



west virginia department of environmental protection

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

www.dep.wv.gov

PERMIT MODIFICATION APPROVAL

/

Re: Permit Modification Approval for

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.

If there are any questions, please feel free to contact me at (304) 926- 0450.

A handwritten signature in blue ink, appearing to read 'G. M. ...', is positioned above the title 'Chief'.

Chief

Operator's Well Number:
Farm Name:
U.S. WELL NUMBER:

Date Modification Issued:

Promoting a healthy environment.

WW-6B
(04/15)

API# 47-085-10172 PERMIT MODIFICATION

API NO. 47-085 - 10172

OPERATOR WELL NO. Pritchard Unit 2H

Well Pad Name: Ireland North Pad

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

1) Well Operator: Antero Resources Corpora 494507062 085- Ritchie Union Pullman 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Pritchard Unit 2H Well Pad Name: Ireland North Pad

3) Farm Name/Surface Owner: Lynwood Ireland, et al Public Road Access: CR 9

4) Elevation, current ground: 945.5' Elevation, proposed post-construction: _____

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

(b) If Gas Shallow Deep _____
Horizontal

*Michael Goff
8-16-18*

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale: 6800' TVD, Anticipated Thickness- 50 feet, Associated Pressure- 3000#

8) Proposed Total Vertical Depth: 6800' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 19750' MD

11) Proposed Horizontal Leg Length: 12235'

12) Approximate Fresh Water Strata Depths: 69', 279', 359'

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

14) Approximate Saltwater Depths: 1451', 1807'

15) Approximate Coal Seam Depths: 343'

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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WW-6B
(04/15)

API# 47-085-10172 PERMIT MODIFICATION

API NO. 47-085 - 10172

OPERATOR WELL NO. Pritchard Unit 2H

Well Pad Name: Ireland North Pad

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#	410' *See #19	410' *See #19	CTS, 570 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	19750'	19750'	CTS, 5023 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

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/HPCZ & 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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MAG
8-16-18

WW-6B
(10/14)

API# 47-085-10172 PERMIT MODIFICATION

API NO. 47- 085 - 10172

OPERATOR WELL NO. Prichard Unit: 2H

Well Pad Name: Ireland North Pad

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.

*Antero will be air drilling the fresh water string which makes it difficult to determine when freshwater is encountered, therefore we have built in a buffer for the casing setting depth which helps to ensure that all fresh water zones are covered.

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): 28.70 existing acres

22) Area to be disturbed for well pad only, less access road (acres): 4.09 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 and 1/4 lb of flake

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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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.

API# 47-085-10172 PERMIT MODIFICATION

10323



47085084950000

47085084470000

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JUL 10 2018
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Environmental Protection

47085086480000



Antero Resources Corporation

Pritchard Unit 2H



WELL SYMBOLS
Gas Well

June 4, 2018

UWI (API Num)	Well Name	Well Number	Operator	Historical Operator	TD	Perforated Interval (shallowest, deepest)	Perforated Formation(s)	Producing Formation(s) not perforated
47085084950000	GODFREY KENNETH L ET UX	2	KEY OIL COMPANY	KEY OIL INCORPORATED	5405	3412 - 5249	Warren, Balltown, Riley, Benson, Elk, Alexander	Big Injun, Weir
47085084470000	CHAPMAN E J HEIRS	5	KEY OIL COMPANY	KEY OIL INCORPORATED	5245	3207 - 5035	Warren, Speechley, Balltown, Riley, Benson, Alexander	Big Injun, Weir
47085085570000	CLAYTON	2	KEY OIL COMPANY	KEY OIL INCORPORATED	5171	3492 - 5052	Warren, Up Speechley, Bradford, Riley, Benson, Alexander	Big Injun, Weir
47085079900000	PRITCHARD R C ET AL	1	TERM ENERGY	TERM ENERGY	5098	3125 - 4945	Riley, Benson, Alexander	Big Injun, Weir
47085086450000	IRELAND	5	KEY OIL COMPANY	KEY OIL INCORPORATED	5423	3287 - 5101	Warren, Balltown, Riley, Benson, Elk, Alexander	Big Injun, Weir
47085086550000	IRELAND	4	KEY OIL COMPANY	KEY OIL INCORPORATED	5124	3097 - 4923	Warren, Balltown, Riley, Benson, Alexander	Big Injun, Weir
47085086480000	IRELAND	7	KEY OIL COMPANY	KEY OIL INCORPORATED	5360	3374 - 5191	Warren, Speechley, Balltown, Riley, Benson, Misc Sands-BNSN/BRLR, Alexander	Big Injun, Weir

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 JUL 10 2018

LATITUDE 39°12'30"

6,935'

97' TO BOTTOM HOLE
LATITUDE 39°12'30"

LONGITUDE 80°55'00"

12,951'

LONGITUDE 80°52'30"

COUNTY NAME

PERMIT

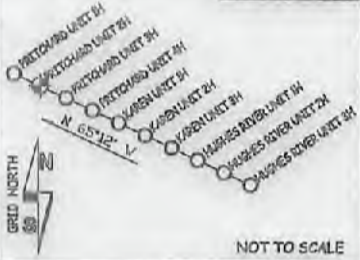
Antero Resources Corporation
Well No. Pritchard Unit 2H
47-085-10323

(NAD) 27 (UTM) ZONE 17 COORDS:
WELL 2H TOP HOLE INFORMATION:
N: 14,224,862ft E: 1,666,910ft
POINT OF ENTRY INFORMATION:
N: 14,224,832ft E: 1,666,848ft
BOTTOM HOLE INFORMATION:
N: 14,236,018ft E: 1,663,926ft

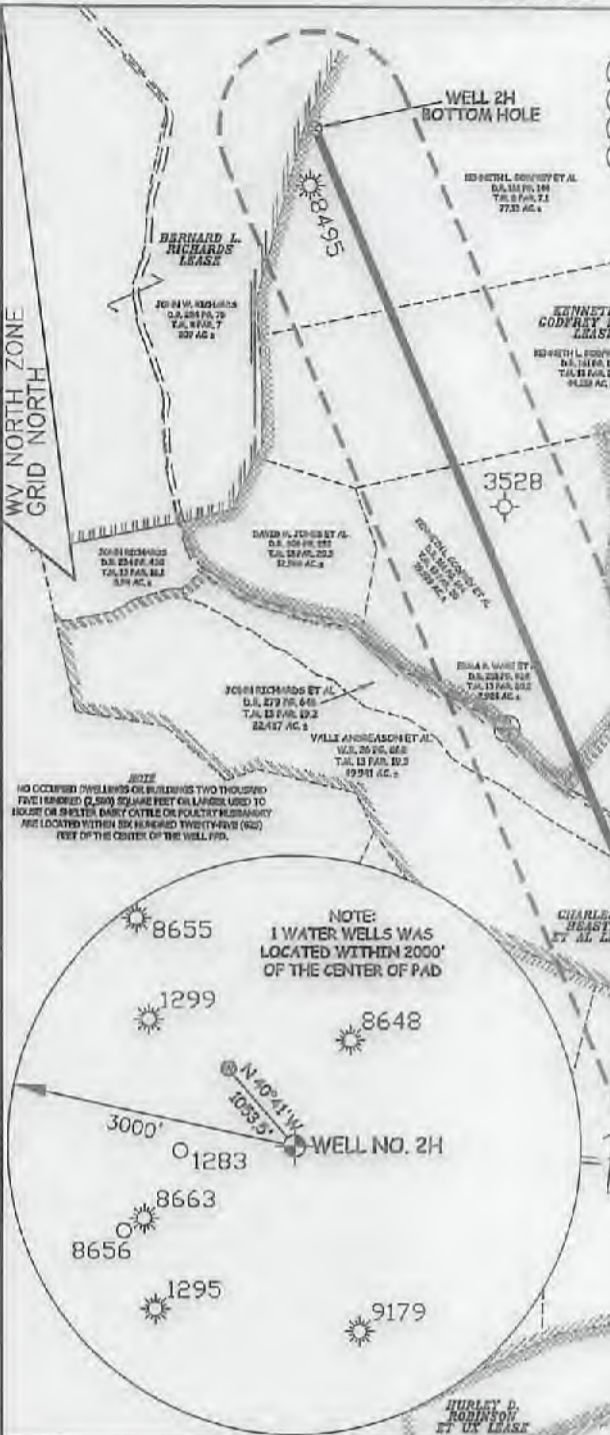
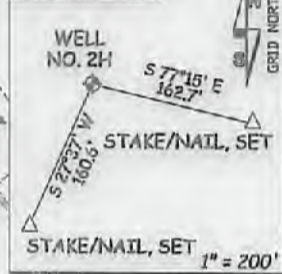
NOTES: 2H BOTTOM HOLE
WELL 2H TOP HOLE INFORMATION:
N: 248,129.8ft E: 1,603,249.5ft
LAT: 39°10'22.00" LON: 80°53'58.06"
BOTTOM HOLE INFORMATION:
N: 259,372ft E: 1,598,451ft
LAT: 39°12'12.36" LON: 80°55'01.24"
WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN 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: 4,335,964m E: 508,699m
BOTTOM HOLE INFORMATION:
N: 4,339,365m E: 507,180m

PAD LAYOUT



REFERENCES



47 - 085 - 10323
STATE COUNTY PERMIT

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 PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



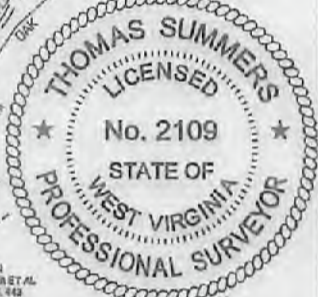
STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

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

JOB # 12-123WA
DRAWING # PRITCHARD2HR9
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
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
THOMAS SUMMERS P.S. 2109
DATE 07/08/18
OPERATOR'S WELL# PRITCHARD UNIT #2H

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL
(IF "GAS") PRODUCTION STORAGE DEEP SHALLOW
LOCATION: ELEVATION 945.5' AS BUILT WATERSHED SOUTH FORK HUGHES RIVER
QUADRANGLE PULLMAN 7.5' DISTRICT UNION COUNTY RITCHIE
SURFACE OWNER LYNWOOD IRELAND ET AL ACREAGE 144.276 ACRES +/-
OIL & GAS ROYALTY OWNER WELLS IRELAND ET AL; IRELAND ET AL; SYMA MAUDE PRITCHARD ET AL LEASE ACREAGE 415 ACRES +/- 222 ACRES +/- 103 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 PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,800' TVD 19,750' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 26313



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
<u>Belle Pritchard Lease</u>			
Belle Pritchard	Ritchie A. Ireland	1/8	0079/0019
Ritchie A. Ireland	S. M. Vokel, et al	Assignment	0080/0386
S. M. Vokel, et al	Warren Associates, Inc.	Assignment	0126/0464
Warren Associates, Inc.	Haught, Inc.	Affidavit	0170/0461
Haught Oil Producing Corporation (Formerly Haught, Inc.)	710 Corporation	Assignment	0180/0791
710 Corporation	Lynwood K. Ireland	Assignment	0204/0553
Lynwood K. Ireland	Antero Resources Appalachian Corporation	*Partial Assignment of Oil & Gas Leases	0255/0652
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>W.P. Ireland, et al Lease</u>			
W.P. Ireland and L.M. Ireland	M. G. Taylor	1/8	0032/0016
M.G. Taylor	Carnegie Natural Gas Company	Assignment	Recited in 0068/0188
Carnegie Natural Gas Company	Coffman Oil and Gas Company	Assignment	0068/0188
Coffman Oil and Gas Company	United Operating Company, Inc.	Assignment	0017/0660
United Operating Company, Inc.	Buttes Resources Company	Assignment	0117/0738
Buttes Resources Company and Inter-City Gas Limited	Earl Stewart	Assignment	0128/0286
Earl Stewart	JCC	Assignment	0205/0483
JCC	Key Oil Company	Assignment	0229/0019
Key Oil Company	Antero Resources Appalachian Corporation	*Partial Assignment of Oil and Gas Leases	0253/0747
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>Eva Maude Pritchard, et al Lease</u>			
Eva Maude Pritchard, et al	Vesta Fuel Company	1/8	0093/0601
Vesta Fuel Company	W. H. Mosser	Assignment	0100/0493
W. H. Mosser	J & J Enterprises, Inc.	Assignment	0133/0004
J & J Enterprises, Inc.	Term Energy Corporation	Assignment	0172/0336
Term Energy Corporation	Antero Resources Appalachian Corporation	Assignment	0257/0362
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>Jack H. Langford Lease</u>			
Jack H. Langford	Key Oil Company	1/8+	254/161
Key Oil Company	Antero Resources Appalachian Company	Assignment	254/1004

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Office of Oil and Gas
JUL 10 2018
1/8 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.

Operator's Well Number

Pritchard Unit 2H

~~API# 47-085-10172~~ PERMIT MODIFICATION

10323

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
Maude G. Pritchard et al Lease			
Maude G. Pritchard et al	Southwestern Development Co.	1/8	92/547
Southwestern Development Co.	Billings Kirk Ruddock	Assignment	190/718
Billings Kirk Ruddock	Adenna Petroleum, Inc.	Assignment	212/273
Adenna Petroleum, Inc.	Lippizan Petroleum, Inc.	Assignment	222/155
Lippizan Petroleum, Inc.	Antero Resources Appalachian Corporation	Assignment	255/591
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
Charles P. Heaster et al Lease			
Charles P. Heaster et al	Key Oil Company	1/8	223/141
Key Oil Company	Antero Resources Appalachian Corporation	Partial Assignment of Oil and Gas Leases	253/747
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1

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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.

WW-6A1
(5/13)

Operator's Well No. Pritchard Unit 2H

**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
<u>Kenneth L. Godfrey et ux Lease</u>				
	Kenneth L. Godfrey et ux	Kanawha Drilling Co.	1/8	0123/0365
	Kanawha Drilling Co.	Industrial Gas Association	Assignment	0124/0536
	Industrial Gas Association	Judith F. Cushing	Assignment	0126/0196
	Judith F. Cushing	Smith & Stalnakar Enterprises	Assignment	0225/0179
	Smith & Stalnakar Enterprises	Antero Resources Appalachian Corp	Assignment	0259/0683

*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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JUL 10 2018
WV Department of
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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: Senior VP of Production

FILED

JUN 10 2013

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



Penney Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvso.com
E-mail: business@wvso.com

APPLICATION FOR
AMENDED CERTIFICATE
OF AUTHORITY

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

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

**** 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:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)
- Other amendments: _____
(attach additional pages if necessary)
- 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.)
Alvyn A. Schopp (303) 357-7310
Contact Name Phone Number
- Signature information (See below *Important Legal Notice Regarding Signature*):
Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person
Signature: [Handwritten Signature] Date: June 10, 2013

***Important Legal Notice Regarding Signature:** For West Virginia Code §31D-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.

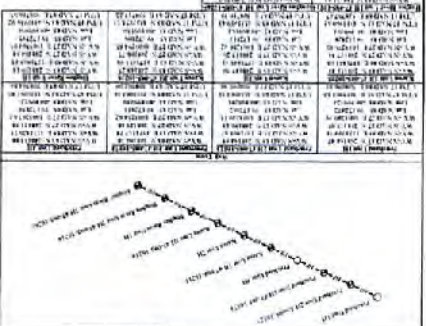
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Office of Oil and Gas
JUL 10 2013
WV Department of
Environmental Protection

WEST VIRGINIA
811
 Know What's Below
 Call 811

The purpose of this map is to show the location of the project within the county and to provide a general overview of the area. The map is not intended to be used for legal purposes.

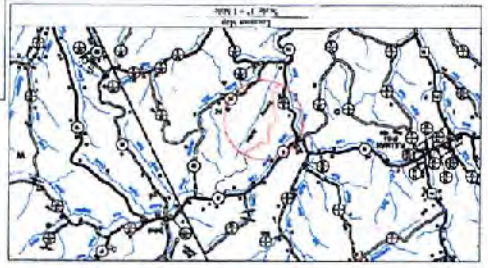
Project Summary

Project Name	Ireland North Site
Project Location	Union District, Richie County, WV
Project Description	As-built
Project Status	Approved
Project Date	6/27/2017



APPROVED
 WDEP OOG
 6/27/2017

Ireland North Site
 As-built
 Antero Resources Corporation
 Richie County
 Union District
 Latitude 39.172824
 Longitude -80.899096
 White Oak Creek - South Fork Hughes River Watershed



Site Data

Property	Value
Area	1.23
Perimeter	1.23
Volume	1.23



Site Information

Site Name	Ireland North Site
Site Location	Union District, Richie County, WV
Site Status	Approved
Site Date	6/27/2017

Site Data

Property	Value
Area	1.23
Perimeter	1.23
Volume	1.23

Site Data

Area	1.23
Perimeter	1.23
Volume	1.23

Site Data

Area	1.23
Perimeter	1.23
Volume	1.23

Site Data

Area	1.23
Perimeter	1.23
Volume	1.23

Site Data

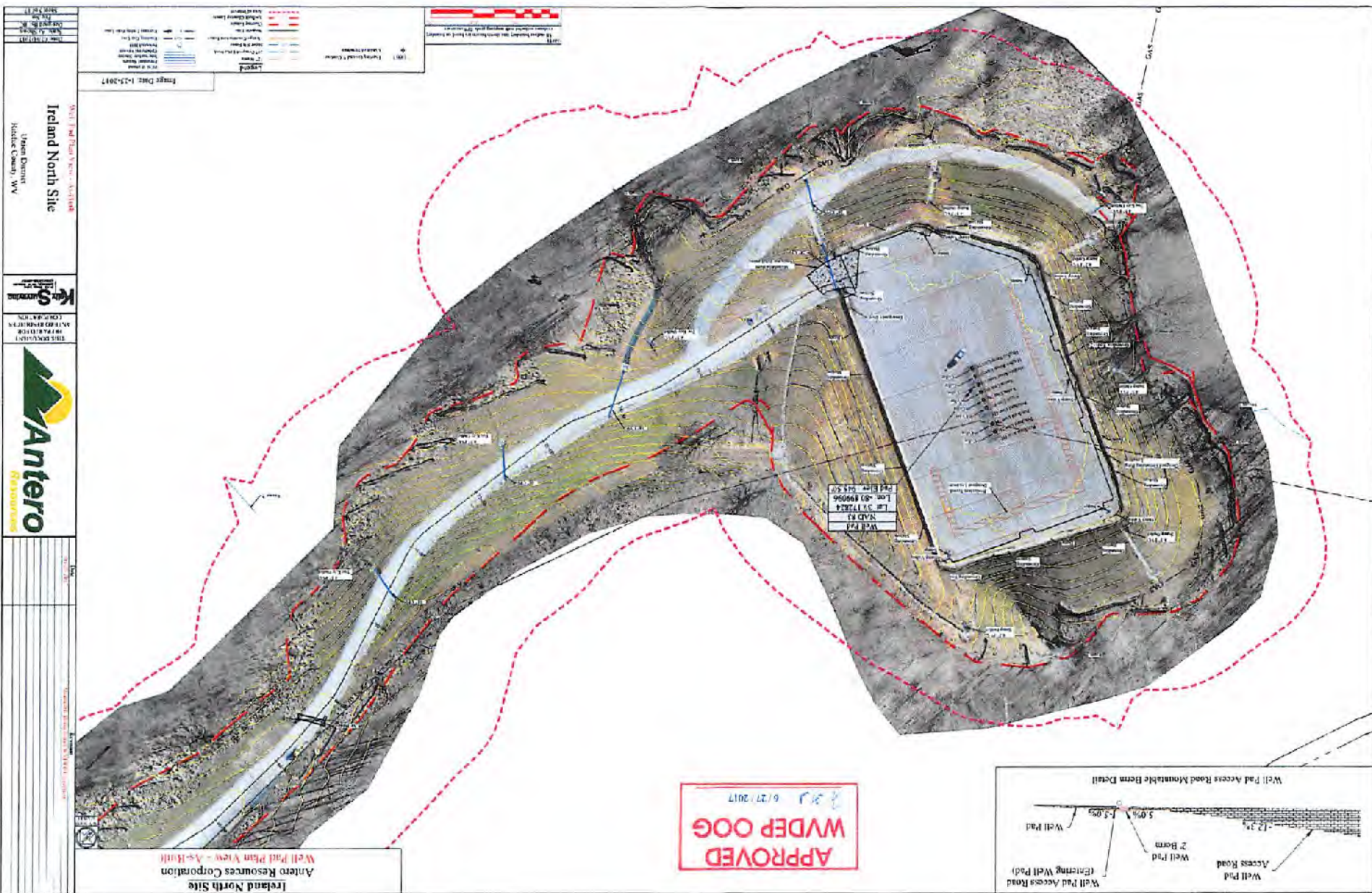
Area	1.23
Perimeter	1.23
Volume	1.23

Site Data

Area	1.23
Perimeter	1.23
Volume	1.23

Permit Site Information
 Project Name: Ireland North Site
 Project Location: Union District, Richie County, WV
 Project Status: Approved
 Project Date: 6/27/2017

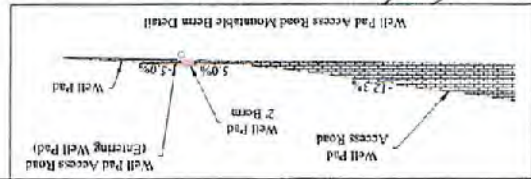
Antero Resources
 Ireland North Site
 Union District, Richie County, WV



Title Block (Left Side):
 Project Name: Ireland North Site
 Client: Antero Resources Corporation
 Date: 6/27/2017
 Scale: 1" = 100'

Ireland North Site
 Antero Resources Corporation
 Well Pad Plain View - As-Built

APPROVED
WVDEP OOG
 6/27/2017



Vertical alignment markers:
 ①
 ②
 ③
 ④



July 9th, 2018

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. Laura Adkins
601 57th Street
Charleston, WV 25304

Ms. Adkins:

Antero Resources Corporation (Antero) would like to submit the following permit modification for five approved wells on the Ireland North Pad. We are requesting to change the bottom hole locations of the Karen Unit 1H (API# 47-085-10215), Karen Unit 3H (API# 47-085-10216), Hughes River Unit 2H (API# 47-085-10214), Hughes River Unit 3H, (API# 47-085-10265) and Pritchard Unit 2H (API# 47-085-10323).

Attached you will find the following documents:

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

If you have any questions please feel free to contact me at (303) 357-7233.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Karin Cox".

Karin Cox
Permitting Agent
Antero Resources Corporation

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Environmental Protection

Enclosures

LATITUDE 39°12'30"

6,935'

97' TO BOTTOM HOLE
LATITUDE 39°12'30"

LONGITUDE 80°55'00"

1,785' TO BOTTOM HOLE

LONGITUDE 80°52'30"

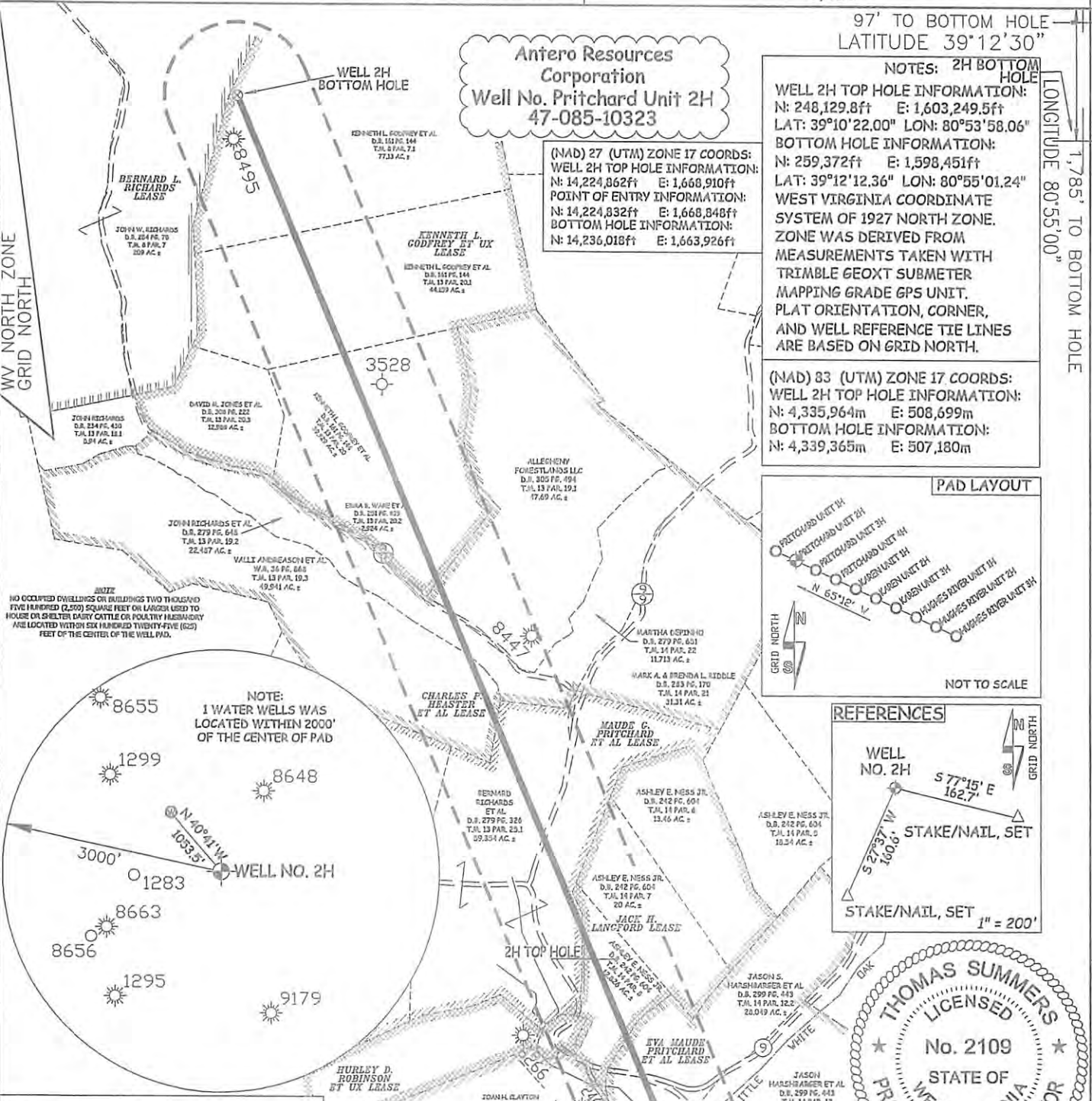
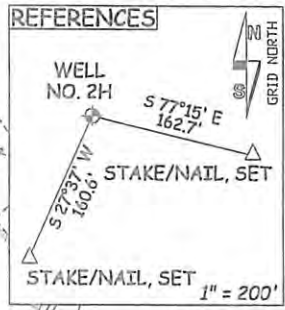
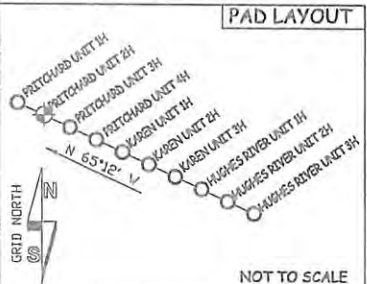
COUNTY NAME PERMIT

Antero Resources Corporation
Well No. Pritchard Unit 2H
47-085-10323

(NAD) 27 (UTM) ZONE 17 COORDS:
WELL 2H TOP HOLE INFORMATION:
N: 14,224,862ft E: 1,668,910ft
POINT OF ENTRY INFORMATION:
N: 14,224,832ft E: 1,668,848ft
BOTTOM HOLE INFORMATION:
N: 14,236,018ft E: 1,663,926ft

NOTES: 2H BOTTOM HOLE
WELL 2H TOP HOLE INFORMATION:
N: 248,129.8ft E: 1,603,249.5ft
LAT: 39°10'22.00" LON: 80°53'58.06"
BOTTOM HOLE INFORMATION:
N: 259,372ft E: 1,598,451ft
LAT: 39°12'12.36" LON: 80°55'01.24"
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: 4,335,964m E: 508,699m
BOTTOM HOLE INFORMATION:
N: 4,339,365m E: 507,180m



47 - 085 - 10323
STATE COUNTY PERMIT

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 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

JOB # 12-123WA
DRAWING # PRITCHARD2HR9
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
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
THOMAS SUMMERS P.S. 2109
DATE 07/06/18
OPERATOR'S WELL# PRITCHARD UNIT #2H

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___
(IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X
LOCATION: ELEVATION 945.5' AS BUILT WATERSHED SOUTH FORK HUGHES RIVER
QUADRANGLE PULLMAN 7.5' DISTRICT UNION COUNTY RITCHIE
SURFACE OWNER LYWOOD IRELAND ET AL ACREAGE 144.276 ACRES +/-
OIL & GAS ROYALTY OWNER BELLE PRITCHARD, W.P. IRELAND ET UX, EVA MAUDE PRITCHARD ET AL LEASE ACREAGE 415 ACRES +/- 222 ACRES +/- 100 ACRES +/-
JACK H. LANGFORD, MAUDE G. PRITCHARD ET AL, CHARLES P. HEASTER ET AL, KENNETH L. GODFREY ET UX 46.5 ACRES +/- 137 ACRES +/- 231.5 ACRES +/- 175.09 ACRES +/-
PROPOSED WORK: DRILL ___ CONVERT ___ DRILL DEEPER X REDRILL ___ FRACTURE OR STIMULATE X
PLUG OFF OLD FORMATION ___ PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL (SPECIFY) MOD-BHL ___ PLUG & ABANDON ___ CLEAN OUT & REPLUG ___
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,800' TVD 19,750' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313



WW-6B
(04/15)

API# 47-085-10172 PERMIT MODIFICATION

API NO. 47-085 - 10172 10323

OPERATOR WELL NO. Pritchard Unit 2H

Well Pad Name: Ireland North Pad

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: 494507062 County: 085- Ritchie District: Union Quadrangle: Pullman 7.5'

2) Operator's Well Number: Pritchard Unit 2H Well Pad Name: Ireland North Pad

3) Farm Name/Surface Owner: Lynwood Ireland, et al Public Road Access: CR 9

4) Elevation, current ground: 945.5' Elevation, proposed post-construction:

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

Other

(b) If Gas Shallow X Deep

Horizontal X

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale: 6800' TVD, Anticipated Thickness- 50 feet, Associated Pressure- 3000#

8) Proposed Total Vertical Depth: 6800' TVD 6500

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 19750' MD 1700

11) Proposed Horizontal Leg Length: 12235' 8709

12) Approximate Fresh Water Strata Depths: 69', 279', 359'

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

14) Approximate Saltwater Depths: 1451', 1807'

15) Approximate Coal Seam Depths: 343'

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

VOID

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

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

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WW-6B
(04/15)

API NO. 47-085 - 10172 10323
OPERATOR WELL NO. Pritchard Unit 2H
Well Pad Name: Ireland North Pad

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#	410' *See #19	410' *See #19	CTS, 570 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	19750'	19750'	CTS, 5023 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

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-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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WW-6B
(10/14)

API NO. 47-085 - 10172 10323
OPERATOR WELL NO. Pritchard Unit 2H
Well Pad Name: Ireland North Pad

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.

*Antero will be air drilling the fresh water string which makes it difficult to determine when freshwater is encountered, therefore we have built in a buffer for the casing setting depth which helps to ensure that all fresh water zones are covered.

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): 28.70 existing acres

22) Area to be disturbed for well pad only, less access road (acres): 4.09 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.

VOID

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 and 1/4 lb of flake
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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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.