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west virginia department of environmental protection

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

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
www.dep.wv.gov

## PERMIT MODIFICATION APPROVAL

August 12, 2014

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, CO 80202

Re: Permit Modification Approval for API Number 1706395 , Well #: GAINS UNIT 1H  
**Bottom hole location changed**

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



March 21, 2014

Antero Resources  
1625 17th Street  
Denver, Colorado 80202  
Office 303.357.7310  
Fax 303.357.7315

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

Ms. Laura Cooper:

Antero Resources Corporation (Antero) would like to submit the following permit modification for an approved well on the Revival Pad. We are requesting to change the bottom hole of the Gains Unit 1H (API#47-017-06395).

Attached you will find the following documents:

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

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

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Ashlie Mihalcin".

Ashlie Mihalcin  
Permit Representative  
Antero Resources Corporation

Enclosures

Received

MAR 24 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection

WW-6B  
(9/13)

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: Gains Unit 1H Well Pad Name: Revival Pad (existing)

3) Farm Name/Surface Owner: Williams, Larry et al Public Road Access: CR 30

4) Elevation, current ground: 1375' Elevation, proposed post-construction: 1375'

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 Associated Pressure(s):  
Marcellus Shale: 7400' TVD, Anticipated Thickness- 55 Feet, Associated Pressure- 2950#

8) Proposed Total Vertical Depth: 7400' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 16,000' MD

11) Proposed Horizontal Leg Length: 7001'

12) Approximate Fresh Water Strata Depths: 450'

13) Method to Determine Fresh Water Depths: Gains-Koch Unit 1H (API# 47-017-06218) on same pad.

14) Approximate Saltwater Depths: 1079', 1808'

15) Approximate Coal Seam Depths: 328', 863'

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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MAR 24 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection

WW-6B  
(9/13)

18)

**CASING AND TUBING PROGRAM**

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill-up (Cu. Ft.)</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#	510'	510' *see #19	CTS, 708 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2460'	2460'	CTS, 1002 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16000'	16000'	4004 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	20"	24"	0.438"	1530	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	Class A	1.18
Intermediate						
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12630	Lead-H/POZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11200		
Liners						

**PACKERS**

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

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WV Dept. of Environmental Protection

WW-6B  
(9/13)

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."

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 15.45 (existing)

22) Area to be disturbed for well pad only, less access road (acres): 4.95 (existing)

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.

Received

MAR 24 2014

24) Describe all cement additives associated with each cement type:

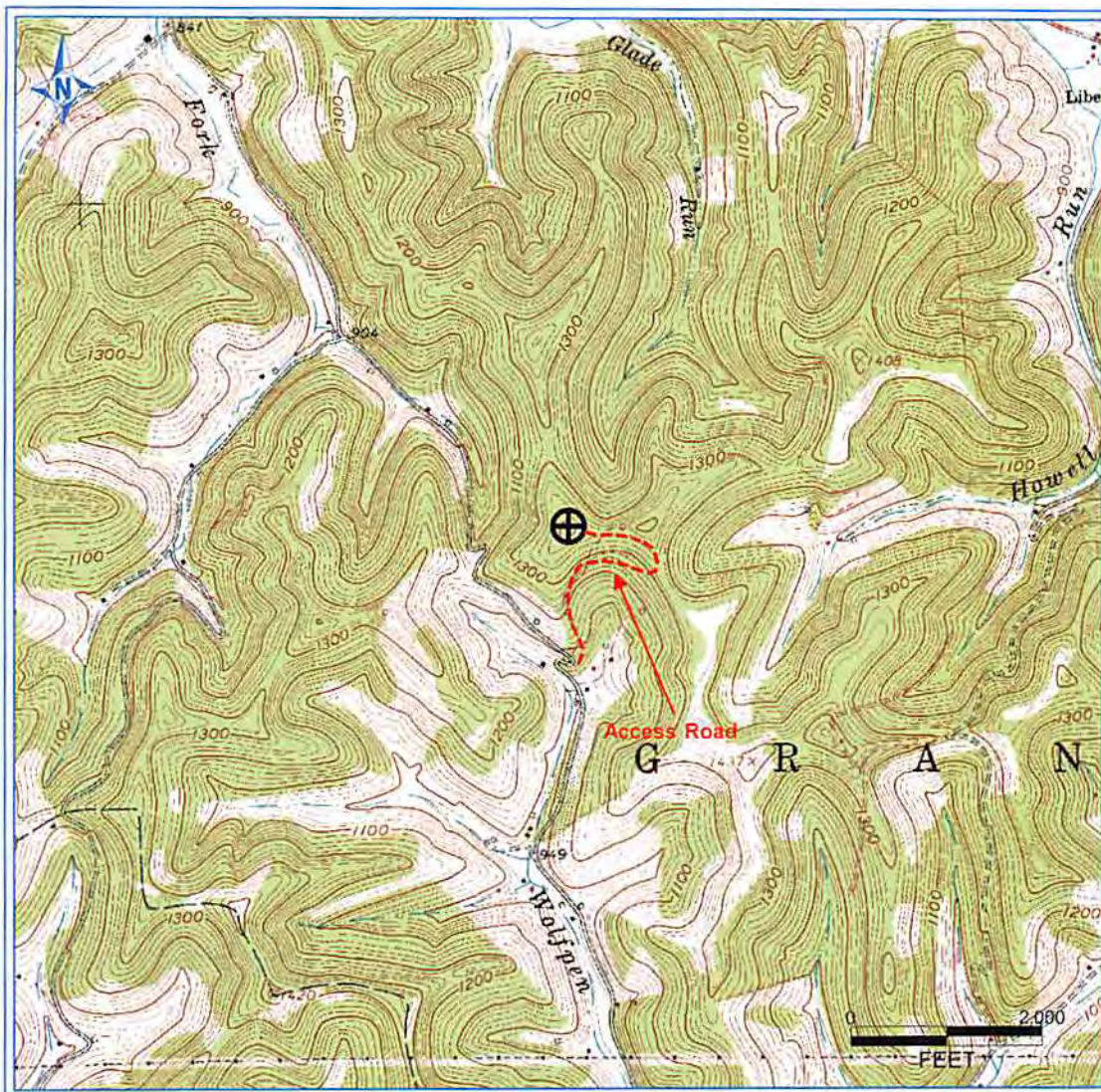
Conductor: no additives, Class A cement.  
Surface: Class A cement with 2% calcium and 1/4 lb flake, 5 gallons of clay treat  
Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat  
Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45%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

Office of Oil and Gas  
WV Dept. of Environmental Protection

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.



PETRA 11/29/2012 4:00:03 PM

DCN  
10-3-2013

RECEIVED  
Office of Oil and Gas  
OCT 04 2013  
WV Department of  
Environmental Protection

Antero Resources Corporation

APPALACHIAN BASIN

Gains Unit 1H

Doddridge County



REMARKS  
QUADRANGLE: SMITHBURG  
WATERSHED:  
DISTRICT: GRANT

Date: 12/04/12 08/15/2014

LATITUDE 39°20'00"

6,680'

5,201' TO BOTTOM HOLE  
LATITUDE 39°20'00"

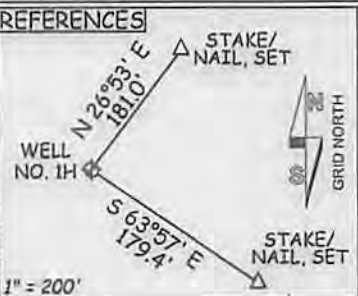
LONGITUDE 80°40'00"  
10,398' TO BOTTOM HOLE  
LONGITUDE 80°40'00"

Antero Resources Corporation  
Well No. Gains Unit 1H

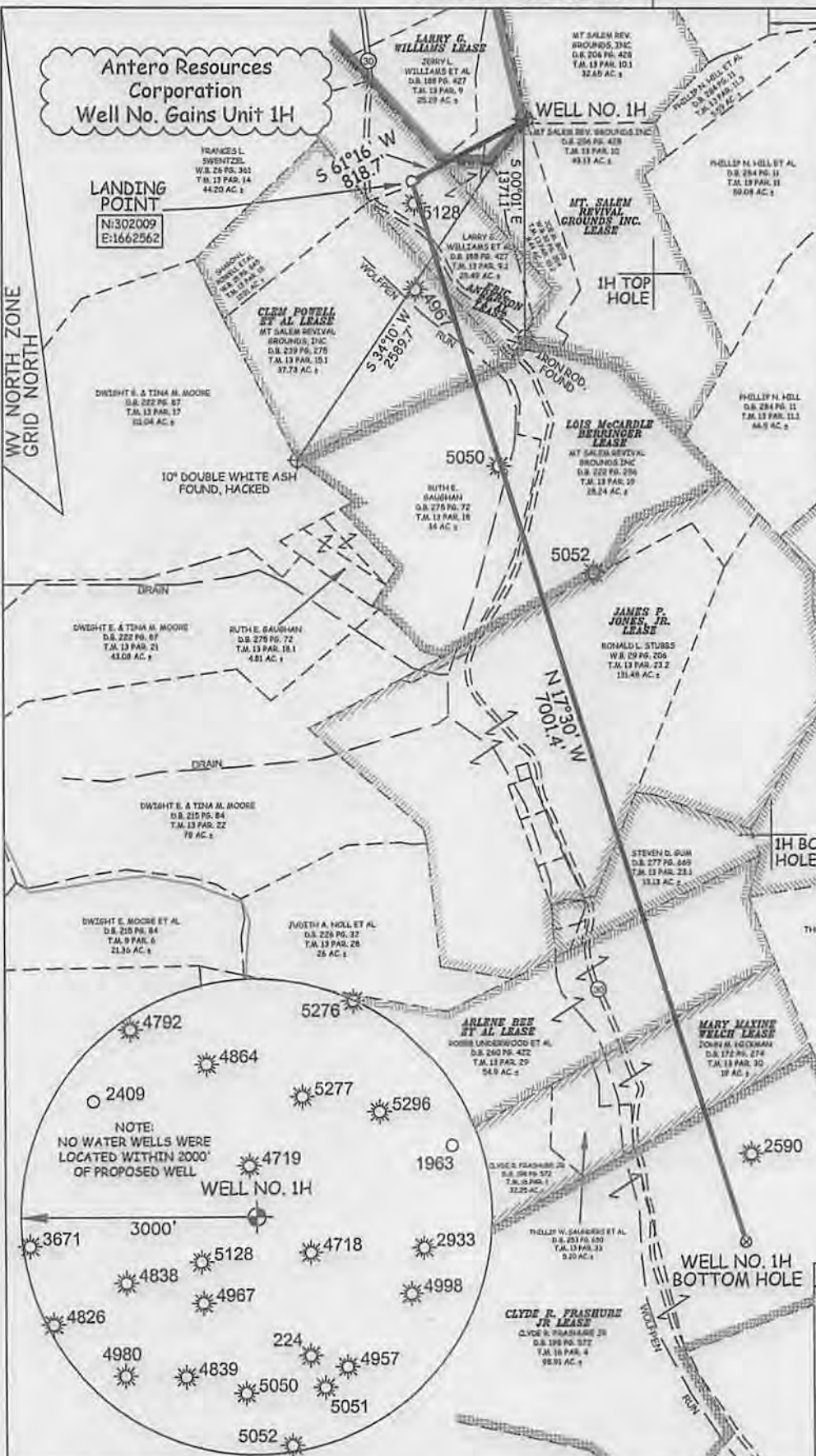
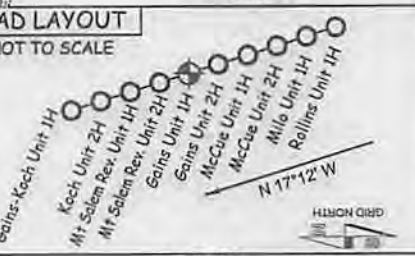
LANDING POINT  
N:302009  
E:1662562

NOTES:  
WELL 1H TOP HOLE INFORMATION:  
N: 302,402ft E: 1,663,280ft  
LAT: 39°19'26.94" LON: 80°41'25.00"  
BOTTOM HOLE INFORMATION:  
N: 295,331ft E: 1,664,667ft  
LAT: 39°18'17.23" LON: 80°41'06.16"  
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 1H TOP HOLE INFORMATION:  
N: 4,352,804m E: 526,712m  
BOTTOM HOLE INFORMATION:  
N: 4,350,657m E: 527,170m



NOTE:  
NO UNOCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY IN ANY MANNER ARE LOCATED WITHIN ONE HUNDRED TWENTY-FIVE (25) FEET OF THE CENTER OF THE WELL PAD.



JOB # 13-077WA  
DRAWING # GAINUNIT1HR1  
SCALE 1" = 1000'  
MINIMUM DEGREE OF ACCURACY SUBMETER  
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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

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

DOUGLAS R. ROWE P.S. 2202

DATE 03/20/14

OPERATOR'S WELL# GAINS UNIT #1H

API WELL # 47 - 017 - 06395  
STATE COUNTY PERMIT

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS  
WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL  
(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X  
LOCATION: ELEVATION 1,375' WATERSHED WOLFPEN RUN  
QUADRANGLE SMITHBURG 7.5' DISTRICT GRANT COUNTY DODD

SURFACE OWNER LARRY WILLIAMS ET AL ACREAGE 25.49 ACRES +/-  
OIL & GAS ROYALTY OWNER LARRY G. WILLIAMS; MT. SALEM REVIVAL GROUNDS INC.; ERIC ANDERSON ET AL; LEASE ACREAGE 35.11 ACRES +/-; 72.7 ACRES +/-; 40 ACRES +/-; CLEM POWELL ET AL; LOIS McCARDLE BERRINGER; JAMES P. JONES, JR.; CLARENCE MUTSCHERANUS; ARLENE BEE ET AL; MARY MAXINE WELCH; CLYDE RYLAN FRASHURE JR ET AL; 51 AC +/-; 67.5 AC +/-; 141 AC +/-; 57 AC +/-; 55 AC +/-; 63,434 AC +/-; 131 AC +/-

PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X  
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL  
(SPECIFY) Permit Modification - BHL PLUG & ABANDON CLEAN OUT & REPLUG  
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,400' TVD 16,000' MD

WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER  
ADDRESS 1625 17TH STREET ADDRESS 5400 D BIG TYLER ROAD  
DENVER, CO 80202 CHARLESTON, WV 25313

COUNTY NAME PERMIT

08/15/2014