February 17, 2010

Mr. Stephen Wilson
Director, Environmental, Safety and Quality Assurance
Crowley Maritime Corporation
1100 SW Massachusetts Street
Seattle, WA 98134-1030
Via e-mail: Stephen.Wilson@crowley.com

**Subject: Iliamna Fuel Release Response Report, Iliamna, Alaska**

Dear Mr. Wilson:

OASIS Environmental, Inc. (OASIS) is submitting this letter report to Crowley Maritime Corporation (Crowley) documenting the results of excavation and sampling activities associated with a spill of aviation fuel (100 octane low lead [100LL]; a.k.a AvGas) at Crowley Petroleum Distribution, Inc.'s Iliamna tank farm located in Iliamna, Alaska. This letter complies with Alaska Administrative Code Title 18, Chapter 75.335 (18 AAC 75.335) and Alaska Department of Environmental Conservation (ADEC) guidance document *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*, dated September 23, 2009.

OASIS aided Crowley by guiding excavation activities, collecting samples to characterize any remaining soils after completion of the excavation activities, and collecting samples to characterize temporarily stockpiled soils. Associated attachments to this report include:

- Figures 1 through 4 depicting site features, the excavation location, the temporary stockpile location, and sample locations (Attachment 1);
- Tables 1, 2, 3, 4 and 5 summarizing analytical results and gas chromatograms (Attachment 2);
- A photographic log (Attachment 3);
- Analytical data results, ADEC Checklist, and Quality Assurance Report (Attachment 4);
- A conceptual site model (CSM; Attachment 5).
- Well Log Tracking System Search Results and Well Logs (Attachment 6)

## BACKGROUND

Iliamna is located approximately 200 air miles southwest of Anchorage, Alaska (Figure 1). The spill occurred on the western side of Crowley's tank farm located east of the Iliamna airport (Figure 2). Crowley's tank farm is located at approximately 59°45'16.44" north latitude and 154°54'22.63" west longitude. Crowley leases the site (Lot 2A, Block 1200) from the State of Alaska Department of Transportation and Public Facility (DOT&PF). The site is located within Bureau of Land Management Public Land Survey Section 9, Township 5 South, Range 33 West, Seward Meridian.

On Monday, December 14, 2009, approximately 38 gallons of fuel, which had been transferred by meter, leaked out of the bottom of tanker truck number 4-35 within a loading dock fuel containment area. Fueling was immediately stopped, and the operator responded by placing two absorbent booms on the spilled fuel and using absorbent pads to mop up the fuel from the loading area. The spill occurred on the loading dock and was immediately contained. The leak was due to a broken fuel line elbow on the truck at the bottom of the tanker's tank. The tanker truck had previously been filled on November 4, 2009, and, until being moved to the loading deck, had been parked on the western side of the tank farm. The metered volume in the tanker truck on November 4 was 1,507 gallons. The entire content is believed to have leaked out between November 4, 2009, and December 14, 2009 at the parking location west of the tank farm fence and south of the pump house (Figure 3). Reported staining on the ground at the parking area was approximately 15 feet by 14 feet in an hourglass shape. The ice and snow on the ground apparently directed the released fuel to the northwest portion of the spill area. The tanker truck is currently reported to be empty.

## FIELD ACTIVITIES

An OASIS project manager (Mr. Daniel Frank) meeting the definition of a qualified person according to 18 AAC 75.990 traveled to Iliamna on December 28, 2009, to guide soil excavation activities and collect excavation confirmation samples for laboratory analysis. OASIS contracted Steppers Construction, Inc. (Steppers) to provide excavation services. TestAmerica, Inc., an ADEC-approved laboratory, was contracted to provide analysis of project samples. All work was performed in accordance with the letter work plan submitted to ADEC's project manager for this site, Mr. Mark Sielaff.

The work plan included a field screening and sampling approach prepared in accordance with ADEC's *Underground Storage Tank Procedures Manual*, dated November 2002 (18 AAC 78).

Prior to conducing field screening and excavation activities, OASIS and Steppers moved four Crowley vehicles, including a box van and three empty fuel tanker trucks. OASIS and Steppers then constructed a lined and bermed soil stockpile area to receive excavated soil. Iliamna-Newhalen-Nondalton Electric Cooperative (INNEC) conducted a utility locate for buried electrical lines leading to and through the site. INNEC identified a buried electrical line in conduit running from the south of the site, through the spill area, and to the north portion of the site.

Weather during site activities, conducted between December 28 and December 31, 2009, was mild with temperatures in the mid to upper 30s (Fahrenheit) and winds from the northeast.

### *Field Screening*

OASIS used field screening and visual observation of stained soil or sheen to guide soil excavation activities. Field screening was conducted using a photo-ionization detector (PID) calibrated to 100 parts per million vapor (ppmv) isobutylene. Both in situ and the ADEC heated headspace field screening method were used to guide delineation and excavation activities.

The PID was used to field screen soils in situ until readings on the PID were less than 100 ppmv. OASIS selected 100 ppmv as a field screening cleanup goal that would likely result in analytical data below ADEC Method Two cleanup levels found in Table B1 and B2 of 18 AAC 75.341, while also accounting for

the extremely volatile nature of aviation fuel. If in situ PID readings associated with soil at a location were above 100 ppmv, OASIS guided the Steppers excavator operator to remove additional soil until field screening results were below 100 ppmv, or until buried utilities and site infrastructure prevented further excavation.

OASIS initially delineated the surface area of impact by collection of surface samples for both heated headspace analysis and in situ analysis. OASIS's pre-excavation sampling grid extended from the north side of the pump house to 10 feet south of the southern boundary of the leased lot; west approximately 25 feet; and east between the tank farm fence and tank farm containment. Screening also was conducted between pallets and other stored material located at the southwestern corner of the fenced area. OASIS additionally collected field screening samples outside of the fenced area along the southern boundary of the site. The initial estimated area of impact based on in situ and heated head space PID field screening is presented in Figure 3.

Field screening results on the western side of the containment fence indicated an area of impact beginning from about 5 feet south of the pump house, extending along the containment and fence line to the south about 77 feet and to the west approximately 20 to 25 feet. It was apparent that spilled fuel migrated from the spill location at the parking area west of the tank farm's containment fence, to the fence line, then along the fence line to the south and into a low area south of and just off the property. Field screening results for the eastern side of the fence indicated an area of impact between the fence and the containment wall, extending south to the southwest corner of the fenced-in portion of the property.

Fields screening results beyond the fence line to the south indicated an area of impact extending along the western side of the fence line, then past the southwestern corner of the fenced-in area, along a narrowing 2-foot-wide segment leading to the adjacent leased lot and immediately around and south of INNEC's electrical meter and post (Figure 4; Photograph Nos. 29, 20, and 31).

OASIS evaluated possible migration from the spill location in a southeasterly direction through the southwestern corner of the fenced area and to a low area located along the southern lot line (Photograph Nos. 29 and 30). Field screening did not indicate impact outside of the fenced area along the southern boundary. OASIS collected four samples at 10-foot intervals beginning with location "D" approximately at the southwest corner of the tank farm fence. The PID locations were identified as A, B, C, and D. PID results were 17 ppmv at locations A, 15 ppmv at location B, 9 ppmv at location C, and 50 ppmv at locations D (Photograph No. 36). Field screening between the fence and the tank farm containment wall indicated an area of impact between these two structures running along the fence line from about 5 feet south of the pump house to the southwest corner of the fenced area (Photograph No. 54).

The adjacent lot to the south, Lot 1C, is leased by the Lake and Peninsula School District (LPSD) and subleased by the Pebble Limited Partnership (Pebble).

### *Soil Stockpile Area Construction*

Prior to beginning excavation work, OASIS directed the construction of a soil stockpile containment within the fenced area of the site, on the southern side of the tank farm containment. The stockpile containment was constructed by excavating an area measuring approximately 20 feet by 25 feet, and forming a berm 2 to 3 feet in height. OASIS noted a weathered diesel fuel odor during the excavation effort, and collected

a five-spot composite sample from the bottom of the containment footprint (Sample No. 09-ILM-01-SS). A 20-mil thick, oil-resistant reinforced polyethylene geo-membrane liner was then put into place, with 2 feet of liner material extending beyond the containment berm (Photograph Nos. 8 through 13).

### *Soil Excavation and Confirmation Sampling*

The excavation and removal effort was limited horizontally by the tank farm fence located adjacent to and east of the spill area, and vertically by a buried electrical cable that passed from the southern portion of the site to the northern portion directly though the area of impact.

Excavation activities began with the area located south of the site on the LPSD leased lot. OASIS obtained verbal permission from LPSD prior to excavation work on their leased lot (Photograph No. 36).. Pebble personnel observed site conditions before, during, and after excavation and backfilling. OASIS directed the removal of approximately 10 loose cubic yards (LCY) of impacted soil from an area of about 8 feet by 8 feet, to a depth of about 2.5 feet. Once in situ PID field screening results indicated no additional impact within the excavated area, OASIS collected three samples for PID screening using ADEC's heated headspace method. PID results ranged from 30 ppmv to 48 ppmv. OASIS then collected a confirmation sample for laboratory analysis (Sample No 09-ILM-02-SS) from the bottom of the excavation area. In situ PID field screening indicated impact to soil remained on the northern side of the lot line adjacent to the electrical meter and post. However, frozen soil and buried electrical cables prevented excavating this area.

Excavation on Crowley's leased lot began by removing the top 6 inches of frozen soil from a 20- by 75-foot area. The fence surrounding the tank farm area prevented excavating the impacted area on the eastern side of the fence. The excavation size was approximately rectangular, encompassing the area south of the pump house along the fence line and west 20 feet into the parking area of the site pad.

The resulting excavation, based on in situ and heated headspace PID testing, was a concave shape about 6 inches in depth at the sides and nearly 2 feet deep at the deepest point. Vertical excavation was halted when buried flagging warning of the buried electrical line was encountered (Photograph No. 46).

Once additional excavating was not necessary based on PID results, or hindered by infrastructure, OASIS established a10- by 10-foot grid over an approximately 75-foot-long by 25-foot-wide area (Figure 4). OASIS collected 23 samples for field screening by ADEC's heated headspace method. Heated headspace PID results ranged from 14 ppmv along the western boundary of the excavation to 1,968 ppmv near the fence just east of the spill location. OASIS then collected seven samples for laboratory analysis (samples 09-ILM-05-SS through 09-ILM-011-SS) from field-selected sample locations. Samples 09-ILM-05-SS and 09-ILM-10-SS were selected from field screening locations with the highest PID concentrations. Samples 09-ILM-06-SS and 09-ILM-07-SS were collected from the southern portion of the on-site excavation, in an area where a weathered diesel odor was noted. Sample 09-ILM-08-SS was collected west of sample 09-ILM-10-SS, along the western edge of the excavation. Sample 09-ILM-09-SS was collected from a relatively clean area at the northwestern edge of the excavation.

### *Soil Stockpile Characterization Sampling*

OASIS estimated that approximately 65 LCYs of soil were removed and placed into the temporary stockpile. OASIS collected two samples, 09-ILM-03-SS and 09-ILM-12-SS, for laboratory analysis to characterize the stockpiled soil. Additionally, one quality assurance/quality control (QA/QC) field duplicate sample 09-ILM-04-SS was collected with primary sample 09-ILM-03-SS.

### *Excavation Backfill*

After collection of confirmation samples from the excavated areas, the excavation was backfilled with approximately 80 LCYs of clean fill obtained from the gravel borrow pit at the Newhalen Landfill. The backfilled area was contoured to achieve a surface higher than the surrounding area to compensate for settlement upon thawing, facilitate run off of surface water and discourage water pooling over the backfilled excavation area.

## ANALYTICAL RESULTS

OASIS collected a total of eight soil samples from the excavation floor, three samples from the stockpiled soil, and one sample from the stockpile area footprint. One duplicate sample was submitted with the project samples to TestAmerica, Inc. in Anchorage, Alaska, for QA purposes. All samples were preserved and stored at a temperature of 4 degrees Celsius (°C) ±2°C and hand carried to the laboratory under standard chain-of-custody procedures.

Soil samples were analyzed for the following target analytes using the methods specified below:

- Gasoline-range organics (GRO by Alaska Method 101 [AK101])
- Benzene, ethylbenzene, toluene, and xylenes (BTEX; United States Environmental Protection Agency [EPA] Method 8260)
- Diesel-range organics (DRO; AK102)
- Riesel-range organics (RRO; AK103)

Additionally, select project samples were analyzed for the following target analytes:

- Polycyclic aromatic hydrocarbons (PAHs; EPA 8270 by Selected Ion Monitoring)
- Total Lead (EPA 6020)

Table 1 summarizes the sample locations and analyses applied. Table 2 summarizes the analytical results for excavation confirmation samples, and Table 3 summarizes sample results for the soil stockpiles. Sample locations are displayed in attached Figure 4. Sample results are compared to ADEC Method Two cleanup levels found in Table B1 and B2 of 18 AAC 75.341. Laboratory data verification and quality assurance summaries are presented with the analytical data in Attachment 3.

Composite sample 09-ILM-01-SS was collected from the stockpile footprint and analyzed for GRO/BTEX, DRO/RRO, and lead. Field observations indicated a weathered diesel fuel odor. Analytical results were below ADEC cleanup levels for all analytes except DRO. DRO was detected at a concentration of 1,010 milligrams per kilogram (mg/kg), exceeding the ADEC Method Two cleanup level of 250 mg/kg for DRO. Analytical results are summarized in the attached Table 3.

Stockpile characterization sample 09-ILM-03-SS and duplicate sample 09-ILM-04-SS were analyzed for GRO/BTEX, DRO/RRO, PAHs, and lead. Stockpile characterization sample 09-ILM-012-SS was analyzed for GRO/BTEX and DRO/RRO. Of the analytes tested for in the characterization samples, only toluene was detected above an ADEC Method Two cleanup level. Toluene was detected at a concentration of 17.6 mg/kg in primary sample 09-ILM-03-SS and 8.96 mg/kg in primary sample 09-ILM-12S, exceeding the Method Two cleanup level of 6.5 mg/kg for toluene.

All eight samples collected as confirmation samples from the excavation floor were analyzed for DRO/RRO and GRO/BTEX. Samples 09-ILM-02-SS, 09-ILM-05-SS, and 09-ILM-06-SS were additionally analyzed for PAHs and lead.

Except for sample 09-ILM-05-SS, no PAHs were detected in the three samples submitted for PAH analysis. Of the four PAHs detected in sample 09-ILM-05-SS, none were measured at concentrations near or exceeding an associated ADEC Method Two cleanup level.

Analytical results for lead ranged from 4.13 mg/kg to 10.8 mg/kg, well below the ADEC Method Two cleanup level of 400 mg/kg.

Sample 09-ILM-05-SS was the only project sample to contain a concentration of GRO (5,550 mg/kg) that exceeded ADEC's Method Two cleanup level for GRO of 300 mg/kg.

DRO was measured at relatively low levels in all samples, but above the ADEC Method Two cleanup level in three samples: 09-ILM-05-SS at 472 mg/kg; 09-ILM-06-SS at 661 mg/kg; and 09-ILM-07-SS at 666 mg/kg.

Toluene was detected above the ADEC Method Two cleanup level of 6.5 mg/kg in three samples: 09-ILM-05-SS at 916 mg/kg; 09-ILM-10-SS at 11.6 mg/kg; and 09-ILM-11-SS at 12.8 mg/kg.

A quality assurance report is included in Attachment 4.

## CONCEPTUAL SITE MODEL

A CSM has been developed for the site based on the analytical data discussed in the previous section. The CSM was developed in accordance with ADEC *Draft Guidance on Developing Conceptual Site Models* (November 30, 2005).

Crowley's Iliamna tank farm site is an industrial facility. Surface soils appeared to have been impacted by petroleum hydrocarbons at concentrations that exceed ADEC soil cleanup criteria for GRO, DRO, and toluene. Impact to subsurface soil below the excavation area may exist. Not all impacts found within the first 2 feet of the surface were removed. Areas of impact remain between the fence and the tank farm containment, at a small area surrounding INNEC's power meter and post at the southern edge of the site, at an area within the southwestern corner of the fenced area, and buried below fill material not removed because of a buried electrical line.

### *Source*

The source of impact at the site was a fuel truck that released 1,507 gallons of100LL Avgas onto the ground.

### *Impacted Media*

Analytical evidence from current sampling indicates that surface soil is impacted by GRO, DRO, and toluene.

### *Transport Mechanisms*

Contaminants at the site could migrate by volatilization or fugitive dust to the air and leaching from soil to groundwater. If groundwater is impacted, contaminants could potentially be transported by volatilization to the indoor air of buildings within 100 feet of the impacted area.

### *Exposure Media*

Possible exposure media at the site include surface soil (0 to 15 feet below ground surface), outdoor air, and groundwater.

### *Human Health Exposure Routes*

The identified routes of exposure include ingestion, inhalation, and absorption. Possible receptors at the site include current or future site visitors and current or future construction, commercial, or industrial workers.

A human health exposure pathway via soil media is complete for commercial/industrial workers, site visitors, and construction workers at the site that would be engaged in excavation activities in areas where petroleum hydrocarbon and toluene impacts are present. This pathway includes incidental soil ingestion and inhalation of outdoor air as toluene is a volatile contaminant. The contaminants of concern are not considered dermally absorptive.

A human health exposure pathway by ingestion of groundwater is considered complete for current and potential future users. Groundwater is used for drinking water in the vicinity of the site. OASIS performed a search for wells near the site using the State of Alaska Department of Natural Resources (DNR) Well Log Tracking System (WELTS). Two wells were reported by WELTS within the area of the site. OASIS assumes more wells may exist. The nearest drinking water well is located approximately 350 feet east of the site and owned by the DOT&PF. This well is completed in fractured rock at 148 feet bgs. The well is cased from the surface to 60 feet bgs, with a reported static water level of 10 feet bgs. The approximate well location is presented on Figure 2. The WELTS search results and well logs for the two reported wells are provided in Attachment 6.

The depth to groundwater is estimated at 10 feet bgs. It is likely that a shallow water table aquifer exists, and a confining layer, depending on its thickness and hydraulic conductivity, would prevent or at a minimum significantly impede migration to the deeper drinking water aquifer located in fractured bedrock at about 150 feet bgs.

A surface water body is not located near the site, and this pathway is not considered complete.

Exposure to site-related contaminants through the ingestion of wild food is not considered a viable exposure pathway as site contaminants of concern are not considered bioaccumulative.

Receptors and completed pathways are presented in the ADEC CSM checklist and graphic CSM provided in Attachment 5.

## FUEL RECOVERY ESTIMATE

A reported 1,507 gallons of Avgas were lost due to a freeze break in a fuel line at the bottom of a fuel tanker truck. OASIS estimates that approximately 120 gallons of Avgas were contained in the soil that was removed and stockpiled. An estimated 450 gallons can be accounted for by volatilization, and the rationale for this estimate is outlined in the rest of this section. Consequently, approximately 936 gallons cannot be accounted for, and is presumably present in the soil profile in the vicinity of the spill. Because Avgas is highly volatile, an additional volume is calculated to have evaporated. Small amounts of fuel exposed to the air typically vaporize within minutes. When larger amounts of fuel are spilled to the ground a pool can develop. The pooling affect will facilitate infiltration of the fuel into subsurface soil because gravity will pull the fuel downward faster than volatilization will occur. The area and thickness of the pool will affect the relative movement of fuel into the soil or vapor phase. Small amounts of fuel will wet the surface soils (the upper 1 or 2 centimeters [cm], depending on soil type) and would also be expected to volatilize. Only when the fuel-holding capacity of the near surface soil is exceeded will infiltration into the subsurface occur. Once fuel is in the subsurface volatilization rate will decrease because soil gas will quickly equilibrate based on the partial pressure of the fuel, thereby halting vaporization unless fresh air enters the soil gas. Vapor extraction remedial systems are based on these concepts. The Canadian Environmental Protection Agency (CEPA) web site (http://www.ec.gc.ca/ ceparegistry/documents regs/e2_rationale/appB.cfm) contains the following equation to estimate liquid evaporation rate:

$$G = (1.74X10^{-4})MKAP)/(RT)$$

Where G = Generation rate (pounds per minute [lb/min]), M = Molecular weight (grams [g]/g-mole), K = Mass transfer coefficient (cm per second [sec]), A = surface area of the spill ($cm^2$), P = vapor pressure in millimeters of mercury (mm Hg), R = ideal gas law constant (82.05 $atm \cdot cm^3$)/(g-mole·°K), and T = temperature in degrees Kelvin.

The molecular weight of fuel was estimated at 68, based on the reported molecular weight of gasoline with a Reid Vapor Pressure of 7 from AP-42.

The vapor pressure was estimated using Figure 7.1-14a from AP-42 assuming aviation gasoline, 20°F and a Reid Vapor Pressure of 7. The vapor pressure was estimated to be 68.3 mm Hg.

The mass transfer coefficient was estimated from the following equation which references the material spilled to water, also provided by CEPA.

$$K = 0.83(18/M)^{.33}$$

$$K = 0.83(18/68)^{.33} = 0.54 \text{ cm/sec}$$

Surface soil was reported by Crowley personnel to be stained in an hourglass shape of approximately a 15-foot by 14-foot area. This stained area could be modeled as the pool area during the release. Infiltration was likely greatest at the release point and minimal at the edges of the surface staining. Consequently, assuming the entire surface staining area as the pool size would probably overestimate volatile loss. Inspection of the area indicated that the most contaminated portion of the surface soil was

likely only a 4-foot by 8-foot area, which is approximately 30,000 $cm^2$. This value was used to estimate the area of the effective pool where volatilization could occur during the spill period.

The spill occurred after the tanker truck was filled on November 4, 2009, and the discovery that the tanker was empty on December 14, 2009. The best estimate of when the spill occurred was during Thanksgiving weekend, right after a sub-zero cold snap. Inspection of the failed line indicated a spilt seam. Based on the size of the hole, the release rate from this split was assumed to be between 0.25 and 0.5 gallons per minute. At this leak rate the entire tank contents would have drained over a three-day period. Assuming the failure occurred during the cold snap and the release commenced when temperatures warmed on Thanksgiving Day. An average assumed ambient temperature of 20°F, or 267°K was assumed for the estimated three-day release period. Average temperatures were slightly warmer during this period, but a lower temperature was assumed to error on the conservative side.

Evaporation rate can now be calculated.

$$G = (1.74X10^{-4})\cdot(68)\cdot(0.54cm/sec)\cdot(30{,}000\ cm^2)\cdot(68.3\ mm\ Hg)/(\ 82.05\ atm\cdot cm^3)/(g\text{-}mole\cdot°K)\cdot(267°K)$$

$$= 0.59\ lb/min$$

Assuming a three-day release period, or 4,320 minutes, total volatile loss can be calculated by multiplying the release period by the release rate.

$$(0.59\ lb/min)\cdot(4{,}320\ min) = 2{,}500\ pounds.$$

At a weight of 5.6 lbs per gallon, this accounts for ~450 gallons lost by evaporation.

## SUMMARY AND CONCLUSIONS

In response to a release of 1,507 gallons of 100LL Avgas at Crowley's Iliamna tank farm, OASIS directed the removal and stockpiling of approximately 65 LCYs of soil characterized as impacted with DRO and toluene above ADEC Method Two cleanup levels. This product, 100LL Avgas, is a volatile fuel with toluene added as an octane booster. Elevated concentrations of toluene found in both excavation confirmation samples and stockpiled soil samples indicate the source was likely this recent 100LL Avgas release. A review of gas chromatograms indicate the presence of fresh diesel or jet fuel mixed with gasoline (Table 5). A diesel odor was noted during the excavation of the soil stockpile footprint, and at the southern portion of the area excavated near samples 06-SS and 07-SS. A secondary diesel or jet fuel release may be present.

The removal of soil was incomplete because of facility infrastructure, including a fence and secondary containment wall for the tank farm, and a buried electrical utility line. Migration of contaminants from remaining impacted soil to groundwater is possible.

## RECOMMENDATIONS

Evaluation of depth to groundwater and the lithology between surface soil and groundwater would aid in determining the likelihood of impact to groundwater. The nearest drinking water well is reportedly east of the site at DOT&PF's garage. The well is reportedly cased to 60 feet bgs, with open hole in fractured

bedrock below that depth. OASIS recommends Crowley identify current drinking water wells in the vicinity of the site that are not already recorded with DNR. Evaluation of the nature and extent of subsurface impact, including possible impact to groundwater is recommended.

OASIS thanks you for the opportunity to assist Crowley with this project. Please contact me at (907) 258-4880 if you have any questions regarding this report.

Sincerely,
**OASIS Environmental, Inc.**

Daniel Frank
Project Manager

Brad Authier
Principal

Attachments:

1. Figures 1 through 4
2. Tables 1 through 5
3. Photographic Log
4. Analytical results; ADEC Checklist; Quality Assurance Report
5. Conceptual Site Model Graphic and Scoping Form
6. Well Log Tracking System Search Results and Well Logs

# FIGURES

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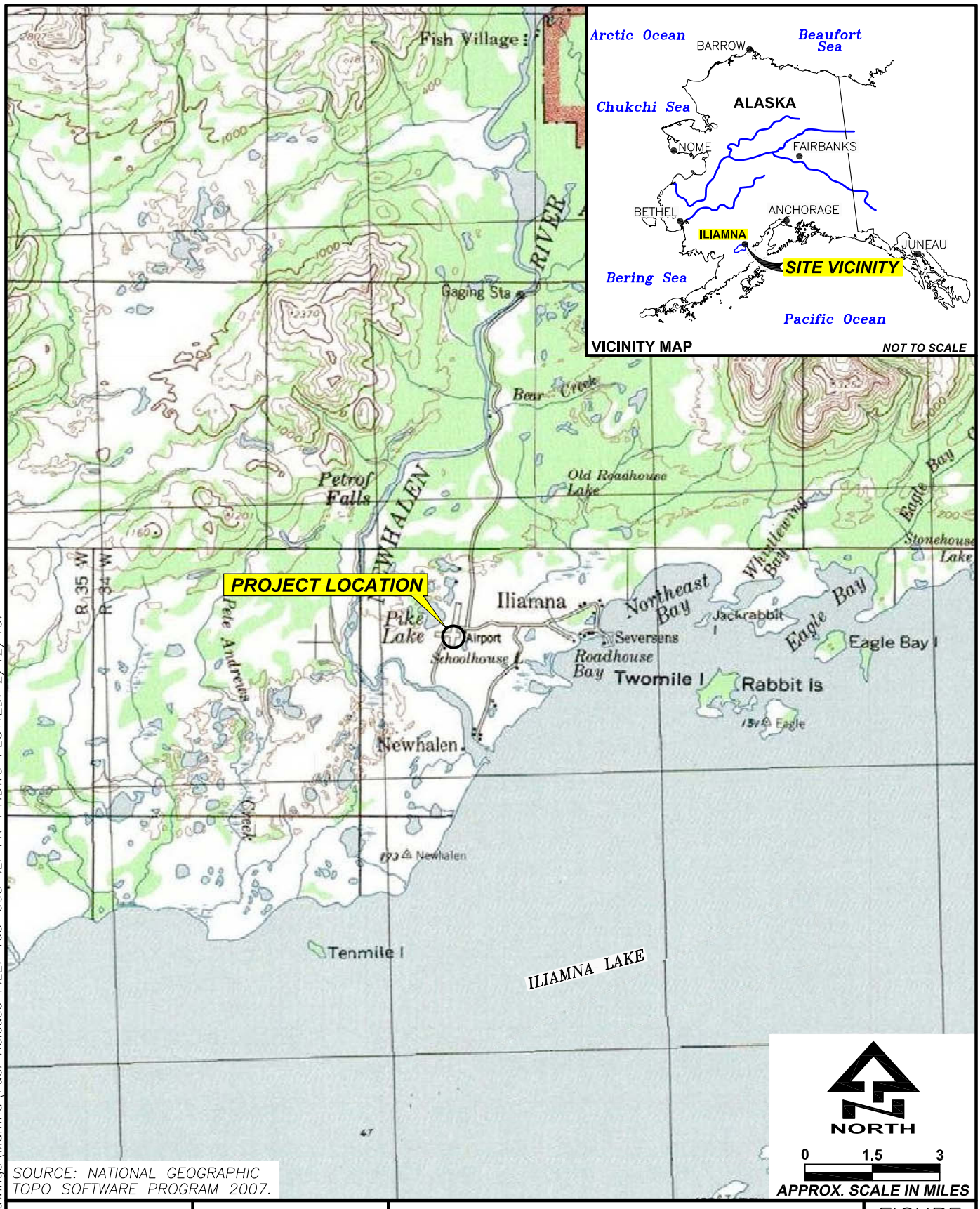


SOURCE: NATIONAL GEOGRAPHIC TOPO SOFTWARE PROGRAM 2007.

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oasis ENVIRONMENTAL

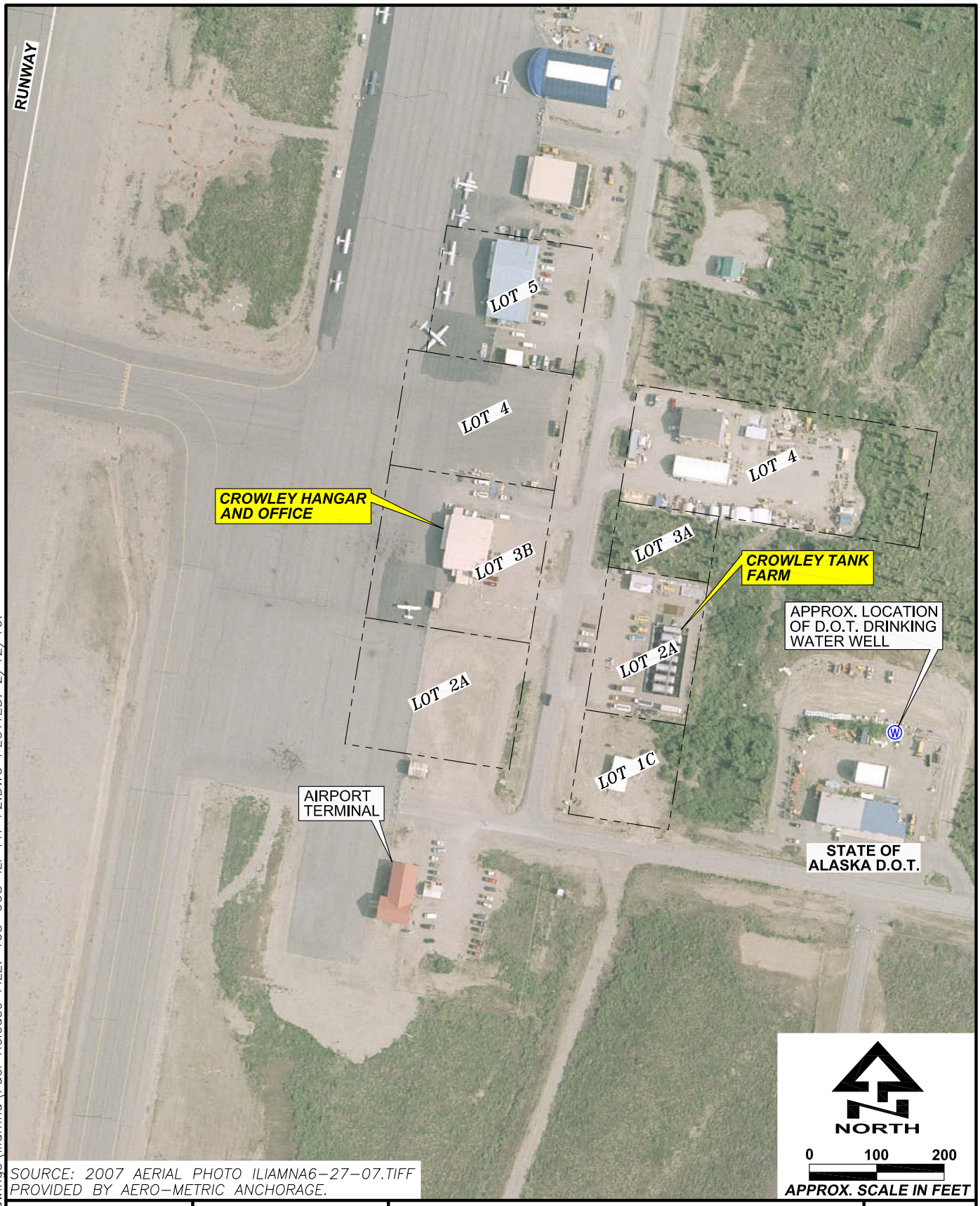
DATE: FEB. 2010
CHKD: D.J.F.
DRAWN: C.E.H
PROJ. No.: 465-008

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

# SITE LOCATION MAP

ILIAMNA FUEL RELEASE
Iliamna, Alaska

FIGURE
1




SOURCE: 2007 AERIAL PHOTO ILIAMNA6-27-07.TIFF PROVIDED BY AERO-METRIC ANCHORAGE.

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DRAWN: C.E.H.
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# SITE MAP

ILIAMNA FUEL RELEASE
Iliamna, Alaska

FIGURE

2


SOURCE: 2007 AERIAL PHOTO ILIAMNA6-27-07.TIFF PROVIDED BY AERO-METRIC ANCHORAGE.

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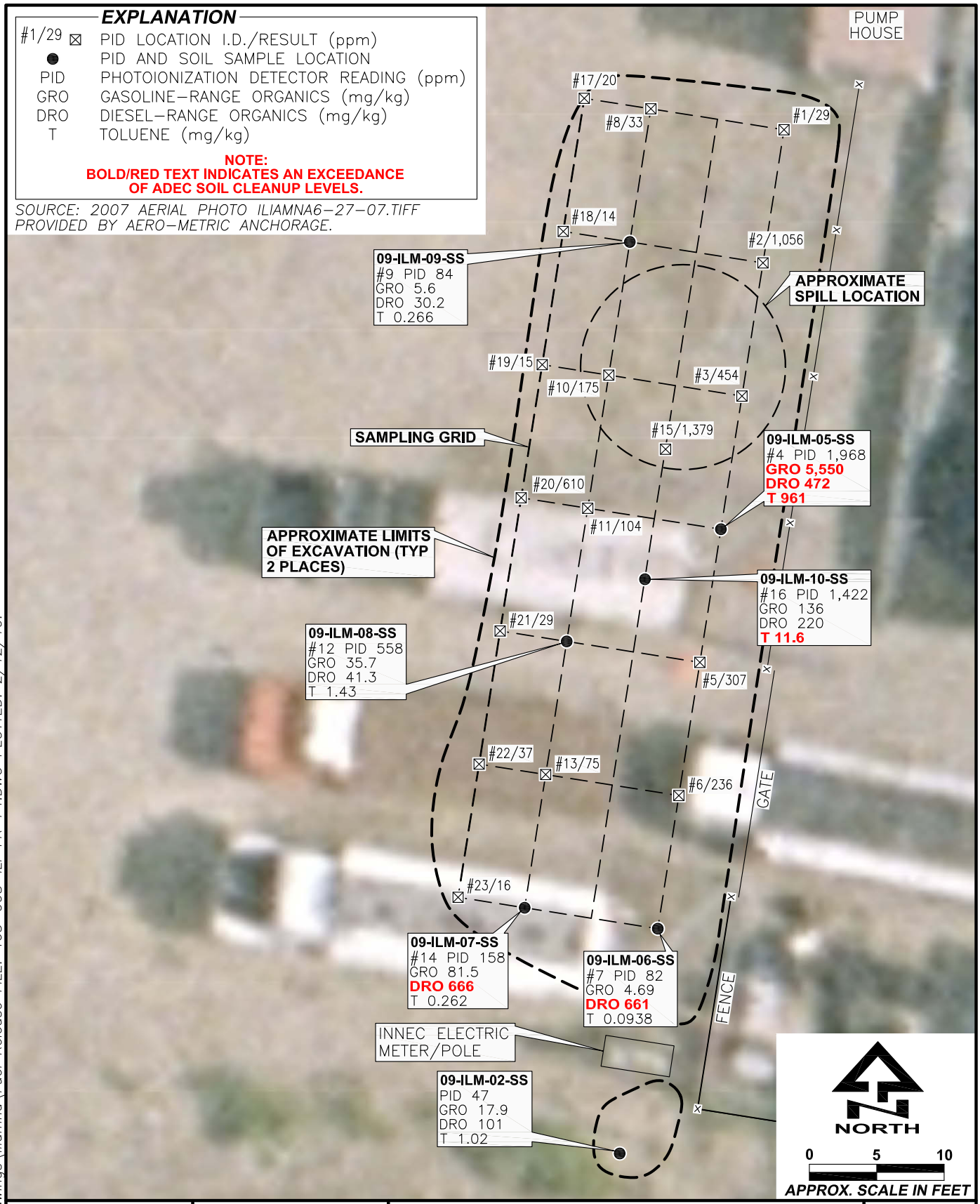
# SITE DETAIL

ILIAMNA FUEL RELEASE
Iliamna, Alaska

FIGURE
3

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DRAWN: C.E.H.
PROJ. No.: 465-008

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# SAMPLE LOCATIONS AND RESULTS

ILIAMNA FUEL RELEASE
Iliamna, Alaska

FIGURE
4

# TABLES

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**TABLE 1**
**Soil Sample Collection Summary**
2009 Site Characterization and Removal - Iliamna Tank Farm
Crowley Maritime Corporationn
Iliamna, Alaska

| Location | Sample No. 09-ILM-: | Depth (bgs) | Duplicate | Sample Date | Sample Time | Laboratory Analyses | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | GRO (AK 101) | DRO (AK 102) | RRO (AK 103) | BTEX (EPA 8260) | PAH - SIM (EPA 8270C) | Lead (EPA 6020) |
| Stockpile Foot Print | 01-SS | 0-6" | | 12/29/2009 | 1155 | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Off-Pad | 02-SS | 0-6" | | 12/30/2009 | 0930 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Stockpile Characterization | 03-SS | 0-18" | | 12/30/2009 | 1045 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Duplicate of 03-SS | 04-SS | 0-18" | ✓ | 12/30/2009 | 1100 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PID Location 4 | 05-SS | 0-6" | | 12/30/2009 | 1525 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PID Location 7 | 06-SS | 0-6" | | 12/30/2009 | 1530 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PID Location 14 | 07-SS | 0-6" | | 12/30/2009 | 1600 | ✓ | ✓ | ✓ | ✓ | | |
| PID Location 12 | 08-SS | 0-6" | | 12/30/2009 | 1615 | ✓ | ✓ | ✓ | ✓ | | |
| PID Location 9 | 09-SS | 0-6" | | 12/30/2009 | 1620 | ✓ | ✓ | ✓ | ✓ | | |
| PID Location 16 | 10-SS | 0-6" | | 12/30/2009 | 1630 | ✓ | ✓ | ✓ | ✓ | | |
| PID Location 2 | 11-SS | 0-6" | | 12/30/2009 | 1645 | ✓ | ✓ | ✓ | ✓ | | |
| Stockpile Characterization | 12-SS | 0-18" | | 12/31/2009 | 1000 | ✓ | ✓ | ✓ | ✓ | | |
| Trip Blank | TB | -- | | 12/29/2009 | 1100 | ✓ | | | ✓ | | |

**Key:**
AK = Alaska
bgs = below ground surface
BTEX = Benzene, tolune, ethylbenzene, xylenes
DRO = Diesel-range organics
EPA = United States Environmental Protection Agency
NA = Not applicable
NS = Not Specified
PAH = Polynuclear aromatic hydrocarbon
RRO = Residual-range organics
SIM = Simultaneous Ion Monitoring

**TABLE 2**
**Soil Excavation Analytical Results**
2009 Site Characterization and Removal - Iliamna Tank Farm
Crowley Maritime Corporation
Iliamna, Alaska

| Location: | ADEC Method Two Cleanup Levels | Off-Pad Confirmation | PID 4 | PID 7 | PID 14 | PID 12 | PID 9 | PID 16 | PID 2 | Trip Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID (09-ILM-):** | | **02-SS** | **05-SS** | **06-SS** | **07-SS** | **08-SS** | **09-SS** | **10-SS** | **11-SS** | **TB** |
| **Sample Date:** | | **12/30/09** | **12/30/09** | **12/30/09** | **12/30/09** | **12/30/09** | **12/30/09** | **12/30/09** | **12/30/09** | **12/29/2009** |
| **PID Readings (ppm)** | | **47** | **1968** | **82** | **158** | **558** | **84** | **1422** | **1056** | **--** |
| **Dry Weigth (%)** | | **95.3%** | **90.8%** | **89.8%** | **87.6%** | **85.9%** | **85.9%** | **89.1%** | **90.0%** | |
| **ADEC Fuels (AK101, AK102, AK103; mg/kg)** | | | | | | | | | | |
| Gasoline Range Organics | 300[1] | 17.9 | **5.550** JS | 4.69 | 81.5 | 35.7 | 5.6 | 136 | 109 | ND (3.33) |
| Diesel Range Organics | 250[1] | 101 | **472** | **661** | **666** | 41.3 | 30.2 | 220 | 29 | -- |
| Residual Range Organics | 10,000[2] | ND (50.8) | 87.4 | 3,830 | 219 | ND (54.5) | 143 | 137 | ND (55.0) | -- |
| **BTEX (8260B; mg/kg)** | | | | | | | | | | |
| Benzene | 0.025[3] | ND (0.0102) | ND (0.380) | ND (0.0116) | ND (0.0155) | ND (0.0116) | ND (0.0101) | ND (0.0130) | ND (0.158) | ND (0.0133) |
| Toluene | 6.5[3] | 1.02 | **916** | 0.0938 | 0.262 | 1.43 | 0.266 | **11.6** | **12.8** | ND (0.0333 |
| Ethylbenzene | 6.9[3] | ND (0.0255) | 4.76 | ND (0.0289) | ND (0.0387) | ND (0.0291) | ND (0.0253) | ND (0.0326) | ND (0.395) | ND (0.0333 |
| Total Xylenes | 63[3] | ND (0.0382) | 61.6 | ND (0.0434) | ND (0.0580) | ND (0.0436) | ND (0.0379) | 0.258 | ND (0.593) | ND (0.0500) |
| **PAHs (8270; mg/kg)** | | | | | | | | | | |
| 1-Methyl naphthalene | 6.2[3] | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methyl naphthalene | 6.1[3] | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | 180[3] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | 180[3] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Anthracene | 3,000[3] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | 3.6[3] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 0.49[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | 49[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,I)perylene | 1,400[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | 49[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Chrysene | 360[3] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h) anthracene | 0.49[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Fluoranthene | 1,400[3] | ND (0.0139) | **0.0241** | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Fluorene | 220[3] | ND (0.0139) | ND (0.0367) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-c,d) pyrene | 4.9[4] | ND (0.0139) | ND (0.0147) | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Napthalene | 20[3] | ND (0.0139) | **0.753** | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Phenathrene | 3,000[3] | ND (0.0139) | **0.182** | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| Pyrene | 1,000[3] | ND (0.0139) | **0.0333** | ND (0.0149) | -- | -- | -- | -- | -- | -- |
| **Inorganics (EPA 6020; mg/kg)** | | | | | | | | | | |
| Lead | 400[3] | 4.46 | 10.8 | 4.13 | | | | | | -- |

**Note:** Detected results are bolded. Results above ADEC cleanup values are **underlined & bolded**.

[1] ADEC Method Two Petroleum Hydrocarbon Soil Cleanup Levels (18 AAC 75.341); Table B2, Under 40 Inches, Migration to Groundwater Pathway

[2] ADEC Method Two Petroleum Hydrocarbon Soil Cleanup Levels; Table B2, Under 40 Inches, IngestionPathway

[3] ADEC Method Two Soil Cleanup Levels; Table B1; Under 40 Inches, Migration to Groundwater Pathway

[4] ADEC Method Two Soil Cleanup Levels; Table B1 ; Under 40 Inches, Direct Contact Pathway

**Key:**

-- Not Analyzed
ADEC = Alaska Department of Environmental Conservation
bgs = below ground surface
BTEX = Benzene, toluene, ethylbenzene, and total xylenes
JS = Estimated Value. Surrogate recoveries outside of method acceptance limits.
mg/kg = Milligrams per kilogram.
NA = Not Applicable
ND = Analyte not detected above the method reporting limit.
NR = Not recorded
PAH = Polynuclear aromatic hydrocarbon
SIM = Selective ion monitoring

**TABLE 3**
**Soil Stockpile Analytical Results**
2009 Site Characterization and Removal - Iliamna Tank Farm
Crowley Maritime Corporation
Iliamna, Alaska

| Location: | ADEC Method Two Cleanup Levels | Stockpile Foot print | Stockpile Characterization | Duplicate of 03-SS | Stockpile Characterization | Trip Blank |
|---|---|---|---|---|---|---|
| **Sample ID (09-ILM-):** | | **01-SS** | **03-SS** | **04-SS** | **12-SS** | **TB** |
| **Sample Date:** | | **12/29/09** | **12/30/09** | **12/30/09** | **12/31/2009** | **12/29/2009** |
| **PID Readings (ppm)** | | **--** | **--** | **--** | **--** | **--** |
| **Dry Weigth (%)** | | **90.8%** | **89.6%** | **86.3%** | **88.6%** | |
| **ADEC Fuels (AK101, AK102, AK103; mg/kg)** | | | | | | |
| Gasoline Range Organics | 300[1] | 203 | 182 | 147 | 116 | ND (3.33) |
| Diesel Range Organics | 250[1] | **1,010** | 95.7 | 67.5 | 57 | -- |
| Residual Range Organics | 10,000[2] | 1,370 | 115 JD | 60.6 JD | 55.2 | -- |
| **BTEX (8260B; mg/kg)** | | | | | | |
| Benzene | 0.025[3] | ND (0.0117) | ND (0.0122) | ND (0.0120) | ND (0.0182) | ND (0.0133) |
| Toluene | 6.5[3] | 0.229 | **17.6** | **12.5** | **8.96** | ND (0.0333 |
| Ethylbenzene | 6.9[3] | ND (0.0292) | 0.0321 | ND (0.0301) | ND (0.0454) | ND (0.0333 |
| Total Xylenes | 63[3] | 1.01 | 0.367 JD | 0.152 JD | 0.215 | ND (0.0500) |
| **PAHs (8270-SIM; mg/kg)** | | | | | | |
| 1-Methyl naphthalene | 6.2[3] | -- | -- | -- | -- | -- |
| 2-Methyl naphthalene | 6.1[3] | -- | -- | -- | -- | -- |
| Acenaphthene | 180[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Acenaphthylene | 180[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Anthracene | 3,000[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Benzo(a)anthracene | 3.6[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Benzo(a)pyrene | 0.49[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Benzo(b)fluoranthene | 49[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Benzo(g,h,I)perylene | 1,400[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Benzo(k)fluoranthene | 49[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Chrysene | 360[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Dibenzo(a,h) anthracene | 0.49[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Fluoranthene | 1,400[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Fluorene | 220[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Indeno(1,2,3-c,d) pyrene | 4.9[4] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Napthalene | 20[3] | -- | **0.0172** | **0.0195** | -- | -- |
| Phenathrene | 3,000[3] | -- | ND (0.0151) | ND (0.0151) | -- | -- |
| Pyrene | 1,000[3] | | **0.0193** | **0.0247** | -- | -- |
| **Inorganics (EPA 6020; mg/kg)** | | | | | | |
| Lead | 400[3] | 3.79 | 5.08 | 4.38 | | -- |

**TABLE 3**
**Soil Stockpile Analytical Results**
2009 Site Characterization and Removal - Iliamna Tank Farm
Crowley Maritime Corporation
Iliamna, Alaska

**Note:** Detected results are bolded. Results above ADEC cleanup values are**underlined & bolded**.

(1) ADEC Method Two Petroleum Hydrocarbon Soil Cleanup Levels (18 AAC 75.341); Table B2, Under 40 Inches, Migration to Groundwater Pathway

(2) ADEC Method Two Petroleum Hydrocarbon Soil Cleanup Levels; Table B2, Under 40 Inches, IngestionPathway

(3) ADEC Method Two Soil Cleanup Levels; Table B1; Under 40 Inches, Migration to Groundwater Pathway

(4) ADEC Method Two Soil Cleanup Levels; Table B1 ; Under 40 Inches, Direct Contact Pathway

**Key:**

-- Not Analyzed
ADEC = Alaska Department of Environmental Conservation
bgs = below ground surface
BTEX = Benzene, toluene, ethylbenzene, and total xylenes
JD = Estimated Value. AnRPD calculation exceeds 50% and therefore is an estimation.
mg/kg = Milligrams per kilogram.
NA = Not Applicable
ND = Analyte not detected above the method reporting limit.
NR = Not recorded
PAH = Polynuclear aromatic hydrocarbon
SIM = Selective ion monitoring

**TABLE 4**
**Fuel Recovery Estimate**
2009 Iliamna Tank Farm Response Report
Crowley Maritime Corporation
Iliamna, Alaska

| Material | Volume Injected Material ($V_s$) | | Sample Location | Sample Number | Sample Analytical Results | | | | | Volume Fuel (Vf)[d] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Solids | GRO | DRO | TPH (GRO + DRO) | TPH (GRO + DRO) | Dry Weight, Using GRO + DRO | Wet Weight, Using GRO + DRO |
| | LCYs | | | | | mg/Kg dry | | | mg/Kg wet[b] | Gallons | Gallons |
| Stockpile | 65 | 65 | Excavation | 09-ILM-05-SS | 85 | **5,555** | **472** | **6,027** | **5,123** | **121** | **103** |
| Soil Remaining between surface and 6 feet bgs (75 foot by 25 foot surface) | 541 | 541 | Excavation | 09-ILM-05-SS | 85 | **5,555** | **472** | **6,027** | **5,123** | **1,011** | **859** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | **Total Fuel Volume In Soil =** | | **1,132** | **963** |

[b] : Percent Solids was used to convert values reported as mg/Kg dry concentrations to mg/Kg wet concentrations. Soil and crude densities were measured as wet densities making mg/Kg wet concentrations more applicable.

[d] : The volume of fuel in the soil (Vf) to be calculated using the formula Vf = Vs * TPH * Ds * (1/Dc)

**TABLE 5**
**Soil Sample Chromatogram Interpretation**
2009 Iliamna Tank Farm Response Report
Crowley Maritime Corporation
Iliamna, Alaska

| Field Sample ID | Location | Laboratory Sample ID | Sample Date | Description | GRO (mg/Kg) | DRO (mg/Kg) | RRO (mg/Kg) | Toluene (mg/kg) | Chromatogram Interpretation |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | *300* | *250* | *10,000* | *7* | |
| 09-ILM-01-SS | Stockpile Foot Print | ASL0040-01 | 12/29/2009 | GRO/BTEX Chrom | 203 | **1,010** | 1,370.0 | 0.229 | Primarily diesel fuel with some gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with similar levels of oil/lubricant present. No biogenic materials present. |
| 09-ILM-02-SS | Adjacent site confirmation sample. | ASL0040-02 | 12/30/2009 | GRO/BTEX Chrom | 17.9 | 101 | ND (50.8) | 1.02 | Primarily diesel fuel with some gasoline constituents |
| | | | | DRO Chrom | | | | | Fresh diesel with unidentified petroleum mixture in residual range present. |
| 09-ILM-03-SS | Stockpile Characterization | ASL0040-03 | 12/30/2009 | GRO/BTEX Chrom | 182 | 96 | 115.0 | **17.6** | Gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with oil/lubricant present. No biogenic materials present. |
| 09-ILM-04-SS | Duplicate of 03-SS | ASL0040-04 | 12/30/2009 | GRO/BTEX Chrom | 147 | 68 | 60.6 | **12.5** | Gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with oil/lubricant present. No biogenic materials present. |
| 09-ILM-05-SS | PID Location 4 | ASL0040-05 | 12/30/2009 | GRO/BTEX Chrom | **5,550** | **472** | 87.4 | **916** | Gasoline constituents present. Lab diluted the sample significantly for analysis. |
| | | | | DRO Chrom | | | | | Gasoline and fresh diesel fuel present. |
| 09-ILM-06-SS | PID Location 7 (weathered DRO expected) | ASL0040-06 | 12/30/2009 | GRO/BTEX Chrom | 4.69 | **661** | 3,830.0 | 0.0938 | Low levels of select gasoline constituents present. No gasoline or diesel signatures evident. |
| | | | | DRO Chrom | | | | | oil/lubricant that's partially quantified as DRO, no diesel fuel signature present. |
| 09-ILM-07-SS | PID Location 14 (weathered DRO expected) | ASL0040-07 | 12/30/2009 | GRO/BTEX Chrom | 81.5 | **666** | 219.0 | 0.262 | Primarily diesel fuel with some gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with oil/lubricant and no biogenic material |
| 09-ILM-08-SS | PID Location 12 | ASL0040-08 | 12/30/2009 | GRO/BTEX Chrom | 35.7 | 41 | ND (54.5) | 1.43 | Primarily diesel fuel with some gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with unidentified petroleum mixture in residual range |
| 09-ILM-09-SS | PID Location 9 | ASL0040-09 | 12/30/2009 | GRO/BTEX Chrom | 5.6 | 30 | 143.0 | 0.266 | Low levels of gasoline and diesel constituents present. |
| | | | | DRO Chrom | | | | | No petroleum mixture signature present, results likely include biogenic material contribution |
| 09-ILM-10-SS | PID Location 16 | ASL0040-10 | 12/30/2009 | GRO/BTEX Chrom | 136 | 220 | 137.0 | **11.6** | Primarily diesel fuel with some gasoline constituents present. |
| | | | | DRO Chrom | | | | | Gasoline, fresh diesel, and oil/lubricant present |
| 09-ILM-11-SS | PID Location 2 | ASL0040-11 | 12/30/2009 | GRO/BTEX Chrom | 109 | 29 | ND (55.0) | **12.8** | Gasoline and diesel constituents present |
| | | | | DRO Chrom | | | | | Gasoline and fresh diesel fuel present. |
| 09-ILM-12-SS | Stockpile Characterization | ASL0040-12 | 12/31/2009 | GRO/BTEX Chrom | 116 | 57 | 55.2 | **8.96** | Primarily diesel fuel with some gasoline constituents present. |
| | | | | DRO Chrom | | | | | Fresh diesel with oil/lubricant present. No biogenic materials present. |

**Notes:** Results above ADEC screening values are bolded and underlined. Refer to original summary table for data qualifiers.

**TABLE 5**
**Soil Sample Chromatogram Interpretation**
2009 Iliamna Tank Farm Response Report
Crowley Maritime Corporation
Iliamna, Alaska

**Key:**
DRO = Diesel-range organics
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
ND = Analyte not detected above the method reporting limit.
RRO = Residual-range organics

# PHOTOGRAPHIC LOG

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Photo: **1** Time: **1030** Date: **12/29/2009** Direction: **Northeast**
Subject: **Spill area and western fence line of tank farm containment. Orange wheel block marks location of tanker truck's rear wheel location during spill.**

Photo: **2** Time: **1030** Date: **12/29/200** Direction: **Northeast**
Subject: **INNEC Utility locate from west to southwest corner of fence and meter/pole.**

Photo: **3** Time: **1231** Date: **12/29/200** Direction: **Northeast**
Subject: **Parking area and pump house prior to excavation.**

Photo: **4** Time: **1233** Date: **12/29/200** Direction: **East**
Subject: **Area south of containment and within fenced area identified for constructing the soil stockpile.**

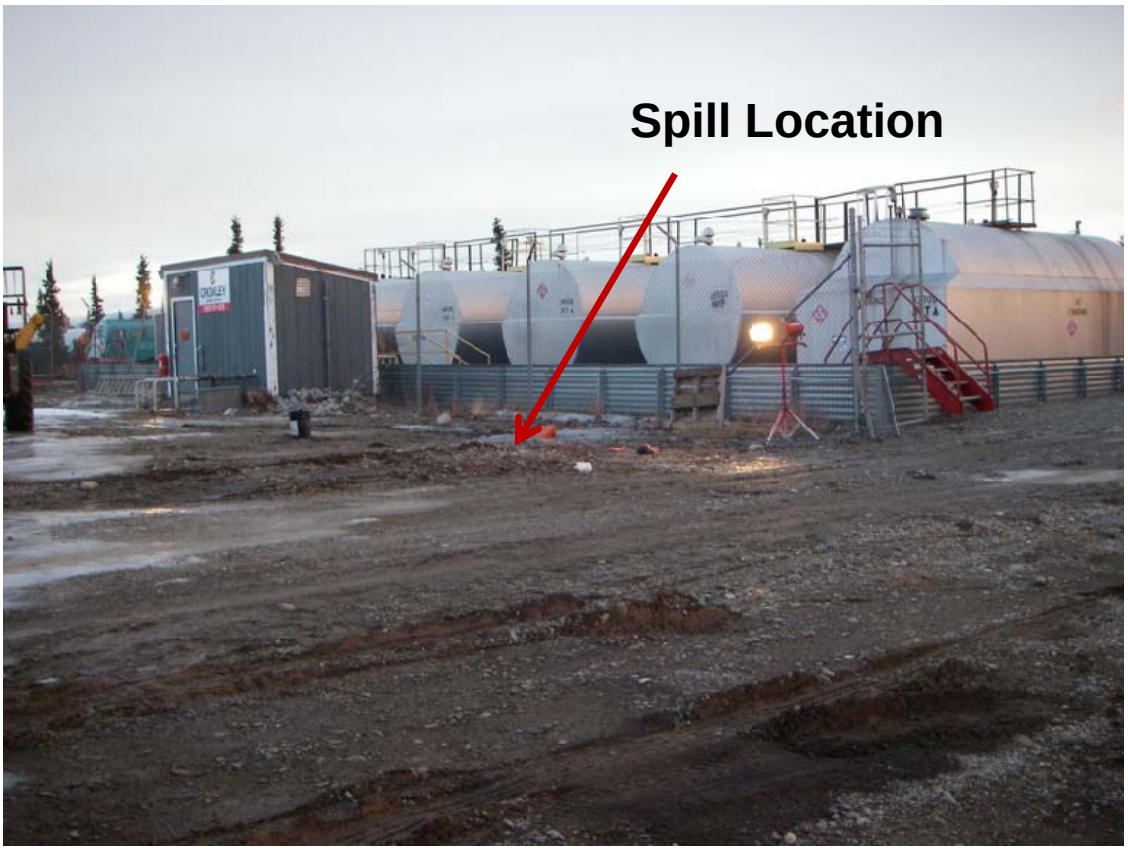


Photo: **5** Time: **1233** Date: **12/29/200** Direction: **Northeast**
Subject: **Spill area prior to excavation.**


Photo: **6** Time: **1234** Date: **12/29/200** Direction: **Southeast**
Subject: **Spill area prior to excavation.**


Photo: **7** Time: **1234** Date: **12/29/200** Direction: **Southeast**
Subject: **Spill area prior to excavation.**

Photo: **8** Time: **1316** Date: **12/29/200** Direction: **East**
Subject: **Stockpile containment.**


Photo: **9** Time: **1317** Date: **12/29/200** Direction: **East**
Subject: **Stockpile containment.**

Photo: **10** Time: **1317** Date: **12/29/200** Direction: **North**
Subject: **Stockpile containment.**


Photo: **11** Time: **1317** Date: **12/29/200** Direction: **North**
Subject: **Stockpile containment floor.**

Photo: **12** Time: **1318** Date: **12/29/200** Direction: **West**
Subject: **Stockpile containment; loading in 20-mil liner.**

Photo: **13** Time: **1329** Date: **12/29/200** Direction: **West**
Subject: **Stockpile containment; loading in 20-mil liner.**

Photo: **14** Time: **1330** Date: **12/29/200** Direction: **Northeast**
Subject: **Historical treatment cell located at north end of fenced area.**


Photo: **15** Time: **1331** Date: **12/29/200** Direction: **South**
Subject: **East side of containment inside fenced area of site.**

Photo: **16** Time: **1331** Date: **12/29/200** Direction: **South**
Subject: **East side of containment inside fenced area of site.**


Photo: **17** Time: **1331** Date: **12/29/200** Direction: **Southwest**
Subject: **Fuel truck loading deck containment area.**


Photo: **18** Time: **1335** Date: **12/29/200** Direction: **East**
Subject: **Begin initial removal at fuel spill location.**


Photo: **19** Time: **1402** Date: **12/29/200** Direction: **East**
Subject: **Northern limit of excavation area; headspace samples visible in centerline. Pump house on left.**

Photo: **20** Time: **1419** Date: **12/29/200** Direction: **South**
Subject: **Excavation area. Soil loaded into loader for transfer into the stockpile containment.**


Photo: **21** Time: **1459** Date: **12/29/200** Direction: **Southeast.**
Subject: **Excavation area along western fence line and parking area.**

Photo: **22** Time: **1542** Date: **12/29/200** Direction: **Southeast.**
Subject: **Excavation area along western fence line and parking area. Stockpile visible at back center, within fence area.**


Photo: **23** Time: **1543** Date: **12/29/200** Direction: **East.**
Subject: **Excavation area viewed from adjacent lot to the south.**

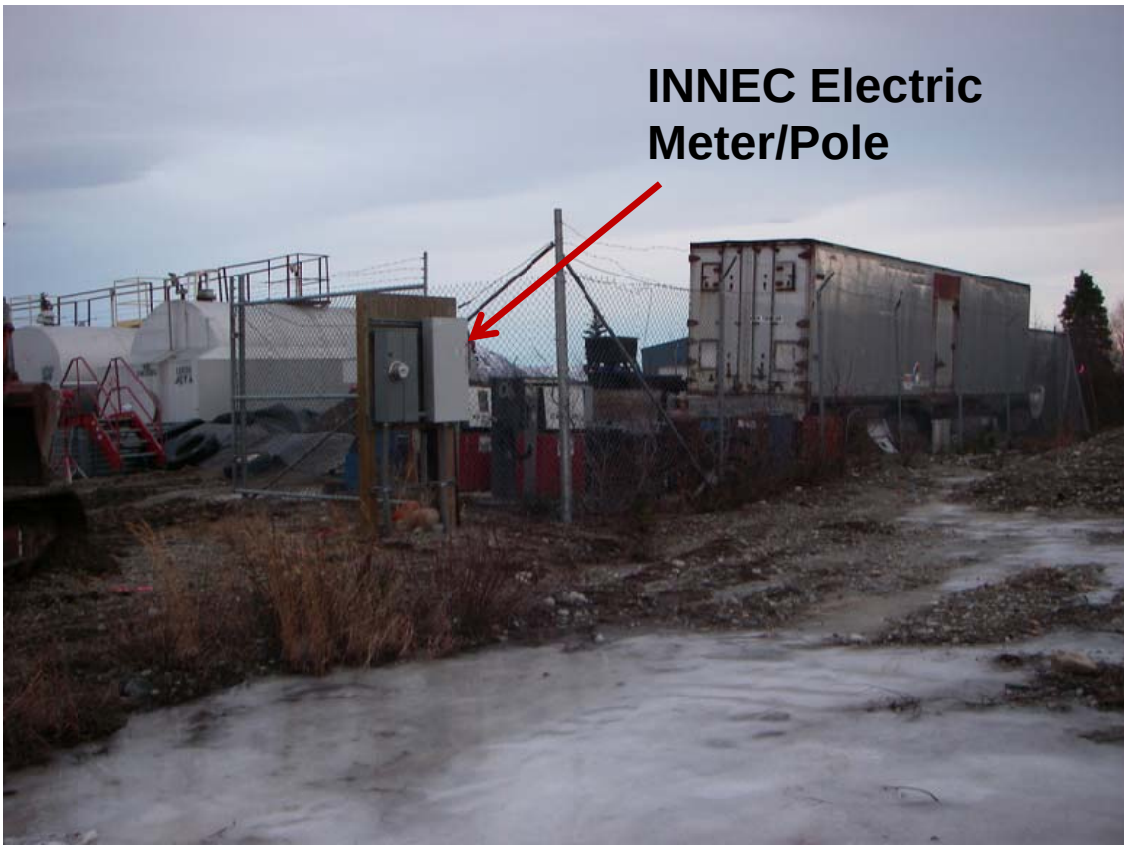


Photo: **24** Time: **1543** Date: **12/29/200** Direction: **Southeast.**
Subject: **Excavation area viewed from adjacent lot to the south.**


Photo: **25** Time: **1544** Date: **12/29/200** Direction: **North.**
Subject: **INNEC Electrical Meter.**

Photo: **26** Time: **1544** Date: **12/29/200** Direction: **East.**
Subject: **Southern fence line and low area; lot corner flag at right center back.**

Photo: **27** Time: **1544** Date: **12/29/200** Direction: **East.**
Subject: **Southern fence line and low area; lot corner flag at right center back.**

Photo: **28** Time: **1544** Date: **12/29/200** Direction: **North.**
Subject: **Lot corner marker at southeast corner.**

Photo: **29** Time: **1545** Date: **12/29/200** Direction: **West.**
Subject: **Lot corner marker at southeast corner; southern fence line.**


Photo: **30** Time: **1546** Date: **12/29/200** Direction: **Northwest.**
Subject: **Southwest corner of fenced area, stockpile loading visible on the right.**

Photo: **31** Time: **1546** Date: **12/29/200** Direction: **West**
Subject: **Southwest corner of fenced area, stockpile loading visible on the right.**

Photo: **32** Time: **1546** Date: **12/29/200** Direction: **East**
Subject: **Southeast corner of fenced area and lot corner marker at center. New DOT building in background/east.**


Photo: **33** Time: **1546** Date: **12/29/200** Direction: **North**
Subject: **Excavation progress at parking area on west side of containment fence. INNEC Meter/Pole at center right.**

Photo: **34** Time: **1552** Date: **12/29/200** Direction: **East**
Subject: **Excavation progress at southern edge of fencing. Progress limited by INNEC Meter/Pole.**

Photo: **35** Time: **1009** Date: **12/30/200** Direction: **North**
Subject: **Excavation area (red line) on LPSD leased lot south of Crowley Lot.**


Photo: **36** Time: **1010** Date: **12/30/200** Direction: **West**
Subject: **Area along southern fence line.**


Photo: **37** Time: **1010** Date: **12/30/200** Direction: **North**
Subject: **Excavation progress on western side of fence.**

Photo: **38** Time: **1010** Date: **12/30/200** Direction: **South**
Subject: **Excavation progress on western side of fence.**


Photo: **39** Time: **1011** Date: **12/30/200** Direction: **South**
Subject: **Excavation progress on western side of fence, pump house on left.**

Photo: **40** Time: **1012** Date: **12/30/200** Direction: **East**
Subject: **Northern portion of Crowley Lots from northwest corner.**

Photo: **41** Time: **1012** Date: **12/30/200** Direction: **Southeast**
Subject: **Crowley site from northwest corner.**


Photo: **42** Time: **1402** Date: **12/30/200** Direction: **South**
Subject: **Final excavation extent/depth. PID sample locations 1 through 16 visible.**

Photo: **43** Time: **1404** Date: **12/30/200** Direction: **South**
Subject: **Final excavation extent/depth. PID sample locations 1 through 16 visible.**

Photo: **44** Time: **1404** Date: **12/30/200** Direction: **North**
Subject: **Final excavation extent/depth. PID sample locations 1 through 16 visible.**

Photo: **45** Time: **1405** Date: **12/30/200** Direction: **North**
Subject: **Final excavation extent/depth. PID sample locations 1 through 16 visible.**

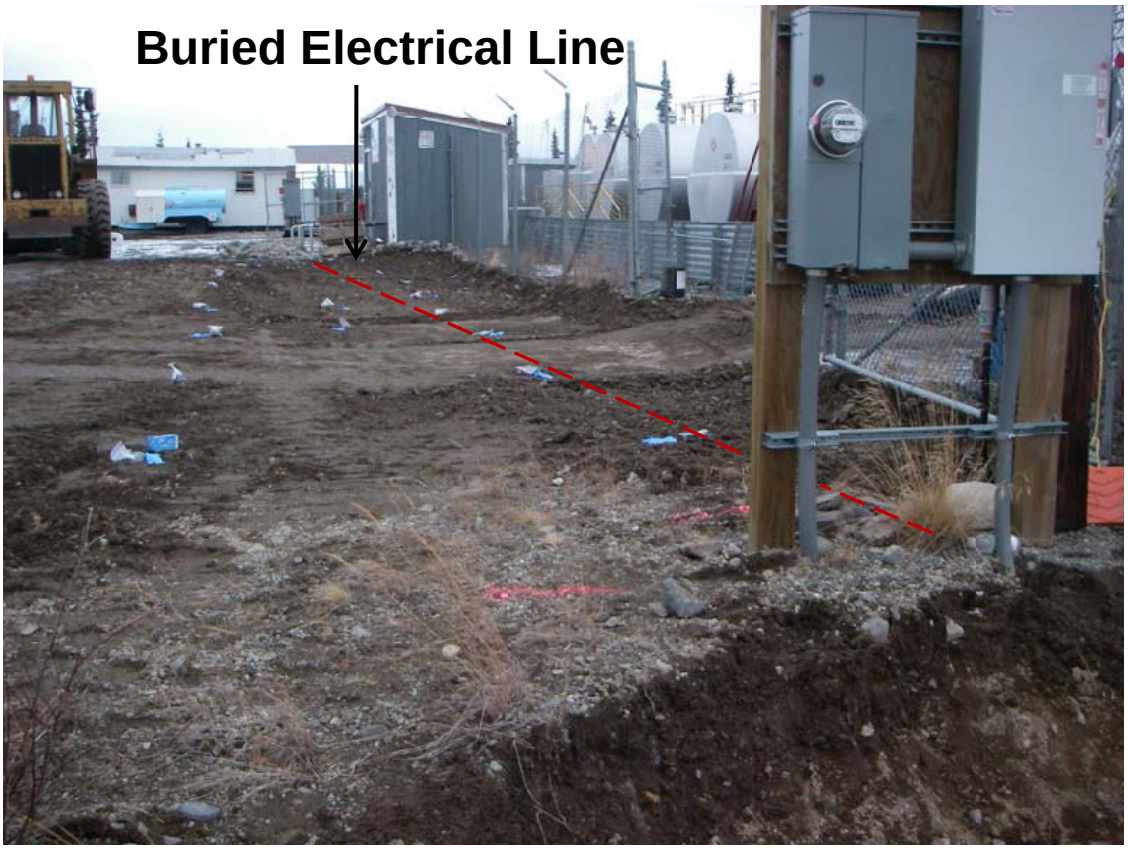


Photo: **46** Time: **1405** Date: **12/30/200** Direction: **North**
Subject: **Final excavation extent/depth. PID sample locations 1 through 16 visible.**

Photo: **47** Time: **1405** Date: **12/30/200** Direction: **North**
Subject: **Final excavation extent/depth on LPSD lot.**

Photo: **48** Time: **1405** Date: **12/30/200** Direction: **East**
Subject: **Soil Stockpile.**

Photo: **49** Time: **1405** Date: **12/30/200** Direction: **Northeast**
Subject: **Soil Stockpile.**

Photo: **50** Time: **1406** Date: **12/30/200** Direction: **West**
Subject: **Soil Stockpile.**

Photo: **51** Time: **1407** Date: **12/30/200** Direction: **Northwest**
Subject: **Excavation limits and PID locations.**

Photo: **52** Time: **1407** Date: **12/30/200** Direction: **South**
Subject: **Excavation limits and PID locations.**


Photo: **53** Time: **1407** Date: **12/30/200** Direction: **South**
Subject: **Excavation limits and PID locations.**

Photo: **54** Time: **1407** Date: **12/30/200** Direction: **North**
Subject: **Gap between western fence and tank farm containment.**

Photo: **55** Time: **1056** Date: **12/31/200** Direction: **South**
Subject: **View of excavated area after being backfilled.**

Photo: **56** Time: **1056** Date: **12/31/200** Direction: **East**
Subject: **View of excavated area after being backfilled.**

Photo: **57** Time: **1056** Date: **12/31/200** Direction: **East**
Subject: **View of excavated area after being backfilled. Covered stockpile at center right.**


Photo: **58** Time: **1056** Date: **12/31/200** Direction: **East**
Subject: **View of excavated area after being backfilled.**

Photo: **59** Time: **1056** Date: **12/31/200** Direction: **East**
Subject: **View of excavated area on LPSD lot after being backfilled.**

Photo: **60** Time: **1057** Date: **12/31/200** Direction: **East**
Subject: **View of excavated area on LPSD lot after being backfilled.**

Photo: **61** Time: **1057** Date: **12/31/200** Direction: **Northeast**
Subject: **View of excavated after being backfilled.**

Photo: **62** Time: **1057** Date: **12/31/200** Direction: **North**
Subject: **View of excavated after being backfilled.**


Photo: **63** Time: **1057** Date: **12/31/200** Direction: **West**
Subject: **View of excavated after being backfilled.**

Photo: **64** Time: **1057** Date: **12/31/200** Direction: **North**
Subject: **View of eastern side of site, east of fence.**


Photo: **65** Time: **1058** Date: **12/31/200** Direction: **West**
Subject: **View of southern fence line.**

Photo: **66** Time: **1058** Date: **12/31/200** Direction: **North**
Subject: **Gap around INNEC Meter/Post.**

Photo: **67** Time: **1058** Date: **12/31/200** Direction: **North**
Subject: **View of western fence line.**

Photo: **68** Time: **1058** Date: **12/31/200** Direction: **East**
Subject: **Soil stockpile with 6-mil reinforced cover.**

Photo: **69** Time: **1059** Date: **12/31/200** Direction: **East**
Subject: **Soil stockpile with 6-mil reinforced cover.**

Photo: **70** Time: **1059** Date: **12/31/200** Direction: **Northeast**
Subject: **Soil stockpile with 6-mil reinforced cover.**

Photo: **71** Time: **1059** Date: **12/31/200** Direction: **North**
Subject: **View of excavated after being backfilled.**

# ANALYTICAL RESULTS

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# Laboratory Data Review Checklist

Completed by: Melissa Connor

Title: Associate Environmental Scientist I

Date: 22 January 2010

CS Report Name: Iliamna Fuel Release – 2009 Response Report (Letter Format)

Report Date: 2/11/2010

Consultant Firm: Oasis Environmental Inc.

Laboratory Name: TestAmerica Inc

Laboratory Report Number: ASL0040

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
   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 ☒ Not Applicable
   Comments:

2. Chain of Custody (COC)

   a. COC information completed, signed, and dated (including released/received by)?
   ☒ Yes ☐ No
   Comments:

b. Correct analyses requested?

☒ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

☒ Yes ☐ No

Comments:

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No

Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No

Comments:

Samples were received in good condition.

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.?

Comments:

There are no discrepancies.

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability is not affected with respect to the laboratory receipt documentation.

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No

Comments:

b. Discrepancies, errors or QC failures identified by the lab?

Comments:

There are no discrepancies, errors or QC failures.

c. Were all corrective actions documented?

Comments:

There are no corrective actions.

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

Comments:

Data quality and usability is not affected with respect to the case narrative.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No

Comments:

b. All applicable holding times met?

☒ Yes ☐ No

Comments:

c. All soils reported on a dry weight basis?

☒ Yes ☐ No

Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No

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

Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No

Comments:

iii. If above PQL, what samples are affected?

☒ Not Applicable

Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ Not Applicable

Comments:

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability is 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

Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☒ Yes ☐ No ☐ Not Applicable

Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No

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

Comments:

In QC batch 10A0006 for RRO analysis, the MSD reported percent recovery and RPD results were above the acceptance limits. The blank LCS was within range and, therefore, no data has been qualified. In QC batch 10A0005 for BTEX analysis, the percent recovery exceeded the limits in the MS and MSD. Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. The blank LCS was within limits; therefore, no data has been qualified.

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

Comments:

For QC batch 10A0006, samples potentially affected include: 09-ILM-01-SS, -02-SS, -03-SS, -04-SS, -05-SS, -06-SS, 07-SS, -08-SS, -09-SS, -10-SS, -11-SS and -12-SS. For QC batch 10A0005, samples potentially affected include: 09-ILM-01-SS, -02-SS, -03-SS, -04-SS, -05-SS, -06-SS, 07-SS, -08-SS, -09-SS, -10-SS, -11-SS, -12-SS and TB.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☒ Yes ☐ No ☐ Not Applicable

Comments:

The blank LCS within limits and all data is suitable for use.

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

Comments:

Data quality and usability is not affected with respect to the LCS/LCSD reported results.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☒ Yes ☐ No

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

Comments:

| |
|---|
| In sample 09-ILM-05-SS, the GRO surrogate was outside the percent recovery limits. The sample required dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information. Associated results have been flagged JS. |

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

☒ Yes ☐ No

Comments:

| |
|---|
| |

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

Comments:

| |
|---|
| Data quality and usability is not affected with respect to the reported surrogate results. |

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

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

☒ Yes ☐ No

Comments:

| |
|---|
| |

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

☒ Yes ☐ No

Comments:

| |
|---|
| |

iii. All results less than PQL?

☒ Yes ☐ No

Comments:

| |
|---|
| |

iv. If above PQL, what samples are affected?

Comments:

| |
|---|
| Not applicable. |

v. Data quality or usability affected? Explain.

Comments:

| |
|---|
| Data quality and usability is not affected with respect to the trip blank reported results. |

e. Field Duplicate

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

☒ Yes ☐ No

Comments:

| |
|---|
| |

ii. Submitted blind to lab?

☒ Yes ☐ No

Comments:

| |
|---|
| |

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

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

Where $R_1$ = Sample Concentration
$R_2$ = Field Duplicate Concentration

☐ Yes ☒ No

Comments:

| |
|---|
| Total xylenes RPD between primary and duplicate is 83%. RRO RPD between primary and duplicate samples is 62%. Associated results have been flagged JD. |

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

Comments:

| |
|---|
| Data quality and usability is not affected with respect to the field duplicate reported results. |

f. Decontamination or Equipment Blank

(If not applicable, a comment stating why must be entered below.)

☐ Yes ☐ No ☒ Not Applicable

Decontamination or equipment blank is not required due to disposable sampling equipment.

i. All results less than PQL?

☐ Yes ☐ No ☒ Not Applicable

Comments:

ii. If above PQL, what samples are affected?

☒ Not Applicable

Comments:

iii. Data quality or usability affected? Explain.

☒ Not Applicable

Comments:

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

a. Defined and appropriate?

Comments:

There are no additional data flags or qualifiers.

# MEMORANDUM

DATE: January 25, 2010

FROM: Melissa Connor, Associate Environmental Scientist, OASIS, Anchorage, Alaska

TO: Daniel Frank, Project Manager, OASIS, Anchorage, Alaska

SUBJ: **Quality Assurance Review, 2009 Crowley Iliamna Tank Farm Avgas Release Response; Crowley Maritime Corporations; Iliamna, Alaska**

REF: Project: 465-008

The data summary check of 13 soil samples collected by OASIS Environmental, Inc. at Crowley's Tank Farm facility in Iliamna, Alaska, has been completed.

Soil samples were delivered to TestAmerica in Anchorage, AK in one sample delivery group, ASL0040. Samples were collected, reported, and shipped to in general accordance with the ADEC-approved work plan (OASIS 2009).The samples were numbered 09-ILM-01-SS through 09-ILM-12-SS.

Alaska Department of Environmental Conservation (ADEC) Environmental Laboratory Data and Quality Assurance Requirements guided the preparation of this report. Additionally, United States Environmental Protection Agency (EPA) National Functional Guidelines for Organic Data Review were followed for this report. The data were reviewed to determine the data quality and to evaluate potential impact on the usability of the data. The data quality objectives for the project were established to support the nature of the investigation. The review was performed using Level II reports that were provided by TestAmerica, Inc, located in Anchorage, Alaska. Analytical data, chain-of-custody documents, and ADEC data review checklists supporting this review are also provided.

Samples were tested using the following methods for the associated analytes:

- Benzene, ethylbenzene, toluene, and xylenes (BTEX; United States Environmental Protection Agency [EPA] Method 8260)
- Gasoline-range organics (GRO by Alaska Method 101 [AK101])
- Diesel-range organics (DRO; AK102)
- Riesel-range organics (RRO; AK103)
- Polycyclic aromatic hydrocarbons (PAH; EPA 8270 by Selected Ion Monitoring)
- Total Lead (EPA 6020)

The following quality control parameters were reviewed:

- Holding Times;
- Sample Handling and Receiving;
- Surrogate Percent Recovery;
- Field Duplicate Sample Comparability;
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries and Relative Percent Difference (RPD);
- Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD) Percent Recoveries and RPD;
- Method Blanks; and,
- Trip Blanks.

**Quality Assurance Summary:**

**1. Holding Times**

All samples were extracted, digested, and/or analyzed within the holding time criteria for the applicable analytical methods and in accordance with the work plan specifications.

**2. Sample Handing and Receiving**

The sample cooler was delivered with custody seals in place, unbroken and intact. All sample containers in the sample coolers were received at the laboratory intact, with proper documentation, and within the specified temperature range of 4°C ± 2°C.

**3. Surrogate Percent Recoveries**

Surrogate recoveries were within prescribed control limits for all primary samples, LCS/LCSD and MS/MSD. In sample 09-ILM-05-SS, the GRO surrogate was outside the percent recovery limits. The sample required dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information. Associated results have been flagged JS. All data is usable.

**4. Field Duplicate Sample Comparability**

Out of eleven (11) samples submitted, there was one (1) soil duplicate collected and analyzed for this project. The frequency of field duplicate collection did meet the 10% frequency requirements specified in the work plan. The primary samples and duplicate RPDs met applicable control limits, with the following exceptions. Primary sample 09-ILM-03-SS and duplicate 09-ILM004-SS RPD for total xylenes (83%) exceeded the recommended 50%. Associated results have been flagged JD. The RPD between primary 09-ILM-03-SS and duplicate 09-ILM-04-SS for RRO (62%) exceeded the recommended control limit of 50% for soil. Associated results have been flagged JD as estimated. Overall, there was adequate comparability of field duplicate results to meet project data quality objectives.

**5. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries and Relative Percent Difference (RPD)**

All MS/MSD samples met method specific limits for percent recovery and RPD with the following exception noted. In QC batch 10A0006 for RRO analysis, the MSD reported percent recovery and RPD results were above the acceptance limits. The blank LCS was within range and, therefore, no data has been qualified. In QC batch 10A0005 for BTEX analysis, the percent recovery exceeded the limits in the MS and MSD. Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. The blank LCS was within limits; therefore, no data has been qualified.

**6. Laboratory Precision**

Analysis of laboratory control samples (LCS) and LCS duplicates (LCSD) for target analytes met laboratory and project QC goals for target analyte. Precision and accuracy were evaluated by comparing field duplicates, MS/MSD, and LCS/LSCD pairs for this project. Recoveries and RPDs for all LCS/LSCD and MS/MSD samples were within required limits, with the following exception.

**7. Method Blanks**

Method blanks were analyzed concurrent with a batch of 20 or fewer primary samples for each of the analytical procedures performed for this project. Method blanks were analyzed at the required frequency and target analytes were not detected (ND) in the blanks at concentrations above the analytical reporting limit or PQL.

**8. Trip Blanks**

A trip blank was prepared by the laboratory, shipped to the site with the empty sample bottles/containers, stored with sample containers during the field event, and transported with the collected samples back to the laboratory for analysis. Trip blanks accompanied all of the sample shipments. The trip blanks was placed the same cooler as the other project volatile organics samples (GRO/BTEX). The trip blank was non-detect (ND) for all analytes.

**Overall Assessment of Data for Use**

Based upon the information provided, the data are acceptable for use with the above stated data qualifications. All other quality control criteria were met. The associated sample results are usable for the purpose of this investigation.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANCHORAGE, AK 2000 W INTERNATIONAL AIRPORT ROAD, SUITE A-10
ANCHORAGE, AK 99502-1119
ph: (907) 563.9200 fax: (907) 563.9210
CS Approval Number: UST-067

January 18, 2010

Dan Frank
Oasis Environmental, Inc.
825 W 8th Ave, ste 200
Anchorage, AK/USA 99501-4427

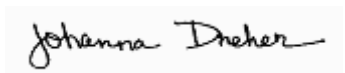
RE: Iliamna

Enclosed are the results of analyses for samples received by the laboratory on 12/31/09 14:30. The following list is a summary of the Work Orders contained in this report, generated on 01/18/10 13:38.

If you have any questions concerning this report, please feel free to contact me.

| Work Order | Project | ProjectNumber |
|---|---|---|
| ASL0040 | Iliamna | 465-008 |





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CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## ANALYTICAL REPORT FOR SAMPLES

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| 09-ILM-01-SS | ASL0040-01 | Soil | 12/29/09 11:55 | 12/31/09 14:30 |
| 09-ILM-02-SS | ASL0040-02 | Soil | 12/30/09 09:30 | 12/31/09 14:30 |
| 09-ILM-03-SS | ASL0040-03 | Soil | 12/30/09 10:45 | 12/31/09 14:30 |
| 09-ILM-04-SS | ASL0040-04 | Soil | 12/30/09 11:00 | 12/31/09 14:30 |
| 09-ILM-05-SS | ASL0040-05 | Soil | 12/30/09 15:25 | 12/31/09 14:30 |
| 09-ILM-06-SS | ASL0040-06 | Soil | 12/30/09 15:30 | 12/31/09 14:30 |
| 09-ILM-07-SS | ASL0040-07 | Soil | 12/30/09 16:00 | 12/31/09 14:30 |
| 09-ILM-08-SS | ASL0040-08 | Soil | 12/30/09 16:15 | 12/31/09 14:30 |
| 09-ILM-09-SS | ASL0040-09 | Soil | 12/30/09 16:20 | 12/31/09 14:30 |
| 09-ILM-10-SS | ASL0040-10 | Soil | 12/30/09 16:30 | 12/31/09 14:30 |
| 09-ILM-11-SS | ASL0040-11 | Soil | 12/30/09 16:45 | 12/31/09 14:30 |
| 09-ILM-12-SS | ASL0040-12 | Soil | 12/31/09 10:00 | 12/31/09 14:30 |
| TB | ASL0040-13 | Soil | 12/29/09 11:00 | 12/31/09 14:30 |

TestAmerica Anchorage

Johanna Dreher

Johanna L Dreher For Troy J. Engstrom, Lab Director

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANCHORAGE, AK 2000 W. INTERNATIONAL AIRPORT ROAD, SUITE A-10
ANCHORAGE, AK 99502-1119
ph: (907) 563.9200 fax: (907) 563.9210
CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Diesel Range Organics (C10-C25) and Residual Range Organics (C25-C36) per AK102/RRO

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-01 (09-ILM-01-SS)** | | **Soil** | | | | **Sampled: 12/29/09 11:55** | | | | | |
| **Diesel Range Organics** | AK102/103 | **1010** | ----- | 21.5 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 10:11 | JN | |
| **Residual Range Organics** | " | **1370** | ----- | 53.8 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *88.5%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *80.1%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-02 (09-ILM-02-SS)** | | **Soil** | | | | **Sampled: 12/30/09 09:30** | | | | | |
| **Diesel Range Organics** | AK102/103 | **101** | ----- | 20.3 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 10:43 | JN | |
| Residual Range Organics | " | ND | ----- | 50.8 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *80.3%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *79.2%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| **Diesel Range Organics** | AK102/103 | **95.7** | ----- | 21.4 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 11:15 | JN | |
| **Residual Range Organics** | " | **115** | ----- | 53.5 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *90.0%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *86.3%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-04 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | |
| **Diesel Range Organics** | AK102/103 | **67.5** | ----- | 22.6 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 11:48 | JN | |
| **Residual Range Organics** | " | **60.6** | ----- | 56.6 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *85.9%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *85.2%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | |
| **Diesel Range Organics** | AK102/103 | **472** | ----- | 19.9 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 12:20 | JN | |
| **Residual Range Organics** | " | **87.4** | ----- | 49.8 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *106%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *78.1%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-06 (09-ILM-06-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:30** | | | | | **RL7** |
| **Diesel Range Organics** | AK102/103 | **661** | ----- | 221 | mg/kg dry | 10x | 10A0006 | 01/06/10 10:47 | 01/07/10 14:28 | JN | |
| **Residual Range Organics** | " | **3830** | ----- | 551 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *70.7%* | | *50 - 150 %* | " | | | | " | |

TestAmerica Anchorage

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Johanna L Dreher For Troy J. Engstrom, Lab Director

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THE LEADER IN ENVIRONMENTAL TESTING

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ANCHORAGE, AK 99502-1119
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CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Diesel Range Organics (C10-C25) and Residual Range Organics (C25-C36) per AK102/RRO

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-06 (09-ILM-06-SS)** | | | **Soil** | | | **Sampled: 12/30/09 15:30** | | | | | **RL7** |
| *Triacontane* | | | *82.3%* | | *50 - 150 %* | *10x* | | | *01/07/10 14:28* | | |
| **ASL0040-07 (09-ILM-07-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:00** | | | | | |
| **Diesel Range Organics** | AK102/103 | **666** | ----- | 21.3 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 12:52 | JN | |
| **Residual Range Organics** | " | **219** | ----- | 53.3 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *86.3%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *86.7%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-08 (09-ILM-08-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:15** | | | | | |
| **Diesel Range Organics** | AK102/103 | **41.3** | ----- | 21.8 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 12:52 | JN | |
| Residual Range Organics | " | ND | ----- | 54.5 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *91.7%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *87.6%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-09 (09-ILM-09-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:20** | | | | | |
| **Diesel Range Organics** | AK102/103 | **30.2** | ----- | 21.8 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 13:24 | JN | |
| **Residual Range Organics** | " | **143** | ----- | 54.5 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *78.0%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *77.9%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-10 (09-ILM-10-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:30** | | | | | |
| **Diesel Range Organics** | AK102/103 | **220** | ----- | 22.0 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 13:24 | JN | |
| **Residual Range Organics** | " | **137** | ----- | 55.0 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *90.0%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *87.5%* | | *50 - 150 %* | " | | | | " | |
| **ASL0040-11 (09-ILM-11-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:45** | | | | | |
| **Diesel Range Organics** | AK102/103 | **29.0** | ----- | 22.0 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 13:56 | JN | |
| Residual Range Organics | " | ND | ----- | 55.0 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *78.2%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *78.3%* | | *50 - 150 %* | " | | | | " | |

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CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Diesel Range Organics (C10-C25) and Residual Range Organics (C25-C36) per AK102/RRO

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-12 (09-ILM-12-SS)** | | **Soil** | | | | | **Sampled: 12/31/09 10:00** | | | | |
| **Diesel Range Organics** | AK102/103 | **57.0** | ----- | 20.9 | mg/kg dry | 1x | 10A0006 | 01/06/10 10:47 | 01/07/10 13:56 | JN | |
| **Residual Range Organics** | " | **55.2** | ----- | 52.4 | " | " | " | " | " | JN | |
| *Surrogate(s): 1-Chlorooctadecane* | | | *90.2%* | | *50 - 150 %* | " | | | | " | |
| *Triacontane* | | | *88.2%* | | *50 - 150 %* | " | | | | " | |

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## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-01 (09-ILM-01-SS)** | | **Soil** | | | | **Sampled: 12/29/09 11:55** | | | | | |
| Benzene | EPA 8260B | ND | ----- | 0.0117 | mg/kg dry | 1x | 10A0005 | 01/07/10 09:00 | 01/07/10 15:01 | ds | |
| **Toluene** | " | **0.229** | ----- | 0.0292 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0292 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **1.01** | ----- | 0.0437 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *97.7%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *111%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *99.4%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *89.2%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-01RE1 (09-ILM-01-SS)** | | **Soil** | | | | **Sampled: 12/29/09 11:55** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **203** | ----- | 17.5 | mg/kg dry | 6.01x | 10A0005 | 01/07/10 09:00 | 01/08/10 00:17 | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *92.2%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *124%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *98.6%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *91.0%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-02 (09-ILM-02-SS)** | | **Soil** | | | | **Sampled: 12/30/09 09:30** | | | | | |
| **Gasoline Range Organics** | EPA 8260B | **17.9** | ----- | 2.55 | mg/kg dry | 1x | 10A0005 | 01/07/10 09:00 | 01/07/10 15:30 | ds | |
| Benzene | " | ND | ----- | 0.0102 | " | " | " | " | " | ds | |
| **Toluene** | " | **1.02** | ----- | 0.0255 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0255 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0382 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *89.3%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *116%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *96.2%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *98.2%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| Benzene | EPA 8260B | ND | ----- | 0.0122 | mg/kg dry | 0.751 | 10A0005 | 01/07/10 09:00 | 01/07/10 17:27 | ds | |
| **Ethylbenzene** | " | **0.0321** | ----- | 0.0306 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **0.367** | ----- | 0.0458 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *89.6%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *102%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *98.8%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *98.6%* | | *75 - 125 %* | " | | | " | | |

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CS Approval Number: UST-067

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|---|---|---|---|
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| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-03RE1 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **182** | ----- | 61.1 | mg/kg dry | 15x | 10A0005 | 01/07/10 09:00 | 01/08/10 12:22 | ds | |
| **Toluene** | " | **17.6** | ----- | 0.611 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *98.7%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *145%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *94.7%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *100%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-04 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | |
| Benzene | EPA 8260B | ND | ----- | 0.0120 | mg/kg dry | 0.751 | 10A0005 | 01/07/10 09:00 | 01/07/10 17:57 | ds | |
| Ethylbenzene | " | ND | ----- | 0.0301 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **0.152** | ----- | 0.0451 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *91.9%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *95.5%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *99.3%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *96.2%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-04RE1 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **147** | ----- | 60.2 | mg/kg dry | 15x | 10A0005 | 01/07/10 09:00 | 01/08/10 12:51 | ds | |
| **Toluene** | " | **12.5** | ----- | 0.602 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *95.6%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *128%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *94.6%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *100%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | **RL7** |
| Benzene | EPA 8260B | ND | ----- | 0.380 | mg/kg dry | 30x | 10A0005 | 01/07/10 09:00 | 01/08/10 00:47 | ds | |
| **Ethylbenzene** | " | **4.76** | ----- | 0.951 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **61.6** | ----- | 1.43 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *93.8%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *140%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *98.4%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *96.6%* | | *75 - 125 %* | " | | | " | | |

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|---|---|---|---|
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| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-05RE1 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **5500** | ----- | 951 | mg/kg dry | 300x | 10A0005 | 01/07/10 09:00 | 01/08/10 13:20 | ds | |
| **Toluene** | " | **916** | ----- | 9.51 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *93.0%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *345%* | | *50 - 150 %* | " | | | " | | ***Z3*** |
| *Toluene-d8* | | | *93.9%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *97.1%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-06 (09-ILM-06-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:30** | | | | | |
| **Gasoline Range Organics** | EPA 8260B | **4.69** | ----- | 2.89 | mg/kg dry | 1x | 10A0005 | 01/07/10 09:00 | 01/08/10 11:53 | ds | |
| Benzene | " | ND | ----- | 0.0116 | " | " | " | " | " | ds | |
| **Toluene** | " | **0.0938** | ----- | 0.0289 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0289 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0434 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *97.2%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *120%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *92.9%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *102%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-07 (09-ILM-07-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:00** | | | | | |
| **Gasoline Range Organics** | EPA 8260B | **81.5** | ----- | 3.87 | mg/kg dry | 1.5x | 10A0005 | 01/07/10 09:00 | 01/07/10 18:55 | ds | |
| Benzene | " | ND | ----- | 0.0155 | " | " | " | " | " | ds | |
| **Toluene** | " | **0.262** | ----- | 0.0387 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0387 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0580 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | | *91.6%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *125%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *100%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *91.2%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-08 (09-ILM-08-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:15** | | | | | |
| **Gasoline Range Organics** | EPA 8260B | **35.7** | ----- | 2.91 | mg/kg dry | 1x | 10A0005 | 01/07/10 09:00 | 01/07/10 19:25 | ds | |
| Benzene | " | ND | ----- | 0.0116 | " | " | " | " | " | ds | |
| **Toluene** | " | **1.43** | ----- | 0.0291 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0291 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0436 | " | " | " | " | " | ds | |

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| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-08 (09-ILM-08-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:15** | | | | | |
| *Surrogate(s): Dibromofluoromethane* | | *92.9%* | | *75 - 125 %* | | *1x* | | | *01/07/10 19:25* | | |
| *a,a,a-TFT* | | *114%* | | *50 - 150 %* | | " | | | " | | |
| *Toluene-d8* | | *97.0%* | | *75 - 125 %* | | " | | | " | | |
| *4-BFB* | | *100%* | | *75 - 125 %* | | " | | | " | | |
| **ASL0040-09 (09-ILM-09-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:20** | | | | | |
| **Gasoline Range Organics** | EPA 8260B | **5.60** | ----- | 2.53 | mg/kg dry | 0.751 x | 10A0005 | 01/07/10 09:00 | 01/07/10 19:54 | ds | |
| Benzene | " | ND | ----- | 0.0101 | " | " | " | " | " | ds | |
| **Toluene** | " | **0.266** | ----- | 0.0253 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0253 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0379 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | *89.8%* | | *75 - 125 %* | | " | | | " | | |
| *a,a,a-TFT* | | *127%* | | *50 - 150 %* | | " | | | " | | |
| *Toluene-d8* | | *99.1%* | | *75 - 125 %* | | " | | | " | | |
| *4-BFB* | | *100%* | | *75 - 125 %* | | " | | | " | | |
| **ASL0040-10 (09-ILM-10-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:30** | | | | | |
| Benzene | EPA 8260B | ND | ----- | 0.0130 | mg/kg dry | 1x | 10A0005 | 01/07/10 09:00 | 01/07/10 20:23 | ds | |
| Ethylbenzene | " | ND | ----- | 0.0326 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **0.258** | ----- | 0.0489 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | *92.5%* | | *75 - 125 %* | | " | | | " | | |
| *a,a,a-TFT* | | *125%* | | *50 - 150 %* | | " | | | " | | |
| *Toluene-d8* | | *100%* | | *75 - 125 %* | | " | | | " | | |
| *4-BFB* | | *97.3%* | | *75 - 125 %* | | " | | | " | | |
| **ASL0040-10RE1 (09-ILM-10-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:30** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **136** | ----- | 49.0 | mg/kg dry | 15x | 10A0005 | 01/07/10 09:00 | 01/08/10 13:50 | ds | |
| **Toluene** | " | **11.6** | ----- | 0.490 | " | " | " | " | " | ds | |
| *Surrogate(s): Dibromofluoromethane* | | *93.9%* | | *75 - 125 %* | | " | | | " | | |
| *a,a,a-TFT* | | *92.1%* | | *50 - 150 %* | | " | | | " | | |
| *Toluene-d8* | | *100%* | | *75 - 125 %* | | " | | | " | | |
| *4-BFB* | | *101%* | | *75 - 125 %* | | " | | | " | | |

TestAmerica Anchorage

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Johanna L Dreher For Troy J. Engstrom, Lab Director

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THE LEADER IN ENVIRONMENTAL TESTING

ANCHORAGE, AK 2000 W. INTERNATIONAL AIRPORT ROAD, SUITE A-10
ANCHORAGE, AK 99502-1119
ph: (907) 563.9200 fax: (907) 563.9210
CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-11 (09-ILM-11-SS)** | | **Soil** | | | | **Sampled: 12/30/09 16:45** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **109** | ----- | 39.5 | mg/kg dry | 15x | 10A0005 | 01/07/10 09:00 | 01/08/10 14:19 | ds | |
| Benzene | " | ND | ----- | 0.158 | " | " | " | " | " | ds | |
| **Toluene** | " | **12.8** | ----- | 0.395 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.395 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.593 | " | " | " | " | " | ds | |
| *Surrogate(s):* *Dibromofluoromethane* | | | *99.2%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *96.0%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *92.8%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *100%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-12 (09-ILM-12-SS)** | | **Soil** | | | | **Sampled: 12/31/09 10:00** | | | | | |
| Benzene | EPA 8260B | ND | ----- | 0.0182 | mg/kg dry | 0.751 | 10A0005 | 01/07/10 09:00 | 01/07/10 23:48 | ds | |
| **Toluene** | " | **8.96** | ----- | 0.0454 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0454 | " | " | " | " | " | ds | |
| **Xylenes (total)** | " | **0.215** | ----- | 0.0681 | " | " | " | " | " | ds | |
| *Surrogate(s):* *Dibromofluoromethane* | | | *94.7%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *99.7%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *96.5%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *94.6%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-12RE1 (09-ILM-12-SS)** | | **Soil** | | | | **Sampled: 12/31/09 10:00** | | | | | **RL7** |
| **Gasoline Range Organics** | EPA 8260B | **116** | ----- | 90.9 | mg/kg dry | 15x | 10A0005 | 01/07/10 09:00 | 01/08/10 14:48 | ds | |
| *Surrogate(s):* *Dibromofluoromethane* | | | *96.0%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *76.9%* | | *50 - 150 %* | " | | | " | | |
| *Toluene-d8* | | | *106%* | | *75 - 125 %* | " | | | " | | |
| *4-BFB* | | | *97.2%* | | *75 - 125 %* | " | | | " | | |
| **ASL0040-13 (TB)** | | **Soil** | | | | **Sampled: 12/29/09 11:00** | | | | | |
| Gasoline Range Organics | EPA 8260B | ND | ----- | 3.33 | mg/kg wet | 1x | 10A0005 | 01/07/10 09:00 | 01/07/10 23:19 | ds | |
| Benzene | " | ND | ----- | 0.0133 | " | " | " | " | " | ds | |
| Toluene | " | ND | ----- | 0.0333 | " | " | " | " | " | ds | |
| Ethylbenzene | " | ND | ----- | 0.0333 | " | " | " | " | " | ds | |
| Xylenes (total) | " | ND | ----- | 0.0500 | " | " | " | " | " | ds | |
| *Surrogate(s):* *Dibromofluoromethane* | | | *93.8%* | | *75 - 125 %* | " | | | " | | |
| *a,a,a-TFT* | | | *118%* | | *50 - 150 %* | " | | | " | | |

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| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-13 (TB)** | | **Soil** | | | | | **Sampled: 12/29/09 11:00** | | | | |
| *Toluene-d8* | | | *97.1%* | | *75 - 125 %* | *1x* | | | *01/07/10 23:19* | | |
| *4-BFB* | | | *102%* | | *75 - 125 %* | *"* | | | *"* | | |

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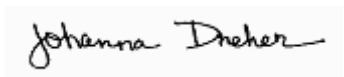
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Physical Parameters by APHA/ASTM/EPA Methods

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-01 (09-ILM-01-SS)** | | | **Soil** | | | **Sampled: 12/29/09 11:55** | | | | | |
| **Dry Weight** | TA-SOP | **90.8** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-02 (09-ILM-02-SS)** | | | **Soil** | | | **Sampled: 12/30/09 09:30** | | | | | |
| **Dry Weight** | TA-SOP | **95.3** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-03 (09-ILM-03-SS)** | | | **Soil** | | | **Sampled: 12/30/09 10:45** | | | | | |
| **Dry Weight** | TA-SOP | **89.6** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-04 (09-ILM-04-SS)** | | | **Soil** | | | **Sampled: 12/30/09 11:00** | | | | | |
| **Dry Weight** | TA-SOP | **86.3** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-05 (09-ILM-05-SS)** | | | **Soil** | | | **Sampled: 12/30/09 15:25** | | | | | |
| **Dry Weight** | TA-SOP | **90.8** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-06 (09-ILM-06-SS)** | | | **Soil** | | | **Sampled: 12/30/09 15:30** | | | | | |
| **Dry Weight** | TA-SOP | **89.8** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-07 (09-ILM-07-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:00** | | | | | |
| **Dry Weight** | TA-SOP | **87.6** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-08 (09-ILM-08-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:15** | | | | | |
| **Dry Weight** | TA-SOP | **88.9** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-09 (09-ILM-09-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:20** | | | | | |
| **Dry Weight** | TA-SOP | **85.9** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-10 (09-ILM-10-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:30** | | | | | |
| **Dry Weight** | TA-SOP | **89.1** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |
| **ASL0040-11 (09-ILM-11-SS)** | | | **Soil** | | | **Sampled: 12/30/09 16:45** | | | | | |
| **Dry Weight** | TA-SOP | **90.0** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |

TestAmerica Anchorage



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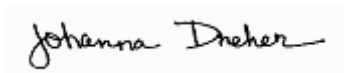
| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Physical Parameters by APHA/ASTM/EPA Methods

TestAmerica Anchorage

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-12 (09-ILM-12-SS)** | | **Soil** | | | | **Sampled: 12/31/09 10:00** | | | | | |
| **Dry Weight** | TA-SOP | **88.6** | ----- | 1.00 | % | 1x | 10A0004 | 01/05/10 14:29 | 01/06/10 09:58 | JN | |

TestAmerica Anchorage



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|---|---|---|---|
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| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Total Metals per EPA 6000/7000 Series Methods

TestAmerica Portland

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-01 (09-ILM-01-SS)** | | **Soil** | | | | **Sampled: 12/29/09 11:55** | | | | | |
| **Lead** | EPA 6020 | **3.79** | ----- | 0.485 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 03:18 | kah | |
| **ASL0040-02 (09-ILM-02-SS)** | | **Soil** | | | | **Sampled: 12/30/09 09:30** | | | | | |
| **Lead** | EPA 6020 | **4.46** | ----- | 0.481 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 03:26 | kah | |
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| **Lead** | EPA 6020 | **5.08** | ----- | 0.481 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 04:13 | kah | |
| **ASL0040-04 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | |
| **Lead** | EPA 6020 | **4.38** | ----- | 0.476 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 04:21 | kah | |
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | |
| **Lead** | EPA 6020 | **10.8** | ----- | 0.476 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 04:29 | kah | |
| **ASL0040-06 (09-ILM-06-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:30** | | | | | |
| **Lead** | EPA 6020 | **4.13** | ----- | 0.485 | mg/kg | 1x | 10A0126 | 01/07/10 10:35 | 01/08/10 04:37 | kah | |

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| Anchorage, AK/USA 99501-4427 | Project Manager: Dan Frank | 01/18/10 13:38 |

## Polynuclear Aromatic Compounds per EPA 8270M-SIM

TestAmerica Portland

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-02 (09-ILM-02-SS)** | | **Soil** | | | | **Sampled: 12/30/09 09:30** | | | | | |
| Acenaphthene | EPA 8270m | ND | ----- | 13.9 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 20:38 | NAF | |
| Acenaphthylene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Anthracene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Benzo (a) anthracene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Benzo (a) pyrene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Benzo (b) fluoranthene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Benzo (ghi) perylene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Benzo (k) fluoranthene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Chrysene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Dibenzo (a,h) anthracene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Fluoranthene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Fluorene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Indeno (1,2,3-cd) pyrene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Naphthalene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Phenanthrene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| Pyrene | " | ND | ----- | 13.9 | " | " | " | " | " | NAF | |
| *Surrogate(s):* *Fluorene-d10* | | | *72.6%* | | *24 - 125 %* | " | | | " | | |
| *Pyrene-d10* | | | *84.4%* | | *41 - 141 %* | " | | | " | | |
| *Benzo (a) pyrene-d12* | | | *82.2%* | | *38 - 143 %* | " | | | " | | |
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| Acenaphthene | EPA 8270m | ND | ----- | 15.1 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 21:06 | NAF | |
| Acenaphthylene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (a) anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (a) pyrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (b) fluoranthene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (ghi) perylene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (k) fluoranthene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Chrysene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Dibenzo (a,h) anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Fluoranthene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Fluorene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Indeno (1,2,3-cd) pyrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| **Naphthalene** | " | **17.2** | ----- | 15.1 | " | " | " | " | " | NAF | |
| Phenanthrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |

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| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Polynuclear Aromatic Compounds per EPA 8270M-SIM

TestAmerica Portland

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| **Pyrene** | EPA 8270m | **19.3** | ----- | 15.1 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 21:06 | NAF | |
| *Surrogate(s): Fluorene-d10* | | | *77.3%* | | *24 - 125 %* | " | | | " | | |
| *Pyrene-d10* | | | *85.1%* | | *41 - 141 %* | " | | | " | | |
| *Benzo (a) pyrene-d12* | | | *86.5%* | | *38 - 143 %* | " | | | " | | |
| **ASL0040-04 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | |
| Acenaphthene | EPA 8270m | ND | ----- | 15.1 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 21:35 | NAF | |
| Acenaphthylene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (a) anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (a) pyrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (b) fluoranthene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (ghi) perylene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Benzo (k) fluoranthene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Chrysene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Dibenzo (a,h) anthracene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| **Fluoranthene** | " | **19.5** | ----- | 15.1 | " | " | " | " | " | NAF | |
| Fluorene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Indeno (1,2,3-cd) pyrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Naphthalene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| Phenanthrene | " | ND | ----- | 15.1 | " | " | " | " | " | NAF | |
| **Pyrene** | " | **24.7** | ----- | 15.1 | " | " | " | " | " | NAF | |
| *Surrogate(s): Fluorene-d10* | | | *76.7%* | | *24 - 125 %* | " | | | " | | |
| *Pyrene-d10* | | | *88.7%* | | *41 - 141 %* | " | | | " | | |
| *Benzo (a) pyrene-d12* | | | *88.9%* | | *38 - 143 %* | " | | | " | | |
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | |
| Acenaphthene | EPA 8270m | ND | ----- | 14.7 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 22:05 | NAF | |
| Acenaphthylene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Anthracene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Benzo (a) anthracene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Benzo (a) pyrene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Benzo (b) fluoranthene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Benzo (ghi) perylene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| Benzo (k) fluoranthene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |

TestAmerica Anchorage

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ANCHORAGE, AK 2000 W. INTERNATIONAL AIRPORT ROAD, SUITE A-10
ANCHORAGE, AK 99502-1119
ph: (907) 563.9200 fax: (907) 563.9210
CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Polynuclear Aromatic Compounds per EPA 8270M-SIM

TestAmerica Portland

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | |
| Chrysene | EPA 8270m | ND | ----- | 14.7 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 22:05 | NAF | |
| Dibenzo (a,h) anthracene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| **Fluoranthene** | " | **24.1** | ----- | 14.7 | " | " | " | " | " | NAF | |
| Fluorene | " | ND | ----- | 36.7 | " | " | " | " | " | NAF | **RL1** |
| Indeno (1,2,3-cd) pyrene | " | ND | ----- | 14.7 | " | " | " | " | " | NAF | |
| **Naphthalene** | " | **753** | ----- | 73.5 | " | 5x | " | " | 01/07/10 16:00 | NAF | |
| **Phenanthrene** | " | **182** | ----- | 14.7 | " | 1x | " | " | 01/06/10 22:05 | NAF | |
| **Pyrene** | " | **33.3** | ----- | 14.7 | " | " | " | " | " | NAF | |
| *Surrogate(s):* *Fluorene-d10* | | | *83.1%* | | *24 - 125 %* | " | | | " | | |
| *Pyrene-d10* | | | *94.3%* | | *41 - 141 %* | " | | | " | | |
| *Benzo (a) pyrene-d12* | | | *82.3%* | | *38 - 143 %* | " | | | " | | |
| **ASL0040-06 (09-ILM-06-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:30** | | | | | |
| Acenaphthene | EPA 8270m | ND | ----- | 14.9 | ug/kg dry | 1x | 10A0089 | 01/06/10 13:05 | 01/06/10 22:34 | NAF | |
| Acenaphthylene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Anthracene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Benzo (a) anthracene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Benzo (a) pyrene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Benzo (b) fluoranthene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Benzo (ghi) perylene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Benzo (k) fluoranthene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Chrysene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Dibenzo (a,h) anthracene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Fluoranthene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Fluorene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Indeno (1,2,3-cd) pyrene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Naphthalene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Phenanthrene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| Pyrene | " | ND | ----- | 14.9 | " | " | " | " | " | NAF | |
| *Surrogate(s):* *Fluorene-d10* | | | *87.3%* | | *24 - 125 %* | " | | | " | | |
| *Pyrene-d10* | | | *70.7%* | | *41 - 141 %* | " | | | " | | |
| *Benzo (a) pyrene-d12* | | | *80.3%* | | *38 - 143 %* | " | | | " | | |

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CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Percent Dry Weight (Solids) per ASTM D2216-80

TestAmerica Portland

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Batch | Prepared | Analyzed | Analyst | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASL0040-01 (09-ILM-01-SS)** | | **Soil** | | | | **Sampled: 12/29/09 11:55** | | | | | |
| **% Solids** | NCA SOP | **92.4** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |
| **ASL0040-02 (09-ILM-02-SS)** | | **Soil** | | | | **Sampled: 12/30/09 09:30** | | | | | |
| **% Solids** | NCA SOP | **95.0** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |
| **ASL0040-03 (09-ILM-03-SS)** | | **Soil** | | | | **Sampled: 12/30/09 10:45** | | | | | |
| **% Solids** | NCA SOP | **88.5** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |
| **ASL0040-04 (09-ILM-04-SS)** | | **Soil** | | | | **Sampled: 12/30/09 11:00** | | | | | |
| **% Solids** | NCA SOP | **88.4** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |
| **ASL0040-05 (09-ILM-05-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:25** | | | | | |
| **% Solids** | NCA SOP | **90.3** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |
| **ASL0040-06 (09-ILM-06-SS)** | | **Soil** | | | | **Sampled: 12/30/09 15:30** | | | | | |
| **% Solids** | NCA SOP | **89.3** | ----- | 0.0100 | % by Weight | 1x | 10A0097 | 01/06/10 13:15 | 01/06/10 13:15 | JJM | |

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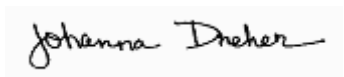

Johanna L Dreher For Troy J. Engstrom, Lab Director

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|---|---|---|---|
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| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Diesel Range Organics (C10-C25) and Residual Range Organics (C25-C36) per AK102/RRO - Laboratory Quality Control Results

TestAmerica Anchorage

**QC Batch: 10A0006** **Soil Preparation Method: EPA 3545**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Blank (10A0006-BLK1)** | | | | | | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | ND | --- | 20.0 | mg/kg wet | 1x | -- | -- | -- | -- | -- | -- | 01/07/10 09:39 | |
| Residual Range Organics | " | ND | --- | 50.0 | " | " | -- | -- | -- | -- | -- | -- | " | |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 86.7%* | | | *Limits: 50-150%* | " | | | | | | | *01/07/10 09:39* | |
| *Triacontane* | | *84.3%* | | | *50-150%* | " | | | | | | | " | |
| **LCS (10A0006-BS1)** | | | | | | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | 114 | --- | 20.0 | mg/kg wet | 1x | -- | 132 | 85.7% | (75-125) | -- | -- | 01/07/10 10:11 | |
| Residual Range Organics | " | 122 | --- | 50.0 | " | " | -- | 130 | 94.1% | (60-120) | -- | -- | " | |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 92.6%* | | | *Limits: 60-120%* | " | | | | | | | *01/07/10 10:11* | |
| *Triacontane* | | *87.4%* | | | *60-120%* | " | | | | | | | " | |
| **LCS Dup (10A0006-BSD1)** | | | | | | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | 117 | --- | 20.0 | mg/kg wet | 1x | -- | 132 | 88.6% | (75-125) | 3.27% | (20) | 01/07/10 10:43 | |
| Residual Range Organics | " | 126 | --- | 50.0 | " | " | -- | 130 | 96.7% | (60-120) | 2.71% | " | " | |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 96.4%* | | | *Limits: 60-120%* | " | | | | | | | *01/07/10 10:43* | |
| *Triacontane* | | *88.0%* | | | *60-120%* | " | | | | | | | " | |
| **Duplicate (10A0006-DUP1)** | | | | | **QC Source: ASL0040-01** | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | 760 | --- | 21.9 | mg/kg dry | 1x | 1010 | -- | -- | -- | 28.5% | (20) | 01/07/10 09:39 | R2 |
| Residual Range Organics | " | 588 | --- | 54.7 | " | " | 1370 | -- | -- | -- | 79.6% | (50) | " | R2 |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 85.4%* | | | *Limits: 50-150%* | " | | | | | | | *01/07/10 09:39* | |
| *Triacontane* | | *78.9%* | | | *50-150%* | " | | | | | | | " | |
| **Matrix Spike (10A0006-MS1)** | | | | | **QC Source: ASL0040-02** | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | 223 | --- | 20.0 | mg/kg dry | 1x | 101 | 132 | 92.6% | (75-125) | -- | -- | 01/07/10 11:15 | |
| Residual Range Organics | " | 170 | --- | 50.0 | " | " | 31.7 | 130 | 107% | (60-120) | -- | -- | " | |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 85.3%* | | | *Limits: 50-150%* | " | | | | | | | *01/07/10 11:15* | |
| *Triacontane* | | *90.7%* | | | *50-150%* | " | | | | | | | " | |
| **Matrix Spike Dup (10A0006-MSD1)** | | | | | **QC Source: ASL0040-02** | | | | **Extracted: 01/06/10 10:47** | | | | | |
| Diesel Range Organics | AK102/103 | 239 | --- | 20.3 | mg/kg dry | 1x | 101 | 135 | 103% | (75-125) | 6.70% | (25) | 01/07/10 11:48 | |
| Residual Range Organics | " | 402 | --- | 50.8 | " | " | 31.7 | 132 | 280% | (60-120) | 81.1% | " | " | M7 |
| *Surrogate(s): 1-Chlorooctadecane* | | *Recovery: 75.9%* | | | *Limits: 50-150%* | " | | | | | | | *01/07/10 11:48* | |
| *Triacontane* | | *69.8%* | | | *50-150%* | " | | | | | | | " | |

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| | | |
|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B - Laboratory Quality Control Results

TestAmerica Anchorage

**QC Batch: 10A0005** **Soil Preparation Method: AK101 Field Prep**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Blank (10A0005-BLK1)** | | | | | | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Gasoline Range Organics | EPA 8260B | ND | --- | 3.33 | mg/kg wet | 1x | -- | -- | -- | -- | -- | -- | 01/07/10 12:05 | |
| Benzene | " | ND | --- | 0.0133 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Toluene | " | ND | --- | 0.0333 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Ethylbenzene | " | ND | --- | 0.0333 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Xylenes (total) | " | ND | --- | 0.0500 | " | " | -- | -- | -- | -- | -- | -- | " | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 92.1%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 12:05* | |
| *a,a,a-TFT* | | *103%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *101%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *105%* | | | *75-125%* | " | | | | | | | " | |
| **LCS (10A0005-BS1)** | | | | | | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Benzene | EPA 8260B | 0.801 | --- | 0.0133 | mg/kg wet | 1x | -- | 0.800 | 100% | (70-130) | -- | -- | 01/07/10 14:31 | |
| Toluene | " | 0.833 | --- | 0.0333 | " | " | -- | " | 104% | " | -- | -- | " | |
| Ethylbenzene | " | 0.823 | --- | 0.0333 | " | " | -- | " | 103% | " | -- | -- | " | |
| Xylenes (total) | " | 2.60 | --- | 0.0500 | " | " | -- | 2.40 | 108% | " | -- | -- | " | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 76.7%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 14:31* | |
| *a,a,a-TFT* | | *114%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *81.1%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *80.4%* | | | *75-125%* | " | | | | | | | " | |
| **LCS (10A0005-BS2)** | | | | | | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Gasoline Range Organics | EPA 8260B | 17.4 | --- | 3.33 | mg/kg wet | 1x | -- | 22.0 | 79.0% | (60-120) | -- | -- | 01/07/10 13:33 | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 95.0%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 13:33* | |
| *a,a,a-TFT* | | *125%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *91.8%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *95.7%* | | | *75-125%* | " | | | | | | | " | |
| **LCS Dup (10A0005-BSD1)** | | | | | | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Benzene | EPA 8260B | 0.775 | --- | 0.0133 | mg/kg wet | 1x | -- | 0.800 | 96.8% | (70-130) | 3.30% | (20) | 01/07/10 13:04 | |
| Toluene | " | 0.794 | --- | 0.0333 | " | " | -- | " | 99.3% | " | 4.79% | " | " | |
| Ethylbenzene | " | 0.809 | --- | 0.0333 | " | " | -- | " | 101% | " | 1.67% | " | " | |
| Xylenes (total) | " | 2.59 | --- | 0.0500 | " | " | -- | 2.40 | 108% | " | 0.141% | " | " | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 80.1%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 13:04* | |
| *a,a,a-TFT* | | *119%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *77.0%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *77.1%* | | | *75-125%* | " | | | | | | | " | |

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| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Selected Volatile Organic Compounds per EPA Method 8260B - Laboratory Quality Control Results

TestAmerica Anchorage

**QC Batch: 10A0005** **Soil Preparation Method: AK101 Field Prep**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LCS Dup (10A0005-BSD2)** | | | | | | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Gasoline Range Organics | EPA 8260B | 18.6 | --- | 3.33 | mg/kg wet | 1x | -- | 22.0 | 84.5% | (60-120) | 6.72% | (20) | 01/07/10 14:02 | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 92.8%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 14:02* | |
| *a,a,a-TFT* | | *131%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *94.6%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *100%* | | | *75-125%* | " | | | | | | | " | |
| **Duplicate (10A0005-DUP1)** | | | | | **QC Source: ASL0040-02** | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Gasoline Range Organics | EPA 8260B | 15.8 | --- | 2.55 | mg/kg dry | 1x | 17.9 | -- | -- | -- | 12.3% | (35) | 01/07/10 15:59 | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 90.3%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 15:59* | |
| *a,a,a-TFT* | | *111%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *95.1%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *95.6%* | | | *75-125%* | " | | | | | | | " | |
| **Matrix Spike (10A0005-MS1)** | | | | | **QC Source: ASL0040-02** | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Benzene | EPA 8260B | 0.591 | --- | 0.0102 | mg/kg dry | 1x | ND | 0.475 | 124% | (60-140) | -- | -- | 01/07/10 16:29 | |
| Toluene | " | 1.78 | --- | 0.0255 | " | " | 1.02 | " | 159% | " | -- | -- | " | MHA |
| Ethylbenzene | " | 0.625 | --- | 0.0255 | " | " | ND | " | 132% | " | -- | -- | " | |
| Xylenes (total) | " | 1.98 | --- | 0.0382 | " | " | 0.0206 | 1.42 | 138% | " | -- | -- | " | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 91.2%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 16:29* | |
| *a,a,a-TFT* | | *129%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *98.6%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *97.5%* | | | *75-125%* | " | | | | | | | " | |
| **Matrix Spike Dup (10A0005-MSD1)** | | | | | **QC Source: ASL0040-02** | | | **Extracted: 01/07/10 09:00** | | | | | | |
| Benzene | EPA 8260B | 0.562 | --- | 0.0102 | mg/kg dry | 1x | ND | 0.475 | 118% | (60-140) | 5.04% | (25) | 01/07/10 16:58 | |
| Toluene | " | 1.72 | --- | 0.0255 | " | " | 1.02 | " | 146% | " | 3.35% | " | " | MHA |
| Ethylbenzene | " | 0.589 | --- | 0.0255 | " | " | ND | " | 124% | " | 5.87% | " | " | |
| Xylenes (total) | " | 1.87 | --- | 0.0382 | " | " | 0.0206 | 1.42 | 129% | " | 6.14% | " | " | |
| *Surrogate(s): Dibromofluoromethane* | | *Recovery: 90.7%* | | | *Limits: 75-125%* | " | | | | | | | *01/07/10 16:58* | |
| *a,a,a-TFT* | | *125%* | | | *50-150%* | " | | | | | | | " | |
| *Toluene-d8* | | *97.4%* | | | *75-125%* | " | | | | | | | " | |
| *4-BFB* | | *97.7%* | | | *75-125%* | " | | | | | | | " | |

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THE LEADER IN ENVIRONMENTAL TESTING

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CS Approval Number: UST-067

| | | | |
|---|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: | **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Physical Parameters by APHA/ASTM/EPA Methods - Laboratory Quality Control Results

TestAmerica Anchorage

**QC Batch: 10A0004** **Soil Preparation Method: *** DEFAULT PREP**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Duplicate (10A0004-DUP1)** | | | | **QC Source: ASL0040-01** | | | | **Extracted: 01/05/10 14:29** | | | | | | |
| Dry Weight | TA-SOP | 89.1 | --- | 1.00 | % | 1x | 90.8 | -- | -- | -- | 1.87% | (25) | 01/06/10 09:58 | |

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|---|---|---|---|
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## Total Metals per EPA 6000/7000 Series Methods - Laboratory Quality Control Results

TestAmerica Portland

**QC Batch: 10A0126** **Other wet Preparation Method: EPA 3050**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Blank (10A0126-BLK1)** | | | | | | | | **Extracted: 01/07/10 10:35** | | | | | | |
| Lead | EPA 6020 | ND | --- | 0.485 | mg/kg | 1x | -- | -- | -- | -- | -- | -- | 01/08/10 01:20 | |
| **LCS (10A0126-BS1)** | | | | | | | | **Extracted: 01/07/10 10:35** | | | | | | |
| Lead | EPA 6020 | 45.7 | --- | 0.481 | mg/kg | 1x | -- | 48.1 | 95.1% | (80-120) | -- | -- | 01/08/10 01:28 | |
| **Matrix Spike (10A0126-MS1)** | | | | **QC Source: ASL0040-02** | | | | **Extracted: 01/07/10 10:35** | | | | | | |
| Lead | EPA 6020 | 49.0 | --- | 0.476 | mg/kg | 1x | 4.46 | 47.6 | 93.6% | (75-125) | -- | -- | 01/08/10 03:57 | |
| **Matrix Spike Dup (10A0126-MSD1)** | | | | **QC Source: ASL0040-02** | | | | **Extracted: 01/07/10 10:35** | | | | | | |
| Lead | EPA 6020 | 51.1 | --- | 0.476 | mg/kg | 1x | 4.46 | 47.6 | 97.9% | (75-125) | 4.09% | (40) | 01/08/10 04:05 | |

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| | | |
|---|---|---|
| **Oasis Environmental, Inc.** | Project Name: **Iliamna** | |
| 825 W 8th Ave, ste 200 | Project Number: 465-008 | Report Created: |
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## Polynuclear Aromatic Compounds per EPA 8270M-SIM - Laboratory Quality Control Results

TestAmerica Portland

**QC Batch: 10A0089** **Soil Preparation Method: EPA 3550**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Blank (10A0089-BLK1)** | | | | | | | | | **Extracted: 01/06/10 13:05** | | | | | |
| Acenaphthene | EPA 8270m | ND | --- | 13.2 | ug/kg wet | 1x | -- | -- | -- | -- | -- | -- | 01/06/10 16:45 | |
| Acenaphthylene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Anthracene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Benzo (a) anthracene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Benzo (a) pyrene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Benzo (b) fluoranthene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Benzo (ghi) perylene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Benzo (k) fluoranthene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Chrysene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Dibenzo (a,h) anthracene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Fluoranthene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Fluorene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Indeno (1,2,3-cd) pyrene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Naphthalene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Phenanthrene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| Pyrene | " | ND | --- | 13.2 | " | " | -- | -- | -- | -- | -- | -- | " | |
| *Surrogate(s): Fluorene-d10* | | *Recovery: 95.2%* | | | *Limits: 24-125%* | " | | | | | | | *01/06/10 16:45* | |
| *Pyrene-d10* | | *108%* | | | *41-141%* | " | | | | | | | " | |
| *Benzo (a) pyrene-d12* | | *94.9%* | | | *38-143%* | " | | | | | | | " | |
| **LCS (10A0089-BS1)** | | | | | | | | | **Extracted: 01/06/10 13:05** | | | | | |
| Acenaphthene | EPA 8270m | 146 | --- | 13.3 | ug/kg wet | 1x | -- | 166 | 88.4% | (33-139) | -- | -- | 01/06/10 16:17 | |
| Benzo (a) pyrene | " | 150 | --- | 13.3 | " | " | -- | " | 90.7% | (45-149) | -- | -- | " | |
| Pyrene | " | 156 | --- | 13.3 | " | " | -- | " | 94.5% | (39-138) | -- | -- | " | |
| *Surrogate(s): Fluorene-d10* | | *Recovery: 84.9%* | | | *Limits: 24-125%* | " | | | | | | | *01/06/10 16:17* | |
| *Pyrene-d10* | | *91.4%* | | | *41-141%* | " | | | | | | | " | |
| *Benzo (a) pyrene-d12* | | *88.5%* | | | *38-143%* | " | | | | | | | " | |
| **Matrix Spike (10A0089-MS1)** | | | | | **QC Source: PSL0968-01** | | | | **Extracted: 01/06/10 13:05** | | | | | |
| Acenaphthene | EPA 8270m | 403 | --- | 73.1 | ug/kg dry | 2x | ND | 455 | 88.7% | (33-139) | -- | -- | 01/06/10 17:43 | |
| Benzo (a) pyrene | " | 411 | --- | 73.1 | " | " | ND | " | 90.4% | (45-149) | -- | -- | " | |
| Pyrene | " | 505 | --- | 73.1 | " | " | ND | " | 111% | (39-138) | -- | -- | " | |
| *Surrogate(s): Fluorene-d10* | | *Recovery: 66.8%* | | | *Limits: 24-125%* | " | | | | | | | *01/06/10 17:43* | |
| *Pyrene-d10* | | *80.5%* | | | *41-141%* | " | | | | | | | " | |
| *Benzo (a) pyrene-d12* | | *56.7%* | | | *38-143%* | " | | | | | | | " | |

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| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Polynuclear Aromatic Compounds per EPA 8270M-SIM - Laboratory Quality Control Results

TestAmerica Portland

**QC Batch: 10A0089** **Soil Preparation Method: EPA 3550**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Matrix Spike Dup (10A0089-MSD1)** | | | | | **QC Source: PSL0968-01** | | | **Extracted: 01/06/10 13:05** | | | | | | |
| Acenaphthene | EPA 8270m | 462 | --- | 73.1 | ug/kg dry | 2x | ND | 454 | 102% | (33-139) | 13.6% | (60) | 01/06/10 18:12 | |
| Benzo (a) pyrene | " | 462 | --- | 73.1 | " | " | ND | " | 102% | (45-149) | 11.6% | " | " | |
| Pyrene | " | 559 | --- | 73.1 | " | " | ND | " | 123% | (39-138) | 10.2% | " | " | |
| *Surrogate(s):* | *Fluorene-d10* | *Recovery:* | *69.6%* | | *Limits:* | *24-125%* | *"* | | | | | | *01/06/10 18:12* | |
| | *Pyrene-d10* | | *79.4%* | | | *41-141%* | *"* | | | | | | *"* | |
| | *Benzo (a) pyrene-d12* | | *58.5%* | | | *38-143%* | *"* | | | | | | *"* | |

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## Percent Dry Weight (Solids) per ASTM D2216-80 - Laboratory Quality Control Results

TestAmerica Portland

**QC Batch: 10A0097** **Soil Preparation Method: Dry Weight**

| Analyte | Method | Result | MDL* | MRL | Units | Dil | Source Result | Spike Amt | % REC | (Limits) | % RPD | (Limits) | Analyzed | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Duplicate (10A0097-DUP1)** | | | | **QC Source: ASL0040-02** | | | | **Extracted: 01/06/10 13:15** | | | | | | |
| % Solids | NCA SOP | 95.1 | --- | 0.0100 | % by Weight | 1x | 95.0 | -- | -- | -- | 0.105% | (20) | 01/06/10 13:15 | |

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|---|---|---|---|
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| 825 W 8th Ave, ste 200 | Project Number: | 465-008 | Report Created: |
| Anchorage, AK/USA 99501-4427 | Project Manager: | Dan Frank | 01/18/10 13:38 |

## Notes and Definitions

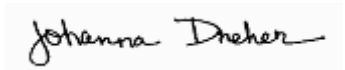
Report Specific Notes:

| | | |
|---|---|---|
| M7 | - | The MS and/or MSD were above the acceptance limits. See Blank Spike (LCS). |
| MHA | - | Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS). |
| R2 | - | The RPD exceeded the acceptance limit. |
| RL1 | - | Reporting limit raised due to sample matrix effects. |
| RL7 | - | Sample required dilution due to high concentrations of target analyte. |
| Z3 | - | The sample required a dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information. |

Laboratory Reporting Conventions:

| | | |
|---|---|---|
| DET | - | Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only. |
| ND | - | Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate). |
| NR/NA | - | Not Reported / Not Available |
| dry | - | Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight. |
| wet | - | Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis. |
| RPD | - | RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries). |
| MRL | - | METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table. |
| MDL* | - | METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results. |
| Dil | - | Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data. |
| Reporting Limits | - | Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable. |
| Electronic Signature | - | Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy.* Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature. |





# CONCEPTUAL SITE MODEL

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# Human Health Conceptual Site Model
# Scoping Form

**Site Name:** Iliamna Tank Farm

**File Number:** TBD

**Completed by:** OASIS Environmental, Inc.

**Introduction**

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

***General Instructions: Follow the italicized instructions in each section below.***

## 1. *General Information:*

**Sources** *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☑ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☑ Other: Fuel Tanker Truck

**Release Mechanisms** *(check potential release mechanisms at the site)*

- ☐ Spills
- ☑ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other: _____

**Impacted Media** *(check potentially-impacted media at the site)*

- ☑ Surface soil (0-2 feet bgs*)
- ☑ Subsurface Soil (>2 feet bgs)
- ☐ Air
- ☑ Groundwater
- ☐ Surface water
- ☐ Other: _____

**Receptors (***check receptors that could be affected by contamination at the site)*

- ☐ Residents (adult or child)
- ☑ Commercial or industrial worker
- ☑ Construction worker
- ☐ Subsistence harvester (i.e., gathers wild foods)
- ☐ Subsistence consumer (i.e., eats wild foods)
- ☑ Site visitor
- ☐ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other: _____

* bgs – below ground surface

## 2. *Exposure Pathways:* *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

### a) Direct Contact –

#### 1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

*If both boxes are checked, label this pathway complete:* Complete

#### 2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☐

| | |
|---|---|
| Arsenic | Lindane |
| Cadmium | PAHs |
| Chlordane | Pentachlorophenol |
| 2,4-dichlorophenoxyacetic acid | PCBs |
| Dioxins | SVOCs |
| DDT | |

*If all of the boxes are checked, label this pathway complete:* _____

### b) Ingestion –

#### 1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☑

*If both the boxes are checked, label this pathway complete:* Complete

### 2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

*If both boxes are checked, label this pathway complete:* _____

### 3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☐

*If all of the boxes are checked, label this pathway complete:* _____

## c) Inhalation

### 1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

*If all of the boxes are checked, label this pathway complete:* Complete

### 2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

*If both boxes are checked, label this pathway complete:* Complete

## *3. Additional Exposure Pathways:* *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

**Dermal Exposure to Contaminants in Groundwater and Surface Water**

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

*Check the box if further evaluation of this pathway is needed:* ☐

Comments:

| |
|---|
| |

**Inhalation of Volatile Compounds in Household Water**

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, and
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

*Check the box if further evaluation of this pathway is needed:* ☐

Comments:

| |
|---|
| |

**Inhalation of Fugitive Dust**

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

*Check the box if further evaluation of this pathway is needed:* ☐

Comments:

**Direct Contact with Sediment**

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

*Check the box if further evaluation of this pathway is needed:* ☐

Comments:

## *4. Other Comments* (*Provide other comments as necessary to support the information provided in this form.)*

# APPENDIX A

## BIOACCUMULATIVE COMPOUNDS

### Table A-1: List of Compounds of Potential Concern for Bioaccumulation

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log $K_{ow}$ greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

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

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

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

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

# APPENDIX B

## VOLATILE COMPOUNDS

**Table B-1: List of Volatile Compounds of Potential Concern**
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1 x $10^{-5}$ atm-$m^3$/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

| | | |
|---|---|---|
| Acenaphthene | 1,4-dichlorobenzene | Pyrene |
| Acetone | 1,1-dichloroethane | Styrene |
| Anthracene | 1,2-dichloroethane | 1,1,2,2-tetrachloroethane |
| Benzene | 1,1-dichloroethylene | Tetrachloroethylene |
| Bis(2-chlorethyl)ether | Cis-1,2-dichloroethylene | Toluene |
| Bromodichloromethane | Trans-1,2-dichloroethylene | 1,2,4-trichlorobenzene |
| Carbon disulfide | 1,2-dichloropropane | 1,1,1-trichloroethane |
| Carbon tetrachloride | 1,3-dichloropropane | 1,1,2-trichloroethane |
| Chlorobenzene | Ethylbenzene | Trichloroethylene |
| Chlorodibromomethane | Fluorene | Vinyl acetate |
| Chloroform | Methyl bromide | Vinyl chloride |
| 2-chlorophenol | Methylene chloride | Xylenes |
| Cyanide | Naphthalene | GRO |
| 1,2-dichlorobenzene | Nitrobenzene | DRO |

# APPENDIX C

## COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

### Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1 x $10^{-5}$ atm-$m^3$/mol or greater.

| | | |
|---|---|---|
| Acenaphthene | Dibenzofuran | Hexachlorobenzene |
| Acetaldehyde | 1,2-Dibromo-3-chloropropane | Hexachlorocyclopentadiene |
| Acetone | 1,2-Dibromoethane (EDB) | Hexachloroethane |
| Acetonitrile | 1,3-Dichlorobenzene | Hexane |
| Acetophenone | 1,2-Dichlorobenzene | Hydrogen cyanide |
| Acrolein | 1,4-Dichlorobenzene | Isobutanol |
| Acrylonitrile | 2-Nitropropane | Mercury (elemental) |
| Aldrin | N-Nitroso-di-n-butylamine | Methacrylonitrile |
| alpha-HCH (alpha-BHC) | n-Propylbenzene | Methoxychlor |
| Benzaldehyde | o-Nitrotoluene | Methyl acetate |
| Benzene | o-Xylene | Methyl acrylate |
| Benzo(b)fluoranthene | p-Xylene | Methyl bromide |
| Benzylchloride | Pyrene | Methyl chloride chloromethane) |
| beta-Chloronaphthalene | sec-Butylbenzene | Methylcyclohexane |
| Biphenyl | Styrene | Methylene bromide |
| Bis(2-chloroethyl)ether | tert-Butylbenzene | Methylene chloride |
| Bis(2-chloroisopropyl)ether | 1,1,1,2-Tetrachloroethane | Methylethylketone (2-butanone) |
| Bis(chloromethyl)ether | 1,1,2,2-Tetrachloroethane | Methylisobutylketone |
| Bromodichloromethane | Tetrachloroethylene | Methylmethacrylate |
| Bromoform | Dichlorodifluoromethane | 2-Methylnaphthalene |
| 1,3-Butadiene | 1,1-Dichloroethane | MTBE |
| Carbon disulfide | 1,2-Dichloroethane | m-Xylene |
| Carbon tetrachloride | 1,1-Dichloroethylene | Naphthalene |
| Chlordane | 1,2-Dichloropropane | n-Butylbenzene |
| 2-Chloro-1,3-butadiene (chloroprene) | 1,3-Dichloropropene | Nitrobenzene |
| Chlorobenzene | Dieldrin | Toluene |
| 1-Chlorobutane | Endosulfan | trans-1,2-Dichloroethylene |
| Chlorodibromomethane | Epichlorohydrin | 1,1,2-Trichloro-1,2,2-trifluoroethane |
| Chlorodifluoromethane | Ethyl ether | 1,2,4-Trichlorobenzene |
| Chloroethane (ethyl chloride) | Ethylacetate | 1,1,2-Trichloroethane |
| Chloroform | Ethylbenzene | 1,1,1-Trichloroethane |
| 2-Chlorophenol | Ethylene oxide | Trichloroethylene |
| 2-Chloropropane | Ethylmethacrylate | Trichlorofluoromethane |
| Chrysene | Fluorene | 1,2,3-Trichloropropane |
| cis-1,2-Dichloroethylene | Furan | 1,2,4-Trimethylbenzene |
| Crotonaldehyde (2-butenal) | Gamma-HCH (Lindane) | 1,3,5-Trimethylbenzene |
| Cumene | Heptachlor | Vinyl acetate |
| DDE | Hexachloro-1,3-butadiene | Vinyl chloride (chloroethene) |

Source: EPA 2002.

# HUMAN HEALTH CONCEPTUAL SITE MODEL

*Site:* Iliamna Tank Farm

*Completed By:* OASIS Environmental, Inc.

*Date Completed:* February 4, 2010

***Follow the directions below. Do not consider engineering or land use controls when describing pathways.***

**(1)**

*Check the media that could be directly affected by the release.*

**(2)**

*For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

**(3)**

*Check exposure media identified in (2).*

**(4)**

*Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

**(5)**

*Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

| Media | Transport Mechanisms | Exposure Media | Exposure Pathways | Current & Future Receptors: Residents (adults or children) | Commercial or industrial workers | Site visitors, trespassers, or recreational users | Construction workers | Farmers or subsistence harvesters | Subsistence consumers | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| ☑ Surface Soil (0-2 ft bgs) | ☑ Direct release to surface soil → check soil | ☑ soil | ☑ Incidental Soil Ingestion | | C/F | C/F | C/F | | | |
| | ☑ Migration or leaching to subsurface → check soil | | ☐ Dermal Absorption of Contaminants from Soil | | | | | | | |
| | ☑ Migration or leaching to groundwater → check groundwater | | | | | | | | | |
| | ☑ Volatilization → check air | | | | | | | | | |
| | ☐ Runoff or erosion → check surface water | | | | | | | | | |
| | ☐ Uptake by plants or animals → check biota | | | | | | | | | |
| | ☐ Other (*list*): Iliamna Tank Farm | | | | | | | | | |
| ☑ Subsurface Soil (2-15 ft bgs) | ☑ Direct release to subsurface soil → check soil | ☑ groundwater | ☑ Ingestion of Groundwater | F | C/F | C/F | C/F | | | |
| | ☐ *Migration to groundwater* → check groundwater | | ☑ Dermal Absorption of Contaminants in Groundwater | | | | | | | |
| | ☑ *Volatilization* → check air | | ☐ Inhalation of Volatile Compounds in Tap Water | | | | | | | |
| | ☐ *Other (list):* TBD | | | | | | | | | |
| ☐ Ground-water | ☐ Direct release to groundwater → check groundwater | ☑ air | ☐ Inhalation of Outdoor Air | | C/F | C/F | C/F | | | |
| | ☐ *Volatilization* → check air | | ☐ Inhalation of Indoor Air | | C/F | C/F | C/F | | | |
| | ☐ *Flow to surface water body* → check surface water | | ☑ Inhalation of Fugitive Dust | | | | | | | |
| | ☑ *Flow to sediment* → check sediment | | | | | | | | | |
| | ☐ *Uptake by plants or animals* → check biota | | | | | | | | | |
| | ☑ *Other (list):* OASIS Environmental, Inc. | | | | | | | | | |
| ☐ Surface Water | ☐ Direct release to surface water → check surface water | ☑ surface water | ☑ Ingestion of Surface Water | | | | | | | |
| | ☐ *Volatilization* → check air | | ☐ Dermal Absorption of Contaminants in Surface Water | | | | | | | |
| | ☐ *Sedimentation* → check sediment | | ☐ Inhalation of Volatile Compounds in Tap Water | | | | | | | |
| | ☑ *Uptake by plants or animals* → check biota | | | | | | | | | |
| | ☐ *Other (list):* Fuel Tanker Truck | | | | | | | | | |
| ☐ Sediment | ☐ Direct release to sediment → check sediment | ☐ sediment | ☐ Direct Contact with Sediment | | | | | | | |
| | ☑ *Resuspension, runoff, or erosion* → check surface water | | | | | | | | | |
| | ☑ *Uptake by plants or animals* → check biota | ☑ biota | ☐ Ingestion of Wild Foods | | | | | | | |
| | ☐ *Other (list):* | | | | | | | | | |

Revised 3/21/06

# WELL LOGS

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# Well Location Query

WELTS Well Log Tracking System

*To view a table of information for a single well or to access a PDF document view of the actual well log for that well (if available) click on the well's highlighted "property description".*

**There are 2 records matching Meridian: SC, Township: 5, Range: 33, Section: 9.**

Get Text File Get it

Get Excel Spreadsheet Get it

| # | Driller | Owner | Description | Key |
|---|---|---|---|---|
| 1 | M-W DRILLING | STATE OF ALASKA, DOT & PF | ILIAMNA AIRPORT | 9332 |
| 2 | M-W DRILLING | NEWHALEN, CITY OF | NEWHALEN AREA | 10318 |

---

**Requery**

9352

85-168

**M-W DRILLING, Inc.**
P.O. Box 10-378 • 10300 Old Seward Highway
(907) 349-8535
ANCHORAGE, ALASKA 99511

## DRILLING LOG

Well Owner I.N.I.T. (Iliamna Nondalton Inter Tie) Use of Well Domestic

Location (address of: Township, Range, Section, if known; or distance main road
Iliamna Airport

Sec.9 T53 R33W S.M.

Size of casing 6" Depth of Hole 148 feet Cased to 60.40 feet

Static water level 10 ft. (~~above~~) (below) land surface. Finish of well (check one) open end ( X );
Screen ( ); Perforated ( ).

Describe screen or perforation

Well pumping test at 10+ gallons per (~~hour~~) (minute) for 6 hours with 10 ft. of drawdown from static level.

Date of completion 5/13/85

## WELL LOG

| Depth in feet from ground surface | Give details of formations penetrated, size of material, color and hardness |
|---|---|
| 0 TO 30 | Sand & Gravel |
| 30 TO 50 | Fine Brown Sand |
| 50 TO 148 | Red Rock |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |
| TO | |

Wayne E Wattum

NWWA Certified Contractor
Certificate No's. 814 & 973

SC 5-339

2 — STATE

10318

85-177

**M-W DRILLING, Inc.**
P.O. Box 10-378 • 10300 Old Seward Highway
(907) 349-8535
ANCHORAGE, ALASKA 99511

## DRILLING LOG

Well Owner John Johnson/City of Newhalen Use of Well Domestic

Location (address of: Township, Range, Section, if known; or distance main road
Lat 59° 45.10'N.
Lon 154° 54.84W.

Size of casing 6" Depth of Hole 210 feet Cased to 53.31 feet

Static water level +2 ft. (~~above~~) (below) land surface. Finish of well (check one) open end ( X );
Screen ( ); Perforated ( ).

Describe screen or perforation None

Well pumping test at 15 gallons per (~~hour~~) (minute) for 6 hours with 60 ft. of drawdown from static level.

Date of completion June 2, 1985

## WELL LOG

| Depth in feet from ground surface | | | Give details of formations penetrated, size of material, color and hardness |
|---|---|---|---|
| 0 | TO | 15 | Brown fine sand |
| 15 | TO | 52 | Grey sand & Gravel |
| 52 | TO | 200 | Hard Rock |
| 200 | TO | 210 | Fractured Rock w/water flow |
| | TO | | |
| | TO | | |
| | TO | | |
| | TO | | |
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| | TO | | |

Wayne E Kuelling

NWWA Certified Contractor
Certificate No's. 814 & 973

SC 5-33-9 CC

2—STATE