

May 25, 2018

Apollo Operating, LLC
1538 Wazee Street
Suite 200
Denver, Colorado 80202

Attention: Mr. Jesse White

Subject: Rodwell #14-31 Drill Site (COGCC Location ID: 442745)
Reserve Pit Sampling
Washington County, Colorado
AGW Project Number: 172478

Dear Mr. White:

As requested, A. G. Wassenaar, Inc. (AGW) collected background soil and mud samples from one unlined reserve pit at the Rodwell #14-31 drill site in Washington County, Colorado operated by Apollo Operating, LLC (Apollo). This letter summarizes the project activities and analytical results.

BACKGROUND

The subject site is located in an agricultural area in the southwest 1/4 of the southwest 1/4 of Section 31, Township 4 South, Range 51 West. It is approximately 1.13 miles northeast of the intersection of Washington County Road Gg and Washington County Road 5. Based on U.S. Geological Survey (USGS) Topographic Map data, the ground surface in the vicinity of the site slopes generally toward the southeast. Figure 1 in Attachment A illustrates the site location and topography.

In 2017, one unlined reserve pit and one lined water pit were constructed on the northern portion of the site to facilitate drilling of the Rodwell #14-31 well. On May 1, 2018, AGW collected one composite background soil sample from the area surrounding the well pad. 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. The 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.

BACKGROUND SOIL SAMPLING METHODS

On May 1, 2018, an AGW geologist visited the site to collect background soil samples for baseline characteristics. At that time, construction of the well pad had been completed and the oil/gas well was plugged and abandoned. The site location consisted of furrowed cropland and active agriculture.

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 discrete 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 discrete sample was collected from a depth ranging from eight to twelve 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. On the day of collection, AGW delivered the samples to Origins Laboratory, Inc. (Origins) in Denver, Colorado for testing.

BACKGROUND ANALYTICAL RESULTS

Origins analyzed the composite soil sample for arsenic by EPA Method 6010C, EC by EPA Method Modified 9050A, pH by EPA Method 9045D, SAR by EPA Method 20B, DRO by EPA Method 8015C, and BTEX and GRO by EPA Method 8260C. The analytical results are included below in Table 1. The laboratory report is included in Attachment B.

**Table 1: Background Soil Analytical Results
Rodwell #14-13 Drill Site
May 1, 2018**

Sample Number	Arsenic (mg/kg) ¹	Specific Conductance (mmhos/cm) ²	pH	Sodium Adsorption Ratio
2478-BG	6.16	0.0909	7.62	0.38
COGCC Standard³	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

Only detected compounds are listed

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 May 1, 2018 to collect samples from the base of the unlined reserve pit. The unlined pit measured approximately 125 feet by 125 feet with a depth of approximately four to five feet BGS.

To evaluate the base of the pit, AGW collected three discrete mud samples. The first sample, 2478-1-P1, was collected from the southeast corner of the pit; the second sample, 2478-1-P2, was obtained from near the center of the pit; and 2478-1-P3 was collected from the southwest corner of the pit.

To collect the samples, AGW transferred dried mud directly into laboratory-supplied glass jars. Prior to sampling, 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. On the day of collection, AGW delivered the samples to Origins in Denver, Colorado for testing.

ANALYTICAL RESULTS

Origins analyzed each pit sample for DRO, BTEX, GRO, arsenic, EC, pH, and SAR by the EPA Methods listed above for the background soil sample. In accordance with the 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
Rodwell #14-31 Drill Site
May 1, 2018**

Sample Number	2478-BG	2478-1-P1	2478-1-P2	2478-1-P3	COGCC Standard ¹
DRO (mg/kg) ²	ND	ND ³	ND	ND	500
GRO (mg/kg)	ND	ND	ND	ND	500
TPH ⁴ (mg/kg)	ND	ND	ND	ND	500
Benzene (mg/kg)	ND	ND	ND	ND	0.17
Toluene (mg/kg)	ND	ND	ND	ND	85
Ethylbenzene (mg/kg)	ND	ND	ND	ND	100
Total Xylene (mg/kg)	ND	ND	ND	ND	175
Arsenic (mg/kg)	6.16	ND	ND	ND	0.39 ⁵

Sample Number	2478-BG	2478-1-P1	2478-1-P2	2478-1-P3	COGCC Standard ¹
Specific Conductance (mmhos/cm) ⁶	0.0909	0.976	1.33	1.07	< 4
pH	7.62	8.77	8.87	8.39	6 - 9
Sodium Adsorption Ratio	0.38	27.61	27.28	20.17	< 12
PID Results ⁷	NA ⁸	0.0	0.0	0.0	-

Legend:

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

2: mg/kg - Milligrams per kilogram

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

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

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

6: mmhos/cm - millimhos per centimeter

7: Photoionization Detector; ionization potential of 10.6 electron volts (eV) p or less

8: NA - Not analyzed

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. Elevated levels of SAR were detected in the three discrete samples. No other analytical results were detected at concentrations that exceeded their respective Table 910-1 limits. 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 Rodwell #14-31 drill site, AGW visited the site on May 1, 2018 and collected a total of three discrete samples from the base of the pit and one composite background soil sample for analytical testing. The pit was generally dry. All four samples were analyzed for arsenic, EC, pH, SAR, TPH, and BTEX.

Based on the analytical results, no TPH or BTEX compounds were identified in any of the samples. The May 2018 analytical results indicate that SAR levels are slightly elevated as compared to COGCC Table 910-1 regulatory guidelines in the three reserve pit samples, ranging from 20.17 to 27.61.

Arsenic was detected at levels greater than the COGCC Table 910-1 standard in the background sample; however, elevated levels of arsenic are common in Colorado. 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 from surficial background soil is within this range.

Based on the project results, the minor analytical exceedances (SAR) in soils/bentonitic mud at the base of the unlined reserve pit and the depth to which burial of this material will occur, which averages

between four and five feet BGS, may enable it to be backfilled with native soils that are currently stockpiled onsite. Following approval from the COGCC, site reclamation activities can subsequently take place in order to return the site back to the surface owner for agricultural purposes.

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.

David M. Slawkowski, P.G.
Environmental Geologist

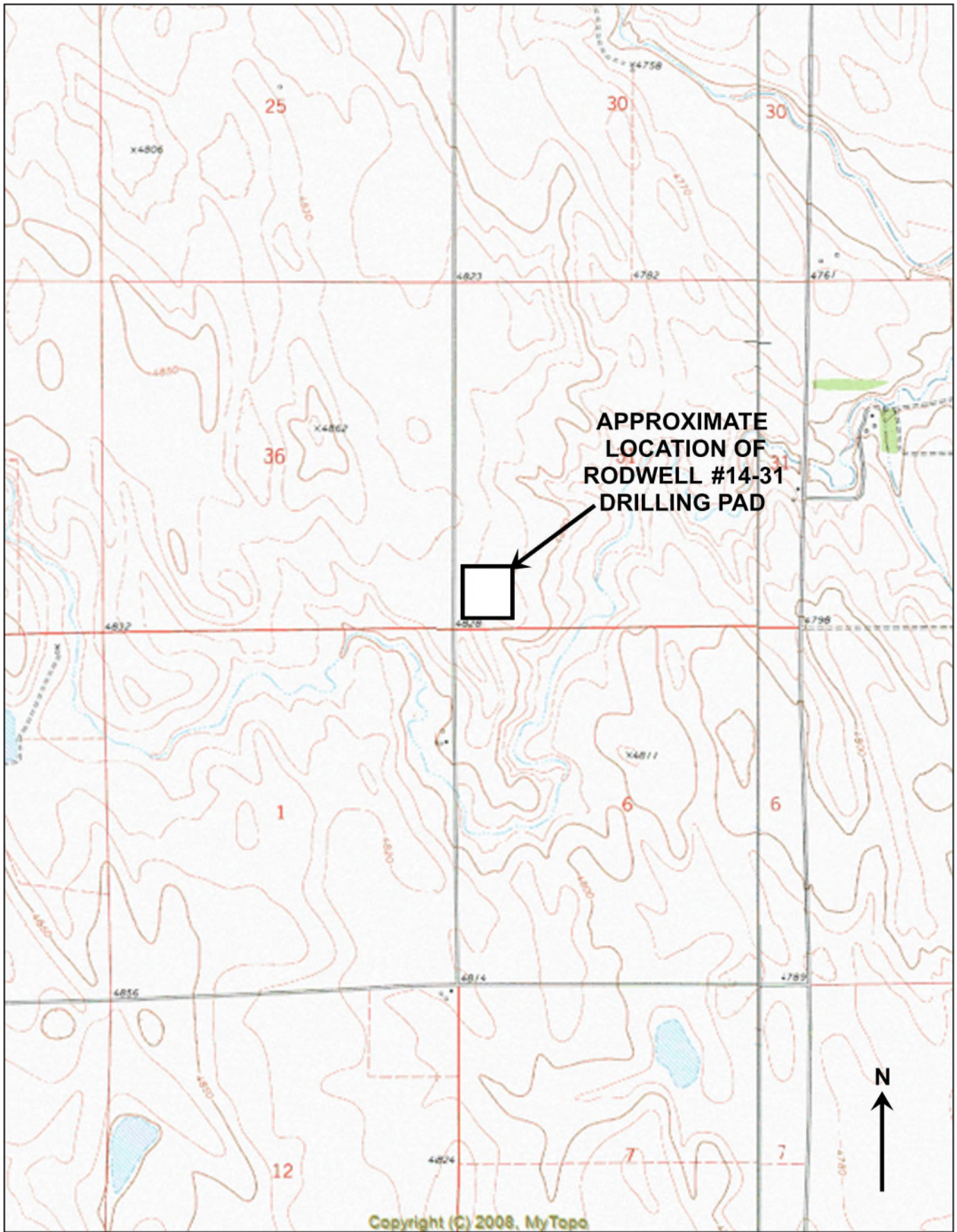
Rachel A. Peterson, P.G.
Senior Project Manager

DMS/rap

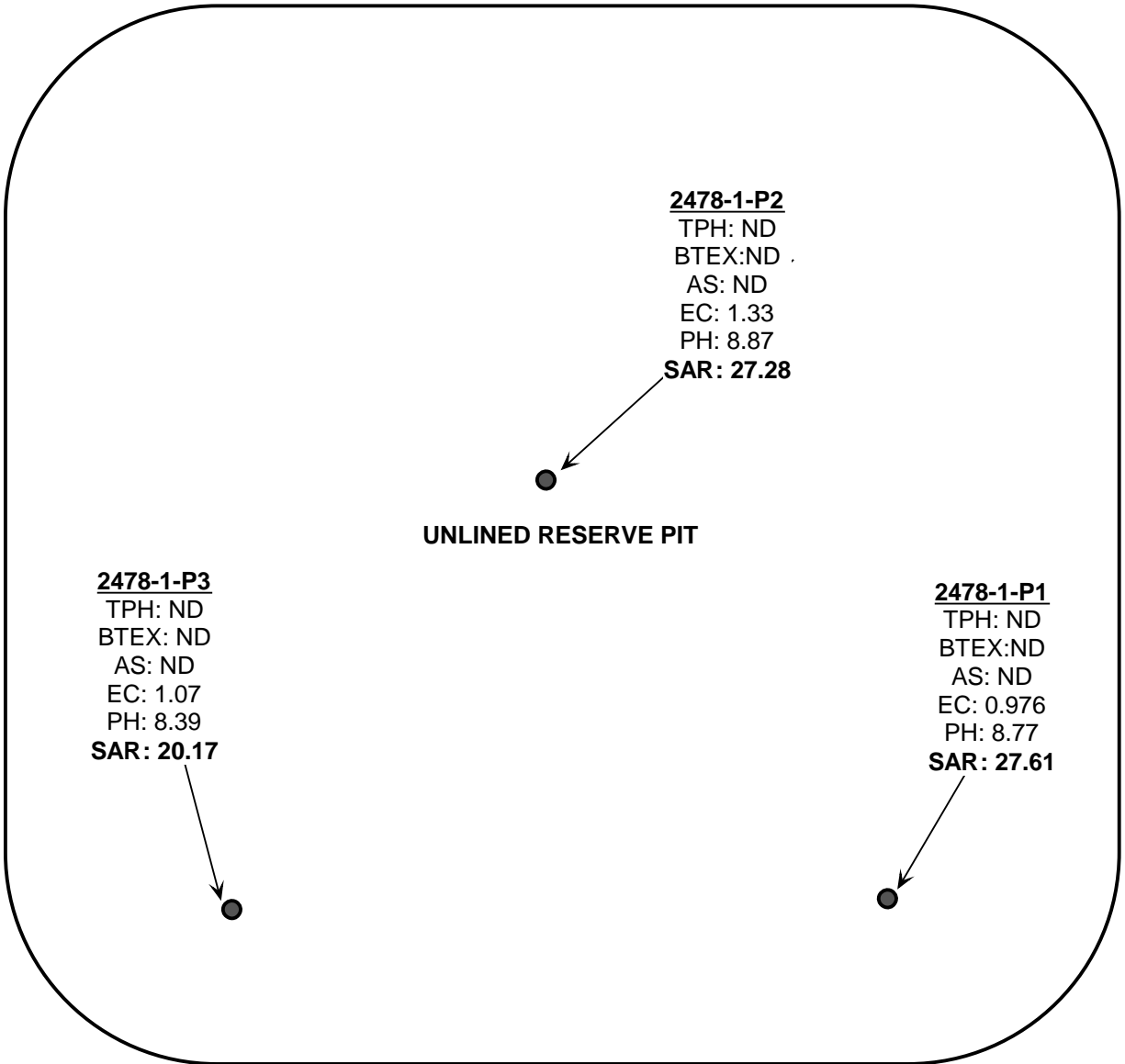
Attachments

ATTACHMENT A
FIGURES





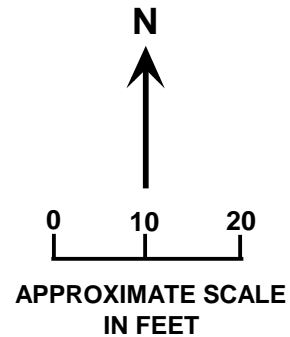
<p>A.G. WASSENAAR INC.</p> <p>GEOTECHNICAL • ENVIRONMENTAL CONSULTANTS</p>	
<p>RODWELL #14-31 WELL SITE WASHINGTON COUNTY, COLORADO APOLLO OPERATING, LLC</p>	<p>FIGURE 1 SITE TOPOGRAPHY AND LOCATION PROJECT: 172478</p>



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 (mmhos/cm)
 VALUES IN BOLD ARE GREATER THAN THE RESPECTIVE COGCC TABLE 910-1 STANDARD
 ALL LOCATIONS ARE APPROXIMATE



A.G. WASSENAAR | **INC.**

GEOTECHNICAL • ENVIRONMENTAL
CONSULTANTS

RODWELL #14-31 WELL SITE WASHINGTON COUNTY APOLLO OPERATING, LLC	FIGURE 2 ANALYTICAL RESULTS May 1, 2018 PROJECT: 172478
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ATTACHMENT B

LABORATORY REPORTS



May 10, 2018

A.G. Wassenaar

David Slawkowski

2180 South Ivanhoe Street - Suite 5

Denver

CO 80222

Project Name - Rodwell #14-31

Project Number - 172478

Attached are your analytical results for Rodwell #14-31 received by Origins Laboratory, Inc. May 01, 2018. This project is associated with Origins project number Y805023-01.

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

David Slawkawski
Project Number: 172478
Project: Rodwell #14-31

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
2478-BG	Y805023-01	Soil	May 1, 2018 14:10	05/01/2018 17:25
2478-1-P1	Y805023-02	Soil	May 1, 2018 14:31	05/01/2018 17:25
2478-1-P2	Y805023-03	Soil	May 1, 2018 14:36	05/01/2018 17:25
2478-1-P3	Y805023-04	Soil	May 1, 2018 14:46	05/01/2018 17:25

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

David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: Y805023

Client: A.G. Wassenaar
 Client Project ID: Rodwell 14-31

Checklist Completed by: SG

Shipped Via: HD
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)
 Airbill #: N/A

Date/time completed: 5/10/2018

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

Cooler Number/Temperature: 1 / 1.4 °C _____ °C _____ °C (Describe)

Thermometer ID: 1003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?	/			
Is there ice present (document if blue ice is used)	/			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		/		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		/		
Were all samples received intact ⁽¹⁾ ?	/			
Was adequate sample volume provided ⁽¹⁾ ?	/			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		/		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	/			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	/			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	/			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	/			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.		/		
Are samples preserved that require preservation and was it checked ⁽¹⁾ ? (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 HNO ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)		/		
Additional Comments (if any):				

⁽¹⁾ 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: [Signature] (Project Manager) Date/Time Reviewed: 5/13/18

Origins Laboratory, Inc.

Jefe Pellegrini

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

David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

2478-BG
5/1/2018 2:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y805023-01 (Soil)

Diesel Range Organics (DRO/TEPH) by EPA 8015C

Diesel (C10-C28)	ND	50.0	mg/kg	1	B8E0205	05/02/2018	05/02/2018	Ua
<i>Surrogate: o-Terphenyl</i>	90.7 %	59-131			"	"	"	

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8E0204	05/02/2018	05/03/2018	Ua
Benzene	ND	0.002	"	"	"	"	"	Ua
Toluene	ND	0.002	"	"	"	"	"	Ua
Ethylbenzene	ND	0.002	"	"	"	"	"	Ua
Xylenes, total	ND	0.002	"	"	"	"	"	Ua

<i>Surrogate: 1,2-Dichloroethane-d4</i>	98.9 %	70-130			"	"	"	
<i>Surrogate: Toluene-d8</i>	96.1 %	70-130			"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>	100 %	70-130			"	"	"	

Metals (Saturated Paste Prep)

Calcium	3.66		me/L	1	'[none]'	05/03/2018	05/07/2018	
Magnesium	1.28		"	"	"	"	"	
Sodium	0.59		"	"	"	"	"	

pH in Soil by EPA 9045D

pH	7.62		pH Units	1	B8E0206	05/02/2018	05/02/2018	
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Origins Laboratory, Inc.



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

David Slawkawski
Project Number: 172478
Project: Rodwell #14-31

2478-BG
5/1/2018 2:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y805023-01 (Soil)

SAR by 20B Saturated Paste

SAR	0.38			1	'[none]'	05/03/2018	05/07/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.0909		mmhos/cm	1	B8E0207	05/02/2018	05/02/2018	
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Total Metals by 6010C

Arsenic	6.16	33.5	mg/kg dry	10	1762386	05/08/2018	05/10/2018	J
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Origins Laboratory, Inc.



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

David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

2478-1-P1
 5/1/2018 2:31:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
 Y805023-02 (Soil)

Diesel Range Organics (DRO/TEPH) by EPA 8015C

Diesel (C10-C28)	ND	50.0	mg/kg	1	B8E0205	05/02/2018	05/02/2018	Ua
<i>Surrogate: o-Terphenyl</i>	112 %	59-131			"	"	"	

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8E0204	05/02/2018	05/03/2018	Ua
Benzene	ND	0.002	"	"	"	"	"	Ua
Toluene	ND	0.002	"	"	"	"	"	Ua
Ethylbenzene	ND	0.002	"	"	"	"	"	Ua
Xylenes, total	ND	0.002	"	"	"	"	"	Ua

<i>Surrogate: 1,2-Dichloroethane-d4</i>	102 %	70-130			"	"	"	
<i>Surrogate: Toluene-d8</i>	95.5 %	70-130			"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>	102 %	70-130			"	"	"	

Metals (Saturated Paste Prep)

Calcium	28.59		me/L	1	'[none]'	05/03/2018	05/07/2018	
Magnesium	4.54		"	"	"	"	"	
Sodium	112.37		"	"	"	"	"	

pH in Soil by EPA 9045D

pH	8.77		pH Units	1	B8E0206	05/02/2018	05/02/2018	
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Origins Laboratory, Inc.



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

David Slawkawski
Project Number: 172478
Project: Rodwell #14-31

2478-1-P1

5/1/2018 2:31:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y805023-02 (Soil)

SAR by 20B Saturated Paste

SAR	27.61			1	'[none]'	05/03/2018	05/07/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.976		mmhos/cm	1	B8E0207	05/02/2018	05/02/2018	
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Total Metals by 6010C

Arsenic	ND	36.3	mg/kg dry	10	1762386	05/08/2018	05/10/2018	U
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Origins Laboratory, Inc.



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

David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

2478-1-P2
 5/1/2018 2:36:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
 Y805023-03 (Soil)

Diesel Range Organics (DRO/TEPH) by EPA 8015C

Diesel (C10-C28)	ND	50.0	mg/kg	1	B8E0205	05/02/2018	05/02/2018	Ua
Surrogate: o-Terphenyl	104 %	59-131			"	"	"	

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8E0204	05/02/2018	05/03/2018	Ua
Benzene	ND	0.002	"	"	"	"	"	Ua
Toluene	ND	0.002	"	"	"	"	"	Ua
Ethylbenzene	ND	0.002	"	"	"	"	"	Ua
Xylenes, total	ND	0.002	"	"	"	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	112 %	70-130			"	"	"	
Surrogate: Toluene-d8	95.3 %	70-130			"	"	"	
Surrogate: 4-Bromofluorobenzene	103 %	70-130			"	"	"	

Metals (Saturated Paste Prep)

Calcium	25.21		me/L	1	'[none]'	05/03/2018	05/07/2018	
Magnesium	6.62		"	"	"	"	"	
Sodium	108.83		"	"	"	"	"	

pH in Soil by EPA 9045D

pH	8.87		pH Units	1	B8E0206	05/02/2018	05/02/2018	
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Origins Laboratory, Inc.



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

David Slawkawski
Project Number: 172478
Project: Rodwell #14-31

2478-1-P2

5/1/2018 2:36:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y805023-03 (Soil)

SAR by 20B Saturated Paste

SAR	27.28			1	'[none]'	05/03/2018	05/07/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	1.33		mmhos/cm	1	B8E0207	05/02/2018	05/02/2018	
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Total Metals by 6010C

Arsenic	ND	33.0	mg/kg dry	10	1762386	05/08/2018	05/10/2018	U
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Origins Laboratory, Inc.



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

David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

2478-1-P3
 5/1/2018 2:46:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
 Y805023-04 (Soil)

Diesel Range Organics (DRO/TEPH) by EPA 8015C

Diesel (C10-C28)	ND	50.0	mg/kg	1	B8E0205	05/02/2018	05/02/2018	Ua
Surrogate: <i>o</i> -Terphenyl	94.3 %	59-131			"	"	"	

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8E0204	05/02/2018	05/03/2018	Ua
Benzene	ND	0.002	"	"	"	"	"	Ua
Toluene	ND	0.002	"	"	"	"	"	Ua
Ethylbenzene	ND	0.002	"	"	"	"	"	Ua
Xylenes, total	ND	0.002	"	"	"	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	114 %	70-130			"	"	"	
Surrogate: Toluene-d8	94.5 %	70-130			"	"	"	
Surrogate: 4-Bromofluorobenzene	102 %	70-130			"	"	"	

Metals (Saturated Paste Prep)

Calcium	26.95		me/L	1	'[none]'	05/03/2018	05/07/2018	
Magnesium	5.64		"	"	"	"	"	
Sodium	81.44		"	"	"	"	"	

pH in Soil by EPA 9045D

pH	8.39		pH Units	1	B8E0206	05/02/2018	05/02/2018	
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Denver CO 80222

David Slawkawski
Project Number: 172478
Project: Rodwell #14-31

2478-1-P3

5/1/2018 2:46:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y805023-04 (Soil)

SAR by 20B Saturated Paste

SAR	20.17			1	'[none]'	05/03/2018	05/07/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	1.07		mmhos/cm	1	B8E0207	05/02/2018	05/02/2018	
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Total Metals by 6010C

Arsenic	ND	35.4	mg/kg dry	10	1762386	05/08/2018	05/10/2018	U
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David Slawkawski
 Project Number: 172478
 Project: Rodwell #14-31

Volatile Organic Compounds by GC/MS SW846 8260C - 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 B8E0204 - EPA 5030 (soil)

Blank (B8E0204-BLK1)

Prepared: 05/02/2018 Analyzed: 05/03/2018

Gasoline Range Hydrocarbons	ND	0.200	mg/kg							Ua
Benzene	ND	0.002	"							Ua
Toluene	ND	0.002	"							Ua
Ethylbenzene	ND	0.002	"							Ua
Xylenes, total	ND	0.002	"							Ua
Surrogate: 1,2-Dichloroethane-d4	57		ug/kg	62.5		90.9	70-130			
Surrogate: Toluene-d8	61		"	62.5		97.1	70-130			
Surrogate: 4-Bromofluorobenzene	58		"	62.5		92.8	70-130			

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Volatile Organic Compounds by GC/MS SW846 8260C - 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 B8E0204 - EPA 5030 (soil)

LCS (B8E0204-BS1)

Prepared: 05/02/2018 Analyzed: 05/03/2018

Benzene	0.096	0.002	mg/kg	0.100		96.5	77.1-124			
Toluene	0.093	0.002	"	0.100		92.7	74.5-128			
Ethylbenzene	0.095	0.002	"	0.100		95.0	66.4-127			
m,p-Xylene	0.176	0.004	"	0.200		88.2	76.6-124			
o-Xylene	0.095	0.002	"	0.100		94.9	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	55		ug/kg	62.5		88.5	70-130			
Surrogate: Toluene-d8	60		"	62.5		96.6	70-130			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		100	70-130			

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Volatile Organic Compounds by GC/MS SW846 8260C - 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 B8E0204 - EPA 5030 (soil)

Matrix Spike (B8E0204-MS1)	Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/03/2018						
Benzene	0.099	0.002	mg/kg	0.100	ND	98.9	71.8-126			
Toluene	0.093	0.002	"	0.100	ND	93.4	65.1-130			
Ethylbenzene	0.096	0.002	"	0.100	ND	95.6	62.2-130			
m,p-Xylene	0.178	0.004	"	0.200	ND	88.8	46.5-137			
o-Xylene	0.095	0.002	"	0.100	ND	95.3	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		92.8	70-130			
Surrogate: Toluene-d8	60		"	62.5		96.0	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

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Volatile Organic Compounds by GC/MS SW846 8260C - 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 B8E0204 - EPA 5030 (soil)

Matrix Spike Dup (B8E0204-MSD1)	Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/03/2018						
Benzene	0.095	0.002	mg/kg	0.100	ND	94.9	71.8-126	4.05	11.3	
Toluene	0.090	0.002	"	0.100	ND	90.5	65.1-130	3.13	15.4	
Ethylbenzene	0.093	0.002	"	0.100	ND	93.0	62.2-130	2.67	19.6	
m,p-Xylene	0.174	0.004	"	0.200	ND	87.1	46.5-137	1.95	19.2	
o-Xylene	0.094	0.002	"	0.100	ND	93.7	54.2-134	1.71	17.9	
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		93.0	70-130			
Surrogate: Toluene-d8	60		"	62.5		96.1	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

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Volatile Organic Compounds by GC/MS SW846 8260C - 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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Extractable Petroleum Hydrocarbons by 8015C - 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 B8E0205 - EPA 3580

Blank (B8E0205-BLK1)					Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	ND	50.0	mg/kg							Ua
Surrogate: o-Terphenyl	56		"	50.0		112	59-131			
Blank (B8E0205-BLK2)					Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	ND	50.0	mg/kg							Ua
Surrogate: o-Terphenyl	49		"	50.0		98.9	59-131			
LCS (B8E0205-BS1)					Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1210	50.0	mg/kg	1000		121	64-121			
Surrogate: o-Terphenyl	66		"	50.0		132	59-131			QM-07
LCS (B8E0205-BS2)					Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1100	50.0	mg/kg	1000		110	64-121			
Surrogate: o-Terphenyl	58		"	50.0		116	59-131			
Matrix Spike (B8E0205-MS1)		Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1030	50.0	mg/kg	1000	ND	103	53-125			
Surrogate: o-Terphenyl	57		"	50.0		114	59-131			
Matrix Spike (B8E0205-MS2)		Source: Y805023-02			Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1130	50.0	mg/kg	1000	ND	113	53-125			
Surrogate: o-Terphenyl	63		"	50.0		126	59-131			

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Extractable Petroleum Hydrocarbons by 8015C - 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 B8E0205 - EPA 3580

Matrix Spike Dup (B8E0205-MSD1)		Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1010	50.0	mg/kg	1000	ND	101	53-125	1.07	20	
Surrogate: o-Terphenyl	53		"	50.0		106	59-131			
Matrix Spike Dup (B8E0205-MSD2)		Source: Y805023-02			Prepared: 05/02/2018 Analyzed: 05/02/2018					
Diesel (C10-C28)	1120	50.0	mg/kg	1000	ND	112	53-125	0.603	20	
Surrogate: o-Terphenyl	63		"	50.0		126	59-131			

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Classical Chemistry Parameters - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8E0206 - EPA 1311										
Duplicate (B8E0206-DUP1)		Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/02/2018					
pH	7.17		pH Units		7.62			6.09	25	
Batch B8E0207 - EPA 1311										
Blank (B8E0207-BLK1)		Prepared: 05/02/2018 Analyzed: 05/02/2018								
Specific Conductance (EC)	0.00280		mmhos/cm							
Duplicate (B8E0207-DUP1)		Source: Y805023-01			Prepared: 05/02/2018 Analyzed: 05/02/2018					
Specific Conductance (EC)	0.0921		mmhos/cm		0.0909			1.31	25	

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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
Batch 1762386 - SW846 3050B										
BLANK (1204024195-BLK)					Prepared: 05/08/2018 Analyzed: 05/10/2018					
Arsenic	ND	2.86	mg/kg				-			U
LCS (1204024196-BKS)					Prepared: 05/08/2018 Analyzed: 05/10/2018					
Arsenic	43.3	2.80	mg/kg	46.6		92.8	80-120			
DUP (1204024197 D)					Source: Y805023-01 Prepared: 05/08/2018 Analyzed: 05/10/2018					
Arsenic	7.14	34.7	mg/kg dry		6.16		0-20	14.8	20	J
MS (1204024198 S)					Source: Y805023-01 Prepared: 05/08/2018 Analyzed: 05/10/2018					
Arsenic	57.9	33.3	mg/kg dry	55.5	6.16	93.3	75-125			

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Project: Rodwell #14-31

Notes and Definitions

Ua Sample is Non-Detect.

U Result not detected above the detection limit

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

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