



**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

March 12, 2014

**WELL WORK PERMIT**

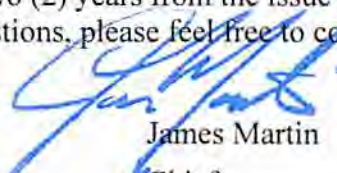
**Horizontal 6A Well**

This permit, API Well Number: 47-1706441, issued to ANTERO RESOURCES CORPORATION, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.



James Martin  
Chief

Operator's Well No: ARTIE UNIT 3H  
Farm Name: FORD, JEFFREY J.  
**API Well Number: 47-1706441**  
**Permit Type: Horizontal 6A Well**  
Date Issued: 03/12/2014

Promoting a healthy environment.

03/14/2014

## PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

### CONDITIONS

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1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACOE). Through this permit, you are hereby being advised to consult with USACOE regarding this proposed activity.
2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the fill material shall be within plus or minus 2% of the optimum moisture content as determined by the standard proctor density test, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. Each lift must meet 95 % compaction of the optimum density based on results from the standard proctor density test of the actual soils used in specific engineered fill sites. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

WW-6B  
(9/13)

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

1) Well Operator: Antero Resources Corporation 494488557 017-Doddridge Greenbrier Big Isaac  
Operator ID County District Quadrangle

2) Operator's Well Number: Artie Unit 3H Well Pad Name: Heflin North Pad

3) Farm Name/Surface Owner: Jeffrey J. Ford Public Road Access: CR 48

4) Elevation, current ground: ~1212' Elevation, proposed post-construction: 1208'

5) Well Type (a) Gas  Oil  Underground Storage   
Other

(b) If Gas Shallow  Deep   
Horizontal

*DCW  
2-26-2014*

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):  
Marcellus Shale: 7400' TVD, Anticipated Thickness- 50 feet, Associated Pressure- 3200#

8) Proposed Total Vertical Depth: 7400' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 13,900' MD

11) Proposed Horizontal Leg Length: 6065'

12) Approximate Fresh Water Strata Depths: 105', 301'

13) Method to Determine Fresh Water Depths: Offset well records. Depths have been adjusted according to surface elevations.

14) Approximate Saltwater Depths: 666', 682'

15) Approximate Coal Seam Depths: 286', 393', 641', 905'

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

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes  No

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

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(9/13)

18)

**CASING AND TUBING PROGRAM**

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill-up (Cu. Ft.)</u>
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#	375'	375'	CTS, 521 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2465'	2465'	CTS, 1004 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	13900'	13900'	3426 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

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2-26-2014*

<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
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			

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MAR - 5 - 2014

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19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

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."

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 3.79 acres

22) Area to be disturbed for well pad only, less access road (acres): 3.79 acres

23) 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.

24) Describe all cement additives associated with each cement type:

Conductor: no additives, Class A cement.

Surface: Class A cement with 2-3% calcium chloride

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

25) 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  
MAR 14 2014  
Page 3 of 3  
Office of Oil and Gas  
WV Dept. of Environmental Protection

WW-9  
(9/13)

API Number 47 - 017 - \_\_\_\_\_  
Operator's Well No. Artie Unit 3H

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

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Antero Resources Corporation OP Code 494488557

Watershed (HUC 10) Big Isaac Creek Quadrangle Big Isaac

Elevation 1208' County Doddridge District Greenbrier

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes  No

Will a pit be used? Yes  No

If so, please describe anticipated pit waste: No pit will be used at this site (Drilling and Flowback Fluids will be stored in tanks. Cuttings will be tanked and hauled off site.)

Will a synthetic liner be used in the pit? Yes  No  If so, what ml.? N/A

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection ( UIC Permit Number \_\_\_\_\_ )
- Reuse (at API Number Future permitted well locations when applicable. API# will be provided on Form WR-34 )
- Off Site Disposal (Supply form WW-9 for disposal location) (Meadowfill Landfill Permit #SWF-1032-98)
- Other (Explain \_\_\_\_\_)

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2-26-2014*

Will closed loop system be used? If so, describe: Yes

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Surface - Air/Freshwater, Intermediate - Dust/Stiff Foam, Production - Water Based Mud

-If oil based, what type? Synthetic, petroleum, etc. N/A

Additives to be used in drilling medium? Please See Attachment

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Stored in tanks, removed offsite and taken to landfill.

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-1032-98)

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature [Signature]

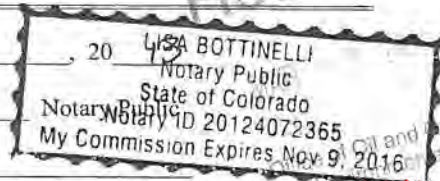
Company Official (Typed Name) Randy Kloberdanz

Company Official Title Environmental Director

Subscribed and sworn before me this 27 day of Dec

[Signature]

My commission expires 11/9/2014



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WV Dept. of Environmental Protection  
03/14/2014

Antero Resources Corporation

Proposed Revegetation Treatment: Acres Disturbed 3.79 Prevegetation pH \_\_\_\_\_

Lime 2-3 Tons/acre or to correct to pH 6.5

Fertilizer type Hay or straw or Wood Fiber (will be used where needed)

Fertilizer amount 500 lbs/acre

Mulch 2-3 Tons/acre

\*Please note that this location is sharing the Access Roads "A" & "B" (3.40), Centralized Impoundment (3.57) and Excess/Topsoil Materials Stockpiles (1.87) with the Heflin North Centralized Impoundment. The Heflin North Pad will consist of 3.79 total acres of disturbance which is referenced as "Staging Area" (3.79) on the Heflin North Centralized Impoundment design.

Seed Mixtures

Temporary

Permanent

Seed Type	lbs/acre
Annual Ryegrass	40

Seed Type	lbs/acre
Crownvetch	10-15

\*See attached Table 3 for additional seed type (Pearl Jean Pad Design Page 15)

\*See attached Table 4a for additional seed type (Heflin North Pad Design Page 15)

\*or type of grass seed requested by surface owner

\*or type of grass seed requested by surface owner

NOTE: No Fescue or Timothy Grass shall be used

Attach:

Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: Douglas Newell

Comments: Reseed + Mulch install ERS TO WD Dep regulations

Title: Oil & Gas Inspector Date: 2-26-2014

Field Reviewed?  Yes  No

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MAR 11 2014  
Office of Oil and Gas  
WV Dept. of Energy  
03/14/2014



# Well Site Safety Plan

## Antero Resources

**Well Name:** Artie Unit 1H, Artie Unit 2H, Artie Unit 3H,  
Sulfur Unit 1H, Sulfur Unit 2H, Lead Unit 1H,  
Lead Unit 2H and Hoover Unit 1H

**Pad Location:** HEFLIN NORTH PAD  
Doddridge County/ Greenbrier District

**GPS Coordinates:** Lat 39°12'12.96"/Long -80°33'6.14" (NAD83)

### Driving Directions:

From Clarksburg, WV

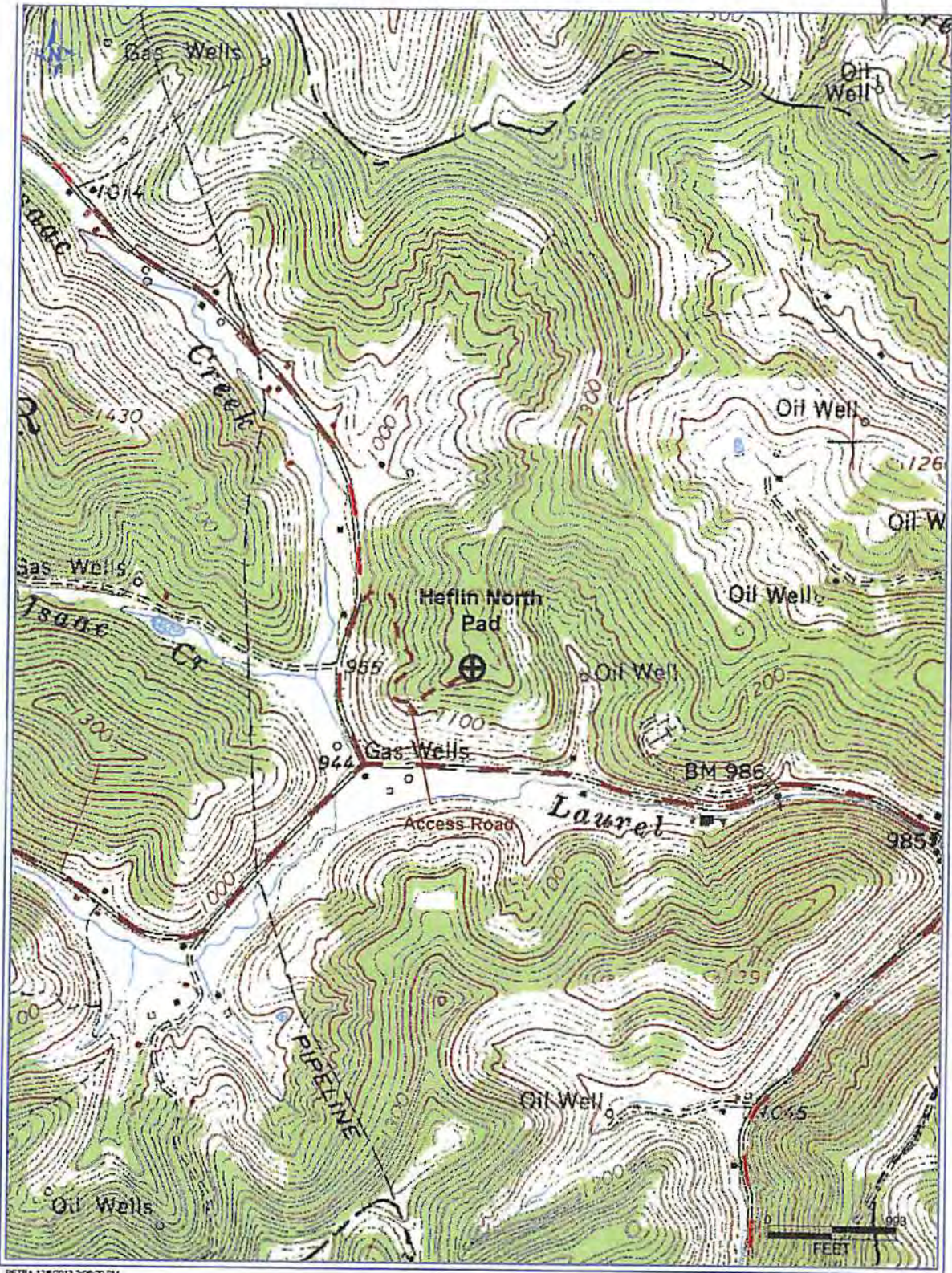
Head west on US 50 W for 8.4 miles. Turn left onto Co RTE 31/Jarvisville-Makin road and continue for 4.8 miles. Turn right onto CO RTE 31/Jarvisville road and continue for 2.6 miles. Make a slight left onto Jarvisville-Makin road and continue for 0.5 miles. Continue onto Co RTE 25/Meathouse Fork for 1.8 miles. Keep right for Co RTE 48 and continue for 0.2 miles. Access Road will be on the right.

*DCN  
2-26-2014*

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plant spotted



DETRA 12/6/2013 2:06:20 PM

DCW  
2-26-2014

**Antero Resources Corporation**  
 Appalachian Basin  
 Artie Unit 3H  
 Doddridge County

Quadrangle: Big Isaac  
 Watershed: Meathouse Fork  
 District: Greenbrier  
 Date: 12-06-2013

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**Antero Resources**  
Well No. Artie Unit 3H  
Antero Resources Corporation

Well Location References

2,892' to Top Hole  
**BTM HOLE LATITUDE 39 - 15 - 00**  
**TOP HOLE LATITUDE 39 - 12 - 30**

**Notes:**  
West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
Well No. Artie Unit 3H Top Hole coordinates are  
N: 257,982.70' Latitude: 39°12'12.69"  
E: 1,701,938.05' Longitude: 80°33'06.48"  
Bottom Hole coordinates are  
N: 263,842.03' Latitude: 39°13'10.25"  
E: 1,698,990.59' Longitude: 80°33'44.80"  
UTM Zone 17, NAD 1983  
Top Hole Coordinates Bottom Hole Coordinates  
N: 4,339,467.924m N: 4,341,237.998m  
E: 538,714.637m E: 537,786.924m  
Plat orientation and corner and well references are based upon the grid north meridian.  
Well location references are based upon the magnetic meridian.



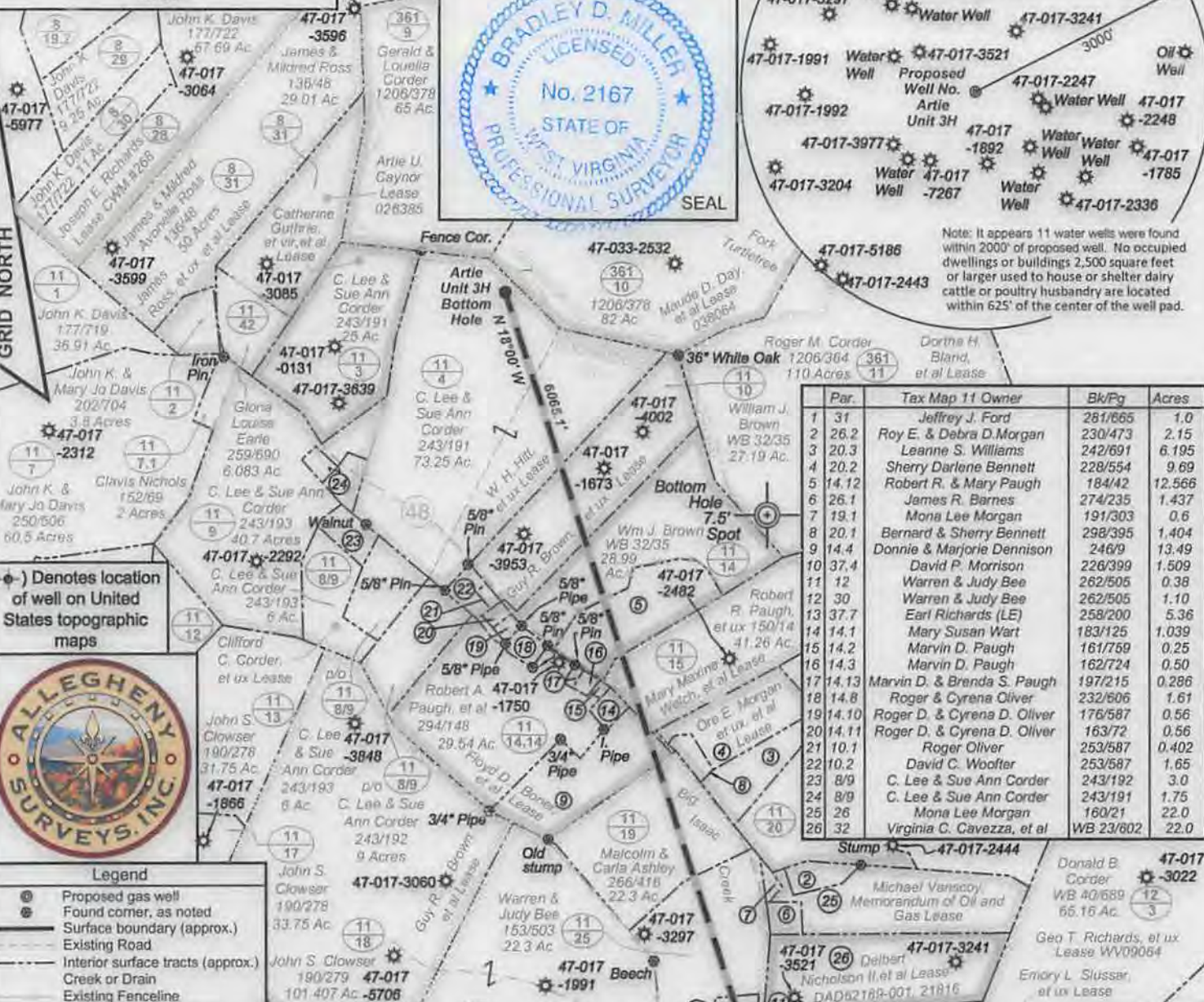
	Bearing	Dist.
L1	S 55°26' E	889.4'
L2	S 69°58' E	1035.3'
L3	N 83°38' W	788.8'
L4	N 85°09' W	1077.1'



LONGITUDE 80 - 32 - 30  
1,718' to Top Hole

Scale: 1" = 200'

Scale: 1" = 2000'



Note: It appears 11 water wells were found within 2000' of proposed well. No occupied dwellings or buildings 2,500 square feet or larger used to house or shelter dairy cattle or poultry husbandry are located within 625' of the center of the well pad.

Par.	Tax Map 11 Owner	Bk/Pg	Acres
1	Jeffrey J. Ford	281/865	1.0
2	Roy E. & Debra D. Morgan	230/473	2.15
3	Leanne S. Williams	242/691	6.195
4	Sherry Darlene Bennett	228/554	9.69
5	Robert R. & Mary Paugh	184/42	12.566
6	James R. Barnes	274/235	1.437
7	Mona Lee Morgan	191/303	0.6
8	Bernard & Sherry Bennett	298/395	1.404
9	Donnie & Marjorie Dennison	246/9	13.49
10	David P. Morrison	226/399	1.509
11	Warren & Judy Bee	262/505	0.38
12	Warren & Judy Bee	262/505	1.10
13	Earl Richards (LE)	258/200	5.36
14	Mary Susan Wart	183/125	1.039
15	Marvin D. Paugh	161/759	0.25
16	Marvin D. Paugh	162/724	0.50
17	Marvin D. & Brenda S. Paugh	197/215	0.286
18	Roger & Cyrena Oliver	232/506	1.61
19	Roger D. & Cyrena D. Oliver	176/587	0.56
20	Roger D. & Cyrena D. Oliver	163/72	0.56
21	Roger Oliver	253/587	0.402
22	David C. Woolfer	253/587	1.65
23	C. Lee & Sue Ann Corder	243/192	3.0
24	C. Lee & Sue Ann Corder	243/191	1.75
25	Mona Lee Morgan	160/21	22.0
26	Virginia C. Cavezza, et al	WB 23/602	22.0

(-o-) Denotes location of well on United States topographic maps



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

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.

*Bradley D. Miller*  
Bradley D. Miller, P.S. 2167

FILE NO: 237-30-G-12  
DRAWING NO: 237-12 Artie 3H Well  
SCALE: 1" = 1200'  
MINIMUM DEGREE OF ACCURACY: Submeter  
PROVEN SOURCE OF ELEVATION: WVDOT, Bridgeport, WV

**STATE OF WEST VIRGINIA**  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
**OFFICE OF OIL AND GAS**

DATE: December 16 20 13  
OPERATOR'S WELL NO. Artie Unit 3H  
API WELL NO: 47 017 06441 H6A  
STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
(IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
LOCATION: ELEVATION: 1207.5' WATERSHED: Big Isaac Creek QUADRANGLE: Big Isaac  
DISTRICT: Greenbrier COUNTY: Doddridge  
SURFACE OWNER: Jeffrey J. Ford Guy R. Brown, et ux; Floyd D. Boner, et al; Mary M. Welch, et al; ACREAGE: 90.74  
ROYALTY OWNER: Jo Lynn Burge, et al; Abraham Hinkle, et ux; W.H. Hitt, et ux LEASE NO: 21447; 44519 ACREAGE: 130; 138; 89.268  
PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) TVD 7,400'  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: MD 13,900'  
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

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DEF 2013