



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

Austin Caperton, Cabinet Secretary
www.dep.wv.gov

Monday, October 15, 2018
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

ARSENAL RESOURCES LLC
6031 WALLACE ROAD EXTENSION
SUITE 603
WEXFORD, PA 15090

Re: Permit Modification Approval for PRITT SOUTH 216
47-033-05908-00-00

Modified lateral spacing and length

ARSENAL RESOURCES LLC

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 'James A. Martin', is positioned above the printed name and title.

James A. Martin
Chief

Operator's Well Number: PRITT SOUTH 216
Farm Name: IRA & LAURA PRITT
U.S. WELL NUMBER: 47-033-05908-00-00
Horizontal 6A New Drill
Date Modification Issued: October 15, 2018

Promoting a healthy environment.

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

1) Well Operator: Arsenal Resources 494519412 Harrison Simpson Brownton
Operator ID County District Quadrangle

2) Operator's Well Number: Pritt South 216 Well Pad Name: Pritt South

3) Farm Name/Surface Owner: Ira and Laura Pritt Public Road Access: County Route 17

4) Elevation, current ground: 1,351.20' Elevation, proposed post-construction: 1,354.80'

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

(b) If Gas Shallow Deep
Horizontal

*SDW
8/15/2018*

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale, 7799.0ft (TVD Heel) – 7799.0ft (TVD Toe), 100ft, 0.5 psi/ft Base of Marcellus Shale, 7899.0ft (TVD Heel) - 7899.0ft (TVD Toe)

8) Proposed Total Vertical Depth: 7,883 ft

9) Formation at Total Vertical Depth: Marcellus shale

10) Proposed Total Measured Depth: 16,393 ft

11) Proposed Horizontal Leg Length: 7,531 ft

12) Approximate Fresh Water Strata Depths: 15', 45', 90', 219', 257', 300', 315', 345', and 385' *

13) Method to Determine Fresh Water Depths: Offsetting wells reported water depths (033-00660, 033-00950, 033-00960, 033-00976, 033-00980, 033-03262)

14) Approximate Saltwater Depths: 1400'

15) Approximate Coal Seam Depths: Bakerstown 492', Brush Creek 591', Upper Freeport 652', Lower Freeport 712', Upper Kittanning 787', Middle Kittanning 847', Lower Kittanning 860'

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

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	24	New	H-40	94	80	80	CTS
Fresh Water	13.375	New	J-55	54.5	450	450	CTS
Coal							
Intermediate	9.625	New	J-55	40	1,500	1,500	CTS
Production	5.5	New	P-110	20	16,393	16,393	TOC @ 1,350' MD
Tubing							
Liners							

** Best Casing Possible. JA*

8/15/2018

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	24	36			0	Class A, 3% CaCl2	1.20
Fresh Water	13.375	17.5	0.38	2730	900	Class A, 3% CaCl2	1.20
Coal							
Intermediate	9.625	12.25	0.395	3950	1500	Class A, 3% CaCl2	1.29
Production	5.5	8.5-8.75	0.361	12,640	9,500	Class A/50:50 Poz	1.29/1.34
Tubing					5,000		
Liners					N/A		

PACKERS

Kind:				
Sizes:				
Depths Set:				

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

The well will be started with a conductor rig drilling a 36" hole to Conductor programmed depth then running 24" casing and circulate cement back to surface. The conductor rig will move out and the drilling rig will move in and rig up. The drilling rig will then spud a 17 1/2" hole and drill to fresh water casing (Surface) to the programmed depth, Run 13- 3/8" casing and cement to surface. The rig will continue drilling a 12- 1/4" intermediate hole to the programmed depth, run 9- 5/8" casing and cement to surface. The rig will then continue to drill an 8- 3/4" hole to a designed KOP. We will then start drilling the curve and lateral section to the programmed total measured depth, run 5 1/2" casing and cement according to the program.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

The well will be completed using a plug and perforation method and stimulated with a slickwater and sand slurry. The anticipated maximum rate will be 90 bpm and the maximum pressure will be 9,500 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 29.78

22) Area to be disturbed for well pad only, less access road (acres): 9.15

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23) Describe centralizer placement for each casing string:

24"- No centralizers 13 3/8" – one bow spring centralizer on every other joint 9 5/8" – one bow spring centralizer every third joint from TD to surface 5 1/2" – one semi rigid centralizer on every joint from TD of casing to end of curve. Then every other joint to KOP. Every third joint from KOP to 1,600'; there will be no centralizers from 1,600 to surface.

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

24" will be circulated to surface. The 13 3/8" casing will be cemented to surface with Class A cement and no greater than 3% CaCl (calcium chloride). The 9 5/8" casing will be cemented to surface with Class A cement, & no greater than 3% calcium chloride. The 5 1/2" production string will be cemented back to 1,350' (+/- 150' above the casing shoe for the 9 5/8") with Class A and 50/50 Poz cement retarded (to extend pumpability) cellophane flaked for fluid loss, Bentonite gel as an extender (increased pumpability and fluid loss), a defoaming agent to decrease cement foaming during mixing to insure the cement is of proper weight to placement and possibly gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additive mentioned here, helps cement achieve a "right angle" set) during the plastic phase of the cement set-up.

25) Proposed borehole conditioning procedures:

Top holes will be drilled with fresh water KOP. At KOP, the wellbore will be loaded with synthetic oil based mud, barite-weighted mud system with such properties as to build a filter-cake on the face of the bore-hole. This will provide lubricity as well as stabilizing the well bore. We will begin rotating the drill string and mud will be circulated upon reaching TD until no further cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will pull three stands of drill pipe, load the hole, pull three stands and load the hole. The weight indicator on the rig will be monitored for any occurrences of drag and if any are noticed, we will re-run the previous stand of pipe pulled across and circulate 2x bottoms up while watching shakers for signs of cuttings. Once at the base curve, the string will be continuously rotated while pumping 2x bottoms up. We will pull three stands and fill the hole until we reach the vertical section of the well.

*Note: Attach additional sheets as needed.



ARSENAL
R E S O U R C E S

Arsenal Resources

Harrison County, West Virginia NAD 83

Pritt South Pad

Pritt South #216

Wellbore #1

Plan: Design #4

QES Well Planning Report

26 June, 2018

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Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Pritt South #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1381.8usft
Project:	Harrison County, West Virginia NAD 83	MD Reference:	WELL @ 1381.8usft
Site:	Pritt South Pad	North Reference:	Grid
Well:	Pritt South #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #4		

Project	Harrison County, West Virginia NAD 83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	West Virginia Northern Zone		

Site	Pritt South Pad		
Site Position:		Northing:	272,369.26 usft
From:	Map	Easting:	1,773,918.84 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	39° 14' 44.725 N
		Longitude:	80° 11' 13.422 W
		Grid Convergence:	-0.44 °

Well	Pritt South #216					
Well Position	+N/-S	-372.2 usft	Northing:	271,997.06 usft	Latitude:	39° 14' 41.061 N
	+E/-W	199.2 usft	Easting:	1,774,118.01 usft	Longitude:	80° 11' 10.855 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	1,354.8 usft	

Wellbore	Wellbore #1		
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/18/2017	-8.93	66.45	51,826.41038759

Design	Design #4		
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Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	357.33

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,698.5	33.97	74.42	3,600.7	131.3	471.0	2.00	2.00	0.00	74.42	
6,164.0	33.97	74.42	5,645.5	501.4	1,798.0	0.00	0.00	0.00	0.00	
7,862.6	0.00	0.00	7,246.2	632.8	2,268.9	2.00	-2.00	0.00	180.00	VP Pritt South #216
8,862.6	90.00	341.00	7,882.8	1,234.7	2,061.7	9.00	9.00	-1.90	341.00	
16,393.1	90.00	341.00	7,882.8	8,355.1	-389.6	0.00	0.00	0.00	0.00	PBHL Pritt South #:

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Well Planning Report



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Company:	Arsenal Resources	TVD Reference:	WELL @ 1381.8usft
Project:	Harrison County, West Virginia NAD 83	MD Reference:	WELL @ 1381.8usft
Site:	Pritt South Pad	North Reference:	Grid
Well:	Pritt South #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #4		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Start Build 2.00										
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
2,100.0	2.00	74.42	2,100.0	0.5	1.7	0.4	2.00	2.00	0.00	0.00
2,200.0	4.00	74.42	2,199.8	1.9	6.7	1.6	2.00	2.00	0.00	0.00
2,300.0	6.00	74.42	2,299.5	4.2	15.1	3.5	2.00	2.00	0.00	0.00
2,400.0	8.00	74.42	2,398.7	7.5	26.9	6.2	2.00	2.00	0.00	0.00
2,500.0	10.00	74.42	2,497.5	11.7	41.9	9.7	2.00	2.00	0.00	0.00
2,600.0	12.00	74.42	2,595.6	16.8	60.3	14.0	2.00	2.00	0.00	0.00
2,700.0	14.00	74.42	2,693.1	22.9	82.0	19.0	2.00	2.00	0.00	0.00
2,800.0	16.00	74.42	2,789.6	29.8	106.9	24.8	2.00	2.00	0.00	0.00
2,900.0	18.00	74.42	2,885.3	37.7	135.1	31.3	2.00	2.00	0.00	0.00
3,000.0	20.00	74.42	2,979.8	46.4	166.4	38.6	2.00	2.00	0.00	0.00
3,100.0	22.00	74.42	3,073.2	56.0	200.9	46.6	2.00	2.00	0.00	0.00
3,200.0	24.00	74.42	3,165.2	66.5	238.6	55.3	2.00	2.00	0.00	0.00
3,300.0	26.00	74.42	3,255.8	77.9	279.3	64.8	2.00	2.00	0.00	0.00
3,400.0	28.00	74.42	3,344.9	90.1	323.0	74.9	2.00	2.00	0.00	0.00
3,500.0	30.00	74.42	3,432.4	103.1	369.7	85.8	2.00	2.00	0.00	0.00
3,600.0	32.00	74.42	3,518.1	116.9	419.3	97.3	2.00	2.00	0.00	0.00
Start 2465.5 hold at 3698.5 MD										
3,698.5	33.97	74.42	3,600.7	131.3	471.0	109.3	2.00	2.00	0.00	0.00
3,700.0	33.97	74.42	3,602.0	131.6	471.8	109.5	0.00	0.00	0.00	0.00
3,800.0	33.97	74.42	3,684.9	146.6	525.6	121.9	0.00	0.00	0.00	0.00
3,900.0	33.97	74.42	3,767.8	161.6	579.4	134.4	0.00	0.00	0.00	0.00
4,000.0	33.97	74.42	3,850.8	176.6	633.2	146.9	0.00	0.00	0.00	0.00
4,100.0	33.97	74.42	3,933.7	191.6	687.1	159.4	0.00	0.00	0.00	0.00
4,200.0	33.97	74.42	4,016.6	206.6	740.9	171.9	0.00	0.00	0.00	0.00
4,300.0	33.97	74.42	4,099.6	221.6	794.7	184.4	0.00	0.00	0.00	0.00
4,400.0	33.97	74.42	4,182.5	236.6	848.5	196.9	0.00	0.00	0.00	0.00
4,500.0	33.97	74.42	4,265.4	251.7	902.3	209.3	0.00	0.00	0.00	0.00
4,600.0	33.97	74.42	4,348.4	266.7	956.2	221.8	0.00	0.00	0.00	0.00
4,700.0	33.97	74.42	4,431.3	281.7	1,010.0	234.3	0.00	0.00	0.00	0.00
4,800.0	33.97	74.42	4,514.2	296.7	1,063.8	246.8	0.00	0.00	0.00	0.00
4,900.0	33.97	74.42	4,597.2	311.7	1,117.6	259.3	0.00	0.00	0.00	0.00
5,000.0	33.97	74.42	4,680.1	326.7	1,171.5	271.8	0.00	0.00	0.00	0.00

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Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
5,100.0	33.97	74.42	4,763.0	341.7	1,225.3	284.3	0.00	0.00	0.00	
5,200.0	33.97	74.42	4,846.0	356.7	1,279.1	296.8	0.00	0.00	0.00	
5,300.0	33.97	74.42	4,928.9	371.7	1,332.9	309.2	0.00	0.00	0.00	
5,400.0	33.97	74.42	5,011.8	386.7	1,386.8	321.7	0.00	0.00	0.00	
5,500.0	33.97	74.42	5,094.8	401.8	1,440.6	334.2	0.00	0.00	0.00	
5,600.0	33.97	74.42	5,177.7	416.8	1,494.4	346.7	0.00	0.00	0.00	
5,700.0	33.97	74.42	5,260.6	431.8	1,548.2	359.2	0.00	0.00	0.00	
5,800.0	33.97	74.42	5,343.6	446.8	1,602.0	371.7	0.00	0.00	0.00	
5,900.0	33.97	74.42	5,426.5	461.8	1,655.9	384.2	0.00	0.00	0.00	
6,000.0	33.97	74.42	5,509.4	476.8	1,709.7	396.7	0.00	0.00	0.00	
6,100.0	33.97	74.42	5,592.4	491.8	1,763.5	409.1	0.00	0.00	0.00	
Start Drop -2.00										
6,164.0	33.97	74.42	5,645.5	501.4	1,798.0	417.1	0.00	0.00	0.00	
6,200.0	33.25	74.42	5,675.4	506.8	1,817.2	421.6	2.00	-2.00	0.00	
6,300.0	31.25	74.42	5,760.0	521.1	1,868.5	433.5	2.00	-2.00	0.00	
6,400.0	29.25	74.42	5,846.4	534.6	1,917.1	444.8	2.00	-2.00	0.00	
6,500.0	27.25	74.42	5,934.4	547.4	1,962.7	455.3	2.00	-2.00	0.00	
6,600.0	25.25	74.42	6,024.1	559.2	2,005.3	465.2	2.00	-2.00	0.00	
6,700.0	23.25	74.42	6,115.3	570.3	2,044.8	474.4	2.00	-2.00	0.00	
6,800.0	21.25	74.42	6,207.8	580.4	2,081.3	482.9	2.00	-2.00	0.00	
6,900.0	19.25	74.42	6,301.7	589.7	2,114.6	490.6	2.00	-2.00	0.00	
7,000.0	17.25	74.42	6,396.6	598.2	2,144.8	497.6	2.00	-2.00	0.00	
7,100.0	15.25	74.42	6,492.6	605.7	2,171.8	503.9	2.00	-2.00	0.00	
7,200.0	13.25	74.42	6,589.5	612.3	2,195.5	509.4	2.00	-2.00	0.00	
7,300.0	11.25	74.42	6,687.3	618.0	2,215.9	514.1	2.00	-2.00	0.00	
7,400.0	9.25	74.42	6,785.7	622.8	2,233.1	518.1	2.00	-2.00	0.00	
7,500.0	7.25	74.42	6,884.6	626.6	2,246.9	521.3	2.00	-2.00	0.00	
7,600.0	5.25	74.42	6,984.0	629.5	2,257.4	523.7	2.00	-2.00	0.00	
7,700.0	3.25	74.42	7,083.7	631.5	2,264.5	525.4	2.00	-2.00	0.00	
7,800.0	1.25	74.42	7,183.7	632.6	2,268.3	526.3	2.00	-2.00	0.00	
Start DLS 9.00 TFO 341.00										
7,862.6	0.00	0.00	7,246.2	632.8	2,268.9	526.4	2.00	-2.00	0.00	
7,900.0	3.37	341.00	7,283.6	633.8	2,268.6	527.5	9.00	9.00	0.00	
7,950.0	7.87	341.00	7,333.4	638.4	2,267.0	532.2	9.00	9.00	0.00	
8,000.0	12.37	341.00	7,382.6	646.8	2,264.1	540.6	9.00	9.00	0.00	
8,050.0	16.87	341.00	7,430.9	658.7	2,260.0	552.7	9.00	9.00	0.00	
8,100.0	21.37	341.00	7,478.2	674.2	2,254.7	568.4	9.00	9.00	0.00	
8,150.0	25.87	341.00	7,524.0	693.1	2,248.2	587.6	9.00	9.00	0.00	
8,200.0	30.37	341.00	7,568.1	715.4	2,240.5	610.2	9.00	9.00	0.00	
8,250.0	34.87	341.00	7,610.2	740.9	2,231.7	636.1	9.00	9.00	0.00	
8,300.0	39.37	341.00	7,650.0	769.4	2,221.9	665.1	9.00	9.00	0.00	
8,350.0	43.87	341.00	7,687.4	800.8	2,211.1	696.9	9.00	9.00	0.00	
8,400.0	48.37	341.00	7,722.0	834.8	2,199.4	731.5	9.00	9.00	0.00	
8,450.0	52.87	341.00	7,753.8	871.4	2,186.8	768.6	9.00	9.00	0.00	
8,500.0	57.37	341.00	7,782.3	910.1	2,173.5	807.9	9.00	9.00	0.00	
8,550.0	61.87	341.00	7,807.6	950.9	2,159.4	849.3	9.00	9.00	0.00	
8,600.0	66.37	341.00	7,829.4	993.4	2,144.8	892.5	9.00	9.00	0.00	
8,650.0	70.87	341.00	7,847.7	1,037.5	2,129.6	937.1	9.00	9.00	0.00	
8,700.0	75.37	341.00	7,862.2	1,082.7	2,114.1	983.0	9.00	9.00	0.00	
8,750.0	79.87	341.00	7,872.9	1,128.9	2,098.2	1,029.9	9.00	9.00	0.00	
8,800.0	84.37	341.00	7,879.7	1,175.7	2,082.0	1,077.4	9.00	9.00	0.00	
8,850.0	88.87	341.00	7,882.7	1,222.9	2,065.8	1,125.3	9.00	9.00	0.00	
Start 7530.5 hold at 8862.6 MD										

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WV Department of Environmental Protection

33-05908 MON



Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Pritt South #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1381.8usft
Project:	Harrison County, West Virginia NAD 83	MD Reference:	WELL @ 1381.8usft
Site:	Pritt South Pad	North Reference:	Grid
Well:	Pritt South #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #4		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
8,862.6	90.00	341.00	7,882.8	1,234.7	2,061.7	1,137.4	9.00	9.00	0.00	
8,900.0	90.00	341.00	7,882.8	1,270.1	2,049.5	1,173.3	0.00	0.00	0.00	
9,000.0	90.00	341.00	7,882.8	1,364.7	2,017.0	1,269.3	0.00	0.00	0.00	
9,100.0	90.00	341.00	7,882.8	1,459.2	1,984.4	1,365.2	0.00	0.00	0.00	
9,200.0	90.00	341.00	7,882.8	1,553.8	1,951.9	1,461.2	0.00	0.00	0.00	
9,300.0	90.00	341.00	7,882.8	1,648.3	1,919.3	1,557.2	0.00	0.00	0.00	
9,400.0	90.00	341.00	7,882.8	1,742.9	1,886.8	1,653.1	0.00	0.00	0.00	
9,500.0	90.00	341.00	7,882.8	1,837.5	1,854.2	1,749.1	0.00	0.00	0.00	
9,600.0	90.00	341.00	7,882.8	1,932.0	1,821.7	1,845.1	0.00	0.00	0.00	
9,700.0	90.00	341.00	7,882.8	2,026.6	1,789.1	1,941.0	0.00	0.00	0.00	
9,800.0	90.00	341.00	7,882.8	2,121.1	1,756.6	2,037.0	0.00	0.00	0.00	
9,900.0	90.00	341.00	7,882.8	2,215.7	1,724.0	2,133.0	0.00	0.00	0.00	
10,000.0	90.00	341.00	7,882.8	2,310.2	1,691.5	2,228.9	0.00	0.00	0.00	
10,100.0	90.00	341.00	7,882.8	2,404.8	1,658.9	2,324.9	0.00	0.00	0.00	
10,200.0	90.00	341.00	7,882.8	2,499.3	1,626.4	2,420.9	0.00	0.00	0.00	
10,300.0	90.00	341.00	7,882.8	2,593.9	1,593.8	2,516.8	0.00	0.00	0.00	
10,400.0	90.00	341.00	7,882.8	2,688.4	1,561.3	2,612.8	0.00	0.00	0.00	
10,500.0	90.00	341.00	7,882.8	2,783.0	1,528.7	2,708.8	0.00	0.00	0.00	
10,600.0	90.00	341.00	7,882.8	2,877.5	1,496.1	2,804.7	0.00	0.00	0.00	
10,700.0	90.00	341.00	7,882.8	2,972.1	1,463.6	2,900.7	0.00	0.00	0.00	
10,800.0	90.00	341.00	7,882.8	3,066.7	1,431.0	2,996.7	0.00	0.00	0.00	
10,900.0	90.00	341.00	7,882.8	3,161.2	1,398.5	3,092.6	0.00	0.00	0.00	
11,000.0	90.00	341.00	7,882.8	3,255.8	1,365.9	3,188.6	0.00	0.00	0.00	
11,100.0	90.00	341.00	7,882.8	3,350.3	1,333.4	3,284.6	0.00	0.00	0.00	
11,200.0	90.00	341.00	7,882.8	3,444.9	1,300.8	3,380.5	0.00	0.00	0.00	
11,300.0	90.00	341.00	7,882.8	3,539.4	1,268.3	3,476.5	0.00	0.00	0.00	
11,400.0	90.00	341.00	7,882.8	3,634.0	1,235.7	3,572.5	0.00	0.00	0.00	
11,500.0	90.00	341.00	7,882.8	3,728.5	1,203.2	3,668.4	0.00	0.00	0.00	
11,600.0	90.00	341.00	7,882.8	3,823.1	1,170.6	3,764.4	0.00	0.00	0.00	
11,700.0	90.00	341.00	7,882.8	3,917.6	1,138.1	3,860.4	0.00	0.00	0.00	
11,800.0	90.00	341.00	7,882.8	4,012.2	1,105.5	3,956.3	0.00	0.00	0.00	
11,900.0	90.00	341.00	7,882.8	4,106.7	1,073.0	4,052.3	0.00	0.00	0.00	
12,000.0	90.00	341.00	7,882.8	4,201.3	1,040.4	4,148.3	0.00	0.00	0.00	
12,100.0	90.00	341.00	7,882.8	4,295.8	1,007.9	4,244.2	0.00	0.00	0.00	
12,200.0	90.00	341.00	7,882.8	4,390.4	975.3	4,340.2	0.00	0.00	0.00	
12,300.0	90.00	341.00	7,882.8	4,485.0	942.8	4,436.2	0.00	0.00	0.00	
12,400.0	90.00	341.00	7,882.8	4,579.5	910.2	4,532.1	0.00	0.00	0.00	
12,500.0	90.00	341.00	7,882.8	4,674.1	877.7	4,628.1	0.00	0.00	0.00	
12,600.0	90.00	341.00	7,882.8	4,768.6	845.1	4,724.1	0.00	0.00	0.00	
12,700.0	90.00	341.00	7,882.8	4,863.2	812.6	4,820.0	0.00	0.00	0.00	
12,800.0	90.00	341.00	7,882.8	4,957.7	780.0	4,916.0	0.00	0.00	0.00	
12,900.0	90.00	341.00	7,882.8	5,052.3	747.5	5,012.0	0.00	0.00	0.00	
13,000.0	90.00	341.00	7,882.8	5,146.8	714.9	5,107.9	0.00	0.00	0.00	
13,100.0	90.00	341.00	7,882.8	5,241.4	682.4	5,203.9	0.00	0.00	0.00	
13,200.0	90.00	341.00	7,882.8	5,335.9	649.8	5,299.9	0.00	0.00	0.00	
13,300.0	90.00	341.00	7,882.8	5,430.5	617.3	5,395.8	0.00	0.00	0.00	
13,400.0	90.00	341.00	7,882.8	5,525.0	584.7	5,491.8	0.00	0.00	0.00	
13,500.0	90.00	341.00	7,882.8	5,619.6	552.1	5,587.8	0.00	0.00	0.00	
13,600.0	90.00	341.00	7,882.8	5,714.2	519.6	5,683.7	0.00	0.00	0.00	
13,700.0	90.00	341.00	7,882.8	5,808.7	487.0	5,779.7	0.00	0.00	0.00	
13,800.0	90.00	341.00	7,882.8	5,903.3	454.5	5,875.7	0.00	0.00	0.00	
13,900.0	90.00	341.00	7,882.8	5,997.8	421.9	5,971.6	0.00	0.00	0.00	
14,000.0	90.00	341.00	7,882.8	6,092.4	389.4	6,067.6	0.00	0.00	0.00	
14,100.0	90.00	341.00	7,882.8	6,186.9	356.8	6,163.6	0.00	0.00	0.00	

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33-05908
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Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Pritt South #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1381.8usft
Project:	Harrison County, West Virginia NAD 83	MD Reference:	WELL @ 1381.8usft
Site:	Pritt South Pad	North Reference:	Grid
Well:	Pritt South #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #4		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,200.0	90.00	341.00	7,882.8	6,281.5	324.3	6,259.6	0.00	0.00	0.00
14,300.0	90.00	341.00	7,882.8	6,376.0	291.7	6,355.5	0.00	0.00	0.00
14,400.0	90.00	341.00	7,882.8	6,470.6	259.2	6,451.5	0.00	0.00	0.00
14,500.0	90.00	341.00	7,882.8	6,565.1	226.6	6,547.5	0.00	0.00	0.00
14,600.0	90.00	341.00	7,882.8	6,659.7	194.1	6,643.4	0.00	0.00	0.00
14,700.0	90.00	341.00	7,882.8	6,754.2	161.5	6,739.4	0.00	0.00	0.00
14,800.0	90.00	341.00	7,882.8	6,848.8	129.0	6,835.4	0.00	0.00	0.00
14,900.0	90.00	341.00	7,882.8	6,943.4	96.4	6,931.3	0.00	0.00	0.00
15,000.0	90.00	341.00	7,882.8	7,037.9	63.9	7,027.3	0.00	0.00	0.00
15,100.0	90.00	341.00	7,882.8	7,132.5	31.3	7,123.3	0.00	0.00	0.00
15,200.0	90.00	341.00	7,882.8	7,227.0	-1.2	7,219.2	0.00	0.00	0.00
15,300.0	90.00	341.00	7,882.8	7,321.6	-33.8	7,315.2	0.00	0.00	0.00
15,400.0	90.00	341.00	7,882.8	7,416.1	-66.3	7,411.2	0.00	0.00	0.00
15,500.0	90.00	341.00	7,882.8	7,510.7	-98.9	7,507.1	0.00	0.00	0.00
15,600.0	90.00	341.00	7,882.8	7,605.2	-131.4	7,603.1	0.00	0.00	0.00
15,700.0	90.00	341.00	7,882.8	7,699.8	-164.0	7,699.1	0.00	0.00	0.00
15,800.0	90.00	341.00	7,882.8	7,794.3	-196.5	7,795.0	0.00	0.00	0.00
15,900.0	90.00	341.00	7,882.8	7,888.9	-229.1	7,891.0	0.00	0.00	0.00
16,000.0	90.00	341.00	7,882.8	7,983.4	-261.6	7,987.0	0.00	0.00	0.00
16,100.0	90.00	341.00	7,882.8	8,078.0	-294.2	8,082.9	0.00	0.00	0.00
16,200.0	90.00	341.00	7,882.8	8,172.5	-326.7	8,178.9	0.00	0.00	0.00
16,300.0	90.00	341.00	7,882.8	8,267.1	-359.3	8,274.9	0.00	0.00	0.00
TD at 16393.1									
16,393.1	90.00	341.00	7,882.8	8,355.1	-389.6	8,364.2	0.00	0.00	0.00

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL Pritt South #216 - hit/miss target - Shape - Point	0.00	360.00	7,882.8	8,355.1	-389.6	280,352.19	1,773,728.41	39° 16' 3.611 N	80° 11' 16.620 W
LP Pritt South #216 D - plan hits target center - Point	0.00	360.00	7,882.8	1,234.7	2,061.7	273,231.78	1,776,179.72	39° 14' 53.420 N	80° 10' 44.767 W

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
2,000.0	2,000.0	0.0	0.0	Start Build 2.00
3,698.5	3,600.7	131.3	471.0	Start 2465.5 hold at 3698.5 MD
6,164.0	5,645.5	501.4	1,798.0	Start Drop -2.00
7,862.6	7,246.2	632.8	2,268.9	Start DLS 9.00 TFO 341.00
8,862.6	7,882.8	1,234.7	2,061.7	Start 7530.5 hold at 8862.6 MD
16,393.1	7,882.8	8,355.1	-389.6	TD at 16393.1

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Purpose

The purpose of this pad-specific Hydraulic Fracturing Monitoring Plan is to identify and notify conventional well operators near Arsenal Resources hydraulic fracturing in Harrison County, WV prior to hydraulic fracturing at the following Arsenal Resources wells on the Pritt South Pad, well 216.

Due to the apparent presence of unique geological conditions, the potential for communication between deep geologic zones exists in this area. This potential communication, via natural gas, water, or both, may occur between hydraulically fractured wells in the Marcellus formation (approximately 7,900' TVD) and existing conventional natural gas wells in the partially-depleted, relatively high permeability Benson formation (approximately 4,700' TVD).

The plan is being implemented as an additional safety measure to be utilized in conjunction with best management practices and emergency action plans for this site. These additional measures include pre-notification of conventional well operators of the timing and location of the hydraulic fracturing, establishment of measures conventional well operators should implement, and assurance that the Division of Oil and Gas is notified of the timeline, as well as any issues that may arise during fracturing.

1. Communications with Conventional Operators.

Arsenal Resources, using available data (WV Geological Survey, WVDEP Website, and IHS data service), has identified all known conventional wells and well operators within 500 feet of this pad and the lateral sections. A map showing these wells along with a list of the wells and operators is included in Attachment A.

Upon approval of this plan, Arsenal Resources will notify these operators, via letter, of the hydraulic fracturing schedule for these wells. A copy of this letter is included in Attachment B.

The letter provides recommendations to these conventional operators to 1) increase their monitoring of their wells during that time period, 2) ensure that their well head equipment is sound, and 3) provide immediate notification to Arsenal Resources and the OOG in the event of any changes in their well conditions.

Specifically, the letter recommends that conventional well operators conduct the following activities during and after fracturing operations:

1. Inspect their surface equipment prior to fracturing to establish integrity and establish proper frac well conditions.
2. Observe wells closely during and after fracturing and monitor for abnormal increases in water, gas or pressure.
3. Inspect or install master valves rated to 3,000 psi or other necessary equipment for wellhead integrity.
4. Notify the OOG and Arsenal Resources if any changes in water, gas production, pressure or other anomalies are identified.

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2. Reporting

Arsenal Resources will provide information relating to the hydraulic fracturing schedule, communication with conventional operators, and ongoing monitoring of the work upon request of OOG or immediately after any event of any noted abnormalities.

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Area of Review Report - **Pritt South** Pad, **216** Lateral, **Harrison** County, WV

Well Name	API Number	Operator Name / Address	Well Type	Latitude	Longitude	Total Depth	Perforated Formation(s)	Producing Zones not Perforated
LG Robey B-466	033-02741	Braxton Oil & Gas Corp.	Existing	39.263456	-80.190181	4520	Fifth, Benson	NA
B-548	033-02937	Greylock Conventional, LLC	Existing	39.263045	-80.185687	4658	Thirty-foot, Balltown, Benson	NA
Goodwin 1	033-02344	Greylock Conventional, LLC	Existing	39.251701	-80.180848	4502	Benson	NA
Goodwin A-1	033-02396	Greylock Conventional, LLC	Existing	39.257796	-80.183275	4664	Benson	NA

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AOR - Attachment
"A"



Click or tap to enter a date.

Braxton Oil & Gas Corp.

Address

State

RE: Click or tap here to enter text.

Dear Sir/Madam,

Arsenal Resources has developed a Marcellus pad Pritt South 216 Pad, located in Harrison County, WV. As an owner or operator of conventional natural gas wells in this area, we are requesting your assistance in this matter.

Due to the apparent presence of unique geological conditions, the potential for communication between deep geologic zones exists in this area. This potential communication, via natural gas, water, or both, may occur between hydraulically fractured wells in the Marcellus formation (approximately 7,900' TVD) and existing conventional natural gas wells included in the attached well list for which you are believed to be the operator.

ARSENAL RESOURCES anticipates conducting hydraulic fracturing at the Pritt South 216 Pad during the Quarter of 2018. We have identified conventional natural gas wells operated by your company within 500' (lateral distance) of our newly planned wells. Plats for each well on this pad are attached.

We recommend that conventional well operators conduct the following activities before, during and after fracturing operations:

1. Inspect surface equipment, prior to fracturing, to establish integrity and establish well conditions.
2. Observe wells closely during and after fracturing and monitor for abnormal increases in water, gas, or pressure.
3. Inspect or install master valves rated to 3,000 psi or other necessary equipment for wellhead integrity.
4. Notify the OOG and ARSENAL RESOURCES if any changes in water, gas production, pressure or other anomalies are identified.

Please feel free to contact me at 724-940-1218 with any questions or comments. You may also contact the WV Office of Oil and Gas at 304-926-0499.

Sincerely,

Kelly Davis
Permitting Specialist

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AOR- Attachment "B"



SITE SAFETY PLAN

Pritt South Pad, Well #216

SDW
8/15/2018

911 Address:

3460 Green Valley Road

Bridgeport, WV 26330

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WW-6A1
(5/13)

Operator's Well No. Pritt South 216

**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:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
----------------------	-----------------------	-----------------------	---------	-----------

* See Attached


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 Environmental Protection

**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: Arsenal Resources
 By: William Veigel 
 Its: Designated Agent

33-05908 mod

Attachment to WW-6A1, Pritt S 216

Letter Designation/Number Designation on Plat	Grantor, Lessor, Assignor, etc.	Grantee, Lessee, Assignee, etc.	Royalty	Book/Page	Acreage
A (00006622)	Ira Pritt and Laura E. Pritt, husband and wife	Carrizo (Marcellus), LLC	15.00%	1448/804	92.06
	Carrizo (Marcellus), LLC	ACP II Marcellus, LLC and Carrizo (Marcellus) WV, LLC		1460/1083	
	Carrizo (Marcellus) WV, LLC and ACP II Marcellus, LLC	PDC Mountaineer, LLC		1518/395	
	PDC Mountaineer, LLC	River Ridge Energy, LLC		59/1263	
B (00004364)	O. Carl Morris and Rachel L. Morris, his wife, William T. Morris and Willa R. Morris, his wife, and Mary Morris Warder and Willis E. Warder, her husband	Petroleum Development Corporation	12.50%	1018/107	122
	Petroleum Development Corporation	PDC Mountaineer, LLC		1474/612	
	PDC Mountaineer, LLC	River Ridge Energy, LLC		59/1263	
C, F (00007872)	Walter D. Goodwin and Dorothy Goodwin, his wife	Petro-Lewis Corporation	12.50%	1062/391	103
	Petro-Lewis Corporation	Partnership Properties, Co.		1072/213	
	Partnership Properties, Co.	Eastern American Energy Corporation		1124/449	
	Eastern American Energy Corporation	Energy Corporation of America		59/879	
	Energy Corporation of America	Greylock Production, LLC		1603/1121	
	Greylock Production, LLC	Mar Key, LLC		1607/855	
D (00007864)	Mike Ross Inc. and Waco Oil and Gas, Inc.	Mar Key, LLC	15.00%	1599/315	85.1375

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D (00006677)	Rebecca Collins Biser, Acting in her capacity as Attorney-in-Fact for James R. Collins, Jr.	Mar Key, LLC	15.00%	1561/490	85
D (00007990)	Chad W. Johnson	Mar Key, LLC	14.00%	1604/287	85.1375
D (00007766)	Charles H. Roberts, widower	Mar Key, LLC	15.00%	1596/493	85.1375
D (00006674)	Debra A. Mulneix	Mar Key, LLC	15.00%	1561/464	85
D (00006697)	Gale M. Steele, widow	Mar Key, LLC	15.00%	1568/76	85
D (00007864)	Mike Ross, Inc. and Waco Oil and Gas Inc.	Mar Key, LLC	15.00%	1599/315	85.1375
D (00007761)	George F. Jack, Jr., Single	Mar Key, LLC	15.00%	1598/842	85.1375
D (00007736)	Marlene B. Steele, widow, by David E. Bowen and Cheryl L. Bowen as Attorney - In - Fact	Mar Key, LLC	15.00%	1585/239	85
D (00006675)	Phyllis G. Steele	Mar Key, LLC	15.00%	1561/454	85
D (00006676)	Alice L. Donley	Mar Key, LLC	15.00%	1561/451	85
E (00004556)	Mark V. Schumacher, unmarried	PDC Mountaineer, LLC	12.50%	1453/1290	52.19
	PDC Mountaineer, LLC	River Ridge Energy, LLC		59/1263	
G (00007873)	Walter B. Goodwin and Dorothy Goodwin, his wife	Petro-Lewis Corporation	12.50%	1062/396	62.25
	Petro-Lewis Corporation	Partnership Properties, Co.		1072/213	
	Partnership Properties, Co.	Eastern American Energy Corporation		1124/449	
	Eastern American Energy Corporation	Energy Corporation of America		59/879	

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53-65908 m00

	Energy Corporation of America	Greylock Production, LLC		1603/1121	
	Greylock Production, LLC	Mar Key, LLC		1607/855	
H (00007973)	Lois Evelyn Webb, widow	Mar Key, LLC	12.50%	1602/947	9.63
H [00007881]	Kenneth N. Sandy and Marilyn R. Sandy, his wife	A. L. McQuaid	12.50%	1129/238	9.63
	A. L. McQuaid	David B. Berry		1130/248	
	David B. Berry	Berry Energy Consultants & Managers, Inc.		1130/317	
	Berry Energy Consultants & Managers, Inc.	J & J Enterprises, Inc.		1130/538	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 1441/1003	
	Energy Corporation of America	Mar Key LLC		1596/1233	
H (00008146)	Pamela Kathryn Mucci and Kenneth Lee Queen, wife and husband	Mar Key LLC	12.50%	1610/707	9.63
H (00008031)	Margaret Eileen Olson and Robert Lewis Olson, husband and wife	Mar Key LLC	12.50%	1606/693	9.63
H (00008115)	Russell Edward Converse, married, dealing in his sole and separate property	Mar Key LLC	12.50%	1609/119	9.63
H (00008134)	Patricia Hall Ambrose and Thomas R. Ambrose, wife and husband	Mar Key LLC	12.50%	1609/137	9.63
H (00008028)	Karl Samuel English, divorced	Mar Key LLC	12.50%	1604/1340	9.63

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H (00007974)	Arthur Michael Oldroyd, divorced	Mar Key LLC	12.50%	1602/943	9.63
H (00008015)	Ronald A. Jarvis and Emiley S. Jarvis, husband and wife	Mar Key LLC	12.50%	1604/281	9.63
H (00008041)	Tara Brooke barker, married, dealing in her sole and separate property	Mar Key LLC	12.50%	1604/1332	9.63
H (00008044)	Thomas W. Miller, Jr., dealing in his sole and separate property	Mar Key LLC	12.50%	1606/691	9.63
H (00008071)	Brittany Kathleen Casey, dealing in her sole and separate property	Mar Key LLC	12.50%	1606/327	9.63
H (00008029)	Roy Cleveland English, dealing in his sole and separate property	Mar Key LLC	12.50%	1604/1342	9.63
H (00008132)	Thomas W. Hall, single	Mar Key LLC	12.50%	1609/135	9.63
H (00008184)	Michele Alley, wioe	Mar Key LLC	12.50%	1610/840	9.63
H (00007882)	James McDonald an Mary Lou McDonald	A. L. McQuaid	12.50%	1130/521	9.63
	A. L. McQuaid	David B. Berry		1130/248	
	David B. Berry	Berry Energy Consultants & Managers, Inc.		1130/317	
	Berry Energy Consultants & Managers, Inc.	J & J Enterprises, Inc.		1130/538	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 1441/1003	
	Energy Corporation of America	Mar Key LLC		1596/1233	
H (00008000)	Roy Cleveland English, dealing in his sole and separate property	Mar Key LLC	12.50%	1604/1342 1604/4091	9.63

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33-05908 mwd

H (00007883)	James McDonald an Mary Lou McDonald	A. L. McQuaid	12.50%	1130/521	9.63
	A. L. McQuaid	David B. Berry		1130/248	
	David B. Berry	Berry Energy Consultants & Managers, Inc.		1130/317	
	Berry Energy Consultants & Managers, Inc.	J & J Enterprises, Inc.		1130/538	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 1441/1003	
	Energy Corporation of America	Mar Key LLC		1596/1233	
H (00008260)	Nancy Lee White, divorced	Mar Key LLC	12.50%	1614/1076	9.63
H (00008201)	Terri Mucci, divorced	Mar Key LLC	12.50%	1611/611	9.63
H (00008334)	William G. Winter, married dealing in his sole and separate property	Mar Key LLC	12.50%	1616/1167	9.63
H (00008246)	Wesley Coy Winter, married dealing in his sole and separate property	Mar Key LLC	12.50%	1612/121	9.63
H (00007884)	Eva G. Smith	Mar Key LLC	12.50%	1130/295	9.63
H (00008325)	Marjorie Mucci Halverson, dealing in her sole and separate property	Mar Key LLC	12.50%	1616/1155	9.63
I (00007879)	Sharon B. Jarvis, single	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	

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	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007877)	R. Holmes Campbell and Helen Campbell, his wife	A.L. McQuaid	12.50%	1127/1015	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007874)	Tygart East Company	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007880)	Mary M. Conrad and Francis P. Conrad, her husband	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	

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2015-05-08

	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007875)	William L. Campbell and Bonnie Campbell, his wife	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007878)	Jessie M. Campbell, widow	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	
	J & J Enterprises, Inc.	Eastern American Energy Corporation		1200/1110	
	Eastern American Energy Corporation	Energy Corporation of America		59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	
I (00007876)	Karen Carr and Lee Carr, her husband	A.L. McQuaid	12.50%	1127/1019	42
	A.L. McQuaid, dba Appalachian Mineral Co.	David B. Berry		1129/947	
	David B. Berry and W.B. Berry	J & J Enterprises, Inc.		1130/263	

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	J & J Enterprises, Inc. Eastern American Energy Corporation	Eastern American Energy Corporation Energy Corporation of America		1200/1110 59/879 (also 1441/1003)	
	Energy Corporation of America	Mar Key, LLC		1596/1239	

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West Virginia Secretary of State — Online Data Services

Business and Licensing

Online Data Services Help

Business Organization Detail

NOTICE: The West Virginia Secretary of State's Office makes every reasonable effort to ensure the accuracy of information. However, we make no representation or warranty as to the correctness or completeness of the information. If information is missing from this page, it is not in the The West Virginia Secretary of State's database.

MAR KEY LLC

Organization Information								
Org Type	Effective Date	Established Date	Filing Date	Charter	Class	Sec Type	Termination Date	Termination Reason
LLC Limited Liability Company	7/11/2011		7/11/2011	Domestic	Profit			

Organization Information			
Business Purpose	2111 - Mining, Quarrying, Oil & Gas Extraction - Oil and Gas Extraction - Crude Oil and Natural Gas Extraction		Capital Stock
Charter County		Control Number	99Q1F
Charter State	WV	Excess Acres	
At Will Term	A	Member Managed	MBR
At Will Term Years		Par Value	

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Authorized Shares

Addresses	
Type	Address
Designated Office Address	65 PROFESSIONAL PLACE SUITE 200 BRIDGEPORT, WV, 26330
Mailing Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Notice of Process Address	CORPORATION SERVICE COMPANY 209 WEST WASHINGTON STREET CHARLESTON, WV, 25302
Principal Office Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Type	Address

Officers	
Type	Name/Address
Member	ARSENAL RESOURCES ENERGY LLC 6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090
Organizer	PAUL M HERZING 560 EPSILON DR. PITTSBURGH, PA, 15238 USA
Type	Name/Address

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Annual Reports
Date filed

3/30/2017
6/20/2016
6/30/2015
4/28/2014
6/28/2013
5/8/2012
Date filed

For more information, please contact the Secretary of State's Office at 304-558-8000.

Tuesday, November 28, 2017 — 9:44 AM

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Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Mountaineer Keystone LLC, a West Virginia limited liability company ("Mountaineer Keystone"), PDC Mountaineer, LLC, a Delaware limited liability company ("PDC"), and PDC Mountaineer Holdings, LLC, a Delaware limited liability company ("PDC Holdings"), is effective as of October 15, 2014. (the "Effective Date") and sets forth the terms pursuant to which Mountaineer Keystone will drill, complete and operate the Wells (as defined below) on behalf of PDC and PDC Holdings. Mountaineer Keystone, PDC, and PDC Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

1. **Term:** This Agreement is effective from the Effective Date until terminated by Mountaineer Keystone on the one hand or PDC and PDC Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** PDC and PDC Holdings authorize Mountaineer Keystone to undertake and perform, on PDC and PDC Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by PDC or PDC Holdings. PDC, PDC Holdings and Mountaineer Keystone are affiliates with a common parent. Mountaineer Keystone was formed to operate oil and gas leasehold acreage held by PDC, PDC Holdings and certain other affiliates. Mountaineer Keystone agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by PDC or PDC Holdings from time to time as directed by PDC or PDC Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]

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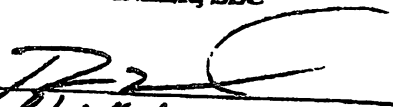
WV Department of
Environmental Protection

IN WITNESS WHEREOF, Mountaineer Keystone, PDC, and PDC Holdings have caused their
duly authorized representatives to execute this Agreement as of the Effective Date.

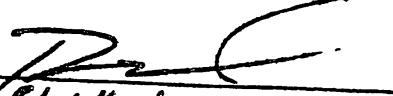
MOUNTAINEER KEYSTONE LLC

By: 
Name: Robert Keel
Title: CEO

PDC MOUNTAINEER, LLC

By: 
Name: Robert Keel
Title: CEO

PDC MOUNTAINEER HOLDINGS, LLC

By: 
Name: Robert Keel
Title: CEO

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Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Arsenal Resources LLC, a West Virginia limited liability company ("Arsenal"), River Ridge Energy, LLC, a Delaware limited liability company ("River Ridge"), and River Ridge Energy, Holdings, LLC, a Delaware limited liability company ("River Ridge Holdings"), is effective as of March 1, 2017. (the "Effective Date") and sets forth the terms pursuant to which Arsenal will drill, complete and operate the Wells (as defined below) on behalf of River Ridge and River Ridge Holdings. Arsenal, River Ridge, and River Ridge Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

1. **Term:** This Agreement is effective from the Effective Date until terminated by Arsenal on the one hand or River Ridge and River Ridge Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** River Ridge and River Holdings authorize Arsenal to undertake and perform, on River Ridge and River Ridge Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by River Ridge or River Ridge Holdings. River Ridge, River Ridge Holdings and Arsenal are affiliates with a common parent. Arsenal was formed to operate oil and gas leasehold acreage held by River Ridge, River Ridge Holdings and certain other affiliates. Arsenal agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by River Ridge or River Ridge Holdings from time to time as directed by River Ridge or River Ridge Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]

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IN WITNESS WHEREOF, Arsenal, River Ridge, and River Ridge Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

ARSENAL RESOURCES LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE ENERGY, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE HOLDINGS, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

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People Powered. Asset Strong.

March 22, 2018

Mr. James Martin, Chief of Oil and Gas
West Virginia Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

RE: Ownership of Roadways; Pritt South Pad

Dear Mr. Martin:

In preparation of filing a permit application for the above referenced well, the Title Department of Arsenal Resources has conducted a thorough title examination in order to determine the ownership of the oil and gas underlying all roadways crossed by the proposed wells. The findings of the title examination show that some of the roadways crossed by the proposed wells are owned in fee by the West Virginia Department of Transportation, Division of Highways and that some are only right of ways. If owned in fee by the West Virginia Department of Transportation, Division of Highways, a lease covering its interest in the roadway or roadways has been properly obtained and provided in the application materials. If a right of way only, the oil and gas underlying such roadway or roadways is owned by the adjoining landowners and is also covered by the leaseholds provided in the application materials.

If you have any questions, concerns or need further information, please do not hesitate to contact me at the address listed below.

Sincerely,

A handwritten signature in blue ink that reads 'Coty Brandon'.

Coty Brandon
Title Manager

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August 17, 2018

WVDEP
Office of Oil and Gas
ATTN: Laura Adkins
601 57th Street SE
Charleston, WV 25304

RE: Pritt South Pad – Pritt South 216, API# 47-033-05908 – Modification due to spacing and extending lateral

Dear Laura:

Enclosed please find the modification for the Pritt South 216, (API# 47-033-05908). This permit was on operator hold. We would like to remove the hold and replace it with this application. This permit is being modified due to adjusting the well bore spacing and moving it to 240' to the east. The well head locations remained the same. This well was originally permitted to 6,082.12'. We have obtained additional leasing for this site during this modification and request to extend the lateral 1,448.43' for a total of 7,530.55'. Included are the following:

- Plat
- WW-6B, Well Work Permit Application/Casing
- Well Bore Schematic
- WW-6A1, Lease Information
- Roadway Letter
- Site Safety Plan
- AOR

Should you have any questions or need any additional information, please feel free to contact me by phone or email. Thank you!

Sincerely,

Kelly Davis
Permitting Specialist
1-304-517-8743 mobile
1-724-940-1218 office
kdavis@arsenalresources.com

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