



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
(304) 926-0450
(304) 926-0452 fax

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL

August 12, 2013

ANTERO RESOURCES APPALACHIAN CORPORATION
1625 17TH STREET, SUITE 300
DENVER, CO 80202

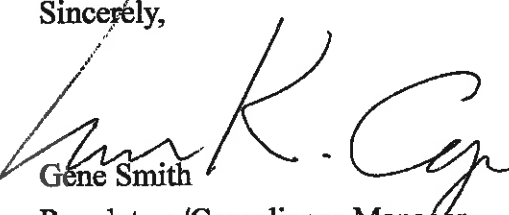
Re: Permit Modification Approval for API Number 3305724 , Well #: ISAAC UNIT 1H
changed bottom hole location

Oil and Gas Operator:

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

for 
Gene Smith
Regulatory/Compliance Manager
Office of Oil and Gas

Promoting a healthy environment.

08/16/2013

33-5724MOD



August 1, 2013

Antero Resources
1625 17th Street
Denver, Colorado 80202
Office 303.357.7310
Fax 303.357.7315

West Virginia Department of Environmental Protection
Office of Oil and Gas
Attn: Ms. Laura Cooper
601 57th Street
Charleston, WV 25304

Ms. Laura Cooper:

Antero Resources Corporation (Antero) would like to submit the following permit modification for an approved well on the Sperry 2 Pad. We are requesting to slightly modify the bottom hole location of the Isaac Unit 1H (API# 47-033-05724).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised MD and Production Casing/Cement program
- REVISED Form WW-6A1, which shows the leases we will be drilling into
- REVISED Mylar Plat, which shows the new bottom hole location

If you have any questions please feel free to contact me at (303) 357-7323.

Thank you in advance for your consideration.

Sincerely,

Ashlie Mihalcin
Permit Representative
Antero Resources Corporation

Enclosures

Received

AUG - 2 2013

Office of Oil and Gas
WV Dept. of Environmental Protection

08/16/2013

WW - 6B
(3/13)

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: Antero Resources Corporation 494488557 033-Harrison Union West Milford
Operator ID County District Quadrangle

2) Operator's Well Number: Isaac Unit 1H Well Pad Name: Existing Washbourne Pad

3 Elevation, current ground: 1168' Elevation, proposed post-construction: 1168'

4) Well Type: (a) Gas Oil Underground Storage
Other _____
(b) If Gas: Shallow Deep
Horizontal

5) Existing Pad? Yes or No: Yes

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):
Marcellus Shale: 7200' TVD, Anticipated Thickness- 65' feet, Associated Pressure- 3100#

7) Proposed Total Vertical Depth: 7,200' TVD

8) Formation at Total Vertical Depth: Marcellus Shale

9) Proposed Total Measured Depth: 18,900' MD

10) Approximate Fresh Water Strata Depths: 50', 75'

11) Method to Determine Fresh Water Depth: GT Post Unit 2H (API #47-033-05577). Subsequent well on same pad.

12) Approximate Saltwater Depths: 625', 721'

13) Approximate Coal Seam Depths: 680', 1142'

14) Approximate Depth to Possible Void (coal mine, karst, other): None anticipated

15) Does proposed well location contain coal seams directly overlying or adjacent to an active mine? If so, indicate name and depth of mine: No

16) Describe proposed well work: Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale

17) Describe fracturing/stimulating methods in detail:
Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 15.45 acres (existing)

19) Area to be disturbed for well pad only, less access road (acres): 3.05 acres (existing)

WW - 6B
(3/13)

20) CASING AND TUBING PROGRAM

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill -up (Cu. Ft.)
Conductor	20"	New	H-40	94#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/ 48#	300'	300'	CTS, 417 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2495'	2495'	CTS, 1016 Cu Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	18900'	18900'	4799 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7200'	
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield
Conductor	20"	24"	0.438"	1530	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	Class A	1.18
Intermediate						
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12630	Lead-H/POZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11200		
Liners						

PACKERS

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

Received
AUG - 2 2013
Office of Oil and Gas
WV Dept. of Environmental Protection Page 2 of 3

08/16/2013

WW - 6B
(3/13)

21) Describe centralizer placement for each casing string. Conductor: no centralizers
Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface.
Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface.
Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.

22) Describe all cement additives associated with each cement type.
Conductor: no additives, Class A cement.
 ✓ Surface: Class A cement with 2% calcium and 1/4 lb flake, 5 gallons of clay treat
Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat
Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51
Production: Tail cement- Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20

23) Proposed borehole conditioning procedures. Conductor: blowhole clean with air, run casing, 10 bbls fresh water.
Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.
Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.
Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

*Note: Attach additional sheets as needed.

Received
 AUG - 2 2013
 Office of Oil and Gas
 WV Dept. of Environmental Protection
 Page 3 of 3

08/16/2013

9,870' to Bottom Hole

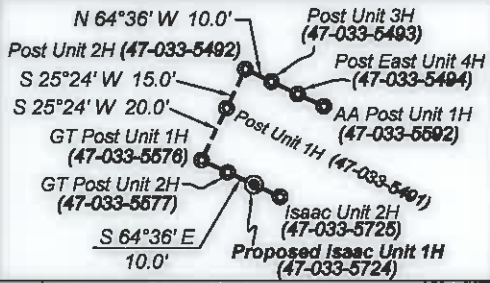
Antero Resources Well No. Isaac Unit 1H Antero Resources Corporation

	Tax Map 364 Owner	Bk/Pg	Acres
1	Ronald D. Cork	1245/1115	22.81
2	Blue Heron Property Mgt II LLC	1441/1042	25.14
3	Blue Heron Property Mgt II LLC	1441/1045	131.61
4	Ronald & Carol Cork	993/216	6.63
5	Blue Heron Property Mgt II LLC	1441/1045	5.0

47-033-4015 2,349' to Top Hole
TOP HOLE LATITUDE 39 - 15 - 00
BOTTOM HOLE LATITUDE 39 - 15 - 00

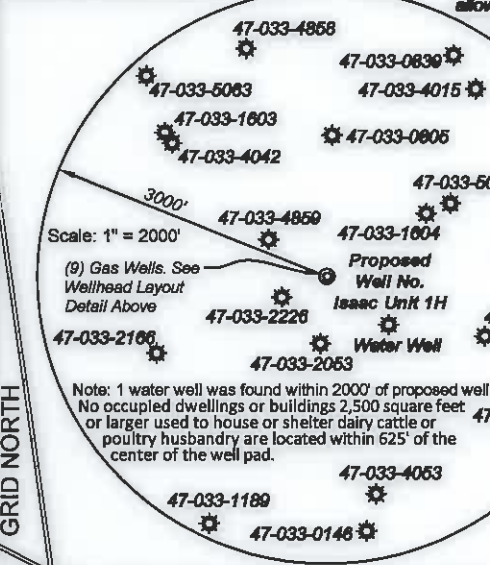
Legend

- Proposed gas well
- Found monument, as noted
- Existing Well (as noted)
- Creek or Drain
- Existing Road
- Surface boundary (approx.)
- Interior surface tracts (approx.)
- Existing Fenceline



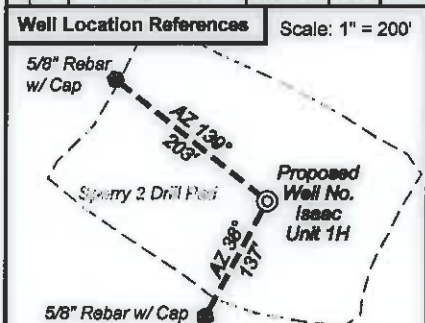
Line	Bearing	Distance
L1	S 77°58' W	2037.4'
L2	N 65°05' E	516.8'
L3	N 28°19' E	1550.3'
L4	N 06°28' E	711.1'
L5	N 80°12' E	1323.8'

(+) Denotes Location of Well on United States Topographic Maps



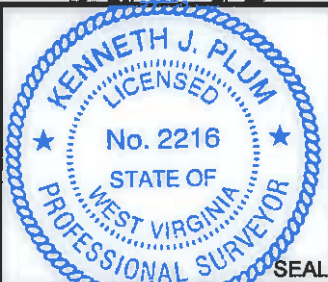
Notes:
 West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.
 Well No. Isaac Unit 1H Top Hole coordinates are
 N: 270,258.90' Latitude: 39°14'16.72"
 E: 1,726,255.88' Longitude: 80°27'59.28"
 Bottom Hole coordinates are
 N: 260,749.44' Latitude: 39°12'43.16"
 E: 1,730,533.98' Longitude: 80°27'03.61"
 UTM Zone 17, NAD 1983
 Top Hole Coordinates Bottom Hole Coordinates
 N: 4,343,331.414m N: 4,340,456.029m
 E: 546,060.879m E: 547,412.496m
 Plat orientation and corner and well references are based upon the grid north meridian.
 Well location references are based upon the magnetic meridian.

Par	Tax Map 364 Owner	Bk/Pg	Acres
6	7.1 Philip J. & Norma Fetsy	923/100	0.55
7	7 Joe, John & Phillip Fetsy	1416/228	22.36
8	7.2 Joe, John & Phillip Fetsy	1416/228	25.90
9	36.3 Deborah McCullough	1328/128	2.84
10	36.1 Irvin Ashcraft	1471/121	12.71



I, the undersigned, hereby certify that this plat is correct to the best of my knowledge and belief and shows all the information required by law and the rules issued and prescribed by the Department of Environmental Protection.

Kenneth J. Plum
 Kenneth J. Plum, P.S. 2216



FILE NO: 183-36-U-11
 DRAWING NO: 183-11 Isaac 1H Well Plat
 SCALE: 1" = 1500'
 MINIMUM DEGREE OF ACCURACY: Submeter
 PROVEN SOURCE OF ELEVATION: WVDOT, Bridgeport, WV

STATE OF WEST VIRGINIA
 DEPARTMENT OF ENVIRONMENTAL PROTECTION
 OIL AND GAS DIVISION

DATE: August 1 2013
 OPERATOR'S WELL NO. Isaac Unit 1H
 API WELL NO. MOD
 47 - 033 - 05724 H6A
 STATE COUNTY PERMIT

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL
 (IF GAS) PRODUCTION: STORAGE DEEP SHALLOW
 LOCATION: ELEVATION: 1168' WATERSHED: Sycamore Creek QUADRANGLE: West Milford
 DISTRICT: Union COUNTY: Harrison
 SURFACE OWNER: Clarence Sperry Isaac L. Post, et ux 90394 & 90458 ACREAGE: 97.16
 ROYALTY OWNER: A.A. Post, et ux; A.A. Post, et ux; Porter Maxwell; G.T. Post S.C. Allen, et al; D.O. Morgan, et ux 052846; 052924; 052851 ACREAGE: 235; 237
 LEASE NO: 052934; 052927; 052925 ACREAGE: 291.5; 270; 254.5
 PROPOSED WORK: DRILL CONVERT DRILL DEEPER FRACTURE OR STIMULATE PLUG OFF OLD FORMATION
 PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) Modification - BHL
 PLUG AND ABANDON CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 7,200' TVD 18,900' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System
 ADDRESS: 1625 17th Street ADDRESS: 5400 D Big Tyler Road
 Denver, CO 80202 Charleston, WV 25313

TOP HOLE LONGITUDE 80 - 27 - 30
 BOTTOM HOLE LONGITUDE 80 - 25 - 00
 4,354' to Top Hole
 13,740' to Bottom Hole

08/16/2013