Total	**2.11**		1.00	0.250	ug/L			08/01/14 02:05	1
o-Xylene	ND		1.00	0.0509	ug/L			08/01/14 02:05	1
m,p-Xylene	**2.11**		2.00	0.0846	ug/L			08/01/14 02:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*57.8 - 139*		*08/01/14 02:05*	*1*
Dibromofluoromethane (Surr)	*99*		*35.8 - 145*		*08/01/14 02:05*	*1*
Toluene-d8 (Surr)	*100*		*38.6 - 147*		*08/01/14 02:05*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	**31.6**	**J B**	50.0	8.46	ug/L			08/01/14 02:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*80 - 120*		*08/01/14 02:05*	*1*
Dibromofluoromethane (Surr)	*99*		*72.7 - 135*		*08/01/14 02:05*	*1*
Toluene-d8 (Surr)	*100*		*72.4 - 121*		*08/01/14 02:05*	*1*

Surrogate Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)								
		BFB	DBFM	TOL	TFT					
Lab Sample ID	Client Sample ID	(57.8-139)	(35.8-145)	(38.6-147)						
230-229-1 - DL	17628-B1MW	97	106	100						
230-229-1 - DL2	17628-B1MW	101	96	100						
230-229-2	17628-B2MW	96	107	100						
230-229-2 DU	17628-B2MW	97	101	100						
230-229-3	17628-B5MW	97	100	100						
230-229-4	17628-TBW	98	99	100						
230-232-A-1 DU	Duplicate	102	96	101						
LCS 230-865/1009	Lab Control Sample	102	98	103	108					
LCS 230-874/1012	Lab Control Sample	105	97	103	106					
LCSD 230-865/10	Lab Control Sample Dup	101	101	102	105					
LCSD 230-874/13	Lab Control Sample Dup	101	100	102	107					
MB 230-865/14	Method Blank	99	96	99						
MB 230-874/17	Method Blank	103	98	102						

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)
TFT = Trifluorotoluene (Surr)

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)								
		BFB	DBFM	TOL	TFT					
Lab Sample ID	Client Sample ID	(80-120)	(72.7-135)	(72.4-121)						
230-229-1 - DL	17628-B1MW	97	106	100						
230-229-1 - DL	17628-B1MW	101	96	100						
230-229-2	17628-B2MW	96	107	100						
230-229-2 DU	17628-B2MW	97	101	100						
230-229-3	17628-B5MW	97	100	100						
230-229-4	17628-TBW	98	99	100						
230-232-A-1 DU	Duplicate	102	96	101						
LCS 230-864/1011	Lab Control Sample	100	100	102	93					
LCS 230-873/1014	Lab Control Sample	101	99	100	109					
LCSD 230-864/12	Lab Control Sample Dup	100	99	100	97					
LCSD 230-873/15	Lab Control Sample Dup	101	98	99	110					
MB 230-864/14	Method Blank	99	96	99						
MB 230-873/17	Method Blank	103	98	102						

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)
TFT = Trifluorotoluene (Surr)

Surrogate Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Method: AK102 - DRO

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)								
		1COD								
Lab Sample ID	Client Sample ID	(50-150)								
230-229-1	17628-B1MW	91								
230-229-1 DU	17628-B1MW	100								
230-229-2	17628-B2MW	97								
230-229-3	17628-B5MW	100								
LCS 230-860/2-A	Lab Control Sample	93								
LCSD 230-860/3-A	Lab Control Sample Dup	94								
MB 230-860/1-A	Method Blank	96								

Surrogate Legend

1COD = 1-Chlorooctadecane

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 230-865/14
Matrix: Water
Analysis Batch: 865

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500	0.0640	ug/L			07/31/14 23:25	1
Ethylbenzene	ND		1.00	0.0504	ug/L			07/31/14 23:25	1
Toluene	ND		1.00	0.0566	ug/L			07/31/14 23:25	1
Xylenes, Total	ND		1.00	0.250	ug/L			07/31/14 23:25	1
o-Xylene	ND		1.00	0.0509	ug/L			07/31/14 23:25	1
m,p-Xylene	ND		2.00	0.0846	ug/L			07/31/14 23:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*57.8 - 139*		*07/31/14 23:25*	*1*
Dibromofluoromethane (Surr)	*96*		*35.8 - 145*		*07/31/14 23:25*	*1*
Toluene-d8 (Surr)	*99*		*38.6 - 147*		*07/31/14 23:25*	*1*

Lab Sample ID: LCS 230-865/1009
Matrix: Water
Analysis Batch: 865

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene			20.0	20.33		ug/L		102	73.8 - 128		
Ethylbenzene			20.0	21.11		ug/L		106	78 - 130		
Toluene			20.0	20.81		ug/L		104	75.6 - 124		
Xylenes, Total			60.0	61.30		ug/L		102	70 - 130		
o-Xylene			20.0	19.41		ug/L		97	75.1 - 137		
m,p-Xylene			40.0	41.89		ug/L		105	76 - 137		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*57.8 - 139*
Dibromofluoromethane (Surr)	*98*		*35.8 - 145*
Toluene-d8 (Surr)	*103*		*38.6 - 147*
Trifluorotoluene (Surr)	*108*		

Lab Sample ID: LCSD 230-865/10
Matrix: Water
Analysis Batch: 865

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			20.0	18.95		ug/L		95	73.8 - 128	7	20
Ethylbenzene			20.0	19.46		ug/L		97	78 - 130	8	20
Toluene			20.0	19.54		ug/L		98	75.6 - 124	6	20
Xylenes, Total			60.0	56.81		ug/L		95	70 - 130	8	20
o-Xylene			20.0	18.11		ug/L		91	75.1 - 137	7	20
m,p-Xylene			40.0	38.70		ug/L		97	76 - 137	8	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*57.8 - 139*
Dibromofluoromethane (Surr)	*101*		*35.8 - 145*
Toluene-d8 (Surr)	*102*		*38.6 - 147*
Trifluorotoluene (Surr)	*105*		

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 230-229-2 DU
Matrix: Water
Analysis Batch: 865

Client Sample ID: 17628-B2MW
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Benzene	ND			1.068		ug/L				NC	20
Ethylbenzene	ND			1.020		ug/L				NC	20
Toluene	ND			6.990		ug/L				NC	20
Xylenes, Total	ND			6.133		ug/L				NC	20
o-Xylene	ND			ND		ug/L				NC	20
m,p-Xylene	ND			6.133		ug/L				NC	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*97*		*57.8 - 139*
Dibromofluoromethane (Surr)	*101*		*35.8 - 145*
Toluene-d8 (Surr)	*100*		*38.6 - 147*

Lab Sample ID: MB 230-874/17
Matrix: Water
Analysis Batch: 874

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500	0.0640	ug/L			08/04/14 21:08	1
Ethylbenzene	ND		1.00	0.0504	ug/L			08/04/14 21:08	1
Toluene	ND		1.00	0.0566	ug/L			08/04/14 21:08	1
Xylenes, Total	ND		1.00	0.250	ug/L			08/04/14 21:08	1
o-Xylene	ND		1.00	0.0509	ug/L			08/04/14 21:08	1
m,p-Xylene	ND		2.00	0.0846	ug/L			08/04/14 21:08	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*57.8 - 139*		*08/04/14 21:08*	*1*
Dibromofluoromethane (Surr)	*98*		*35.8 - 145*		*08/04/14 21:08*	*1*
Toluene-d8 (Surr)	*102*		*38.6 - 147*		*08/04/14 21:08*	*1*

Lab Sample ID: LCS 230-874/1012
Matrix: Water
Analysis Batch: 874

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene			20.0	20.13		ug/L		101	73.8 - 128		
Ethylbenzene			20.0	20.44		ug/L		102	78 - 130		
Toluene			20.0	21.03		ug/L		105	75.6 - 124		
Xylenes, Total			60.0	60.49		ug/L		101	70 - 130		
o-Xylene			20.0	19.39		ug/L		97	75.1 - 137		
m,p-Xylene			40.0	41.10		ug/L		103	76 - 137		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*105*		*57.8 - 139*
Dibromofluoromethane (Surr)	*97*		*35.8 - 145*
Toluene-d8 (Surr)	*103*		*38.6 - 147*
Trifluorotoluene (Surr)	*106*		

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 230-874/13
Matrix: Water
Analysis Batch: 874

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			20.0	20.31		ug/L		102	73.8 - 128	1	20
Ethylbenzene			20.0	20.62		ug/L		103	78 - 130	1	20
Toluene			20.0	21.29		ug/L		106	75.6 - 124	1	20
Xylenes, Total			60.0	60.68		ug/L		101	70 - 130	0	20
o-Xylene			20.0	19.49		ug/L		97	75.1 - 137	1	20
m,p-Xylene			40.0	41.19		ug/L		103	76 - 137	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*57.8 - 139*
Dibromofluoromethane (Surr)	*100*		*35.8 - 145*
Toluene-d8 (Surr)	*102*		*38.6 - 147*
Trifluorotoluene (Surr)	*107*		

Lab Sample ID: 230-232-A-1 DU
Matrix: Water
Analysis Batch: 874

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte		Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Benzene		606			616.6	E	ug/L				2	20
Ethylbenzene		11.3			11.54		ug/L				2	20
Toluene		1.86			1.995		ug/L				7	20
Xylenes, Total		278			283.5		ug/L				2	20
o-Xylene		ND			ND		ug/L				NC	20
m,p-Xylene		278			283.5		ug/L				2	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*57.8 - 139*
Dibromofluoromethane (Surr)	*96*		*35.8 - 145*
Toluene-d8 (Surr)	*101*		*38.6 - 147*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS)

Lab Sample ID: MB 230-864/14
Matrix: Water
Analysis Batch: 864

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	13.75	J	50.0	8.46	ug/L			07/31/14 23:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*07/31/14 23:25*	*1*
Dibromofluoromethane (Surr)	*96*		*72.7 - 135*		*07/31/14 23:25*	*1*
Toluene-d8 (Surr)	*99*		*72.4 - 121*		*07/31/14 23:25*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS) (Continued)

Lab Sample ID: LCS 230-864/1011
Matrix: Water
Analysis Batch: 864

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Gasoline Range Organics (GRO) -C6-C10			500	420.1		ug/L		84	60 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*
Dibromofluoromethane (Surr)	*100*		*72.7 - 135*
Toluene-d8 (Surr)	*102*		*72.4 - 121*
Trifluorotoluene (Surr)	*93*		

Lab Sample ID: LCSD 230-864/12
Matrix: Water
Analysis Batch: 864

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Gasoline Range Organics (GRO) -C6-C10			500	440.1		ug/L		88	60 - 120	5	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*72.7 - 135*
Toluene-d8 (Surr)	*100*		*72.4 - 121*
Trifluorotoluene (Surr)	*97*		

Lab Sample ID: 230-229-2 DU
Matrix: Water
Analysis Batch: 864

Client Sample ID: 17628-B2MW
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Gasoline Range Organics (GRO) -C6-C10	19.4	J B		70.90		ug/L				114	

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*97*		*80 - 120*
Dibromofluoromethane (Surr)	*101*		*72.7 - 135*
Toluene-d8 (Surr)	*100*		*72.4 - 121*

Lab Sample ID: MB 230-873/17
Matrix: Water
Analysis Batch: 873

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	27.38	J	50.0	8.46	ug/L			08/04/14 21:08	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*08/04/14 21:08*	*1*
Dibromofluoromethane (Surr)	*98*		*72.7 - 135*		*08/04/14 21:08*	*1*
Toluene-d8 (Surr)	*102*		*72.4 - 121*		*08/04/14 21:08*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC/MS) (Continued)

Lab Sample ID: LCS 230-873/1014
Matrix: Water
Analysis Batch: 873

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Gasoline Range Organics (GRO) -C6-C10			500	478.4		ug/L		96	60 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*72.7 - 135*
Toluene-d8 (Surr)	*100*		*72.4 - 121*
Trifluorotoluene (Surr)	*109*		

Lab Sample ID: LCSD 230-873/15
Matrix: Water
Analysis Batch: 873

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Gasoline Range Organics (GRO) -C6-C10			500	445.9		ug/L		89	60 - 120	7	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*
Dibromofluoromethane (Surr)	*98*		*72.7 - 135*
Toluene-d8 (Surr)	*99*		*72.4 - 121*
Trifluorotoluene (Surr)	*110*		

Lab Sample ID: 230-232-A-1 DU
Matrix: Water
Analysis Batch: 873

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Gasoline Range Organics (GRO) -C6-C10	2140	B		2156		ug/L				0.7	

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*
Dibromofluoromethane (Surr)	*96*		*72.7 - 135*
Toluene-d8 (Surr)	*101*		*72.4 - 121*

Method: AK102 - DRO

Lab Sample ID: MB 230-860/1-A
Matrix: Water
Analysis Batch: 869

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 860

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C25	0.2968	J	0.500	0.150	mg/L		07/31/14 10:16	08/04/14 14:17	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*96*		*50 - 150*	*07/31/14 10:16*	*08/04/14 14:17*	*1*

Method: AK102 - DRO (Continued)

Lab Sample ID: LCS 230-860/2-A
Matrix: Water
Analysis Batch: 869

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 860

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
C10-C25			10.0	8.099		mg/L		81	75 - 125		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1-Chlorooctadecane	*93*		*50 - 150*

Lab Sample ID: LCSD 230-860/3-A
Matrix: Water
Analysis Batch: 869

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 860

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
C10-C25			10.0	7.807		mg/L		78	75 - 125	4	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1-Chlorooctadecane	*94*		*50 - 150*

Lab Sample ID: 230-229-1 DU
Matrix: Water
Analysis Batch: 869

Client Sample ID: 17628-B1MW
Prep Type: Total/NA
Prep Batch: 860

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
C10-C25	18.1	B		19.73		mg/L				8	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
1-Chlorooctadecane	*100*		*50 - 150*

GC/MS VOA

Analysis Batch: 864

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1 - DL	17628-B1MW	Total/NA	Water	AK101	
230-229-2	17628-B2MW	Total/NA	Water	AK101	
230-229-2 DU	17628-B2MW	Total/NA	Water	AK101	
230-229-3	17628-B5MW	Total/NA	Water	AK101	
230-229-4	17628-TBW	Total/NA	Water	AK101	
LCS 230-864/1011	Lab Control Sample	Total/NA	Water	AK101	
LCSD 230-864/12	Lab Control Sample Dup	Total/NA	Water	AK101	
MB 230-864/14	Method Blank	Total/NA	Water	AK101	

Analysis Batch: 865

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1 - DL	17628-B1MW	Total/NA	Water	8260B	
230-229-2	17628-B2MW	Total/NA	Water	8260B	
230-229-2 DU	17628-B2MW	Total/NA	Water	8260B	
230-229-3	17628-B5MW	Total/NA	Water	8260B	
230-229-4	17628-TBW	Total/NA	Water	8260B	
LCS 230-865/1009	Lab Control Sample	Total/NA	Water	8260B	
LCSD 230-865/10	Lab Control Sample Dup	Total/NA	Water	8260B	
MB 230-865/14	Method Blank	Total/NA	Water	8260B	

Analysis Batch: 873

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1 - DL	17628-B1MW	Total/NA	Water	AK101	
230-232-A-1 DU	Duplicate	Total/NA	Water	AK101	
LCS 230-873/1014	Lab Control Sample	Total/NA	Water	AK101	
LCSD 230-873/15	Lab Control Sample Dup	Total/NA	Water	AK101	
MB 230-873/17	Method Blank	Total/NA	Water	AK101	

Analysis Batch: 874

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1 - DL2	17628-B1MW	Total/NA	Water	8260B	
230-232-A-1 DU	Duplicate	Total/NA	Water	8260B	
LCS 230-874/1012	Lab Control Sample	Total/NA	Water	8260B	
LCSD 230-874/13	Lab Control Sample Dup	Total/NA	Water	8260B	
MB 230-874/17	Method Blank	Total/NA	Water	8260B	

GC Semi VOA

Prep Batch: 860

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1	17628-B1MW	Total/NA	Water	3510C	
230-229-1 DU	17628-B1MW	Total/NA	Water	3510C	
230-229-2	17628-B2MW	Total/NA	Water	3510C	
230-229-3	17628-B5MW	Total/NA	Water	3510C	
LCS 230-860/2-A	Lab Control Sample	Total/NA	Water	3510C	
LCSD 230-860/3-A	Lab Control Sample Dup	Total/NA	Water	3510C	
MB 230-860/1-A	Method Blank	Total/NA	Water	3510C	

GC Semi VOA (Continued)

Analysis Batch: 869

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
230-229-1	17628-B1MW	Total/NA	Water	AK102	860
230-229-1 DU	17628-B1MW	Total/NA	Water	AK102	860
230-229-2	17628-B2MW	Total/NA	Water	AK102	860
230-229-3	17628-B5MW	Total/NA	Water	AK102	860
LCS 230-860/2-A	Lab Control Sample	Total/NA	Water	AK102	860
LCSD 230-860/3-A	Lab Control Sample Dup	Total/NA	Water	AK102	860
MB 230-860/1-A	Method Blank	Total/NA	Water	AK102	860

Lab Chronicle

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Client Sample ID: 17628-B1MW — Lab Sample ID: 230-229-1

Date Collected: 07/30/14 14:35 — **Matrix: Water**
Date Received: 07/30/14 15:37

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B	DL	100	865	08/01/14 14:17	ASD	TAL ANC
Total/NA	Analysis	8260B	DL2	1000	874	08/04/14 21:40	ASD	TAL ANC
Total/NA	Analysis	AK101	DL	100	864	08/01/14 14:17	ASD	TAL ANC
Total/NA	Analysis	AK101	DL	1000	873	08/04/14 21:40	ASD	TAL ANC
Total/NA	Prep	3510C			860	07/31/14 10:16	ASD	TAL ANC
Total/NA	Analysis	AK102		1	869	08/04/14 18:36	ASD	TAL ANC

Client Sample ID: 17628-B2MW — Lab Sample ID: 230-229-2

Date Collected: 07/30/14 12:30 — **Matrix: Water**
Date Received: 07/30/14 15:37

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	865	08/01/14 13:45	ASD	TAL ANC
Total/NA	Analysis	AK101		1	864	08/01/14 13:45	ASD	TAL ANC
Total/NA	Prep	3510C			860	07/31/14 10:16	ASD	TAL ANC
Total/NA	Analysis	AK102		1	869	08/04/14 20:13	ASD	TAL ANC

Client Sample ID: 17628-B5MW — Lab Sample ID: 230-229-3

Date Collected: 07/30/14 12:35 — **Matrix: Water**
Date Received: 07/30/14 15:37

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	865	08/01/14 01:33	ASD	TAL ANC
Total/NA	Analysis	AK101		1	864	08/01/14 01:33	ASD	TAL ANC
Total/NA	Prep	3510C			860	07/31/14 10:16	ASD	TAL ANC
Total/NA	Analysis	AK102		1	869	08/04/14 20:45	ASD	TAL ANC

Client Sample ID: 17628-TBW — Lab Sample ID: 230-229-4

Date Collected: 07/30/14 00:00 — **Matrix: Water**
Date Received: 07/30/14 15:37

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	865	08/01/14 02:05	ASD	TAL ANC
Total/NA	Analysis	AK101		1	864	08/01/14 02:05	ASD	TAL ANC

Laboratory References:

TAL ANC = TestAmerica Anchorage, 2000 West International Airport Road, Suite A10, Anchorage, AK 99502-1119, TEL (907)563-9200

Certification Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Laboratory: TestAmerica Anchorage

The certifications listed below are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-067	06-16-14 *

* Certification renewal pending - certification considered valid.

Method Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL ANC
AK101	Alaska - Gasoline Range Organics (GC/MS)	ADEC	TAL ANC
AK102	DRO	ADEC	TAL ANC

Protocol References:

ADEC = Alaska Department of Environmental Conservation

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL ANC = TestAmerica Anchorage, 2000 West International Airport Road, Suite A10, Anchorage, AK 99502-1119, TEL (907)563-9200

Sample Summary

Client: Shannon & Wilson
Project/Site: MOA FS No.4

TestAmerica Job ID: 230-229-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
230-229-1	17628-B1MW	Water	07/30/14 14:35	07/30/14 15:37
230-229-2	17628-B2MW	Water	07/30/14 12:30	07/30/14 15:37
230-229-3	17628-B5MW	Water	07/30/14 12:35	07/30/14 15:37
230-229-4	17628-TBW	Water	07/30/14 00:00	07/30/14 15:37

230-229 Chain of Custody

8/6/2014

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Laboratory TEST AMERICA
Attn: STEVE CRUPI

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5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2255 S.W. Canyon Road
Portland, OR 97201-2498
(503) 223-6147

1200 17th Street, Suite 1024
Denver, Co 80202
(303) 825-3800

Analysis Parameters/Sample Container Description
(include preservative if used)

230-229

Sample Identity	Lab No.	Time (per Jessa Tibbetts)	Date Sampled	Comp.	Grab	GRO (AK 101)	BTEX (8021B)	DRO (AK 102)				Total Number of Containers	Remarks/Matrix	Sample No.
						ARC 7/30/14								
17628-B1MW		1435	7/30/14		✓	✓	✓	✓				5	GROUNDWATER	01
17628-B2MW		1230	7/30/14		✓	✓	✓	✓				5	↓	02
17628-B5MW		1235	7/30/14		✓	✓	✓	✓				5		03
17628-TBN			7/30/14		✓	✓	✓						TRIP BLANK	04

Project Information	
Project Number: 32-1-17628	
Project Name: MOA FS No. 4	
Contact: JDS (Jen Simmons)	
Ongoing Project? Yes ☒ No ☐	
Sampler: JHT	

Sample Receipt	
Total Number of Containers	
COC Seals/Intact? Y/N/NA	
Received Good Cond./Cold	
Delivery Method: (attach shipping bill, if any)	

Instructions	
Requested Turnaround Time:	STANDARD
Special Instructions:	T: 8.8°C

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: [signature] Time: 937	Signature: Time:	Signature: Time:
Printed Name: Jessa H. Tibbetts Date: 7/30/14	Printed Name: Date:	Printed Name: Date:
Company: Shannon + Wilson, Inc	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: [signature] Time: 15:37	Signature: Time:	Signature: Time:
Printed Name: Andrew Pike Date: 7/30/14	Printed Name: Date:	Printed Name: Date:
Company: TA-AK	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. 30544

230-229 Chain of Custody

8/6/2014

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN-OF-CUSTODY RECORD

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(907) 561-2120

2255 S.W. Canyon Road
Portland, OR 97201-2498
(503) 223-6147

1200 17th Street, Suite 1024
Denver, Co 80202
(303) 825-3800

Page 1 of 1

Laboratory TEST AMERICA
Attn: STEVE CRUPI

230-229

per Jessa Tibbetts

ARC 7/30/14

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	GRO (AK 101)	BTEX (8021B)	DRO (AK 102)				Total Number of Containers	Remarks/Matrix	Sample No.
17628-B1MW		1435	7/30/14		✓	✓	✓	✓				5	GROUNDWATER	01
17628-B2MW		1230	7/30/14		✓	✓	✓	✓				5	↓	02
17628-B5MW		1235	7/30/14		✓	✓	✓	✓				5	↓	03
17628-TBW			7/30/14		✓	✓	✓						TRIP BLANK	04

Project Information	Sample Receipt
Project Number: 32-1-17628	Total Number of Containers
Project Name: MOA FS No. 4	COC Seals/Intact? Y/N/NA
Contact: JDS (Jen Simmons)	Received Good Cond./Cold
Ongoing Project? Yes ☒ No ☐	Delivery Method:
Sampler: JHT	(attach shipping bill, if any)

Instructions	
Requested Turnaround Time:	STANDARD
Special Instructions:	T: 8.8°C

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature:	Signature:	Signature:
Time: 935	Time:	Time:
Printed Name: Jessa H. Tibbetts	Printed Name:	Printed Name:
Date: 7/30/14	Date:	Date:
Company: Shannon + Wilson, Inc	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature:	Signature:	Signature:
Time: 15:37	Time:	Time:
Printed Name: Andrew Pika	Printed Name:	Printed Name:
Date: 7/30/14	Date:	Date:
Company: TA-AK	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. 30544

Sample Login Acknowledgement

Job 230-229-1

Client Job Description: MOA FS No.4
Purchase Order #: Purchase Order not required
Work Order #:
Project Manager: Steve R Crupi
Job Due Date: 8/7/2014
Job TAT: 5 Days
Max Deliverable Level: II
Earliest Deliverable Due: 8/7/2014

Report To: Shannon & Wilson
Jennifer Simmons
5430 Fairbanks Street
Suite 3
Anchorage, AK 99518-1263

Bill To: Shannon & Wilson
Jennifer Simmons
5430 Fairbanks Street
Suite 3
Anchorage, AK 99518-1263

Login 230-229

Sample Receipt: 7/30/2014 3:37:00 PM
Method of Delivery: Client Drop off
Number of Coolers: 1
Cooler Temperature(s) (C°): 8.8;

Lab Sample # / Method	Client Sample ID / Method Description / Work Location	Date Sampled	Matrix	Rpt Basis	Dry / Wet **
230-229-1	**17628-B1MW**	**7/30/2014 2:35:00 PM**	**Water**		
8260B	BTEX (GC/MS) / In-Lab			Total	Wet
AK101_MS	Alaska - Gasoline Range Organics (GC/MS) / In-Lab			Total	Wet
AK102_103	DRO / In-Lab			Total	Wet
230-229-2	**17628-B2MW**	**7/30/2014 12:30:00 PM**	**Water**		
8260B	BTEX (GC/MS) / In-Lab			Total	Wet
AK101_MS	Alaska - Gasoline Range Organics (GC/MS) / In-Lab			Total	Wet
AK102_103	DRO / In-Lab			Total	Wet
230-229-3	**17628-B5MW**	**7/30/2014 12:35:00 PM**	**Water**		
8260B	BTEX (GC/MS) / In-Lab			Total	Wet
AK101_MS	Alaska - Gasoline Range Organics (GC/MS) / In-Lab			Total	Wet
AK102_103	DRO / In-Lab			Total	Wet
230-229-4	**17628-TBW**	**7/30/2014 12:00:00 AM**	**Water**		
8260B	BTEX (GC/MS) / In-Lab			Total	Wet
AK101_MS	Alaska - Gasoline Range Organics (GC/MS) / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Login Sample Receipt Checklist

Client: Shannon & Wilson

Job Number: 230-229-1

Login Number: 229

List Source: TestAmerica Anchorage

List Number: 1

Creator: Pilch, Andrew C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	Received same day of collection; chilling process has begun.
Cooler Temperature is recorded.	True	8.8 °C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Shannon & Wilson

Job Number: 230-229-1

Login Number: 229

List Source: TestAmerica Anchorage

List Number: 1

Creator: Pilch, Andrew C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	Received same day of collection; chilling process has begun.
Cooler Temperature is recorded.	True	8.8 °C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

LABORATORY DATA REVIEW CHECKLIST

Completed by: Jennifer Simmons
Title: Environmental Scientist
Date: September 10, 2014

CS Report Name: Semi-Annual Groundwater Monitoring, Fire Station No. 4, 4350 MacInnes Street, Anchorage, Alaska

Laboratory Report Date: August 6, 2014

Consultant Firm: Shannon & Wilson, Inc.

Laboratory Name: TestAmerica Laboratories, Inc.
Laboratory Report Number: 230-229-1

ADEC File Number: *2100.26.315*
ADEC RecKey Number: *NA*
(**NOTE**: ***NA*** = not applicable; Text in *italics* added by Shannon & Wilson, Inc.)

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: *The cooler temperature was 8.8 ° C at the time of sample submittal. However, exemption is permitted for chilled samples collected within 8 hours of delivery to the laboratory.*

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: *The laboratory noted that the samples did not appear to have been compromised.*

d. If there were any discrepancies, were they documented? – For example, incorrect sample containers/preservation, sample temperature outside acceptance range, insufficient or missing samples, etc.? **Yes / No / NA** (please explain)
Comments: *No discrepancies noted.*

e. Data quality or usability affected? Please explain. **NA**
Comments: *The samples were submitted to the laboratory within 8 hours of sample collection. Therefore, the slightly elevated cooler temperature will not impact data usability.*

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: *GRO and DRO were detected in method blank samples.*

c. Were corrective actions documented? **Yes / No / NA** (please explain)
Comments: *Since the method blank detections were less than the reporting limits, re-extraction and re-analysis of samples were not performed.*

d. What is the effect on data quality/usability, according to the case narrative?
Comments: *The case narrative does not comment on data quality/usability.*

5. Sample Results

a. Correct analyses performed/reported as requested on COC? **Yes / No / NA** (please explain)
Comments: *The COC requested BTEX testing by EPA 8021B but the laboratory analyzed the samples by EPA 8260B instead.*

b. All applicable holding times met? **Yes / No / NA** (please explain)
Comments:

All soils reported on a dry weight basis? **Yes / No / NA** (please explain)
Comments:

c. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project? **Yes / No / NA** (please explain)
Comments:

d. Data quality or usability affected? **NA** Please explain.
Comments: *The data is not impacted by using EPA Method 8260B instead of 8021B.*

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 LOQ? **Yes / No / NA** (please explain)
Comments: *Although less than the LOQ, estimated (J-flagged) concentrations of GRO and DRO were detected in the method blanks. The samples associated with the method blank detections are "B" flagged when the reported sample concentration is within 10x the reported method blank concentration. If both the sample and method blank concentrations are reported at levels less than the LOQ, the sample concentration is reported as non-detect at the LOQ. If the reported sample concentration is greater than the LOQ and less than 5x the method blank concentration, the sample concentration is reported as non-detect at the detected sample concentration. If the sample concentration is greater than 5x the method blank concentration and less than or equal to 10x the method blank concentration, the sample concentration is reported at the detected sample concentration. If the sample concentration is greater than 10x the method blank concentration, the sample is reported at the detected concentration and is not flagged.*

iii. If above LOQ, what samples are affected? ***NA***
Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
Yes / No / NA (please explain)
Comments: *The potentially impacted samples are flagged "B" in Table 4.*

v. Data quality or usability affected? Please explain.
Comments: *Each of the affected sample results are less than the ADEC cleanup level; therefore the affected data is acceptable for the purposes of this report.*

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 (RPDs) 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%, VOCs 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? **NA**
Comments:

vi. Do the affected samples(s) have data flags? If so, are the data flags clearly defined? **Yes / No / NA** (please explain)
Comments:

vii. Data quality or usability affected? Please explain. ***NA***
Comments:

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:

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:

iv. Data quality or usability affected? Please explain. ***NA***
Comments:

d. Trip Blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.) Water and Soil

i. One trip blank reported per matrix, analysis and cooler? (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 stating why must be entered below.) **Yes / No / NA** (please explain)
Comments: *Only one cooler was used to store and transport the samples.*

iii. All results less than LOQ? **Yes / No / NA** (please explain)
Comments: *Although less than the LOQ, GRO, toluene, ethylbenzene, and xylenes were detected in the trip blank. The samples associated with the trip blank detections are "B" flagged when the reported sample concentration is within 10x the reported trip blank concentration. If both the sample and trip blank concentrations are reported at levels less than the LOQ, the sample concentration is reported as non-detect at the LOQ. If the reported sample concentration is greater than the LOQ and less than 5x the trip blank concentration, the sample concentration is reported as non-detect at the detected sample concentration. If the sample concentration is greater than 5x the trip blank concentration and less than or equal to 10x the trip blank concentration, the sample concentration is reported at the detected sample concentration. If the sample concentration is greater than 10x the trip blank concentration, the sample is reported at the detected concentration and is not flagged.*

iv. If above LOQ, what samples are affected? ***NA***
Comments**:**

v. Data quality or usability affected? Please explain. ***NA***
Comments: *Each of the affected sample results are less than the ADEC cleanup level; therefore the affected data is acceptable for the purposes of this report.*

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples? **Yes / No NA** (please explain)
Comments: *Sample B5MW is the field duplicate of Sample B2MW.*

ii. Submitted blind to the lab? **Yes / No / NA** (please explain)
Comments:

iii. Precision – All relative percent differences (RPDs) less than specified DQOs? (Recommended: 30% for water, 50% for soil) **Yes / No / NA** (please explain)
Comments: *The RPDs could not be calculated because Sample B2MW did not contain detectable analyte concentrations.*

iv. Data quality or usability affected? Please explain. ***NA***
Comments:

f. Decontamination or Equipment Blank (if not applicable)
Yes / No / NA (please explain)
Comments: *The use of a decontamination or equipment blank was beyond the scope of this project.*

i. All results less than LOQ? **Yes / No / NA** (please explain)
Comments:

ii. If above LOQ, what samples are affected? ***NA***
Comments:

iii. Data quality or usability affected? Please explain. ***NA***
Comments:

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab-specific, etc.)

a. Defined and appropriate? **Yes / No / NA** (please explain)
Comments: *A key is provided on page 3 of the laboratory report*.

APPENDIX C

INVESTIGATION DERIVED WASTE DISPOSAL DOCUMENTATION

*** IN CASE OF EMERGENCY CALL 1-800-424-9300 Contract# 7619 *** AK23076 (RP)

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE

GENERATOR

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: C E S Q G

Manifest Document No.: 2 3 0 7 6

2. Page 1 of 1

3. Generator's Name and Mailing Address:
MOA FIRE STATION NO. 4
4350 MACINNES STREET
ANCHORAGE, AK 99508

Site Address:
MOA FIRE STATION NO. 4
4350 MACINNES STREET
ANCHORAGE, AK 99508

ANDREW LEE

4. Generator's Phone ((907) 561-2120

5. Transporter 1 Company Name: EMERALD ALASKA, INC

6. US EPA ID Number: A K R 0 0 0 0 0 4 1 8 4

A. State Transporter's ID

B. Transporter 1 Phone: (907) 258-1558

7. Transporter 2 Company Name

8. US EPA ID Number

C. State Transporter's ID

D. Transporter 2 Phone

9. Designated Facility Name and Site Address:
EMERALD ALASKA, INC.
2020 VIKING DRIVE
ANCHORAGE, AK 99501

10. US EPA ID Number: A K R 0 0 0 0 0 4 1 8 4

E. State Facility's ID

F. Facility's Phone: (907) 258-1558

11. WASTE DESCRIPTION	Containers No.	Containers Type	13. Total Quantity	14. Unit Wt./Vol.
HM				
a. RQ, UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (BENZENE), 9, PGIII, RQ=10, ERG#171 X	1	DF	3	G
b.				
c.				
d.				

G. Additional Descriptions for Materials Listed Above

1)EA0306 WATER CONTAMINATED WITH BENZENE

H. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

16. **GENERATOR'S CERTIFICATION:** I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name: Jennifer Simmons for MOA — Signature — Date: Month 9 Day 23 Year 14

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Jennifer Simmons for MOA — Signature — Date: Month 9 Day 23 Year 14

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name — Signature — Date: Month Day Year

CERTIFICATE OF DISPOSAL/RECYCLE

GENERATOR: MOA FIRE STATION NO. 4
4350 MACINNES STREET
ANCHORAGE AK 99508

DISPOSAL FACILITY: EMERALD ALASKA, INC.
2020 VIKING DRIVE
ANCHORAGE AK 99501

EPA ID NUMBER: CESQG
MANIFEST/DOCUMENT #: 23076
DATE OF DISPOSAL/RECYCLE: 09/24/2014

LINE	WASTE DESCRIPTION	CONTAINERS	TYPE	QUANTITY	UOM
1	WATER CONTAMINATED WITH BENZENE	1	DF	3	G

I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above described waste was managed in compliance with all applicable laws, regulations, permits, and licenses on the date listed above.

PREPARED BY: PATRICIA BEASLEY

SIGNATURE: Patricia S Beasley **DATE:** 9/24/2014

APPENDIX D

CONCEPTUAL SITE MODEL FORMS

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: 4350 MacInnes Street, Anchorage, Alaska

Completed By: Shannon & Wilson

Date Completed: September 18, 2014

***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**

- ☐ **Surface Soil (0-2 ft bgs)**
  - Direct release to surface soil — *check soil*
  - ☐ Migration to subsurface — *check soil*
  - ☐ Migration to groundwater — *check groundwater*
  - ☐ Volatilization — *check air*
  - ☐ Runoff or erosion — *check surface water*
  - ☐ Uptake by plants or animals — *check biota*
  - ☐ Other (list):
- ☑ **Subsurface Soil (2-15 ft bgs)**
  - Direct release to subsurface soil — *check soil*
  - ☑ Migration to groundwater — *check groundwater*
  - ☑ Volatilization — *check air*
  - ☐ Uptake by plants or animals — *check biota*
  - ☐ Other (list):
- ☑ **Ground-water**
  - Direct release to groundwater — *check groundwater*
  - ☑ 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
☑ soil	☑ Incidental Soil Ingestion	F	F	F	F			
	☐ Dermal Absorption of Contaminants from Soil							
	☐ Inhalation of Fugitive Dust							
☑ groundwater	☑ Ingestion of Groundwater	F	F	F	F			
	☑ Dermal Absorption of Contaminants in Groundwater				F			
	☑ Inhalation of Volatile Compounds in Tap Water	F	F	F	F			
☑ air	☑ Inhalation of Outdoor Air	C/F	C/F	C/F	C/F			
	☑ Inhalation of Indoor Air	C/F	C/F	C/F	C/F			
	☐ 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							

Revised, 10/01/2010

Print Form

Human Health Conceptual Site Model Scoping Form

Site Name: 4350 MacInnes Street, Anchorage, Alaska

File Number: Hazard ID: 23660, and ADEC File Number: 2100.26.315

Completed by: Shannon & Wilson

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:

Complete due to the historical presence of GRO, DRO, benzene, toluene, ethylbenzene, and xylenes following UST removals. Mitigating factors include the commercial site use and partial asphalt paving.

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: Incomplete

Comments:

The primary COCs are GRO, DRO, and BTEX which, according to Appendix B, cannot permeate the skin.

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: Complete

Comments:

DRO, GRO, benzene, toluene, ethylbenzene, and xylenes have been detected in groundwater above the ADEC Table C cleanup levels. Mitigating factors include the commercial site use of the Property with the on-site structures connected to municipal water services.

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:

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:

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 been detected above ADEC cleanup levels.

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:

Benzene, toluene, ethylbenzene, and xylenes were detected above ADEC levels. Mitigating factors include the vapor barrier and air scrubbers that were installed during construction of the building's addition.

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:

There is a potential for exposure to GRO, DRO, and BTEX-impacted groundwater during construction activities.

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:

The primary COCs (GRO, DRO, and BTEX) are listed as volatile contaminants in Appendix D.

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.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS OF POTENTIAL CONCERN

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table B-1 of 18 AAC 75.341 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greather than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000).

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS OF POTENTIAL CONCERN

A chemical is identified here as sufficiently volatile and toxic for further evaluation if the Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater, the molecular weight is less than 200 g/mole (EPA 2004a), and the vapor concentration of the pure component posed an incremental lifetime cancer risk greater than 10^{-6} or a non-cancer hazard quotient of 0.1, or other available scientific data indicates the chemical should be considered a volatile. Chemicals that are solid at typical soil temperatures and do not sublime are generally not considered volatile.

Acetone	Mercury (elemental)
Benzene	Methyl bromide (Bromomethane)
Bis(2-chloroethyl)ether	Methyl chloride (Chloromethane)
Bromodichloromethane	Methyl ethyl ketone (MEK)
Bromoform	Methyl isobutyl ketone (MIBK)
n-Butylbenzene	Methylene bromide
sec-Butylbenzene	Methylene chloride
tert-Buytlbenzene	**1-Methylnaphthalene**
Carbon disulfide	**2-Methylnaphthalene**
Carbon tetrachloride	Methyl *tert*-butyl ether (MTBE)
Chlorobenzene	**Naphthalene**
Chlorodibromomethane (Dibromochloromethane)	Nitrobenzene
Chloroethane	n-Nitrosodimethylamine
Chloroform	**n-Propylbenzene**
2-Chlorophenol	**Styrene**
1,2-Dichlorobenzene	1,1,2,2-Tetrachlorethane
1,3-Dichlorobenzene	Tetrachloroethylene (PCE)
1,4-Dichlorobenzene	**Toluene**

Dichlorodifluoromethane	1,2,4-Trichlorobenzene
1,1-Dichloroethane	1,1,1-Trichloroethane
1,2-Dichloroethane	1,1,2-Trichloroethane
1,1-Dichloroethylene	Trichloroethane
cis-1,2-Dichloroethylene	2,4,6-Trichlorophenol
trans-1,2-Dichloroethylene	1,2,3-Trichloropropane
1,2-Dichloropropane	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)
1,3-Dichloropropane	Trichlorofluoromethane (Freon-11)
Ethylbenzene	**1,2,4-Trimethylbenzene**
Ethylene dibromide (1,2-Dibromoethane)	**1,3,5-Trimethylbenzene**
Hexachlorobenzene	Vinyl acetate
Hexachloro-1,3-butadiene	Vinyl chloride (Chloroethene)
Hexachlorocyclopentadiene	**Xylenes (total)**
Hexachloroethane	GRO (see note 3 below)
Hydrazine	DRO (see note 3 below)
Isopropylbenzene (Cumene)	RRO (see note 3 below)

Notes:

1. Bolded chemicals should be investigated as volatile compounds when petroleum is present. If fuel containing additives (e.g., 1,2-dichloroethane, ethylene dibromide, methyl *tert*-butyl ether) were spilled, these chemicals should also be investigated.
2. If a chemical is not on this list, and not in Tables B of 18 AAC 75.345, the chemical has not been evaluated for volatility. Contact the ADEC risk assessor to determine if the chemical is volatile.
3. At this time, ADEC does not require evaluation of petroleum ranges GRO, DRO, or RRO for the indoor air inhalation (vapor intrusion) pathway.

APPENDIX E

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 32-1-17628-001

Date: February 2015
To: Municipality of Anchorage
Re: 2014 Semi-Annual Groundwater Monitoring,
Fire Station No. 4, 4350 MacInnes Street
Anchorage, Alaska

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland