Ahtna
Engineering Services, LLC

2018 GROUNDWATER SAMPLING REPORT
COPPER VALLEY ELECTRIC ASSOCIATION
GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

FINAL
NOVEMBER 2018

Copper Valley ELECTRIC
A Touchstone Energy® Cooperative

Prepared for:
Copper Valley Electric Association
PO Box 45
Glennallen, Alaska 99588

Prepared by:
Ahtna Engineering Services, LLC
110 W. 38th Avenue, Suite 200A
Anchorage, Alaska 99503

(This Page Intentionally Left Blank)

APPROVAL PAGE

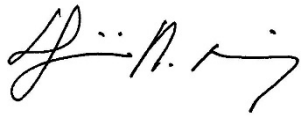
This report for groundwater sampling at the Copper Valley Electric Association (CVEA) Glennallen Diesel Plant site in Glennallen, Alaska, has been prepared for CVEA by Ahtna Engineering Services, LLC (Ahtna) under Professional Service Agreement (PSA) 1204, Purchase Order No. 4204.

ADEC File No.: 240.38.001

Report Prepared by:

Alex Geilich
Ahtna Engineering Services.
Project Manager

Report Reviewed By:



Herminio R. Muniz, P.G.
Ahtna Engineering Services.
Senior Hydrogeologist

(This Page Intentionally Left Blank)

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AAC .....Alaska Administrative Code
ADEC.....Alaska Department of Environmental Conservation
Ahtna.....Ahtna Engineering Services, LLC
BTEX .....benzene, toluene, ethylbenzene, and total xylenes
°C .....degrees Celsius
COC .....chain of custody
COPC .....contaminant of potential concern
CSM .....conceptual site model
CVEA.....Copper Valley Electric Association
DRO .....diesel-range organics
DQR .....data quality review
IDW.....investigation-derived waste
LNAPL.....light non-aqueous phase liquids
mg/L.....milligrams per liter
M-K.....Mann-Kendall
NFRAP.....No Further Remedial Action Planned
No.....Number
OASIS .....OASIS Environmental, Inc.
PAH.....polynuclear aromatic hydrocarbons
PPE.....personal protective equipment

(This Page Intentionally Left Blank)

1.0 INTRODUCTION

Ahtna Engineering Services, LLC (Ahtna) is presenting this report for the 2018 annual groundwater sampling event at the Copper Valley Electric Association (CVEA) diesel plant in Glennallen, Alaska. This work was conducted to provide updated information on petroleum hydrocarbon levels and groundwater quality at the site and assess contaminant level trends.

The Alaska Department of Environmental Conservation (ADEC) File Number (No.) for this site is 240.38.001. This work was performed under CVEA Professional Service Agreement 1204, Purchase Order No. 4204. This report provides a site description, a summary of the conceptual site model (CSM) prepared for the site, the project objectives, a description of the work performed, site observations, analytical results, and conclusions/recommendations. Appendices include field notes and sampling logs, laboratory reports, a review of data quality including an ADEC Laboratory Data Review Checklist, Mann-Kendall (M-K) trend analysis tables and sampling methodologies.

1.1 Site Description

The CVEA diesel plant is located three blocks north of the Glenn Highway on the corner of Co-Op Road and North First Avenue in Glennallen, Alaska (Figure 1). The site is located within Section 23, Township 4 North, Range 2 West of the Copper River Meridian, on the Gulkana A-4, Alaska U.S. Geological Survey Quadrangle map. The facility, as shown in Figure 2, consists of the power plant building, a line crew building, the line crew equipment shed, and an office building.

The diesel plant produces electricity using diesel-driven generators fed by an aboveground fuel tank. The diesel plant is operated in conjunction with other CVEA plants. The output of this plant varies over the year depending on other system inputs.

1.2 Site History

Since 1991, several environmental site assessment and cleanup projects related to an underground storage tank, an aboveground storage tank, and multiple ethylene glycol releases have been conducted at the site. By 1999, all environmental assessments and cleanups at the site were complete, and ADEC provided a letter of No Further Remedial Action Planned (NFRAP).

As a condition of the NFRAP, all site monitoring wells were required to be decommissioned. During the decommissioning, light non-aqueous phase liquids (LNAPL), or free product, were encountered at GMW-2 when grout was pumped into the well. GMW-2 was located at the present location of GWM-10 (Figure 3).

Subsequent monitoring and recovery wells were installed in this area for monitoring purposes and for LNAPL recovery. Free-phase petroleum was recovered from well GMW-12 for two years until the product thickness thinned to the point that the recovery system could no longer pump the product. In September 2008, the thickness in GMW-12 was measured as 0.05 feet in the well (estimated 0.01 feet in the formation).

1.2.1 Groundwater Monitoring

Groundwater sampling has been conducted semiannually since 2002 (except in 2008 when the project transferred from Clarus Environmental to OASIS Environmental (OASIS); groundwater was sampled in September only). Based on groundwater sampling conducted at the site since 2002, the contaminant of concern is diesel-range organics (DRO) (Clarus 2007; Hart Crowser 2007). Past sampling events determined that concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) and polynuclear aromatic hydrocarbons (PAH) are less than ADEC groundwater cleanup levels and thus do not require monitoring. Free-phase petroleum hydrocarbons have not been observed at the site since the September 2008 field effort.

In recent years, DRO concentrations have been detected above the ADEC cleanup level at all seven monitoring wells at the site (GMW-10 through GMW-16). However, DRO concentrations in GMW-15, which is located at the southern edge of the property and furthest down gradient from the release (Figure 3), has not exceeded groundwater cleanup levels since 2009. Similarly, DRO concentrations at GMW-14 have not exceeded cleanup levels since 2009 and was not sampled in 2018. PAHs were sampled for in the fall of 2011. PAH constituents were detected in GMW-12 but were below cleanup levels. PAH constituents were not detected in other down gradient wells sampled.

In September 2011, the DRO level in GMW-16 was elevated; however, review of the chromatogram by the laboratory analyst suggests the pattern was not consistent with a diesel pattern (large spikes) and was more consistent with a glycol pattern. The sample was preserved and could not be analyzed for glycols. A yellow green color was noted in the water in June 2011 and a definite glycol odor in September 2011. The well is located in the plant building in a sump area; it was noted that the well had a monument, but the well itself had no plug inside the monument. Plant personnel noted that ethylene glycol releases have occasionally occurred in this area from a nearby valve. It is possible that one or multiple releases flowed into the sump and then into the well (OASIS, 2012).

In 2012, Ahtna sampled the monitoring well network for DRO. DRO was detected in all 6 wells sampled. Monitoring wells with DRO concentrations above the ADEC DRO cleanup level of 1.5 milligrams per liter (mg/L) included GMW-10, GMW-11, GMW-12, and GMW-16. GMW-15, located at the south and down gradient edge of the property, had a DRO concentration below the cleanup level for the eighth consecutive fall sampling event. The presence of ethylene glycol was confirmed in GMW-16 by laboratory analysis. GMW-13 along with GRW-1, GRW-2, and GRW-3 were decommissioned at the site (Ahtna, 2012).

In meetings with ADEC in December 2012, it was agreed that the 2012 monitoring wells would again be sampled for both DRO and ethylene glycol in 2013. Sampling conducted by Ahtna in 2013 showed DRO concentrations again to be steady or declining. The sampling also showed ethylene glycol to only be present in GMW-16 and not migrating downgradient (Ahtna, 2013).

Sampling conducted by Ahtna in 2014 showed DRO concentrations again to be steady or declining. However, sampling showed an evident increase in the DRO concentration in GMW-11. This well was resampled in October and the elevated DRO concentration was again observed. The sampling also showed ethylene glycol to only be present in GMW-16 (Ahtna, 2014).

Ahtna sampled the site again in September 2015. DRO was detected in all wells sampled except GMW-14. DRO concentrations exceeded ADEC cleanup level of 1.5 mg/L in GMW-10, GMW-11, GMW-12, and GMW-16. Only GMW-15, located at the south and downgradient edge of the property, had a DRO concentration below the cleanup level. M-K trend analysis showed several wells with an increasing trend. The cedar-like odor, believed to associated with degraded glycol, was noted again at some locations. Ethylene glycol was only sampled in GMW-16 and was detected at 1,800 mg/L above the ADEC cleanup level.

Due to the fact that no known releases of DRO have occurred, the presence of the cedar-like odor, and that ethylene glycol can elute in the DRO range (increasing the apparent DRO concentration), it was suspected that the ethylene glycol beneath the building had mobilized and was migrating south. Ahtna recommended sampling all wells for both DRO and ethylene glycol (Ahtna, 2015).

Sampling was conducted in 2016 for DRO and ethylene glycol. Ethylene glycol was not detected in any wells at the site, but analyses were performed outside of hold times and results are potentially biased low. Monitoring wells with DRO concentrations above the ADEC DRO cleanup level of 1.5 mg/L included GMW-10, GMW-11, GMW-12, and GMW-16. GMW-15 located at the south and downgradient edge of the property had a DRO concentration below the cleanup level, but with an increasing trend (Ahtna, 2016).

Ahtna conducted sampling in 2017 for DRO and ethylene glycol. Ethylene glycol was not detected in any wells. Monitoring wells GMW-10, GMW-11, and GMW-12 (primary and duplicate) tested above the ADEC DRO cleanup level of 1.5 mg/L. DRO was detected in monitoring wells GMW-15 and GMW-16 but below the ADEC cleanup level. No DRO was detected in monitoring well GMW-15 (Ahtna, 2017).

1.2.2 RegenOx™ Injection

In June 2009, following completion of the groundwater monitoring effort, OASIS injected approximately 950 pounds of RegenOx™ into a 1,500-square-foot area, shown in Figure 3. In June 2010, an additional 400 pounds of RegenOx™ was injected into the same area (OASIS, 2012).

1.3 Conceptual Site Model

In the fall 2010 report for the site, a CSM was prepared by OASIS (OASIS, 2011). Petroleum hydrocarbons, primarily DRO, were the contaminants of potential concern (COPC); however, work performed in 2011 suggests that ethylene glycol was also a COPC.

Receptors were identified as industrial workers along with site visitors and trespassers. Construction workers are considered potential future receptors due to the possibility of future construction or demolition efforts at the site.

The identified exposure pathways include incidental soil ingestion, groundwater ingestion, dermal absorption, outdoor air inhalation, and indoor air inhalation. The inhalation of indoor and outdoor air pathways are considered complete because although BTEX has not been detected in the groundwater and ADEC does not require evaluation of DRO for vapor intrusion. Naphthalene, a constituent in diesel fuel that does require evaluation for the indoor air pathway, was not tested for

in soil. While DRO is not recognized by ADEC as a contaminant that can permeate the skin, naphthalene was detected in groundwater in GMW-12 (below the groundwater cleanup level); thus, there was the potential of the presence of naphthalene in soil. Naphthalene can permeate the skin therefore dermal absorption must be considered a complete pathway. However, the pathway was insignificant as it was only present within the groundwater smear zone and under the building where contact with the soil is highly unlikely.

Ingestion of groundwater is a complete pathway, but because the water in the unconfined aquifer will not be used now or in the future for water supply, and because the site geology precludes movement of the contaminants into the deeper aquifer in this area, this pathway is considered insignificant.

Ethylene glycol, naphthalene, and other PAH compounds may be present in soil; therefore the indoor air inhalation pathway is complete. However, as this is a power generation plant that uses diesel fuel, the presence of low levels of PAH compounds from the soil could not be differentiated over ambient PAH levels in the diesel vapors in the building.

1.4 Regulatory Framework

Releases that have occurred at this site are fuel and ethylene glycol related. Sampling has shown that gasoline-range organics, BTEX, and PAH are not present at levels above ADEC groundwater cleanup levels. Therefore, the contaminants of concern are DRO and ethylene glycol.

Per 18 Alaska Administrative Code (AAC) 75.345 Table C, the groundwater cleanup level is 1.5 mg/L for DRO and 40 mg/L for ethylene glycol.

1.5 Project Objectives

The 2018 project objectives are as follows:

- Evaluate whether concentrations above ADEC screening levels may be migrating offsite
- Assess current concentrations of ethylene glycol in the groundwater at all monitoring wells
- Evaluate DRO contaminant trends at the site

2.0 WORK PERFORMED

The following work was performed to meet the project objectives in accordance with the ADEC-approved work plan (dated May 10, 2018), 18 AAC 75 (November 2017), and the ADEC Field Sampling Guidance (August 2017).

Fieldwork was conducted on September 13, 2018. Work was managed by Alex Geilich and fieldwork performed by Felipe Restrepo, an Ahtna environmental scientist. Mr. Geilich and Mr. Restrepo both meet the definition of an "environmental professional" per 18 AAC 75.333.

2.1 Groundwater Sampling

On September 13, 2018, an Ahtna environmental scientist drove to the CVEA site and performed groundwater sampling. These included measuring the water depth in each project monitoring well, purging the wells with a bladder pump using low-flow techniques in accordance with ADEC *Field Sampling Guidance* (2017), monitoring groundwater parameters during purging, and then collecting samples from the wells for analysis of DRO and ethylene glycol. The sampling methodologies are included in Appendix E. Monitoring wells GMW-10, GMW-11, GMW-12, GMW-15, and GMW-16 were sampled in this manner. DRO and ethylene glycol field duplicate sample (GMW-99) were collected from GMW-16. Only GMW-16 was sampled for ethylene glycol.

2.2 Sample Handling Requirements

All samples were placed in a cooler with sufficient gel ice to keep sample temperatures at 4 degrees Celsius (°C) ±2°C until delivery to the project laboratory under standard chain-of-custody (COC) procedures. A temperature blank was included in the cooler.

2.3 Investigation-Derived Wastes

Investigation-derived wastes (IDW) consisted of purge and decontamination water, and disposable sampling gear/ personal protective equipment (PPE). Disposable sampling equipment (e.g., pump tubing) and PPE was bagged, taped shut, and disposed of as solid waste in a dumpster designated by onsite CVEA personnel.

All IDW water was turned over to CVEA for disposal. The water is used in an onsite parts cleaner to wash industrial equipment soiled with petroleum hydrocarbons and glycol. All water is contained in the parts cleaner and properly disposed of on an as needed basis.

(This Page Intentionally Left Blank)

3.0 SITE OBSERVATIONS

The following sections describe the observations made during groundwater sampling.

3.1 Groundwater Level Measurements

Calculated groundwater elevations are summarized in Table 1. Groundwater elevations were on average 5.28 feet higher than in September 2017 and 1.83 feet higher than in September 2016. Based on approximately 20 years of groundwater measurements, starting in 1993, groundwater flow direction at the site is towards the south.

3.2 Purge Water Observations.

During purging, a slight hydrocarbon odor was noted at GMW-12, no sheen was present.

In 2014 and 2015, during purging at GMW-11, the purge water was observed to be yellow and a hydrocarbon and pungent aromatic odor was observed. Neither the yellow color nor the pungent aromatic odor was noted during 2018 sampling event nor have they been noted since the 2015 sampling event.

(This Page Intentionally Left Blank)

4.0 ANALYTICAL RESULTS

The following section summarizes analytical testing results. Results from the 2018 sampling event are provided in Table 2; historical results for DRO and ethylene glycol are provided in Tables 3 and 4 respectively. The laboratory report is provided in Appendix B, and a review of data quality, along with an ADEC Laboratory Data Review Checklist is provided in Appendix C. This section also includes a discussion of trend analysis for the data.

4.1 Laboratory Results

DRO was detected in all wells sampled. Monitoring wells with DRO concentrations above ADEC DRO cleanup level of 1,500 µg/L included GMW-10, GMW-11, GMW-12, GMW-16. GMW-15, located at the south and downgradient edge of the property, had a DRO concentration below the cleanup level for the 12th consecutive sampling event.

Ethylene glycol was below the detection limit in GMW-16.

4.2 Mann-Kendall Analysis

M-K trend analyses for DRO concentrations were updated for fall sampling events for all sampled wells. Table 5 provides a summary of the trend analyses; individual well trend analyses are provided in Appendix D along with an explanation of M-K analysis. M-K analysis provides trend analysis for non-parametric data sets such as lab data. Trend analysis for GMW-16 has not been included as this well has apparently been affected by ethylene glycol that is masking true DRO concentration readings.

M-K analyses indicate increasing or possibly increasing DRO levels in GMW-15. Monitoring wells GMW-10, GMW-11, and GMW-12 have no trend.

4.3 Data Quality Review

Data quality review (DQR) is a process for evaluating the completeness, correctness, consistency, compliance with method procedures and quality control requirements, and identification of anomalous data. DQR reports and ADEC Laboratory Data Review Checklists are provided in Appendix C and include a review, where appropriate, of the following parameters.

- Sample receipt conditions
    - Sample preservation
    - Cooler receipt forms
    - COC condition
- Extraction and analytical procedures
    - Holding times
    - Analytical reporting limits
    - Method blanks
    - Laboratory control samples and duplicates
    - Matrix spike samples and duplicates
    - Laboratory duplicate samples

    - Surrogate recoveries (organics only)
- Sampling procedures
    - Field blanks
    - Trip blanks
    - Field duplicate samples
- Correspondence to method criteria and project data quality objectives

4.3.1 Overall Data Assessment

Based on the data review completed, no data were rejected and no data qualifiers were assigned. All analytical data is considered usable for the purpose of evaluating the presence or absence and magnitude of the suspected site contaminants.

5.0 CONCLUSIONS AND RECOMMENDATIONS

DRO concentrations above the ADEC cleanup level of 1.5 mg/L persist at the site. A groundwater concentration indicating the potential presence of LNAPL was seen at GMW-10, GMW-11, and GMW-12. This is not entirely unexpected as this was near the source area for the diesel fuel release and an LNAPL recovery system had operated in this area in the past. In addition, groundwater elevations have risen over 5 feet in the last year which may have mobilized LNAPL. No ethylene glycol was detected in GMW-16, the area where ethylene glycol releases have occurred in the past.

Trend analyses of DRO concentrations at the site show no trend in wells GMW-10, GMW-11, GMW-12. Monitoring well GMW-15 shows an increasing trend. This well is the most downgradient well at the site. The concentration of DRO at well GMW-15 has been below the cleanup level since 2009 and was at only 676 µg/L for this sampling event, well below the cleanup level of 1,500 µg/L.

All monitoring wells tested in 2018 saw an increase in DRO concentration from 2017, with the exception of GMW-15, which saw a decrease in concentration (Table 3).

Ahtna recommends continued monitoring of the site in fall of 2019 to further assess the DRO concentration trends. If the GMW-15 concentrations trend continues to increase and concentrations that exceed ADEC cleanup levels begin migrating off-site, additional remedial action may be required by ADEC. Similarly, no ethylene glycol has been detected in the monitoring wells sampled for the past 3 years. Ahtna recommends removing sampling of ethylene glycol at GMW-16.

(This Page Intentionally Left Blank)

6.0 LIMITATIONS

This report was prepared and work for this project performed in accordance with generally accepted professional practices for the nature and conditions of the work completed, in the same and similar localities, at the time that the work was performed. It is intended for the exclusive use of the CVEA. This report is not meant to represent a legal opinion, and no other warranty, express or implied, is made.

(This Page Intentionally Left Blank)

7.0 REFERENCES

Ahtna Engineering Services, LLC (Ahtna), 2012. *Report for 2012 Groundwater Sampling and Well Decommissioning, Copper Valley Electric Association Glennallen Diesel Plant, Glennallen, Alaska*. November 27.

Ahtna, 2013. *Report for 2013 Groundwater Sampling, Copper Valley Electric Association Glennallen Diesel Plant, Glennallen, Alaska*. November 5.

Ahtna, 2014. *2014 Groundwater Sampling Report, Copper Valley Electric Association, Glennallen Diesel Plant, Glennallen, Alaska*. November 12.

Ahtna, 2015. *2015 Groundwater Sampling Report, Copper Valley Electric Association, Glennallen Diesel Plant, Glennallen, Alaska*. December 8.

Ahtna, 2016. *2016 Groundwater Sampling Report, Copper Valley Electric Association, Glennallen Diesel Plant, Glennallen, Alaska*. December 15.

Ahtna, 2016. *2017 Groundwater Sampling Report, Copper Valley Electric Association, Glennallen Diesel Plant, Glennallen, Alaska*. November 14.

Alaska Department of Environmental Conservation (ADEC), 2016. *Field Sampling Guidance*. March.

ADEC 2016. 18 Alaska Administrative Code [AAC] 75 Oil and Other Hazardous Substances Pollution Control. November 6.

OASIS Environmental (OASIS), 2011. *Fall 2010 Groundwater Sampling, CVEA Glennallen Plant, ADEC File No. 240.38.001*. January 4.

OASIS, 2012. *2011 CVEA Power Plant Groundwater Monitoring Report, Glennallen, Alaska*. February 3.

Clarus Environmental, 2007. *October 2007 Free-Phase Hydrocarbon Measurements and Groundwater Sampling. Clarus Technologies, LLC*. November 26.

Hart Crowser, 2007. *Free-Phase Hydrocarbon Measurements and Groundwater Sampling*. July 26.

(This Page Intentionally Left Blank)

TABLES

(This Page Intentionally Left Blank)

TABLE 1: GROUNDWATER ELEVATIONS - 2018
CVEA GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

Well Number	Measuring Point Elevation [1] in feet	Depth to Water in feet BTOC	Product Thickness in feet	Groundwater Elevation in feet
GMW-10	99.40	8.30	NM	91.10
GMW-11	99.44	8.95	NM	90.49
GMW-12	99.33	8.65	NM	90.68
GMW-15	98.63	9.33	NM	89.30
GMW-16	NE	4.83	NM	----------

Notes:

[1] Temporary benchmark (TBM) of 100.00 established at the west end of the south facing side of the CVEA plant building on the west side of the concrete overhead door sill. Marked as "HC BM" in red paint.
BTOC - Below top of casing
NE - Not established
NM - No measureable product

Ahtna
Engineering Services, LLC

TABLE 2: GROUNDWATER ANALYTICAL RESULTS - SEP. 13, 2018
CVEA GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

Sample/Well Number	Sample Number	Alaska Method AK 102 DRO in mg/L	EPA Method 8015D Ethylene Glycol in mg/L
GMW-10	18-GWM-10	**11.70**	NS
GMW-11	18-GWM-11	**9.31**	NS
GMW-12	18-GMW-12	**6.29**	NS
GMW-15	18-GMW-15	0.676	NS
GMW-16	18-GMW-16	**2.93**	ND (10)
Field Duplicate	18-GMW-99	**2.88**	ND (10)
ADEC Cleanup Level [1]		***1.5***	***40***

Notes:

Bolded= Concentrations in excess of ADEC cleanup level (18 AAC 75.345, Table C)

ADEC - Alaska Department of Environmental Conservation
EPA - US Environmental Protection Agency
DRO - Diesel-range organics
mg/L - milligrams per liter
ND = Not detected at concentration shown

Ahtna Engineering Services, LLC

TABLE 3: HISTORICAL GROUNDWATER ANALYTICAL RESULTS - DRO
CVEA GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

Monitoring Well	Date										
	Dec-02	**Jun-03**	**Dec-03**	**May-05**	**Oct-05**	**May-06**	**Sep-06**	**Jun-07**	**Oct-07**	**Sep-08**	**Jun-09**
GMW-10	**78.2**	NS[1]	NS[2]	NS[2]	NS[2]	**3.75**	**7.15**	**1.54**	**4.76**	**4.00**	0.89
GMW-11	**23.0**	NS[2]	**4.95**	NS[3]	**23.3**	**3.89**	**5.94**	**2.28**	**1.97**	**1.96**	**2.68**
GMW-12	**45.2**	NS[4]	NS[4]	NS[4]	NS[4]	NS[5]	NS[5]	NS[2]	NS[4]	**26.1**	**3.86**
GMW-13	Not Installed	0.27	ND (0.64)	ND (0.40)	1.17	ND (0.41)	ND (0.40)	ND (0.42)	ND (0.43)	ND (0.43)	ND (0.40)
GMW-14	Not Installed	0.95	0.65	0.48	**4.12**	0.87	**3.21**	**2.19**	ND (0.40)	**2.87**	**2.87**
GMW-15	Not Installed	0.83	**1.51**	NS[3]	0.87	**2.10**	0.71	**2.10**	0.64	0.80	**2.22**
GMW-16	Not Installed			ND (0.39)	NS[4]	NS[6]	**15.7**	**13.7**	NS[7]	**6.24**	0.94

Monitoring Well	Date											
	Sep-09	**Jun-10**	**Oct-10**	**Jun-11**	**Sep-11**	**Sep-12**	**Sep-13**	**Sep-14**	**Sep-15**	**Sep-16**	**Sep-17**	**Sep-18**
GMW-10	**5.23**	0.63	**3.08**	0.59	**3.15**	**5.45**	**4.46***	**1.9**	**5.9**	**3.6**	**1.7**	**11.70**
GMW-11	**1.92**	1.36	**2.02***	Frozen	**2.44**	**5.96**	**3.58**	**22** **36**[9]	**13**	**2.5**	**1.9**	**9.31**
GMW-12	**19.3**	**5.95**	**2.12**	No Water	**3.60**	**2.68**	**4.04**	**2.0**	**6.6**	**2.7**	**5.8**	**6.29**
GMW-13	0.44	ND (0.39)	ND (0.41)	ND (0.41)	ND (0.40)	NS[8]	NS[8]	NS[8]	NS[8]	NS[8]	NS[8]	NS[8]
GMW-14	ND (0.40)	ND (0.39)	0.53	1.47	1.43	1.11	0.82	1.2	ND (0.40)	0.36	ND (0.3)	NS[10]
GMW-15	0.86	0.98	0.40	0.56	0.56	0.77	0.93	1.1	1.0	1.2	1.46	0.68
GMW-16	**8.25**	0.68	**4.37**	**4.64**	**63.20**	**112**	**4.49**	1.5	**13.0**	**3.0**	1.45	**2.93**

Notes:
ADEC cleanup level for DRO = 1.5 mg/L per 18 AAC 75.345, Table C
Bolded = Concentrations in excess of cleanup level; all measurements in mg/L
ADEC = Alaska Department of Environmental Conservation
DRO = Diesel-range organics
mg/L = Milligrams per liter
ND = Not detected at concentration shown
* - Duplicate sample value; duplicate result higher than primary value
[1] Not sampled - unable to locate well
[2] Not sampled - not programmed or not located
[3] Not sampled - insufficient or no water in well
[4] Not sampled - free-phase hydrocarbons measured in well
[5] Not sampled - product pump in well
[6] Not sampled - bailer too large to fit in well
[7] Not sampled - heavy sheen on groundwater
[8] Not sampled - Well decommissioned Sept-12
[9] Well resampled in October 2014
[10] Not Sampled - Well Removed from monitoring program

Ahtna
Engineering Services, LLC

TABLE 4: HISTORICAL GROUNDWATER ANALYTICAL RESULTS - ETHYLENE GLYCOL
CVEA GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

Monitoring Well	EPA Method 8015D- Ethlyene Glycol in mg/L						
	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18
GMW-10	NS	ND (20)	NS	NS	ND (10) Q-	ND (10)	NS
GMW-11	NS	ND (20)	NS	NS	ND (10) Q-	ND (10)	NS
GMW-12	NS	ND (20)	NS	NS	ND (20) Q-	ND (10)	NS
GMW-14	NS	ND (20)	NS	NS	ND (10) Q-	ND (10)	NS
GMW-15	NS	ND (20)	NS	NS	ND (10) Q-	ND (10)	NS
GMW-16	**3,800***	**2,200**	**91***	**1,800**	ND (10) Q-	ND (10)	ND (10)

Notes:
ADEC cleanup level for Ethylene Glycol = 40 mg/L per 18 AAC 75.345, Table C (10-9-08)
Bolded = Concentrations in excess of cleanup level; all measurements in mg/L
ADEC = Alaska Department of Environmental Conservation
mg/L = Milligrams per liter
ND = Not detected at concentration shown
NS - Not sampled
* - Duplicate sample value; duplicate result higher than primary value
Q- = Analyte result is considered estimated to be biased low due to failed quality control criteria

Ahtna
Engineering Services, LLC

TABLE 5: MANN - KENDALL TREND ANALYSIS - SEP. 13, 2018
CVEA GLENNALLEN DIESEL PLANT
GLENNALLEN, ALASKA

Sample/Well Number	Most Recent Sample Date	DRO	
		Most Recent Concentration (mg/L)	Trend Status
ADEC Groundwater Cleanup Level		**1.5**	
GMW-10	9/13/2018	**11.70**	No trend
GMW-11	9/13/2018	**9.31**	No trend
GMW-12	9/13/2018	**6.29**	No Trend
GMW-15	9/13/2018	0.676	Increasing

Notes:
Bolded= Concentrations in excess of ADEC cleanup level (18 AAC 75.345, Table C)
mg/L - milligrams per liter

Ahtna
Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-11
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	<90%	>1	No trend

Monitoring date:	**Sep-08**	**Sep-09**	**Oct-10**	**Sep-11**	**Sep-12**	**Sep-13**	**Sep-14**	**Sep-15**	**Sep-16**	**Sep-17**	**Sep-18**
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11
DRO (mg/L)	**1.96**	**1.92**	**2.02**	**2.44**	**5.96**	**3.58**	**36.0**	**13.0**	**2.50**	**1.93**	**9.31**

Row 1: Compare to Event 1		-1	1	1	1	1	1	1	1	-1	1	6
Row 2: Compare to Event 2			1	1	1	1	1	1	1	1	1	9
Row 3: Compare to Event 3				1	1	1	1	1	1	-1	1	6
Row 4: Compare to Event 4					1	1	1	1	1	-1	1	5
Row 5: Compare to Event 5						-1	1	1	-1	-1	1	0
Row 6: Compare to Event 6							1	1	-1	-1	1	1
Row 7: Compare to Event 7								-1	-1	-1	-1	-4
Row 8: Compare to Event 8									-1	-1	-1	-3
Row 9: Compare to Event 9										-1	1	0
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**21**
Confidence Level	**87.9%**
Coefficient of Variance (CV)	**1.39**
Number of Events (n)	**11**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.

Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-10
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	<90%	<1	No Trend

Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18	
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	
DRO (mg/L)	**4.00**	**5.23**	**3.08**	**3.15**	**5.45**	**4.46**	**1.90**	**5.90**	**3.50**	**1.70**	**11.7**	
Row 1: Compare to Event 1		1	-1	-1	1	1	-1	1	-1	-1	1	0
Row 2: Compare to Event 2			-1	-1	1	-1	-1	1	-1	-1	1	-3
Row 3: Compare to Event 3				1	1	1	-1	1	1	-1	1	4
Row 4: Compare to Event 4					1	1	-1	1	1	-1	1	3
Row 5: Compare to Event 5						-1	-1	1	-1	-1	1	-2
Row 6: Compare to Event 6							-1	1	-1	-1	1	-1
Row 7: Compare to Event 7								1	1	-1	1	2
Row 8: Compare to Event 8									-1	-1	1	-1
Row 9: Compare to Event 9										-1	1	0
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**3**
Confidence Level	**<90%**
Coefficient of Variance (CV)	**0.60**
Number of Events (n)	**11**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-12
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
<1	<90%	>1	No Trend

Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11
DRO (mg/L)	**26.10**	**19.30**	**2.12**	**3.60**	**2.68**	**4.04**	**2.0**	**6.6**	**2.7**	**5.8**	**6.3**

Row 1: Compare to Event 1		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
Row 2: Compare to Event 2			-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Row 3: Compare to Event 3				1	1	1	-1	1	1	1	1	6
Row 4: Compare to Event 4					-1	1	-1	1	-1	1	1	1
Row 5: Compare to Event 5						1	-1	1	1	1	1	4
Row 6: Compare to Event 6							-1	1	-1	1	1	1
Row 7: Compare to Event 7								1	1	1	1	4
Row 8: Compare to Event 8									-1	-1	-1	-3
Row 9: Compare to Event 9										1	1	2
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**-4**
Confidence Level	**62.2%**
Coefficient of Variance (CV)	**1.07**
Number of Events (n)	**11**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-15
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	>95%	<1	Increasing

Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11
DRO (mg/L)	0.80	0.86	0.40	0.56	0.77	0.93	1.10	1.00	1.20	1.46	0.68

Row 1: Compare to Event 1		1	-1	-1	-1	1	1	1	1	1	-1	2
Row 2: Compare to Event 2			-1	-1	-1	1	1	1	1	1	-1	1
Row 3: Compare to Event 3				1	1	1	1	1	1	1	1	8
Row 4: Compare to Event 4					1	1	1	1	1	1	1	7
Row 5: Compare to Event 5						1	1	1	1	1	-1	4
Row 6: Compare to Event 6							1	1	1	1	-1	3
Row 7: Compare to Event 7								-1	1	1	-1	0
Row 8: Compare to Event 8									1	1	-1	1
Row 9: Compare to Event 9										1	-1	0
Row 10: Compare to Event 10											-1	-1

Mann-Kendall Statistic (S) = Total	**25**
Confidence Level	**97.42%**
Coefficient of Variance (CV)	**0.34**
Number of Events (n)	**11**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Ahtna Engineering Services, LLC

CVEA Glennallen Power Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-16
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
<1	>95%	>1	Decreasing

Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18	
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	
DRO (mg/L)	**6.24**	**8.25**	**4.37**	**62.3**	**112**	**4.49**	**1.5**	**5.1**	**3**	1.45	**2.93**	
Row 1: Compare to Event 1		1	-1	1	1	-1	-1	-1	-1	-1	-1	-4
Row 2: Compare to Event 2			-1	1	1	-1	-1	-1	-1	-1	-1	-5
Row 3: Compare to Event 3				1	1	1	-1	1	-1	-1	-1	0
Row 4: Compare to Event 4					1	-1	-1	-1	-1	-1	-1	-5
Row 5: Compare to Event 5						-1	-1	-1	-1	-1	-1	-6
Row 6: Compare to Event 6							-1	1	-1	-1	-1	-3
Row 7: Compare to Event 7								1	1	-1	1	2
Row 8: Compare to Event 8									-1	-1	-1	-3
Row 9: Compare to Event 9										-1	-1	-2
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**-25**
Confidence Level	**97.4%**
Coefficient of Variance (CV)	**1.84**
Number of Events	**11**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Ahtna Engineering Services, LLC

MANN-KENDALL S STATISTIC 90% CONFIDENCE LEVELS

2018 Groundwater Monitoring Event

Copper Valley Electric Assoication, Glennallen Deisel Plant, Glennallen, Alaska

Confidence Levels for Mann-Kendall S Statistic and Sample Size, from Standard Normal Z-Score

Total Number of Sampling Events

S (+/-)	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	0.912884306	0.836406561	0.77381482	0.725997214	0.68965464	0.661671339	0.639742606	0.622251563	0.60806919	0.596398357	0.586667	0.5784574	0.57145907	0.5654377	0.5602136	0.5556472	0.5516286
5	0.95528532	0.889664319	0.826220982	0.773655395	0.73190661	0.698916236	0.672639577	0.651454195	0.634149138	0.619833846	0.6078518	0.5977145	0.589054154	0.5815901	0.5751058	0.5694318	0.5644343
6	0.979229966	0.929177655	0.870171822	0.816239631	0.77104947	0.734192712	0.704247482	0.679785606	0.659623309	0.642837358	0.6287216	0.6167374	0.606471841	0.5976062	0.5898916	0.5831324	0.5771727
7	0.991291435	0.956794634	0.905756981	0.853443022	0.80676188	0.767243915	0.734375007	0.707105793	0.68438909	0.665332993	0.6492195	0.6354828	0.623679009	0.61346	0.6045507	0.5967327	0.5898309
8	0.996710793	0.974978239	0.933572522	0.885221893	0.8388502	0.797875753	0.762862825	0.733291743	0.708353275	0.68725026	0.669292	0.6539096	0.640643785	0.6291266	0.6190633	0.610217	0.6023962
9	0.99888273	0.986256832	0.95456303	0.911762855	0.86724481	0.825958688	0.78958568	0.75823897	0.731433071	0.708524721	0.6888891	0.671979	0.657335722	0.644582	0.6334103	0.6235699	0.6148561
10	0.999659145	0.992847061	0.969855413	0.933435758	0.89198971	0.851426735	0.814453315	0.781862536	0.753556882	0.729098532	0.7079648	0.6896546	0.673725955	0.6598033	0.6475733	0.6367765	0.6271986
11	0.999906706	0.996474635	0.980611248	0.95073949	0.91322689	0.874273907	0.83741026	0.804097573	0.774664857	0.748920874	0.7264774	0.7069027	0.689787353	0.6747684	0.6615345	0.6498225	0.6394118
12	0.999977111	0.998355693	0.987914726	0.964247292	0.93117708	0.894548537	0.858434565	0.824899305	0.794709202	0.767948263	0.7443898	0.7236924	0.705494648	0.6894569	0.6752772	0.662694	0.6514845
13	0.99999497	0.999274569	0.992702483	0.974557129	0.94611885	0.91234596	0.877535611	0.844242598	0.813654255	0.786144745	0.7616696	0.739996	0.720824545	0.7038494	0.6887853	0.6753779	0.6634056
14	0.999999011	0.999697414	0.99573254	0.982250934	0.95836774	0.927800104	0.89475115	0.862121076	0.831476337	0.803481974	0.7782893	0.7557888	0.735755822	0.7179278	0.7020438	0.6878616	0.6751647
15	0.999999826	0.999880718	0.99758388	0.98786468	0.96825673	0.941074552	0.910143753	0.87854587	0.848163393	0.819939176	0.7942262	0.7710495	0.750269398	0.7316759	0.7150387	0.7001332	0.6867519
16	0.999999973	0.999955575	0.999675918	0.991869532	0.97611938	0.952353581	0.923796858	0.893544049	0.863714441	0.835503	0.8094628	0.7857598	0.764348397	0.7450785	0.727757	0.7121815	0.6981575
17	0.999999996	0.999984373	0.999297797	0.994662991	0.98227605	0.96183363	0.935810614	0.907156815	0.878138858	0.850167276	0.8239861	0.799905	0.77797818	0.7581221	0.7401866	0.7239963	0.7093726
18	1	0.99999481	0.99963969	0.996568103	0.98702377	0.96971557	0.946297682	0.919437525	0.891455525	0.86393268	0.8377882	0.8134734	0.791146365	0.7707949	0.7523169	0.7355677	0.7203889
19	1	0.999998372	0.999821154	0.997838444	0.99062943	0.976198023	0.955379177	0.930449617	0.903691863	0.87680632	0.8508656	0.8264569	0.803842826	0.7830866	0.7641378	0.7468871	0.7311984
20	1	0.999999518	0.999914137	0.998666659	0.99332621	0.981471891	0.963180865	0.940264507	0.91488279	0.888801251	0.8632193	0.8388502	0.816059679	0.7949883	0.775641	0.7579462	0.7417939
21	1	0.999999865	0.999960135	0.999194603	0.99531262	0.985716159	0.969829734	0.948959519	0.925069626	0.899935941	0.8748545	0.8506512	0.827791239	0.806493	0.7868188	0.768738	0.7521686
22	1	0.999999965	0.999982103	0.999523646	0.99675357	0.98909494	0.975451009	0.956615914	0.934298979	0.910233697	0.8857801	0.8618608	0.839033975	0.817595	0.7976649	0.7792559	0.7623166
23	1	0.999999991	0.999992232	0.999724159	0.997783	0.991755672	0.980165665	0.963317037	0.942621633	0.919722054	0.8960088	0.8724825	0.849786442	0.8282903	0.808174	0.7894944	0.7722323
24	1	0.999999998	0.99999674	0.999843628	0.99850726	0.99382832	0.984088436	0.969146655	0.950091469	0.928432162	0.9055563	0.8825226	0.860049198	0.8385762	0.818342	0.7994487	0.7819108
25	1	1	0.999998678	0.999913224	0.99900911	0.995425426	0.987326341	0.974187483	0.956764436	0.936398156	0.9144413	0.8919897	0.869824715	0.8484517	0.828166	0.8091149	0.7913479
26	1	1	0.999999482	0.999952865	0.99935155	0.996642805	0.989977666	0.978519927	0.962697589	0.94365655	0.9226851	0.9008947	0.879117274	0.8579172	0.8376438	0.8184898	0.8005399
27	1	1	0.999999804	0.999974941	0.99958169	0.997560718	0.992131389	0.982221047	0.967948212	0.950245634	0.9303111	0.9092504	0.887932849	0.8669741	0.8467747	0.8275711	0.8094838
28	1	1	0.999999928	0.999986961	0.999734	0.998245355	0.993866969	0.985363745	0.97257303	0.956204911	0.9373444	0.9170717	0.896278993	0.8756256	0.8555586	0.8363572	0.8181771
29	1	1	0.999999975	0.99999336	0.99983327	0.998750486	0.995254452	0.98801616	0.976627529	0.961574564	0.9438118	0.9243747	0.904164704	0.8838756	0.8639967	0.8448473	0.8266179
30	1	1	0.999999991	0.999996691	0.999897	0.999119149	0.996354821	0.990241259	0.980165372	0.966394961	0.9497409	0.9311771	0.911600299	0.8917296	0.872091	0.8530414	0.834805
31	1	1	0.999999997	0.999998387	0.99993728	0.999385308	0.99722054	0.992096613	0.983237917	0.970706212	0.9551603	0.9374977	0.918597275	0.8991938	0.8798443	0.8609401	0.8427376
32	1	1	0.999999999	0.99999923	0.99996236	0.999575387	0.997896224	0.993634318	0.985893849	0.974547776	0.960099	0.9433564	0.925168175	0.9062756	0.8872604	0.8685447	0.8504155
33	1	1	1	0.999999641	0.99997774	0.999709667	0.998419389	0.994901062	0.988178891	0.977958108	0.9645862	0.9487735	0.931326452	0.9129832	0.8943437	0.8758573	0.8578391
34	1	1	1	0.999999836	0.99998703	0.999803503	0.998821236	0.995938288	0.990135616	0.980974372	0.9686509	0.9537702	0.93708633	0.9193256	0.9010995	0.8828804	0.8650094
35	1	1	1	0.999999927	0.99999255	0.99986837	0.999127441	0.996782454	0.991803342	0.983632195	0.972322	0.9583677	0.942462676	0.9253124	0.9075337	0.8896172	0.8719275
36	1	1	1	0.999999968	0.99999578	0.999912725	0.999358908	0.997465345	0.993218085	0.985965475	0.9756275	0.9625877	0.947470869	0.9309541	0.9136528	0.8960716	0.8785955
37	1	1	1	0.999999986	0.99999765	0.999942728	0.999532487	0.998014436	0.994412594	0.988006233	0.9785951	0.9664516	0.952126672	0.9362615	0.919464	0.9022478	0.8850155

> 90% and < 95% Confidence

> 95% Confidence

Notes:

– The test statistic, tau, is computed as $\tau = S/(n(n-1)/2)$

Donald W. Meals, Jean Spooner, Steven A. Dressing, and Jon B. Harcum. 2011. Statistical analysis for monotonic trends, Tech Notes 6, November 2011. Developed for U.S. Environmental Protection Agency by Tetra Tech, Inc., Fairfax, VA, 23 p. Available online at www.bae.ncsu.edu/programs/extension/wqg/319monitoring/tech_notes.htm.

– The standard normal z-score is defined as $z = \tau((9n(n-1))/(2(2n+5)))^{1/2}$

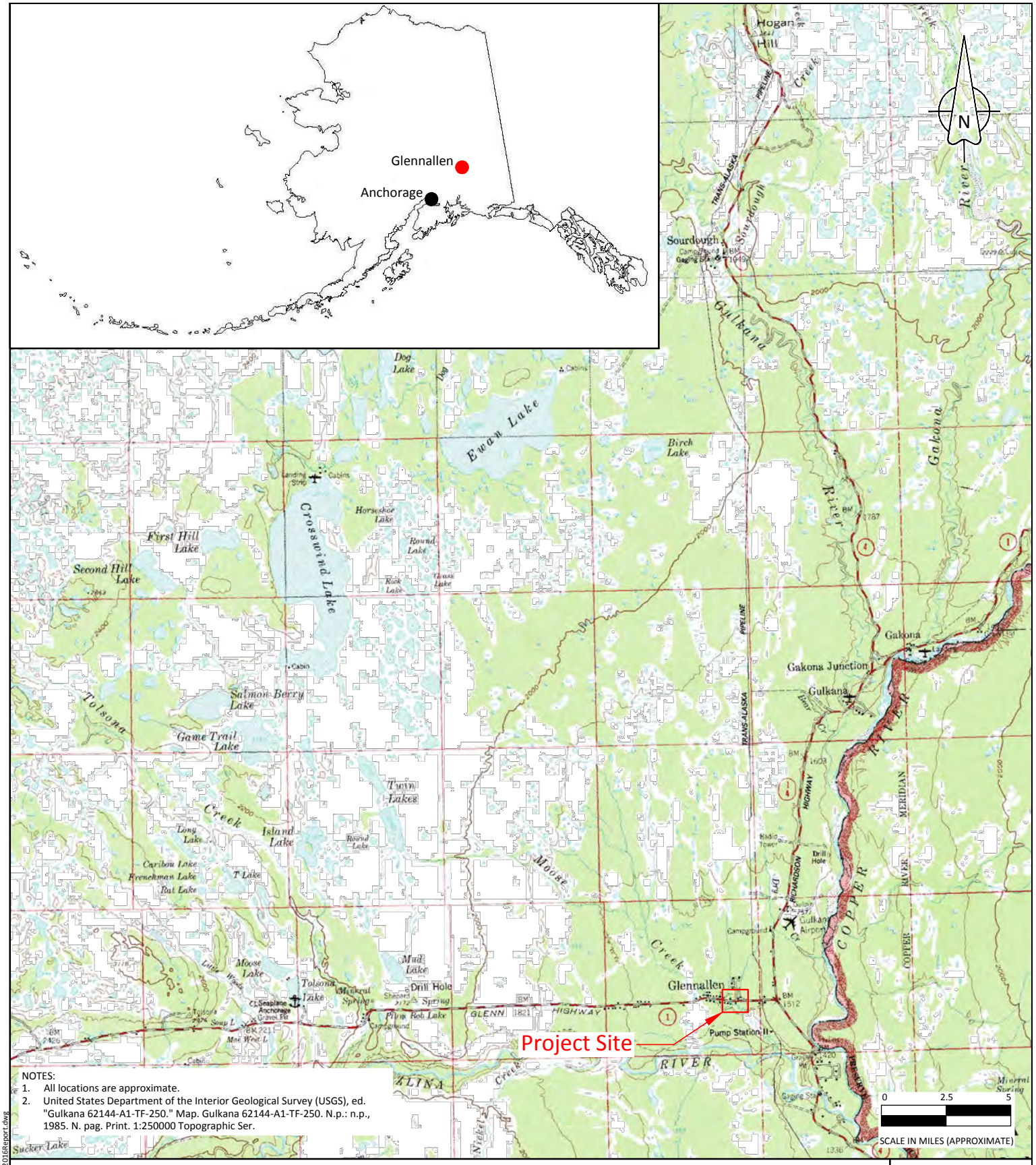
Ajit C. Tamhane and Dorothy D. Dunlop. 2000. Statistics and Data Analysis, from Elementary to Intermediate. Prentice Hall, Upper Saddle River, NJ 07458. p. 591

Ahtna Engineering Services, LLC

(This Page Intentionally Left Blank)

FIGURES

(This Page Intentionally Left Blank)



NOTES:
1. All locations are approximate.
2. United States Department of the Interior Geological Survey (USGS), ed. "Gulkana 62144-A1-TF-250." Map. Gulkana 62144-A1-TF-250. N.p.: n.p., 1985. N. pag. Print. 1:250000 Topographic Ser.

CVEA Diesel Plant - 2018 Groundwater Monitoring Glennallen, Alaska

Ahtna Engineering Services, LLC

State and Site Vicinity Maps

Project Number: 20210.08	Figure Number: 1
Date: 10.08.2018	
Drawn By: R.F.	

L:\Glennallen\20210.06\CAD\20210.06CVEA2018Report.dwg

(This Page Intentionally Left Blank)

CVEA Diesel Plant - 2018 Groundwater Monitoring Glennallen, Alaska

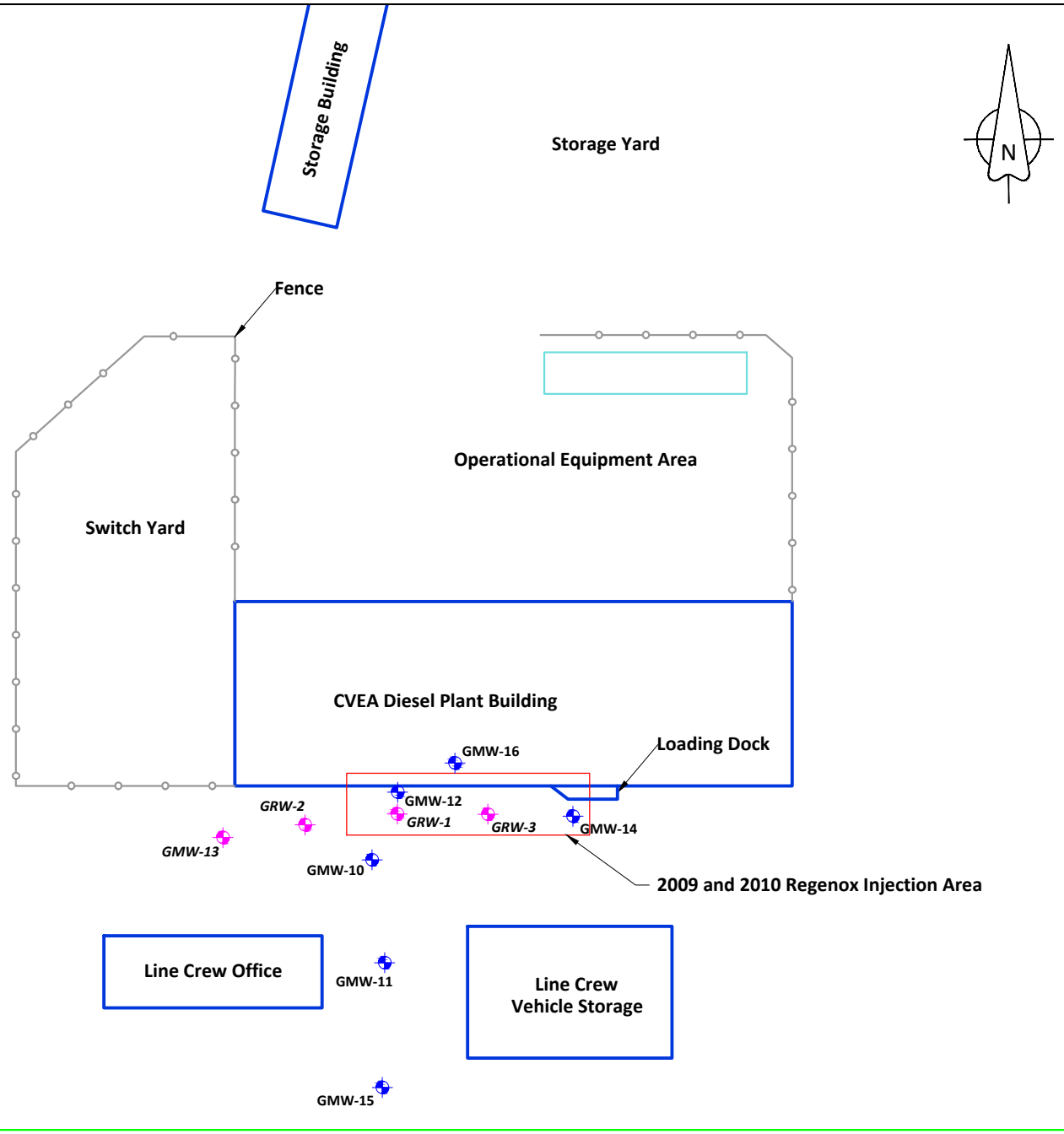
Ahtna Engineering Services, LLC

Site Plan

Project Number:	Figure Number:
20210.08	2
Date: 10.08.2018	
Drawn By: R.F.	

L:\Glennallen\20210.06\CAD\20210.06CVEA2018Report.dwg

(This Page Intentionally Left Blank)



Key:

AST	Aboveground storage tank
	AST
	Existing structure
	Injection Area
	Monitoring Well
	Well decommissioned in 2012
	Road

NOTES:
1. All locations are approximate.

0 25 50

SCALE IN FEET (APPROXIMATE)

CVEA Diesel Plant - 2018 Groundwater Monitoring Glennallen, Alaska

Ahtna Engineering Services, LLC

Monitoring Well Locations

Project Number: 20210.08	Figure Number: 3
Date: 10.08.2018	
Drawn By: R.F.	

L:\Glennallen\20210.06\CAD\20210.06CVEA2018Report.dwg

(This Page Intentionally Left Blank)

APPENDIX A

FIELD NOTES AND WELL SAMPLING LOGS

(This Page Intentionally Left Blank)

CVEA

GW SAMPLING

Rite in the Rain®

ALL-WEATHER

UNIVERSAL

№ 371FX

Glennallen, AK

MADE IN TACOMA — SINCE 1916 —

Rite in the Rain®

— DEFYING MOTHER NATURE —

Name Ahtna Engineering Services

Address 110 W. 38th Ave
Anchorage, AK 99503

Phone

Project Copper Valley Electric Association
Glennallen Diesel Plant
Glennallen, Alaska

MADE IN USA · RITE GREEN · Archival

RiteintheRain.com

CONTENTS

PAGE	REFERENCE	DATE

~52° Mostly Cloudy A. FitzGerald Sept. 7, 2017

0630 A. FitzGerald departs Anchorage. All sampling equipment mobilized in Alpine truck on 9/6/17.

1000 Arrive at project site in Glennallen, AK. Check in with CVEA facility manager, Michael. Michael provides facility safety briefing, and walks the site with A. FitzGerald to show the location of each well. He informs Alpine field personnel that the facility will be closed by 3pm today. The monitoring well inside the facility will need to be sampled prior to that, which was originally planned to sampled last as it is known to be contaminated (GMW-16). Michael also requests the groundwater levels of these wells over the past 5 years to help with a study currently

9/7/17

being conducted on the North side of the building to determine why groundwater is penetrating the concrete foundation / liner.

0635 A. FitzGerald conducts daily tailgate safety meeting.

1045 Calibrate YSI and Turbidimeter

1110 Set up sampling equipment at GMW-15, DTW: 14.80 TD: 20.42

1200 Collect sample 17-GMW-15. All samples collected will be submitted to SGS Laboratory in Anchorage for analysis of DRO by AK 102, and for ethylene glycol by EPA 8015-modified.

1220 Set up at GMW-11.
DTW: 14.61
TD: 18.91
A fast initial purge rate (~400 mL/min) lead to large draw down, however once purge rate was significantly

reduced (170 mL/min) the draw-down stopped and maintained the water level.

1300 Collect sample 17-GMW-11. NOTE: A piece of old sample tubing was pulled up with tubing after sampling complete. This was added to project IDW for disposal. Also, the well needs to be cut down so the monument lid can be placed/secured evenly over the top. The monument lid (screw holes noted) needs to be replaced with new screws.

1315 A. FitzGerald requests Michael (CVEA) open the cover over the top of GMW-14. A concrete pad has recently been poured over the top, but an access cover was placed over the top of the MW.

1340 Cap in concrete pad and

Scale: 1 square = _____

monument over GMW-14 are opened. Due to time constraint, A. FitzGerald will set up and sample GMW-16 first.

1350 Set up at GMW-16, inside building crawl space.
DTW: 10.68
TD: 17.76

1440 Collect sample 17-GMW-16. Same issue with large draw-down, however water level evenes out/stabilized when purge rate greatly lowered. NOTE: A. FitzGerald discusses what to do with purge water with Michael, after he leaves for the day and closes the facility. He will label 5-gallon buckets for storage, and will dispose of them properly at a later time.

1515 Set up at GMW-14.

Scale: 1 square = _____

DTW: 13.57
TD: 18.87
The well should be cut ~2-3 inches. Well cap needs to be replaced as it had fallen into the well ~4 in. The monument lid is also damaged, however may be okay because it is protected by the concrete pad cover. Unsure of water-tightness.
1615 Collect sample 17-GMW-14.
Close concrete well cover (metal cover in concrete pad) using hand tools.
1645 Set up at GMW-12.
Unable to remove well cap, no one available at the facility to assist. A. Fitzgerald packs equipment into truck and goes to hardware store to buy small hacksaw and new well cap.
1730 Return to site. A CVEA employee happens to be there and helps to get the well cap removed.
1740 Set up sampling equipment at GMW-12.
DTW: 13.06
TD: 18.96
1810 Collect sample 17-GMW-12.
Collect duplicate sample 17-GMW-22 @1845.
1840 ~~Set~~ AF Set up at GMW-10.
DTW: 13.90
TD: 17.82
1920 Collect sample 17-GMW-10.
1930 Pack all sampling equipment and supplies into Antea vehicle.
1950 Depart project site, and demobilize to Anchorage. Samples will be delivered to SGS Laboratory in the morning.
2330 ~~2350~~ AF Arrive in Anchorage. End of Day.

9/7/17

Scale: 1 square = _____

Scale: 1 square = _____

0645 - Depart Anchorage w/ Field gear in Ahtna truck.
0945 - Arrive in Glennallen CVEA Facility
1015 - Brief introduction & site safety meeting w/ Michael (CVEA)
1100 - Locate all GW monitoring wells to sample & begin calibrating YSI.
1150 - Begin collecting GW parameters at GMW-15
1215 - collect DRO samples from GMW-15
1300 - Begin collecting GW parameters at GMW-11
1320 - collect GW sample @ GMW-11
1402 - Begin collecting GW parameters @ GMW-10
1425 - collect GW sample @ GMW-10
1455 - Begin collecting GW parameters at GMW-12
1520 - Collect GW sample @ GMW-12
1650 - Begin collecting GW parameters at GMW-16
1720 - Collect GW sample of DRO & ethylene glycol @ GMW-16

Scale: 1 square = _____

* Additionally, collect sample duplicate From GMW-16. (labeled as "18-GMW-99") w/ time of 1820.
1900 - Finish packaging all samples & deconing equipment
1915 - Begin drive back to Anchorage.
2230 - Arrive in Anchorage. Place GW samples in office refrigerator.

Daily summary: Collected six (6) GW samples (5 primaries + 1 duplicate). All samples collected For DRO, additionally, samples From GMW-16 also collected For ethylene glycol.

Wells sampled:
GMW-10
GMW-11
GMW-12
GMW-15
GMW-16

End of Day 9/13/18

Scale: 1 square = _____

Ahtna Engineering Services, LLC

GROUNDWATER SAMPLING FORM

PROJECT NUMBER:

WELL NUMBER: GMW-15

SHEET: of

PROJECT NAME	CVEA GW Sampling	WELL CONDITION	Good
CLIENT	CVEA	DAMAGE PRESENT	NA
DATE	9/13/18	DEPTH TO BASE (FROM TOC)	20.40 Feet
AOC		DEPTH TO WATER (FROM TOC)	9.33 Feet
SCIENTIST	F. Restrepo	HEIGHT OF WATER COLUMN	11.07 Feet
WEATHER/ TEMPERATURE	55°, sunny	WELL VOLUME	1.8819 gal
WIND	slight	3 WELL VOLUMES	5.6457 gal

NOMINAL DIAMETER	O.D.	I.D.	VOLUME (GAL/LIN FT)
1"	1.315"	1.049"	0.04
1.5"	1.9"	1.610"	0.11
(2)	2.375"	2.067"	0.17
3"	3.5"	3.068"	0.38
4"	4.5"	4.026"	0.66

SAMPLING DATA

DEPTH OF PUMP INTAKE:

SAMPLE COLLECTED WITH: __ Bailer ✓ Pump, Type: Bladder __ Other, Specify:

MADE OF: __ Stainless Steel __ PVC

__ Teflon __ Disposable LDPE __ Other, Specify:

SAMPLING DECON PROCEDURE: Alconox, DI Water

SAMPLE DESCRIPTION: (color, free product thickness, odor, turbidity)

FIELD WATER QUALITY PARAMETERS

						Stabilization Requirements (3 must be stable) ± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Purged Volume (Gal)	Purge Rate (mL/min)	Water Level	Draw Down (ft)	Temperature (°C)	Spec. Cond. (µS/cm)[c]	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Color	Odor
1150	0.1	200	9.38		10.20	1112	6.44	6.68	160.3	11.05	Clear	None
1153	0.2	(1)	9.40		9.52	1158	6.07	6.72	152.6	8.40	Clear	None
1202	0.5	(1)	9.41		8.91	1130	4.96	6.74	143.7	6.62	Clear	None
1205	0.6	(1)	9.42		9.01	1128	4.90	6.77	143.1	4.63	(1)	(1)
1208	0.7	(1)	9.41		9.07	1125	4.80	6.77	142.8	4.22	(1)	(1)
1211	0.8	(1)	9.41		9.05	1122	4.64	6.77	142.7	5.59	(1)	(1)
						✓		✓	✓	✓		

ANALYTICAL SAMPLE INFORMATION

Sample ID	Time	Analytes
18-GMW-15	1215	(DRO) RRO GRO BTEX PAH VOCs PEST HERB
		DRO RRO GRO BTEX PAH VOCs PEST HERB
		DRO RRO GRO BTEX PAH VOCs PEST HERB

Sampling Notes:

Ahtna Engineering Services, LLC

GROUNDWATER SAMPLING FORM

PROJECT NUMBER:

WELL NUMBER: GMW-11

SHEET: of

PROJECT NAME	CVEA GW Sampling	WELL CONDITION	Good	NOMINAL DIAMETER	O.D.	I.D.	VOLUME (GAL/LIN FT)
CLIENT	CVEA	DAMAGE PRESENT	NA	1"	1.315"	1.049"	0.04
DATE	9/13/18	DEPTH TO BASE (FROM TOC)	18.45	1.5"	1.9"	1.610"	0.11
AOC		DEPTH TO WATER (FROM TOC)	8.95	(2")	2.375"	2.067"	0.17
SCIENTIST	F. Restrepo	HEIGHT OF WATER COLUMN	9.50	3"	3.5"	3.068"	0.38
WEATHER/ TEMPERATURE	55°, sunny	WELL VOLUME	1.615	4"	4.5"	4.026"	0.66
WIND	slight	3 WELL VOLUMES	4.845				

SAMPLING DATA

DEPTH OF PUMP INTAKE:

SAMPLE COLLECTED WITH: __ Bailer ✓ Pump, Type: Bladder ___ Other, Specify:

MADE OF: __ Stainless Steel ___ PVC

__ Teflon ___ Disposable LDPE ___ Other, Specify:

SAMPLING DECON PROCEDURE: Alconox, DI Water

SAMPLE DESCRIPTION: (color, free product thickness, odor, turbidity)

FIELD WATER QUALITY PARAMETERS

						Stabilization Requirements (3 must be stable)						
						± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Purged Volume (Gal)	Purge Rate (mL/min)	Water Level	Draw Down (ft)	Temperature (°C)	Spec. Cond. (µS/cm)[c]	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Color	Odor
1300	0.1	150	9.00		12.04	1147	1.43	6.69	153.9	17.11	Clear	None
1303	0.2	150	9.01		11.88	1150	1.29	6.70	152.3	12.44	Clear	None
1306	0.3	150	9.00		11.90	1149	1.14	6.69	151.0	7.51	(1)	(1)
1309	0.4	(1)	9.02		11.71	1154	1.08	6.69	153.0	7.55	(1)	(1)
1312	0.5	(1)	9.01		11.60	1155	1.05	6.70	152.2	7.37	(1)	(1)
1315	0.6	(1)	9.02		11.60	1155	0.99	6.69	152.8	7.54	(1)	(1)
						✓		✓	✓	✓		

ANALYTICAL SAMPLE INFORMATION

Sample ID	Time	Analytes	Sampling Notes:
18-GMW-11	1320	(DRO) RRO GRO BTEX PAH VOCs PEST HERB	
		DRO RRO GRO BTEX PAH VOCs PEST HERB	
		DRO RRO GRO BTEX PAH VOCs PEST HERB	

Ahtna Engineering Services, LLC

GROUNDWATER SAMPLING FORM

PROJECT NUMBER:

WELL NUMBER: GMW-10

SHEET: of

PROJECT NAME: CVEA GW sampling
CLIENT: CVEA
DATE: 9/13/18
AOC:
SCIENTIST: F. Restrepo
WEATHER/ TEMPERATURE: 55°, sunny
WIND: minimal

WELL CONDITION: Good
DAMAGE PRESENT: NA
DEPTH TO BASE (FROM TOC): 17.60 Ft.
DEPTH TO WATER (FROM TOC): 8.30 Ft.
HEIGHT OF WATER COLUMN: 9.30 Feet
WELL VOLUME: 1.581 gal
3 WELL VOLUMES: 4.743 gal

NOMINAL DIAMETER	O.D.	I.D.	VOLUME (GAL/LIN FT)
1"	1.315"	1.049"	0.04
1.5"	1.9"	1.610"	0.11
(2")	2.375"	2.067"	0.17
3"	3.5"	3.068"	0.38
4"	4.5"	4.026"	0.66

SAMPLING DATA

DEPTH OF PUMP INTAKE:

SAMPLE COLLECTED WITH: __ Bailer ✓ Pump, Type: Bladder __ Other, Specify:

MADE OF: __ Stainless Steel __ PVC
__ Teflon __ Disposable LDPE __ Other, Specify:

SAMPLING DECON PROCEDURE: Alconox, DI

SAMPLE DESCRIPTION: (color, free product thickness, odor, turbidity)

FIELD WATER QUALITY PARAMETERS

						Stabilization Requirements (3 must be stable) ± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Purged Volume (Gal)	Purge Rate (mL/min)	Water Level	Draw Down (ft)	Temperature (°C)	Spec. Cond. (µS/cm)[C]	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Color	Odor
1402	0.20	150	8.51		13.29	1071	0.36	6.60	7.0	109.0	Clear	None
1405	0.30	150	8.53		13.24	1090	0.31	6.61	5.7	100.8	Clear	None
1408	0.40	150	8.52		13.09	1111	0.28	6.61	4.1	95.4	Clear	None
1411	0.50	150	8.51		12.93	1121	0.25	6.62	2.0	83.37	(1)	(1)
1414	0.60	(1)	8.51		12.80	1131	0.23	6.61	1.0	74.89	(1)	(1)
1417	0.70	(1)	8.52		12.86	1136	0.23	6.62	-2.1	67.39	(1)	(1)
1420	0.80	(1)	8.52		12.86	1137	0.21	6.63	-5.4	64.17	(1)	(1)
						✓	✓	✓	✓			

ANALYTICAL SAMPLE INFORMATION

Sample ID	Time	Analytes	Sampling Notes:
18-GMW-10	1425	(DRO) RRO GRO BTEX PAH VOCs PEST HERB	
		DRO RRO GRO BTEX PAH VOCs PEST HERB	
		DRO RRO GRO BTEX PAH VOCs PEST HERB	

Ahtna Engineering Services, LLC

GROUNDWATER SAMPLING FORM

PROJECT NUMBER:

WELL NUMBER: GMW-12

SHEET: of

PROJECT NAME	CVEA GW Sampling	WELL CONDITION	Good	NOMINAL DIAMETER	O.D.	I.D.	VOLUME (GAL/LIN FT)
CLIENT	CVEA	DAMAGE PRESENT	NA	1"	1.315"	1.049"	0.04
DATE	4/13/18	DEPTH TO BASE (FROM TOC)	18.95 Ft	1.5"	1.9"	1.610"	0.11
AOC		DEPTH TO WATER (FROM TOC)	8.65 Ft	(2")	2.375"	2.067"	0.17
SCIENTIST	F. Restrepo	HEIGHT OF WATER COLUMN	10.30 Ft	3"	3.5"	3.068"	0.38
WEATHER/ TEMPERATURE	55°, sunny	WELL VOLUME	1.751 gal	4"	4.5"	4.026"	0.66
WIND	minimal	3 WELL VOLUMES	5.253 gal				

SAMPLING DATA

DEPTH OF PUMP INTAKE:

SAMPLE COLLECTED WITH: __ Bailer ✓ Pump, Type: Bladder __ Other, Specify:

MADE OF: __ Stainless Steel ____ PVC

__ Teflon ____ Disposable LDPE __ Other, Specify:

SAMPLING DECON PROCEDURE: Alconox, DI water

SAMPLE DESCRIPTION: (color, free product thickness, odor, turbidity)

FIELD WATER QUALITY PARAMETERS

						Stabilization Requirements (3 must be stable) ± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Purged Volume (Gal)	Purge Rate (mL/min)	Water Level	Draw Down (ft)	Temperature (°C)	Spec. Cond. (µS/cm)[C]	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Color	Odor
1455	0.1	150	8.40		16.27	950	0.52	6.62	-48.1	200.1	Cloudy	Slight HC
1458	0.2	150	8.93		16.17	951	0.43	6.61	-48.3	193.7	Cloudy	Slight HC/Organic
1501	0.3	150	8.95		15.85	959	0.35	6.63	-49.4	177.9	Cloudy	"
1504	0.4	"	8.94		15.89	963	0.30	6.63	-50.0	158.8	"	"
1507	0.5	"	8.95		15.84	970	0.27	6.63	-53.2	145.2	"	"
1510	0.6	"	8.94		15.80	976	0.25	6.64	-55.0	138.2	"	"
1513	0.7	"	8.94		15.66	980	0.24 ✓	6.64 ✓	-59.4 ✓	128.7	"	"

ANALYTICAL SAMPLE INFORMATION

Sample ID	Time	Analytes
18-GMW-12	1520	(DRO) RRO GRO BTEX PAH VOCs PEST HERB
		DRO RRO GRO BTEX PAH VOCs PEST HERB
		DRO RRO GRO BTEX PAH VOCs PEST HERB

Sampling Notes:

Ahtna Engineering Services, LLC

GROUNDWATER SAMPLING FORM

PROJECT NUMBER:

WELL NUMBER: GMW-16

SHEET: of

PROJECT NAME	CVEA GW Sampling	WELL CONDITION	Good	NOMINAL DIAMETER	O.D.	I.D.	VOLUME (GAL/LIN FT)
CLIENT	CVEA	DAMAGE PRESENT	NA	1"	1.315"	1.049"	0.04
DATE	9/13/18	DEPTH TO BASE (FROM TOC)	18.75 Ft	(1.5")	1.9"	1.610"	0.11
AOC	[redacted]	DEPTH TO WATER (FROM TOC)	4.83 Ft	2"	2.375"	2.067"	0.17
SCIENTIST	F. Restrepo	HEIGHT OF WATER COLUMN	13.92 Ft	3"	3.5"	3.068"	0.38
WEATHER/ TEMPERATURE	55°, sunny	WELL VOLUME	1.5312 gal	4"	4.5"	4.026"	0.66
WIND	minimal	3 WELL VOLUMES	4.5936 gal				

SAMPLING DATA

DEPTH OF PUMP INTAKE:

SAMPLE COLLECTED WITH: __ Bailer ✓ Pump, Type: Bladder __ Other, Specify:

MADE OF: __ Stainless Steel ____ PVC __ Teflon ____ Disposable LDPE __ Other, Specify:

SAMPLING DECON PROCEDURE:

SAMPLE DESCRIPTION: (color, free product thickness, odor, turbidity)

FIELD WATER QUALITY PARAMETERS

						Stabilization Requirements (3 must be stable)						
						± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Purged Volume (Gal)	Purge Rate (mL/min)	Water Level	Draw Down (ft)	Temperature (°C)	Spec. Cond. (µS/cm)[c]	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Color	Odor
1650	0.1	150	5.01		18.98	1106	2.05	6.88	-114.1	210.1	yellowish	Organic
1655	0.3	150	5.11		18.25	1125	2.09	6.86	-110.9	200.3	yellow cloudy	Organic
1700	0.5	(1)	5.25		18.18	1127	2.14	6.86	-108.3	191.9	(1)	(1)
1705	0.7	(1)	5.66		18.03	1136	2.03	6.85	-105.4	187.1	(1)	(1)
1710	0.9	(1)	5.81		17.94	1140	2.19	6.83	-103.1	180.9	(1)	(1)
1715	1.1	(1)	5.97		17.93	1144	2.07	6.83	-101.1	177.2	(1)	(1)
						✓		✓	✓			

ANALYTICAL SAMPLE INFORMATION

Sample ID	Time	Analytes	Sampling Notes:
18-GMW-16	1720	(DRO) RRO GRO BTEX PAH VOCs PEST HERB Ethylene Chloride 4/4=01 (1)	
18-GMW-99	1820	(DRO) RRO GRO BTEX PAH VOCs PEST HERB	
		DRO RRO GRO BTEX PAH VOCs PEST HERB	

(This Page Intentionally Left Blank)

APPENDIX B

LABORATORY REPORT

(This Page Intentionally Left Blank)

Laboratory Report of Analysis

To: Ahtna Engineering Svs
110 West 38th Ave Ste 200A
Anchorage, AK 99503

Report Number: **1185234**

Client Project: **CVEA Glennallen 2018**

Dear Alex Geilich,

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

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

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

Sincerely,
SGS North America Inc.

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

Case Narrative

SGS Client: **Ahtna Engineering Svs**
SGS Project: **1185234**
Project Name/Site: **CVEA Glennallen 2018**
Project Contact: **Alex Geilich**

Refer to sample receipt form for information on sample condition.

18-GMW-16 (1185234005) PS

Ethylene Glycol by 8015M was analyzed by Bio-Chem of Grand Rapids, MI.

*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. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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) & 17-021 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8015C, 8021B, 8082A, 8260C, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

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

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
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
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
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.

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

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
18-GMW-10	1185234001	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)
18-GMW-11	1185234002	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)
18-GMW-12	1185234003	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)
18-GMW-15	1185234004	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)
18-GMW-16	1185234005	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)
18-GMW-99	1185234006	09/13/2018	09/14/2018	Water (Surface, Eff., Ground)

Method	Method Description
AK102	DRO Low Volume (W)

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

Detectable Results Summary

Client Sample ID: **18-GMW-10**
Lab Sample ID: 1185234001

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	11.7	mg/L

Client Sample ID: **18-GMW-11**
Lab Sample ID: 1185234002

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	9.31	mg/L

Client Sample ID: **18-GMW-12**
Lab Sample ID: 1185234003

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	6.29	mg/L

Client Sample ID: **18-GMW-15**
Lab Sample ID: 1185234004

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	0.676	mg/L

Client Sample ID: **18-GMW-16**
Lab Sample ID: 1185234005

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	2.93	mg/L

Client Sample ID: **18-GMW-99**
Lab Sample ID: 1185234006

	Parameter	Result	Units
Semivolatile Organic Fuels	Diesel Range Organics	2.88	mg/L

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

Results of **18-GMW-10**

Client Sample ID: **18-GMW-10**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234001
Lab Project ID: 1185234

Collection Date: 09/13/18 14:25
Received Date: 09/14/18 11:25
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	11.7		0.577	0.173	mg/L	1		09/17/18 09:52
Surrogates								
5a Androstane (surr)	79.2		50-150		%	1		09/17/18 09:52

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 09:52
Container ID: 1185234001-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 260 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Results of **18-GMW-11**

Client Sample ID: **18-GMW-11**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234002
Lab Project ID: 1185234

Collection Date: 09/13/18 13:20
Received Date: 09/14/18 11:25
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	9.31		0.600	0.180	mg/L	1		09/17/18 10:02
Surrogates								
5a Androstane (surr)	75.2		50-150		%	1		09/17/18 10:02

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 10:02
Container ID: 1185234002-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Results of **18-GMW-12**

Client Sample ID: **18-GMW-12**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234003
Lab Project ID: 1185234

Collection Date: 09/13/18 15:20
Received Date: 09/14/18 11:25
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	6.29		0.588	0.176	mg/L	1		09/17/18 10:12
Surrogates								
5a Androstane (surr)	72.4		50-150		%	1		09/17/18 10:12

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 10:12
Container ID: 1185234003-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 255 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Results of **18-GMW-15**

Client Sample ID: **18-GMW-15**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234004
Lab Project ID: 1185234

Collection Date: 09/13/18 12:15
Received Date: 09/14/18 11:25
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	0.676		0.600	0.180	mg/L	1		09/17/18 10:22
Surrogates								
5a Androstane (surr)	71.7		50-150		%	1		09/17/18 10:22

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 10:22
Container ID: 1185234004-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Results of **18-GMW-16**

Client Sample ID: **18-GMW-16**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234005
Lab Project ID: 1185234

Collection Date: 09/13/18 17:20
Received Date: 09/14/18 11:25
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	2.93		0.588	0.176	mg/L	1		09/17/18 10:31
Surrogates								
5a Androstane (surr)	73		50-150		%	1		09/17/18 10:31

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 10:31
Container ID: 1185234005-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 255 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Results of **18-GMW-99**

Client Sample ID: **18-GMW-99**
Client Project ID: **CVEA Glennallen 2018**
Lab Sample ID: 1185234006
Lab Project ID: 1185234

Collection Date: 09/13/18 18:20
Received Date: 09/14/18 11:25
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	2.88		0.600	0.180	mg/L	1		09/17/18 10:41
Surrogates								
5a Androstane (surr)	71.2		50-150		%	1		09/17/18 10:41

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/17/18 10:41
Container ID: 1185234006-A

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 09/16/18 08:10
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/26/2018 10:25:18AM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1786064 [XXX/40483]
Blank Lab ID: 1475454

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1185234001, 1185234002, 1185234003, 1185234004, 1185234005, 1185234006

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	0.300U	0.600	0.180	mg/L
Surrogates				
5a Androstane (surr)	84.6	60-120		%

Batch Information

Analytical Batch: XFC14607
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CMS
Analytical Date/Time: 9/17/2018 9:23:00AM

Prep Batch: XXX40483
Prep Method: SW3520C
Prep Date/Time: 9/16/2018 8:10:13AM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1185234 [XXX40483]
Blank Spike Lab ID: 1475455
Date Analyzed: 09/17/2018 09:32

Spike Duplicate ID: LCSD for HBN 1185234 [XXX40483]
Spike Duplicate Lab ID: 1475456
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1185234001, 1185234002, 1185234003, 1185234004, 1185234005, 1185234006

Results by **AK102**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	20	17.5	87	20	16.5	83	(75-125)	5.60	(< 20)
Surrogates									
5a Androstane (surr)	0.4	89.3	89	0.4	87	87	(60-120)	2.60	

Batch Information

Analytical Batch: **XFC14607**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CMS**

Prep Batch: **XXX40483**
Prep Method: **SW3520C**
Prep Date/Time: **09/16/2018 08:10**
Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

SGS

REVISED NIC

SGS North America Inc.
CHAIN OF CUSTODY RECORD

1185234

Locations Nationwide
Alaska Maryland
New Jersey New York
North Carolina Indiana
West Virgina Kentucky
www.us.sgs.com

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Section 1

CLIENT: Ahtna Engineering Services, LLC
CONTACT: Alex Geilich PHONE NO: 907-771-4431 (O)
PROJECT NAME: CVEA Glennallen 2018 PROJECT/ PWSID/ PERMIT#:
REPORTS TO: Emily Freitas, Jess St. Laurent, & Tom Day E-MAIL: ahtnalab@ahtna.net
INVOICE TO: Alex Geilich ageilich@ahtna.net QUOTE #:
P.O. #: 20210108

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	Section 3 # CONTAINERS	Type C = COMP G = GRAB MI = Multi Incremental Soils	Preservative HCl	AK 102 - DRO	Ethylene Glycol	REMARKS/ LOC ID
(1) A-B	18-GMW-10	09/13/18	1425	GW	2		✓			
(2) A-B	18-GMW-11	09/13/18	1320	GW	2		✓			
(3) A-B	18-GMW-12	09/13/18	1520	GW	2		✓			
(4) A-B	18-GMW-15	09/13/18	1215	GW	2		✓			
(5) A-E	18-GMW-16	09/13/18	1720	GW	5		✓	✓		
(6) A-E	18-GMW-99	09/13/18	1820	GW	5		✓	✓		

Section 5

	Date	Time	
Relinquished By: (1) Felipe Restrepo	9/14/18	1115	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	9/14/18	11:25	Received For Laboratory By: KET

Section 4

DOD Project? Yes (No)

Data Deliverable Requirements:

Cooler ID:

Requested Turnaround Time and/or Special Instructions:
Standard TAT

Temp Blank °C: 6.0 D44
or Ambient [ ]
(See attached Sample Receipt Form)

Chain of Custody Seal: (Circle)
INTACT BROKEN (ABSENT)
(See attached Sample Receipt Form)

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

e-Sample Receipt Form

SGS Workorder #: **1185234**

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements		yes Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	n/a	hand delivered
COC accompanied samples?	yes	
n/a **Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	yes	Cooler ID: 1 @ 6.0 °C Therm. ID: D44
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
If >6°C, were samples collected <8 hours ago?	n/a	
If <0°C, were sample containers ice free?	n/a	
If samples received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "**COOLER TEMP**" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Were samples received within holding time?	yes	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	yes	
**Note: If times differ <1hr, record details & login per COC.		
Were analyses requested unambiguous? (i.e., method is specified for analyses with >1 option for analysis)	yes	
	n/a	***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	yes	
Volatile / LL-Hg Requirements		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	n/a	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	n/a	
Were all soil VOAs field extracted with MeOH+BFB?	n/a	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1185234001-A	HCL to pH < 2	OK			
1185234001-B	HCL to pH < 2	OK			
1185234002-A	HCL to pH < 2	OK			
1185234002-B	HCL to pH < 2	OK			
1185234003-A	HCL to pH < 2	OK			
1185234003-B	HCL to pH < 2	OK			
1185234004-A	HCL to pH < 2	OK			
1185234004-B	HCL to pH < 2	OK			
1185234005-A	HCL to pH < 2	OK			
1185234005-B	HCL to pH < 2	OK			
1185234005-C	No Preservative Required	OK			
1185234005-D	No Preservative Required	OK			
1185234005-E	No Preservative Required	OK			
1185234006-A	HCL to pH < 2	OK			
1185234006-B	HCL to pH < 2	OK			
1185234006-C	No Preservative Required	OK			
1185234006-D	No Preservative Required	OK			
1185234006-E	No Preservative Required	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM - The container was received damaged.
FR - The container was received frozen and not usable for Bacteria or BOD analyses.
IC - The container provided for microbiology analysis was not a laboratory-supplied, pre-sterilized container and therefore was not suitable for analysis.
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.

Bio-Chem LABORATORIES, INC.

1049 - 28th Street SE
Grand Rapids, MI 49508
Ph: 616/248-4900
Toll Free: 800/362-LABS
Fax: 616/248-4904

September 26, 2018

Julie Shumway
SGS Environmental
200 W. Potter Drive
Anchorage, AK 99518

TEL: (907) 562-2343
FAX (907) 561-5301

RE: 1185234

Dear Julie Shumway:

Order No.: 1809085

BIO-CHEM Laboratories, Inc. received 2 samples on 9/19/2018 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative.

If you have any questions regarding these tests results, please feel free to call.

Please note that unless otherwise instructed, residual samples will be held for sixty (60) days from the original report date. At that time, all non-hazardous samples will be disposed of in accordance with federal, state and local regulations and ordinances, and hazardous samples shall be returned to you. Please contact the laboratory within thirty (30) days if other arrangements for sample retention need to be made.

Sincerely,

Cindy Euwema

Cindy Euwema
Office Manager

Working with you to ensure a better tomorrow.

1809085

SGS

SGS North America Inc.

CHAIN OF CUSTODY RECORD

1 1 8 5 2 3 4

Locations Nationwide

Alaska Florida
New Jersey Colorado
Texas North Carolina
Virginia Louisiana

www.us.sgs.com

CLIENT:	SGS North America Inc. - Alaska Division	**SGS Reference:**	**Bio-Chem**
CONTACT:	Julie Shumway	**PHONE NO:**	(907) 562-2343
PROJECT NAME:	1185234	**PWSID#:**	
		NPDL#:	
REPORTS TO:		**E-MAIL:**	Julie.Shumway@sgs.com
INVOICE TO:	SGS - Alaska	**QUOTE #:**	
		P.O. #:	1185234

Additional Comments: All soils report out in dry weight unless otherwise requested.

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HHMM	MATRIX/ MATRIX	# CONTAINERS	Preservative Used: NONE	TYPE C = COMP G = GRAB Multi Incremental Soils	Ethylene Glycol by 8015M				MS	MSD	SGS lab #	Location ID
	18-GMW-16	9/13/2018	17:20	~~glycol~~	3	G =		X						1185234005	
	18-GMW-99	9/13/2018	18:20	~~glycol~~	3	G =		X						1185234006	
				Water (per attached) 9-19-18											

Relinquished By: (1)	Date	Time	Received By:	DOD Project? ~~YES~~ JS
J Shumway	09/19/18	0932	UPS 9-19-18 Cindy Ewuena 10:30	Report to DL (J Flags)? YES
Relinquished By: (2)	Date	Time	Received By:	Cooler ID:
Relinquished By: (3)	Date	Time	Received By:	Data Deliverable Requirements: Level 2 Report with Data View and ~~AHTNA EQuIS~~ JS
Relinquished By: (4)	Date	Time	Received For Laboratory By:	Requested Turnaround Time and-or Special Instructions:

Report all analyses for Soils/Waters in mg/L or mg/Kg, where possible

Temp Blank °C: 0.3°

or Ambient [ ]

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

[X] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

Gmail by Google

Cindy Euwema <ceuwema@bio-chem.com>

1185234-received 9/13/18

2 messages

Cindy Euwema <ceuwema@bio-chem.com> Wed, Sep 19, 2018 at 1:54 PM
To: Julie Shumway <julie.shumway@sgs.com>

Hi Julie,

The matrix for these samples say: Glycol. They look like water samples.

Please let me know.

Thanks,

Cindy Euwema
Bio-Chem Laboratories, Inc.
1049 28th St SE
Grand Rapids, MI 49508
Phone: (616) 248-4900
Toll Free: (800) 362-5227
Fax: (616) 248-4904
email: ceuwema@bio-chem.com

Shumway, Julie (Anchorage) <Julie.Shumway@sgs.com> Wed, Sep 19, 2018 at 3:05 PM
To: Cindy Euwema <ceuwema@bio-chem.com>

I'm sorry, I think the PM and I both missed that, it's been so hectic as fall hits up here. Please assume they are a water matrix. Utilize this email as a change order.

Julie

Julie Shumway

Environment, Health & Safety

Business Development

BIO-CHEM Laboratories, Inc.

Date: *26-Sep-18*

CLIENT: SGS Environmental
Project: 1185234
Lab Order: 1809085

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received
1809085-01A	18-GMW-16	Water	9/13/2018	9/19/2018
1809085-02A	18-GMW-99	Water	9/13/2018	9/19/2018

BIO-CHEM Laboratories, Inc.

Date: *26-Sep-18*

CLIENT: SGS Environmental
Project: 1185234
Lab Order: 1809085

CASE NARRATIVE

Samples are routinely analyzed using methods outlined in the following references:

(SW) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Ed.
(E) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
(A) Standard Methods for the Examination of Water and Wastewater, APHA, 18th Ed.
(D) Annual Book of ASTM Standards.

Specific methods utilized for this project are provided in the analytical report and are identified by the reference document abbreviation ( ) followed by the method number.

All QA/QC and sample analyses met method, laboratory and/or regulatory data quality objectives unless otherwise specified below.

No data qualifications required and there are no "J" flags to report.

BIO-CHEM Laboratories, Inc.

Date: *9/26/2018*

ANALYTICAL REPORT

CLIENT: SGS Environmental
Lab Order: 1809085
Project: 1185234
Lab Sample ID: 1809085-01A

Project Number: 1185234
Client Sample ID: 18-GMW-16
Collection Date: 9/13/2018
Matrix: WATER

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Alcohols by GC/FID								
1. Ethylene Glycol	SW8015B	< 10		10	mg/L	1	LEB	9/24/2018

Definitions:
PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q):
J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *9/26/2018*

ANALYTICAL REPORT

CLIENT: SGS Environmental
Lab Order: 1809085
Project: 1185234
Lab Sample ID: 1809085-02A

Project Number: 1185234
Client Sample ID: 18-GMW-99
Collection Date: 9/13/2018
Matrix: WATER

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
Alcohols by GC/FID								
1. Ethylene Glycol	SW8015B	< 10		10	mg/L	1	LEB	9/24/2018

Definitions:
PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q):
J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

Lab Order: 1809085
Client: SGS Environmental
Project: 1185234

ANALYTICAL DETAIL REPORT

Sample ID	Client Sample ID	Matrix	Test Name	Date Sampled	TCLP/SPLP Date	Prep Date	QC Batch	Analysis Date	Analytical Batch
1809085-01A	18-GMW-16	Water	Alcohols by GC/FID	9/13/2018		9/24/2018	42657	9/24/2018	GC_B_FID_180924A
1809085-02A	18-GMW-99	Water	Alcohols by GC/FID	9/13/2018		9/24/2018	42657	9/24/2018	GC_B_FID_180924A

CLIENT: SGS Environmental
Work Order: 1809085
Project: 1185234

ANALYTICAL QC SUMMARY REPORT

TestCode: ALCOHOL_W

Sample ID: **MB-42657** SampType: **MBLK** TestCode: **ALCOHOL_W** Units: **mg/L** Prep Date: **9/24/2018** Run ID: **GC_B_FID_180924A**
Client ID: **ZZZZZ** Batch ID: **42657** TestNo: **SW8015B (SW8015B)** Analysis Date: **9/24/2018** SeqNo: **1081902**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylene Glycol	< 10	10									

Sample ID: **LCS-42657** SampType: **LCS** TestCode: **ALCOHOL_W** Units: **mg/L** Prep Date: **9/24/2018** Run ID: **GC_B_FID_180924A**
Client ID: **ZZZZZ** Batch ID: **42657** TestNo: **SW8015B (SW8015B)** Analysis Date: **9/24/2018** SeqNo: **1081903**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylene Glycol	44.68	10	50	0	89.4	73.3	129	0	0		

Sample ID: **1809085-01Ams** SampType: **MS** TestCode: **ALCOHOL_W** Units: **mg/L** Prep Date: **9/24/2018** Run ID: **GC_B_FID_180924A**
Client ID: **18-GMW-16** Batch ID: **42657** TestNo: **SW8015B (SW8015B)** Analysis Date: **9/24/2018** SeqNo: **1081906**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylene Glycol	47.85	10	50	0	95.7	46	148	0	0		

Sample ID: **1809085-01Amsd** SampType: **MSD** TestCode: **ALCOHOL_W** Units: **mg/L** Prep Date: **9/24/2018** Run ID: **GC_B_FID_180924A**
Client ID: **18-GMW-16** Batch ID: **42657** TestNo: **SW8015B (SW8015B)** Analysis Date: **9/24/2018** SeqNo: **1081907**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylene Glycol	57.75	10	50	0	116	46	148	47.85	18.8	20	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

(This Page Intentionally Left Blank)

APPENDIX C

DATA QUALITY REVIEW AND ADEC LABORATORY DATA REVIEW CHECKLIST

(This Page Intentionally Left Blank)

DATA QUALITY REVIEW

Date: October 15, 2018

Project : CVEA Glennallen 2018
Site: Glennallen Diesel Plant
Laboratory: SGS North America
Work Order: 1185234

Reviewer Name: Jess St. Laurent, Ahtna
Reviewer Title: Project Chemist

INTRODUCTION

Table 1 lists the field sample numbers, corresponding laboratory numbers, and identifies quality control (QC) samples.

TABLE 1: FIELD SAMPLE PLAN OVERVIEW

Field Sample ID	Lab Sample ID	Quality Control
18-GMW-10	1185234001	
18-GMW-11	1185234002	
18-GMW-12	1185234003	
18-GMW-15	1185234004	
18-GMW-16	1185234005	Primary
18-GMW-99	1185234006	Duplicate

DATA QUALIFIER DEFINITIONS

For the purpose of this Data Quality Review (DQR) the following code letters and associated definitions are provided for use by the project chemist to summarize the data quality.

R Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J The associated numerical value is an estimated quantity because QC criteria were not met, may be biased high or low.

UJ The reported quantitation limit is estimated because QC criteria were not met and the element or compound was not detected.

Q The result is qualified due to quality control criteria not being met

DATA REVIEW

This DQR includes a review, where appropriate, of the following parameters:

- Data completeness
- Chain of Custody (COC) and Cooler Receipt Forms
- Holding times and preservation
- Analytical reporting limits (limits of quantitation [LOQ] and method detection limits [DL])
- Blank analysis results
- Surrogate recoveries (organics only)
- Field duplicates
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results

Each analysis that was performed is evaluated in the following subsections of this report, and only the criteria exceedances that impact data qualification or require assessment beyond laboratory documentation are discussed.

Validation was conducted in accordance with the United State Environmental Protection Agency (EPA) document "*Test Methods for Evaluating Solid Wastes, SW-846, revision 6*" (July, 2014 and updates), USEPA *Contract Laboratory Program National Functional Guidelines for Inorganic and Organic Review* (January, 2017), where and when applicable.

Sample Receipt Conditions

Samples were submitted to SGS North America located in Anchorage, AK. Six water samples were hand delivered in one cooler without custody seals to the lab. Data was reported in sample delivery group (SDG) 1185234. Two of the six samples were set out to Bio-Chem Laboratories Inc in Grand Rapids MI for analysis of ethylene glycol.

Holding Times and Preservatives

All samples were received within hold times and with proper preservation.

PRECISION

Field Duplicates

One duplicate set was submitted for analysis – primary 18-GMW-16 and duplicate 18-GMW-99. Relative percent difference (RPD) was calculated using the following equation for the primary and duplicate field samples when both analytes were detected. Calculated RPDs are shown in Table 2 below.

EQUATION 1 – RELATIVE PERCENT DIFFERENCE

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

TABLE 2 – RPD CALCULATION

Analyte	Units	18-GMW-16 Primary	18-GMW-99 Duplicate	RPD (<30% goal)
Diesel Range Organics	ug/L	2.93	2.88	1.7

%: percent
RPD: Relative percent difference

All calculated RPDs are within control limits.

ACCURACY

Matrix Spike/Duplicates, Laboratory Control Samples/Duplicates and Internal Standards

All laboratory quality control samples were within laboratory limits.

Surrogate Recovery

All surrogate recoveries were within necessary limits.

REPRESENTATIVENESS

All samples were collected in accordance with the work plan. Samples collected are considered representative of conditions and meet data quality objectives discussed in the work plan.

COMPARABILITY

One laboratory was used, and one SDG was received for this project. However, SGS did ship two samples to an outside lab for analysis of 8015M. The results, methods, procedures, quantitation units, and format of the work order are comparable in quality and data validity to all applicable regulations.

COMPLETENESS

All data necessary to complete a level II data validation on this SDG was provided. No data were rejected, so 100% of the results are usable. This exceeds the 85% minimum project completeness goal.

SENSITIVITY

All results were evaluated to the LOD. No qualifications were made based on LODs.

Trip Blanks

No trip blank was submitted.

Method Blanks

Laboratory method blanks were not detected at or above the LOD.

OVERALL ASSESSMENT

Based on the data review completed, no data were rejected. All analytical data is considered usable for the purpose of evaluating the presence or absence and magnitude of the suspected site contaminants.

Laboratory Data Review Checklist

Completed by: Jess St.Laurent

Title: Chemist Date: 10/15/18

CS Report Name: CVEA Glennallen 2018 Report Date: 9/26/18

Consultant Firm: Ahtna Engineering Services

Laboratory Name: SGS North America Inc. Laboratory Report Number: 1185234

ADEC File Number: ADEC RecKey Number:

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:

      Two samples were transferred to Bio-Chem in Grand Rapids, MI.

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

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

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

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

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

There were no issues reported with the sample conditions.

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

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

Data usability or quality is not affected by the sample receipt conditions.

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:

No discrepancies documented.

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

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

Usability is not affected.

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

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

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

No soil samples were submitted within this data set.

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

e. Data quality or usability affected?
Comments:

Data quality and usability is not affected with respect to the reported sample results.

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

Yes both labs ran method blanks for their analyesis.

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

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

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

There were no affected samples

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

Data quality and usability was not affected with respect to the reported method blank results.

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:

No metals were run.

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

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

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

No samples were affected

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

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

Data quality or usability is not affected with respect to the reported results.

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:

No surrogates failed.

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

Data quality or usability is not affected with regards to the surrogate results.

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

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☒ No ☐NA (Please explain.) Comments:

No trip blank was submitted with the samples.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☒NA (Please explain.) Comments:

No VOA samples were submitted.

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

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

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

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
☒Yes ☐ No ☐NA (Please explain.) Comments:

One set was submitted to the lab, primary sample 18-GMW-16 and duplicate 18-GMW-99.

ii. Submitted blind to lab?

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

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

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

All calculated RPDs are within control limits.

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

Comments:

Data usability is not affected by the duplicate sample.

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

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

No equipment blank was submitted. Disposable sampling equipment was used.

i. All results less than PQL?

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

ii. If above PQL, what samples are affected?

Comments:

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

Comments:

Usability is not affected.

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

a. Defined and appropriate?

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

No additional data qualifiers were used.

APPENDIX D

MANN-KENDALL ANALYSES

(This Page Intentionally Left Blank)

Mann-Kendall and Linear Regression Analysis Description Text

To evaluate the stability of the petroleum hydrocarbon plume at the site, Ahtna performed a trend analysis using the historical monitoring results. The analytical data were compared using the nonparametric Mann-Kendall test (Gilbert 1987) to analyze whether concentrations of diesel range organics (DRO) exhibit an increasing or decreasing trend over time in a given well. The Mann-Kendall test compares a later-measured value to each earlier-measured value and assigns the integer value of -1, 0 or 1, indicating that the later value is lower, equal or higher than each earlier value. The Mann-Kendall test does not assume a distribution and is resistant to the influence of outliers. Individual Mann-Kendall calculation tables and graphs are presented in this Attachment.

The Mann-Kendall test assumes the null hypothesis of no trend unless the data indicate the alternative. Ahtna selected a significance level of $\alpha = 0.10$, or 10%. If the probability, *p*, of obtaining the computed Mann-Kendall statistic (S) is less than 0.10 (or 10%), the confidence level is greater than 90%. If $p < 0.10$, the null hypothesis is rejected and there is evidence to conclude that constituent 'x' in well point 'y' exhibits a trend. If the probability of obtaining S is greater than 0.10 ($p > 0.10$), then the confidence level is less than 90% and the null hypothesis is not rejected. If the confidence level is greater than 90%, then the sign of the S value indicates the trend direction, with a positive S value indicating an increasing trend and a negative S value indicating a decreasing trend.

The coefficient of variation (CV) for each data set was computed to determine the stability of the contaminants regardless of the trend. The CV value identifies the degree of variation in concentrations between sampling events and is defined as the sample standard deviation divided by the sample mean. The lower the value of the CV, the less variation exists and the more stable the concentration is in the well. For a negative S value with a confidence level of < 90%, a coefficient of variation less than one (CV < 1) indicates that the concentration at that location is stable, and CV > 1 indicates no trend.

A linear regression analysis was also performed on the data as a parametric alternative to the Mann-Kendall test. The analysis assesses the slope and computes the R^2 value of the least-squares regression on the sample mean. The R^2 value indicates the fit of the data, or distance of data points from the regression line. Higher R^2 values (> 0.8) indicate a close fit of the data and a strong correlation, suggesting that there is a trend. Values of R^2 between 0.5 and 0.8 suggest some correlation in the data and the possibility of a trend. Linear regression is based on the assumption that the data approximately follow a normal distribution and can confidently be used with 8 or more data points. With fewer than 8 data points it is difficult to determine if the normality assumption has been met and the linear regression has low power, or a lower probability of correctly detecting a trend when a trend exists. Linear regressions are provided as a qualitative assessment of trend but should be used for decision-making with caution since the distribution of the data has not been determined and the number of data points has not been considered.

The results of the regression analyses and the Mann-Kendall tests for DRO concentrations are shown in this Attachment. Also included in is a table providing the Mann-Kendall confidence levels for various sample sizes and S values. The table shows the range of confidence levels which have been calculated using S values and sample size. If the S value and sample size falls in the blue shaded area, the confidence level is greater than 90% and the concentration exhibits a trend at that location.

Reference

Gilbert, Richard O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold.

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-10
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	<90%	<1	No Trend

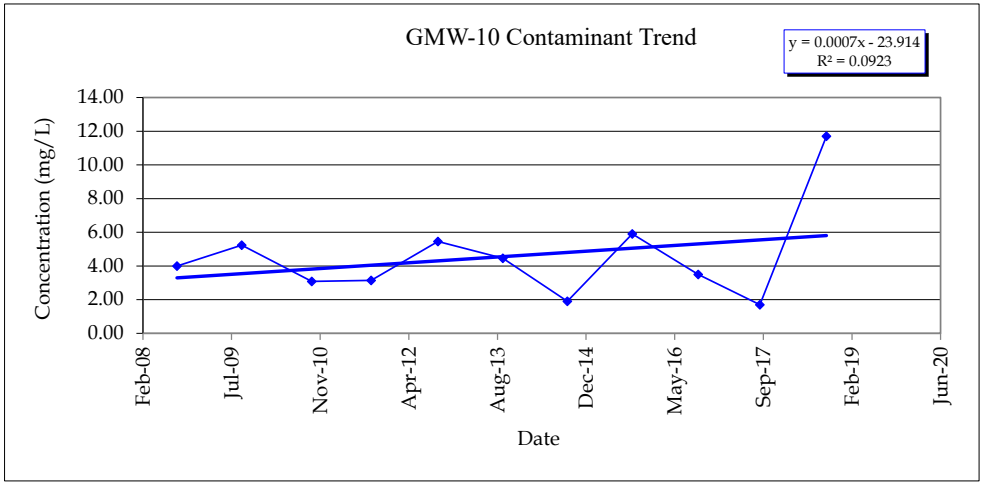
Monitoring date:	**Sep-08**	**Sep-09**	**Oct-10**	**Sep-11**	**Sep-12**	**Sep-13**	**Sep-14**	**Sep-15**	**Sep-16**	**Sep-17**	**Sep-18**	
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	
DRO (mg/L)	**4.00**	**5.23**	**3.08**	**3.15**	**5.45**	**4.46**	**1.90**	**5.90**	**3.50**	**1.70**	**11.7**	
Row 1: Compare to Event 1		1	-1	-1	1	1	-1	1	-1	-1	1	0
Row 2: Compare to Event 2			-1	-1	1	-1	-1	1	-1	-1	1	-3
Row 3: Compare to Event 3				1	1	1	-1	1	1	-1	1	4
Row 4: Compare to Event 4					1	1	-1	1	1	-1	1	3
Row 5: Compare to Event 5						-1	-1	1	-1	-1	1	-2
Row 6: Compare to Event 6							-1	1	-1	-1	1	-1
Row 7: Compare to Event 7								1	1	-1	1	2
Row 8: Compare to Event 8									-1	-1	1	-1
Row 9: Compare to Event 9										-1	1	0
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**3**
Confidence Level	**<90%**
Coefficient of Variance (CV)	**0.60**
Number of Events (n)	**11**
R^2	**0.0923**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
- R2 is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R2 values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R2 values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Trend Analysis	
Statistical Method	**Result**
Linear Regression	No trend
Mann-Kendall	No trend



Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-11
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	<90%	>1	No trend

Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11
DRO (mg/L)	**1.96**	**1.92**	**2.02**	**2.44**	**5.96**	**3.58**	**36.0**	**13.0**	**2.50**	**1.93**	**9.31**

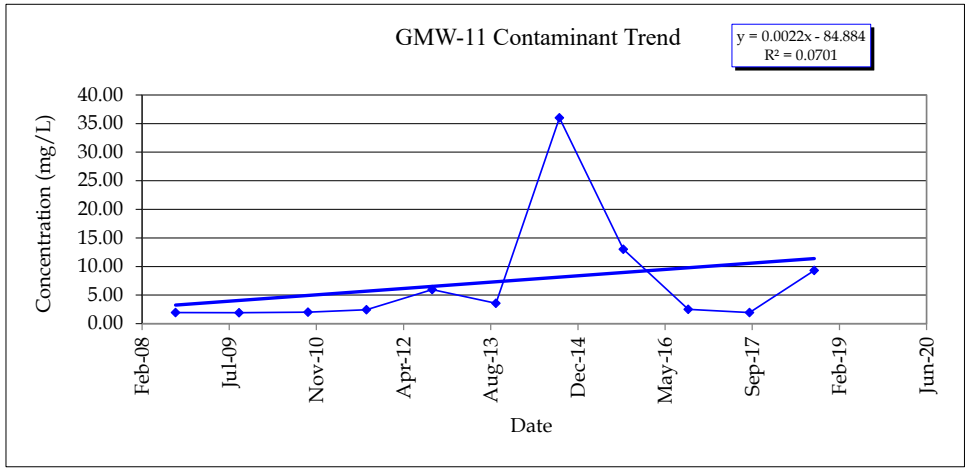
Row 1: Compare to Event 1		-1	1	1	1	1	1	1	1	-1	1	6
Row 2: Compare to Event 2			1	1	1	1	1	1	1	1	1	9
Row 3: Compare to Event 3				1	1	1	1	1	1	-1	1	6
Row 4: Compare to Event 4					1	1	1	1	1	-1	1	5
Row 5: Compare to Event 5						-1	1	1	-1	-1	1	0
Row 6: Compare to Event 6							1	1	-1	-1	1	1
Row 7: Compare to Event 7								-1	-1	-1	-1	-4
Row 8: Compare to Event 8									-1	-1	-1	-3
Row 9: Compare to Event 9										-1	1	0
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**21**
Confidence Level	**87.9%**
Coefficient of Variance (CV)	**1.39**
Number of Events (n)	**11**
R^2	**0.0701**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
- R2 is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R2 values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R2 values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Trend Analysis	
Statistical Method	**Result**
Linear Regression	No Trend
Mann-Kendall	No Trend



Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-12
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
<1	<90%	>1	No Trend

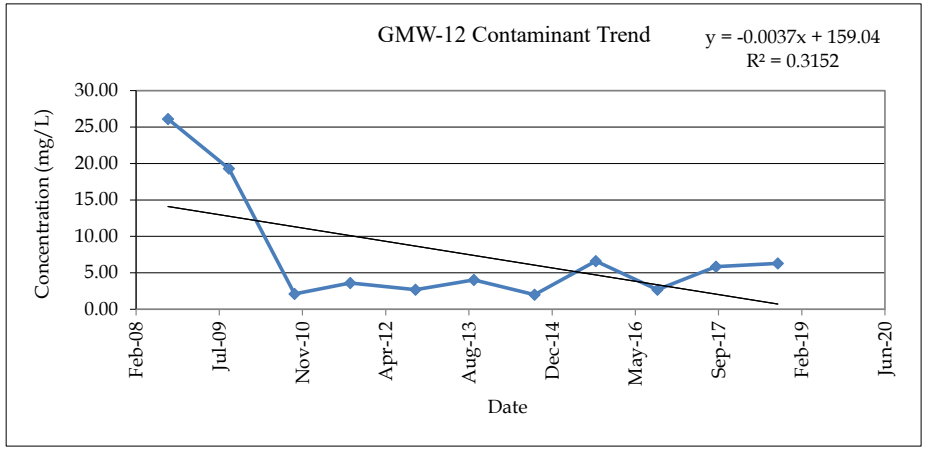
Monitoring date:	Sep-08	Sep-09	Oct-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15	Sep-16	Sep-17	Sep-18	
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	
DRO (mg/L)	**26.10**	**19.30**	**2.12**	**3.60**	**2.68**	**4.04**	**2.0**	**6.6**	**2.7**	**5.8**	**6.3**	
Row 1: Compare to Event 1		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
Row 2: Compare to Event 2			-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Row 3: Compare to Event 3				1	1	1	-1	1	1	1	1	6
Row 4: Compare to Event 4					-1	1	-1	1	-1	1	1	1
Row 5: Compare to Event 5						1	-1	1	1	1	1	4
Row 6: Compare to Event 6							-1	1	-1	1	1	1
Row 7: Compare to Event 7								1	1	1	1	4
Row 8: Compare to Event 8									-1	-1	-1	-3
Row 9: Compare to Event 9										1	1	2
Row 10: Compare to Event 10											1	1

Mann-Kendall Statistic (S) = Total	**-4**
Confidence Level	**62.2%**
Coefficient of Variance (CV)	**1.07**
Number of Events (n)	**11**
R^2	**0.3152**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
- R2 is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R2 values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R2 values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Trend Analysis	
Statistical Method	**Result**
Linear Regression	No Trend
Mann-Kendall	No Trend



Ahtna Engineering Services, LLC

CVEA Glennallen Diesel Plant
Mann-Kendall Test for Trend Analysis

Monitoring Well No.	GMW-15
Contaminant	DRO

Trend Analysis			
S-Statistic	**Confidence Level**	**CV**	**Result**
>1	>95%	<1	Increasing

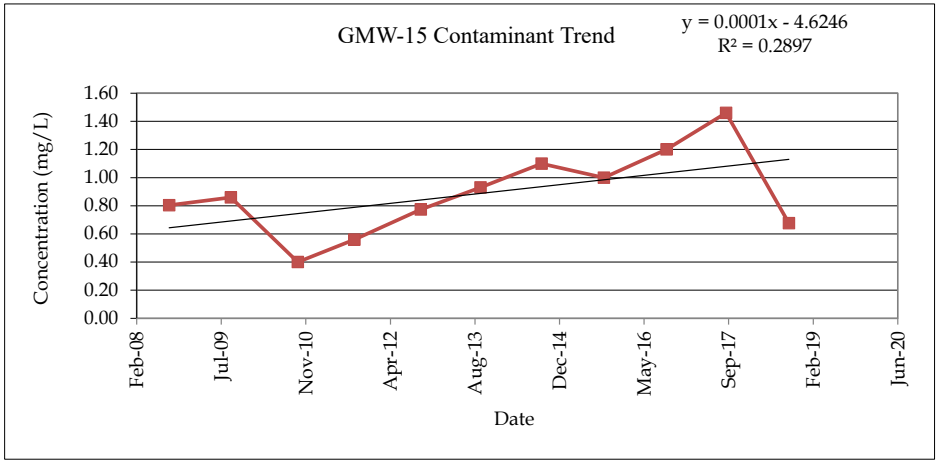
Monitoring date:	**Sep-08**	**Sep-09**	**Oct-10**	**Sep-11**	**Sep-12**	**Sep-13**	**Sep-14**	**Sep-15**	**Sep-16**	**Sep-17**	**Sep-18**	
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	
DRO (mg/L)	0.80	0.86	0.40	0.56	0.77	0.93	1.10	1.00	1.20	1.46	0.68	
Row 1: Compare to Event 1		1	-1	-1	-1	1	1	1	1	1	-1	2
Row 2: Compare to Event 2			-1	-1	-1	1	1	1	1	1	-1	1
Row 3: Compare to Event 3				1	1	1	1	1	1	1	1	8
Row 4: Compare to Event 4					1	1	1	1	1	1	1	7
Row 5: Compare to Event 5						1	1	1	1	1	-1	4
Row 6: Compare to Event 6							1	1	1	1	-1	3
Row 7: Compare to Event 7								-1	1	1	-1	0
Row 8: Compare to Event 8									1	1	-1	1
Row 9: Compare to Event 9										1	-1	0
Row 10: Compare to Event 10											-1	-1

Mann-Kendall Statistic (S) = Total	**25**
Confidence Level	**97.42%**
Coefficient of Variance (CV)	**0.34**
Number of Events (n)	**11**
R^2	**0.2897**

Notes:

– A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
– Non-detects are listed as 1/2 of the Reporting Limit (RL)
– A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.
– A negative S value with confidence > 95% indicates a decreasing concentration trend.
– A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
– A positive S value with confidence > 95% indicates an increasing concentration trend.
– A positive S value with confidence < 90% indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
– A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
– The closer to zero the CV is, the less variation in concentrations between sampling events.
- R2 is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R2 values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R2 values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
Confidence Level Determination Based on Table A18 (Gilbert 1987)
Effects of Coefficient of Variance based on Table 3.2 (AFCEE, 2000)

Trend Analysis	
Statistical Method	**Result**
Linear Regression	No Trend
Mann-Kendall	Incresing



Ahtna Engineering Services, LLC

MANN-KENDALL S STATISTIC 90% CONFIDENCE LEVELS

2018 Groundwater Monitoring Event

Copper Valley Electric Assoication, Glennallen Deisel Plant, Glennallen, Alaska

Confidence Levels for Mann-Kendall S Statistic and Sample Size, from Standard Normal Z-Score

Total Number of Sampling Events

S (+/-)	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	0.912884306	0.836406561	0.77381482	0.725997214	0.68965464	0.661671339	0.639742606	0.622251563	0.60806919	0.596398357	0.586667	0.5784574	0.57145907	0.5654377	0.5602136	0.5556472	0.55162862
5	0.95528532	0.889664319	0.826220982	0.773655395	0.73190661	0.698916236	0.672639577	0.651454195	0.634149138	0.619833846	0.6078518	0.5977145	0.589054154	0.5815901	0.5751058	0.5694318	0.56443425
6	0.979229966	0.929177655	0.870171822	0.816239631	0.77104947	0.734192712	0.704247482	0.679785606	0.659623309	0.642837358	0.6287216	0.6167374	0.606471841	0.5976062	0.5898916	0.5831324	0.57717267
7	0.991291435	0.956794634	0.905756981	0.853443022	0.80676188	0.767243915	0.734375007	0.707105793	0.68438909	0.665332993	0.6492195	0.6354828	0.623679009	0.61346	0.6045507	0.5967327	0.58983089
8	0.996710793	0.974978239	0.933572522	0.885221893	0.8388502	0.797875753	0.762862825	0.733291743	0.708353275	0.68725026	0.669292	0.6539096	0.640643785	0.6291266	0.6190633	0.610217	0.60239619
9	0.99888273	0.986256832	0.95456303	0.911762855	0.86724481	0.825958688	0.78958568	0.75823897	0.731433071	0.708524721	0.6888891	0.671979	0.657335722	0.644582	0.6334103	0.6235699	0.61485614
10	0.999659145	0.992847061	0.969855413	0.933435758	0.89198971	0.851426735	0.814453315	0.781862536	0.753556882	0.729098532	0.7079648	0.6896546	0.673725955	0.6598033	0.6475733	0.6367765	0.62719861
11	0.999906706	0.996474635	0.980611248	0.95073949	0.91322689	0.874273907	0.83741026	0.804097573	0.774664857	0.748920874	0.7264774	0.7069027	0.689787353	0.6747684	0.6615345	0.6498225	0.63941185
12	0.999977111	0.998355693	0.987914726	0.964247292	0.93117708	0.894548537	0.858434565	0.824899305	0.794709202	0.767948263	0.7443898	0.7236924	0.705494648	0.6894569	0.6752772	0.662694	0.6514845
13	0.99999497	0.999274569	0.992702483	0.974557129	0.94611885	0.91234596	0.877535611	0.844242598	0.813654255	0.786144745	0.7616696	0.739996	0.720824545	0.7038494	0.6887853	0.6753779	0.66340563
14	0.999999011	0.999697414	0.99573254	0.982250934	0.95836774	0.927800104	0.89475115	0.862121076	0.831476337	0.803481974	0.7782893	0.7557888	0.735755822	0.7179278	0.7020438	0.6878616	0.67516475
15	0.999999826	0.999880718	0.99758388	0.98786468	0.96825673	0.941074552	0.910143753	0.87854587	0.848163393	0.819939176	0.7942262	0.7710495	0.750269398	0.7316759	0.7150387	0.7001332	0.68675186
16	0.999999973	0.999955575	0.998675918	0.991869532	0.97611938	0.952353581	0.923796858	0.893544049	0.863714441	0.835503	0.8094628	0.7857598	0.764348397	0.7450785	0.727757	0.7121815	0.69815748
17	0.999999996	0.999984373	0.999297797	0.994662991	0.98227605	0.96183363	0.935810614	0.907156815	0.878138858	0.850167276	0.8239861	0.799905	0.77797818	0.7581221	0.7401866	0.7239963	0.70937262
18	1	0.99999481	0.99963969	0.996568103	0.98702377	0.96971557	0.946297682	0.919437525	0.891455525	0.86393268	0.8377882	0.8134734	0.791146365	0.7707949	0.7523169	0.7355677	0.72038887
19	1	0.999998372	0.999821154	0.997838444	0.99062943	0.976198023	0.955379177	0.930449617	0.903691863	0.87680632	0.8508656	0.8264569	0.803842826	0.7830866	0.7641378	0.7468871	0.73119838
20	1	0.999999518	0.999914137	0.998666659	0.99332621	0.981471891	0.963180865	0.940264507	0.91488279	0.888801251	0.8632193	0.8388502	0.816059679	0.7949883	0.775641	0.7579462	0.74179387
21	1	0.999999865	0.999960135	0.999194603	0.99531262	0.985716159	0.969829734	0.948959519	0.925069626	0.899935941	0.8748545	0.8506512	0.827791239	0.806493	0.7868188	0.768738	0.75216864
22	1	0.999999965	0.999982103	0.999523646	0.99675357	0.98909494	0.975451009	0.956615914	0.934298979	0.910233697	0.8857801	0.8618608	0.839033975	0.817595	0.7976649	0.7792559	0.76231661
23	1	0.999999991	0.999992232	0.999724159	0.997783	0.991755672	0.980165665	0.963317037	0.942621633	0.919722054	0.8960088	0.8724825	0.849786442	0.8282903	0.808174	0.7894944	0.77223229
24	1	0.999999998	0.99999674	0.999843628	0.99850726	0.99382832	0.984088436	0.969146655	0.950091469	0.928432162	0.9055563	0.8825226	0.860049198	0.8385762	0.818342	0.7994487	0.78191082
25	1	1	0.999998678	0.999913224	0.99900911	0.995425426	0.987326341	0.974187483	0.956764436	0.936398156	0.9144413	0.8919897	0.869824715	0.8484517	0.828166	0.8091149	0.79134792
26	1	1	0.999999482	0.999952865	0.99935155	0.996642805	0.989977666	0.978519927	0.962697589	0.94365655	0.9226851	0.9008947	0.879117274	0.8579172	0.8376438	0.8184898	0.80053993
27	1	1	0.999999804	0.999974941	0.99958169	0.997560718	0.992131389	0.982221047	0.967948212	0.950245634	0.9303111	0.9092504	0.887932849	0.8669741	0.8467747	0.8275711	0.80948381
28	1	1	0.999999928	0.999986961	0.999734	0.998245355	0.993866969	0.985363745	0.97257303	0.956204911	0.9373444	0.9170717	0.896278993	0.8756256	0.8555586	0.8363572	0.81817709
29	1	1	0.999999975	0.99999336	0.99983327	0.998750486	0.995254452	0.98801616	0.976627529	0.961574564	0.9438118	0.9243747	0.904164704	0.8838756	0.8639967	0.8448473	0.82661791
30	1	1	0.999999991	0.999996691	0.999897	0.999119149	0.996354821	0.990241259	0.980165372	0.966394961	0.9497409	0.9311771	0.911600299	0.8917296	0.872091	0.8530414	0.83480498
31	1	1	0.999999997	0.999998387	0.99993728	0.999385308	0.99722054	0.992096613	0.983237917	0.970706212	0.9551603	0.9374977	0.918597275	0.8991938	0.8798443	0.8609401	0.84273757
32	1	1	0.999999999	0.99999923	0.99996236	0.999575387	0.997896224	0.993634318	0.985893849	0.974547776	0.960099	0.9433564	0.925168175	0.9062756	0.8872604	0.8685447	0.8504155
33	1	1	1	0.999999641	0.99997774	0.999709667	0.998419389	0.994901062	0.988178891	0.977958108	0.9645862	0.9487735	0.931326452	0.9129832	0.8943437	0.8758573	0.85783914
34	1	1	1	0.999999836	0.99998703	0.999803503	0.998821236	0.995938288	0.990135616	0.980974372	0.9686509	0.9537702	0.93708633	0.9193256	0.9010995	0.8828804	0.86500936
35	1	1	1	0.999999927	0.99999255	0.99986837	0.999127441	0.996782454	0.991803342	0.983632195	0.972322	0.9583677	0.942462676	0.9253124	0.9075337	0.8896172	0.87192752
36	1	1	1	0.999999968	0.99999578	0.999912725	0.999358908	0.997465345	0.993218085	0.985965475	0.9756275	0.9625877	0.947470869	0.9309541	0.9136528	0.8960716	0.87859545
37	1	1	1	0.999999986	0.99999765	0.999942728	0.999532487	0.998014436	0.994412594	0.988006233	0.9785951	0.9664516	0.952126672	0.9362615	0.919464	0.9022478	0.88501546

> 90% and < 95% Confidence

> 95% Confidence

Notes:

– The test statistic, tau, is computed as $\tau = S/(n(n-1)/2)$

Donald W. Meals, Jean Spooner, Steven A. Dressing, and Jon B. Harcum. 2011. Statistical analysis for monotonic trends, Tech Notes 6, November 2011. Developed for U.S. Environmental Protection Agency by Tetra Tech, Inc., Fairfax, VA, 23 p. Available online at www.bae.ncsu.edu/programs/extension/wqg/319monitoring/tech_notes.htm.

– The standard normal z-score is defined as $z = \tau((9n(n-1))/(2(2n+5)))^{1/2}$

Ajit C. Tamhane and Dorothy D. Dunlop. 2000. Statistics and Data Analysis, from Elementary to Intermediate. Prentice Hall, Upper Saddle River, NJ 07458. p. 591

Ahtna Engineering Services, LLC

(This Page Intentionally Left Blank)

APPENDIX E

SAMPLING METHODOLOGIES

(This Page Intentionally Left Blank)

SAMPLING METHODOLOGIES

1.0 GROUNDWATER SAMPLES

Groundwater was sampled in each of the six wells using the United States Environmental Protection Agency (EPA) low-drawdown groundwater sampling procedure. First groundwater level and total well depth were measured to the nearest 0.01 foot using an electronic water level meter. A peristaltic pump was then used to purge and sample each groundwater monitoring well. The low-flow purge and sample collection technique involved purging the well at a rate that minimized and maintained a stable drawdown. Once a flow rate was established, the field team repeatedly measured the depth to water during purging to ensure that minimal drawdown was occurring in the well. If drawdown occurred at more than 0.3 feet while purging, the flow rate was decreased until the recharge was equivalent to the discharge. A water quality meter with flow-through cell was then connected to the peristaltic pump discharge line and water quality measurements were recorded every three to five minutes. During purging, water quality parameters were monitored until three of the four below parameters were stable based on the following criteria:

- pH was stable within 0.1 pH units;
- Conductivity was stable within 3 percent (%);
- Oxygen reduction potential (ORP) was stable within 10 millivolts; or
- Dissolved oxygen was stable within 10%.

All measurements, including depth to water and the parameters listed above, were recorded on groundwater sample data sheets.

Once purging was complete, and the water quality meter disconnected, groundwater samples were collected. Each water sample volume for DRO and ethylene gylcol analysis was placed into appropriately preserved laboratory-supplied jars. Care was taken to avoid touching the mouth of the discharge line, the top of the sample bottle, or the inside of the cap. The bottle was then filled completely such that a positive meniscus formed.

2.0 SAMPLE ANALYSES

All samples were analyzed for:

- DRO by Alaska Method AK102;
- Ethylene Glycol by EPA Method 8015D

All laboratory sample containers were immediately labeled with the proper analytical method and pre-assigned sample identification number, sealed, and placed in a cooler on ice.

3.0 SAMPLE PRESERVATION

All samples were placed in a cooler with sufficient gel ice to keep sample temperatures at 4 degrees Celsius (°C) ± 2°C until delivery to the project laboratory under standard chain of custody (COC) procedures. A temperature blank was included with each cooler.

APPENDIX F

ADEC APPROVAL LETTER

(This Page Intentionally Left Blank)

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

555 Cordova Street
Anchorage, AK 99501
Main: 907-269-7691
Fax: 907-269-7687
www.dec.alaska.gov

File No.: 240.38.001

November 26, 2018

Travis Million
Copper Valley Electric
PO Box 45
Glennallen, AK 99588

Re: 2018 Groundwater Sampling Report
CVEA Glennallen Power Plant GW

Dear Mr. Million:

The Alaska Department of Environmental Conservation (ADEC) reviewed the *2018 Groundwater Sampling report*, dated November 2018. Five groundwater monitoring wells (GMW-10 through GMW-12, and GMW-15 and GMW-16) were sampled on September 13, 2018. All water samples were submitted for laboratory analysis of diesel range organics (DRO). The sample collected from MW-16 was also submitted for laboratory analysis of ethylene glycol. Concentrations of DRO exceeded the Table C groundwater cleanup level of 1.5 mg/l in Wells GMW-10 (11.7 mg/l), GMW-11 (9.31 mg/l), GMW-12 (6.29 mg/l) and GMW-16 (2.93 mg/l). Ethylene glycol was not present in the sample collected from Well GMW-16. ADEC agrees with the report recommendations for continued monitoring of the same five wells and discontinuation of sampling for ethylene glycol.

Please submit the next work plan by May 1, 2019. As a general reminder, work plans and reports may be submitted electronically. If your submittals are less than 8 gigabytes, you may submit it to me through the Alaska ZendTo "drop-off" option at https://drop.state.ak.us/drop/. Submittals less than 20 megabytes can be emailed to the CS.Submittals@alaska.gov inbox. The division of SPAR/Contaminated Sites Program prefers and encourages electronic submittals.

This report is approved. Feel free to contact me with any questions at (907) 269-7691 or joshua.barsis@alaska.gov.

Sincerely,

Joshua Barsis
Environmental Program Specialist

cc: Ahtna (via email)