



November 25, 2019

Grand Mesa Operating Company  
1700 North Waterfront Parkway  
Building 600  
Wichita, Kansas 67206

Attention: Ms. Phyllis Brewer

**Subject:** Grand Canyon #1-31 Drill Site (COGCC Location ID: 463808)  
Reserve Pit Sampling  
Lincoln County, Colorado  
Project Number 190216

Dear Ms. Phyllis Brewer,

As requested, A. G. Wassenaar, Inc. (AGW) collected background soil and mud samples from one unlined reserve pit at the Grand Canyon #1-31 drill site in Lincoln County, Colorado operated by Grand Mesa Operating Company (Grand Mesa). This letter summarizes the project activities and analytical results.

## **BACKGROUND**

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The subject site is located in a rural grazing area in the northeast ¼ of the northeast ¼ of Section 31, Township 7 South, Range 54 West. It is approximately 0.15 mile southwest of the intersection of Lincoln County Road 3S and Lincoln County Road 32. Based on U.S. Geological Survey (USGS) Topographic Map data, the ground surface in the vicinity of the site generally slopes toward the north-northwest. Figure 1 in Attachment A illustrates the site location and topography.

In 2019, one unlined reserve pit and one lined water pit were constructed on the western portion of the site to facilitate drilling of the Grand Canyon #1-31 well. To help restore the site after drilling and to comply with Colorado Oil and Gas Conservation Commission (COGCC) pit closure requirements, AGW was tasked with collecting dried mud samples from the base of the unlined reserve pit. Three discrete dried mud samples were collected from the base of the pit on September 26, 2019. The dried mud samples were analyzed for total petroleum hydrocarbons (TPH); benzene, toluene, ethylbenzene, and xylenes (BTEX); sodium adsorption ratio (SAR); specific conductance (EC); arsenic; and pH. In accordance with COGCC rules, the TPH values were derived by adding the concentrations of gasoline range organics (GRO) and diesel range organics (DRO). The lined pit was used exclusively for clean water, so soil beneath the liner was not sampled. AGW also collected background soil samples from the area surrounding the well pad, on September 26, 2019.

## BACKGROUND SOIL SAMPLING METHODS

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On September 26, 2019, an AGW geologist visited the site to collect background soil samples for baseline characteristics. At that time, construction had been completed and the oil/gas well had been drilled, and plugged and abandoned. The land surrounding the site consisted of grassland used for livestock grazing.

To evaluate the background soil conditions, AGW collected one composite sample from three discrete and random locations. The discrete samples were collected adjacent to the constructed well site location. To collect the samples, AGW utilized a clean stainless-steel trowel. Prior to use, the trowel was cleaned in a solution of Alconox® detergent and municipal water followed by a municipal water rinse. To control potential cross contamination, the AGW geologist also wore new nitrile gloves for this sampling event. Each sample was collected from a depth ranging from 1 to 4 inches below ground surface (bgs).

Each discrete sample was immediately transferred into one Ziploc bag and sufficiently combined to create one representative composite sample. The final composited sample was transferred to clean, laboratory-supplied glass jars, labeled, and placed into a cooler with ice (a preservative) for laboratory submittal. During this project, AGW followed chain-of-custody procedures in general accordance with EPA guidelines. AGW delivered the samples to Origins Laboratory, Inc. (Origins) in Denver, Colorado for testing.

## BACKGROUND ANALYTICAL RESULTS

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Origins analyzed the composite soil sample for arsenic by EPA Method 6010C, EC by EPA Method Modified 9050A, pH by EPA Method 9045D, and SAR by EPA Method 20B. The arsenic, EC, pH, and SAR results are included below in Table 1. The laboratory report is included in Attachment B.

**Table 1:**  
**Background Soil Analytical Results**  
**Grand Canyon #1-31 Drill Site**  
**September 26, 2019**

<b>Sample Number</b>	<b>Arsenic (mg/kg)<sup>1</sup></b>	<b>Specific Conductance (mmhos/cm)<sup>2</sup></b>	<b>pH</b>	<b>Sodium Adsorption Ratio</b>
0216-BG	<b>3.77</b>	0.0480	7.68	1.49
<b>COGCC Standard<sup>3</sup></b>	0.39*	< 4	6 - 9	< 12

**Legend:**

1: mg/kg - milligrams per kilogram (parts per million)

2: mmhos/cm - millimhos per centimeter

3: Standards from Colorado Oil and Gas Conservation Commission Table 910-1, effective January 30, 2015

\*: Naturally occurring elevated levels of arsenic are common in Colorado

Values in **bold** exceed their respective regulatory standard

## RESERVE PIT SAMPLING METHODS

After drilling was completed and the mud at the base of the pit was sufficiently dry, an AGW geologist visited the site on September 26, 2019 to collect samples from the base of the unlined reserve pit. The unlined pit depth was approximately 3 to 7 feet bgs.

To evaluate the base of the pit, AGW collected three discrete mud samples. The first sample, 0216-1-P1, was collected from the northeast corner of the pit; the second sample, 0216-1-P2, was obtained from the southeast corner of the pit; and 0216-1-P3 was collected from the east center of the pit. To collect the samples, AGW transferred mud directly into laboratory-supplied glass jars. The AGW geologist wore new nitrile gloves at each sample location. Each sample was collected from a depth of approximately zero to six inches beneath the base of the pit.

Each sample was immediately transferred into three laboratory-supplied glass jars, labeled, and placed into a cooler with ice (a preservative) for laboratory submittal. During this project, AGW followed chain-of-custody procedures in general accordance with EPA guidelines. The samples were delivered to Origins in Denver, Colorado for testing.

## ANALYTICAL RESULTS

Origins analyzed each pit sample for DRO by EPA Method 8015C, BTEX and GRO by EPA Method 8260C, and arsenic, EC, pH, and SAR by EPA Methods listed above for the background soil sample. In accordance with COGCC requirements as published in Table 910-1 of their Rules, each set of DRO and GRO values were added together to obtain the TPH concentration for comparison to the COGCC TPH standard. The DRO, GRO, TPH, BTEX, EC, pH, and SAR results are included below in Table 2. The results are also illustrated on Figure 2 in Attachment A. The laboratory report is included in Attachment B.

**Table 2:  
Pit Sampling Results  
Grand Canyon #1-31 Drill Site  
September 26, 2019**

Analyte	Sample Number				COGCC Standard <sup>1</sup>
	0216-BG	0216-1-P1	0216-1-P2	0216-1-P3	
DRO (mg/kg) <sup>2</sup>	NA <sup>3</sup>	ND <sup>4</sup>	ND	ND	500
GRO (mg/kg)	NA	ND	ND	ND	500
TPH <sup>5</sup> (mg/kg)	NA	ND	ND	ND	500
Benzene (mg/kg)	NA	ND	ND	0.00200	0.17

Analyte	Sample Number				COGCC Standard <sup>1</sup>
	0216-BG	0216-1-P1	0216-1-P2	0216-1-P3	
<b>Toluene (mg/kg)</b>	NA	ND	ND	0.00328	85
<b>Ethylbenzene (mg/kg)</b>	NA	ND	ND	ND	100
<b>Total Xylene (mg/kg)</b>	NA	ND	ND	ND	175
<b>Arsenic (mg/kg)</b>	<b>3.77</b>	<b>5.39</b>	<b>3.80</b>	<b>5.00</b>	0.39 <sup>6</sup>
<b>Specific Conductance (mmhos/cm)<sup>7</sup></b>	0.0480	2.35	1.10	1.06	< 4
<b>pH</b>	7.68	<b>9.19</b>	<b>9.27</b>	<b>9.50</b>	6 - 9
<b>Sodium Adsorption Ratio</b>	1.49	<b>118.17</b>	<b>69.94</b>	<b>56.58</b>	< 12

**Legend:**

1: Standards from Colorado Oil and Gas Conservation Commission Table 910-1, effective January 30, 2015

2: mg/kg - Milligrams per kilogram

3: NA - Not analyzed

4: ND - Not detected at or above laboratory reporting limit

5: TPH - Total petroleum hydrocarbons. Value determined by adding DRO and GRO per COGCC Table 910-1 Rules

6: Naturally occurring elevated levels of arsenic are common in Colorado

7: mmhos/cm - millimhos per centimeter

Values in **bold** exceed their respective regulatory standard

To evaluate the analytical results, AGW compared detected concentrations to the regulatory standards published in Table 910-1 of the COGCC Series 900 Rules. TPH was not detected at or above laboratory reporting limits in any of the samples. Benzene and toluene were detected at levels below the regulatory standard in 0216-1-P3. Elevated levels of SAR and pH were detected in all three pit samples. Arsenic was also detected at levels above standard in each sample. The analytical laboratory reports for the background and pit sampling are included in Attachment B.

## CONCLUSIONS AND RECOMMENDATIONS

To help evaluate the condition of drilling mud at the base of one reserve pit at the Grand Canyon #1-31 drill site, AGW visited the site on September 26, 2019 and collected one composite background soil sample and three discrete samples from the unlined pit for analytical testing. The pit was generally dry. All four samples were analyzed for arsenic, EC, pH, and SAR, and the pit sample analysis included TPH and BTEX.

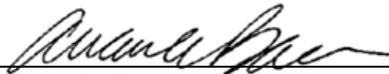
Based on the analytical results, TPH and BTEX compounds were not identified above the regulatory standard in any of the pit samples. SAR and pH levels were elevated in all three of the pit samples as compared to COGCC Table 910-1 regulatory guidelines.

Arsenic was detected at levels greater than the COGCC Table 910-1 standard in each sample; however, elevated levels of arsenic are common in Colorado, as indicated by the background sample. The CDPHE has issued a risk management guidance document for evaluating arsenic concentrations in soil, reviewed/revised July 2014, which relies on an EPA study of background levels in Colorado. The data indicate arsenic concentrations commonly range from 3 to 14 mg/kg on native grassland, rangeland, and other agricultural uses. The arsenic concentrations in the samples collected from the pit are within this range and therefore do not require further action.

Based on the depth of the pit (approximately 3 to 7 feet bgs), in which the analytical exceedances of SAR and EC occur, backfilling with native soils currently stockpiled on site shall result in this material being buried at a depth of three feet or greater, therefore ensuring adequate vegetation regrowth. Following pit burial, site reclamation activities can subsequently take place in order to return the site back to the surface owner.

Thank you for the opportunity to assist you with this project. If you have any questions or require further information, please call us at (303) 759-8373.

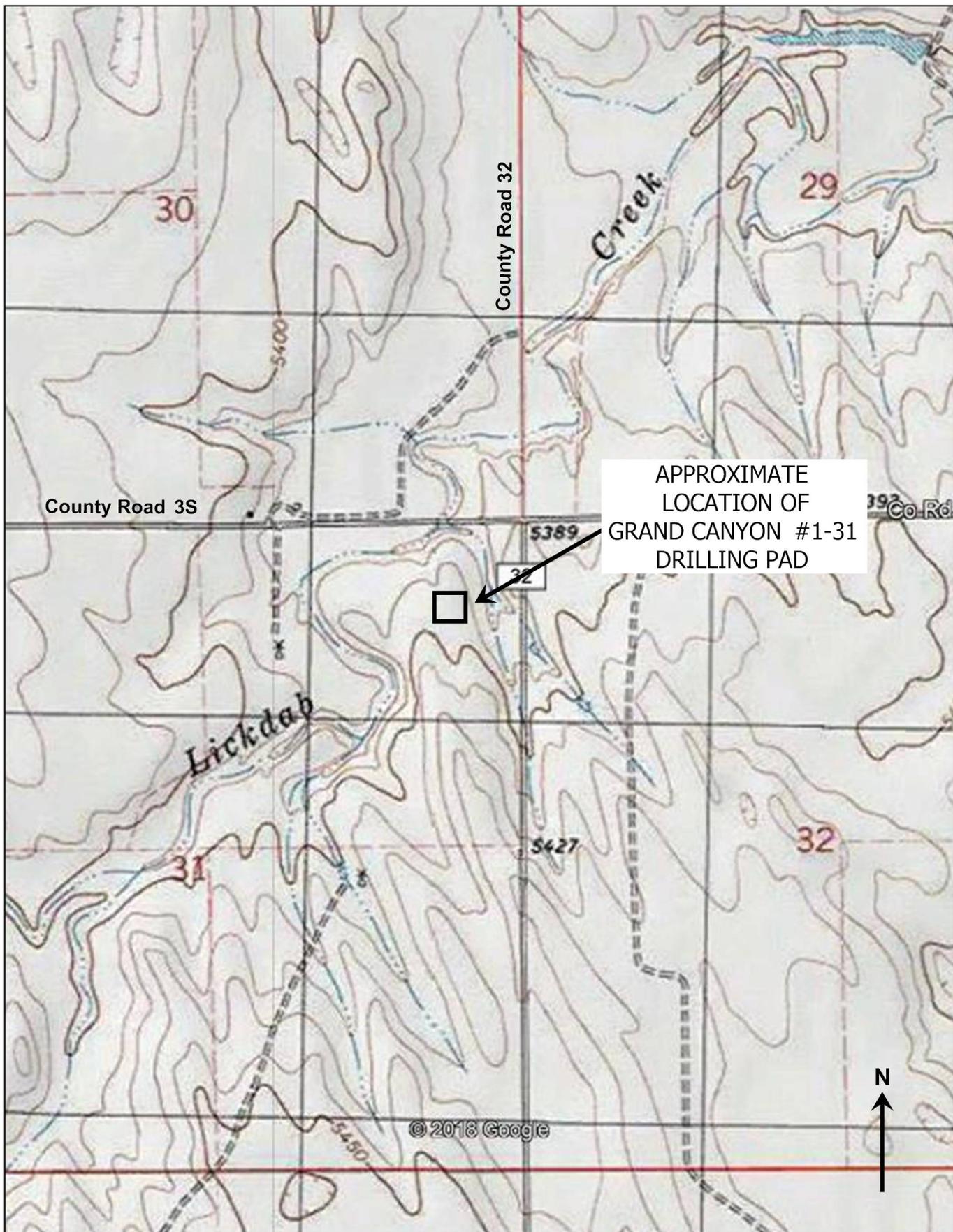
Sincerely,  
A. G. WASSENAAR, INC.

  
\_\_\_\_\_  
Amanda L. Baca  
Environmental Scientist

  
\_\_\_\_\_  
Rachel A. Peterson, P.G.  
Environmental Department Manager

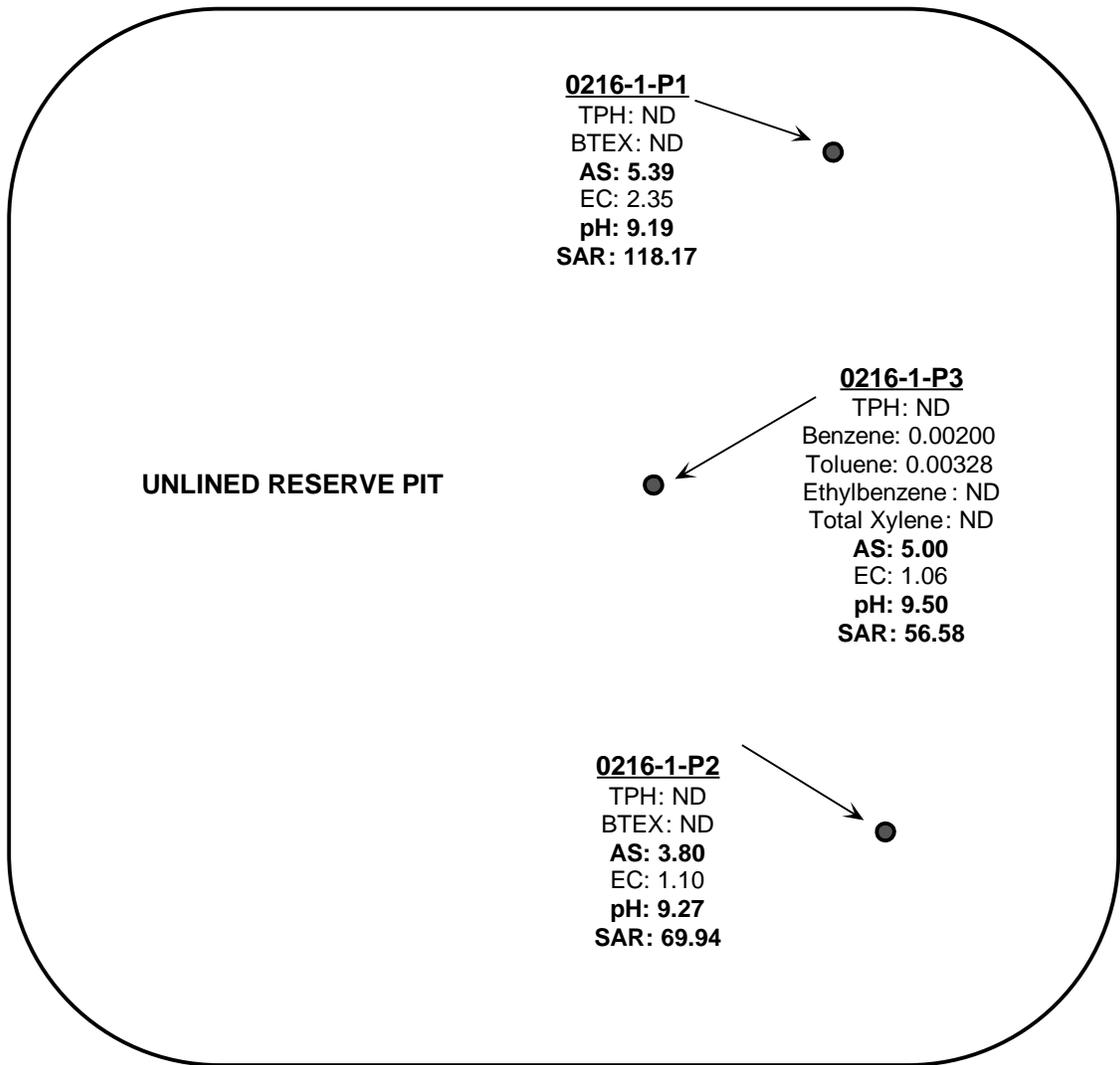
# **ATTACHMENT A**

## **FIGURES**



GRAND CANYON #1-31 WELL SITE  
LINCOLN COUNTY, COLORADO  
GRAND MESA OPERATING COMPANY

FIGURE 1  
SITE TOPOGRAPHY AND  
LOCATION  
PROJECT: 190216



UNLINED RESERVE PIT

**0216-1-P1**  
 TPH: ND  
 BTEX: ND  
**AS: 5.39**  
 EC: 2.35  
**pH: 9.19**  
 SAR: 118.17

**0216-1-P3**  
 TPH: ND  
 Benzene: 0.00200  
 Toluene: 0.00328  
 Ethylbenzene: ND  
 Total Xylene: ND  
**AS: 5.00**  
 EC: 1.06  
**pH: 9.50**  
**SAR: 56.58**

**0216-1-P2**  
 TPH: ND  
 BTEX: ND  
**AS: 3.80**  
 EC: 1.10  
**pH: 9.27**  
**SAR: 69.94**

LEGEND

- - SAMPLE LOCATION
- TPH- TOTAL PETROLEUM HYDROCARBONS
- B - BENZENE
- T - TOLUENE
- E - ETHYLBENZENE
- X - TOTAL XYLENE
- AS - ARSENIC
- EC - SPECIFIC CONDUCTIVITY
- SAR - SODIUM ADSORPTION RATIO
- ND - NOT DETECTED

NOTE: TPH, BTEX, AND ARSENIC CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg)  
 EC CONCENTRATIONS ARE IN MILLIMHOS PER CENTIMETER  
 VALUES IN BOLD ARE GREATER THAN THE RESPECTIVE COGCC TABLE 910-1 STANDARD  
 ALL LOCATIONS ARE APPROXIMATE



**AGW**

A.G. WASSENAAR, INC.

GRAND CANYON #1-31 WELL SITE  
 LINCOLN COUNTY, COLORADO  
 GRAND MESA OPERATING COMPANY

FIGURE 2  
 ANALYTICAL RESULTS  
 September 26, 2019  
 PROJECT #: 190216

**ATTACHMENT B**

**LABORATORY REPORT**

October 03, 2019

**A.G. Wassenaar**

**Amanda Baca**

**2180 South Ivanhoe Street - Suite 5**

**Denver**

**CO 80222**

**Project Name - Grand Canyon 1-31**

**Project Number - 190216**

Attached are your analytical results for Grand Canyon 1-31 received by Origins Laboratory, Inc. September 26, 2019. This project is associated with Origins project number Y909454-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.  
303.433.1322  
o-squad@oelabinc.com



A.G. Wassenaar  
2180 South Ivanhoe Street - Suite 5  
Denver CO 80222

Amanda Baca  
Project Number: 190216  
Project: Grand Canyon 1-31

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
0216-1-P1	Y909454-01	Soil	September 26, 2019 11:50	09/26/2019 15:18
0216-1-P2	Y909454-02	Soil	September 26, 2019 12:00	09/26/2019 15:18
0216-1-P3	Y909454-03	Soil	September 26, 2019 12:10	09/26/2019 15:18
0216-BG	Y909454-04	Soil	September 26, 2019 12:20	09/26/2019 15:18

Origins Laboratory, Inc.



*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

Origins Laboratory

F-012207-01-R1  
 Effective Date: 01/09/12

Sample Receipt Checklist

Origins Work Order: 1909454

Client: A.G.W

Client Project ID: Grand Canyon 1-31

Checklist Completed by: [Signature]

Shipped Via: HS  
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 9/27/15

Airbill #: N/A

Matrix(s) Received: (Check all that apply)  Soil/Solid  Water  Other: \_\_\_\_\_

Cooler Number/Temperature: 1 6.9 °C / \_\_\_\_\_ °C / \_\_\_\_\_ °C / \_\_\_\_\_ °C (Describe)

Thermometer ID: 7003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C <sup>(1)</sup> ?		<input checked="" type="checkbox"/>		<u>Same Day</u>
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? <b>If yes, contact client and note in narrative.</b>			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked <sup>(1)</sup> ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)(pH <2 for samples preserved with HNO3, HCL, H2SO4) / ( pH >10 for samples preserved with NaAsO2+NaOH, ZnAc+NaOH)			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

<sup>(1)</sup>If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager) [Signature]

Date/Time Reviewed 10/1/19

Origins Laboratory, Inc.

[Signature]

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

0216-1-P1  
 9/26/2019 11:50:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
 Y909454-01 (Soil)

**BTEX/TVPH by EPA 8260D**

Benzene	ND	0.00200	mg/kg	1	B912706	KDK	09/27/2019	09/27/2019	Ua
Toluene	ND	0.00200	"	"	"	KDK	"	"	Ua
Ethylbenzene	ND	0.00200	"	"	"	KDK	"	"	Ua
Xylenes, total	ND	0.00200	"	"	"	KDK	"	"	Ua
Gasoline Range Hydrocarbons	ND	0.200	"	"	"	KDK	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	104 %	70-130			"	"	"	"	
Surrogate: Toluene-d8	96.8 %	70-130			"	"	"	"	
Surrogate: 4-Bromofluorobenzene	102 %	70-130			"	"	"	"	

**Diesel Range Organics (DRO/TEPH) by EPA 8015D**

Diesel (C10-C28)	ND	50.0	mg/kg	1	B912707	JMS	09/27/2019	09/27/2019	Ua
Surrogate: o-Terphenyl	89.4 %	50-150			"	"	"	"	

**Metals (Saturated Paste Prep)**

Calcium	4.24		me/L	1	[none]		09/30/2019	10/02/2019	
Magnesium	2.02		"	"	"		"	"	
Sodium	209.06		"	"	"		"	"	

**pH in Soil by EPA 9045D**

pH	9.19		pH Units	1	B912702	OLAB	09/27/2019	09/27/2019	
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Origins Laboratory, Inc.



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A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

0216-1-P1

9/26/2019 11:50:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
 Y909454-01 (Soil)

**SAR by 20B Saturated Paste**

SAR	118.17			1	[none]		09/30/2019	10/02/2019	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	2.35	0.00501	mmhos/cm	1	B9I2703	DJL	09/27/2019	09/27/2019	
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**Total Metals by 6010C**

Arsenic	5.39	3.77	mg/kg dry	1	1921712	TXT1	09/30/2019	10/01/2019	
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Origins Laboratory, Inc.



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A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

0216-1-P2  
 9/26/2019 12:00:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
 Y909454-02 (Soil)

**BTEX/TVPH by EPA 8260D**

Benzene	ND	0.00200	mg/kg	1	B912706	KDK	09/27/2019	09/27/2019	Ua
Toluene	ND	0.00200	"	"	"	KDK	"	"	Ua
Ethylbenzene	ND	0.00200	"	"	"	KDK	"	"	Ua
Xylenes, total	ND	0.00200	"	"	"	KDK	"	"	Ua
Gasoline Range Hydrocarbons	ND	0.200	"	"	"	KDK	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	98.7 %	70-130			"	"	"	"	
Surrogate: Toluene-d8	96.1 %	70-130			"	"	"	"	
Surrogate: 4-Bromofluorobenzene	99.6 %	70-130			"	"	"	"	

**Diesel Range Organics (DRO/TEPH) by EPA 8015D**

Diesel (C10-C28)	ND	50.0	mg/kg	1	B912707	JMS	09/27/2019	09/27/2019	Ua
Surrogate: o-Terphenyl	73.3 %	50-150			"	"	"	"	

**Metals (Saturated Paste Prep)**

Calcium	9.39		me/L	1	[none]		09/30/2019	10/02/2019	
Magnesium	3.52		"	"	"		"	"	
Sodium	177.70		"	"	"		"	"	

**pH in Soil by EPA 9045D**

pH	9.27		pH Units	1	B912702	OLAB	09/27/2019	09/27/2019	
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Origins Laboratory, Inc.



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A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

0216-1-P2

9/26/2019 12:00:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
 Y909454-02 (Soil)

**SAR by 20B Saturated Paste**

SAR	69.94			1	[none]		09/30/2019	10/02/2019	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	1.10	0.00500	mmhos/cm	1	B9I2703	DJL	09/27/2019	09/27/2019	
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**Total Metals by 6010C**

Arsenic	3.80	3.95	mg/kg dry	1	1921712	TXT1	09/30/2019	10/01/2019	J
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Origins Laboratory, Inc.



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A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

0216-1-P3  
 9/26/2019 12:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
 Y909454-03 (Soil)

**BTEX/TVPH by EPA 8260D**

Benzene	0.00200	0.00200	mg/kg	1	B912706	KDK	09/27/2019	09/27/2019	
Toluene	0.00328	0.00200	"	"	"	KDK	"	"	
Ethylbenzene	ND	0.00200	"	"	"	KDK	"	"	Ua
Xylenes, total	ND	0.00200	"	"	"	KDK	"	"	Ua
Gasoline Range Hydrocarbons	ND	0.200	"	"	"	KDK	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	100 %	70-130			"	"	"	"	
Surrogate: Toluene-d8	95.4 %	70-130			"	"	"	"	
Surrogate: 4-Bromofluorobenzene	103 %	70-130			"	"	"	"	

**Diesel Range Organics (DRO/TEPH) by EPA 8015D**

Diesel (C10-C28)	ND	50.0	mg/kg	1	B912707	JMS	09/27/2019	09/27/2019	Ua
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Surrogate: o-Terphenyl	76.8 %	50-150			"	"	"	"	
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**Metals (Saturated Paste Prep)**

Calcium	20.53		me/L	1	[none]		09/30/2019	10/02/2019	
Magnesium	5.96		"	"	"		"	"	
Sodium	205.92		"	"	"		"	"	

**pH in Soil by EPA 9045D**

pH	9.50		pH Units	1	B912702	OLAB	09/27/2019	09/27/2019	
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A.G. Wassenaar  
2180 South Ivanhoe Street - Suite 5  
Denver CO 80222

Amanda Baca  
Project Number: 190216  
Project: Grand Canyon 1-31

0216-1-P3

9/26/2019 12:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
Y909454-03 (Soil)

**SAR by 20B Saturated Paste**

SAR	56.58			1	[none]		09/30/2019	10/02/2019	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	1.06	0.00506	mmhos/cm	1	B9I2703	DJL	09/27/2019	09/27/2019	
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**Total Metals by 6010C**

Arsenic	5.00	6.21	mg/kg dry	1	1921712	TXT1	09/30/2019	10/01/2019	J
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Amanda Baca  
 Project Number: 190216  
 Project: Grand Canyon 1-31

**0216-BG**

**9/26/2019 12:20:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**AAL, Inc.**  
**Y909454-04 (Soil)**

**Metals (Saturated Paste Prep)**

Calcium	6.83		me/L	1	[none]		09/30/2019	10/02/2019	
Magnesium	2.53		"	"	"		"	"	
Sodium	3.23		"	"	"		"	"	

**pH in Soil by EPA 9045D**

pH	7.68		pH Units	1	B9I2702	OLAB	09/27/2019	09/27/2019	
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**SAR by 20B Saturated Paste**

SAR	1.49			1	[none]		09/30/2019	10/02/2019	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	0.0480	0.00500	mmhos/cm	1	B9I2703	DJL	09/27/2019	09/27/2019	
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**Total Metals by 6010C**

Arsenic	3.77	2.90	mg/kg dry	1	1921712	TXT1	09/30/2019	10/01/2019	
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Amanda Baca  
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 Project: Grand Canyon 1-31

**Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B912706 - EPA 5030 (soil)**

**Blank (B912706-BLK1)**

Prepared: 09/27/2019 Analyzed: 09/27/2019

Benzene	ND	0.00200	mg/kg							Ua
Toluene	ND	0.00200	"							Ua
Ethylbenzene	ND	0.00200	"							Ua
Xylenes, total	ND	0.00200	"							Ua
Gasoline Range Hydrocarbons	ND	0.200	"							Ua
Surrogate: 1,2-Dichloroethane-d4	0.12		"	0.125		95.4	70-130			
Surrogate: Toluene-d8	0.12		"	0.125		97.8	70-130			
Surrogate: 4-Bromofluorobenzene	0.13		"	0.125		100	70-130			

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Amanda Baca  
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 Project: Grand Canyon 1-31

**Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B9I2706 - EPA 5030 (soil)**

**LCS (B9I2706-BS1)**

Prepared: 09/27/2019 Analyzed: 09/27/2019

Benzene	0.0943	0.00200	mg/kg	0.100		94.3	70-130			
Toluene	0.0961	0.00200	"	0.100		96.1	70-130			
Ethylbenzene	0.0919	0.00200	"	0.100		91.9	70-130			
m,p-Xylene	0.194	0.00400	"	0.200		97.0	70-130			
o-Xylene	0.0955	0.00200	"	0.100		95.5	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.12		"	0.125		94.7	70-130			
Surrogate: Toluene-d8	0.13		"	0.125		100	70-130			
Surrogate: 4-Bromofluorobenzene	0.13		"	0.125		101	70-130			

Origins Laboratory, Inc.



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Amanda Baca  
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 Project: Grand Canyon 1-31

**Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B9I2706 - EPA 5030 (soil)

Matrix Spike (B9I2706-MS1)	Source: Y909462-01			Prepared: 09/27/2019 Analyzed: 09/27/2019						
Benzene	0.107	0.00200	mg/kg	0.100	ND	107	70-130			
Toluene	0.106	0.00200	"	0.100	ND	106	70-130			
Ethylbenzene	0.0961	0.00200	"	0.100	ND	96.1	70-130			
m,p-Xylene	0.200	0.00400	"	0.200	ND	99.9	70-130			
o-Xylene	0.101	0.00200	"	0.100	ND	101	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.12		"	0.125		96.0	70-130			
Surrogate: Toluene-d8	0.13		"	0.125		102	70-130			
Surrogate: 4-Bromofluorobenzene	0.12		"	0.125		95.6	70-130			

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Amanda Baca  
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 Project: Grand Canyon 1-31

**Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B9I2706 - EPA 5030 (soil)

Matrix Spike Dup (B9I2706-MSD1)	Source: Y909462-01			Prepared: 09/27/2019 Analyzed: 09/27/2019						
Benzene	0.0953	0.00200	mg/kg	0.100	ND	95.3	70-130	11.9	20	
Toluene	0.0914	0.00200	"	0.100	ND	91.4	70-130	14.4	20	
Ethylbenzene	0.0901	0.00200	"	0.100	ND	90.1	70-130	6.38	20	
m,p-Xylene	0.189	0.00400	"	0.200	ND	94.4	70-130	5.65	20	
o-Xylene	0.0928	0.00200	"	0.100	ND	92.8	70-130	8.29	20	
Surrogate: 1,2-Dichloroethane-d4	0.12		"	0.125		95.2	70-130			
Surrogate: Toluene-d8	0.12		"	0.125		95.7	70-130			
Surrogate: 4-Bromofluorobenzene	0.13		"	0.125		100	70-130			

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**Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B912707 - EPA 3580</b>										
<b>Blank (B912707-BLK1)</b>										
					Prepared: 09/27/2019 Analyzed: 09/27/2019					
Diesel (C10-C28)	ND	50.0	mg/kg							Ua
Surrogate: o-Terphenyl	46		"	50.0		92.7	50-150			

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**Extractable Petroleum Hydrocarbons by 8015D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B912707 - EPA 3580**

**LCS (B912707-BS1)**

Prepared: 09/27/2019 Analyzed: 09/27/2019

Diesel (C10-C28)	954	50.0	mg/kg	1000		95.4	70-130			
Surrogate: o-Terphenyl	50		"	50.0		100	50-150			

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Project: Grand Canyon 1-31

**Extractable Petroleum Hydrocarbons by 8015D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B912707 - EPA 3580**

<b>Matrix Spike (B912707-MS1)</b>	<b>Source: Y909462-01</b>			Prepared: 09/27/2019 Analyzed: 09/27/2019						
Diesel (C10-C28)	930	50.0	mg/kg	1000	ND	93.0	70-130			
Surrogate: <i>o</i> -Terphenyl	48		"	50.0		95.4	50-150			

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**Extractable Petroleum Hydrocarbons by 8015D - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B912707 - EPA 3580**

<b>Matrix Spike Dup (B912707-MSD1)</b>	<b>Source: Y909462-01</b>		<b>Prepared: 09/27/2019 Analyzed: 09/27/2019</b>							
Diesel (C10-C28)	933	50.0	mg/kg	1000	ND	93.3	70-130	0.349	35	
Surrogate: o-Terphenyl	49		"	50.0		98.6	50-150			

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**Total Metals by 6010C - Quality Control**  
**GEL Laboratories, LLC**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch 1921712 - SW846 3050B</b>										
<b>BLANK (1204392689-BLK)</b>					Prepared: 09/30/2019 Analyzed: 10/01/2019					
Arsenic	ND	2.86	mg/kg				-			U
<b>LCS (1204392690-BKS)</b>					Prepared: 09/30/2019 Analyzed: 10/01/2019					
Arsenic	48.6	2.86	mg/kg	47.7		102	80-120			
<b>DUP (1204392691 D)</b>					Prepared: 09/30/2019 Analyzed: 10/01/2019					
		<b>Source: 491492001</b>								
Arsenic	6.37	4.59	mg/kg dry		6.56		0-20	3.01	20	
<b>MS (1204392692 S)</b>					Prepared: 09/30/2019 Analyzed: 10/01/2019					
		<b>Source: 491492001</b>								
Arsenic	87.9	5.01	mg/kg dry	83.6	6.56	97.4	75-125			

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Amanda Baca  
Project Number: 190216  
Project: Grand Canyon 1-31

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**Notes and Definitions**

- Ua Sample is Non-Detect.
- U Result not detected above the detection limit
- J Greater than the detection limit but less than the reporting limit
- ND Analyte NOT DETECTED at or above the reporting limit
- RPD Relative Percent Difference
- All soil results are reported at a wet weight basis.

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Jen Pellegrini For Noelle Doyle Mathis, President