Weston Solutions, Inc.
425 G Street, Suite 300
Anchorage, Alaska 99501
907-276-6610 ● Fax: 907-276-6694
www.westonsolutions.com

January 25, 2019

Mr. Prathap Kodial
Crowley Fuels Alaska, LLC
201 Arctic Slope Avenue
Anchorage, Alaska 99518-3033
e-mail: Prathap.Kodial@crowley.com

Subject: 2018 Groundwater Monitoring Work Plan
Nenana Header and Rail Line Area, Crowley Nenana Facility
Nenana, Alaska

Dear Mr. Kodial,

Weston Solutions, Inc. (Weston) is pleased to present our 2018 Work Plan to Crowley Fuels Alaska, LLC (Crowley) to perform annual groundwater monitoring and to conduct a subsurface investigation at the Nenana Middle Tank Farm Facility located in Nenana, Alaska. This Work Plan describes activities for groundwater monitoring and collecting groundwater samples in fall 2018. The purpose of these activities is to monitor the current nature and extent of the hydrocarbon impact in the groundwater at the Nenana Middle Tank Farm. The Nenana Fuel Terminal is listed with the Alaska Department of Conservation (ADEC) File Numbers 110.38.010 (Header Area) and 110.38.011 (Rail Line Area).

SITE BACKGROUND

The Nenana Fuel Terminal is located at approximately 64.564688° north latitude and 149.100866° west longitude, on the south shore of the Tanana River adjacent to the confluence of the Nenana River (Figure 1). Nenana is located approximately 55 road miles south of Fairbanks, Alaska. The site history dates back to the early 1900s; Nenana was an active depot location to support the transport of freight and fuel amongst the Alaska Railroad and barge operations of the Tanana and Yukon River systems.

Initial site characterization work began at the Header Area in May 2010 after the discovery of hydrocarbon-contaminated soil during excavation work to inspect the header lines. The May 2010 characterization work included collection of soil samples from the open excavation area, and further delineation activities were conducted in October 2010. The hydrocarbon contaminated soils are believed to be related to historical site activities dating back to the early 1900s.

Similarly, excavation work along an inactive rail line in September 2010 located west of the Header Area also encountered impacted soil. Additional characterization activities were conducted at the Header and Rail Line Area in October 2010. The impacted soil in the Rail Line Area, along the abandoned rail road track, is believed to be related to historical operations that included the off-loading of fuel from rail cars during previous facility operations.

Various site assessment and groundwater monitoring activities have been conducted at the facility between 2010 and 2017. These activities have included Geoprobe® soil borings, installation of groundwater monitoring wells (MW-1 through MW-16), product recovery (MW-13), and collection of soil and groundwater samples for laboratory analysis. Groundwater sampling events have been performed at the facility since 2011. Results of the assessments and semi-annual groundwater sampling events have been used to estimate the extent of soil contamination and of the groundwater plumes located within the facility. Analytical results of the soil and groundwater samples have identified diesel-range organics (DRO), gasoline-range organics (GRO), residual-range organics (RRO), and benzene, ethylbenzene, toluene and xylenes (BTEX) as the primary constituents of concern. Detailed information of the activities and analytical results are provided in the groundwater summary reports submitted to Crowley each year.

2018 PROJECT SCOPE AND OBJECTIVES

Weston will perform the groundwater monitoring and sampling activities at the Nenana Facility in October 2018 as discussed with ADEC through email correspondence on October 8, 2018.

Annual Groundwater Sampling

Weston will mobilize a two person field team from our Anchorage office to perform the annual groundwater sampling event at the Nenana Facility (Header and Rail Line Area). Weston anticipates performing the sampling events in October 2018. All field activities will be coordinated and scheduled with Crowley personnel to minimize disruption to ongoing operations at the facility. Weston will perform the following activities during the semi-annual groundwater sampling events:

- Gauge all site groundwater monitoring wells (MW-1 through MW-7 and MW-9 through MW-16) for depth to water measurements (Figure 2). The depth-to-water measurements will be used to determine the groundwater elevations and groundwater flow direction within the facility. MW-8 was properly abandoned in September 2015 with ADEC approval;
- Perform low-flow sampling procedures on monitoring wells MW-1 through MW-7 and MW-9 through MW-16 for collection of groundwater samples (Figure 2). If product is present on MW-13, groundwater samples will not be collected for laboratory analysis.
- Submit annual groundwater samples to SGS of North America, Inc. (SGS) for petroleum hydrocarbon constituents.
- Review and compare analytical results to their respective ADEC Table C and 18 Alaska Administrative Code (AAC) 70 Water Quality Standards.
- Develop a conceptual site model identifying potential pathways through which receptors might be exposed to contaminants of concern.
- Prepare an analytical summary report presenting tabulated analytical results, field gathered water quality data, groundwater elevation, and interpreted flow direction.

Regulatory Standards

Analytical results for the work reported herein will be compared to relevant State of Alaska Cleanup Criteria. The State of Alaska, through ADEC, has established cleanup criteria for petroleum-contaminated sites. Cleanup standards are defined in AAC Title 18, Chapter 75, Article 3: *Oil and Other Hazardous Substance Pollution Control; Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances* (ADEC, 2018). Groundwater sample analytical results will be compared to 18 AAC 75.345, Table C groundwater cleanup levels. Analytical data collected from the monitoring wells will be used to calculate total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) for comparison to 18 AAC 70, Water Quality Standards. ADEC groundwater cleanup levels and surface water quality criteria are summarized in Table 1.

TABLE 1: ADEC GROUNDWATER CLEANUP LEVELS/WATER QUALITY CRITERIA

Contaminant of Concern	ADEC Groundwater Cleanup Level (µg/L)[1]	ADEC Water Quality Standards (µg/L)[2]
Hydrocarbon Constituents		
GRO	2,200	--
DRO	1,500	--
RRO	1,100	--
BTEX Constituents		
Benzene	4.6	--
Toluene	1,100	--
Ethylbenzene	15	--
Total xylenes (sum of m, p and o)	190	--
PAH Constituents		
Acenaphthene	530	--
Acenaphthylene	260	--
Anthracene	43	--
Benzo(a)anthracene	0.30	--
Benzo(a)pyrene	0.25	--
Benzo(b)fluoranthene	2	--
Benzo(g,h,i)perylene	0.26	--
Benzo(k)fluoranthene	0.80	--
Chrysene	2.0	--
Dibenz(a,h)anthracene	0.25	--
Fluoranthene	260	--
Fluorene	290	--
Indeno(1,2,3-c,d)pyrene	0.19	--
Naphthalene	1.7	--
Phenanthrene	170	--
Pyrene	120	--
1-Methylnaphthalene	11	--
2-Methylnaphthalene	36	--
Surface Water Quality Constituents		
TAH (sum of BTEX)	--	10
TAqH (BTEX + PAH)	--	15

Notes:

[1] Alaska Administrative Code Title 18 Chapter 75, Table C

[2] Alaska Administrative Code Title 18 Chapter 70

µg/L = micrograms per liter

PAH = polycyclic aromatic hydrocarbon

SAMPLING AND ANALYSIS PLAN

Weston will collect groundwater samples during the annual sampling events according to ADEC and U.S. Environmental Protection Agency (EPA) guidelines. Weston will use ADEC-approved laboratory SGS located in Anchorage, Alaska, for all analytical services. Sample containers will be picked up at the SGS field office prior to sampling activities. Upon completion of the sampling activities, groundwater samples will be delivered to SGS.

Analytical Methods

All groundwater samples will be analyzed for:

- GRO by AK101;
- DRO/RRO by AK102/103;
- BTEX by EPA SW8260B; and
- PAH analysis by EPA SW8270-SIM

Groundwater Elevation Measurements

Each groundwater monitoring well will be gauged for static water level (SWL) and total well depth prior to commencement of the low-flow sampling procedures. Monitoring wells containing light non-aqueous phase liquid (LNAPL) hydrocarbons evident as separate-phase will not be purged or sampled. Thickness of free-phase hydrocarbons in the wells will be measured and recorded if it is encountered.

Low-Flow Purging

Groundwater samples will be collected using Hurricane ProActive Stainless Steel Pump following EPA low-flow sampling procedures. Care will be taken to minimize drawdown by routinely monitoring the depth to groundwater (DTW). The low-flow purge and sample collection technique involves purging the well at flow rates of 0.1 to 0.5 liter per minute using a stop-watch and a 1-liter graduated cylinder. Once a flow rate is established, the field team will repeatedly measure the DTW during purging to ensure that minimal drawdown (less than 0.3 foot) is occurring in the well. If drawdown occurs at more than 0.3 foot while purging, the flow rate will be decreased until the recharge is equivalent to the discharge. A water quality meter with a flow-through cell will then be connected to the peristaltic pump discharge line, and water quality measurements will be recorded every 3 to 5 minutes. During purging, water quality parameters will be monitored until:

- pH is stable within 0.1 pH units;
- Temperature is stable within 0.2 degrees Celsius (°C);
- Conductivity is stable within 3 percent (%); and
- Dissolved oxygen (DO) is stable within 10%.

Values for oxygen-reduction potential (ORP) will also be recorded. Stability is considered achieved once three successive water quality parameter readings fall within the above ranges. All measurements, including DTW and the above parameters, will be recorded on groundwater sample data sheets.

If stability of the above parameters cannot be achieved, then removal of three casing volumes will be performed, at which time sampling will commence. The removal of three volumes is not necessary if stability is achieved during the purge process, as evidenced by successive readings of the above parameters within the stated tolerances.

Groundwater samples will be collected as close as possible to the groundwater surface. If a well is low yield and purges dry, a sample will not be collected until 80% recharge is measured. Generally, 12 to 24 hours will be allowed to elapse between purging and sampling in the case of a well that purges dry. When returning to collect a sample from a low-yield well, no additional purging will be conducted; the sample will be immediately collected.

Groundwater Sample Collection

Once purging is complete and the water quality meter is disconnected, groundwater samples will be collected. Each water sample volume for GRO and volatile organic compound (VOC) analysis will be placed into 40-milliliter (mL) vials that have been pre-preserved with hydrochloric acid (HCl). The sample bottles for volatile organics (VOCs and GRO) will be filled slowly to prevent the entrapment of air bubbles, splashing, or agitation of the water. Care will be taken to avoid touching the mouth of the discharge line, the top of the sample bottle, the inside of the cap, or the Teflon® septa. A septum that falls out of the cap onto the ground cannot be used. The bottle will be filled completely so that a meniscus forms. The cap will then be secured and the bottle inverted, tapped firmly, and checked for the presence of air bubbles. Accurate analytical results for volatiles may be compromised if there is any free air trapped inside the sample container. All laboratory sample containers will be immediately labeled with the proper analytical method and pre-assigned a sample identification number, sealed, and placed in a cooler on ice.

Water Quality Data Collection

During well purging, water quality parameters will be collected by the field team. Groundwater quality data will be collected using a direct-read field instrument, such as a YSI® water quality meter (with flow-through cell), which will be calibrated daily. The normal pH range for groundwater is generally between 4 and 9, with a theoretical range from 0 to 14. The normal DO range for groundwater is between 2 and 12 milligrams per liter (mg/L), with a theoretical oxygen saturation point at approximately 12 mg/L. Values encountered outside of the theoretical ranges will indicate the need to either re-calibrate the water quality meter, or replace the meter. ORP and specific conductivity are dependent upon the concentration of anions and cations in the groundwater, so ranges are not included here.

SAMPLE HANDLING

Field Documentation

Field documentation will include sample identification labels, photographs, laboratory analysis requests, and permanently bound field logs. A field logbook will be maintained by the Weston field team for recording detailed descriptions of all field activities and samples collected. Pages will not be removed from any data logbook for any reason. Any possible corrections will be made by drawing a single line through the original entry so that the original entry can still be read. The corrections will be written alongside the crossed-out entry. The corrections will be initialed and dated.

Sample Labeling

Each sample container will be sealed and labeled immediately after collection. Sample labels will be completed using waterproof ink and will be affixed firmly to the sample containers. A sample code will be assigned to each sample as an identification number to track collected samples. The sample label will include the project name, date and time of collection, sample identification number, analysis required, and the preservation method used. Weston will use an alpha-numeric code for sample identification numbers. The sample codes for the laboratory samples are shown in Table 2.

TABLE 2: SAMPLE IDENTIFICATION SCHEME

Digits	Description	Code Examples
1-2	Sample Media	GW
3-5	Site Code	NEN
6-8	Sample Location	MW1
9-10	Sample Number	01

Example: GW-NEN-MW1-01.

Duplicate samples will be numbered sequentially without any indication of the primary sample so that the laboratory cannot identify the quality control (QC) purpose of the sample. Trip blanks will be numbered sequentially for the project.

After a sample is collected, pertinent information, including the sample identification number, date and time of sample collection, location, sample collection method, description of sample, and any field screening measurements, will be recorded in the field logbook.

Chain-of-Custody, Sample Packaging

A chain-of-custody (CoC) record will be completed and shipped with the samples. Proper sample custody is maintained through adherence to the procedures listed below.

- Custody seals will be placed in two locations over the lid/cooler edge and secured with clear packing tape.

- A CoC record will accompany the coolers in which the samples are packed. When transferring samples, the individuals relinquishing and receiving the coolers must sign, date, and note the time on the CoC record. This record will document the sample custody transfer.

Samples will be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. Adherence to the following sample package requirements is essential:

- Sample container lids must never be mixed. All lids must remain with their original container.
- Environmental samples must be cooled to 0°C- 6°C to preserve many chemical constituents. All coolers will contain a temperature blank that the laboratory will use to document sample temperatures.
- Any remaining space in the cooler will be filled with inert packing material, such as bubble wrap, newspaper, etc. Under no circumstances should material such as sawdust, sand, or Styrofoam peanuts be used.

Shipping

Environmental samples will be properly packaged and labeled inside an insulated cooler for transport and delivery to the SGS Fairbanks Office. Sample analysis will be performed at the SGS laboratory in Anchorage, Alaska.

QUALITY ASSURANCE AND QUALITY CONTROL

Quality Control Samples

QC samples will be collected to assess potential errors introduced during sample collection, handling, and analysis. As part of the field quality assurance (QA)/QC program, field duplicate samples, trip blanks, and extra sample volume for matrix spike/matrix spike duplicate (MS/MSD) procedures will be collected. The allowable tolerances for field duplicates are a relative percent difference of 30% for water samples. As summarized in Table 3, QC samples will be collected or prepared to assess potential errors introduced during sample collection, handling, and analysis. In summary, QC samples will include the following:

- One duplicate field sample for every 10 samples collected for laboratory analysis.
- One trip blank for each cooler containing volatile sample fractions (e.g., GRO, VOCs).
- Extra volume for MS/MSD procedures for water samples at a rate of 1 per 20 samples collected per laboratory analysis.

TABLE 3: QUALITY CONTROL REQUIREMENTS

Analytical Parameter	Analytical Method	Number of Trip Blank Samples	Number of Primary Samples	Number of Duplicate Samples	MS/MSD	Total Number of Samples
Groundwater						
GRO	AK101	1 per	14	1 per 10	1 per 20	19
DRO/RRO	AK102/103	NA	14	1 per 10	1 per 20	18
PAHs	SW8270-SIM-	NA	14	1 per 10	1 per 20	18
BTEX	SW8260B	1 per	14	1 per 10	1 per 20	19

Notes:
AK = Alaska
NA = not applicable
SIM = selective ion monitoring
SV = small volume
SW = solid waste method

Sample Containers, Hold Times, and Preservation

Table 4 summarizes sample analysis methods, containers, preservation, and holding times, as reflected in the *ADEC 2017 Field Sampling Guidance*.

TABLE 4: ANALYTICAL METHOD, CONTAINER, HOLDING TIME, AND PRESERVATION

Parameter	Analytical Method	Holding Time	Containers	Preservation	
Groundwater					
GRO	AK101	14 days	3 – 40 ml amber VOA vials	pH<2, HCl	0-6°C
BTEX	SW8260B	14 days	3 – 40 ml amber VOA vials	pH<2, HCl	0-6°C
DRO/RRO	AK102/103-SV	14 days/7 days	2 – 250 ml amber bottles	pH<2, HCl	0-6°C
PAHs	SW8270-SIM	7 days	2 – 250 ml amber bottles	0-6°C	

Notes:
VOA = volatile organic analysis

Data Quality Objectives

The data quality objective (DQO) for this project is to obtain analytical data of sufficient quality and quantity to satisfy the specific project objectives outlined in this Work Plan. To achieve this general objective, data of known and acceptable precision, accuracy, representativeness, completeness, and comparability must be generated of sufficient quantity and quality to accomplish the following:

- Monitor dissolved-phase petroleum hydrocarbon concentrations to verify conformance with groundwater cleanup levels specified in 18 AAC 75.345.
- Ensure the integrity of the results is legally defensible.

Overall project completeness goal is 90%. All practical quantitation limits (PQLs) are below ADEC limits. The SGS laboratory analytical DQOs for the planned sampling activities are presented in Table 5.

TABLE 5: ANALYTICAL METHODS AND DQOS

Parameter	Method	MDL	RDL/PQL
		Water (mg/L)	
Benzene	SW8260B	0.000288	0.001
Toluene		0.000269	0.005
Ethyl benzene		0.000222	0.001
Xylenes		0.00086	0.003
GRO	AK101	0.0314	0.1
DRO	AK102-SV	0.0224	0.8
RRO	AK103-SV	0.0667	0.2
Acenaphthene	SW8270-SIM	0.00000177	0.00005
Acenaphthylene		0.00000141	0.00005
Anthracene		0.00000045	0.00005
Benzo(a)anthracene		0.00000101	0.00005
Benzo(a)pyrene		0.00000105	0.00005
Benzo(b)fluoranthene		0.00000104	0.00005
Benzo(g,h,i)perylene		0.0000011	0.00005
Benzo(k)fluoranthene		0.00000213	0.00005
Chrysene		0.00000068	0.00005
Dibenz(a,h)anthracene		0.00000096	0.00005
Fluoranthene		0.00000065	0.00005
Fluorene		0.00000109	0.00005
Indeno(1,2,3-c,d) pyrene		0.00000116	0.00005
Naphthalene		0.00001085	0.00025
Phenanthrene		0.00000073	0.00005
Pyrene		0.00000083	0.00005
1-Methylnaphthalene		0.00000190	0.00025
2-Methylnaphthalene		0.00000195	0.00025
2-Chloronaphthalene		0.0000833	0.00025

Notes:
MDL = method reporting limit
RDL = reported detection limit

Data Reduction, Validation, and Reporting

Validation and review of all analytical data will be performed by a qualified professional experienced in data validation and review procedures. All data will be validated and reviewed in accordance with appropriate EPA procedural guidance documents and ADEC regulatory guidance documents. The reference documents include the EPA *Functional Guidelines for Superfund Organic Methods Data Review* (EPA, 2017) and *Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data and Sample Handling, Technical Memorandum* (ADEC, 2017).

Calibration of Field Instruments – Water Quality Meter

Water quality parameters will be collected by the field team during well purging. Calibration of the water quality meter sensors will be verified with calibration standards prior to use. Personnel operating the water quality meter will understand the working ranges and maximum saturation values for the various sensors and will monitor results during purging and testing to ensure that they remain within these ranges or beneath maximum theoretical values. In the event the response for any individual sensor fails to meet precision and accuracy criteria specified by the equipment manufacturer, or actual project sample responses fall near or outside the theoretical working range for each sensor, the unit will be recalibrated or repaired as necessary before purging and sampling activities are continued. Calibration date, time, and results for all instruments will be recorded. The instrument model and serial number will be also recorded. Calibration for pH, DO, and ORP will be conducted daily using fresh calibration fluids.

INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation-derived waste during the groundwater investigation will consist of purge water. The purge water will be filtered through 5-gallon portable granular activate carbon units and surface discharged at least 100 feet from the Nenana or Tanana River. The filtered water will be surface discharged at least 100 feet from the Nenana or Tanana River. Nitrile gloves, paper towels, sample tubing, and empty cardboard boxes will be placed in trash bags for disposal by the Nenana Facility.

REPORTING

Upon receipt of the final laboratory analytical results, Weston will validate and compare the analytical data to applicable ADEC Table C Groundwater Cleanup Levels. Weston will prepare one report that will summarize results of the fall site investigation activities. The report will include ADEC-required QA reporting, analytical data tables, site figures depicting sampling/well locations, groundwater elevations, and an associated potentiometric surface map. The analytical report will be reviewed by Crowley prior to ADEC submittal.

2018 SCHEDULE

Weston anticipates the following schedule to be implemented during 2018:

Task Description	Tentative Schedule
Fall Groundwater Sampling	October 2018
Analytical Summary Report	March 2019

Please do not hesitate to contact me if you have any questions regarding the activities discussed within this Work Plan. Weston appreciates the opportunity to assist Crowley with the groundwater monitoring activities performed at the Nenana Facility.

Sincerely,

Martin Mylet
Senior Project Scientist
(907) 231-7902

Attachments:

1. Site Figures

REFERENCES

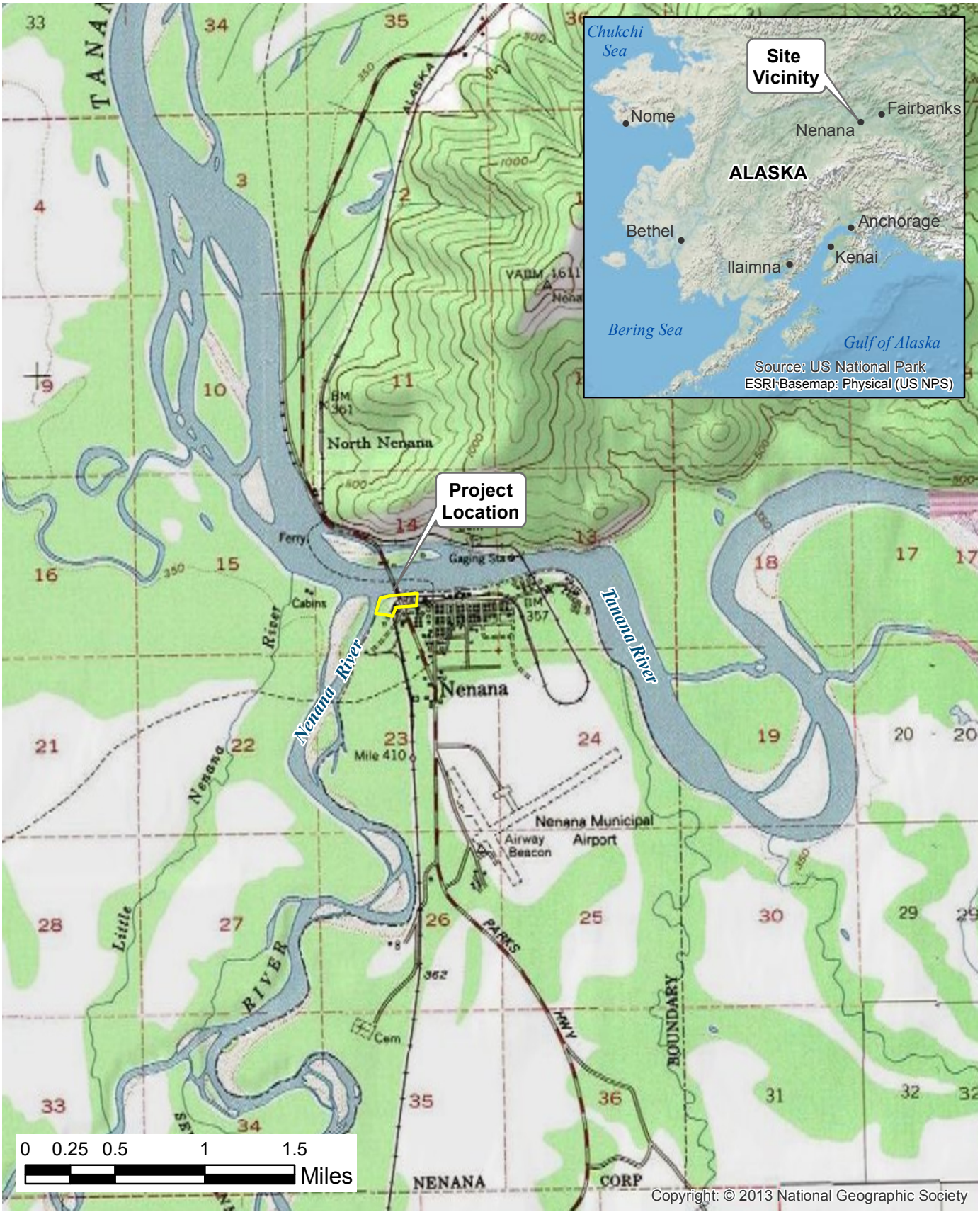
Alaska Department of Environmental Conservation (ADEC). 2017. *Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling, Technical Memorandum*. March 2017.

ADEC. 2018. *18 AAC 75. Oil and Other Hazardous Substances Pollution Control Regulations, Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances*. September.

U.S. Environmental Protection Agency (EPA). 2017. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA-540-R-2016-002).

ATTACHMENT 1

SITE FIGURES



Date: 15 May 2015 Drawn by: SJ K:\PROJECTS\Industrial-Commercial\Nenana\MXDS\2015_Nenana_GW-06.mxd

N

WESTON SOLUTIONS

NENANA HEADER AREA AND RAIL LINE SITE LOCATION MAP

Figure 1

Crowley Fuels Alaska-LLC
Nenana, Alaska

Date: 05 Mar 2018 Created by: SJ K:\PROJECTS\Industrial-Commercial\Nenana\MXDS\20182018_Nenana_MTF-02.mxd

WESTON SOLUTIONS

0 25 50 100 150 Feet

Data Sources : Image by Aerometric dated 6/8/10
Well locations based on survey by Design Alaska, Inc.
Dated September 2014, (Wells MW-7R and MW-10R
were added as replacement wells in 2017).

MONITORING WELL LOCATIONS

2018 Groundwater Monitoring Workplan
Nenana Header Area and Rail Line Site
Crowley Fuels Alaska-LLC Nenana, Alaska

Figure
2