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west virginia department of environmental protection

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

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Tuesday, November 26, 2019  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for REBA UNIT 3H  
47-095-02645-00-00

**Modified POE and extended lateral length**

ANTERO RESOURCES CORPORATION

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.

James A. Martin  
Chief

Operator's Well Number: REBA UNIT 3H  
Farm Name: RIDGETOP CAPITAL LP  
U.S. WELL NUMBER: 47-095-02645-00-00  
Horizontal 6A New Drill  
Date Modification Issued: 11/26/19

Promoting a healthy environment.

WW-6B  
(04/15)

API NO. 47-095 - 02645  
OPERATOR WELL NO. Reba Unit 3H  
Well Pad Name: Gamehenge Pad

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

1) Well Operator: Antero Resources Corporation 494507062 095 - Tyler Ellsworth Paden City 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Reba Unit 3H Well Pad Name: Gamehenge Pad

3) Farm Name/Surface Owner: Ridgetop Capital, LP Public Road Access: State Ridge Road

4) Elevation, current ground: 1052' Elevation, proposed post-construction: ~1026'

5) Well Type (a) Gas  Oil  Underground Storage

Other

(b) If Gas Shallow  Deep

Horizontal

*JEB*  
*11/18/2019*

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus Shale: 7000' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 7000' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 17700' MD

11) Proposed Horizontal Leg Length: 8129'

12) Approximate Fresh Water Strata Depths: 363'

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

14) Approximate Saltwater Depths: 1093'

15) Approximate Coal Seam Depths: 550'

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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(04/15)

API NO. 47- 095 - 02645  
 OPERATOR WELL NO. Reba Unit 3H  
 Well Pad Name: Gamehenge 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#	80	80	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	413 *see # 19	413 *see # 19	CTS, 574 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500	2500	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	23#	17700	17700	4460 Cu. Ft
Tubing	2-3/8"	New	N-80	4.7#			
Liners							

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11/18/2019

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	20"	24"	0.438"	1530	50	Class A	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"	2730	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"	0.415"	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- 095 - 02645  
OPERATOR WELL NO. Reba Unit 3H  
Well Pad Name: Gamehenge 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 fresh water 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

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*11/10/2019*

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 60.16 acres

22) Area to be disturbed for well pad only, less access road (acres): 11.76 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:

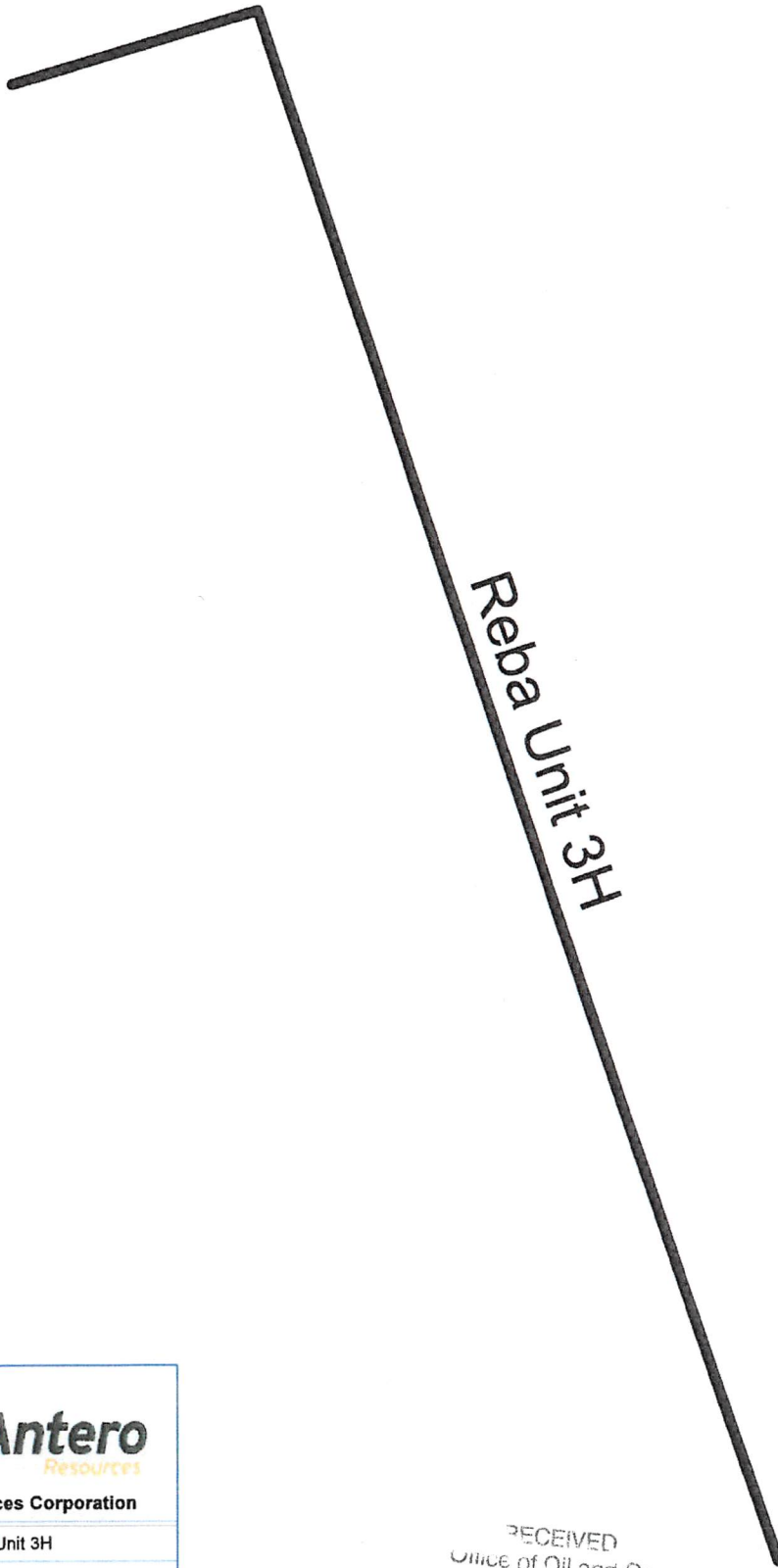
Conductor: no additives, Class A cement.  
Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake  
Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat  
Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% 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

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.

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Reba Unit 3H



Antero Resources Corporation

Reba Unit 3H



WELL SYMBOLS  
Gas Well

December 17, 2018

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47095021260000

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11/18/2019

UWI (APINUM)	Well Name	Well Number	Operator	Hist Oper	TD	Perforated Interval (shallowest, deepest)	Perforated Formation(s)	Producible Formation(s) not perf'd
47095021260000	WEIGLE UNIT	1H	ANTERO RESOURCES CORPORATION		17,829	7109 - 17738	Marcellus	N/A

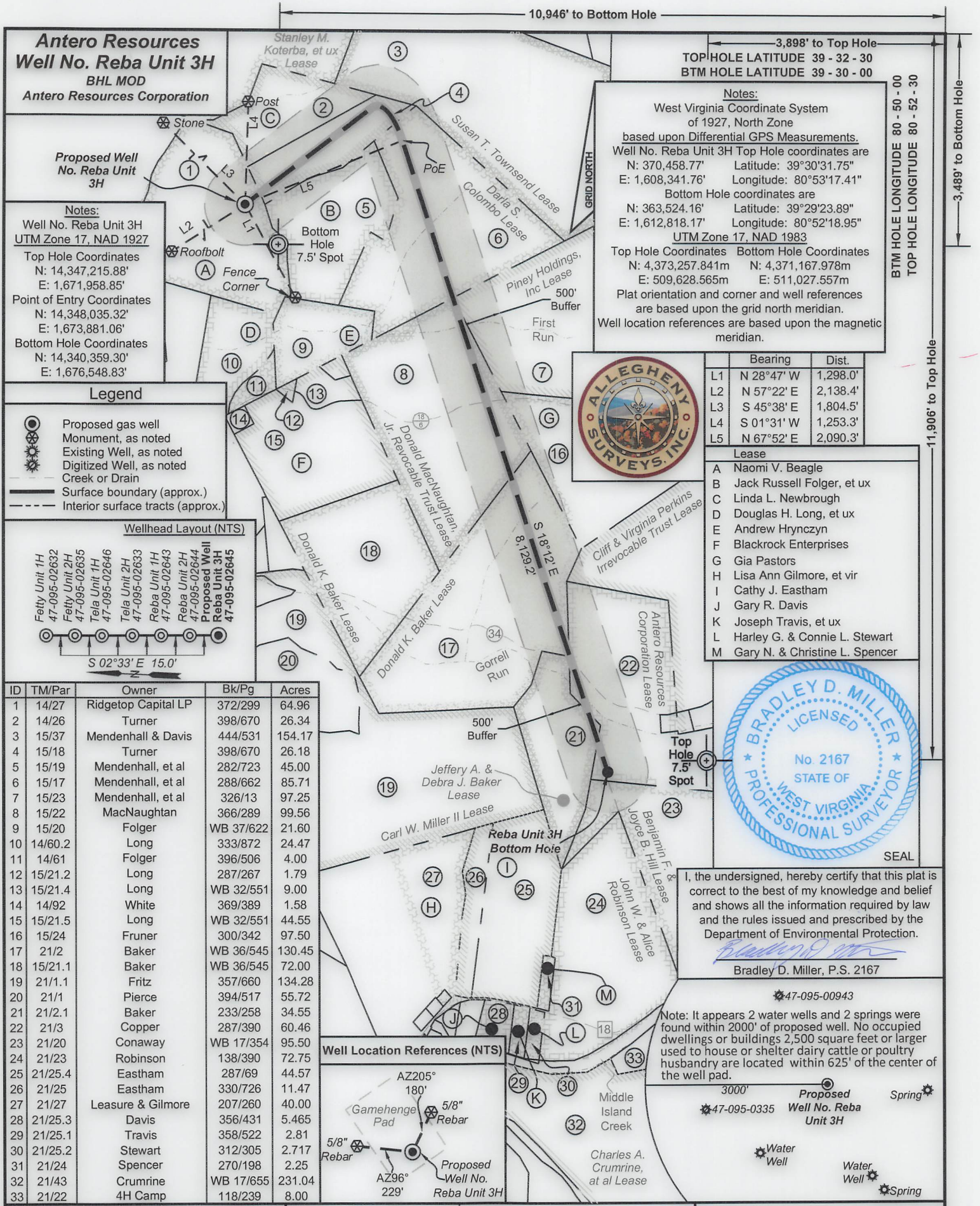
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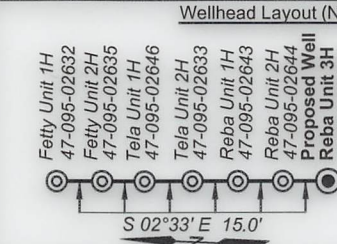


**Antero Resources  
Well No. Reba Unit 3H  
BHL MOD  
Antero Resources Corporation**

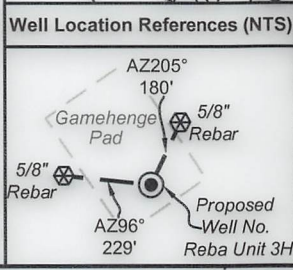
**Notes:**  
Well No. Reba Unit 3H  
UTM Zone 17, NAD 1927  
Top Hole Coordinates  
N: 14,347,215.88'  
E: 1,671,958.85'  
Point of Entry Coordinates  
N: 14,348,035.32'  
E: 1,673,881.06'  
Bottom Hole Coordinates  
N: 14,340,359.30'  
E: 1,676,548.83'

**Legend**

- Proposed gas well
- Monument, as noted
- Existing Well, as noted
- Digitized Well, as noted
- Creek or Drain
- Surface boundary (approx.)
- Interior surface tracts (approx.)



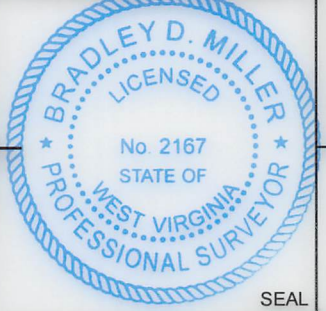
ID	TM/Par	Owner	Bk/Pg	Acres
1	14/27	Ridgetop Capital LP	372/299	64.96
2	14/26	Turner	398/670	26.34
3	15/37	Mendenhall & Davis	444/531	154.17
4	15/18	Turner	398/670	26.18
5	15/19	Mendenhall, et al	282/723	45.00
6	15/17	Mendenhall, et al	288/662	85.71
7	15/23	Mendenhall, et al	326/13	97.25
8	15/22	MacNaughtan	366/289	99.56
9	15/20	Folger	WB 37/622	21.60
10	14/60.2	Long	333/872	24.47
11	14/61	Folger	396/506	4.00
12	15/21.2	Long	287/267	1.79
13	15/21.4	Long	WB 32/551	9.00
14	14/92	White	369/389	1.58
15	15/21.5	Long	WB 32/551	44.55
16	15/24	Fruner	300/342	97.50
17	21/2	Baker	WB 36/545	130.45
18	15/21.1	Baker	WB 36/545	72.00
19	21/1.1	Fritz	357/660	134.28
20	21/1	Pierce	394/517	55.72
21	21/2.1	Baker	233/258	34.55
22	21/3	Copper	287/390	60.46
23	21/20	Conaway	WB 17/354	95.50
24	21/23	Robinson	138/390	72.75
25	21/25.4	Eastham	287/69	44.57
26	21/25	Eastham	330/726	11.47
27	21/27	Leasure & Gilmore	207/260	40.00
28	21/25.3	Davis	356/431	5.465
29	21/25.1	Travis	358/522	2.81
30	21/25.2	Stewart	312/305	2.717
31	21/24	Spencer	270/198	2.25
32	21/43	Crumrine	WB 17/655	231.04
33	21/22	4H Camp	118/239	8.00



**Notes:**  
West Virginia Coordinate System of 1927, North Zone  
based upon Differential GPS Measurements.  
Well No. Reba Unit 3H Top Hole coordinates are  
N: 370,458.77' Latitude: 39°30'31.75"  
E: 1,608,341.76' Longitude: 80°53'17.41"  
Bottom Hole coordinates are  
N: 363,524.16' Latitude: 39°29'23.89"  
E: 1,612,818.17' Longitude: 80°52'18.95"  
UTM Zone 17, NAD 1983  
Top Hole Coordinates Bottom Hole Coordinates  
N: 4,373,257.841m N: 4,371,167.978m  
E: 509,628.565m E: 511,027.557m  
Plat orientation and corner and well references are based upon the grid north meridian.  
Well location references are based upon the magnetic meridian.

	Bearing	Dist.
L1	N 28°47' W	1,298.0'
L2	N 57°22' E	2,138.4'
L3	S 45°38' E	1,804.5'
L4	S 01°31' W	1,253.3'
L5	N 67°52' E	2,090.3'

- Lease**
- A Naomi V. Beagle
  - B Jack Russell Folger, et ux
  - C Linda L. Newbrough
  - D Douglas H. Long, et ux
  - E Andrew Hrynczyn
  - F Blackrock Enterprises
  - G Gia Pastors
  - H Lisa Ann Gilmore, et vir
  - I Cathy J. Eastham
  - J Gary R. Davis
  - K Joseph Travis, et ux
  - L Harley G. & Connie L. Stewart
  - M Gary N. & Christine L. Spencer



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, P.S. 2167

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

FILE NO: 40-54-E-16  
DRAWING NO: Reba 3H Well Plat  
SCALE: 1" = 1500'  
MINIMUM DEGREE OF ACCURACY: Submeter  
PROVEN SOURCE OF ELEVATION: WVDOT, Harrisville, WV

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

DATE: October 30 2019  
OPERATOR'S WELL NO. Reba Unit 3H  
API WELL NO  
47 - 095 - 02645  
STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
(IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
Proposed 1026'  
LOCATION: ELEVATION: Existing 1052' WATERSHED: Outlet Middle Island Creek QUADRANGLE: Btm - Shirley  
DISTRICT: Ellsworth COUNTY: Tyler  
SURFACE OWNER: Ridgetop Capital LP Jeffery A. & Debra J. Baker; Antero Resources Corporation; Piney Holdings, Inc.; Donald MacNaughtan, Jr.; ACREAGE: 64.96  
ROYALTY OWNER: Naomi V. Beagle; Linda L. Newbrough; Darla S. Colombo; Donald K. Baker LEASE NO: ACREAGE: 62.84375; 64.18  
PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) BHL MOD  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 7,000' TVD  
17,700' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System  
ADDRESS: 1615 Wynkoop Street ADDRESS: 5400 D Big Tyler Road  
Denver, CO 80202 Charleston, WV 25313



WW-6A1

Operator's Well Number Reba Unit 3H

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>Naomi V. Beagle Lease</u></b>			
Naomi V. Beagle	Antero Resources Corporation	1/8+	0535/0464
<b><u>Linda L. Newbrough Lease</u></b>			
Linda L. Newbrough	Chesapeake Appalachia LLC	1/8	0373/0234
Chesapeake Appalachia LLC	Statoil USA Onshore Properties Inc	Assignment	0376/0733
Statoil USA Onshore Properties Inc	EQT Production Company	Assignment	0539/0239
EQT Production Company	Antero Resources Corporation	Assignment	0663/0001
<b><u>Darla S. Columbo Lease</u></b>			
Darla S. Columbo	Stone Energy Corporation	1/8	0397/0728
Stone Energy Corporation	Antero Resources Corporation	Assignment	0442/0037
<b><u>Donald MacNaughtan Jr. Revocable Trust Lease</u></b>			
Donald MacNaughtan Jr. Revocable Trust	Antero Resources Corporation	1/8+	0619/0363
<b><u>Donald K. Baker Lease</u></b>			
Donald K. Baker	Statoil USA Onshore Properties Inc.	1/8	0443/0806
Statoil USA Onshore Properties Inc.	EQT Production Company	Assignment	0539/0239
EQT Production Company	Antero Resources Corporation	Assignment	0663/0001
<b><u>Antero Resources Corporation Lease</u></b>			
Antero Resources Corporation	Antero Resources Corporation		0598/0667
<b><u>Jeffery A. Baker et ux Lease</u></b>			
Jeffery A. Baker et ux	Statoil USA Onshore Properties Inc.	1/8	0447/0053
Statoil USA Onshore Properties Inc.	EQT Production Company	Assignment	0539/0239
EQT Production Company	Antero Resources Corporation	Assignment	0663/0001

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11/18/2019

\*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.

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



WW-6A1  
(5/13)

Operator's Well No. Reba Unit 3H

**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:

Lease Name or  
Antero Resources Corporation Lease

Antero Resources Corporation

Antero Resources Corporation

0598/0667

\*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: Tim Rady  
Its: VP of Land

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