



---

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](http://www.dep.wv.gov)

## PERMIT MODIFICATION APPROVAL

June 13, 2014

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, CO 80202

Re: Permit Modification Approval for API Number 9502130 , Well #: PURSLEY UNIT 1H  
**Lateral Extended**

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,

Gene Smith

Regulatory/Compliance Manager  
Office of Oil and Gas



March 6, 2014

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 57<sup>th</sup> 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 Nalley Pad. We are requesting to extend the horizontal lateral length which will change the bottom hole location of the Pursley Unit 1H (API#47-095-02130).

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, .

A handwritten signature in blue ink that reads "Ashlie Mihalcin".

Ashlie Mihalcin  
Permit Representative  
Antero Resources Corporation

Enclosures

RECEIVED  
Office of Oil and Gas

MAR 09 2014

WV Department of  
Environmental Protection

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 095- Tyler Lincoln Paden City  
Operator ID County District Quadrangle

2) Operator's Well Number: Pursley Unit 1H Well Pad Name: Nalley Pad

3) Farm Name/Surface Owner: Nalley, Robert D. & Virginia D. Public Road Access: CR 18

4) Elevation, current ground: ~985' Elevation, proposed post-construction: 971'

5) Well Type (a) Gas  Oil  Underground Storage

Other \_\_\_\_\_

(b) If Gas Shallow  Deep

Horizontal

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):  
Marcellus Shale: 6300' TVD, Anticipated Thickness- 55 feet , Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 6300' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 15,800' MD

11) Proposed Horizontal Leg Length: 9019'

12) Approximate Fresh Water Strata Depths: 40', 130'

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

14) Approximate Saltwater Depths: 1415', 1510', 1745'

15) Approximate Coal Seam Depths: 667', 692', 1132'

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: \_\_\_\_\_

RECEIVED  
Office of Oil and Gas  
Environmental Protection  
47-095-02130  
11/20/14  
WV Department of  
Environmental Protection  
Office of Oil and Gas  
RECEIVED  
Page 1 of 3

WW-6B  
(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#                           | 90'                          | 90'                            | CTS, 86 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#                           | 2450'                        | 2450'                          | CTS, 998 Cu. Ft.                 |
| Intermediate |             |                    |              |                               |                              |                                |                                  |
| Production   | 5-1/2"      | New                | P-110        | 20#                           | 15800'                       | 15800'                         | 3952 Cu. Ft.                     |
| Tubing       | 2-3/8"      | New                | N-80         | 4.7#                          |                              | 7100'                          |                                  |
| Liners       |             |                    |              |                               |                              |                                |                                  |

| <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 |  |  |  |

RECEIVED  
Office of Oil and Gas  
MAR 09 2014  
WV Department of  
Environmental Protection  
Page 2 of 3

WW-6B  
(9/13)

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): 26.60 acres

22) Area to be disturbed for well pad only, less access road (acres): 6.10 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 pipe capacity + 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.

RECEIVED  
 Office of Oil and Gas  
 MAR 11 2014  
 WV Department of  
 Environmental Protection

\*Note: Attach additional sheets as needed.

10,971' to Top Hole

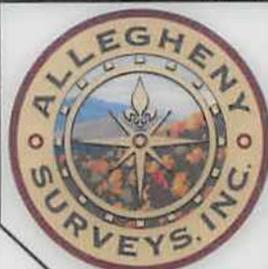
2,567' to Bottom Hole  
TOP & BTM HOLE LATITUDE 39 - 35 - 00

BTM HOLE LONGITUDE 80 - 57 - 30  
TOP HOLE LONGITUDE 80 - 55 - 00

5,430' to Bottom Hole  
13,958' to Top Hole

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

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



**Notes:**  
West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
Well No. Pursley Unit 1H Top Hole coordinates  
N: 383,763.14' Latitude: 39°32'40.32"  
E: 1,589,759.37' Longitude: 80°57'17.22"  
Bottom Hole coordinates  
N: 392,479.28' Latitude: 39°34'05.93"  
E: 1,586,421.29' Longitude: 80°58'01.65"  
**UTM Zone 17, NAD 1983**  
Top Hole Coordinates Bottom Hole Coordinates  
N: 4,377,216.437m N: 4,379,854.862m  
E: 503,899.807m E: 502,838.575m  
Plat orientation and corner and well references are based upon the grid north meridian.  
Well location references are based upon the magnetic meridian.

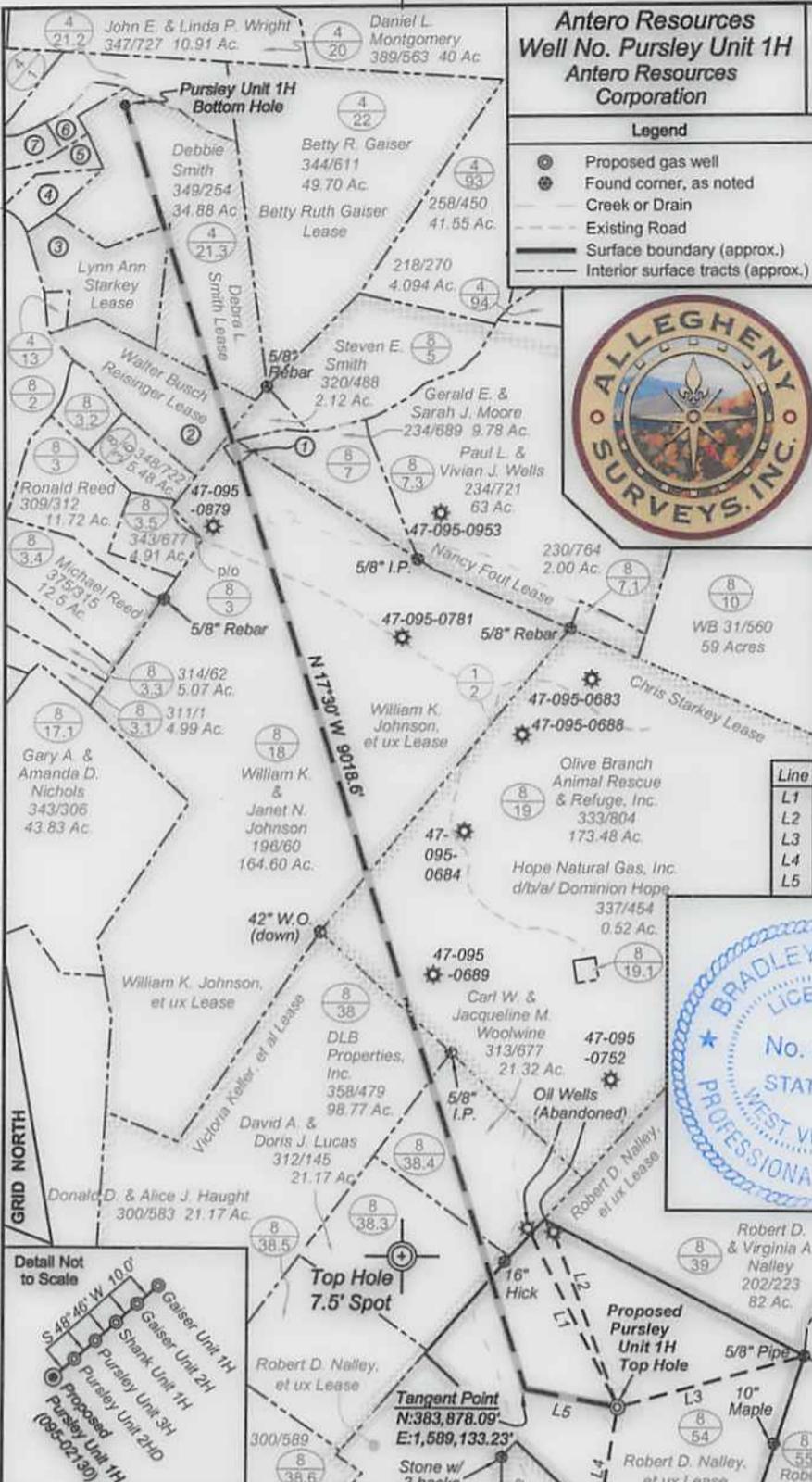
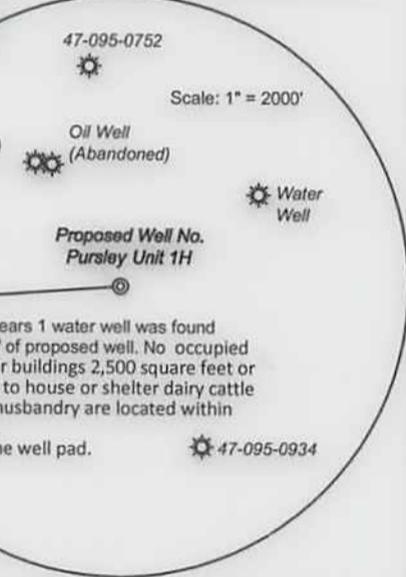
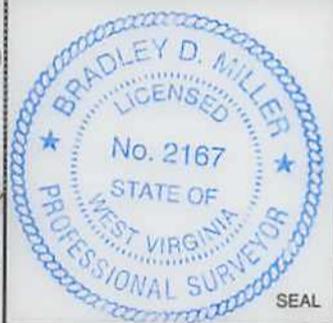
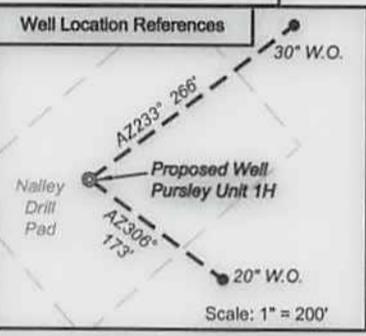
Bottom Hole  
7.5' Spot

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

| Line | Bearing    | Dist.   |
|------|------------|---------|
| L1   | S 27°16' E | 1339.0' |
| L2   | S 20°38' E | 1247.2' |
| L3   | S 74°27' W | 1304.4' |
| L4   | N 09°47' E | 760.7'  |
| L5   | N 79°36' W | 636.6'  |

(-⊙-) Denotes Location of Well on United States Topographic Maps



**Tax Map 8 Owners**

| Par. | Owner                          | Bk. Pg. | Acres |
|------|--------------------------------|---------|-------|
| 1    | Robert E. & Audrey L. Christy  | 346/395 | 0.38  |
| 2    | Melissa D. & David L. Robinson | 368/541 | 14.00 |

**Tax Map 4 Owners**

| Par. | Owner                               | Bk. Pg. | Acres |
|------|-------------------------------------|---------|-------|
| 3    | Anita Jean Starkey (Ass'd 8.54 Ac.) | 204/134 | 11.52 |
| 4    | John E. Wright, et al               | 344/608 | 3.02  |
| 5    | Brian L. Wright                     | 347/721 | 2.96  |
| 6    | Robert Allen & Joseph Aaron Wayne   | 208/6   | 1.90  |
| 7    | Beverly Baker                       | 344/608 | 3.06  |

FILE NO: 214-54-L-13  
DRAWING NO: 214-13 Pursley Unit 1H  
SCALE: 1" = 1200'  
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: March 5 2014  
OPERATOR'S WELL NO. Pursley Unit 1H  
API WELL NO. MOD 47 - 095 - 02130 H6A  
STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
(IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
LOCATION: ELEVATION: 971' WATERSHED: Pursley Creek of the Ohio River QUADRANGLE: Paden City  
DISTRICT: Lincoln Robert D. & Debra L. Smith; Lynn Ann Starkey COUNTY: Tyler 8.54  
SURFACE OWNER: Virginia D. Nalley Nancy Fout; Walter Busch Reisinger ACREAGE: 80 14; 34.88  
ROYALTY OWNER: Robert D. Nalley, et ux; Victoria Keller, et al; Chris Starkey LEASE NO: ACREAGE: 80; 164; 109  
PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) Modification to BHL  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 6,300' TVD 15,800' 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