



LEGEND

 Site Location



Figure 1
Site Location Map
June 5, 2018 LBK

**State Antelope 11-12
Water Vault Removal
Facility ID: 306266
NWNW, Sec 12, T5N, R62W, 6th PM
Weld County, Colorado**



Aerial photograph courtesy of Google Earth Pro

LEGEND

● Soil Sample



Figure 2
Soil Sample Location Map
June 5, 2018 LBK

**State Antelope 11-12
Water Vault Removal
Facility ID: 306266
NWNW, Sec 12, T5N, R62W, 6th PM
Weld County, Colorado**

TABLE 1
SOIL ANALYTICAL RESULTS
STATE ANTELOPE 11-12
WELD COUNTY, COLORADO
BONANZA CREEK ENERGY OPERATING COMPANY LLC.

Parameters		COGCC Table 910-1 Concentration Level	SS01
BTEX	Benzene	0.17	<0.002
	Toluene	85	<0.002
	Ethylbenzene	100	<0.002
	Total Xylenes	175	<0.002
TPH	DRO	--	<50
	GRO	--	<50
	Total	500	<50
Inorganics	EC (mmhos/cm)	<4	0.0482
	SAR	<12	1.11
	pH (unitless)	6 - 9	8.40

Notes:

COGCC - Colorado Oil and Gas Conservation Commission

BOLD - analytical result exceeds the COGCC Table 910-1 Concentration Level

BTEX - benzene, toluene, ethylbenzene, xylenes (total)

TPH - total petroleum hydrocarbons

DRO - diesel range organics

GRO - gasoline range organics

-- - no concentration level is available

EC - electrical conductivity

mmhos/cm - millimhos per centimeter

SAR - sodium adsorption ratio

All results are in mg/kg unless stated otherwise.

March 08, 2018

Bonanza Creek Energy, Inc.

Brian Dodek

410 17th St, Suite 1400

Denver CO 80211

Project Name - State Antelope 11-12

Project Number - [none]

Attached are your analytical results for State Antelope 11-12 received by Origins Laboratory, Inc. February 28, 2018. This project is associated with Origins project number Y803002-01.

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



Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01	Y803002-01	Soil	February 26, 2018 11:00	02/28/2018 17:05

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.

Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: Y803002

Client: Bonanza Creek Energy

Client Project ID: State Antelope 11-12

Checklist Completed by: J. Dodek

Shipped Via: HD

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 3-1-12

Airbill #: NA

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

Cooler Number/Temperature: 1 / 2.6 °C _____ / _____ °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)?}	<input checked="" type="checkbox"/>			
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 ^{(1)?}	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ^{(1)?}	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ^{(1)?}	<input checked="" type="checkbox"/>			pt
Is a chain-of-custody (COC) present and filled out completely ^{(1)?}	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ^{(1)?}	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ^{(1)?}	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ^{(1)?}	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
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)			<input checked="" type="checkbox"/>	
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 (Project Manager) J. Dodek

Date/Time Reviewed 3/15/12

Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

SS01

2/26/2018 11:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y803002-01 (Soil)

BTEX by EPA 8260C

Benzene	ND	0.002	mg/kg	1	B8C0503	03/05/2018	03/06/2018	U
Toluene	ND	0.002	"	"	"	"	"	U
Ethylbenzene	ND	0.002	"	"	"	"	"	U
Xylenes, total	ND	0.002	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	107 %	70-130			"	"	"	
Surrogate: Toluene-d8	99.0 %	70-130			"	"	"	
Surrogate: 4-Bromofluorobenzene	96.9 %	70-130			"	"	"	

GRO (TVPH)/DRO (TEPH)by EPA 8015C

Gasoline (C6-C10)	ND	50.0	mg/kg	1	B8C0504	03/05/2018	03/05/2018	U
Diesel (C10-C28)	ND	50.0	"	"	"	"	"	U

Surrogate: o-Terphenyl	80.8 %	59-131			"	"	"	
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Metals (Saturated Paste Prep)

Calcium	3.66		me/L	1	'[none]'	03/02/2018	03/05/2018	
Magnesium	1.39		"	"	"	"	"	
Sodium	1.77		"	"	"	"	"	

pH in Soil by EPA 9045D

pH	8.40		pH Units	1	B8C0505	03/05/2018	03/05/2018	
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Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

SS01

2/26/2018 11:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y803002-01 (Soil)

SAR by 20B Saturated Paste

SAR	1.11			1	'[none]'	03/02/2018	03/05/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.0842		mmhos/cm	1	B8C0506	03/05/2018	03/05/2018	
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Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0503 - EPA 5030 (soil)

Blank (B8C0503-BLK1)

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

Benzene	ND	0.002	mg/kg							U
Toluene	ND	0.002	"							U
Ethylbenzene	ND	0.002	"							U
Xylenes, total	ND	0.002	"							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	61		ug/kg	62.5		98.3	70-130			
<i>Surrogate: Toluene-d8</i>	64		"	62.5		103	70-130			
<i>Surrogate: 4-Bromofluorobenzene</i>	60		"	62.5		95.5	70-130			

Origins Laboratory, Inc.



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410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0503 - EPA 5030 (soil)

LCS (B8C0503-BS1)

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

Benzene	0.099	0.002	mg/kg	0.100		99.4	77.1-124			
Toluene	0.099	0.002	"	0.100		98.5	74.5-128			
Ethylbenzene	0.089	0.002	"	0.100		89.1	66.4-127			
m,p-Xylene	0.185	0.004	"	0.200		92.5	76.6-124			
o-Xylene	0.091	0.002	"	0.100		91.2	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	54		ug/kg	62.5		87.0	70-130			
Surrogate: Toluene-d8	63		"	62.5		102	70-130			
Surrogate: 4-Bromofluorobenzene	58		"	62.5		93.1	70-130			

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410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0503 - EPA 5030 (soil)

Matrix Spike (B8C0503-MS1)	Source: Y802358-01			Prepared: 03/05/2018 Analyzed: 03/05/2018						
Benzene	0.092	0.002	mg/kg	0.100	ND	92.1	71.8-126			
Toluene	0.089	0.002	"	0.100	0.0007	88.9	65.1-130			
Ethylbenzene	0.078	0.002	"	0.100	ND	77.9	62.2-130			
m,p-Xylene	0.159	0.004	"	0.200	ND	79.5	46.5-137			
o-Xylene	0.080	0.002	"	0.100	ND	79.9	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	63		ug/kg	62.5		101	70-130			
Surrogate: Toluene-d8	61		"	62.5		98.1	70-130			
Surrogate: 4-Bromofluorobenzene	59		"	62.5		94.2	70-130			

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410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0503 - EPA 5030 (soil)

Matrix Spike Dup (B8C0503-MSD1)	Source: Y802358-01			Prepared: 03/05/2018 Analyzed: 03/05/2018						
Benzene	0.074	0.002	mg/kg	0.100	ND	73.9	71.8-126	21.9	11.3	QR-02
Toluene	0.070	0.002	"	0.100	0.0007	70.3	65.1-130	23.4	15.4	QR-02
Ethylbenzene	0.062	0.002	"	0.100	ND	61.8	62.2-130	23.0	19.6	QM-07, QR-03
m,p-Xylene	0.123	0.004	"	0.200	ND	61.3	46.5-137	25.9	19.2	QR-02
o-Xylene	0.063	0.002	"	0.100	ND	62.7	54.2-134	24.2	17.9	QR-02
Surrogate: 1,2-Dichloroethane-d4	66		ug/kg	62.5		105	70-130			
Surrogate: Toluene-d8	61		"	62.5		98.3	70-130			
Surrogate: 4-Bromofluorobenzene	59		"	62.5		93.9	70-130			

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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0504 - EPA 3550B

Blank (B8C0504-BLK1)

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

Gasoline (C6-C10)	ND	50.0	mg/kg							U
Diesel (C10-C28)	ND	50.0	"							U
Surrogate: o-Terphenyl	47		"	50.0		94.9	59-131			

Blank (B8C0504-BLK2)

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

Gasoline (C6-C10)	ND	50.0	mg/kg							U
Diesel (C10-C28)	ND	50.0	"							U
Surrogate: o-Terphenyl	46		"	50.0		91.5	59-131			

LCS (B8C0504-BS1)

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

Gasoline (C6-C10)	891	50.0	mg/kg	1000		89.1	59-133			
Diesel (C10-C28)	1020	50.0	"	1000		102	64-121			
Surrogate: o-Terphenyl	49		"	50.0		98.0	59-131			

LCS (B8C0504-BS2)

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

Gasoline (C6-C10)	991	50.0	mg/kg	1000		99.1	59-133			
Diesel (C10-C28)	1050	50.0	"	1000		105	64-121			
Surrogate: o-Terphenyl	51		"	50.0		102	59-131			

Matrix Spike (B8C0504-MS1)

Source: Y802375-01

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

Gasoline (C6-C10)	957	50.0	mg/kg	1000	17.3	94.0	57-139			
Diesel (C10-C28)	1070	50.0	"	1000	ND	107	53-125			

Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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
Batch B8C0504 - EPA 3550B										
Matrix Spike (B8C0504-MS1)			Source: Y802375-01		Prepared: 03/05/2018 Analyzed: 03/05/2018					
Surrogate: o-Terphenyl	50		mg/kg	50.0		99.6	59-131			
Matrix Spike (B8C0504-MS2)			Source: Y802376-01		Prepared: 03/05/2018 Analyzed: 03/05/2018					
Gasoline (C6-C10)	1020	50.0	mg/kg	1000	19.3	100	57-139			
Diesel (C10-C28)	1120	50.0	"	1000	ND	112	53-125			
Surrogate: o-Terphenyl	53		"	50.0		106	59-131			
Matrix Spike Dup (B8C0504-MSD1)			Source: Y802375-01		Prepared: 03/05/2018 Analyzed: 03/05/2018					
Gasoline (C6-C10)	949	50.0	mg/kg	1000	17.3	93.1	57-139	0.928	20	
Diesel (C10-C28)	1030	50.0	"	1000	ND	103	53-125	3.05	20	
Surrogate: o-Terphenyl	49		"	50.0		98.6	59-131			
Matrix Spike Dup (B8C0504-MSD2)			Source: Y802376-01		Prepared: 03/05/2018 Analyzed: 03/05/2018					
Gasoline (C6-C10)	1010	50.0	mg/kg	1000	19.3	98.6	57-139	1.38	20	
Diesel (C10-C28)	1080	50.0	"	1000	ND	108	53-125	3.47	20	
Surrogate: o-Terphenyl	52		"	50.0		103	59-131			

Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

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 B8C0505 - NO PREP										
Duplicate (B8C0505-DUP1)		Source: Y802375-01			Prepared: 03/05/2018 Analyzed: 03/05/2018					
pH	7.82		pH Units		8.70			10.7	25	
Batch B8C0506 - NO PREP										
Blank (B8C0506-BLK1)		Prepared: 03/05/2018 Analyzed: 03/05/2018								
Specific Conductance (EC)	0.00210		mmhos/cm							
Duplicate (B8C0506-DUP1)		Source: Y802375-01			Prepared: 03/05/2018 Analyzed: 03/05/2018					
Specific Conductance (EC)	0.0794		mmhos/cm		0.0853			7.16	25	

Origins Laboratory, Inc.



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Bonanza Creek Energy, Inc.

410 17th St, Suite 1400

Denver CO 80211

Brian Dodek

Project Number: [none]

Project: State Antelope 11-12

Notes and Definitions

U Sample is Non-Detect.

QR-03 The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.

QR-02 The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data.

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

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, Inc.



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