



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

December 10, 2015

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET
DENVER, CO 80202

Re: Permit Modification Approval for API Number 1706401, Well #: KNIGHT UNIT 1H

Extending 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,

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

Promoting a healthy environment.

12/11/2015



Department of Environmental Protection

Environmental Protection
Department
100 North Dearborn Street
Chicago, IL 60611

Environmental Protection
Department
100 North Dearborn Street
Chicago, IL 60611
Tel: 312-343-7000
Fax: 312-343-7001

STATEMENT OF WORK

December 2015

STATEMENT OF WORK
FOR THE
PROVISION OF
CONSULTING SERVICES

The Department of Environmental Protection (DEP) is seeking proposals for the provision of consulting services to support the implementation of the State of Illinois' Green Economy Strategy. The services to be provided include, but are not limited to, the following:

1. Conduct a comprehensive assessment of the current state of the green economy in Illinois.

James A. DeBenedictis

James A. DeBenedictis
Assistant Director of Policy
and Planning

Promoting a Healthy Environment

12/11/2015

API# 47-017-06401 PERMIT MODIFICATION

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 Grant Smithburg 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Knight Unit 1H Well Pad Name: Hamilton Pad

3) Farm Name/Surface Owner: Hamilton, Kenneth E., et al Public Road Access: CR 24

4) Elevation, current ground: 1157' Elevation, proposed post-construction: 1157'

5) Well Type (a) Gas Oil Underground Storage

Other

(b) If Gas Shallow Deep

Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale: 7200' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2950#

8) Proposed Total Vertical Depth: 7200' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 17200' MD

11) Proposed Horizontal Leg Length: 9377'

12) Approximate Fresh Water Strata Depths: 220'

13) Method to Determine Fresh Water Depths: Gaskins Unit 1H (API# 47-017-06260) on same pad.

14) Approximate Saltwater Depths: 611'

15) Approximate Coal Seam Depths: 821'

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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18)

CASING AND TUBING PROGRAM

TYPE	<u>Size (in)</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling (ft)</u>	<u>INTERVALS: Left in Well (ft)</u>	<u>CEMENT: Fill-up (Cu. Ft.)/CTS</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#	391'	391'	CTS, 543 Cu. Ft
Coal	9-5/8"	New	J-55	36#	2515'	2515'	CTS, 1024 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	17200'	17200'	4318 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

TYPE	<u>Size (in)</u>	<u>Wellbore Diameter (in)</u>	<u>Wall Thickness (in)</u>	<u>Burst Pressure (psi)</u>	<u>Anticipated Max. Internal Pressure (psi)</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
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-H/POZ & 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			

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Office of Oil & Gas
DEC 09 2015

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

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 27.12 Existing Acres

22) Area to be disturbed for well pad only, less access road (acres): 3.14 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

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DEC 09 2015

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.

WW-6A1

Operator's Well Number

Knight Unit 1H

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:

Table with 4 columns: Grantor, lessor, etc.; Grantee, lessee, etc.; Royalty; Book/Page. Contains multiple lease entries such as Silas Ash Lease, Angelina Duncan Lease, Charles N. Costlow Lease, Emory Kimball Lease, and Maude Shrader et al Lease.

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*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.

17-06401400

WW-6A1
(5/13)

Operator's Well No. Knight Unit 1H
API# 47-017-06401 PERMIT MODIFICATION

**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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Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Edgar Hartley Lease	Edgar B. Hartley	Antero Resources Corporation	1/8+	0498/0326

*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.

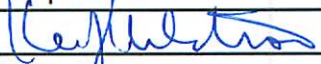
**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

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

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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: Vice President of Production

17-06401 (over)

WW-60
(7-01)

API# 47-017-06401 PERMIT MODIFICATION

DATE: Decemeber 8, 20 15

OPERATOR'S

WELL NO. Knight Unit 1H

API NO: 47- 017 06401
State County Permit No.

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

A F F I D A V I T

State of Colorado

County of Denver

I, Brett Kuhn (the designated owner or operator, or authorized representative thereof), after being duly sworn, do declare that the undersigned is authorized by the owner of the working interest in the well permit application to which this affidavit is attached to state that (he, she, or it) shall tender to the owner of the oil and gas in place not less than one-eighth of the total amount paid to or received by or allowed to the owner of the working interest at the wellhead for the oil or gas so extracted, produced, or marketed before deducting the amount to be paid or set aside for the owner of the oil or gas in place, or all such oil or gas to be extracted, produced, or marketed from the well. West Virginia Code 22-6-8(e).

Signed: [Signature]

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Office of Oil & Gas

DEC 09 2015

Taken, subscribed and sworn to before me this 8 day of December, 20 15.

[Signature]
Notary Public

My Commission expires: July 21, 2018

KARA QUACKENBUSH
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20144028297
MY COMMISSION EXPIRES JULY 21, 2018

12/11/2015

Important Legal Notice Regarding Signatures Per West Virginia Code §31D-1-12g. 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.

Signature: [Signature] Date: June 10, 2013
Print Name of Signer: Allyn A. Schopp
Title/Capacity: Authorized Person

7. Signature Information (See below "Important Legal Notice Regarding Signatures")

Contact Name: Allyn A. Schopp Phone Number: (303) 367-7310

6. Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, having a contact person and phone number may avoid having to return or reject the document.)

5. Other amendments: (attach additional pages if necessary)

4. Name the corporation elects to use in WV: (due to home state name not being available)

Antero Resources Corporation

3. Corporate name has been changed to: (Attach one Certified Copy of Name Change as filed in home state of incorporation.)

Antero Resources Corporation

2. Date Certificate of Authority was issued in West Virginia:

6/26/2008

1. Name under which the corporation was authorized to transact business in WV:

Antero Resources Appalachian Corporation

*** 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:

FILE ONE ORIGINAL (Two if you want a filed stamped copy returned to you) FEE: \$25.00
Natalie E. Tennant, Secretary of State, 1900 Kanawha Blvd E, Bldg 1, Suite 157-K, Charleston, WV 25305
Penney Barker, Manager, IN THE OFFICE OF SECRETARY OF STATE, Tel: (304)558-8000, Fax: (304)558-8381, Website: www.wv.gov, B-mail: business@wv.gov, Office Hours: Monday - Friday, 8:30 a.m. - 5:00 p.m. RT



FILED JUN 10 2013

FORM WV-6A1 EXHIBIT 1

12/11/2015

Received Office of Oil & Gas DEC 09 2015

17-06401/KCP

AC

State of West Virginia



Certificate

I, Betty Ireland, Secretary of State of the State of West Virginia, hereby certify that

DOMINION APPALACHIAN DEVELOPMENT, INC.
(a Virginia corporation)

filed an application for Conversion in my office as required by the provisions of the West Virginia Code and was found to conform to law.

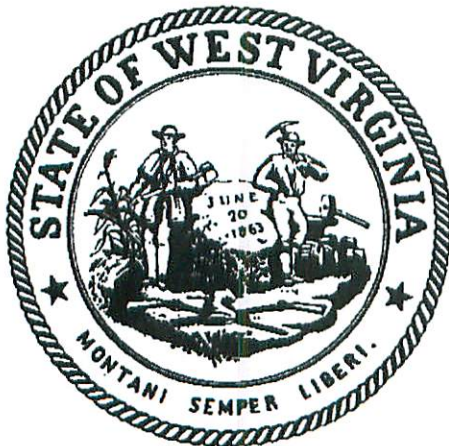
Therefore, I issue this

CERTIFICATE OF CONVERSION

converting the corporation to

DOMINION APPALACHIAN DEVELOPMENT, LLC
(a Virginia Limited Liability Company)

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Office of Oil & Gas
DEC 09 2015



Given under my hand and the Great Seal of the State of West Virginia on

February 23, 2006

Betty Ireland

Secretary of State

12/11/2015

LATITUDE 39°22'30"

10,029'

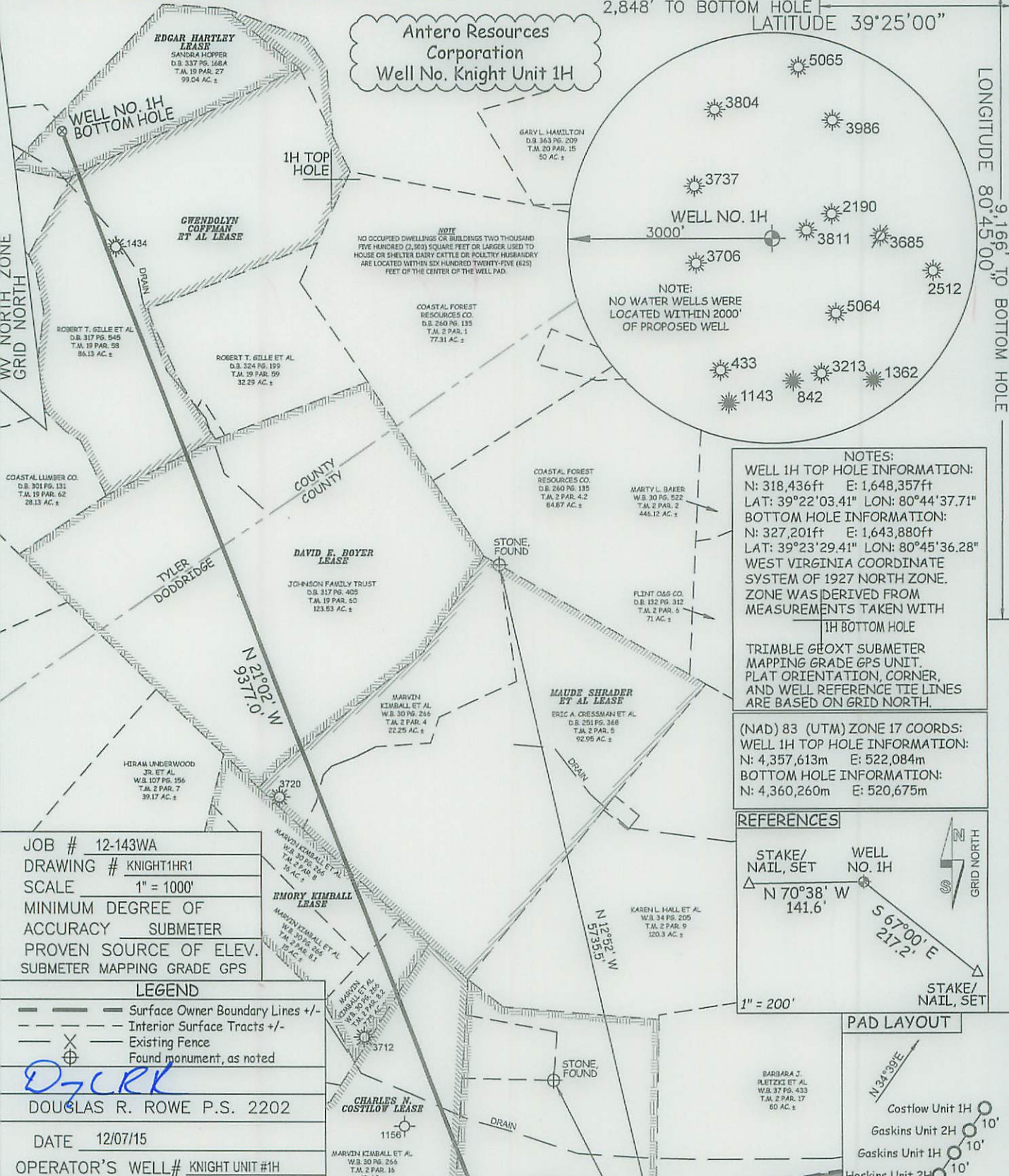
2,848' TO BOTTOM HOLE

LATITUDE 39°25'00"

LONGITUDE 80°45'00"

9,196' TO BOTTOM HOLE

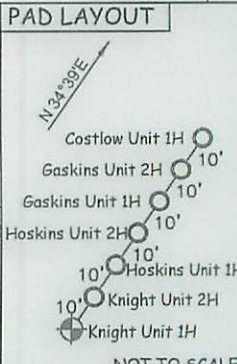
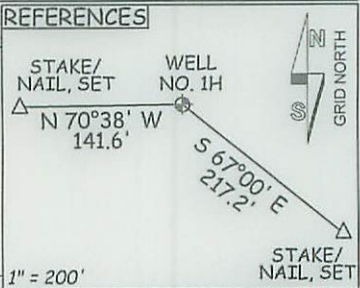
Antero Resources Corporation
Well No. Knight Unit 1H



NOTES:
 WELL 1H TOP HOLE INFORMATION:
 N: 318,436ft E: 1,648,357ft
 LAT: 39°22'03.41" LON: 80°44'37.71"
 BOTTOM HOLE INFORMATION:
 N: 327,201ft E: 1,643,880ft
 LAT: 39°23'29.41" LON: 80°45'36.28"
 WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH 1H BOTTOM HOLE

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 1H TOP HOLE INFORMATION:
 N: 4,357,613m E: 522,084m
 BOTTOM HOLE INFORMATION:
 N: 4,360,260m E: 520,675m



JOB # 12-143WA
 DRAWING # KNIGHT1HR1
 SCALE 1" = 1000'
 MINIMUM DEGREE OF ACCURACY SUBMETER
 PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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

DOUGLAS R. ROWE P.S. 2202

DATE 12/07/15
 OPERATOR'S WELL# KNIGHT UNIT #1H

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAN IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

WILLOW LAND SURVEYING PLLC
 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS
 API WELL # 47 - 017 - 06401
 STATE COUNTY PERMIT

WELL TYPE: OIL ___ GAS LIQUID INJECTION ___ WASTE DISPOSAL ___
 (IF "GAS") PRODUCTION STORAGE ___ DEEP ___ SHALLOW

LOCATION: ELEVATION ORIG 1,171' - PROPOSED 1,157' WATERSHED McELROY CREEK

QUADRANGLE SMITHBURG 7.5 (TH) SHIRLEY 7.5 (BH) DISTRICT GRANT COUNTY DODDRIDGE

SURFACE OWNER KENNETH E. HAMILTON ET AL ACREAGE 90.35 ACRES +/-

OIL & GAS ROYALTY OWNER SILAS ASH; ANGELINA DUNCAN; CHARLES N. COSTILOW; EMORY KIMBALL; MAUDE SHRADER ET AL; DAVID E. BOYER; GWENDOLYN COFFMAN ET AL; EDGAR HARTLEY
 LEASE ACREAGE 120 ACRES±; 100 ACRES±; 46.411 ACRES±; 38.75 ACRES±; 114.5 ACRES±; 102.48 ACRES±; 88.13 ACRES±; 30 ACRES±

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

TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,200' TVD 17,200' MD

WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER
 ADDRESS 1615 WYNKOOP STREET ADDRESS CT CORPORATION SYSTEM
 DENVER, CO 80202 CHARI ESTON WV 26313

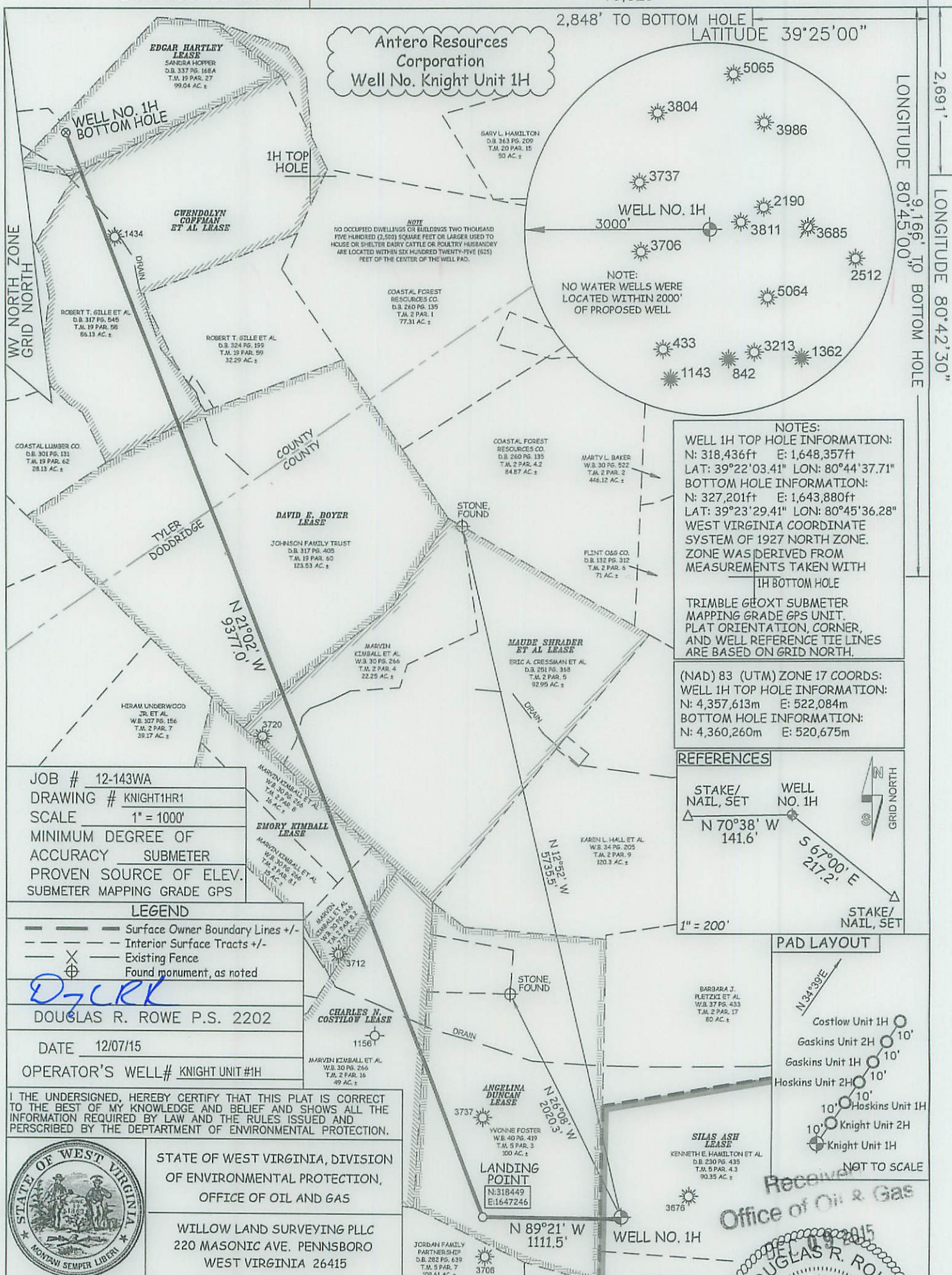


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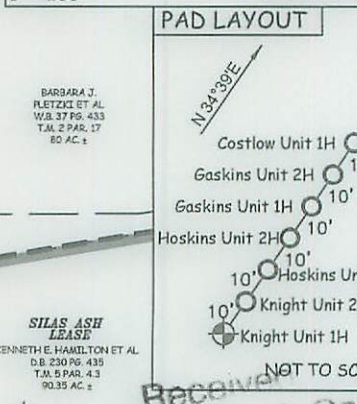
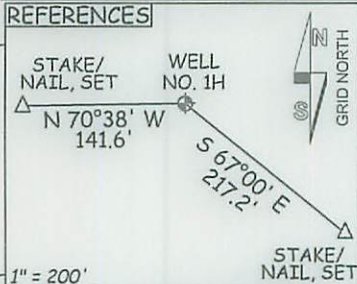


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Received
Office of Oil & Gas
DOUGLAS R. ROWE
LICENSED
No. 2202
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR
12/11/2015

JOB # 12-143WA
DRAWING # KNIGHT1HR1
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
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DOUGLAS R. ROWE P.S. 2202

DATE 12/07/15
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WILLOW LAND SURVEYING PLLC
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

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API WELL # 47 - 017 - 06401
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TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,200' TVD 17,200' 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

COUNTY NAME PERMIT

12/11/2015

12/11/2015

12/11/2015

17-06417 MOD.
17-06401 MOD

December 8, 2015

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

Ms. Hankins:

Antero Resources Corporation (Antero) would like to submit the following permit modifications for three approved wells on the existing Hamilton Pad. We are requesting to extend the lateral length and associated Estimated Measured Depth for the Hoskins Unit 1H (API# 47-017-06416), Knight Unit 1H (API #47-017-06401) and Knight Unit 2H (API #47-017-06417).

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 lease we will be drilling into

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

Thank you in advance for your consideration.

Sincerely,



Ashlie Steele
Permitting Supervisor
Antero Resources Corporation

Received
Office of Oil & Gas
DEC 09 2015

Enclosures

12/11/2015

17-06417 MOD.
17-06416 MOD.

December 8, 2015

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

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Antero Resources Corporation

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Office of Oil & Gas
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Enclosures

12/11/2015