SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ALASKA
CALIFORNIA
COLORADO
FLORIDA
MISSOURI
OREGON
WASHINGTON
WISCONSIN

June 9, 2015

Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, Alaska 99501

Attn. Mr. Joshua Barsis

RE: CONTAMINATED SOIL STOCKPILE SAMPLING, KOBUK ABANDONED TANK FARM, KOBUK, ALASKA; ADEC HAZARD ID 4615

This letter report presents the results of our soil stockpile sampling activities at the Kobuk Abandoned Tank Farm in Kobuk, Alaska. The purpose of this project is to collect soil samples from the contaminated soil stockpile with an objective of determining whether it is appropriate to utilize the stockpile as daily landfill cover.

The project was performed under Shannon & Wilson, Inc's (Shannon & Wilson) Alaska Department of Environmental Conservation (ADEC) Hazardous Substance Spill Prevention and Response Contract 18-8036-03. ADEC authorization to proceed was received on May 8, 2015 with Notice to Proceed No. 18-8036-03-030.

BACKGROUND

The abandoned tank farm, known as the Old Fuel Distribution Site or Backup Generator Site, is owned by the City of Kobuk and is located on Lot 26, U.S. Survey #37-88. The site is situated east of the Kobuk River in Kobuk Alaska, as shown in the vicinity map (Figure 1). The site was once a fueling station and tank farm and is now the Backup Generator Site.

The abandoned tank farm was the site of a 2007 ADEC Brownfield Assessment. Diesel range organic (DRO)-impacted soil was excavated from the abandoned tank farm site and transported to the stockpile location near the Kobuk Landfill.

The approximately 200 cubic yard (cy) stockpile was sampled in 2007 and 2012. Of the five soil samples (including one field duplicate) collected in 2012, four were greater than the ADEC cleanup level of 250 mg/kg, with concentrations ranging from 186 mg/kg to 3,640 milligrams per kilogram (mg/kg). Concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents were detected in each soil sample, but at concentrations less than the applicable cleanup levels.

5430 FAIRBANKS STREET•SUITE 3
ANCHORAGE, ALASKA 99518
907-561-2120 • FAX 907-561-4483

FIELD ACTIVITIES

On May 14, 2015 a Shannon & Wilson field representative traveled to Kobuk to conduct field screening and collect analytical samples from the stockpile in accordance with the ADEC's May 2010 *Draft Field Sampling Guidance* document.

At the time of the site visit, the stockpile had vegetation growing on it (Photo 1) and the top liner of the stockpile was weathered and deteriorating (Photo 2). Based on a screening frequency of at least one screening sample per 10 cy of soil, 20 test pits were advanced using a shovel. The soil screening samples were collected at approximately 1.5 to 1.7 feet beneath the stockpile surface. One screening sample was collected from each test pit. The soil samples were evaluated in the field using visual descriptions and semi-quantitative headspace screening. Headspace screening was conducted in accordance with ADEC guidelines using an OVM 580B photoionization detector (PID) calibrated with 100 parts per million (ppm) isobutylene standard gas. The field screening samples were collected in re-sealable bags, warmed, and tested within 60 minutes of collection.

Four analytical soil samples and one field duplicate were collected from the stockpile. The analytical soil samples were selected based on headspace results and spatial representation. Sample locations, descriptions, headspace screening results are provided in Table 1. Approximate sample locations are shown in Figure 2.

LABORATORY ANALYSES

The analytical soil samples were placed in laboratory-supplied jars and stored in a chilled cooler after collection. Soil samples were transported to Anchorage and submitted to SGS North America Inc. (SGS) using chain-of-custody procedures. The soil samples were analyzed for diesel range organics (DRO) by Alaska Method (AK) 102.

DISCUSSION OF ANALYTICAL RESULTS

The soil sample results are compared to the most stringent ADEC Method Two cleanup levels listed in 18 AAC 75.341 (October 2014) Tables B1 and B2 for the "under 40-inch (precipitation) zone". The applicable cleanup levels are provided in Table 2 with the tabled sample results. It is our understanding that the Kobuk landfill can accept soil containing a maximum of 2,000 mg/kg DRO for use as daily landfill cover.

Three of the five stockpile samples (including one field duplicate) contained DRO concentrations greater than the 250 mg/kg cleanup level. DRO concentrations ranged from 273 mg/kg (Sample SS17) to 927 mg/kg (Sample SS18).

QUALITY ASSURANCE SUMMARY

The project laboratory follows on-going quality assurance/quality control procedures to evaluate conformance to applicable ADEC data quality objectives (DQOs). Internal laboratory controls to assess data quality for this project included surrogate spikes, method blanks, laboratory control samples/laboratory control sample duplicates (LCS/LCSD), and matrix spike/matrix spike duplicates (MS/MSD) to assess recovery rates, precision, and accuracy. If a DQO was not met, the project laboratory provides a report specific note identifying the problem in the Case Narrative of their Laboratory Analysis Report (see Attachment 3).

Shannon & Wilson reviewed the SGS data deliverables and completed the ADEC's Laboratory Data Review Checklist, which is included in Attachment 3. No non-conformances that would adversely affect data usability were noted in the laboratory report.

One soil field duplicate set (Samples SS18/SS28) was compared to assess precision of the sampling and analysis processes using the calculated relative percent difference (RPD). The RPDs are within the ADEC recommended DQO of 50 percent for soil.

CONCLUSIONS

The maximum DRO concentration detected in the stockpile was measured to be 927 mg/kg. The concentrations are less than allowable limits (2,000 mg/kg) for use as cover at the Kobuk landfill.

CLOSURE/LIMITATIONS

This letter report was prepared for the exclusive use of our clients and their representatives in the study of this site. The findings we have presented within this report are based on the limited sampling, and analyses that we conducted. It is possible that our tests missed higher levels of petroleum hydrocarbon constituents, although our intention was to sample the stockpile in accordance with our ADEC-approved proposal. The data presented in this report should be considered representative of the time of our site assessment. Changes in site conditions can occur with time, due to natural forces or human activity. In addition, changes in government codes, regulations, or laws may occur. Because of such changes beyond our control, our observations and interpretations may need to be revised. Shannon & Wilson has prepared the attachments in Attachment 4, "Important Information About Your Geotechnical/Environmental Report," to assist you and others in understanding the use and limitations of our reports.

You are advised that various state and federal agencies (ADEC, EPA, etc.) may require the reporting of this information. Shannon & Wilson does not assume the responsibility for

reporting these findings and therefore has not, and will not, disclose the results of this study unless specifically authorized by you or required by law.

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

We appreciate this opportunity to be of service. Please call the undersigned at (907) 561-2120 with any questions or comments concerning the contents of this report.

Sincerely,

SHANNON & WILSON, INC.

for:

Trevor Crosby
Environmental Scientist

Dan P. McMahon
Sr. Principal Environmental Scientist

Encl: Tables 1 and 2; Figures 1 and 2; and Attachments 1 through 4

TABLE 1
SAMPLE LOCATIONS AND DESCRIPTIONS

Sample ID Number	Date	Sample Location (See Figure 2)	Depth ** (feet)	Headspace (ppm) ^	Sample Description (See Attachment 2)
Stockpile Samples					
* SS1	5/14/2015	Northeast corner of stockpile	1.5-1.7	1.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS2	5/14/2015	Central portion of northern side of stockpile	1.5-1.7	0.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS3	5/14/2015	Northwest corner of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS4	5/14/2015	Western edge of stockpile	1.5-1.7	1.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS5	5/14/2015	Central portion of western side of stockpile	1.5-1.7	0.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS6	5/14/2015	Central portion of eastern side of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS7	5/14/2015	Eastern edge of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS8	5/14/2015	Eastern edge of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS9	5/14/2015	Central portion of eastern side of stockpile	1.5-1.7	0.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS10	5/14/2015	Central portion of western side of stockpile	1.5-1.7	0.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS11	5/14/2015	Western edge of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS12	5/14/2015	Western edge of stockpile	1.5-1.7	0.2	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS13	5/14/2015	Central portion of western side of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
* SS14	5/14/2015	Central portion of eastern side of stockpile	1.5-1.7	5.4	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS15	5/14/2015	Eastern edge of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS16	5/14/2015	Central portion of south side of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
* SS17	5/14/2015	Western edge of stockpile	1.5-1.7	6.4	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
* SS18	5/14/2015	Western edge of stockpile	1.5-1.7	90	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics; hydrocarbon odor
* SS28	5/14/2015	Duplicate of Sample SS18	1.5-1.7	90	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics; hydrocarbon odor
SS19	5/14/2015	Central portion of south side of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics
SS20	5/14/2015	Eastern edge of stockpile	1.5-1.7	0.7	Gray to brown, P*oorly Graded Sand with Gravel* (SP); moist; trace organics

Notes:

* = Sample analyzed by the project laboratory (See Table 2)

^ = Field screening instrument was a Thermo Environmental Instruments 580B photoionization detector (PID)

** = Beneath top of stockpile

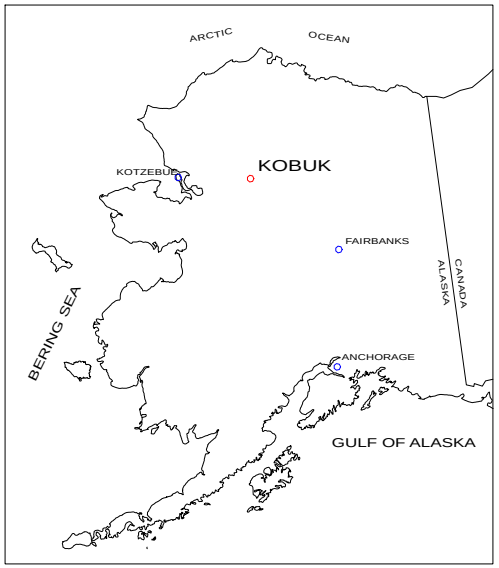
ppm = Parts per million

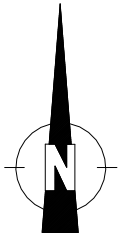
TABLE 2
SUMMARY OF SOIL ANALYTICAL RESULTS

			Sample ID Number^, and Collection Depth in Feet (See Table 1 and Figure 2)				
			Soil Stockpile				
Parameter Tested	**Method**	**Cleanup Level****	SS1 1.5-1.7	SS14 1.5-1.7	SS17 1.5-1.7	SS18 1.5-1.7	SS28~ 1.5-1.7
Headspace Reading - ppm	OVM 580B	-	1.2	5.4	6.4	90	90.0
Diesel Range Organics (DRO) - mg/kg	AK 102	250	**144**	**216**	**273**	**927**	**900**

Notes:

*	= Soil cleanup level is the most stringent ADEC Method 2 standard listed in Table B1 or B2, 18 AAC 75.341 (October 2014).
^	= Sample ID No. preceded by "17732-" on the chain of custody form
ppm	= parts per million
mg/kg	= milligrams per kilogram
~	= duplicate of Sample SS18
-	= not applicable or sample not tested for this analyte
144	= analyte detected
927	= bolded and highlighted results are greater than ADEC Method Two cleanup levels





0 2000 4000

APPROXIMATE SCALE IN FEET

Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth Mapping Service.

Kobuk Abandoned Tank Farm
Kobuk, Alaska

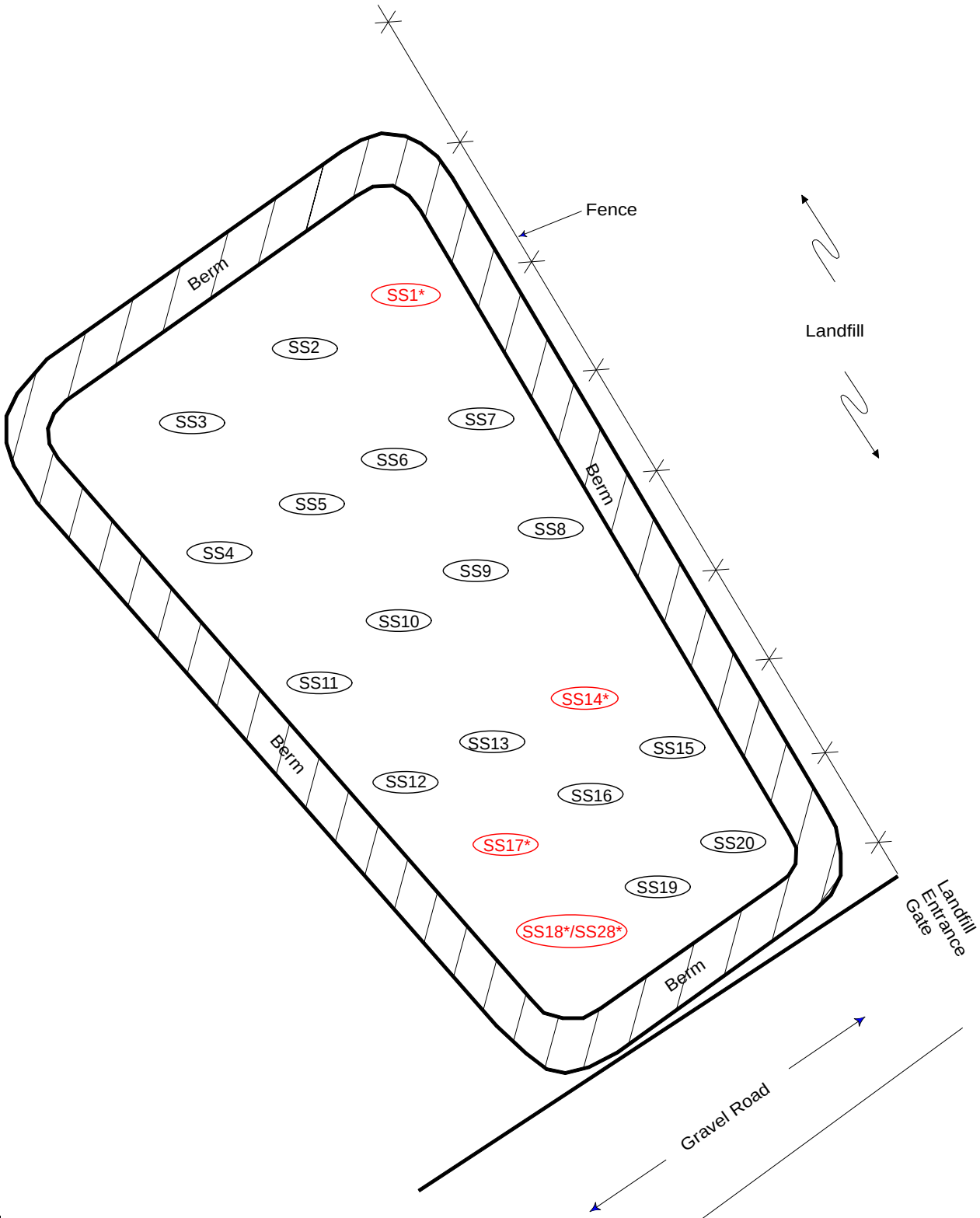
VICINITY MAP

June 2015

32-1-17732-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1



LEGEND

SS2 — Approximate location of field screening Sample SS2, collected by Shannon & Wilson, Inc. on May 14, 2015

SS1* — Approximate location of field screening and analytical Sample SS1, collected by Shannon & Wilson, Inc. on May 14, 2015

0 15 30

APPROXIMATE SCALE IN FEET

Kobuk Abandoned Tank Farm
Kobuk, Alaska

ANALYTICAL SAMPLE LOCATIONS

June 2015

32-1-17732-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 2

ATTACHMENT 1

SITE PHOTOGRAPHS

Photo 1: Looking north at the stockpile. (May 14, 2015)

Photo 2: Deteriorating liner towards the north end of the stockpile. (May 14, 2015)

ATTACHMENT 2

FIELD NOTES

FIELD ACTIVITIES DAILY LOG

Date 5/14/15
Sheet 1 of 1
Project No. 17732-001

Project Name: Kobuk Abandoned Tank Farm
Field activity subject: Stockpile Sampling
Description of daily activities and events:

0500 - Arrive at Anchorage Airport for departure to Kotzebue then to Kobuk

1030 - Arrive in Kobuk
Get ride to Kobuk City Council office.
Meet Carl and prep for sampling activities

1045 - Arrive at stockpile (near landfill)
Stockpile has vegetation growing and debris from landfill on it. (See photos)
Difficult to identify berm from stockpile.
Begin collecting screening samples (20 samples)

1200 - Based on field screening results, collect analytical samples. (See Sample collection log for details)

1240 - Back at City Council office to label jars

1630 - Depart Kobuk for Kotzebue
2 stops prior to arrival

Visitors on site: —

Changes from plans/specifications and other special orders and important decisions:
NA

Weather conditions: Overcast / Rain 40°F

Important telephone calls: NA

Personnel on site: Jake Tracy
Signature: Jake Tracy

Date: 5/14/15

SAMPLE COLLECTION LOG

Project Number: 17732-001 Location: Kobuk Abandoned Tank Farm

Date: 5/14/15

Sampler: Jake Tracy Overcast/Rain 40°F

Sample Number	Location	Sample Time	Depth Interval (ft) top	Depth Interval (ft) bottom	Matrix Type	Sampling Method	Sample Type	PID Reading	Analyses
Stockpile Sample 1 (SS1)	See Figure on back of this page	1200	1.5	1.7	Soil	Grab	ES	1.2	DRO
SS2		—					FS	0.2	—
SS3		—					FS	0.7	—
SS4		1205					ES	1.2	DRO
SS5		—					FS	0.2	—
SS6		—					FS	0.7	—
SS7		—					FS	0.7	—
SS8		—					FS	0.7	—
SS9		—					FS	0.2	—
SS10		—					FS	0.2	—
SS11		—					FS	0.7	—
SS12		—					FS	0.2	—
SS13		—					FS	0.7	—
SS14		1210					ES	5.4	DRO
SS15		—					FS	0.7	—
SS16		—					FS	0.7	—
SS17		1215					ES	6.4	DRO
SS18		1220					ES	90	DRO
SS19		—					FS	0.7	—
SS20		—					FS	0.7	—
FS28	Duplicate of Sample SS18	1225	1.5		Soil	Grab	FD	90	DRO

Soil description: Gray to brown, poorly graded SAND with GRAVEL (sm); moist; trace organics
(Applys to all Samples) G: 20% S: 75% F: 5%
SS18 has hydrocarbon odor

Matrix Type

AR	Air
GW	Groundwater
PR	Product
SB	Subsurf. soil
SE	Sediment
SG	Sludge
SS	Surface soil
SW	Surface water
WR	Water

Sampling Method

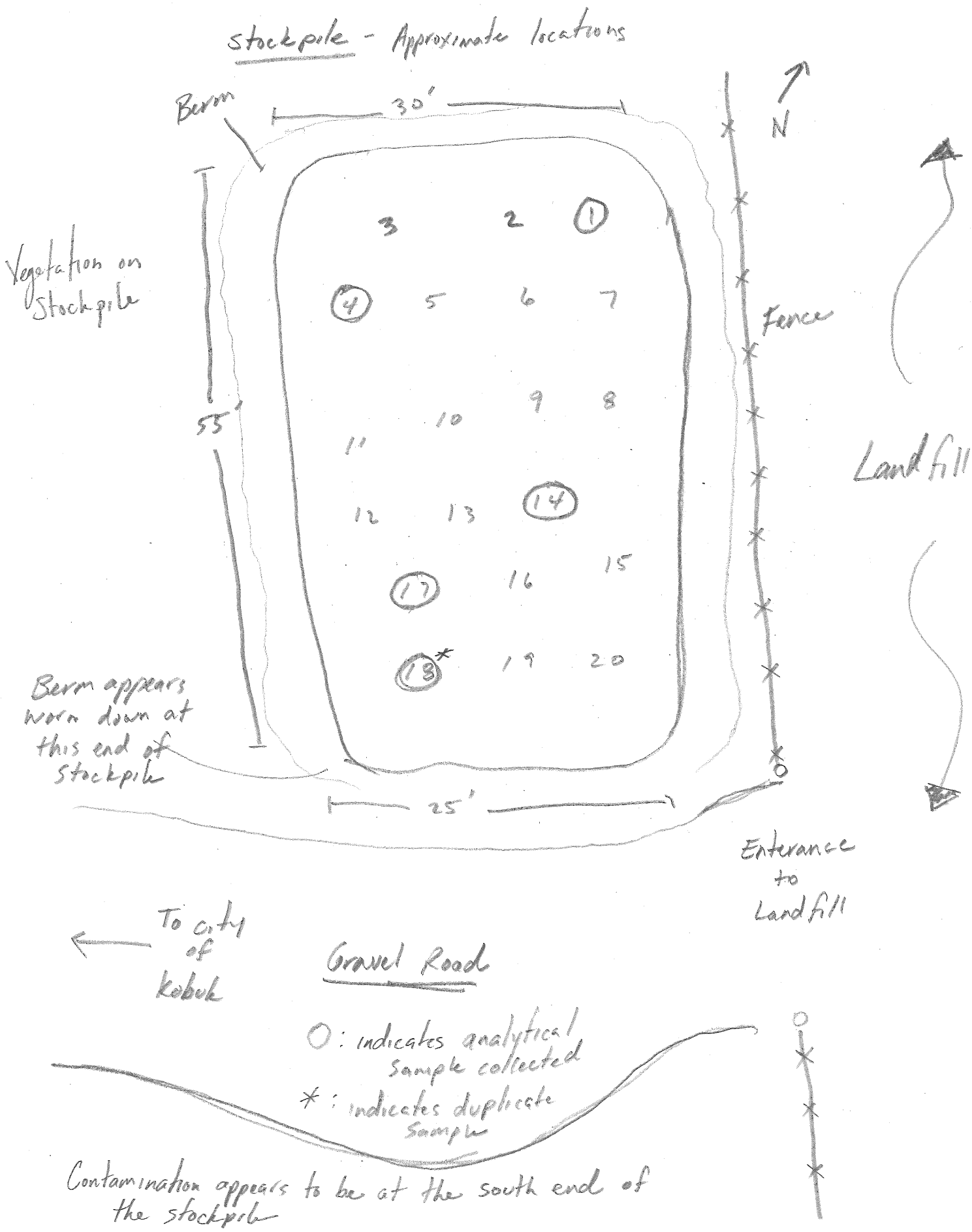
B	Bailer/Coliwas
D	Drill cuttings
G	Grab sampling
H	Hand auger
L	Tube liner
P	Pump (liquid)
SS	Split spoon
T	Shelby tube
V	Vacuum (gas)
W	Wipe sampling

Sample Type

ES	Environmental sample
ER	Equipment rinsate
FB	Field blank
FD	Field duplicate
FM	Field measurement
FR	Field replicate
MD	Matrix spike duplicate
MS	Matrix spike duplicate
TB	Trip blank

FS: Field Screen only

17732-001 Kobuk Abandoned Tank Farm 5/14/15



ATTACHMENT 3

RESULTS OF ANALYTICAL TESTING BY

SGS NORTH AMERICA INC. OF ANCHORAGE, ALASKA

AND

ADEC LABORATORY DATA REVIEW CHECKLIST

Laboratory Report of Analysis

To: Shannon & Wilson, Inc.
5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907)433-3223

Report Number: **1152120**

Client Project: **17732-001 Kobuk**

Dear Dan McMahon,

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

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

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

Sincerely,
SGS North America Inc.

SGS North America Inc.
Environmental Services – Alaska Division
Project Manager

Victoria Pennick
2015.06.02
15:23:11 -08'00'

Victoria Pennick Date
Project Manager
Victoria.Pennick@sgs.com

Print Date: 06/02/2015 2:26:42PM

Case Narrative

SGS Client: **Shannon & Wilson, Inc.**
SGS Project: **1152120**
Project Name/Site: **17732-001 Kobuk**
Project Contact: **Dan McMahon**

Refer to sample receipt form for information on sample condition.

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

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

Laboratory Qualifiers

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

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

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

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

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

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

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

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
17732-SS1	1152120001	05/14/2015	05/15/2015	Soil/Solid (dry weight)
17732-SS14	1152120002	05/14/2015	05/15/2015	Soil/Solid (dry weight)
17732-SS17	1152120003	05/14/2015	05/15/2015	Soil/Solid (dry weight)
17732-SS18	1152120004	05/14/2015	05/15/2015	Soil/Solid (dry weight)
17732-SS28	1152120005	05/14/2015	05/15/2015	Soil/Solid (dry weight)

Method	Method Description
AK102	Diesel Range Organics (S)
SM21 2540G	Percent Solids SM2540G

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

Detectable Results Summary

Client Sample ID: **17732-SS1**
Lab Sample ID: 1152120001
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	144	mg/Kg

Client Sample ID: **17732-SS14**
Lab Sample ID: 1152120002
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	216	mg/Kg

Client Sample ID: **17732-SS17**
Lab Sample ID: 1152120003
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	273	mg/Kg

Client Sample ID: **17732-SS18**
Lab Sample ID: 1152120004
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	927	mg/Kg

Client Sample ID: **17732-SS28**
Lab Sample ID: 1152120005
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	900	mg/Kg

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

Results of **17732-SS1**

Client Sample ID: **17732-SS1**
Client Project ID: **17732-001 Kobuk**
Lab Sample ID: 1152120001
Lab Project ID: 1152120

Collection Date: 05/14/15 12:00
Received Date: 05/15/15 10:00
Matrix: Soil/Solid (dry weight)
Solids (%):81.0
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	144		24.6	7.61	mg/Kg	1		06/02/15 06:01
Surrogates								
5a Androstane (surr)	92.7		50-150		%	1		06/02/15 06:01

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 06/02/15 06:01
Container ID: 1152120001-A

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 05/27/15 21:08
Prep Initial Wt./Vol.: 30.151 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **17732-SS14**

Client Sample ID: **17732-SS14**
Client Project ID: **17732-001 Kobuk**
Lab Sample ID: 1152120002
Lab Project ID: 1152120

Collection Date: 05/14/15 12:10
Received Date: 05/15/15 10:00
Matrix: Soil/Solid (dry weight)
Solids (%):85.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	216		23.0	7.14	mg/Kg	1		06/02/15 06:11
Surrogates								
5a Androstane (surr)	92		50-150		%	1		06/02/15 06:11

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 06/02/15 06:11
Container ID: 1152120002-A

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 05/27/15 21:08
Prep Initial Wt./Vol.: 30.427 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **17732-SS17**

Client Sample ID: **17732-SS17**
Client Project ID: **17732-001 Kobuk**
Lab Sample ID: 1152120003
Lab Project ID: 1152120

Collection Date: 05/14/15 12:15
Received Date: 05/15/15 10:00
Matrix: Soil/Solid (dry weight)
Solids (%):80.9
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	273		24.5	7.60	mg/Kg	1		06/02/15 06:21
Surrogates								
5a Androstane (surr)	86.1		50-150		%	1		06/02/15 06:21

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 06/02/15 06:21
Container ID: 1152120003-A

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 05/27/15 21:08
Prep Initial Wt./Vol.: 30.265 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **17732-SS18**

Client Sample ID: **17732-SS18**
Client Project ID: **17732-001 Kobuk**
Lab Sample ID: 1152120004
Lab Project ID: 1152120

Collection Date: 05/14/15 12:20
Received Date: 05/15/15 10:00
Matrix: Soil/Solid (dry weight)
Solids (%):81.1
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	927		98.1	30.4	mg/Kg	4		06/02/15 07:11
Surrogates								
5a Androstane (surr)	87.2		50-150		%	4		06/02/15 07:11

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 06/02/15 07:11
Container ID: 1152120004-A

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 05/27/15 21:08
Prep Initial Wt./Vol.: 30.171 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **17732-SS28**

Client Sample ID: **17732-SS28**
Client Project ID: **17732-001 Kobuk**
Lab Sample ID: 1152120005
Lab Project ID: 1152120

Collection Date: 05/14/15 12:25
Received Date: 05/15/15 10:00
Matrix: Soil/Solid (dry weight)
Solids (%):78.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	900		101	31.4	mg/Kg	4		06/02/15 07:21
Surrogates								
5a Androstane (surr)	88.4		50-150		%	4		06/02/15 07:21

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 06/02/15 07:21
Container ID: 1152120005-A

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 05/27/15 21:08
Prep Initial Wt./Vol.: 30.147 g
Prep Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Method Blank

Blank ID: MB for HBN 1709371 [SPT/9604]
Blank Lab ID: 1266132

Matrix: Soil/Solid (dry weight)

QC for Samples:
1152120001, 1152120002, 1152120003, 1152120004, 1152120005

Results by **SM21 2540G**

Parameter	Results	LOQ/CL	DL	Units
Total Solids	100			%

Batch Information

Analytical Batch: SPT9604
Analytical Method: SM21 2540G
Instrument:
Analyst: MEV
Analytical Date/Time: 5/23/2015 6:24:00PM

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Duplicate Sample Summary

Original Sample ID: 1152206014
Duplicate Sample ID: 1266134
Analysis Date: 05/23/2015 18:24
Matrix: Soil/Solid (dry weight)

QC for Samples:

1152120001, 1152120002, 1152120003, 1152120004, 1152120005

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	94.3	92.3	%	2.10	(< 5)

Batch Information

Analytical Batch: SPT9604
Analytical Method: SM21 2540G
Instrument:
Analyst: MEV

Print Date: 06/02/2015 2:26:51PM

Method Blank

Blank ID: MB for HBN 1709719 [XXX/33149]
Blank Lab ID: 1266848

Matrix: Soil/Solid (dry weight)

QC for Samples:
1152120001, 1152120002, 1152120003, 1152120004, 1152120005

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	9.48J	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	87.8	60-120		%

Batch Information

Analytical Batch: XFC11859
Analytical Method: AK102
Instrument: HP 6890 Series II FID SV D R
Analyst: AYC
Analytical Date/Time: 6/2/2015 3:11:00AM

Prep Batch: XXX33149
Prep Method: SW3550C
Prep Date/Time: 5/27/2015 9:08:59PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1152120 [XXX33149]
Blank Spike Lab ID: 1266849
Date Analyzed: 06/02/2015 03:21

Spike Duplicate ID: LCSD for HBN 1152120 [XXX33149]
Spike Duplicate Lab ID: 1266850
Matrix: Soil/Solid (dry weight)

QC for Samples: 1152120001, 1152120002, 1152120003, 1152120004, 1152120005

Results by **AK102**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	167	169	102	167	152	91	(75-125)	10.60	(< 20)
Surrogates									
5a Androstane (surr)	3.33	92	92	3.33	83.4	83	(60-120)	9.70	

Batch Information

Analytical Batch: **XFC11859**
Analytical Method: **AK102**
Instrument: **HP 6890 Series II FID SV D R**
Analyst: **AYC**

Prep Batch: **XXX33149**
Prep Method: **SW3550C**
Prep Date/Time: **05/27/2015 21:08**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN-OF-CUSTODY RECORD

Laboratory SGS
Attn: Teri

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

2043 Westport Center Drive
St. Louis, MO 63146-3564
(314) 699-9660

2705 Saint Andrews Loop, Suite A
Pasco, WA 99301-3378
(509) 946-6309

2355 Hill Road
Fairbanks, AK 99709
(907) 479-0600

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

3990 Collins Way, Suite 100
Lake Oswego, OR 97035
(503) 223-6147

1321 Bannock Street, Suite 200
Denver, CO 80204
(303) 825-3800

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

1152120

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	DRO AK 102						Total of Cc	Remarks/Matrix
17732-551	(1) A	1200	5/14/15		x	x						1	Soil
~~554~~		~~1205~~			x	x						1	DPM
5514	(2) A	1210			x	x						1	
5517	(3) A	1215			x	x						1	
5518	(4) A	1220			x	x						1	
5528	(5) A	1225			x	x						1	

Project Information		Sample Receipt	
Project Number: 17732-001		Total Number of Containers	
Project Name: Kobuk		COC Seals/Intact? Y/N/NA	
Contact: JCT & DPM		Received Good Cond./Cold	4.0°C
Ongoing Project? Yes ☒ No ☐		Delivery Method:	#03
Sampler: Jake Tracy		(attach shipping bill, if any)	

Instructions
Requested Turnaround Time: Standard
Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 1030 p	Signature: Time: 1000	Signature: Time:
Printed Name: Jake Tracy Date: 5/14/15	Printed Name: Erika Knight Date: 5/15/15	Printed Name: Date:
Company: SQW	Company: S+W	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time: 5/15/15	Signature: Time:	Signature: Time: 1000
Printed Name: Erika Knight Date: 910 am	Printed Name: Date:	Printed Name: W Wall Date: 5/15/15
Company: S+W	Company:	Company: SGS

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

F-19-91/UR

No. 30532

1152120

SAMPLE RECEIPT FORM

Review Criteria:	Yes	N/A	No	Comments/Action Taken:
Were **custody seals** intact? Note # & location, if applicable. COC accompanied samples?	☐ ☑	☑ ☐	☐ ☐	***Exemption permitted if sampler hand carries/delivers.***
Temperature blank compliant* (i.e., 0-6°C after CF)? *If >6 °C, were samples collected <8 hours ago?* *If <0 °C, were all sample containers ice free?* Cooler ID: [1] _____ @ 4.0 _____ w/ Therm.ID: D3 _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ If samples are received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "**COOLER TEMP**" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled."	☑ ☐ ☐	☐ ☑ ☑	☐ ☐ ☐	***Exemption permitted if chilled & collected <8 hrs ago.*** ***Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.***
Delivery method (specify all that apply): ☑Client (hand carried) ☐USPS ☐Lynden ☐AK Air ☐Alert Courier ☐UPS ☐FedEx ☐RAVN ☐C&D Delivery ☐Carlile ☐Pen Air ☐Warp Speed ☐Other: _____ → *For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?*		☑	☐	

	Yes	N/A	No	
Were samples received within hold time? Do samples **match COC*** (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?	☑ ☑ ☑	☐ ☐ ☐	☐ ☐ ☐	***Note: Refer to form F-083 "Sample Guide" for hold times.*** ***Note: If times differ <1hr, record details and login per COC.***
Were samples in **good condition** (no leaks/cracks/breakage)? Packing material used (specify all that apply): ☑Bubble Wrap ☐Separate plastic bags ☐Vermiculite ☐Other:	☑	☐	☐	
Were **proper containers** (type/mass/volume/preservative*) used? Were **Trip Blanks** (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials **free of headspace** (i.e., bubbles ≤6 mm)? Were all soil VOAs **field extracted** with MeOH+BFB?	☑ ☐ ☐ ☐	☐ ☑ ☑ ☑	☐ ☐ ☐ ☐	☐ ***Exemption permitted for metals (e.g., 200.8/6020A).***
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was **pH verified and compliant**? If pH was adjusted, were bottles flagged (i.e., stickers)?	☐ ☐	☑ ☑	☐ ☐	
For **special handling** (e.g., "MI" soils, foreign soils, lab filter for dissolved…, lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)?	☐	☑	☐	
For **RUSH/SHORT Hold Time**, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	☐	☑	☐	
For **SITE-SPECIFIC QC, e.g. BMS/BMSD/BDUP**, were containers / paperwork flagged accordingly?	☐	☑	☐	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	☐	☑	☐	SRF Completed by: NEG PM notified:
Was **PEER REVIEW** of ***sample numbering/labeling completed?***	☐	☑	☐	Peer Reviewed by:

Additional notes (if applicable):

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

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1152120001-A	No Preservative Required	OK			
1152120002-A	No Preservative Required	OK			
1152120003-A	No Preservative Required	OK			
1152120004-A	No Preservative Required	OK			
1152120005-A	No Preservative Required	OK			

Container Condition Glossary

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

OK - The container was received at an acceptable pH for the analysis requested.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
BU - The container was received with headspace greater than 6mm.

LABORATORY DATA REVIEW CHECKLIST

Completed by: Trevor Crosby
Title: Environmental Scientist
Date: June 5, 2012

CS Report Name: Re: Stockpile Sampling and Management, Kobuk Abandoned Tank Farm, Kobuk, Alaska
ADEC Hazard ID 4615

Laboratory Report Date: June 10, 2015

Consultant Firm: Shannon & Wilson, Inc.

Laboratory Name: SGS North America Inc.
Laboratory Report Number: 1152120

ADEC File Number: 480.57.001
ADEC RecKey Number: *NA*
(**NOTE**: ***NA*** = not applicable; Text in *italics* added by Shannon & Wilson, Inc.)

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses? **Yes / No / NA** (please explain)
Comments:

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

2. Chain of Custody (COC)

a. COC information completed, signed, and dated (including released/received by)?
Yes / No / NA (please explain)
Comments**:**

b. Correct analyses requested? **Yes / No / NA** (please explain)
Comments**:**

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
Yes / No / NA (please explain)
Comments: *The temperature blank was 4.0° C.*

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)? **Yes / No / NA** (please explain)
Comments: *Methanol preserved samples were not submitted under this scope of work.*

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)? **Yes / No / NA** (please explain)
Comments: *The laboratory noted that the samples were in good condition.*

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

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

4. Case Narrative

a. Present and understandable? **Yes / No / NA** (please explain)
Comments:

b. Discrepancies, errors or QC failures identified by the lab? **Yes / No / NA** (please explain)
Comments:

c. Were corrective actions documented? **Yes / No / NA** (please explain)
Comments: *Corrective actions were not performed.*

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

5. Sample Results

a. Correct analyses performed/reported as requested on COC? **Yes / No / NA** (please explain)
Comments:

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

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

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

Comments:

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

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis, and 20 samples?
Yes / No / NA (please explain)
Comments:

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

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

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

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

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

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

ii. Metals/Inorganics - One LCS and one sample duplicate reported per matrix, analysis and 20 samples? **Yes / No / NA** (please explain)
Comments:

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

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

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

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

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

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses, field, QC and laboratory samples? **Yes / No / NA** (please explain)
Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages) **Yes / No / NA** (please explain)
Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined? **Yes / No / NA** (please explain)
Comments:

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

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

i. One trip blank reported per matrix, analysis and cooler? (If not, enter explanation below.) **Yes / No / NA** (please explain)
Comments: *Volatile samples were not submitted under this scope of work.*

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? **(**If not, a comment stating why must be entered below.) **Yes / No / NA** (please explain)
Comments: *Volatile samples were not submitted under this scope of work.*

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

Comments:

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

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

e. Field Duplicate

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

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

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

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

f. Decontamination or Equipment Blank (if not applicable)
Yes / No / NA (please explain)
Comments: *An equipment blank was not included as part of this project.*

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

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

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

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

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

ATTACHMENT 4

IMPORTANT INFORMATION ABOUT YOUR

GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 32-1-17732-001

Date: June 2015
To: Alaska Department of Environmental Conservation
Re: 555 Cordova Street, Anchorage, Alaska 99501

Important Information About Your Geotechnical/Environmental Report

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

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

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

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

SUBSURFACE CONDITIONS CAN CHANGE.

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

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

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

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

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

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

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

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

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

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

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

READ RESPONSIBILITY CLAUSES CLOSELY.

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

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