

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

API 47 - 033 - 05602 County Harrison District Tenmile
Quad Wolf Summit Pad Name Southern Pad Field/Pool Name _____
Farm name Southern, Edgar Well Number Cottrill Unit 3H
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 4,346,399.076m Easting 544,925.656m
Landing Point of Curve Northing 4,346,270.60m Easting 545,110.59m
Bottom Hole Northing 4,345,005.425m Easting 545,506.898m

Elevation (ft) 1,175' 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 04/20/2012 Date drilling commenced 07/11/2012 Date drilling ceased 02/16/2013
Date completion activities began 03/13/2013 Date completion activities ceased 03/26/2013
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 202' Open mine(s) (Y/N) depths Y
Salt water depth(s) ft None Available Void(s) encountered (Y/N) depths Y, ~210-220'
Coal depth(s) ft 687' Cavern(s) encountered (Y/N) depths None
Is coal being mined in area (Y/N) Yes - Sycamore Creek Mine

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Reviewed by:
A.W. 5/26/15
W.S. 06/01/15

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API 47-033 - 05602

Farm name Southern, Edgar

Well number Cottrill Unit 3H

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"	26"	70'	New	136#; J-55	N/A	Yes
Surface	17-1/2"	16"	210'	New	65#; H-40	N/A	Yes
Surface	14-3/4"	13-3/8"	440'	New	48#; J-55	N/A	Yes
Intermediate 1	12-1/4"	9-5/8"	2,477'	New	36#; J-55	N/A	Yes
Intermediate 2							
Intermediate 3							
Production	8-3/4" & 8-1/2"	5-1/2"	11,789'	New	20#; P-110	N/A	Yes
Tubing		2-3/8"	7173'		4.7#; N-80	N/A	
Packer type and depth set		N/A					

Comment Details *Due to unanticipated void, Antero was unable to get surface casing beyond ~210' (GL) and unable to isolate the coal seam at ~210'-220' with cement.

Following proposal submitted to WVDEP on 8/29/12, cemented 16" casing with 1000 sx of Class A cement. Ran Bond Log, drilled out casing and cleaned wellbore to 483' (KB) to run 13-3/8" casing with 2 baskets above and below coal seam, centralizing every 3 joints to surface and cemented with no returns to surface. Notified Inspector, ran Bond Log and set Cement Retainer.

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	Class A	163 sx	15.6	1.18	67	0'	8 Hrs.
Surface	Class A	1,000 sx	15.6	1.18	146	*See Comments	8 Hrs. +
Surface	Class A	222 sx	15.6	1.18	306	230'	8 Hrs. +
Intermediate 1	Class A	921 sx	15.6	1.18	776	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	963 sx (Lead); 602 sx (Tail)	13.5 (Lead); 15.2 (Tail)	1.44 (Lead); 1.8 (Tail)	2248	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 11,789' MD, 6,952' TVD (BHL); 7,033' TVD (Deepest Point Drilled) Loggers TD (ft) 11,746'
 Deepest formation penetrated Marcellus Plug back to (ft) N/A
 Plug back procedure N/A

Kick off depth (ft) 6,379'

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
 Surface- 1 above guide shoe, 1 above insert float, 1 every 3rd 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 Radioactive & Chemical RECEIVED
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API 47- 033 - 05602 Farm name Southern, Edgar Well number Cottrill Unit 3H

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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EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	13-Mar-13	11,479	11,735	60	Marcellus
2	14-Mar-13	11,126	11,382	60	Marcellus
3	15-Mar-13	10,772	11,028	60	Marcellus
4	15-Mar-13	10,419	10,675	60	Marcellus
5	15-Mar-13	10,066	10,322	60	Marcellus
6	15-Mar-13	9,712	9,968	60	Marcellus
7	16-Mar-13	9,359	9,615	60	Marcellus
8	16-Mar-13	9,006	9,262	60	Marcellus
9	16-Mar-13	8,652	8,908	60	Marcellus
10	16-Mar-13	8,299	8,555	60	Marcellus
11	16-Mar-13	7,946	8,202	60	Marcellus
12	17-Mar-13	7,592	7,848	60	Marcellus
13	17-Mar-13	7,239	7,495	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-Mar-13	72.0	7,577	6,021	4,670	274,300	7,165	N/A
2	14-Mar-13	72.0	7,048	6,015	4,406	271,812	7,806	N/A
3	15-Mar-13	72.0	7,328	6,015	4,375	275,839	7,509	N/A
4	15-Mar-13	72.0	7,144	6,127	4,786	274,552	8,228	N/A
5	15-Mar-13	69.0	7,339	7,000	4,461	220,991	8,184	N/A
6	15-Mar-13	70.0	7,282	6,277	4,052	277,606	7,361	N/A
7	16-Mar-13	71.0	6,981	6,041	4,607	276,348	7,473	N/A
8	16-Mar-13	73.0	6,887	5,779	4,481	271,810	7,183	N/A
9	16-Mar-13	73.0	691	5,746	4,025	274,988	7,066	N/A
10	16-Mar-13	73.0	6,837	5,673	4,382	278,535	7,153	N/A
11	17-Mar-13	70.0	7,451	6,475	5,013	207,411	7,468	N/A
12	17-Mar-13	72.0	6,845	6,180	5,347	277,024	7,130	N/A
13	17-Mar-13	72.0	6,557	5,100	4,169	274,704	7,002	N/A
	AVG=	72	6,613	6,035	4,521	3,455,920	96,728	TOTAL

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EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Fresh Water	202	N/A	202	N/A
Siltstone	0	17	0	17
Siltstone w/Trace Coal	est 17	267	est 17	267
Sand/Siltstone	est 267	687	est 267	687
Coal	est 687	747	est 687	747
Siltstone w/Trace Coal	est 747	867	est 747	867
Sandstone	est 867	927	est 867	927
Shale	est 927	1,207	est 927	1,207
Shale/ Siltstone	est 1207	1,417	est 1207	1,417
Shale	est 1417	1,523	est 1417	1,523
Big Lime	1,523	1,604	1,523	1,604
Big Injun	1,604	2,037	1,604	2,037
Gantz Sand	2,037	2,145	2,037	2,145
Fifty Foot Sandstone	2,145	2,253	2,145	2,253
Gordon	2,253	2,557	2,253	2,557
Fifth Sandstone	2,557	2,603	2,557	2,603
Bayard	2,603	2,979	2,603	2,979
Warren	2,979	3,248	2,979	3,249
Speechley	3,248	3,799	3,249	3,799
Baltown	3,799	4,131	3,799	4,131
Bradford	4,131	4,628	4,131	4,629
Benson	4,628	4,921	4,629	4,921
Alexander	4,921	5,116	4,921	5,117
Elk	5,116	5,802	5,117	5,803
Rhinestreet	5,802	6,343	5,803	6,344
Sycamore	6,343	6,573	6,344	6,588
Middlesex	6,573	6,761	6,588	6,830
Burkett	6,761	6,788	6,830	6,869
Tully	6,788	6,965	6,869	7,196
Marcellus	6,965	NA	7,196	NA

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Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date	3/14/2013
Job End Date	3/17/2013
State	West Virginia
County	Harrison
API Number	47-033-05602-00-00
Operator Name	Antero Resources Corporation
Well Name and Number	Cottrell Unit 3H
Longitude	-80.47941940
Latitude	39.26571390
Datum	NAD27
Federal/Tribal Well	NO
Total Base Water Volume (gal)	4,055,898
Total Base Non Water Volume	170,765

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	Operator	Carrier	Water		100.00000	90.36293	
Sand, White, 40/70	Baker Hughes	Proppant	Crystalline Silica (Quartz)	14808-60-7	100.00000	4.83317	
Sand, White, 20/40	Baker Hughes	Proppant	Crystalline Silica (Quartz)	14808-60-7	100.00000	3.11641	
Sand, White, 100 mesh	Baker Hughes	Proppant	Crystalline Silica (Quartz)	14808-60-7	100.00000	1.28579	
HCl, 10.1 - 15%	Baker Hughes	Acidizing	Water	7732-18-5	85.00000	0.15370	
			Hydrochloric Acid	7647-01-0	15.00000	0.02712	
GW-3LDF	Baker Hughes	Gelling Agent	Guar Gum	9000-30-0	60.00000	0.04503	SmartCare Product
			Petroleum Distillates	64742-47-8	30.00000	0.02252	SmartCare Product
			Paraffinic Petroleum Distillate	64742-55-8	30.00000	0.02252	SmartCare Product
			Crystalline Silica, Quartz (SiO2)	14808-60-7	5.00000	0.00375	SmartCare Product
			1-Butoxy-2-Propanol	5131-66-8	5.00000	0.00375	SmartCare Product
			sofridecanol, ethoxylated	9043-30-5	5.00000	0.00375	SmartCare Product
FRW-18	Baker Hughes	Friction Reducer	Petroleum Distillates	64742-47-8	30.00000	0.01578	SmartCare Product



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Enzyme G-NE	Baker Hughes	Breaker	Water	7732-18-5	95.00000	0.01196	
			Hemicellulase Enzyme Concentrate	3025-56-3	5.00000	0.00063	
Alpha 1427	Baker Hughes	Biodice	Glycolaldehyde	111-30-8	30.00000	0.00673	SmartCare Product
			Didecyl Dimethyl Ammonium Chloride	7173-51-5	10.00000	0.00224	SmartCare Product
			Ethanol	64-17-5	5.00000	0.00115	SmartCare Product
			Quaternary Ammonium Compound	38424-85-1	5.00000	0.00112	SmartCare Product
Scaletro 720	Baker Hughes	Scale Inhibitor	Ethylene Glycol	107-21-1	30.00000	0.00465	
			Calcium Chloride	10043-52-4	5.00000	0.00078	
Ferrotrol 300L	Baker Hughes	Iron Control	Citric Acid	77-92-9	60.00000	0.00071	SmartCare Product
Cl-14	Baker Hughes	Corrosion Inhibitor	Polyoxyalkylenes	Trade Secret	30.00000	0.00008	
			Fatty Acids	Trade Secret	10.00000	0.00003	
			Propargyl Alcohol	107-19-7	5.00000	0.00001	
			Clefin	Trade Secret	5.00000	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							
		Other Chemicals	Water	7732-18-5		0.04806	
			Poly (acrylamide-co-acrylic acid)	Trade Secret		0.01578	
			Polyacrylate	Trade Secret		0.00313	
			Salt	Trade Secret		0.00263	
			Sorbital Monoololate	Trade Secret		0.00263	
			Ethoxylated Alcohol	Trade Secret		0.00105	
			Methanol	67-56-1		0.00027	
			2-Butoxy-1-Propanol	15821-83-7		0.00006	
			Modified Thiocrea Polymer	58527-49-1		0.00002	
			Potassium Chloride	7447-40-7		0.00001	
			Sodium Chloride	7647-14-5		0.00000	
			Hydrochloric Acid	7647-01-0		0.00000	
			Formaldehyde	50-00-0		0.00000	

* 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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