

received 07/06/2016  
Facility 443520  
Document 2526572

May 17, 2016

Mr. Jacob Evans  
Senior Environmental Specialist  
Noble Energy, Inc.  
2115 117<sup>th</sup> Ave  
Greeley, CO 80631

**RE: Monitoring Report  
Sandau East Spreadfield COGCC #443520  
Weld County, CO**

Dear Mr. Evans:

Olsson Associates (Olsson), under the direction of Noble Energy, Inc. (Noble) conducted soil sampling on April 25, 2016 at the Sandau East Spreadfield (Site) to monitor the conditions of the soil post incorporation activities.

### **Location Description**

The Site is located in Weld County at the northeast corner of the intersection of County Road 35 and County Road 40. The legal site description is Section 25, Township 4 North, Range 66 West, 6<sup>th</sup> Principal Meridian. Cutting application began on October 8, 2015 and is permitted to continue until October 8, 2018.

### **Sampling Procedures**

On April 25, 2016, Olsson collected eight individual soil samples and one 20 point composite sample as depicted on the attached Soil Sample Location Map. The soil samples were collected using a clean hand auger and placed into laboratory prepared glassware. Equipment was cleaned with Alconox and deionized water between samples. Each sample represents surface to eight inches below ground surface (bgs). Samples were delivered by hand on the same day to Summit laboratory in Golden, Colorado following chain of custody procedures.

### **Analytical Results**

A copy of the laboratory analytical report is included as Attachment 1 and is summarized in attached Table 1. TPH (total petroleum hydrocarbons) and BTEX (benzene, toluene, ethylbenzene, and xylenes (total)) were non-detect (ND) in all soil samples. Arsenic concentrations ranged between 1.71 mg/kg for SS 3 and 7.87 mg/kg for SS 4. The average

arsenic concentration for the April 25, 2016 soil samples was 4.62 mg/kg and the median arsenic concentration was 4.45 mg/kg.

Trace amounts of Polycyclic Aromatic Hydrocarbons (PAH's) were detected in the composite sample; Benzo (b) fluoranthene 0.0113 mg/kg, Chrysene 0.0282 mg/kg, Naphthalene 0.0192 mg/kg, Phenanthrene 0.0281 mg/kg, Pyrene 0.0140 mg/kg. All other PAH's were ND.

## Summary and Conclusions

Olsson collected eight soil samples which were the submitted for laboratory analysis at Summit. With the exception of arsenic, all results were within Table 910-1 standards. Soils in Weld County are characteristically high in arsenic. In soil samples collected for baseline data in June, 2012 arsenic ranged from 1.46 mg/kg to 1.81 mg/kg with an average of 1.61 mg/kg. Arsenic in soil samples collected on April 25, 2016 ranged from 1.71 mg/kg to 7.87 mg/kg with an average of 4.62 mg/kg.

Please call me if you have any questions.

Sincerely,  
**Olsson Associates, Inc.**

Nikki Grady

Nikki Graber  
Associate Scientist

*John K.*

Paige Koutelas  
Associate Scientist

Attachments: Table 1 - Soil Analytical Results  
Attachment 1 - Summit Laboratory Analytical Reports  
Attachment 2 - Soil Sample Location Map

COGCC ID #	Spreadfield Name	Date Sampled
443520	Sandau East Spreadfield	April 25, 2016

**Laboratory Analytical Summary- Composite PAH'S**

Analysis	6/15/2012 Composite (mg/kg)	4/12/2016 Composite (mg/kg)
Acenaphthene	ND	ND
Acenaphthylene	ND	ND
Anthracene	ND	ND
Benzo (a) anthracene	ND	ND
Benzo (b) fluoranthene	ND	0.0113
Benzo (k) fluoranthene	ND	ND
Benzo (g,h,i) perylene	ND	ND
Benzo (a) pyrene	ND	ND
Chrysene	ND	0.0282
Dibenz (a,h) anthracene	ND	ND
Fluoranthene	ND	ND
Fluorene	ND	ND
Indeno (1,2,3-cd) pyrene	ND	ND
Naphthalene	ND	0.0192
Phenanthrene	ND	0.0281
Pyrene	ND	0.0140

mg/kg - Milligrams per kilogram

ND-Non Detect

PAH- Polycyclic Aromatic Hydrocarbons

COGCC ID #	Spreadfield Name	Date Sampled
443520	Sandau East Spreadfield	April 25, 2016

**Laboratory Analytical Summary- Arsenic**

Sample Number	Arsenic 6/15/2012 (mg/kg) Background	Arsenic 4/25/2016 (mg/kg)	Difference
Sandau E 1	1.72	4.47	2.8
Sandau E 2	1.49	5.94	4.5
Sandau E 3	1.46	1.71	0.3
Sandau E 4	1.50	7.87	6.4
Sandau E 5	1.73	5.02	3.3
Sandau E 6	1.61	4.42	2.8
Sandau E 7	1.54	4.38	2.8
Sandau E 8	1.81	3.13	1.3

<b>Average</b>	1.61	4.62	3.01
<b>Median</b>	1.58	4.45	2.83

<b>Minimum Concentration</b>	1.46	1.71
<b>Maximum Concentration</b>	1.81	7.87

mg/kg - Milligrams per kilogram

COGCC ID #	Spreadfield Name	Date Sampled
443520	Sandau East Spreadfield	April 25, 2016

**Laboratory Analytical Summary- Total Petroleum Hydrocarbons**

Sample Number	TPH 6/15/2012 (mg/kg) Background	TPH 4/25/2016 (mg/kg)	Difference
Sandau E 1	ND	ND	NA
Sandau E 2	ND	ND	NA
Sandau E 3	ND	ND	NA
Sandau E 4	ND	ND	NA
Sandau E 5	ND	ND	NA
Sandau E 6	ND	ND	NA
Sandau E 7	ND	ND	NA
Sandau E 8	ND	ND	NA

<b>Average</b>	NA	NA	NA
<b>Median</b>	NA	NA	NA

<b>Minimum Concentration</b>	0	0
<b>Maximum Concentration</b>	0	0

mg/kg - Milligrams per  
 TPH-Total Petroleum Hydrocarbons (GRO+DRP)  
 ND-Non detect  
 NA-Not applicable

COGCC ID #	Spreadfield Name	Date Sampled
443520	Sandau East Spreadfield	April 25, 2016

**Laboratory Analytical Summary- BTEX**

Sample Number	BTEX 6/15/2012 (ug/kg) Background		BTEX 4/25/2016 (ug/kg)		Difference
Sandau E 1	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 2	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 3	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 4	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 5	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 6	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 7	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA
Sandau E 8	Benzene	ND	Benzene	ND	NA
	Toluene	ND	Toluene	ND	NA
	Ethylbenzene	ND	Ethylbenzene	ND	NA
	Xylenes (total)	ND	Xylenes (total)	ND	NA

ug/kg- micrograms per kilogram

ND-Non Detect

COGCC ID #	Spreadfield Name	Date Sampled
443520	Sandau East Spreadfield	April 25, 2016

**Laboratory Analytical Summary- EC, SAR, pH**

Closure Sample Number	Specific Conductance (EC) (mmhos/cm)	Sodium Adsorption Ratio (SAR)	pH
Sandau E 1	0.454	0.457	8.14
Sandau E 2	0.562	0.52	8.36
Sandau E 3	0.380	0.666	8.07
Sandau E 4	1.12	2.14	8.41
Sandau E 5	0.608	1.45	8.65
Sandau E 6	0.508	0.873	8.23
Sandau E 7	0.716	1.5	8.52
Sandau E 8	0.5060	0.751	8.16

<b>Closure Average</b>	0.607	1.045	8.32
<b>Closure Median</b>	0.535	0.812	8.30

<b>Closure Minimum Concentration</b>	0.38	0.4570	8.07
<b>Closure Maximum Concentration</b>	1.12	2.14	8.65

Baseline Sample Number	Specific Conductance (EC) (mmhos/cm)	Sodium Adsorption Ratio	pH
Sandau SS01	0.452	1.08	7.1
Sandau SS02	0.359	2.39	7.2
Sandau SS03	0.422	1.66	7.4
Sandau SS04	0.450	0.950	6.5
Sandau SS05	0.359	1.42	6.8
Sandau SS06	0.458	2.33	6.7
Sandau SS07	0.233	1.65	7.0
Sandau SS08	0.169	1.47	7.2

<b>Baseline Average</b>	0.363	1.619	6.99
<b>Baseline Median</b>	0.391	1.560	7.05

<b>Baseline Minimum Concentration</b>	0.169	0.9500	6.50
<b>Baseline Maximum Concentration</b>	0.458	2.3900	7.40

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

May 02, 2016

Nikki Graber

Olsson Associates

4690 Table Mountain Drive, Suite 200

Golden, CO 80403

RE: Sandau East

Enclosed are the results of analyses for samples received by Summit Scientific on 04/25/16 15:02. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury  
President





Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Sandau E-1	1604205-01	Soil	04/25/16 12:02	04/25/16 15:02
Sandau E-2	1604205-02	Soil	04/25/16 12:08	04/25/16 15:02
Sandau E-3	1604205-03	Soil	04/25/16 12:20	04/25/16 15:02
Sandau E-4	1604205-04	Soil	04/25/16 12:30	04/25/16 15:02
Sandau E-5	1604205-05	Soil	04/25/16 12:42	04/25/16 15:02
Sandau E-6	1604205-06	Soil	04/25/16 12:52	04/25/16 15:02
Sandau E-7	1604205-07	Soil	04/25/16 13:00	04/25/16 15:02
Sandau E-8	1604205-08	Soil	04/25/16 13:13	04/25/16 15:02
Sandau E Composite	1604205-09	Soil	04/25/16 13:27	04/25/16 15:02

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

# Summit Scientific

1604205

741 Corporate Circle Suite 1 • Golden, Colorado 80401  
303-277-9310 • 303-374-5933 Fax

Page 1 of 1

Client: Olsson  
Address: 300 E 16th St  
City/State/Zip: Greeley, CO 80631  
Phone: 928-240-1043 Fax:  
Sampler Name: Nikki Graber  
Project Manager: Nikki Graber  
E-Mail: ngrab@olssonassociates.com  
Project Name: Sandau East  
Project Number:

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix				Analyze For:								Special Instructions
				HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	BTEX260b	GRO&DRO 8015M	EC USDA HB60	SAR EPA 6020	PH(paste)	ARSENIC 6020	PAH's (SIM)8270		
Sandau E-1	4/25/2016	1202	2																	
Sandau E-2	4/25/2016	1208	2																	
Sandau E-3	4/25/2016	1220	2																	
Sandau E-4	4/25/2016	1230	2																	
Sandau E-5	4/25/2016	1246	2																	
Sandau E-6	4/25/2016	1256	2																	
Sandau E-7	4/25/2016	1300	2																	
Sandau E-8	4/25/2016	1313	2																	
Sandau E Composite	4/25/2016	1323	2																	

Relinquished by:	Date/Time:	Received by:	Date/Time:	Turn Around Time (Check)	Notes:
	4/25/16 15:02		4-25-16 15:02	Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/> 24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 Hours <input type="checkbox"/>	
Relinquished by:	Date/Time:	Received by:	Date/Time:	Sample Integrity:	
	4-25-16 16:40			Temperature Upon Receipt: 133 Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	

www.s2scientific.com

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

### Sample Receipt Checklist

S2 Work Order: 1604205

Client: Olsson

Client Project ID: Sandau East

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

Airbill #: \_\_\_\_\_

Matrix (check all that apply): ☐ Air ☒ Soil/Solid ☐ Water ☐ Other: \_\_\_\_\_ (Describe)

Cooler ID					
Temp (°C)	<u>13.3</u>				

Thermometer ID: 61857165-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature just above 0°C to ≤ 6°C <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
NOTE: If samples are delivered the same day of sampling, this requirement is waived provided that there is evidence that cooling has begun.				
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present?			<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form 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 w/ date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Note the type of preservative in the Comments column – HCl, H <sub>2</sub> SO <sub>4</sub> , NaOH, etc.			<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Record the pH in Comments.			<input checked="" type="checkbox"/>	
If dissolved metals are requested, were samples field filtered?			<input checked="" type="checkbox"/>	
Additional Comments (if any):				
<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.				

Muri Premier

RA 4-25-16

K:06



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-1**  
**1604205-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/27/16	8015M	

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		102 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		117 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		101 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.3 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	4.47	0.108	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-1**  
**1604205-01 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	2490	10.0	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	173	5.00	"	"	"	"	"	"	
Sodium	87.5	5.00	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.457		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.454	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.14	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:02**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	83.4		%	"	1604272	04/26/16	04/27/16	% calculation	

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4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-2**  
**1604205-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/27/16	8015M	

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		106 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		123 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.3 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>5.94</b>	0.120	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-2**  
**1604205-02 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	3480	12.0	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	221	5.98	"	"	"	"	"	"	
Sodium	118	5.98	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.524		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.562	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.36	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	83.6		%	"	1604272	04/26/16	04/27/16	% calculation	

Summit Scientific

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-3**  
**1604205-03 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/27/16	8015M	

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		96.4 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		112 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		101 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.5 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>1.71</b>	0.0977	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-3**  
**1604205-03 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	517	11.2	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	99.2	5.59	"	"	"	"	"	"	
Sodium	63.1	5.59	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.666		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.380	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.07	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	89.5		%	"	1604272	04/26/16	04/27/16	% calculation	

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Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-4**  
**1604205-04 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/28/16	8015M	

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		103 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		115 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.6 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.6 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>7.87</b>	0.122	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-4**  
**1604205-04 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	4160	11.0	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	328	5.48	"	"	"	"	"	"	
Sodium	532	5.48	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	2.14		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	1.12	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.41	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	82.1		%	"	1604272	04/26/16	04/27/16	% calculation	

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4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-5**  
**1604205-05 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/28/16	8015M	

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		97.0 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane- <i>d</i> 4		110 %	23-173		"	"	"	"	
Surrogate: Toluene- <i>d</i> 8		99.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		91.8 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	5.02	0.122	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-5**  
**1604205-05 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	2390	10.9	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	159	5.44	"	"	"	"	"	"	
Sodium	272	5.44	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	1.45		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.608	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.65	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	82.1		%	"	1604272	04/26/16	04/27/16	% calculation	

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Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-6**  
**1604205-06 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/28/16	8015M	

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		99.5 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane- <i>d</i> 4		110 %	23-173		"	"	"	"	
Surrogate: Toluene- <i>d</i> 8		99.8 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.3 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>4.42</b>	0.118	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-6**  
**1604205-06 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1510	8.81	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	168	4.41	"	"	"	"	"	"	
Sodium	134	4.41	"	"	"	"	"	"	

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.873		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.508	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.23	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 12:52**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	85.1		%	"	1604272	04/26/16	04/27/16	% calculation	

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Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-7**  
**1604205-07 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/28/16	8015M	

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		99.5 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		119 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		100 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		93.5 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Arsenic</b>	<b>4.38</b>	0.116	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

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4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-7**  
**1604205-07 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	2120	9.75	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	235	4.87	"	"	"	"	"	"	
Sodium	273	4.87	"	"	"	"	"	"	

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	1.50		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.716	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.52	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 13:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	86.5		%	"	1604272	04/26/16	04/27/16	% calculation	

Summit Scientific

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Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Sandau E-8**  
**1604205-08 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1604273	04/26/16	04/28/16	8015M	

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		97.0 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1604274	04/26/16	04/27/16	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		113 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		102 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		92.0 %	21-167		"	"	"	"	

**Total Metals by EPA Method 6020 - Dry Weight Basis**

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic	<b>3.13</b>	0.126	mg/kg dry	1	1604283	04/27/16	04/28/16	EPA 6020A	

Summit Scientific

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4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E-8**  
**1604205-08 (Soil)**

**Summit Scientific**

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis**

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	1840	10.1	mg/kg dry	1	1604285	04/27/16	04/28/16	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	200	5.06	"	"	"	"	"	"	
Sodium	127	5.06	"	"	"	"	"	"	

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.751		units	"	1605001	05/02/16	05/02/16	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.506	0.0100	mmhos/cm	1	1604271	04/26/16	04/26/16	SM 2510B	

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.16	0.100	pH Units	"	1604270	04/26/16	04/26/16	EPA 9045	

Date Sampled: **04/25/16 13:13**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	79.3		%	"	1604272	04/26/16	04/27/16	% calculation	

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Sandau E Composite**  
**1604205-09 (Soil)**

**Summit Scientific**

**Semivolatile Organic Compounds by EPA Method 8270D SIM**

Date Sampled: 04/25/16 13:27

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Acenaphthene	ND	0.00500	mg/kg	1	1604287	04/28/16	04/29/16	EPA 8270D SIM	
Acenaphthylene	ND	0.00500	"	"	"	"	"	"	
Anthracene	ND	0.00500	"	"	"	"	"	"	
Benzo (a) anthracene	ND	0.00500	"	"	"	"	"	"	
<b>Benzo (b) fluoranthene</b>	<b>0.0113</b>	0.00500	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	0.00500	"	"	"	"	"	"	
Benzo (g,h,i) perylene	ND	0.00500	"	"	"	"	"	"	
Benzo (a) pyrene	ND	0.00500	"	"	"	"	"	"	
<b>Chrysene</b>	<b>0.0282</b>	0.00500	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	0.00500	"	"	"	"	"	"	
<b>Fluoranthene</b>	<b>0.00568</b>	0.00500	"	"	"	"	"	"	
Fluorene	ND	0.00500	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	0.00500	"	"	"	"	"	"	
<b>Naphthalene</b>	<b>0.0192</b>	0.00500	"	"	"	"	"	"	
<b>Phenanthrene</b>	<b>0.0281</b>	0.00500	"	"	"	"	"	"	
<b>Pyrene</b>	<b>0.0140</b>	0.00500	"	"	"	"	"	"	

Date Sampled: 04/25/16 13:27

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 2-Methylnaphthalene-d10		30.8 %	20-150		"	"	"	"	
Surrogate: Fluoranthene-d10		31.1 %	20-150		"	"	"	"	

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604273 - EPA 3550A**

**Blank (1604273-BLK1)**

Prepared & Analyzed: 04/26/16

C10-C28 (DRO) ND 50 mg/kg

Surrogate: o-Terphenyl 12.6 " 12.5 101 30-150

**LCS (1604273-BS1)**

Prepared: 04/26/16 Analyzed: 04/27/16

C10-C28 (DRO) 598 50 mg/kg 499 120 73-134

Surrogate: o-Terphenyl 14.3 " 12.5 114 30-150

**Matrix Spike (1604273-MS1)**

Source: 1604204-01

Prepared: 04/26/16 Analyzed: 04/27/16

C10-C28 (DRO) 521 50 mg/kg 459 37.6 105 50-148

Surrogate: o-Terphenyl 13.7 " 11.5 119 30-150

**Matrix Spike Dup (1604273-MSD1)**

Source: 1604204-01

Prepared: 04/26/16 Analyzed: 04/27/16

C10-C28 (DRO) 531 50 mg/kg 477 37.6 103 50-148 1.79 13

Surrogate: o-Terphenyl 13.6 " 12.0 114 30-150

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Project Manager: Nikki Graber

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**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
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Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604274 - EPA 5030 Soil MS**

**Blank (1604274-BLK1)**

Prepared: 04/26/16 Analyzed: 04/27/16

Benzene	ND	0.0020	mg/kg							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.0050	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
Surrogate: 1,2-Dichloroethane-d4	0.0428		"	0.0400		107	23-173			
Surrogate: Toluene-d8	0.0403		"	0.0400		101	20-170			
Surrogate: 4-Bromofluorobenzene	0.0387		"	0.0400		96.8	21-167			

**LCS (1604274-BS1)**

Prepared: 04/26/16 Analyzed: 04/27/16

Benzene	0.0882	0.0020	mg/kg	0.100		88.2	58-130			
Toluene	0.0900	0.0050	"	0.100		90.0	61-134			
Ethylbenzene	0.120	0.0050	"	0.0992		121	74-139			
m,p-Xylene	0.230	0.010	"	0.200		115	73-137			
o-Xylene	0.108	0.0050	"	0.0980		110	73-141			
Xylenes (total)	0.338	0.0050	"				30-150			
Gasoline Range Hydrocarbons	2.68	0.50	"				30-150			
Surrogate: 1,2-Dichloroethane-d4	0.0422		"	0.0400		106	23-173			
Surrogate: Toluene-d8	0.0403		"	0.0400		101	20-170			
Surrogate: 4-Bromofluorobenzene	0.0392		"	0.0400		98.1	21-167			

**Matrix Spike (1604274-MS1)**

Source: 1604204-01

Prepared: 04/26/16 Analyzed: 04/27/16

Benzene	0.0878	0.0020	mg/kg	0.0996	ND	88.2	30-131			
Toluene	0.0884	0.0050	"	0.0996	ND	88.7	30-134			
Ethylbenzene	0.121	0.0050	"	0.0988	ND	122	22-153			
m,p-Xylene	0.231	0.010	"	0.199	ND	116	10-159			
o-Xylene	0.111	0.0050	"	0.0976	ND	113	31-151			
Xylenes (total)	0.341	0.0050	"		ND		30-150			
Gasoline Range Hydrocarbons	2.75	0.50	"		ND		30-150			
Surrogate: 1,2-Dichloroethane-d4	0.0440		"	0.0398		111	23-173			
Surrogate: Toluene-d8	0.0396		"	0.0398		99.3	20-170			
Surrogate: 4-Bromofluorobenzene	0.0390		"	0.0398		98.0	21-167			

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Project Manager: Nikki Graber

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**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
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Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604274 - EPA 5030 Soil MS**

Matrix Spike Dup (1604274-MSD1)		Source: 1604204-01			Prepared: 04/26/16 Analyzed: 04/27/16					
Benzene	0.0901	0.0020	mg/kg	0.0982	ND	91.8	30-131	2.58	34	
Toluene	0.0891	0.0050	"	0.0982	ND	90.7	30-134	0.790	30	
Ethylbenzene	0.117	0.0050	"	0.0974	ND	120	22-153	3.18	24	
m,p-Xylene	0.224	0.010	"	0.196	ND	114	10-159	2.87	68	
o-Xylene	0.109	0.0050	"	0.0963	ND	113	31-151	1.49	38	
Xylenes (total)	0.333	0.0050	"		ND		30-150	2.42	20	
Gasoline Range Hydrocarbons	2.80	0.50	"		ND		30-150	1.66	20	
Surrogate: 1,2-Dichloroethane-d4	0.0457		"	0.0393		116	23-173			
Surrogate: Toluene-d8	0.0399		"	0.0393		102	20-170			
Surrogate: 4-Bromofluorobenzene	0.0378		"	0.0393		96.2	21-167			

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**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604287 - EPA 5030 Soil MS**

**Blank (1604287-BLK1)**

Prepared: 04/28/16 Analyzed: 04/29/16

Acenaphthene	ND	0.00500	mg/kg
Acenaphthylene	ND	0.00500	"
Anthracene	ND	0.00500	"
Benzo (a) anthracene	ND	0.00500	"
Benzo (b) fluoranthene	ND	0.00500	"
Benzo (k) fluoranthene	ND	0.00500	"
Benzo (g,h,i) perylene	ND	0.00500	"
Benzo (a) pyrene	ND	0.00500	"
Chrysene	ND	0.00500	"
Dibenz (a,h) anthracene	ND	0.00500	"
Fluoranthene	ND	0.00500	"
Fluorene	ND	0.00500	"
Indeno (1,2,3-cd) pyrene	ND	0.00500	"
Naphthalene	ND	0.00500	"
Phenanthrene	ND	0.00500	"
Pyrene	ND	0.00500	"

Surrogate: 2-Methylnaphthalene-d10

0.0275

"

0.0329

83.7

35-150

Surrogate: Fluoranthene-d10

0.0315

"

0.0329

95.7

35-150

**LCS (1604287-BS1)**

Prepared: 04/28/16 Analyzed: 04/29/16

Acenaphthene	0.0266	0.00500	mg/kg	0.0329	80.8	50-150
Acenaphthylene	0.0259	0.00500	"	0.0329	78.9	50-150
Anthracene	0.0304	0.00500	"	0.0329	92.3	50-150
Benzo (a) anthracene	0.0340	0.00500	"	0.0329	103	50-150
Benzo (b) fluoranthene	0.0363	0.00500	"	0.0329	110	50-150
Benzo (k) fluoranthene	0.0385	0.00500	"	0.0329	117	50-150
Benzo (g,h,i) perylene	0.0322	0.00500	"	0.0329	97.9	50-150
Benzo (a) pyrene	0.0331	0.00500	"	0.0329	101	50-150
Chrysene	0.0348	0.00500	"	0.0329	106	50-150
Dibenz (a,h) anthracene	0.0343	0.00500	"	0.0329	104	50-150
Fluoranthene	0.0312	0.00500	"	0.0329	94.8	50-150
Fluorene	0.0259	0.00500	"	0.0329	78.8	50-150
Indeno (1,2,3-cd) pyrene	0.0317	0.00500	"	0.0329	96.4	50-150
2-Methylnaphthalene	0.0248	0.00500	"	0.0329	75.5	0-200
Naphthalene	0.0215	0.00500	"	0.0329	65.4	50-150
Phenanthrene	0.0276	0.00500	"	0.0329	84.0	50-150
Pyrene	0.0320	0.00500	"	0.0329	97.2	50-150

Surrogate: 2-Methylnaphthalene-d10

0.0248

"

0.0329

75.5

35-150

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Project Number: [none]  
Project Manager: Nikki Graber

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05/02/16 08:58

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604287 - EPA 5030 Soil MS**

**LCS (1604287-BS1)**

Prepared: 04/28/16 Analyzed: 04/29/16

Surrogate: Fluoranthene-d10	0.0335		mg/kg	0.0329		102	35-150			
<b>Matrix Spike (1604287-MS1)</b>										
	<b>Source: 1604205-09</b>			Prepared: 04/28/16 Analyzed: 04/29/16						
Acenaphthene	0.0308	0.00500	mg/kg	0.0330	ND	93.3	50-150			
Acenaphthylene	0.0237	0.00500	"	0.0330	ND	71.9	50-150			
Anthracene	0.0286	0.00500	"	0.0330	ND	86.8	50-150			
Benzo (a) anthracene	0.0321	0.00500	"	0.0330	0.00367	86.1	50-150			
Benzo (b) fluoranthene	0.0428	0.00500	"	0.0330	0.0113	95.6	50-150			
Benzo (k) fluoranthene	0.0359	0.00500	"	0.0330	0.00278	100	50-150			
Benzo (g,h,i) perylene	0.0145	0.00500	"	0.0330	0.00302	34.6	50-150			QM-07
Benzo (a) pyrene	0.0267	0.00500	"	0.0330	ND	81.0	50-150			
Chrysene	0.0641	0.00500	"	0.0330	0.0282	109	50-150			
Dibenz (a,h) anthracene	0.0153	0.00500	"	0.0330	ND	46.3	50-150			QM-07
Fluoranthene	0.0306	0.00500	"	0.0330	0.00568	75.5	50-150			
Fluorene	0.0333	0.00500	"	0.0330	ND	101	50-150			
Indeno (1,2,3-cd) pyrene	0.0132	0.00500	"	0.0330	0.00174	34.6	50-150			QM-07
2-Methylnaphthalene	0.0699	0.00500	"	0.0330	0.0378	97.5	0-200			
Naphthalene	0.0462	0.00500	"	0.0330	0.0192	81.8	50-150			
Phenanthrene	0.0543	0.00500	"	0.0330	0.0281	79.4	50-150			
Pyrene	0.0450	0.00500	"	0.0330	0.0140	93.9	50-150			
Surrogate: 2-Methylnaphthalene-d10	0.00692		"	0.0330		21.0	35-150			S-03
Surrogate: Fluoranthene-d10	0.00770		"	0.0330		23.3	35-150			S-03

**Matrix Spike Dup (1604287-MSD1)**

**Source: 1604205-09**

Prepared: 04/28/16 Analyzed: 04/29/16

Acenaphthene	0.0252	0.00500	mg/kg	0.0331	ND	76.1	50-150	20.0	20	
Acenaphthylene	0.0213	0.00500	"	0.0331	ND	64.2	50-150	10.9	20	
Anthracene	0.0211	0.00500	"	0.0331	ND	63.6	50-150	30.5	20	QM-07
Benzo (a) anthracene	0.0282	0.00500	"	0.0331	0.00367	74.2	50-150	12.7	20	
Benzo (b) fluoranthene	0.0373	0.00500	"	0.0331	0.0113	78.5	50-150	13.9	20	
Benzo (k) fluoranthene	0.0321	0.00500	"	0.0331	0.00278	88.5	50-150	11.1	20	
Benzo (g,h,i) perylene	0.0118	0.00500	"	0.0331	0.00302	26.6	50-150	19.9	20	QM-07
Benzo (a) pyrene	0.0240	0.00500	"	0.0331	ND	72.5	50-150	10.7	20	
Chrysene	0.0524	0.00500	"	0.0331	0.0282	73.1	50-150	19.9	20	
Dibenz (a,h) anthracene	0.0133	0.00500	"	0.0331	ND	40.3	50-150	13.5	20	QM-07
Fluoranthene	0.0254	0.00500	"	0.0331	0.00568	59.6	50-150	18.5	20	
Fluorene	0.0269	0.00500	"	0.0331	ND	81.3	50-150	21.2	20	QM-07
Indeno (1,2,3-cd) pyrene	0.0123	0.00500	"	0.0331	0.00174	31.9	50-150	6.63	20	QM-07
2-Methylnaphthalene	0.0525	0.00500	"	0.0331	0.0378	44.4	0-200	28.6	200	

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Semivolatile Organic Compounds by EPA Method 8270D SIM - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604287 - EPA 5030 Soil MS**

Matrix Spike Dup (1604287-MSD1)	Source: 1604205-09			Prepared: 04/28/16		Analyzed: 04/29/16				
Naphthalene	0.0339	0.00500	mg/kg	0.0331	0.0192	44.2	50-150	30.9	20	QM-07
Phenanthrene	0.0406	0.00500	"	0.0331	0.0281	37.6	50-150	28.9	20	QM-07
Pyrene	0.0307	0.00500	"	0.0331	0.0140	50.6	50-150	37.6	20	QM-07
Surrogate: 2-Methylnaphthalene-d10	0.00935		"	0.0331		28.2	35-150			S-03
Surrogate: Fluoranthene-d10	0.0100		"	0.0331		30.3	35-150			S-03

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Total Metals by EPA Method 6020 - Dry Weight Basis - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604283 - EPA 3050B**

**Blank (1604283-BLK1)**

Prepared & Analyzed: 04/27/16

Arsenic 1.66 0.100 mg/kg wet

**LCS (1604283-BS1)**

Prepared & Analyzed: 04/27/16

Arsenic 43.9 0.100 mg/kg wet 40.0 110 59.7-113

**Duplicate (1604283-DUP1)**

Source: 1604204-01

Prepared & Analyzed: 04/27/16

Arsenic 5.47 0.102 mg/kg dry 5.20 5.23 20

**Matrix Spike (1604283-MS1)**

Source: 1604204-01

Prepared & Analyzed: 04/27/16

Arsenic 48.3 0.103 mg/kg dry 41.3 5.20 105 75-125

**Matrix Spike Dup (1604283-MSD1)**

Source: 1604204-01

Prepared & Analyzed: 04/27/16

Arsenic 46.5 0.102 mg/kg dry 40.8 5.20 101 75-125 3.77 25

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

**Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch 1604285 - General Preparation**

**Blank (1604285-BLK1)**

Prepared: 04/27/16 Analyzed: 04/28/16

Calcium	ND	10.0	mg/kg wet
Magnesium	ND	5.00	"
Sodium	ND	5.00	"

**LCS (1604285-BS1)**

Prepared: 04/27/16 Analyzed: 04/28/16

Calcium	530	10.0	mg/kg wet	500	106	82.9-118
Magnesium	498	5.00	"	500	99.6	77.1-123
Sodium	545	5.00	"	500	109	71-129

**Duplicate (1604285-DUP1)**

Source: 1604204-01

Prepared: 04/27/16 Analyzed: 04/28/16

Calcium	1590	11.4	mg/kg dry	1720	7.41	200
Magnesium	146	5.71	"	137	6.20	200
Sodium	95.6	5.71	"	97.2	1.66	200

**Matrix Spike (1604285-MS1)**

Source: 1604204-01

Prepared: 04/27/16 Analyzed: 04/28/16

Calcium	2180	11.4	mg/kg dry	538	1720	87.4	75-125
Magnesium	688	5.71	"	538	137	103	75-125
Sodium	668	5.71	"	538	97.2	106	75-125

**Matrix Spike Dup (1604285-MSD1)**

Source: 1604204-01

Prepared: 04/27/16 Analyzed: 04/28/16

Calcium	2170	11.4	mg/kg dry	538	1720	85.4	75-125	0.492	25
Magnesium	679	5.71	"	538	137	101	75-125	1.37	25
Sodium	730	5.71	"	538	97.2	118	75-125	8.86	25

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Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

Reported:  
05/02/16 08:58

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control  
Summit Scientific

Analyte	Reporting			Spike	Source	%REC		RPD		
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch 1604270 - General Preparation

LCS (1604270-BS1)					Prepared & Analyzed: 04/26/16						
pH	8.03	0.100	pH Units	8.00	100	95-105					
Duplicate (1604270-DUP1)					Source: 1604204-01 Prepared & Analyzed: 04/26/16						
pH	8.33	0.100	pH Units	8.37				0.479	20		

Batch 1604271 - General Preparation

Blank (1604271-BLK1)					Prepared & Analyzed: 04/26/16						
Specific Conductance (EC)	ND	0.0100	mmhos/cm								
LCS (1604271-BS1)					Prepared & Analyzed: 04/26/16						
Specific Conductance (EC)	0.500	0.0100	mmhos/cm	0.500	99.9	90-110					
Duplicate (1604271-DUP1)					Source: 1604204-01 Prepared & Analyzed: 04/26/16						
Specific Conductance (EC)	0.552	0.0100	mmhos/cm	0.453				19.6	20		

Batch 1604272 - General Preparation

Duplicate (1604272-DUP1)					Source: 1604204-01 Prepared: 04/26/16 Analyzed: 04/27/16						
% Solids	88.0		%	87.6				0.522	20		

Summit Scientific

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.



Olsson Associates  
4690 Table Mountain Drive, Suite 200  
Golden CO, 80403

Project: Sandau East  
Project Number: [none]  
Project Manager: Nikki Graber

**Reported:**  
05/02/16 08:58

### Notes and Definitions

S-03      The surrogate recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.

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

DET      Analyte DETECTED

ND      Analyte NOT DETECTED at or above the reporting limit

NR      Not Reported

dry      Sample results reported on a dry weight basis

RPD      Relative Percent Difference





F:\Projects\015-142\140-Design\GIS\15-07-01\_ENVA\_Site Map.mxd User: rdoty



IMAGE COURTESY OF ESRI

**Legend**

-  SURFACE SOIL SAMPLE
-  SPREADFIELD BOUNDARY

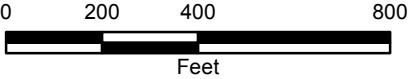


FIGURE 1  
SITE MAP  
SANDAU EAST SPREADFIELD  
WELD COUNTY, COLORADO  
  
NOBLE ENERGY, INC.

