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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

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

PERMIT MODIFICATION APPROVAL  
Horizontal 6A / Horizontal 6A Well

EQT PRODUCTION COMPANY  
120 PROFESSIONAL PLACE  
BUILDING II  
BRIDGEPORT, WV 26330


Re: Permit Modification Approval for BLIZZARD 4H  
47-095-02242-00-00

Changing casing program to set 13-3/8" casing at 747' KB and the 9-5/8" casing at 2797' KB

EQT PRODUCTION COMPANY

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: BLIZZARD 4H  
Farm Name: BLIZZARDM ROGER D. & SPENCER, RUTH E  
U.S. WELL NUMBER: 47-095-02242-00-00  
Horizontal 6A / Horizontal 6A Well  
Date Issued: 1/20/2017

Promoting a healthy environment.

01/27/2017

2/20/15

WW-6B  
(04/15)

API NO. 47-088 - 02242

OPERATOR WELL NO. Blizzard 4H

Well Pad Name: Blizzard

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

1) Well Operator: EQT Production Company 306686 Tyler Ellsworth Shirley  
Operator ID County District Quadrangle

2) Operator's Well Number: Blizzard 4H Well Pad Name: Blizzard

3) Farm Name/Surface Owner: Roger D. Blizzard and Ruth E. Spencer Public Road Access: Co. Rt. 34

4) Elevation, current ground: 1004' Elevation, proposed post-construction: 1004'

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, 6531', 51', 2747 PSI

8) Proposed Total Vertical Depth: 6531

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 18344

11) Proposed Horizontal Leg Length: 10805

12) Approximate Fresh Water Strata Depths: 234,289,571,647

13) Method to Determine Fresh Water Depths: From offset wells

14) Approximate Saltwater Depths: 1443,1670,2074

15) Approximate Coal Seam Depths: None reported

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

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: \_\_\_\_\_

JAS  
11/14/16

DMA  
11-14-16

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WW-6B  
(04/15)

API NO. 47- 095 - 02242  
 OPERATOR WELL NO. Blizzard 4H  
 Well Pad Name: Blizzard

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	A-500	78.6	40	40	60 ft <sup>3</sup> / CTS
Fresh Water	13 3/8	New	J-55	54.5	747	747	666 ft <sup>3</sup> / CTS
Coal							
Intermediate	9 5/8	New	A-500	40	2797	2797	1100 ft <sup>3</sup> / CTS
Production	5 1/2	New	P-110	20	18344	18344	500' above top producing zone
Tubing	2 3/8		J-55	4.7		May not be run, if run set 40' above top perf or 80° inclination.	
Liners							

*DWH*  
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11/14/16

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	26	.375	1378	1102	Class A	1.18
Fresh Water	13 3/8	17 1/2	.38	2700	2160	See Variance	1.19
Coal							
Intermediate	9 5/8	12 3/8	.395	3950	3160	See Variance	1.19
Production	5 1/2	8 1/2	.361	12640	10112	Class A/H	1.123/2.098
Tubing	2 3/8	NA	.19	7700			
Liners							

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Kind:				
Sizes:				
Depths Set:				

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

Drill and complete a new horizontal well in the Marcellus Formation. Drill the vertical to an approximate depth of 6652'. Tag the Onondaga not more than 100' and run logs. Plug back with a solid cement plug to approximately 3,835'. Kick off and drill curve. Drill the lateral in the Marcellus. Cement casing.

*DMH*  
*JPS*  
*11/14/16*

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

Hydraulic fracturing is completed in accordance with state regulations using water recycled from previously fractured wells and obtained from freshwater sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, friction reducer, biocide, and scale inhibitor), referred to in the industry as a "slickwater" completion. Maximum anticipated internal casing pressure is expected to be approximately 10000 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 250,000 gallons of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 250,000 pounds of sand per stage.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): no additional

22) Area to be disturbed for well pad only, less access road (acres): no additional

23) Describe centralizer placement for each casing string:

- Surface: Bow spring centralizers – One centralizer at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers– One centralizer at the shoe and one spaced every 500'.
- Production: One solid body centralizer spaced every joint from production casing shoe to KOP

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

Conductor: Class A no additives  
 Surface (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries  
 Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries.  
 Production:  
 Lead (Class A Cement): 0.2% CD-20 (dispersant makes cement easier to mix). .15% SuperFL-300 (fluid loss/lengthens thickening time) .15% SEC-10 (fluid loss) 50:50 POZ (extender)  
 Tail (Class H Cement): 0.2% Super CR-1 (Retarder). Lengthens thickening time. .3% Super FL-200 (fluid loss) .2% SEC-10 (Fluid loss). .2% SuperFL-360 (fluid loss) Reduces amount of water lost to formation. 80 % Calcium Carbonate. Acid solubility.

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25) Proposed borehole conditioning procedures:

Surface: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.  
 Intermediate: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.  
 Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume. Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across the shakers every 15 minutes.

\*Note: Attach additional sheets as needed.

47-095-02242

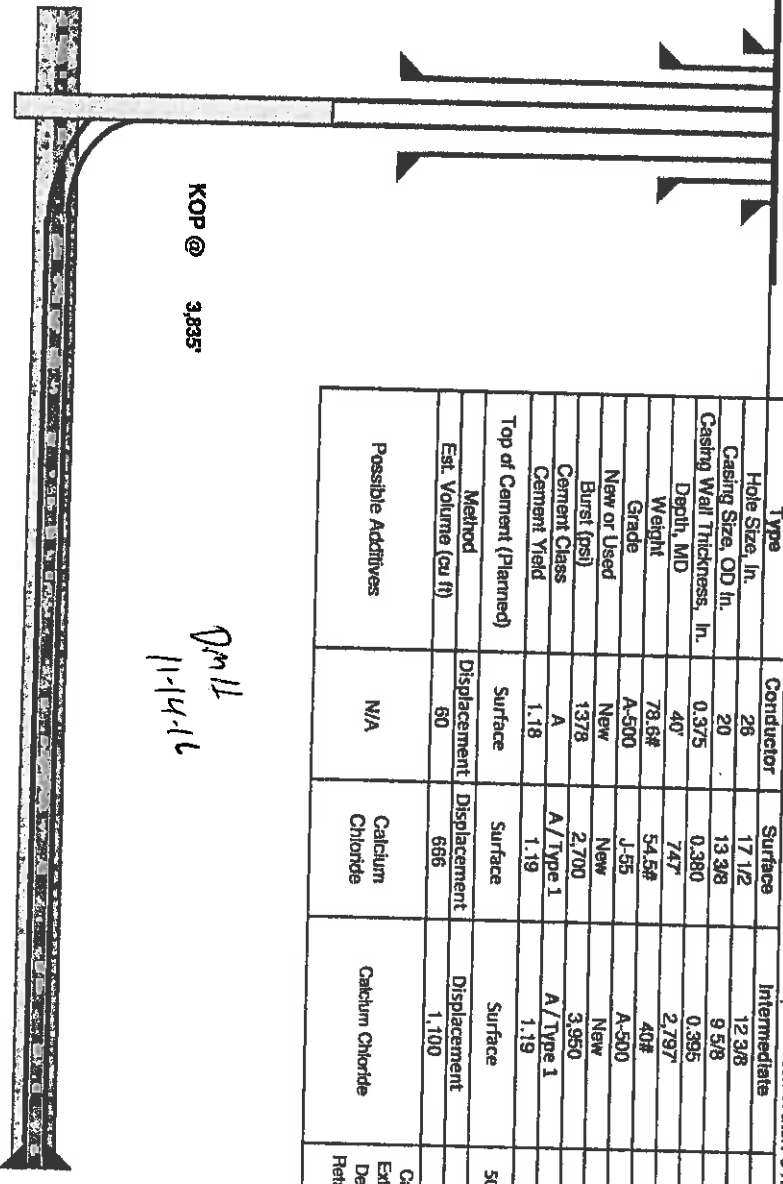
Well  
EOT Production  
Porters Falls Quad  
Tyler County, WV

Blossard 4H

Note: Diagram is not to scale

Asimuth 157  
Vertical Section 10273

Formations	Top TVD	Base TVD
Conductor	40	
Base Fresh Water	647	
Surface Casing	747	
Base Red Rock	1076	
Maxton	1683 - 1727	
Big Lime	1809 - 2005	
Big Injun Well	2005 - 2052	
Gantz	2063 - 2173	
	2450 - 2491	
Fifty foot Gordon	2543 - 2603	2635 - 2747
Intermediate Casing	2797	
Bayard	2892 - 3075	
Warren	3333 - 3503	
Speechley	3536 - 3655	
Baltimore A	3800 - 4039	
Riley	4568 - 4609	
Benson	4979 - 5046	
Alexander	5218 - 5274	
Sonyea	6207 - 6332	
Middlesex	6332 - 6361	
Genesee	6361 - 6428	
Genesee	6428 - 6455	
Tully	6455 - 6469	
Hamilton	6469 - 6501	
Marcellus	6501 - 6552	
Production Casing	18344	MD
Onondaga	6552	



Casing and Cementing

Type	Conductor	Surface	Intermediate	Production
Hole Size, In.	26	17 1/2	12 3/8	8 1/2
Casing Size, OD In.	20	13 3/8	9 5/8	5 1/2
Casing Wall Thickness, In.	0.375	0.380	0.381	0.361
Depth, MD	40'	747'	2,797'	18,344'
Weight	78.6#	54.5#	40#	20#
Grade	A-500	J-55	A-500	P-110
New or Used	New	New	New	New
Burst (psi)	1378	2,700	3,960	12,640
Cement Class	A	A / Type 1	A / Type 1	A / H
Cement Yield	1.18	1.19	1.19	1.123 / 2.098
Top of Cement (Planned)	Surface	Surface	Surface	500' above top Producing Zone
Method	Displacement	Displacement	Displacement	Displacement
Est. Volume (cu ft)	60	666	1,100	2,980
Possible Additives	N/A	Calcium Chloride	Calcium Chloride	Calcium Carbonate, Fluid Loss, Extender, Dispersant, Viscosifier, Defoamer, POZ, Bonding Agent, Retarder, Anti-Segregating/Suspension Agent

Proposed Well Work:  
Drill and complete a new horizontal well in the Marcellus formation.  
Drill the vertical to an approximate depth of 6652'.  
Tag the Onondaga not more than 100' run logs, then plug back with a solid cement plug to approximately 3835'.

10,805' Lateral

Land curve @ 6,531' TVD  
7,539' MD

Est. TD @

6,531' TVD  
18,344' MD

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Where energy meets innovation.

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11/4/16

# Site Specific Safety Plan

EQT  
Blizzard Unit Pad  
  
Middlebourne  
Tyler County, WV

For Wells:

Blizzard 2H Blizzard 4H

Date Prepared: October 12, 2016

[Signature]  
 EQT Production  
Permitting Supervisor  
 Title  
11-2-16  
 Date

[Signature]  
 WV Oil and Gas Inspector  
OIL & GAS INST  
 Title  
11/4/16  
 Date

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