



May 28, 2014

Mr. Jacob Evans  
Noble Energy Inc.  
1625 Broadway, Suite 2000  
Denver, CO 80202

Subject:     **Initial Groundwater Monitoring Report**  
              Betz 30-11, 30-14  
              API # 05-123-22861, Remediation #8392  
              Weld County, Colorado

Dear Mr. Evans:

Please find an enclosed copy of the above-referenced Initial Groundwater Monitoring Report for the Betz 30-11, 30-14 site in Weld County, Colorado. The enclosed report describes groundwater monitoring activities conducted in accordance with the previously submitted Form 27 (COGCC Document #2148721). Please contact me at (303) 912-2625 if you require additional information.

Tasman appreciates the opportunity to provide this service.

Sincerely,  
Tasman Geosciences, LLC

A handwritten signature in blue ink, appearing to read "Daniel Wade".

Daniel Wade P.G.  
Senior Geologist – Assessment & Remediation

Enclosure:    Initial Groundwater Monitoring Report

**BETZ 30-11, 30-14**

**INITIAL GROUNDWATER MONITORING REPORT**

May 28, 2014

PREPARED ON BEHALF OF

Noble Energy, Inc.  
1625 Broadway, Suite 2000  
Denver, CO 80202



PREPARED BY

Tasman Geosciences, LLC  
6899 Pecos Street, Unit C  
Denver, CO 80221



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## 1.0 INTRODUCTION

This Initial Groundwater Monitoring Report (Report) presents the results of groundwater field monitoring activities performed during the first quarter 2014 at the Betz 30-11, 30-14 Tank Battery (Site). Field activities were performed by Tasman Geosciences, LLC (Tasman), on behalf of Noble Energy, Inc. (Noble), pursuant to Colorado Oil and Gas Conservation Commission (COGCC) guidance.

Field activities described in this Report were conducted to evaluate groundwater flow and quality conditions across the Site. The data collected were used to develop the analytical summary tables and maps included herein.

### 1.1 Site Background

The Site is located in the NE  $\frac{1}{4}$  of the NE  $\frac{1}{4}$  of Section 30, Township 5 North, Range 67 West, approximately 2.8 miles northwest of the town of Johnstown, Colorado in Weld County (Figure 1). Groundwater monitoring activities are being performed in response to historic impacts discovered beneath the produced water vault on November 22, 2013. In response to impacts observed, production equipment at the Site was shut in and the produced water vault was removed.

A summary of significant and/or recent environmental monitoring and remediation activities is provided below:

- On November 22, 2013 excavation activities were conducted to remove soil with petroleum hydrocarbon impacts in the vicinity of the produced water vault. The final dimensions of the excavation was 11 feet (ft.) by 12 ft. by 3.5 ft. below ground surface (bgs), as described in the Site Excavation Report dated April 9, 2014 and illustrated on Figure 2. Approximately 10 cubic yards of impacted soil was transported to the Buffalo Ridge Landfill for disposal. Clean fill was then returned to the Site.
- Four confirmation soil samples were collected and submitted for laboratory analysis for benzene, toluene, ethylbenzene, and total xylenes (collectively referred to as BTEX), naphthalene, and total petroleum hydrocarbons-gasoline range organics (TPH-GRO) using United States Environmental Protection Agency (USEPA) Method 8260 and for total petroleum hydrocarbons-diesel range organics (TPH-DRO) using USEPA Method 8015. Soil sample analytical data are presented in Table 1 and illustrated in Figure 3.
- Groundwater was encountered during the excavation at a depth of approximately 3.5 ft. bgs. A laboratory sample (GW01) was collected and analyzed for BTEX using USEPA Method 8260B. The groundwater was found to have concentrations above the COGCC Table 910-1 standard for benzene and toluene.
- Two groundwater monitoring wells (MW-02 and MW-03) were installed at the Site on December 19, 2013 as shown in Figure 2. Soil samples from the well borings were collected and submitted for laboratory analysis. Soil boring laboratory analytical results are presented in Table 1 and illustrated in Figure 3.
- Two additional groundwater monitoring wells (MW-01 and MW-04) were installed at the Site on January 10, 2014.

- Groundwater elevations were measured and groundwater samples were collected from the four monitoring wells on-site on January 23, 2014. Groundwater sampling procedures and results are described in subsequent sections of this Report.

## **1.2 Site Topography, Geology, and Hydrogeology**

The Site is located approximately 4,795 feet above mean sea level (amsl), and the surface topography slopes gradually in a southerly direction. The groundwater table is encountered at approximately 3 ft. (bgs).

Site investigation activities indicate that the subsurface geology immediately beneath the ground surface is composed of poorly sorted, medium to coarse grain sand with minor gravel. The sediments are alluvial in deposition and loosely bedded.

## **2.0 GROUNDWATER MONITORING ACTIVITIES**

Initial groundwater monitoring activities were performed at the Site on January 23, 2014. The activities included measurement of groundwater levels and collection of groundwater samples from each of the four Site monitoring wells.

### **2.1 Groundwater Level Measurements**

Both general and significant observations from the groundwater gauging event are presented in the following sections.

#### *General*

Groundwater levels are measured (i.e. gauged) in order to evaluate hydraulic characteristics and to provide information regarding seasonal and annual fluctuations in groundwater elevation at the Site. During the initial groundwater monitoring event, groundwater levels were measured at the four Site monitoring wells.

Groundwater levels were measured on the north side of the well casing to the nearest 0.01-foot using an oil-water interface probe (IP). Groundwater level data were subsequently converted to elevations (feet amsl) by subtracting the measured groundwater depth-to-water (DTW) level from the well's top-of-casing (TOC) elevation survey datum.

#### *Significant Observations*

No measurable free-product (light non-aqueous phase liquid [LNAPL]) was detected in groundwater monitoring wells during the initial groundwater monitoring event.

## 2.2 Groundwater Sampling

This section summarizes the groundwater sampling activities that were performed and the protocols followed during the initial groundwater monitoring event.

### 2.2.1 Groundwater Sampling Points

On January 23, 2014, the four Site groundwater monitoring wells (MW-01, MW-02, MW-03, and MW-04) were sampled as part of the initial groundwater monitoring event. The Site monitoring locations are illustrated in Figure 2.

### 2.2.2 Groundwater Purging and Sampling Activities

This section summarizes both general and significant observations from the groundwater purging and sampling activities.

#### General

Prior to collecting groundwater samples, groundwater levels were measured at each of the Site monitoring wells, as previously described. The presence of product was also evaluated using an IP. Subsequently, a minimum of three well casing volumes of groundwater (calculated from total depth of well and groundwater level measurements) were purged from the subject well prior to collecting a groundwater sample.

Groundwater monitoring wells were sampled using individual, disposable, polyethylene bailers to limit the potential for cross-contamination between sampling points. Clean sample containers (40-milliliter [ml] volatile organic analysis [VOA] vials) supplied by the analytical laboratory were used to contain liquid for subsequent analyses.

VOA vials were overfilled and capped to reduce the potential for any headspace and to prevent the loss of volatile analytes, and then subsequently inverted and gently tapped to dislodge any air bubbles that may have formed around the cap or sides. Sample bottles were then labeled with the corresponding date, time, and well identification, and subsequently placed in an ice-filled cooler and maintained at approximately 4 degrees Celsius (°C) for transportation.

The groundwater samples were packed as designated by the analytical laboratory and transferred for analysis under chain-of-custody procedures to Summit Scientific in Golden, CO. Monitoring well groundwater samples were submitted for analysis of BTEX using USEPA Method 8260B.

#### Significant Observations

Significant observations are outlined below.

- No hydrocarbon sheen was observed in any of the four groundwater monitoring locations.
- No hydrocarbon odors were detected in purge water collected from any of the four groundwater monitoring locations.

## 3.0 GROUNDWATER MONITORING RESULTS AND EVALUATION

Groundwater monitoring results are presented in the following sections.

### 3.1 Groundwater Monitoring Results

During the initial groundwater monitoring event, groundwater elevations ranged from 4792.32 ft. amsl at MW-4 on the northern boundary of the Site to 4792.08 ft. amsl at MW-2. Groundwater elevation data are presented in Table 2 and the initial potentiometric surface map is illustrated in Figure 4. As illustrated, measured groundwater elevations from the four monitoring wells indicate a groundwater gradient to the south.

Groundwater analytical results for the initial groundwater monitoring event are summarized below, presented in Table 3 and illustrated in Figure 5. To evaluate Site conditions, groundwater analytical results are compared to the COGCC Table 910-1 standards for BTEX in groundwater. The laboratory analytical reports are provided in Attachment A.

- Benzene was not detected above the COGCC Table 910-1 standard of 5 micrograms per liter ( $\mu\text{g/L}$ ) in the 4 monitoring wells sampled.
- Toluene was not detected above the COGCC Table 910-1 standard of 560  $\mu\text{g/L}$  in any of the 4 monitoring wells sampled.
- Ethylbenzene was not detected above the COGCC Table 910-1 standard of 700  $\mu\text{g/L}$  in any of the 4 monitoring wells sampled.
- Total xylenes were not detected above the COGCC Table 910-1 standard of 1400  $\mu\text{g/L}$  in any of the 4 monitoring wells sampled.

### 3.2 Hydrocarbon Concentration Trends

#### Hydrocarbon Trends

The groundwater monitoring event conducted on January 24, 2014 represented the first such monitoring event at the Site. As such, hydrocarbon concentration trends cannot be illustrated until additional data is collected in the second quarter of 2014. Concentrations of BTEX were below laboratory reporting limits in the initial groundwater samples.

#### Hydrocarbon COC Trend Graphing

Hydrocarbon concentration trend graphs will be prepared subsequent to the second quarter 2014 groundwater monitoring event.

## **4.0 CONCLUSIONS AND RECOMMENDATIONS**

This section of the Report presents conclusions from the findings of the initial activities as well as recommendations for future activities.

### **4.1 Conclusions**

Data indicate that dissolved-phase petroleum hydrocarbon concentrations are not present above laboratory reporting limits in groundwater monitoring well locations.

### **4.2 Recommendations**

Ongoing quarterly activities, including groundwater gauging and sampling, will provide for continued monitoring of Site conditions and analysis of Site hydrocarbon concentration trends.

## **5.0 UPCOMING SITE ACTIVITIES**

Upcoming Site activities anticipated for the next quarterly monitoring period include the following items:

- Conduct the second quarter 2014 groundwater monitoring and sampling event in April 2014.

# **TABLES**

**TABLE 1 - SOIL DATA**  
**NOBLE ENERGY, INC. - BETZ 30-11, 30-14**  
**SUMMARY OF SOIL ANALYTICAL RESULTS**

Date	Soil Sample ID	Laboratory Results	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Total Xylenes mg/kg	TPH-GRO mg/kg	TPH-DRO mg/kg	Naphthalene mg/kg
		COGCC Standard	0.17	85	100	175	500	23	
11/22/13	SS01@3'	Result =	<0.0020	<0.0050	<0.0050	<0.010	<0.50	<50	<0.010
12/19/13	MW-2@1-3'	Result =	<0.0020	<0.0050	<0.0050	<0.010	<0.50	<50	<0.010
12/19/13	MW-3@1-3'	Result =	<0.0020	<0.0050	<0.0050	<0.010	<0.50	<50	<0.010
2/17/14	SS05@3'	Result =	<0.01	<0.01	<0.01	<0.01	<50	<50	<0.01
2/17/14	SS06@3'	Result =	<0.01	<0.01	<0.01	<0.01	<50	<50	<0.01
2/17/14	SS07@3'	Result =	<0.01	<0.01	<0.01	<0.01	<50	<50	<0.01

Date	Soil Sample ID	Laboratory Results	EC	pH	SAR
		COGCC Standard	4 or 2x BG.	6-9	<12
11/22/13	SS01@3'	Result =	2.63	7.81	1.91

COGCC = Colorado Oil and Gas Conservation Commission

mg/kg = Milligrams per kilogram

< = Analytical result is less than the indicated laboratory reporting limit

EC = specific conductance

BG = background

SAR = sodium adsorption ratio

Soil standards referenced from COGCC Table 910-1

Highlighted results exceed the COGCC Table 910-1 standard

**TABLE 2**  
**NOBLE ENERGY, INC. - BETZ 30-11, 30-14**  
**SUMMARY OF GROUNDWATER ELEVATION DATA**

Date	Monitoring Well ID	Surveyed Well Elevation	Total Depth	Depth to Water	Depth to Free Product	Free Product Thickness	Corrected GW Elevation
		ft	ft	ft	ft	ft	ft
1/23/14	MW-1	4797.84	7.94	5.58	NP	NP	4792.26
1/23/14	MW-2	4794.00	9.78	1.92	NP	NP	4792.08
1/23/14	MW-3	4794.24	9.54	2.12	NP	NP	4792.12
1/23/14	MW-4	4798.62	7.82	6.30	NP	NP	4792.32

ft = feet

NP = No product detected

**TABLE 3**  
**NOBLE ENERGY, INC. - BETZ 30-11, 30-14**  
**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS**

Date	Monitoring Well ID	Laboratory Results	Benzene $\mu\text{g/l}$	Toluene $\mu\text{g/l}$	Ethylbenzene $\mu\text{g/l}$	Total Xylenes $\mu\text{g/l}$
		COGCC Standard	5	560	700	1,400
11/22/13	GW01	Result =	350	590	120	840
1/23/14	MW-1	Result =	<1.0	<1.0	<1.0	<1.0
1/23/14	MW-2	Result =	<1.0	<1.0	<1.0	<1.0
1/23/14	MW-3	Result =	<1.0	<1.0	<1.0	<1.0
1/23/14	MW-4	Result =	<1.0	<1.0	<1.0	<1.0

COGCC = Colorado Oil and Gas Conservation Commission

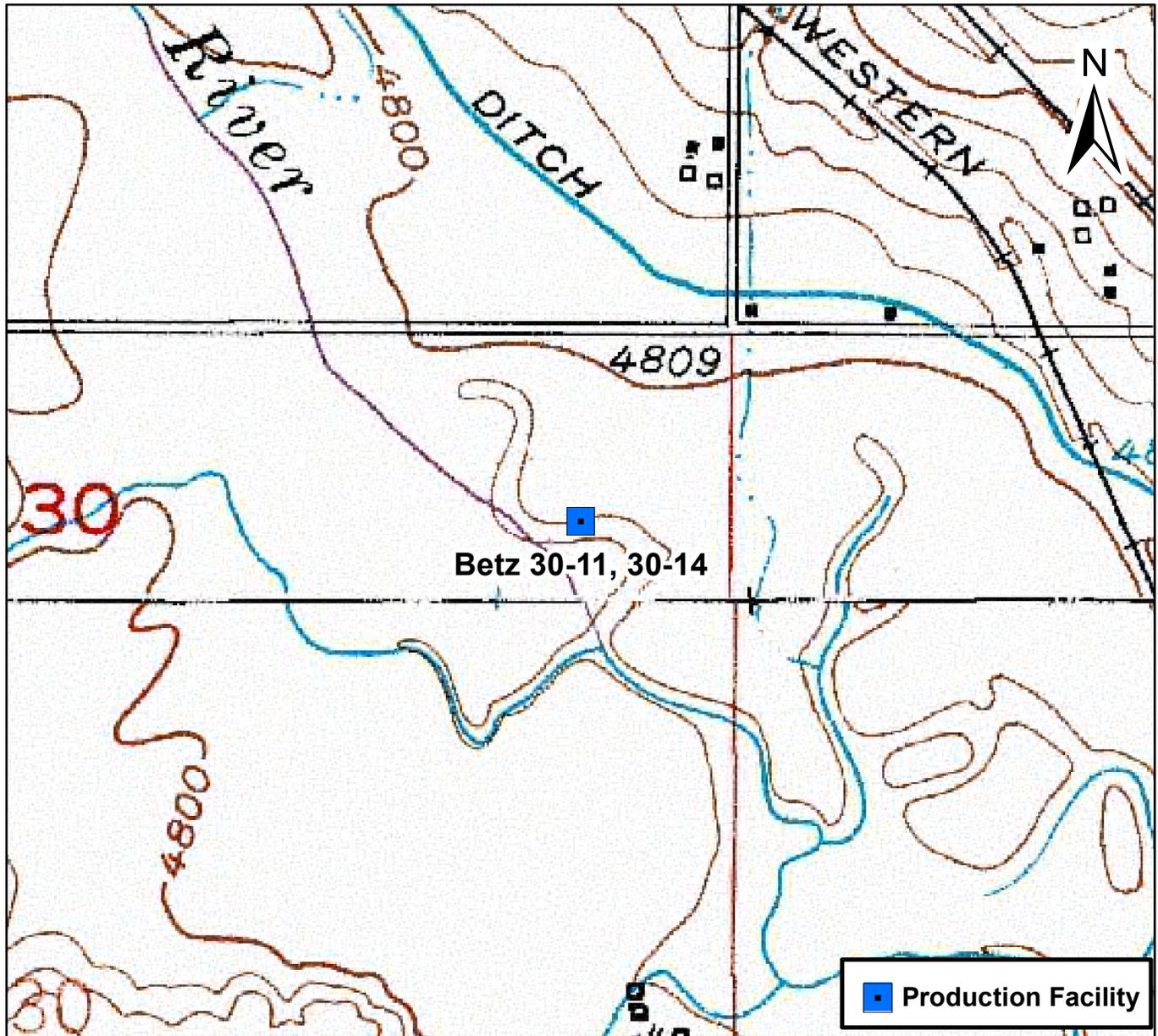
$\mu\text{g/l}$  = micrograms per liter

<= Analytical result is less than the indicated laboratory reporting limit

Groundwater standards referenced from COGCC Table 910-1

 Highlighted results exceed the COGCC Table 910-1 standard

## **FIGURES**



■ Production Facility



**Figure 1**  
 Site Location Map  
 Betz 30-11, 30-14  
 NENE S30 T5N R67W  
 Weld County, Colorado

Drawn By: DBA  
 Date: 12/16/2013





PROJECT NO:  
 DRAWN BY: ATF  
 DATE: 3/05/2014

**TASMAN** GEOSCIENCES  
 6899 Pecos St., Unit C  
 Denver, CO 80221

**Facility Diagram**  
 Noble Energy  
 Betz 30-11, 30-14  
 Weld County, CO

**LEGEND:**

-  Groundwater Monitoring Location
-  Earthen Berm
-  Excavation Extent (Surveyed Via Trimble Unit)
-  Oil Tank

  
 Scale: 1" = 53'

Site Map  
 Figure 2



PROJECT NO:  
 DRAWN BY: ATF  
 DATE: 3/05/2014


 6899 Pecos St., Unit C  
 Denver, CO 80221

**Facility Diagram**  
 Noble Energy  
 Betz 30-11, 30-14  
 Weld County, CO

**LEGEND:**

-  Excavation Soil Sample Location
-  Borehole Sample Location
-  Excavation Extent (Surveyed Via Trimble Unit)

-  Earthen Berm
-  Oil Tank

  
 Scale: 1" = 53'

Soil Analytical Sample Locations Map

Figure 3



PROJECT NO:  
 DRAWN BY: ATF  
 DATE: 3/05/2014

**TASMAN** GEOSCIENCES  
 6899 Pecos St., Unit C  
 Denver, CO 80221

**Facility Diagram**  
 Noble Energy  
 Betz 30-11, 30-14  
 Weld County, CO

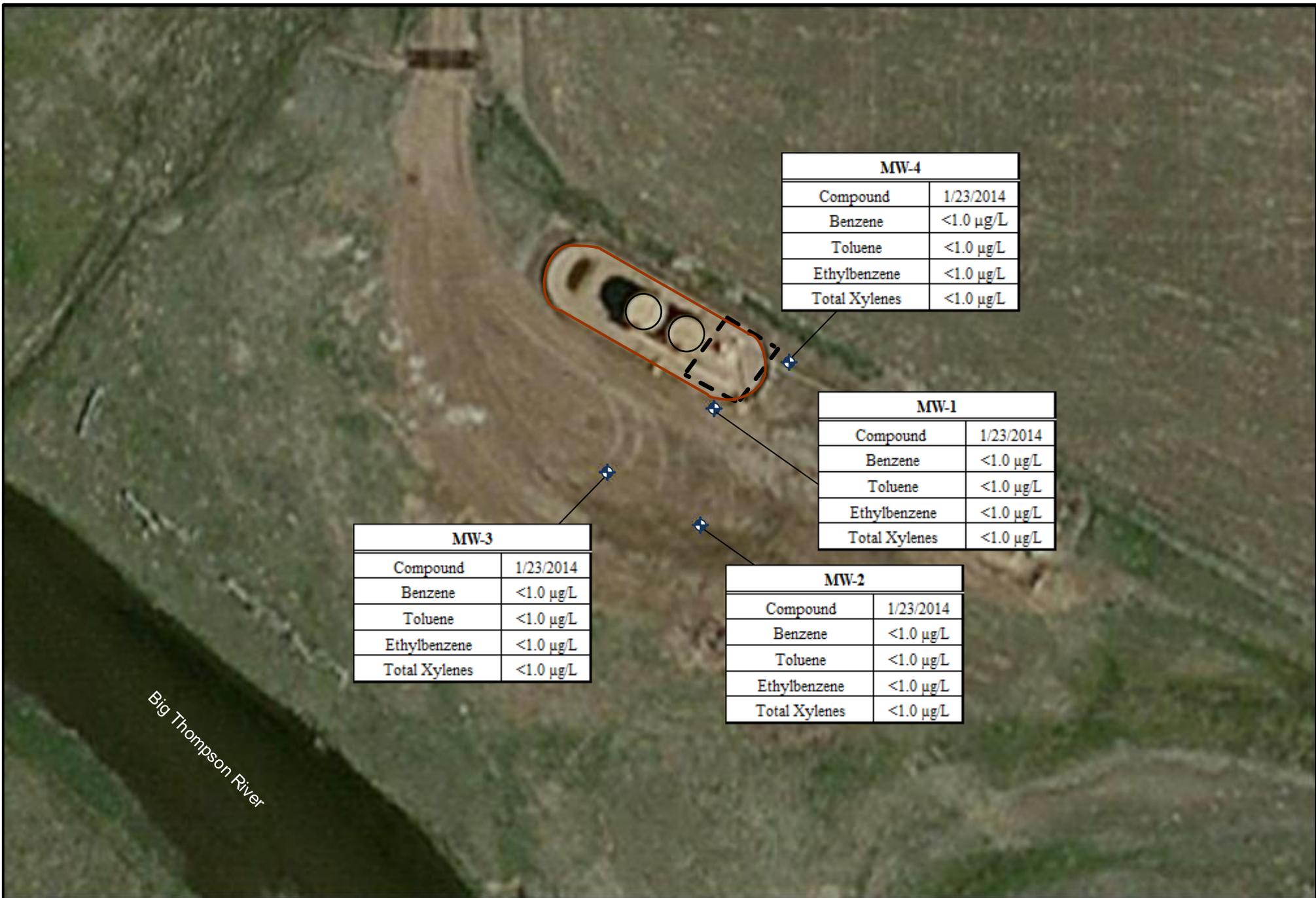
**LEGEND:**

- Groundwater Monitoring Location
- Earthen Berm
- Flow Direction
- Excavation Extent (Surveyed Via Trimble Unit)

- Groundwater Contour
- Inferred Groundwater Contour
- 4792.26** Measured Groundwater Elevation
- Oil Tank

Scale: 1" = 53'

Initial Potentiometric  
 Surface Map (January  
 23, 2014)  
 Figure 4



MW-4	
Compound	1/23/2014
Benzene	<1.0 µg/L
Toluene	<1.0 µg/L
Ethylbenzene	<1.0 µg/L
Total Xylenes	<1.0 µg/L

MW-1	
Compound	1/23/2014
Benzene	<1.0 µg/L
Toluene	<1.0 µg/L
Ethylbenzene	<1.0 µg/L
Total Xylenes	<1.0 µg/L

MW-3	
Compound	1/23/2014
Benzene	<1.0 µg/L
Toluene	<1.0 µg/L
Ethylbenzene	<1.0 µg/L
Total Xylenes	<1.0 µg/L

MW-2	
Compound	1/23/2014
Benzene	<1.0 µg/L
Toluene	<1.0 µg/L
Ethylbenzene	<1.0 µg/L
Total Xylenes	<1.0 µg/L

PROJECT NO:  
DRAWN BY: ATF  
DATE: 3/05/2014



**Facility Diagram**  
Noble Energy  
Betz 30-11, 30-14  
Weld County, CO

**LEGEND:**

- Earthen Berm
- Groundwater Monitoring Location
- Excavation Extent (Surveyed Via Trimble Unit)
- Excavation Groundwater Sample Location
- Oil Tank



Initial Groundwater Analytical Results Map  
Figure 5

# **ATTACHMENT A**

## **LABORATORY ANALYTICAL DATA REPORTS**

# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

January 15, 2014

Daniel Wade  
Noble Energy  
804 Grand Avenue  
Platteville, CO 80651  
RE: Betz 30-11, 30-14

Enclosed are the results of analyses for samples received by Summit Scientific on 12/20/13 16:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to be 'BS', with a long, sweeping horizontal line extending to the right.

Ben Shrewsbury  
President / Laboratory Manager



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/15/14 11:41

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-2 1'-3'	R312147-01	Soil	12/19/13 15:00	12/20/13 16:30
MW-3 1'-3'	R312147-02	Soil	12/19/13 15:30	12/20/13 16:30

---

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

Reported:  
01/15/14 11:41

R312147

# Summit Scientific

S: 1

741 Corporate Circle, Suite 100 • Golden, Colorado 80401  
303-277-9310 • 303-574-5933

Client: Noble Energy/Tasman Project Manager: Daniel Wade Page 1 of 1  
Address: \_\_\_\_\_ E-Mail: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: 303-912-2625 Fax: \_\_\_\_\_ Project Name: Betz 30-11, 30-14  
Sampler Name: Daniel Wade Project Number: \_\_\_\_\_

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative			Matrix			Analysis Requested	Special Instructions	
					HCl	HNO3	None	Other (Specify)	Groundwater	Soil			Air-Canister #
1	MW-2 1-3'	12/19	1500	1	X			X					
2	MW-3 1-3'	12/19	1530	1	X			X					
3													
4													
5													
6													
7													
8													
9													
10													
Relinquished by: <u>[Signature]</u>		Date/Time: <u>12/19/13 1730</u>	Received by: <u>[Signature]</u>	Date/Time: <u>12/26/13 1630</u>	Turn Around Time (Check)			Notes:					
Relinquished by: _____		Date/Time: _____	Received by: _____	Date/Time: _____	Same Day _____			72 hours _____					
Relinquished by: _____		Date/Time: _____	Received by: _____	Date/Time: _____	24 hours _____			Standard _____					
Relinquished by: _____		Date/Time: _____	Received by: _____	Date/Time: _____	48 hours _____			Sample Integrity: <u>3°C</u>					
Relinquished by: _____		Date/Time: _____	Received by: _____	Date/Time: _____	Temperature Upon Receipt: <u>3°C</u>			Intact: <u>Yes</u> No					

www.s2scientific.com



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

Reported:  
01/15/14 11:41

**MW-2 1'-3'**  
**R312147-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: 12/19/13 15:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	3122304	12/23/13	12/24/13	8015M	

Date Sampled: 12/19/13 15:00

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

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

Date Sampled: 12/19/13 15:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	3122303	12/23/13	12/24/13	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: 12/19/13 15:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		103 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		96.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		102 %	21-167		"	"	"	"	

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.



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/15/14 11:41

**MW-3 1'-3'**  
**R312147-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: 12/19/13 15:30

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	3122304	12/23/13	12/24/13	8015M	

Date Sampled: 12/19/13 15:30

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		104 %	30-150		"	"	"	"	

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

Date Sampled: 12/19/13 15:30

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	3122303	12/23/13	12/24/13	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: 12/19/13 15:30

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		96.9 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		102 %	21-167		"	"	"	"	

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/15/14 11:41

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

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

**Batch 3122304 - EPA 3550A**

**Blank (3122304-BLK1)**

Prepared & Analyzed: 12/23/13

C10-C28 (DRO)                      ND                      50    mg/kg

**LCS (3122304-BS1)**

Prepared & Analyzed: 12/23/13

C10-C28 (DRO)                      494                      50    mg/kg                      495                      99.7    73-134

**Matrix Spike (3122304-MS1)**

**Source: R312151-02**

Prepared & Analyzed: 12/23/13

C10-C28 (DRO)                      494                      50    mg/kg                      495                      ND                      99.7    50-148

**Matrix Spike Dup (3122304-MSD1)**

**Source: R312151-02**

Prepared & Analyzed: 12/23/13

C10-C28 (DRO)                      484                      50    mg/kg                      492                      ND                      98.3    50-148                      1.98                      13

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

Reported:  
01/15/14 11:41

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

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

**Batch 3122303 - EPA 5030 Soil MS**

**Blank (3122303-BLK1)**

Prepared & Analyzed: 12/23/13

Naphthalene	ND	0.010	mg/kg							
Benzene	ND	0.0020	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.010	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0394</i>		<i>"</i>	<i>0.0387</i>		<i>102</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0377</i>		<i>"</i>	<i>0.0391</i>		<i>96.4</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0390</i>		<i>"</i>	<i>0.0391</i>		<i>99.9</i>	<i>21-167</i>			

**LCS (3122303-BS1)**

Prepared & Analyzed: 12/23/13

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0823	0.0020	"	0.0960		85.7	58-130			
Toluene	0.101	0.0050	"	0.0960		105	61-134			
Ethylbenzene	0.132	0.0050	"	0.0960		138	74-139			
m,p-Xylene	0.231	0.010	"	0.192		120	73-137			
o-Xylene	0.120	0.0050	"	0.0960		126	73-141			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0381</i>		<i>"</i>	<i>0.0380</i>		<i>100</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0379</i>		<i>"</i>	<i>0.0384</i>		<i>98.6</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0368</i>		<i>"</i>	<i>0.0384</i>		<i>95.8</i>	<i>21-167</i>			

**Matrix Spike (3122303-MS1)**

Source: R312151-02

Prepared & Analyzed: 12/23/13

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.0851	0.0020	"	0.0960	ND	88.7	30-131			
Toluene	0.103	0.0050	"	0.0960	ND	107	30-134			
Ethylbenzene	0.133	0.0050	"	0.0960	ND	138	22-153			
m,p-Xylene	0.232	0.010	"	0.192	ND	121	10-159			
o-Xylene	0.123	0.0050	"	0.0960	ND	128	31-151			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0415</i>		<i>"</i>	<i>0.0380</i>		<i>109</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0385</i>		<i>"</i>	<i>0.0384</i>		<i>100</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0374</i>		<i>"</i>	<i>0.0384</i>		<i>97.5</i>	<i>21-167</i>			

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

Reported:  
01/15/14 11:41

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

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

**Batch 3122303 - EPA 5030 Soil MS**

**Matrix Spike Dup (3122303-MSD1)**

**Source: R312151-02**

Prepared & Analyzed: 12/23/13

Naphthalene	ND	0.010	mg/kg		ND		10-158		42	
Benzene	0.0852	0.0020	"	0.0978	ND	87.0	30-131	0.0599	34	
Toluene	0.104	0.0050	"	0.0978	ND	106	30-134	0.786	30	
Ethylbenzene	0.135	0.0050	"	0.0978	ND	138	22-153	1.89	24	
m,p-Xylene	0.238	0.010	"	0.196	ND	122	10-159	2.66	68	
o-Xylene	0.125	0.0050	"	0.0978	ND	127	31-151	1.16	38	
Surrogate: 1,2-Dichloroethane-d4	0.0414		"	0.0387		107	23-173			
Surrogate: Toluene-d8	0.0387		"	0.0391		98.9	20-170			
Surrogate: 4-Bromofluorobenzene	0.0382		"	0.0391		97.7	21-167			

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/15/14 11:41

### Notes and Definitions

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

---

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.*

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

January 29, 2014

Daniel Wade  
Noble Energy  
804 Grand Avenue  
Platteville, CO 80651  
RE: Betz 30-11, 30-14

Enclosed are the results of analyses for samples received by Summit Scientific on 01/24/14 16:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to be 'BS', with a long, sweeping horizontal line extending to the right.

Ben Shrewsbury  
President / Laboratory Manager



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	1401134-01	Water	01/23/14 16:55	01/24/14 16:30
MW-2	1401134-02	Water	01/23/14 17:00	01/24/14 16:30
MW-3	1401134-03	Water	01/23/14 17:15	01/24/14 16:30
MW-4	1401134-04	Water	01/23/14 17:30	01/24/14 16:30

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

**MW-1**  
**1401134-01 (Water)**

**Summit Scientific**

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

Date Sampled: **01/23/14 16:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1401128	01/29/14	01/29/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **01/23/14 16:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>109 %</i>	<i>37-154</i>		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		<i>101 %</i>	<i>45-149</i>		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>100 %</i>	<i>45-146</i>		"	"	"	"	

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

**MW-2**  
**1401134-02 (Water)**

**Summit Scientific**

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

Date Sampled: **01/23/14 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1401128	01/29/14	01/29/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **01/23/14 17:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		99.5 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	45-146		"	"	"	"	

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

**MW-3**  
**1401134-03 (Water)**

**Summit Scientific**

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

Date Sampled: **01/23/14 17:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1401128	01/29/14	01/29/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **01/23/14 17:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		<i>105 %</i>	<i>37-154</i>		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		<i>98.0 %</i>	<i>45-149</i>		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>101 %</i>	<i>45-146</i>		"	"	"	"	

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

**MW-4**  
**1401134-04 (Water)**

**Summit Scientific**

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

Date Sampled: **01/23/14 17:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1401128	01/29/14	01/29/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **01/23/14 17:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		106 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		102 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		106 %	45-146		"	"	"	"	

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

Reported:  
01/29/14 18:36

### Volatile Organic Compounds by EPA Method 8260B - Quality Control

#### Summit Scientific

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

#### Batch 1401128 - EPA 5030 Water MS

##### Blank (1401128-BLK1)

Prepared & Analyzed: 01/27/14

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	14.0		"	13.2		106	37-154			
Surrogate: Toluene-d8	13.1		"	13.3		98.0	45-149			
Surrogate: 4-Bromofluorobenzene	13.9		"	13.3		104	45-146			

##### LCS (1401128-BS1)

Prepared & Analyzed: 01/27/14

Benzene	33.7	1.0	ug/l	33.3		101	51-132			
Toluene	34.7	1.0	"	33.3		104	51-138			
Ethylbenzene	33.5	1.0	"	33.3		101	58-146			
m,p-Xylene	66.4	2.0	"	66.7		99.7	57-144			
o-Xylene	32.0	1.0	"	33.3		96.0	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.2		"	13.2		108	37-154			
Surrogate: Toluene-d8	13.6		"	13.3		102	45-149			
Surrogate: 4-Bromofluorobenzene	13.4		"	13.3		100	45-146			

##### Matrix Spike (1401128-MS1)

Source: 1401132-01

Prepared & Analyzed: 01/27/14

Benzene	238	1.0	ug/l	33.3	210	86.2	34-141			
Toluene	481	1.0	"	33.3	531	NR	27-151			S-02
Ethylbenzene	114	1.0	"	33.3	82.7	94.3	29-160			
m,p-Xylene	1210	2.0	"	66.7	1380	NR	20-166			S-02
o-Xylene	281	1.0	"	33.3	303	NR	33-159			S-02
Surrogate: 1,2-Dichloroethane-d4	14.1		"	13.2		107	37-154			
Surrogate: Toluene-d8	13.7		"	13.3		103	45-149			
Surrogate: 4-Bromofluorobenzene	13.7		"	13.3		102	45-146			

Summit Scientific

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Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**  
**Summit Scientific**

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

**Batch 1401128 - EPA 5030 Water MS**

<b>Matrix Spike Dup (1401128-MSD1)</b>	<b>Source: 1401132-01</b>			<b>Prepared &amp; Analyzed: 01/27/14</b>						
Benzene	206	1.0	ug/l	33.3	210	NR	34-141	14.7	32	
Toluene	411	1.0	"	33.3	531	NR	27-151	15.7	25	S-02
Ethylbenzene	102	1.0	"	33.3	82.7	59.1	29-160	10.8	50	
m,p-Xylene	1020	2.0	"	66.7	1380	NR	20-166	16.7	36	S-02
o-Xylene	241	1.0	"	33.3	303	NR	33-159	15.4	26	S-02
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>14.3</i>		<i>"</i>	<i>13.2</i>		<i>108</i>	<i>37-154</i>			
<i>Surrogate: Toluene-d8</i>	<i>13.5</i>		<i>"</i>	<i>13.3</i>		<i>101</i>	<i>45-149</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>13.3</i>		<i>"</i>	<i>13.3</i>		<i>99.5</i>	<i>45-146</i>			

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.*



Noble Energy  
804 Grand Avenue  
Platteville CO, 80651

Project: Betz 30-11, 30-14

Project Number: [none]  
Project Manager: Daniel Wade

**Reported:**  
01/29/14 18:36

### Notes and Definitions

- S-02 The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.
- 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

# **ATTACHMENT B**

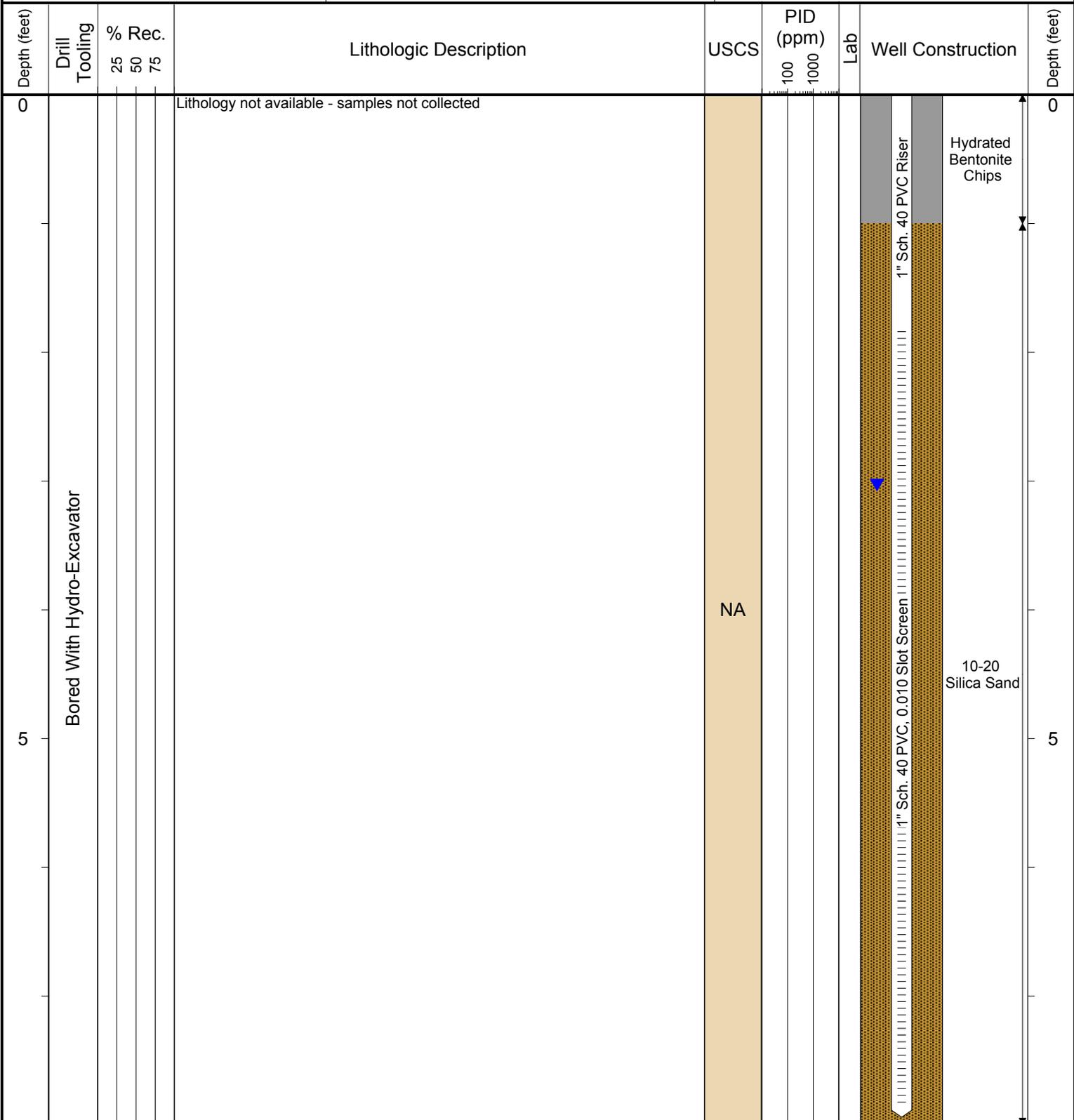
## **BORING LOGS**



6899 Pecos Street, Unit C  
Denver, Colorado 80221

CLIENT: Noble Energy  
 LOGGED BY: Daniel Wade P.G.  
 PROJECT MANAGER: Daniel Wade P.G.  
 DRILLING CONTRACTOR: Tasman Geosciences  
 DRILLING EQUIPMENT: Hydrovac  
 DRILL BIT SIZE (INCHES): NA  
 DATE STARTED - COMPLETED: 01/10/14 - 01/10/14  
 TOTAL WELL DEPTH (FT. BGS): 7.94  
 DEPTH TO WATER (FT. BGS): 3.03 (1/23/14) ▼

**Betz 30-11**  
**BORING / WELL ID: MW-01**  
 LOCATION: Weld County, Colorado  
 NORTHING (CO STATE PLANE): 1380347.57  
 EASTING (CO STATE PLANE): 3159176.211  
 CASING ELEVATION (FT. AMSL): 4797.8391  
 GROUND ELEVATION (FT. AMSL): 4795.2851



**Drilling / Sample Method:**

- Macro-Core
- Expendable Well Tip
- Perforated Injection Tool
- HydroPunch Groundwater Sampler

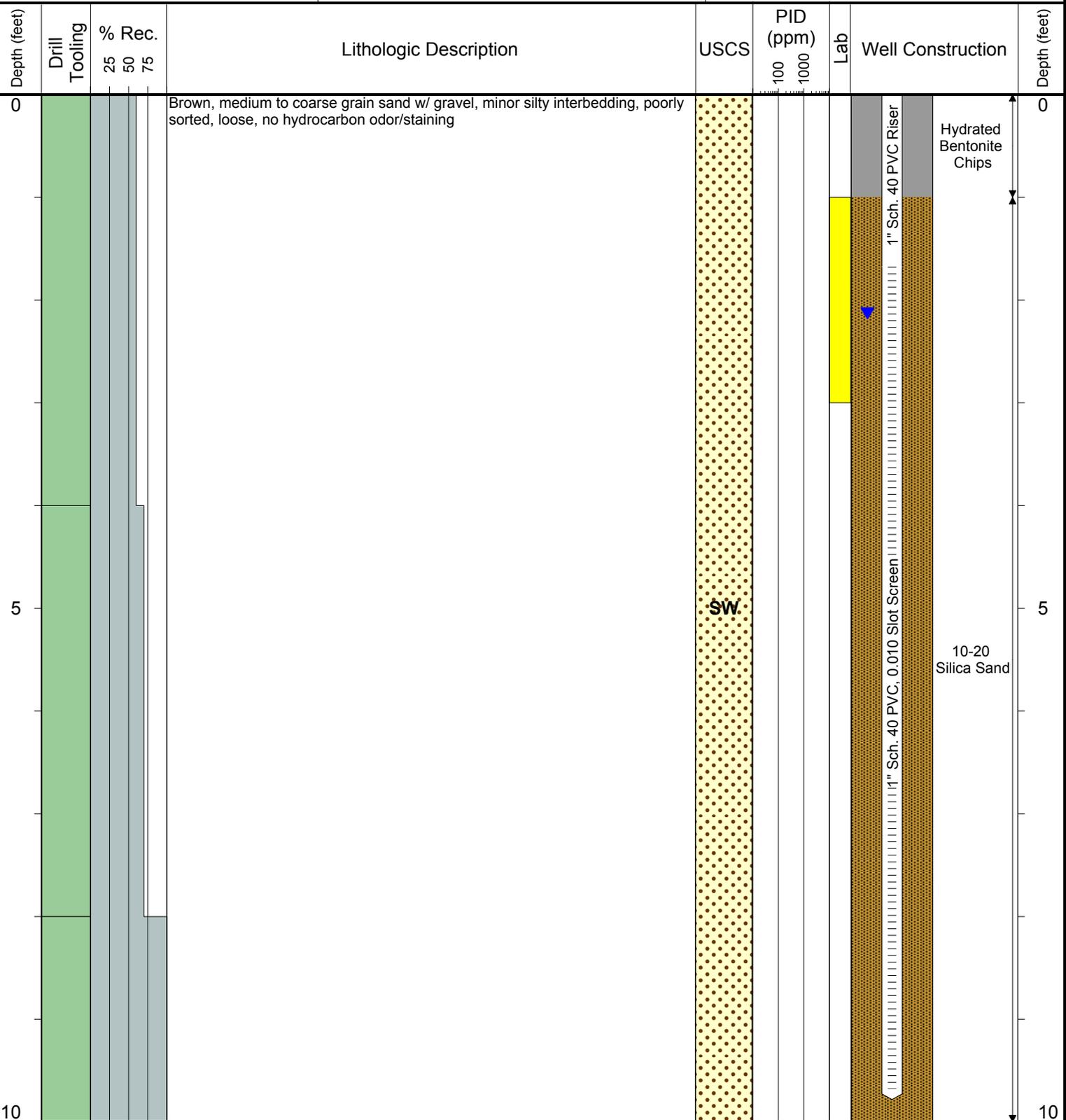
**Laboratory Sample Types:**

- Geotechnical Lab
- Analytical Chemistry Lab
- Geotechnical & Analytical Chemistry Lab



6899 Pecos Street, Unit C  
Denver, Colorado 80221

CLIENT: Noble Energy	<b>Betz 30-11</b>
LOGGED BY: Daniel Wade P.G.	
PROJECT MANAGER: Daniel Wade P.G.	<b>BORING / WELL ID: MW-02</b>
DRILLING CONTRACTOR: DrillPro Services	
DRILLING EQUIPMENT: Geoprobe	LOCATION: Weld County, Colorado
DRILL BIT SIZE (INCHES): 3.25	NORTHING (CO STATE PLANE): 1380309.623
DATE STARTED - COMPLETED: 12/19/13 - 12/19/13	EASTING (CO STATE PLANE): 3159171.964
TOTAL WELL DEPTH (FT. BGS): 9.78	CASING ELEVATION (FT. AMSL): 4793.9991
DEPTH TO WATER (FT. BGS): 2.13 (1/23/14) ▼	GROUND ELEVATION (FT. AMSL): 4794.2131

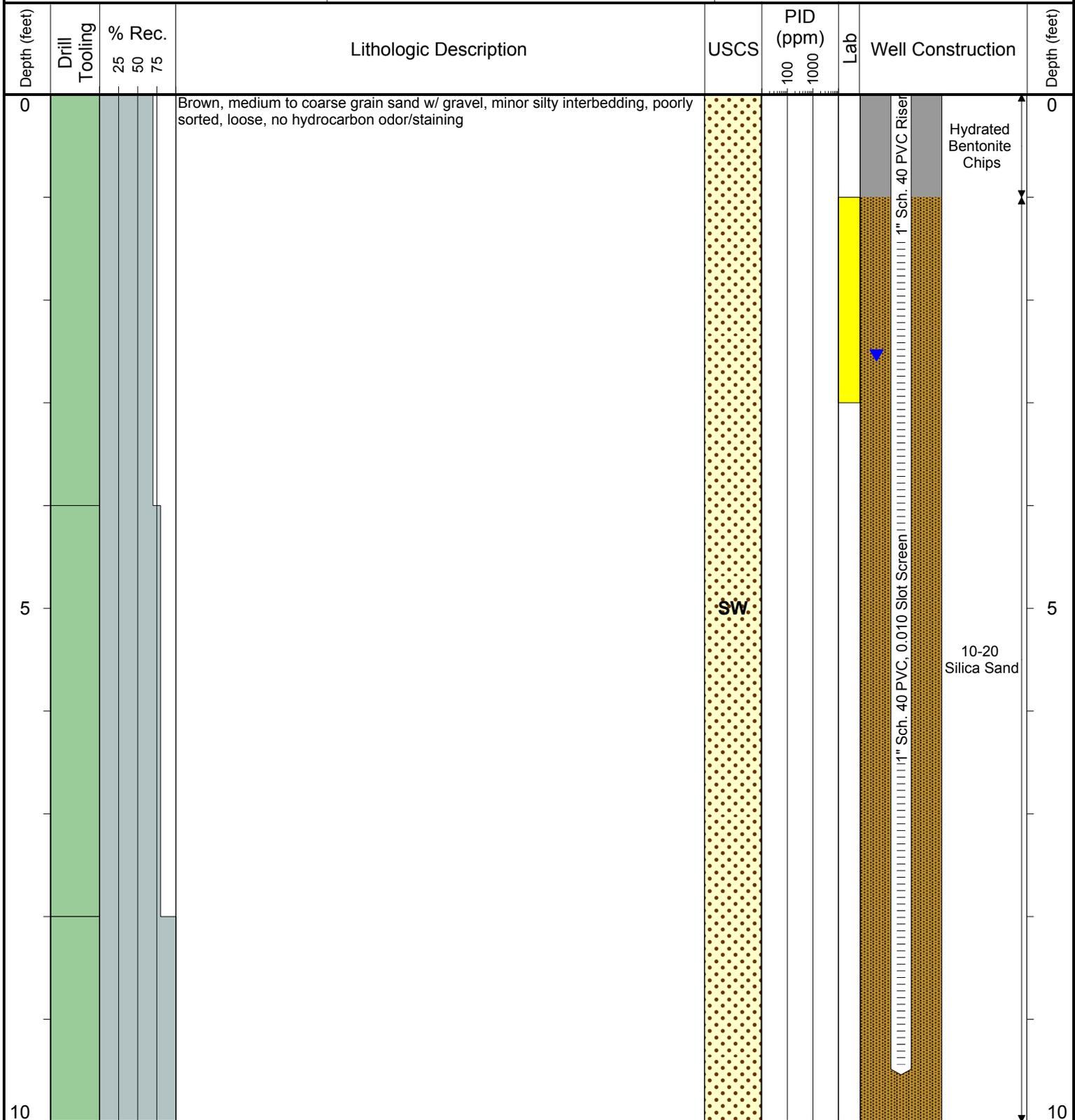


<b>Drilling / Sample Method:</b>		<b>Laboratory Sample Types:</b>	
Macro-Core	Perforated Injection Tool	Geotechnical Lab	Geotechnical & Analytical Chemistry Lab
Expendable Well Tip	HydroPunch Groundwater Sampler	Analytical Chemistry Lab	



6899 Pecos Street, Unit C  
Denver, Colorado 80221

CLIENT: Noble Energy	<b>Betz 30-11</b>
LOGGED BY: Daniel Wade P.G.	
PROJECT MANAGER: Daniel Wade P.G.	<b>BORING / WELL ID: MW-03</b>
DRILLING CONTRACTOR: DrillPro Services	
DRILLING EQUIPMENT: Geoprobe	LOCATION: Weld County, Colorado
DRILL BIT SIZE (INCHES): 3.25	NORTHING (CO STATE PLANE): 1380326.115
DATE STARTED - COMPLETED: 12/19/13 - 12/19/13	EASTING (CO STATE PLANE): 3159142.011
TOTAL WELL DEPTH (FT. BGS): 9.54	CASING ELEVATION (FT. AMSL): 4794.2431
DEPTH TO WATER (FT. BGS): 2.54 (1/23/14) ▼	GROUND ELEVATION (FT. AMSL): 4794.6571



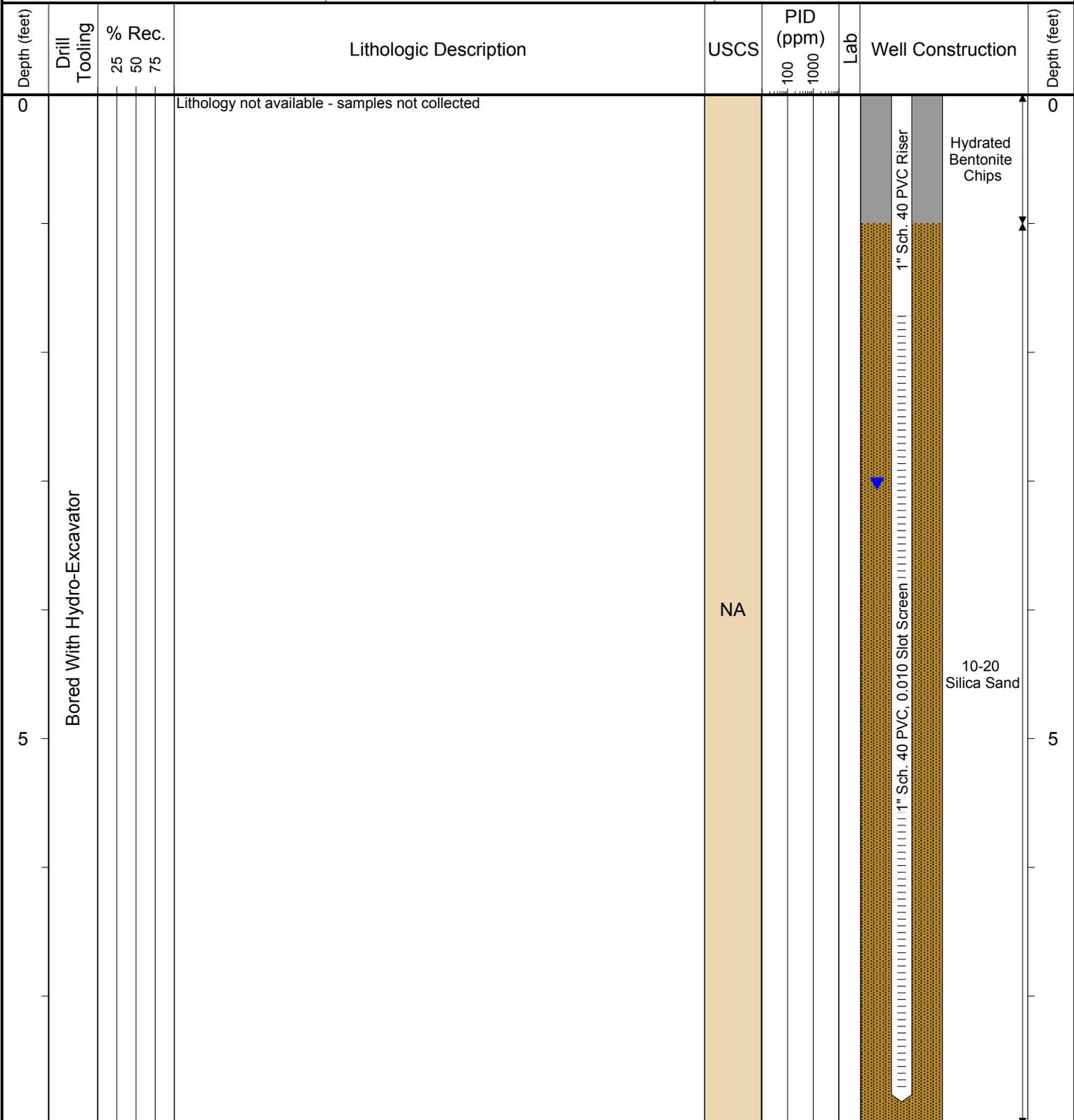
<b>Drilling / Sample Method:</b>	<b>Laboratory Sample Types:</b>
<ul style="list-style-type: none"> <li>Macro-Core</li> <li>Expendable Well Tip</li> <li>Perforated Injection Tool</li> <li>HydroPunch Groundwater Sampler</li> </ul>	<ul style="list-style-type: none"> <li>Geotechnical Lab</li> <li>Analytical Chemistry Lab</li> <li>Geotechnical &amp; Analytical Chemistry Lab</li> </ul>



6899 Pecos Street, Unit C  
Denver, Colorado 80221

CLIENT: Noble Energy  
 LOGGED BY: Daniel Wade P.G.  
 PROJECT MANAGER: Daniel Wade P.G.  
 DRILLING CONTRACTOR: Tasman Geosciences  
 DRILLING EQUIPMENT: Hydrovac  
 DRILL BIT SIZE (INCHES): NA  
 DATE STARTED - COMPLETED: 01/10/14 - 01/10/14  
 TOTAL WELL DEPTH (FT. BGS): 7.82  
 DEPTH TO WATER (FT. BGS): 3.02 (1/23/14) ▼

**Betz 30-11**  
**BORING / WELL ID: MW-04**  
 LOCATION: Weld County, Colorado  
 NORTHING (CO STATE PLANE): 1380362.57  
 EASTING (CO STATE PLANE): 3159201.314  
 CASING ELEVATION (FT. AMSL): 4798.6151  
 GROUND ELEVATION (FT. AMSL): 4795.3381



**Drilling / Sample Method:**

- Macro-Core
- Expendable Well Tip
- Perforated Injection Tool
- HydroPunch Groundwater Sampler

**Laboratory Sample Types:**

- Geotechnical Lab
- Analytical Chemistry Lab
- Geotechnical & Analytical Chemistry Lab