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west virginia department of environmental protection

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

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

Thursday, October 25, 2018  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

EQT PRODUCTION COMPANY  
625 LIBERTY AVE., SUITE 1700

PITTSBURGH, PA 15222

Re: Permit Modification Approval for BIG 245 H17  
47-103-03236-00-00

Modified Conductor to 26"

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.

A blue ink signature of James A. Martin.

James A. Martin  
Chief

Operator's Well Number: BIG 245 H17  
Farm Name: ET BLUE GRASS, LLC  
U.S. WELL NUMBER: 47-103-03236-00-00  
Horizontal 6A New Drill  
Date Modification Issued: October 25, 2018

Promoting a healthy environment.

4

WW-6B  
(04/15)

API NO. 47- 103 - 03236 mo D  
OPERATOR WELL NO. BIG245H17  
Well Pad Name: BIG245

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

1) Well Operator: EQT Production Company 306686 Wetzel Grant Big Run  
Operator ID County District Quadrangle

2) Operator's Well Number: BIG245H17 Well Pad Name: BIG245

3) Farm Name/Surface Owner: E.T. Bluegrass Public Road Access: Rt. 19/2

4) Elevation, current ground: 1480 Elevation, proposed post-construction: 1430

5) Well Type (a) Gas X Oil \_\_\_\_\_ Underground Storage \_\_\_\_\_

Other \_\_\_\_\_

(b) If Gas Shallow X Deep \_\_\_\_\_

Horizontal X \_\_\_\_\_

6) Existing Pad: Yes or No No *DMA 8/15/18*

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus, 7531, 51, 2620 PSI

8) Proposed Total Vertical Depth: 7531

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 18990

11) Proposed Horizontal Leg Length: 8332

12) Approximate Fresh Water Strata Depths: 229, 507, 662, 752, 1011

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

14) Approximate Saltwater Depths: None

15) Approximate Coal Seam Depths: 925, 1024, 1132

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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 X  
WV Department of Environmental Protection

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

18)

**CASING AND TUBING PROGRAM**

<b>TYPE</b>	<b>Size (in)</b>	<b>New or Used</b>	<b>Grade</b>	<b>Weight per ft. (lb/ft)</b>	<b>FOOTAGE: For Drilling (ft)</b>	<b>INTERVALS: Left in Well (ft)</b>	<b>CEMENT: Fill-up (Cu. Ft.)/CTS</b>
Conductor	26	New	A-500	85.6	40	40	49 ft <sup>3</sup> / CTS
Fresh Water	13 3/8	New	J-55	54.5	1179	1179	1086 ft <sup>3</sup> / CTS
Coal							
Intermediate	9 5/8	New	A-500	40	2925	2855	1108 ft <sup>3</sup> / CTS
Production	5 1/2	New	P-110	20	18990	18990	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 8/15/18*

<b>TYPE</b>	<b>Size (in)</b>	<b>Wellbore Diameter (in)</b>	<b>Wall Thickness (in)</b>	<b>Burst Pressure (psi)</b>	<b>Anticipated Max. Internal Pressure (psi)</b>	<b>Cement Type</b>	<b>Cement Yield (cu. ft./k)</b>
Conductor	26	30	.312	1378	17	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	Class H	1.07
Production	5 1/2	8 1/2	.361	12640	10112	Class H	1.123/2.098
Tubing	2 3/8	NA	.19	7700			
Liners							

**PACKERS**

Kind:				RECEIVED Office of Oil and Gas
Sizes:				OCT - 9 2018
Depths Set:				WV Department of Environmental Protection

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 5477'. Kick off and drill curve. Drill the lateral in the Marcellus. Cement casing.

*DMAH 8/15/18*

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, gelling agent, gel breaker, 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 350,000 barrels of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 400,000 pounds of sand per stage.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): +/- 40.35

22) Area to be disturbed for well pad only, less access road (acres): +/- 34.59

23) Describe centralizer placement for each casing string:

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

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

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Conductor: Class A no additives  
 Surface (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries, 25% Flake Loss Circulation Material (LCM)  
 Intermediate (Class H Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries. 0.25% flake. Loss Circulation Material (LCM) .8% Super FL-300 (fluid loss/lengthens thickening time)  
 Production:  
 Lead (Class H 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-350 (fluid loss) Reduces amount of water lost to formation. 60 % Calcium Carbonate Acid solubility

WV Department of  
Environmental Protection

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.

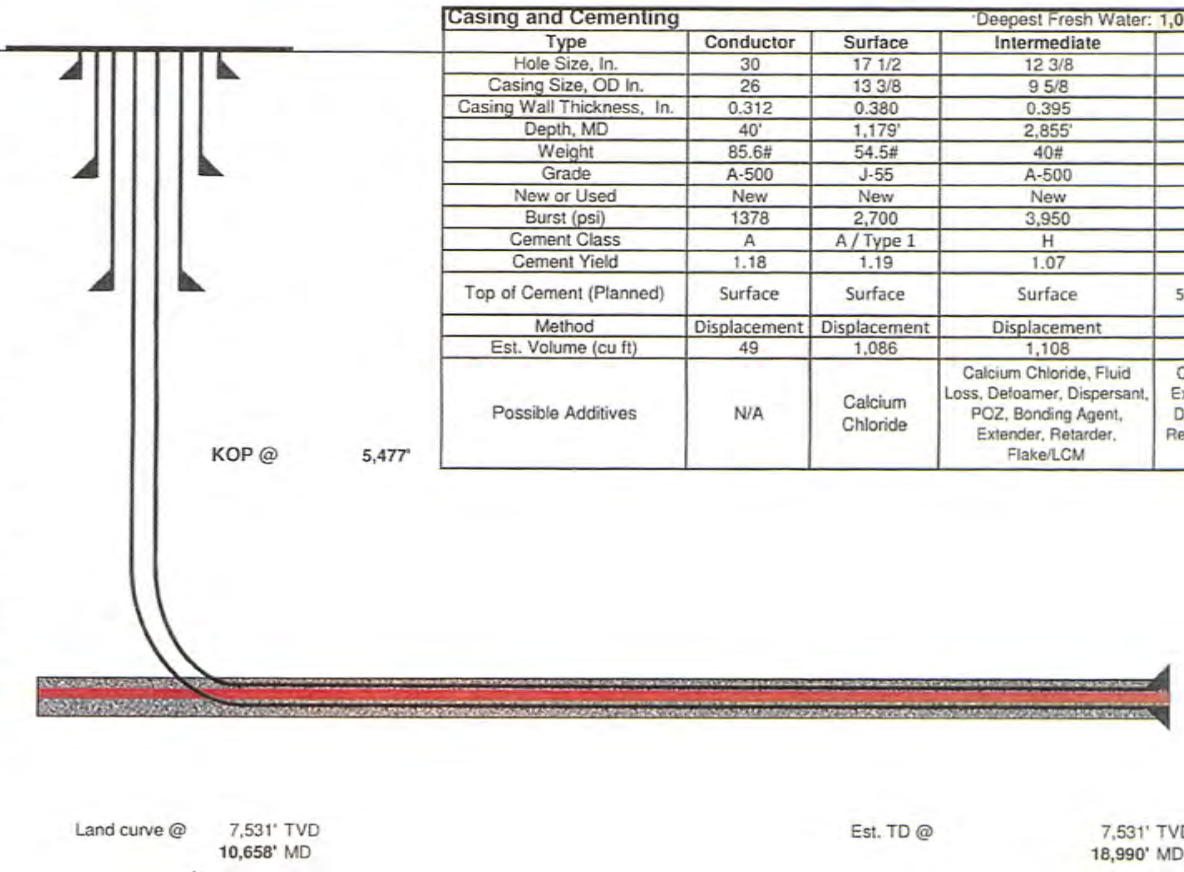
\*Note: Attach additional sheets as needed.

Well **BIG245H17**  
 EQT Production  
 Big Run Quad  
 Wetzel County, WV

ENERTIA # 516520  
 Azimuth 335  
 Vertical Section 8381

Note: Diagram is not to scale

Formations	Top TVD	Base TVD
Conductor	40	
Base Red Rock	967	
Base Fresh Water	1011	
Surface Casing	1179	
<b>Maxton</b>	2305 -	2346
<b>Big Lime</b>	2359 -	2429
<b>Big Injun</b>	2429 -	2596
Intermediate Casing	2855	
<b>Gordon</b>	3163 -	3202
<b>Forth Sand</b>	3221 -	3265
<b>Bayard</b>	3124 -	3499
<b>Speechley</b>	3891 -	4113
<b>Riley</b>	4684 -	4916
<b>Benson</b>	5380 -	5528
<b>Alexander</b>	5842 -	6158
<b>Sonyea</b>	7063 -	7140
<b>Middlesex</b>	7140 -	7324
<b>Genesee</b>	7324 -	7362
<b>Geneseo</b>	7362 -	7388
<b>Tully</b>	7388 -	7410
<b>Hamilton</b>	7410 -	7509
<b>Marcellus</b>	7509 -	7560
Production Casing	18990	MD
Onondaga	7560	



Casing and Cementing		Deepest Fresh Water: 1,011'		
Type	Conductor	Surface	Intermediate	Production
Hole Size, In.	30	17 1/2	12 3/8	8 1/2
Casing Size, OD In.	26	13 3/8	9 5/8	5 1/2
Casing Wall Thickness, In.	0.312	0.380	0.395	0.361
Depth, MD	40'	1,179'	2,855'	18,990'
Weight	85.6#	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	3,950	12,640
Cement Class	A	A / Type 1	H	H
Cement Yield	1.18	1.19	1.07	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)	49	1,086	1,108	2,883
Possible Additives	N/A	Calcium Chloride	Calcium Chloride, Fluid Loss, Defoamer, Dispersant, POZ, Bonding Agent, Extender, Retarder, Flake/LCM	Calcium Carbonate, Fluid Loss, Extender, Dispersant, Viscosifier, Defoamer, POZ, Bonding Agent, Retarder, Anti-Settling/Suspension Agent

Proposed Well Work:  
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 Drill the vertical to an approximate depth of 5477'.  
 Kick off and drill curve. Drill lateral in the Marcellus. Cement casing.

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 WV Department of Environmental Protection

103-03236 moj

BIG245  
BIG245H17  
EQT PRODUCTION COMPANY

BOTTOM HOLE LATITUDE 39°37'30"

2580'

Table with columns: TAG, TM-PAR., SURFACE OWNERS, ACRES. Lists various land parcels and owners including Joseph F & Gay Blake, Coastal Forest Resources Co, Virginia Ruth Blake, etc.



SUBSURFACE AGREEMENT table with columns: PARTY, ACRES, LEASE NO. Includes entries for IKEY JOE WILLEY, ACCROPOLIS INC. ET AL, EQT PRODUCTION COMPANY, NORMA JEAN PHILLIPS RIGGS ET AL., JOSEPH SHIBEN & MINNIE SHIBEN ESTATE ET AL.

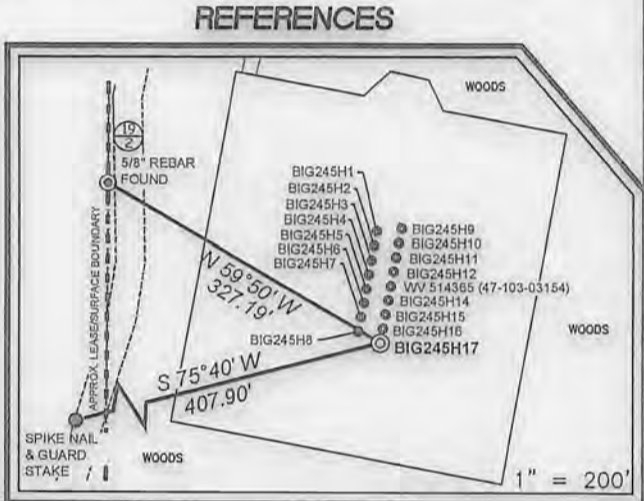
Table with columns: TAG, TM-PAR., SURFACE OWNERS, ACRES. Lists parcels owned by James Arthur YoHo, Dale K & Sherry L Dulaney, Dorn H Higginbotham et al, Coastal Forest Resources Company, Debra Fronczek et al, James L & Karen Dulaney, James & Jim YoHo, James L Dulaney, Franklin M. Blake heirs and/or assigns.

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)
NAD'27 S.P.C.(FT) N. 400,664.67 E. 1,698,774.30
NAD'27 GEO. LAT-(N) 39.595137 LONG-(W) 80.568955
NAD'83 UTM (M) N. 4,382,920.986 E. 537,026.476
LANDING POINT
NAD'27 S.P.C.(FT) N. 398,256.77 E. 1,695,593.84
NAD'27 GEO. LAT-(N) 39.588422 LONG-(W) 80.580137
NAD'83 UTM (M) N. 4,382,171.188 E. 536,069.714
BOTTOM HOLE
NAD'27 S.P.C.(FT) N. 405,868.50 E. 1,692,204.87
NAD'27 GEO. LAT-(N) 39.609206 LONG-(W) 80.592490
NAD'83 UTM (M) N. 4,384,472.93 E. 534,998.591



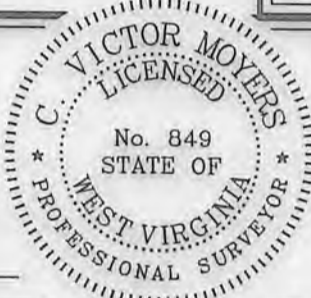
NOTES ON SURVEY

- 1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS 2500 SQ. FT. OR GREATER WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.
2. WELL SPOT CIRCLE (SHEET 1) AND TOPO MARK SCALE ARE 1" = 2000'.



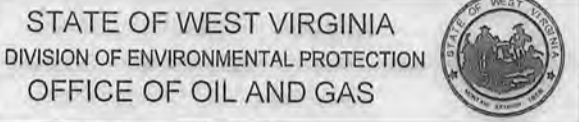
I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 849 C. Victor Moyers



Form fields: DATE MAY 1, 20 18; REVISED 8/6/18; OPERATORS WELL NO. BIG245H17; API WELL NO. 47 - 103 - 03230; STATE COUNTY PERMIT.

MINIMUM DEGREE OF ACCURACY 1/2500; FILE NO. 7812PBIG245H17-R.dwg; SCALE SEE NOTE 2; CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORN NETWORK)



WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION X STORAGE DEEP SHALLOW X; LOCATION: GROUND ELEV. 1489', PROPOSED ELEV. 1430'; DISTRICT GRANT COUNTY WETZEL QUADRANGLE BIG RUN 7.5'; SURFACE OWNER ET BLUE GRASS, LLC ACREAGE 138.93±; ROYALTY OWNER SHIBEN ESTATES, INC ACREAGE 140±; PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION PERFORATE NEW FORMATION PLUG AND ABANDON CLEAN OUT AND REPLUG OTHER; PHYSICAL CHANGE IN WELL (SPECIFY) TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7532'

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT JASON RANSON; ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

BOTTOM HOLE LONGITUDE 80°35'00" TOP HOLE LONGITUDE 80°32'30" COUNTY NAME PERMIT

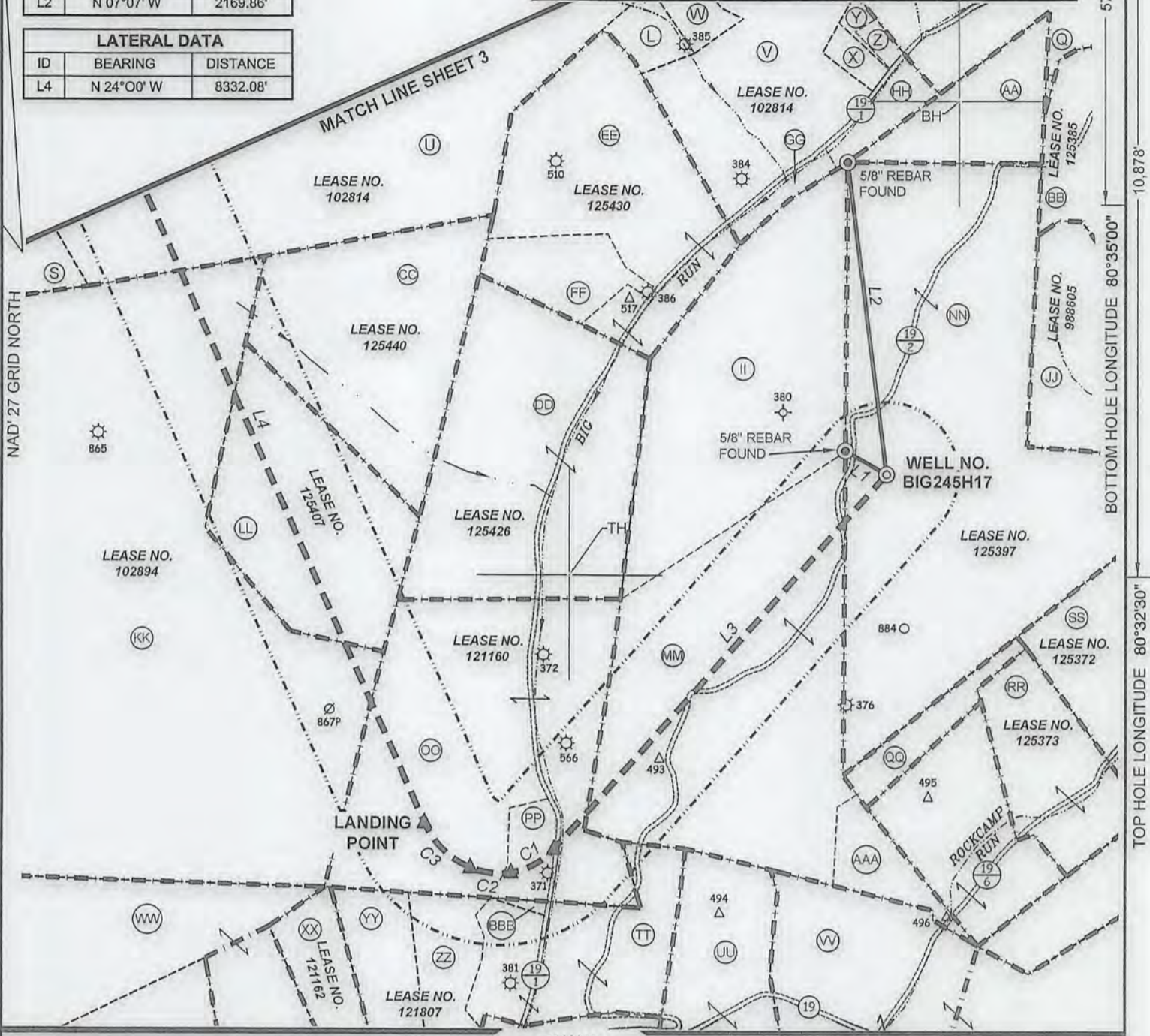
**BIG245**  
**BIG245H17**  
**EQT PRODUCTION COMPANY**

BUILD OUT DATA		
ID	BEARING	DISTANCE
L3	S 41°30' W	3456.93'

CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	342.29'	496.79'	S 61°05'12" W	335.56'
C2	287.48'	522.46'	N 83°10'01" W	283.87'
C3	452.24'	593.96'	N 45°25'29" W	441.40'

WELL TIES		
ID	BEARING	DISTANCE
L1	N 59°50' W	327.19'
L2	N 07°07' W	2169.86'

LATERAL DATA		
ID	BEARING	DISTANCE
L4	N 24°00' W	8332.08'



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.  
 FILE NO. 7812PBIG245H17-R.dwg SCALE SEE NOTE 2  
 DATE MAY 1, 20 18  
 REVISED 8/6/18  
 OPERATORS WELL NO. BIG245H8  
 API WELL NO. 47 - 103 - 03230  
 STATE COUNTY PERMIT

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STATE OF WEST VIRGINIA  
 DIVISION OF ENVIRONMENTAL PROTECTION  
 OFFICE OF OIL AND GAS



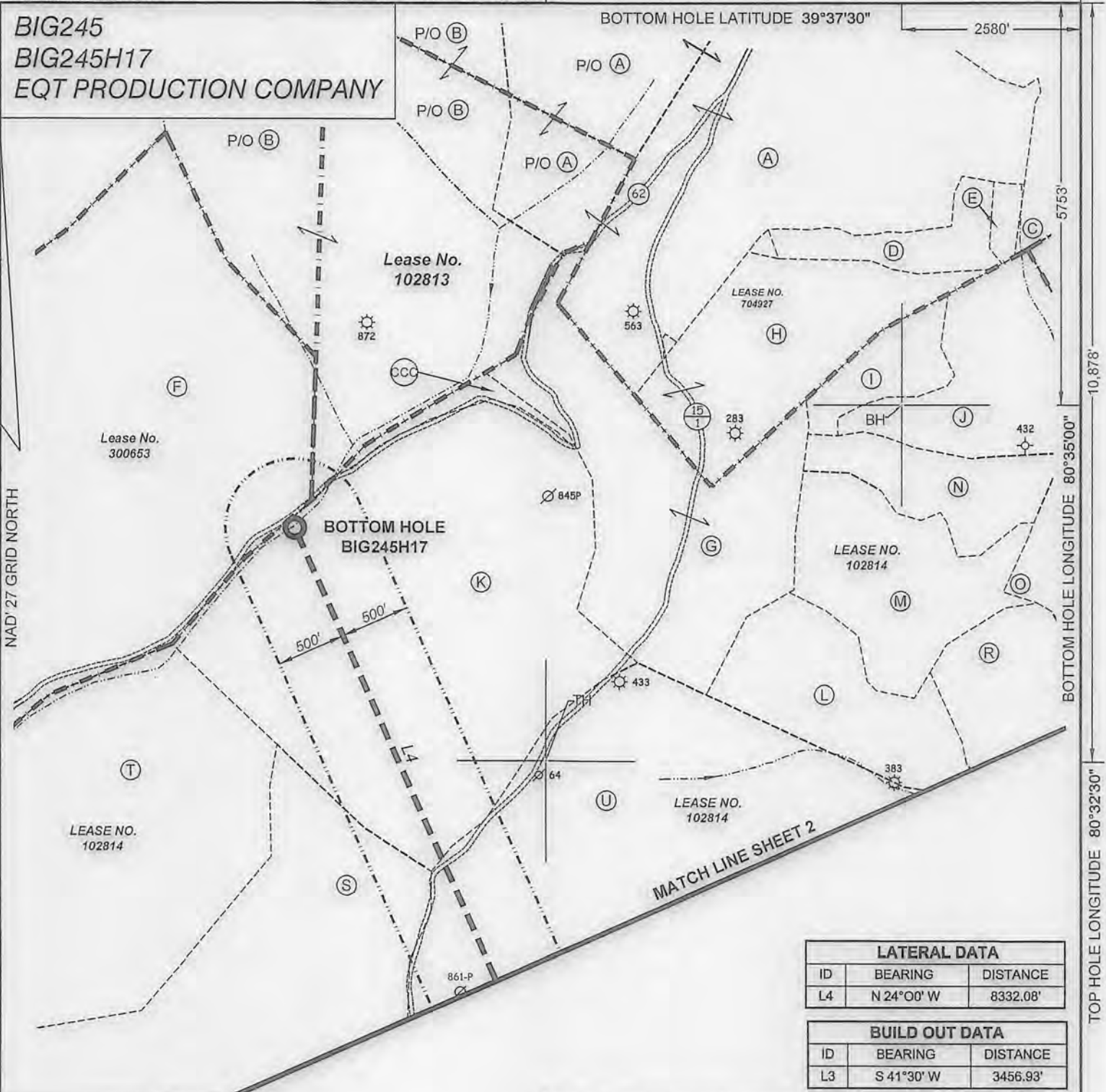
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LEGEND	
COUNTY ROUTE	
PROPOSED WELL	
EXISTING WELL	
PERMITTED WELL	
DRILL PATH BEND POINT	
GRANT DISTRICT TAX MAP-PARCEL	
LEASE LINE	
SURFACE LINE	
WELL LATERAL	
OFFSET LINE	
TIE LINE	
CREEK	
ROAD	

WELL OPERATOR EQT PRODUCTION COMPANY  
 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

DESIGNATED AGENT JASON RANSON  
 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

**BIG245**  
**BIG245H17**  
**EQT PRODUCTION COMPANY**



NAD'27 GRID NORTH

BOTTOM HOLE LONGITUDE 80°35'00"

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LATERAL DATA		
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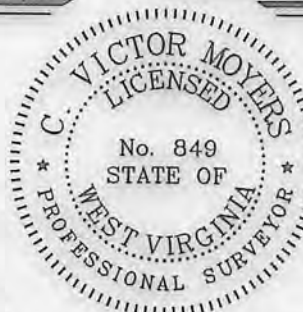
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(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.  
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STATE OF WEST VIRGINIA  
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DESIGNATED AGENT JASON RANSON  
 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330





Laura Adkins  
WVDEP  
Office of Oil and Gas  
601 57<sup>th</sup> Street SE  
Charleston WV 25304-2345

Re: Modification of wells BIG245H8 (47-103-03234), BIG245H16 (47-103-03235), and  
BIG245 (47-103-03236)

Dear Ms. Adkins

Attached are the modifications for the above API numbers. The conductor casing size has  
been changed for the conductor only.

If you have any questions, please do not hesitate to contact me at (304) 848-0035.

Sincerely,

Rebecca Wanstreet  
Landman I – Permitting WV

Enc.

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WV Department of  
Environmental Protection