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west virginia department of environmental protection

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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

January 15, 2016

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, CO 80202

Re: Permit Modification Approval for API Number 1706692, Well #: ALDER UNIT 2H

### Extend Lateral

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,

A handwritten signature in blue ink that reads "Taylor Bensen" with "For" written below it.

Gene Smith  
Assistant Chief of Permitting  
Office of Oil and Gas

Promoting a healthy environment.



December 14, 2015

Antero Resources  
1615 Wynkoop Street  
Denver, CO 80202  
Office 303.357.7310  
Fax 303.357.7315

West Virginia Department of Environmental Protection  
Office of Oil and Gas  
Attn: Ms. Melanie Hankins  
601 57<sup>th</sup> Street  
Charleston, WV 25304

Ms. Hankins:

Antero Resources Corporation (Antero) would like to submit the following permit modification for one approved well on the existing Dotson-Holland Pad. We are requesting to extend the lateral length and associated Estimated Measured Depth for the Alder Unit 2H (API# 47-017-06692).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the updated BHL and Measured Depth
- REVISED Mylar Plat, which shows the new Lateral Length and Estimated Measured Depth
- REVISED Form WW-6A1, which shows the new leases we will be drilling

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 Steele".

Ashlie Steele  
Permitting Supervisor  
Antero Resources Corporation

Enclosures

4701706692 MOD

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

1) Well Operator: Antero Resources Corporation Operator ID: 494488557 County: 017 - Doddridge District: Central Quadrangle: West Union 7.5'

2) Operator's Well Number: Alder Unit 2H Well Pad Name: Dotson-Holland Pad

3) Farm Name/Surface Owner: Holland, Robert L., Jr. Public Road Access: CR 50/31

4) Elevation, current ground: 989' Elevation, proposed post-construction: 989'

5) Well Type (a) Gas  Oil  Underground Storage

Other

(b) If Gas Shallow  Deep

Horizontal

6) Existing Pad: Yes or No Yes 4701706692 MOD

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus Shale: 6,600 TVD, Anticipated Thickness- 60 feet, Associated Pressure- 3100#

8) Proposed Total Vertical Depth: 6600' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 18900' MD

11) Proposed Horizontal Leg Length: 11240'

12) Approximate Fresh Water Strata Depths: 75', 80'

13) Method to Determine Fresh Water Depths: Amanda Unit 1H (API# 47-017-06431) & Amanda Unit 2H (API# 47-017-06432) on same pad

14) Approximate Saltwater Depths: 665'

15) Approximate Coal Seam Depths: 381'

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: \_\_\_\_\_

18)

**CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
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#	360'	360'	CTS, 778 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#	18900'	18900'	4805 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

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TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	24"	0.438"	1530	50	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	1000	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A	1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12,630	2500	Lead-HPOZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

**PACKERS**

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

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."

Anticipated Max Pressure - 9300 lbs  
Anticipated Max Rate - 80 bpm

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21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 33.17 existing acres

22) Area to be disturbed for well pad only, less access road (acres): 4.13 existing 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.

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE  
Chapter 22, Article 6A, Section 5(a)(5)  
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

(1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;

(2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<b><u>Anna Barker, et al Lease</u></b>			
Anna Barker, et al	Lawrence Jacobs	1/8	0061/0423
Lawrence Jacobs	W. Leslie Rogers	Assignment	0061/0400
W. Leslie Rogers	W. Kevin Snider & Ritchie Petroleum Corp.	Assignment	0178/0499
W. Kevin Snider & Ritchie Petroleum Corp.	Key Oil Company	Assignment	0185/0061
W. Kevin Snider & Ritchie Petroleum Corp.	Key Oil Company	Assignment	0187/0059
Key Oil Company	Antero Resources Appalachian Corporation	Assignment	0256/0285
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b><u>Duckworth Cemetery Lease</u></b>			
James Albert Doak, acting as Trustee of the Duckworth Cemetery Fund	Antero Resources Appalachian Corporation	1/8+	0291/0248
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b><u>WVSRA Lease</u></b>			
West Virginia State Rail Authority	Antero Resources Appalachian Corporation	1/8+	0253/0409
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b><u>Kate Mason, et al Lease</u></b>			
Kate Mason, et al	Lawrence Jacob	1/8	0060/0242
Lawrence Jacob	W. Leslie Rogers	Assignment	0061/0400
William L. Rogers, et al	W. Kevin Snider and Ritchie Petroleum Corporation	Assignment	0178/0499
W. Kevin Snider and Ritchie Petroleum Corporation	Key Oil Company	Assignment	0185/0661
Key Oil Company	Antero Resources Appalachian Corporation	Assignment	0276/0526
Antero Resources Appalachian Corporation	Antero Resources	Name Change	Exhibit 1
<b><u>James C. Riddle, et al Lease</u></b>			
James C. Riddle, et al	Lawrence Jacob	1/8+	0060/0246
Lawrence Jacob	W. Leslie Rogers	Assignment	0061/0400
W. Leslie Rogers, et al	W. Kevin Snider and Ritchie Petroleum Corporation	Assignment	0178/0499
W. Kevin Snider and Ritchie Petroleum Corporation	Antero Resources Appalachian Corporation	*Partial Assignment of Oil and Gas Lease	0279/0546
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b><u>Arnold Lyle Stuart, et ux Lease</u></b>			
Arnold Lyle Stuart, et ux	Antero Resources Corporation	1/8+	0356/0378

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WV Department of  
Environmental Protection

\*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE  
Chapter 22, Article 6A, Section 5(a)(5)  
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

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- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<b>Harry Williamson Lease</b>			
Harry D. Williamson	J & J Enterprises	1/8	0136/0270
J & J Enterprises	Eastern American Energy Corp.	Merger	0211/0437
Eastern American Energy Corp.	Enervest East Limited Partnership	Assignment	0193/0509
Enervest East Limited Partnership	The Houston Exploration Company	Assignment	0196/0228
The Houston Exploration Company	Seneca-Upshur Petroleum, Inc.	Assignment	0199/0024
Seneca-Upshur Petroleum, Inc.	Antero Resources Appalachian Corporation	Memorandum of Agreement	0287/0321
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b>Maxine Reed Lease</b>			
Maxine Reed	Eastern American Energy Corporation	1/8	0158/0674
Eastern American Energy Corporation	Eastern Corporation of America	Confirmatory Deed & Assignment of Leases	0240/0498
Eastern Corporation of America	Enerv Eastern Corporation of America	*Partial Assignment of Oil & Gas Leases	0272/0307
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<b>Phyllis Boyce Lease</b>			
Phyllis L. Boyd, et al	Antero Resources Corporation	1/8+	0506/0238
<b>Robert Posey Lease</b>			
Robert G. Posey	Antero Resources Corporation	1/8+	0510/0096

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\*\*CONTINUED ON NEXT PAGE\*\*

WV Department of  
Environmental Protection

\*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

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Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
<b>David Robinson, et al Lease</b>				
David Robinson, et al	Eastern American Energy Corporation	Eastern American Energy Corporation	1/8	0283/0552
Eastern American Energy Corporation	Eastern Corporation of America	Eastern Corporation of America	Confirmatory Deed & Assignment of Leases	0371/0528
Eastern Corporation of America	Antero Resources Appalachian Corp.	Antero Resources Appalachian Corp.	*Partial Assignment of Oil & Gas Leases	0398/0416
Antero Resources Appalachian Corporation	Antero Resources Corporation	Antero Resources Corporation	Name Change	Exhibit 1

\*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

**Acknowledgement of Possible Permitting/Approval  
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Antero Resources Corporation  
 By: Kevin Kilstrom  
 Its: VP Production

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 Page 1 of \_\_\_\_\_  
 WV Department of  
 Environmental Protection

**FORM WW-6A1  
EXHIBIT 1**

**FILED**

**JUN 10 2013**

Natalie E. Torrant,  
Secretary of State  
1900 Kanawha Blvd E  
Bldg 1, Suite 157-K  
Charleston, WV 25305



**IN THE OFFICE OF  
SECRETARY OF STATE**  
Penny Barker, Manager  
Corporations Division  
Tel: (304)558-8000  
Fax: (304)558-8381  
Website: [www.wv.gov](http://www.wv.gov)  
E-mail: [business@wv.gov](mailto:business@wv.gov)

**FILE ONE ORIGINAL.**  
(Two if you want a filed  
stamped copy returned to you)  
**FEE: \$25.00**

**APPLICATION FOR  
AMENDED CERTIFICATE  
OF AUTHORITY**

**Office Hours: Monday - Friday  
8:30 a.m. - 5:00 p.m. ET**

\*\*\*\* In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby \*\*\*\*  
applies for an Amended Certificate of Authority and submits the following statement:

1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
2. Date Certificate of Authority was issued in West Virginia: 6/25/2008
3. Corporate name has been changed to: Antero Resources Corporation  
(Attach one Certified Copy of Name Change as filed in home State of Incorporation.)
4. Name the corporation elects to use in WV: Antero Resources Corporation  
(due to home state name not being available)
5. Other amendments:  
(attach additional pages if necessary)
6. Name and phone number of contact person. (This is optional; however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)  

<u>Alvyn A. Schopp</u>	<u>(303) 367-7310</u>
Contact Name	Phone Number
7. Signature information (See below *\*Important Legal Notice Regarding Signatures\**):  

Print Name of Signer: <u>Alvyn A. Schopp</u>	Title/Capacity: <u>Authorized Person</u>
Signature: <u><i>Alvyn A. Schopp</i></u>	Date: <u>June 10, 2013</u>

4701706692 MSB

*\*Important Legal Notice Regarding Signatures\** For West Virginia Code 3311-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

Form CF-4

Issued by the Office of the Secretary of State

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Office of Oil and Gas  
Revised 4/13

DEC 17 2015

WV Department of  
Environmental Protection

LATITUDE 39°17'30"

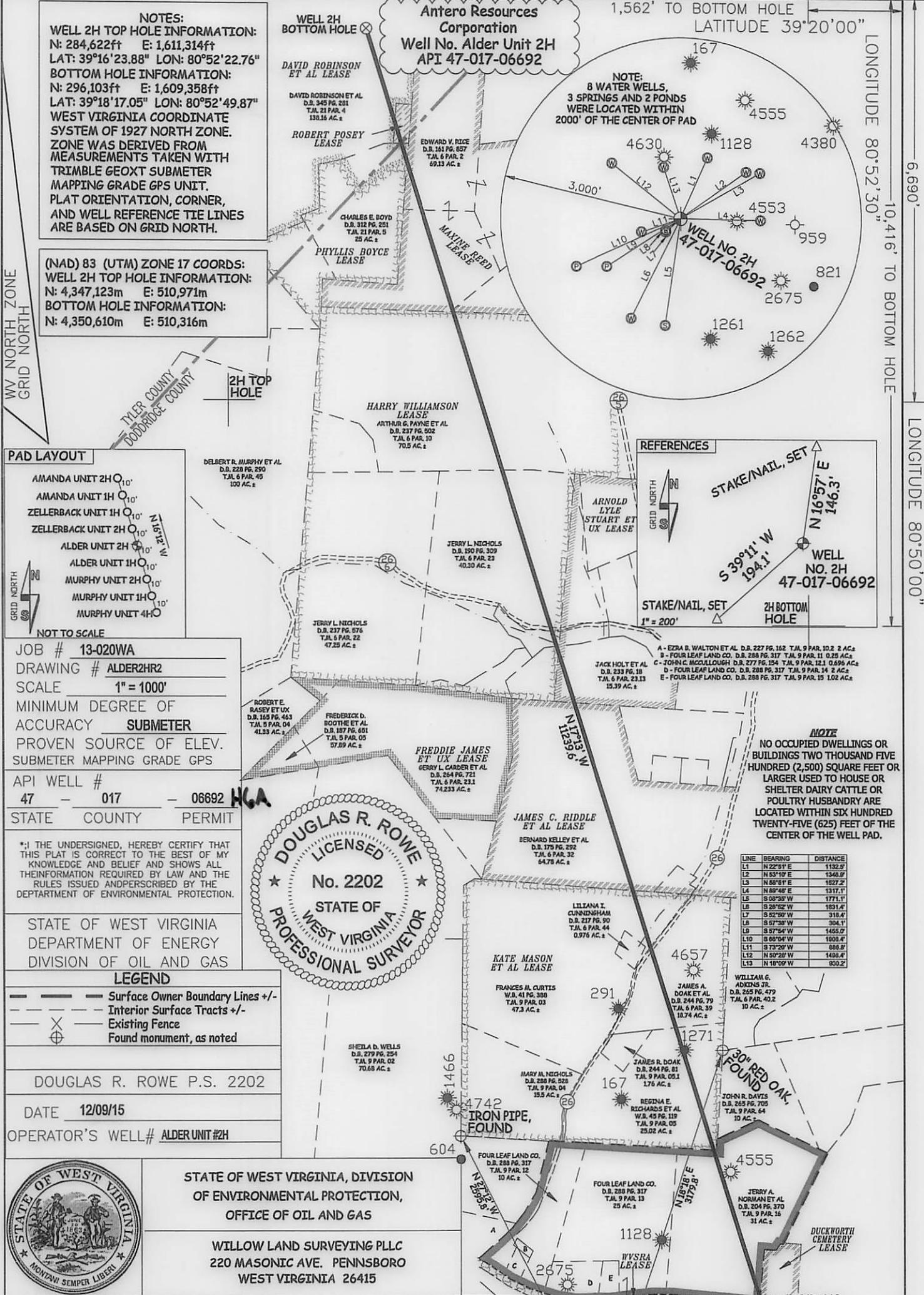
11,226'

1,562' TO BOTTOM HOLE  
LATITUDE 39°20'00"

LONGITUDE 80°52'30"

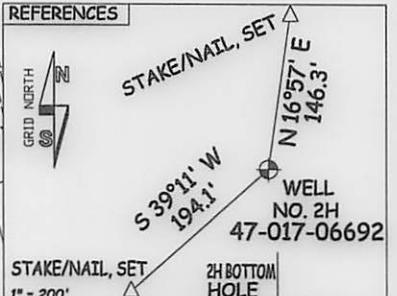
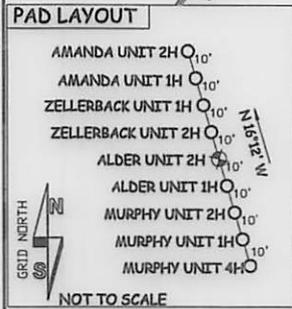
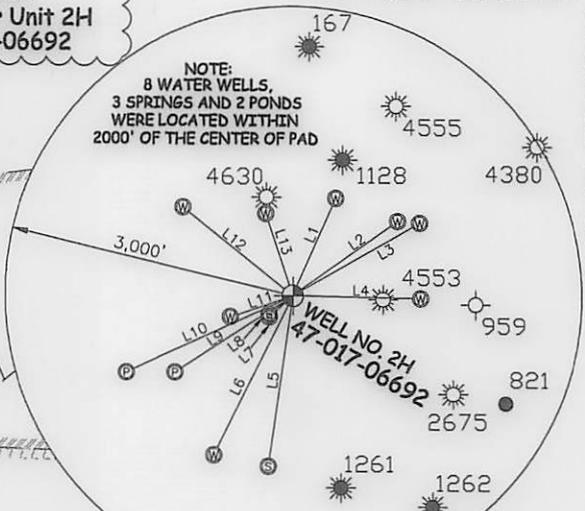
10,416' TO BOTTOM HOLE

LONGITUDE 80°50'00"



**NOTES:**  
**WELL 2H TOP HOLE INFORMATION:**  
 N: 284,622ft E: 1,611,314ft  
 LAT: 39°16'23.88" LON: 80°52'22.76"  
**BOTTOM HOLE INFORMATION:**  
 N: 296,103ft E: 1,609,358ft  
 LAT: 39°18'17.05" LON: 80°52'49.87"  
 WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

**(NAD) 83 (UTM) ZONE 17 COORDS:**  
**WELL 2H TOP HOLE INFORMATION:**  
 N: 4,347,123m E: 510,971m  
**BOTTOM HOLE INFORMATION:**  
 N: 4,350,610m E: 510,316m

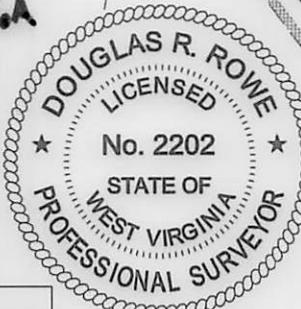


**JOB #** 13-020WA  
**DRAWING #** ALDER2HR2  
**SCALE** 1" = 1000'  
**MINIMUM DEGREE OF ACCURACY** SUBMETER  
**PROVEN SOURCE OF ELEV.** SUBMETER MAPPING GRADE GPS  
**API WELL #** 47 - 017 - 06692  
**STATE COUNTY PERMIT**

STATE OF WEST VIRGINIA  
 DEPARTMENT OF ENERGY  
 DIVISION OF OIL AND GAS

**LEGEND**  
 --- Surface Owner Boundary Lines +/-  
 --- Interior Surface Tracts +/-  
 X Existing Fence  
 ⊕ Found monument, as noted

**DOUGLAS R. ROWE P.S. 2202**  
**DATE** 12/09/15  
**OPERATOR'S WELL #** ALDER UNIT #2H



**NOTE**  
 NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY HUSBANDRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD.

LINE	BEARING	DISTANCE
L1	N 22°17' E	1132.9'
L2	N 53°19' E	1340.9'
L3	N 60°11' E	1527.2'
L4	N 69°40' E	1317.1'
L5	S 08°35' W	1771.1'
L6	S 20°42' W	1831.4'
L7	S 52°50' W	318.4'
L8	S 57°38' W	304.1'
L9	S 57°54' W	1465.0'
L10	S 66°04' W	1800.4'
L11	S 73°20' W	688.8'
L12	N 02°58' W	1408.4'
L13	N 10°09' W	800.2'



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
 WILLOW LAND SURVEYING PLLC  
 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

WELL TYPE: OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL   
 (IF "GAS") PRODUCTION  STORAGE  DEEP  SHALLOW   
 LOCATION: ELEVATION 990' ORIGINAL - 989' AS BUILT WATERSHED NORTH FORK HUGHES RIVER  
 QUADRANGLE WEST UNION 7.5' TH; PENNSBORO 7.5' BH DISTRICT CENTRAL COUNTY DODDRIDGE  
 SURFACE OWNER ROBERT L. HOLLAND JR. ACREAGE 6.60 ACRES +/-  
 OIL & GAS ROYALTY OWNER ANNA BARKER ET AL; WYSRA; DUCKWORTH CEMETERY; KATE MASON ET AL. LEASE ACREAGE 127 AC.; 381.19 AC.; 3.29 AC.; 36 AC.;  
 JAMES C. RIDDLE ET AL; ARNOLD LYLE STUART ET UX; HARRY WILLIAMSON; MAYNE REED; PHYLLIS BOYCE; ROBERT POSEY; DAVID ROBINSON ET AL. 75 AC.; 38 AC.; 106 AC.; 73 AC.; 22 AC.; 14C.; 138.16 AC.;  
 PROPOSED WORK: DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE   
 PLUG OFF OLD FORMATION  PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL  
 (SPECIFY) MOD-BHL  PLUG & ABANDON  CLEAN OUT & REPLUG   
 TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,600' TVD 18,900' MD  
 WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER  
 ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD  
 FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313