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WV GEOLOGICAL SURVEY  
MORGANTOWN, WV

State of West Virginia  
Department of Environmental Protection - Office of Oil and Gas  
Well Operator's Report of Well Work

API 47-017-06318 County Doddridge District West Union  
Quad Smithburg 7.5' Pad Name Nash Pad Field/Pool Name \_\_\_\_\_  
Farm name Haug, Robert M. et al Well Number Olivia Unit 2H  
Operator (as registered with the OOG) Antero Resources Corporation  
Address 1615 Wynkoop Street City Denver State CO Zip 80202

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey  
Top hole Northing 4,351,837m Easting 524,803m  
Landing Point of Curve Northing 4,351,741.83m Easting 525,114.85m  
Bottom Hole Northing 4,349,786m Easting 525,780m

Elevation (ft) 1,381' GL Type of Well  New  Existing Type of Report  Interim  Final  
Permit Type  Deviated  Horizontal  Horizontal 6A  Vertical Depth Type  Deep  Shallow  
Type of Operation  Convert  Deepen  Drill  Plug Back  Redrilling  Rework  Stimulate  
Well Type  Brine Disposal  CBM  Gas  Oil  Secondary Recovery  Solution Mining  Storage  Other \_\_\_\_\_  
Type of Completion  Single  Multiple Fluids Produced  Brine  Gas  NGL  Oil  Other \_\_\_\_\_  
Drilled with  Cable  Rotary

Drilling Media Surface hole  Air  Mud  Fresh Water Intermediate hole  Air  Mud  Fresh Water  Brine  
Production hole  Air  Mud  Fresh Water  Brine

Mud Type(s) and Additive(s)  
Air- Foam & 4% KCL  
Mud- Polymer

Date permit issued 09/23/2013 Date drilling commenced 03/12/2014 Date drilling ceased 04/01/2014  
Date completion activities began 05/02/2014 Date completion activities ceased 08/29/2014  
Verbal plugging (Y/N) N/A Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 206', 222' Open mine(s) (Y/N) depths No  
Salt water depth(s) ft 1561', 1854' Void(s) encountered (Y/N) depths None  
Coal depth(s) ft None Identified Cavern(s) encountered (Y/N) depths None  
Is coal being mined in area (Y/N) No

Reviewed by: \_\_\_\_\_

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API 47-017 - 06318 Farm name Haug, Robert M. et al Well number Olivia Unit 2H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor	30"	20"	40'	New	94#; K-55	N/A	Yes
Surface	17 1/2"	13 3/8"	397'	New	48#; H-40	N/A	Yes
Coal							
Intermediate 1	12 1/4"	9 5/8"	2,530'	New	36#; J-55	N/A	Yes
Intermediate 2							
Intermediate 3							
Production	8 3/4" & 8 1/2"	5 1/2"	14,546'	New	20#; P-110	N/A	Yes
Tubing		2 3/8"	7,435'		4.7#; N-80	N/A	
Packer type and depth set	N/A						

Comment Details \_\_\_\_\_

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	Class A	200 sx	15.6	1.18	109	0'	8 Hrs.
Surface	Class A	462 sx	15.6	1.18	276	0'	8 Hrs.
Coal							
Intermediate 1	Class A	984 sx	15.6	1.18	792	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	1,011 sx (Lead); 1,185 sx (Tail)	13.5 (Lead); 15.2 (Tail)	1.44 (Lead); 1.80 (Tail)	2,897	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 14,546' MD; 7,141' TVD (BHL); 7,196' TVD (Deepest Point Drilled) Loggers TD (ft) 14,487'

Deepest formation penetrated Marcellus Plug back to (ft) N/A

Plug back procedure N/A

Kick off depth (ft) 6,923'

\*\*This is a subsequent well. Antero only runs wireline logs on one well on a multi-well pad (Olivia Unit 1H, API #47-017-06332). Please reference the wireline logs submitted with Form WR-35 for the Olivia Unit 1H. A Cement Bond Log has been included with this submittal.

Check all wireline logs run \*\*  
 caliper     density     deviated/directional     induction  
 neutron     resistivity     gamma ray     temperature     sonic

Well cored  Yes  No    Conventional    Sidewall    Were cuttings collected  Yes  No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING \_\_\_\_\_

Conductor- 0

Surface- 1 above guide shoe, 1 above insert float, 1 every 4th joint to surface

Intermediate- 1 above float joint, 1 above float collar, 1 every 4th joint to surface

Production- 1 above float joint, 1 below float collar, 1 every 3rd joint to top of cement

WAS WELL COMPLETED AS SHOT HOLE  Yes  No    DETAILS \_\_\_\_\_

WAS WELL COMPLETED OPEN HOLE?  Yes  No    DETAILS \_\_\_\_\_

WERE TRACERS USED  Yes  No    TYPE OF TRACER(S) USED \_\_\_\_\_

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API 47- 017 - 06318

Farm name Haug, Robert M. et al

Well number Olivia Unit 2H

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)

\* PLEASE SEE ATTACHED EXHIBIT 1

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)

\* PLEASE SEE ATTACHED EXHIBIT 2

Please insert additional pages as applicable.

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API 47- 017 - 06318 Farm name Haug, Robert M. et al Well number Olivia Unit 2H

PRODUCING FORMATION(S)	DEPTHS		
Marcellus	7,131' (top)	TVD	7,468' (top) MD
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Please insert additional pages as applicable.

GAS TEST  Build up  Drawdown  Open Flow OIL TEST  Flow  Pump

SHUT-IN PRESSURE Surface 3550 psi Bottom Hole \_\_\_\_\_ psi DURATION OF TEST \_\_\_\_\_ hrs

OPEN FLOW Gas 5,890 mcfpd Oil 6 bpd NGL \_\_\_\_\_ bpd Water 1,119 bpd GAS MEASURED BY  Estimated  Orifice  Pilot

LITHOLOGY/ FORMATION	TOP	BOTTOM	TOP	BOTTOM	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H <sub>2</sub> S, ETC)
	DEPTH IN FT NAME TVD	DEPTH IN FT TVD	DEPTH IN FT MD	DEPTH IN FT MD	
	0		0		

**\* PLEASE SEE ATTACHED EXHIBIT 3**

Please insert additional pages as applicable.

Drilling Contractor Frontier Drilling, LLC  
Address 562 Spring Run Road City Pennsboro State WV Zip 26415

Logging Company Cased Hole Solutions  
Address 100 Arentzen Blvd. City Charleroi State PA Zip 15022

Cementing Company Allied Oil & Gas Services, LLC  
Address 1036 East Main Street City Bridgeport State WV Zip 26330

Stimulating Company US Well Services  
Address 533 Industrial Park Drive City Jane Lew State WV Zip 26378

Please insert additional pages as applicable.

Completed by Megan Darling Telephone 303-357-7230  
Signature Megan C. Darling Title Permitting Agent Date 06/05/2015

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

API 47-017-06318 Farm Name Haug, Robert M. et al Well Number Olivia Unit 2H

**EXHIBIT 1**

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	2-May-14	14,290	14,458	60	Marcellus
2	15-Jul-14	14,091	14,259	60	Marcellus
3	15-Jul-14	13,891	14,059	60	Marcellus
4	16-Jul-14	13,692	13,860	60	Marcellus
5	16-Jul-14	13,492	13,661	60	Marcellus
6	16-Jul-14	13,293	13,461	60	Marcellus
7	16-Jul-14	13,094	13,262	60	Marcellus
8	17-Jul-14	12,894	13,062	60	Marcellus
9	17-Jul-14	12,695	12,863	60	Marcellus
10	17-Jul-14	12,496	12,664	60	Marcellus
11	23-Jul-14	12,296	12,464	60	Marcellus
12	23-Jul-14	12,097	12,265	60	Marcellus
13	23-Jul-14	11,897	12,066	60	Marcellus
14	24-Jul-14	11,698	11,866	60	Marcellus
15	24-Jul-14	11,499	11,667	60	Marcellus
16	24-Jul-14	11,299	11,467	60	Marcellus
17	24-Jul-14	11,100	11,268	60	Marcellus
18	25-Jul-14	10,900	11,069	60	Marcellus
19	25-Jul-14	10,701	10,869	60	Marcellus
20	25-Jul-14	10,502	10,670	60	Marcellus
21	25-Jul-14	10,302	10,471	60	Marcellus
22	26-Jul-14	10,103	10,271	60	Marcellus
23	26-Jul-14	9,904	10,072	60	Marcellus
24	26-Jul-14	9,704	9,872	60	Marcellus
25	26-Jul-14	9,505	9,673	60	Marcellus
26	26-Jul-14	9,305	9,474	60	Marcellus
27	27-Jul-14	9,106	9,274	60	Marcellus
28	27-Jul-14	8,907	9,075	60	Marcellus
29	27-Jul-14	8,707	8,875	60	Marcellus
30	27-Jul-14	8,508	8,676	60	Marcellus
31	27-Jul-14	8,309	8,477	60	Marcellus
32	28-Jul-14	8,109	8,277	60	Marcellus
33	28-Jul-14	7,910	8,078	60	Marcellus
34	28-Jul-14	7,710	7,879	60	Marcellus
35	28-Jul-14	7,511	7,679	60	Marcellus

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## EXHIBIT 2

Stage No.	Stimulations Date	Avg Pump Rate	Avg Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/ other (units)
1	14-Jul-14	72.0	6,544	N/A	5,170	255,480	6,522	N/A
2	15-Jul-14	76.0	6,875	5,222	5,666	246,960	6,489	N/A
3	15-Jul-14	80.0	6,566	5,350	5,532	236,121	7,016	N/A
4	16-Jul-14	77.0	6,716	5,351	5,204	241,042	6,549	N/A
5	16-Jul-14	79.0	6,701	5,177	5,697	243,330	6,437	N/A
6	16-Jul-14	80.0	6,647	5,123	5,180	243,220	6,993	N/A
7	16-Jul-14	77.0	6,701	5,601	5,207	236,630	6,434	N/A
8	17-Jul-14	76.0	6,591	5,242	5,286	232,820	6,444	N/A
9	17-Jul-14	79.0	6,808	5,655	5,109	242,420	6,412	N/A
10	17-Jul-14	72.0	6,819	5,435	6,708	251,920	6,514	N/A
11	23-Jul-14	79.0	6,714	N/A	5,431	245,050	6,364	N/A
12	23-Jul-14	78.0	6,637	5,347	5,144	251,860	6,334	N/A
13	23-Jul-14	77.0	6,498	5,102	5,195	243,350	6,383	N/A
14	24-Jul-14	77.0	6,497	5,128	4,832	234,900	6,396	N/A
15	24-Jul-14	81.0	6,340	5,047	5,431	241,520	6,468	N/A
16	24-Jul-14	75.0	6,649	5,218	5,307	195,090	6,894	N/A
17	24-Jul-14	77.0	6,661	5,266	5,347	236,950	6,254	N/A
18	25-Jul-14	77.0	6,607	5,167	5,004	244,050	6,284	N/A
19	25-Jul-14	60.0	6,481	5,103	4,854	238,850	6,248	N/A
20	25-Jul-14	79.0	6,518	5,488	5,492	237,400	6,232	N/A
21	25-Jul-14	77.0	6,863	5,428	5,224	237,940	6,093	N/A
22	26-Jul-14	74.0	6,786	5,116	5,147	197,400	5,832	N/A
23	26-Jul-14	79.0	6,469	5,359	4,551	236,370	6,208	N/A
24	26-Jul-14	78.0	6,569	5,419	5,109	235,500	6,214	N/A
25	26-Jul-14	76.0	6,571	5,324	4,993	247,690	6,185	N/A
26	26-Jul-14	77.0	6,717	5,317	4,961	244,200	6,131	N/A
27	27-Jul-14	77.0	6,519	5,315	5,224	233,920	5,743	N/A
28	27-Jul-14	78.0	6,721	5,665	5,358	236,500	5,877	N/A
29	27-Jul-14	78.0	6,721	5,665	5,358	236,500	6,125	N/A
30	27-Jul-14	78.0	6,215	5,353	5,282	238,300	6,118	N/A
31	27-Jul-14	79.0	6,327	5,328	5,573	249,780	6,107	N/A
32	28-Jul-14	72.0	6,217	5,246	4,678	187,200	6,691	N/A
33	28-Jul-14	78.0	6,272	5,216	5,343	240,075	6,084	N/A
34	28-Jul-14	80.0	6,372	5,297	5,353	248,950	6,072	N/A
35	28-Jul-14	79.5	6,348	6,408	4,535	165,354	5,638	N/A
	AVG=	76.8	6,579	5,348	5,242	8,234,642	220,785	TOTAL

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## EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD) From
	From Surface	From Surface	From Surface	Surface
Fresh Water	206'	N/A	206'	N/A
Fresh Water	222'	N/A	222'	N/A
Shale	0	37	0	37
Siltstone	Est. 37	317	Est. 37	317
Sandstone	Est. 317	332	Est. 317	332
Siltstone/ Trace Coal	Est. 332	397	Est. 332	397
Sandstone	Est. 397	557	Est. 397	557
Silty Limestone	Est. 557	677	Est. 557	677
Sandstone	Est. 677	717	Est. 677	717
Siltstone	Est. 717	797	Est. 717	797
Limestone/Shale	Est. 797	837	Est. 797	837
Siltstone/ Sandstone	Est. 837	897	Est. 837	897
Limestone	Est. 897	917	Est. 897	917
Sandstone/ Siltstone	Est. 917	977	Est. 917	977
Limestone	Est. 977	997	Est. 977	997
Siltstone/ Limestone	Est. 997	1,357	Est. 997	1,357
Shale	Est. 1357	1,397	Est. 1357	1,397
Sandstone	Est. 1397	1,437	Est. 1397	1,437
Shale/ Sandstone	Est. 1437	1,617	Est. 1437	1,617
Sandstone	Est. 1617	1,677	Est. 1617	1,677
Sandstone/ Trace Coal	Est. 1677	1,717	Est. 1677	1,717
Sandstone / Siltstone	Est. 1717	2,127	Est. 1717	2,127
Big Lime	2,127	2,279	2,127	2,279
Big Injun	2,279	2,709	2,279	2,709
Gantz Sand	2,709	2,837	2,709	2,837
Fifty Foot Sandstone	2,837	2,918	2,837	2,918
Gordon	2,918	2,837	2,918	2,837
Fifth Sandstone	2,837	3,396	2,837	3,396
Bayard	3,396	3,615	3,396	3,615
Warren	3,615	3,994	3,615	3,994
Speechley	3,994	4,322	3,994	4,322
Baltown	4,322	4,731	4,322	4,731
Bradford	4,731	5,268	4,731	5,270
Benson	5,268	5,522	5,270	5,530
Alexander	5,522	5,773	5,530	5,794
Elk	5,773	6,317	5,794	6,398
Rhinestreet	6,317	6,647	6,398	6,774
Sycamore	6,647	6,874	6,774	7,042
Middlesex	6,874	7,026	7,042	7,249
Burkett	7,026	7,055	7,249	7,296
Tully	7,055	7,131	7,296	7,468
Marcellus	7,131	NA	7,468	NA

\*Please note Antero determines shallow formation tops based on mud logs that are only run on one well on a multi-well pad. The measured depth (MD) data on subsequent wells may be slightly different due to the well's unique departure.

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# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	7/14/2014
Job End Date:	7/28/2014
State:	West Virginia
County:	Doddridge
API Number:	47-017-06318-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Olivia Unit 2H
Longitude:	-80.71228100
Latitude:	39.31557800
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	7,195
Total Base Water Volume (gal):	9,280,068
Total Base Non Water Volume:	409,689

## Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Water	Antero Resources	Base Fluid	Water	7732-18-5	100.00000	90.12484	
Sand	U.S. Well Services, LLC	Proppant	Crystalline Silica, quartz	14808-60-7	100.00000	9.58624	
HCL Acid (12.6%-18.0%)	U.S. Well Services, LLC	Bulk Acid	Water	7732-18-5	87.50000	0.08914	
LGC-15	U.S. Well Services, LLC	Gelling Agents	Hydrogen Chloride	7641-01-1	18.00000	0.02129	
			Guar Gum	9000-30-0	50.00000	0.04096	
			Petroleum Distillates	64742-47-8	60.00000	0.03879	
			Suspending agent (solid)	14808-60-7	3.00000	0.00626	
			Surfactant	68439-51-0	3.00000	0.00246	
WFRA-405	U.S. Well Services, LLC	Friction Reducer	Water	7732-18-5	40.00000	0.02242	
			Anionic Polyacrylamide	Proprietary		0.02242	
			Petroleum Distillates	64742-47-8	22.00000	0.01805	
			Crystalline Salt	12125-02-9	5.00000	0.00280	



SI-1000	U.S. Well Services, LLC	Scale Inhibitor	Ethoxylated alcohol blend	Proprietary	5.00000	0.00280
			Anionic Copolymer	Proprietary		0.00399
			Ethylene Glycol	107-21-1	20.00000	0.00360
			Water	7732-18-5	30.00000	0.00300
X-BAC 1020	U.S. Well Services, LLC	Anti-Bacterial Agent				
			2,2-dibromo-3-nitriopropanamide	10222-01-2	20.00000	0.00566
			Deionized Water	7732-18-5	28.00000	0.00323
AP One	U.S. Well Services, LLC	Gel Breakers				
			Ammonium Persulfate	7727-54-0	100.00000	0.00149
AI-300	U.S. Well Services, LLC	Acid Corrosion Inhibitors				
			Ethylene Glycol	107-21-1	31.00000	0.00023
			N,N-Dimethylformamide	68-12-2	15.00000	0.00007
			Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	13.00000	0.00006
			Cinnamaldehyde	104-55-2	5.00000	0.00006
			2-Butoxyethanol	111-76-2	7.00000	0.00006
			Water	7732-18-5	20.00000	0.00002
			Ethoxylated Nonylphenol	68412-54-4	5.00000	0.00002
			Isopropyl Alcohol	67-63-0	3.00000	0.00001
			Triethyl Phosphate	78-40-0	3.00000	0.00001

Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS.

\* Total Water Volume sources may include fresh water, produced water, and/or recycled water

\*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided. Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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