



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

Harold D. Ward, Cabinet Secretary
www.dep.wv.gov

Monday, April 3, 2023
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for SHOTTER 2H
47-017-06946-00-00

Lateral Extension

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.

A blue ink signature of James A. Martin, written in a cursive style.

James A. Martin
Chief

Operator's Well Number: SHOTTER 2H
Farm Name: ANTERO RESOURCES CORPORATION
U.S. WELL NUMBER: 47-017-06946-00-00
Horizontal 6A New Drill
Date Modification Issued: 04/03/2023

Promoting a healthy environment.

04/07/2023

WW-6B
(04/15)

API NO. 47-017 -
OPERATOR WELL NO. Shotter Unit 2H MOD
Well Pad Name: Locke 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 017 - Doddri Southwe Oxford 7.5'
Operator ID County District Quadrangle
- 2) Operator's Well Number: Shotter Unit 2H MOD Well Pad Name: Locke Pad
- 3) Farm Name/Surface Owner: Antero Resources Corporation Public Road Access: Taylor Drain Road
- 4) Elevation, current ground: 1100.5' - As Built Elevation, proposed post-construction: _____
- 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: 7000' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2850#
- 8) Proposed Total Vertical Depth: 7000' TVD
- 9) Formation at Total Vertical Depth: Marcellus
- 10) Proposed Total Measured Depth: 19300' MD
- 11) Proposed Horizontal Leg Length: 10347' *Open to modification at a later date
- 12) Approximate Fresh Water Strata Depths: 236', 260', 320', 326'
- 13) Method to Determine Fresh Water Depths: 47017033900000, 47017000980000 Offset well records. Depths have been adjusted according to surface elevations.
- 14) Approximate Saltwater Depths: 1733', 1750'
- 15) Approximate Coal Seam Depths: None Anticipated
- 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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 03/31/2023

04/07/2023

WW-6B
(04/15)

4701706946

API NO. 47-017 -
OPERATOR WELL NO. Shotter Unit 2H MOD
Well Pad Name: Locke 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	79#	100'	100'	CTS, 96 Cu. Ft.
Fresh Water	13-3/8"	New	J/K-55	54.5#	376'	376'	CTS, 392 Cu. Ft.
Coal	9-5/8"	New	J-/K55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110CY	20#	19300'	19300'	CTS, 3936 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#			
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	20"	24"	0.375"	2250	50	Class A/L	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"	2730	1000	Class A/L	~1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A/L	~1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.415"	14,360	2500	Class G/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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dc 03/31/2023

04/07/2023

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill a new horizontal shallow well into the 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

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 27.54 acres

22) Area to be disturbed for well pad only, less access road (acres): 13.31 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/L cement.
Surface: Class A/L cement with 2-3% calcium chloride and 1/4 lb of flake
Intermediate: Class A/L 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 G/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.

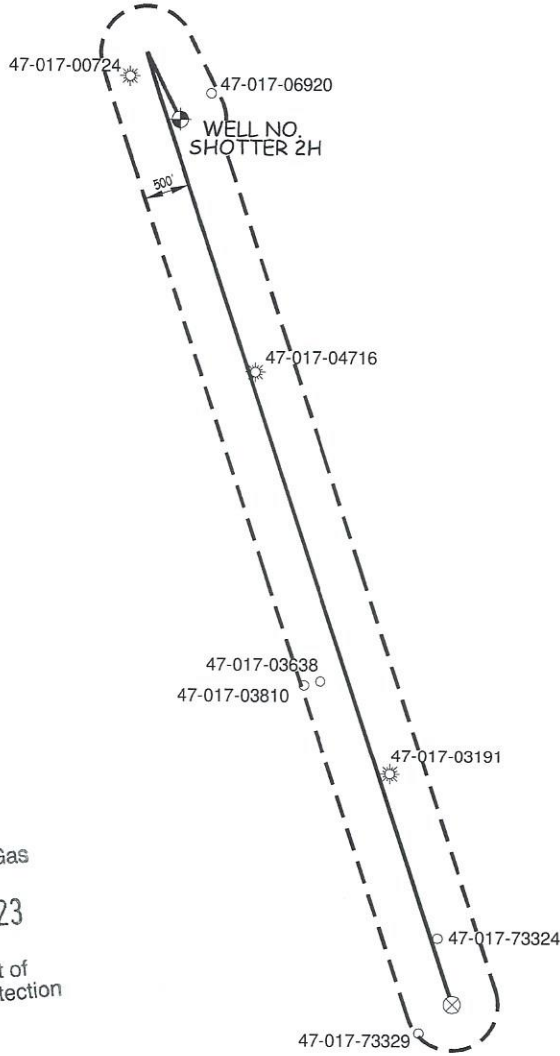
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04/07/2023

LOCKE PAD
ANTERO RESOURCES
CORPORATION



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WILLOW LAND SURVEYING, PLLC
P.O. BOX 17, PENNSBORO, WV 26415
(304) 659-1717

JOB #: 22-005WA

DATE: 03/03/23

DRAWN BY: D.R.R.

FILE: SHOTTER2HAOR.DWG

SCALE : 1-INCH = 2000-FEET



04/07/2023

4701706946

UWI (API Num)	Well Name	Well Number	Operator	Historical Operator	TD	Perforated Interval (shallowest, deepest)	Perforated Formation(s)	Productible Formation(s) not perf'd
47017047160000	OSBORN	1	KEY OIL CO	KEY OIL CO	5,280	3,256 - 5,133	Warren, Speecheley, Balltown, Riley, Benson, Warren, Alexander	Weir
47017007240000	E W OSBURN	1	TRIO O&G CO INC	TRIO PETROLEUM INC	1,880			Weir, Benson, Alexander
47017036380000	HUSK	1	RUBIN RESOURCES	RUBIN RESOURCES				Weir, Benson, Alexander
47017038100000	TRENT LORAINE	89-1	GASSEARCH CORP	GASSEARCH CORP				
47017031910000	DENNISON CHARLES J	J-735	BRAXTON O&G CORP	J & J ENTERPRISES	5,147	4952 - 4997	Alexander	Weir, Benson
47017733240000	J W HICKMAN	1	UNKNOWN	UNKNOWN				Weir, Benson, Alexander
47017733290000	EDNA M BROWN		UNKNOWN	UNKNOWN				

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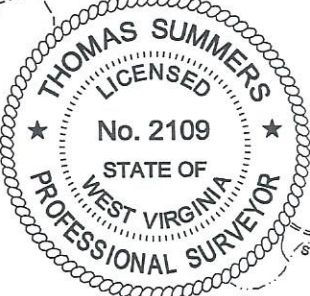
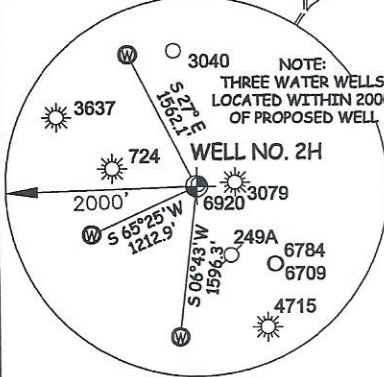
Antero Resources Corporation
Well No. Shotter #2H

NOTES:
WELL 2H TOP HOLE INFORMATION:
 N: 249,569ft E: 1,621,923ft
 LAT: 39°10'39.04" LON: 80°50'01.25"
BOTTOM HOLE INFORMATION:
 N: 239,955ft E: 1,624,928ft
 LAT: 39°09'04.45" LON: 80°49'21.29"
WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE.
 ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE 660XT 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: 4,336,498m E: 514,381m
BOTTOM HOLE INFORMATION:
 N: 4,333,584m E: 515,345m

(NAD) 27 (UTM) ZONE 17 COORDS:
WELL 2H TOP HOLE INFORMATION:
 N: 14,226,613ft E: 1,687,550ft
POINT OF ENTRY INFORMATION:
 N: 14,226,831ft E: 1,687,338ft
BOTTOM HOLE INFORMATION:
 N: 14,217,053ft E: 1,690,714ft

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.



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.

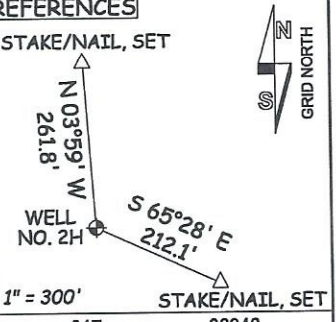
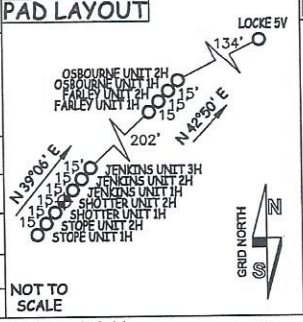


STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
 WILLOW LAND SURVEYING PLLC
 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

SOUTHWEST DISTRICT - DODDRIDGE COUNTY	
13-01	MANSFIELD LEESON
8-05	LARRY GANDER
13-03	HUNTER JENKINS
8-06	JOHN WALKUS
13-04	JACQUELINE PAYNE
9-07	BRIAN PRIM
13-10	HAROLD HINZMAN
9-08	ROBERT LEE BROWNFIELD JR.
13-21	ERNEST SEEDS
9-09	ANTERO RESOURCES CORPORATION
13-22	MICHAEL MCLOY
9-10	DELBERT OSBORNE
13-23	DANA LONG
9-11	STEPHEN HARRIS
13-25	DANA LONG
9-11.1	DELBERT OSBORNE
13-42	JAMES HAUGHT
9-13	ANTHONY RAMEY
13-46	JAMES HAUGHT
9-13.1	GARY SANCHEZ
13-47	FLOYD STOUT JR.
9-14	KERRY JUNKINS
13-48	JUDITH MORAN
9-15	ROBERT LEE BROWNFIELD JR.
13-52	STEVEN ADAMS
9-16	HUNTER JENKINS
13-55	DANA LONG
12-01	DAVID BALL JR.
13-71	ROBERT LEE BROWNFIELD JR.
12-05	DAVID BALL JR.
16-01	COY ADAMS
12-06	JAMES HAUGHT
16-02	UTAHONA WILLIAMS

JOB # 21-005WA
 DRAWING # SHOTTER2H
 SCALE 1" = 2000'
 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 +/-
 - - - Adjoining Surface Tracts +/-
 ⊕ Found monument, as noted
 THOMAS SUMMERS P.S. 2109
 DATE 03/20/23
 OPERATOR'S WELL# SHOTTER #2H



WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___ 47 - 017 - 06946
 (IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X STATE COUNTY PERMIT
 LOCATION: ELEVATION 1,100.5' - AS BUILT WATERSHED SOUTH FORK HUGHES RIVER
 QUADRANGLE OXFORD 7.5' DISTRICT SOUTHWEST COUNTY DODDRIDGE COUNTY NAME
 SURFACE OWNER ANTERO RESOURCES CORPORATION ACREAGE 59.74 ACRES +/-
 OIL & GAS ROYALTY OWNER E. W. OSBORNE ET AL; ANNA E. PARKS ET AL; LEASE ACREAGE 180 AC±; 48 AC±; 150 AC±; 70 AC±; 23 AC±; 26.16 AC±; 04/07/2023
 J. S. BRITTON ET UX; W. FRANK OSBORNE; JAN E. CHAPMAN; MILDRED P. CANTWELL ET VIR;
 FRANKLIN L. BUTLER; JIMMIE R. TRENT ET UX; LAWSON C. HUSK; FRED SIENA ET UX; BETTY LOUISE RICHARDS; 19 AC±; 16 AC±; 18.81 AC±; 0.39 AC±; 4.62 AC±;
 TARA JEE K. WITHERS; RICHARD CARLYLE WILKERSON; CLAUDE A. HICKMAN; GOODWIN BROWN, LLC; MARTHA H. CALDWELL 2.75 AC±; 1.00 AC±; 5.61 AC±; 10.5 AC±; 100 AC±;
 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 7,000' TVD 19,300' MD
 WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT KEVIN ELLIS
 ADDRESS 1615 WYNKOOP ST. ADDRESS 535 WHITE OAKS BLVD
 FORM WW-6 DENVER, CO 80202 BRIDGEPORT, WV 26330

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>E.W. Osborne, et al Lease</u>			
E.W. Osborne, et al	Hope Natural Gas	1/8	0057/0132
Hope Natural Gas	Trio Oil and Gas Company	Assignment	0072/0496
Trio Oil and Gas Company	Charter D. Stinespring, Paul B. Davis, and G.W. Hill	Assignment	0131/0687
Charter D. Stinespring, Paul B. Davis, and G.W. Hill	J&J Enterprises, Inc.	Assignment	0131/0762
J&J Enterprises, Inc.	Eastern American Energy Corp.	Assignment	0159/0139
Eastern American Energy Corp.	Energy Corporation of America	Merger	0006/0450
Energy Corporation of America	Antero Resources Appalachian Corporation	Assignment	0272/0307
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	0046/0523
<u>Anna E. Parks, et al Lease</u>			
Anna E. Parks, et al	Pittsburgh & WV Gas Company	1/8	0051/0454
Pittsburgh & WV Gas Company	Equitable Gas Company	Assignment	0121/0257
Equitable Gas Company	Equitrans, Inc.	Assignment	0155/0634
Equitrans, Inc.	Equitrans, LP	Deed	0302/0123
Equitrans, LP	Equitable Production-Eastern States Inc.	Assignment	0192/0019
Equitable Production-Eastern States Inc.	Equitable Production Company	Merge	0281/0346
Equitable Production Company	EQT Production Company	Name Change	0281/0346
EQT Production Company	Antero Resources Corporation	Assignment	0487/0641
<u>J.S. Britton, et ux Lease</u>			
J.S. Britton, et ux	U.G. Summers	1/8	0022/0438
U.G. Summers	The Fisher Oil Company	Assignment	0022/0443
The Fisher Oil Company	The Philadelphia Company Of West Virginia	Assignment	0024/0064
The Philadelphia Company Of West Virginia	Pittsburgh & WV Gas Company	Assignment	0032/0253
Pittsburgh & WV Gas Company	Equitable Gas Company	Assignment	0121/0257
Equitable Gas Company	Equitrans, Inc.	Assignment	0154/0475
Equitrans, Inc.	Equitrans, LP	Deed	0302/0123
Equitrans, LP	Equitable Production-Eastern States Inc.	Assignment	0192/0019
Equitable Production-Eastern States Inc.	Equitable Production Company	Merge	0281/0346
Equitable Production Company	EQT Production Company	Name Change	0281/0346
EQT Production Company	Antero Resources Corporation	Assignment	0487/0641

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Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<u>W. Frank Osborne Lease</u>			
W. Frank Osborne	Pittsburgh & West Virginia Gas Company	1/8	45/301
Pittsburgh & West Virginia Gas Company	Equitable Gas Company	Assignment	121/303
Equitable Gas Company	Equitrans Inc.	Assignment	154/475
Equitrans Inc.	Equitrans LP	Deed	302/123
Equitrans LP	Equitable Production – Eastern States Inc.	Assignment	192/19
Equitable Production-Eastern States Inc.	Equitable Production Company	Merge	281/346
Equitable Production Company	EQT Production Company	Name Change	281/346
EQT Production Company	Antero Resources Corporation	Assignment	487/641
<u>Jan E. Chapman Lease</u>			
Jan E. Chapman	Antero Resources Corporation	1/8+	512/522
<u>W. Frank Osborne Lease</u>			
W. Frank Osborne	Pittsburgh & West Virginia Gas Company	1/8	45/301
Pittsburgh & West Virginia Gas Company	Equitable Gas Company	Assignment	121/303
Equitable Gas Company	Equitrans Inc.	Assignment	154/475
Equitrans Inc.	Equitrans LP	Deed	302/123
Equitrans LP	Equitable Production – Eastern States Inc.	Assignment	192/19
Equitable Production-Eastern States Inc.	Equitable Production Company	Merge	281/346
Equitable Production Company	EQT Production Company	Name Change	281/346
EQT Production Company	Antero Resources Corporation	Assignment	487/641
<u>Mildred P. Cantwell et vir Lease</u>			
Mildred P. Cantwell et vir	Eastern American Energy Corporation	1/8	181/89
Eastern American Energy Corporation	Energy Corporation of America	Merge	283/431
Energy Corporation of America	Antero Resources Appalachian Corporation	Assignment	272/307
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	46/523
<u>Franklin L. Butler Lease</u>			
Franklin L. Butler	Antero Resources Corporation	1/8+	512/616
<u>Jimmie R. Trent et ux Lease</u>			
Jimmie R. Trent et ux	Key Oil Company	1/8	186/451
Key Oil Company	Antero Resources Appalachian Corporation	Assignment	276/526
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	46/523
<u>Fred Siena et ux Lease</u>			
Fred Siena et ux	Antero Resources Corporation	1/8+	479/725
<u>Lawson C. Husk Lease</u>			
Lawson C. Husk	Clarence Mutschelknaus	1/8	127/643
Clarence Mutschelknaus	Antero Resources Corporation	Assignment	327/340
<u>Betty Louise Richards Lease</u>			
Betty Louise Richards	Antero Resources Corporation	1/8+	510/718
<u>Tarajee K. Withers Lease</u>			
Tarajee K. Withers	Antero Resources Corporation	1/8+	508/358

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Operator's Well Number Shotter Unit 2H MOD

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
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IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

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Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<u>Richard Carlyle Wilkerson Lease</u> Richard Carlyle Wilkerson	Antero Resources Corporation	1/8+	507/546
<u>Claude A. Hickman Lease</u> Claude A. Hickman	Antero Resources Corporation	1/8+	507/239
<u>Goodwin Brown, LLC Lease</u> Goodwin Brown, LLC	Antero Resources Corporation	1/8+	478/598

*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
<u>Martha H. Caldwell Lease</u>	Martha H. Caldwell Jay-Bee Production Company JBU LLC	Jay-Bee Production Company JBU LLC Antero Resources Corporation	1/8 Assignment Assignment	206/384 278/209 453/234

*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.

- 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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WV Department of
Environmental Protection

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: Senior Vice President of Land