west virginia department of environmental protection

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 05, 2013

EQT PRODUCTION COMPANY
POST OFFICE BOX 280
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 1706062 , Well #: 514210 - CARR
increased TVD, extended lateral

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,

for

Gene Smith
Regulatory/Compliance Manager
Office of Oil and Gas

08/09/2013

WW - 6B
(1/12)

API# 47-017-06062 MOD

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
W.VA. CODE §22-6A - WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company

	017	3	611
Operator ID	County	District	Quadrangle

2) Operator's Well Number: 514210 Well Pad Name: SMI27

3 Elevation, current ground: 1,194.0 Elevation, proposed post-construction: 1,179.0

4) Well Type: (a) Gas ▪ Oil _____

Other _____

(b) If Gas: Shallow ▪ Deep _____

Horizontal ▪

5) Existing Pad? Yes or No: yes

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):
Target formation is Marcellus at a depth of 7024 with the anticipated thickness to be 46 feet and anticipated target pressure of 4723 PSI

7) Proposed Total Vertical Depth: 7,149
8) Formation at Total Vertical Depth: Onondaga
9) Proposed Total Measured Depth: 15,660
10) Approximate Fresh Water Strata Depths: 25, 344, 444, 654, 849, 919
11) Method to Determine Fresh Water Depth: By offset wells
12) Approximate Saltwater Depths: 1,187
13) Approximate Coal Seam Depths: N/A
14) Approximate Depth to Possible Void (coal mine, karst, other): none reported
15) Does land contain coal seams tributary or adjacent to, active mine? none reported
16) Describe proposed well work: Drill and complete a new horizontal well. The vertical drill to go down to approximately depth of 7149 Tagging the Onondaga not more than 100' then plug back to approximately 4877 and kick off the horizontal leg into the marcellus using a slick water frac.

17) Describe fracturing/stimulating methods in detail:
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). Stage lengths vary from 150 to 450 feet. Average approximately 400,000 gallons of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 400,000 pounds of sand per stage.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 41.9

19) Area to be disturbed for well pad only, less access road (acres): 19.7

Danny Newlon
4-1 2013
Dill
4-1-13

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Office of Oil & Gas
APR 10 2013
WV Department of Environmental Protection

08/09/2013

WW - 6B
(1/12)

API# 47-017-06062 MOD

CASING AND TUBING PROGRAM

20)

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: for Drilling	INTERVALS: Left in Well	CEMENT: Fill- up (Cu.Ft.)
Conductor	20	New	MC-50	81#	40	40	38
Fresh Water	13 3/8	New	MC-50	54#	1,019	1,019	884
Coal	—	—	—	—	—	—	—
Intermediate	9 5/8	New	MC-50	40#	3,249	3,249	1,269
Production	5 1/2	New	P-110	20#	15,660	15,660	See Note 1
Tubing	2 3/8	—	J-55	4.6	—	—	May not be run, if run will be set 100' less than TD
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield
Conductor	20	24	0.635	—	Construction	1.18
Fresh Water	13 3/8	17 1/2	0.38	2,480	1	1.21
Coal	—	—	—	—	—	—
Intermediate	9 5/8	12 3/8	0.395	3,590	1	1.21
Production	5 1/2	8 1/2	0.361	12,640	—	1.27/1.86
Tubing						
Liners						

Packers

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

Note 1: EQT plans to bring the TOC on the production casing cement job 1,000' above kick off point, which is at least 500' above the shallowest production zone, to avoid communication.

Doug Newlon
4-1-2013

Date
4-1-13

RECEIVED
Office of Oil & Gas
APR 10 2013
WV Department of Environmental Protection

08/09/2013

API# 47-017-06062/MOD

21) 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 spaced every 1000' from KOP to Int csg shoe

22) Describe all cement additives associated with each cement type. **Surface (Type 1 Cement):** 0-3% Calcium Chloride Used to speed the setting of cement slurries.

0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of the cement slurry to a thief zone.

Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Salt is used in shallow, low temperature formations to speed the setting of cement slurries. 0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry (not filtrate) to a thief zone.

Production:

Lead (Type 1 Cement): 0.2-0.7% Lignosulfonate (Retarder). Lengthens thickening time.

0.3% CFR (dispersant). Makes cement easier to mix.

Tail (Type H Cement): 0.25-0.40% Lignosulfonate (Retarder). Lengthens thickening time.

0.2-0.3% CFR (dispersant). This is to make the cement easier to mix.

60 % Calcuim Carbonate. Acid solubility.

0.4-0.6% Halad (fluid loss). Reduces amount of water lost to formation.

23) Proposed borehole conditioning procedures. **Surface:** Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back on and circulate hole clean. A constant rate of higher than expected cuttings volume likely indicates washouts that will not clean up.

Intermediate: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhance hole cleaning use a soap sweep or increase injection rate & foam concentration.

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.

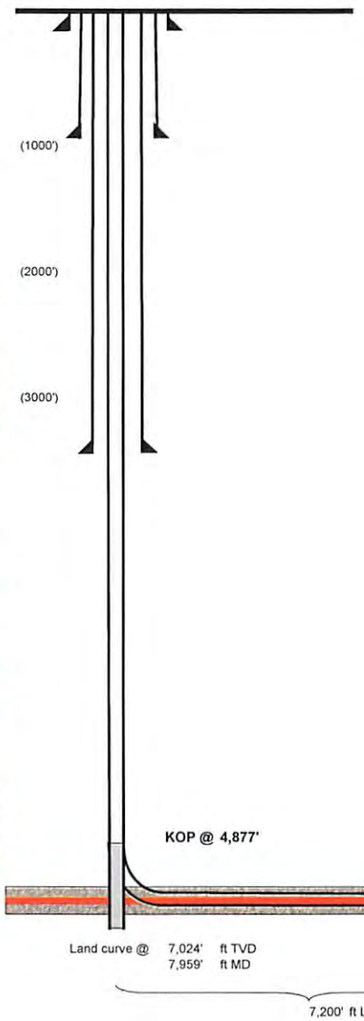
*Note: Attach additional sheets as needed.

08/09/2013

API 47-017-06062 MOD

Well 514210 (SMI27H12)
EQT Production
Smithburg
Doddridge West Virgina

Azimuth 155
Vertical Section 7752



TVD Depth (feet)	Formation Tops (TVD)			Hole Size (inches)	Casing Type	Casing Size (inches)	Wt (ppf)/Grade
0'				24	Conductor	20	
250'							
500'							
750'							
1,000'	Base Fresh Water	919		17 1/2	Surface	13 3/8	54#/MC-50
1,250'							
1,500'							
1,750'							
2,000'	Maxton	2008	2080				
2,250'	Big Lime	2168	2264				
2,500'	Big Injun	2264	2431				
2,750'	Top Devonian	2667	0				
3,000'	-Gantz	2667	2722				
3,250'	-Fifty foot	2734	2782				
3,500'	-Thirty foot	2873	2898				
3,750'	-Gordon	2960	3024				
4,000'	-Forth Sand	3024	3122				
4,250'	-Fifth Sand	3122	3199				
4,500'	Int. csg pt	3249		12 3/8	Intermediate	9 5/8	40#/MC-50
4,750'	-Warren	3598	3654				
5,000'							
5,250'	-Bradford	4468	4590				
5,500'							
5,750'	-Benson	5173	5240				
6,000'	-Alexander	5593	5717				
6,250'							
6,500'	-Elk	6036	6444				
6,750'	-Sonyea	6631	6725				
7,000'	-Middlesex	6773	6809				
7,250'	-Genesee	6809	6891				
7,500'	-Geneseo	6891	6919				
7,750'	-Tully	6919	6943				
	-Hamilton	6943	7003				
	Marcellus top	7003					
	Target Inside Marcellus	**7024**		8 1/2	Production Casing	5 1/2	20#/P-110
	Marcellus Bottom	7049					

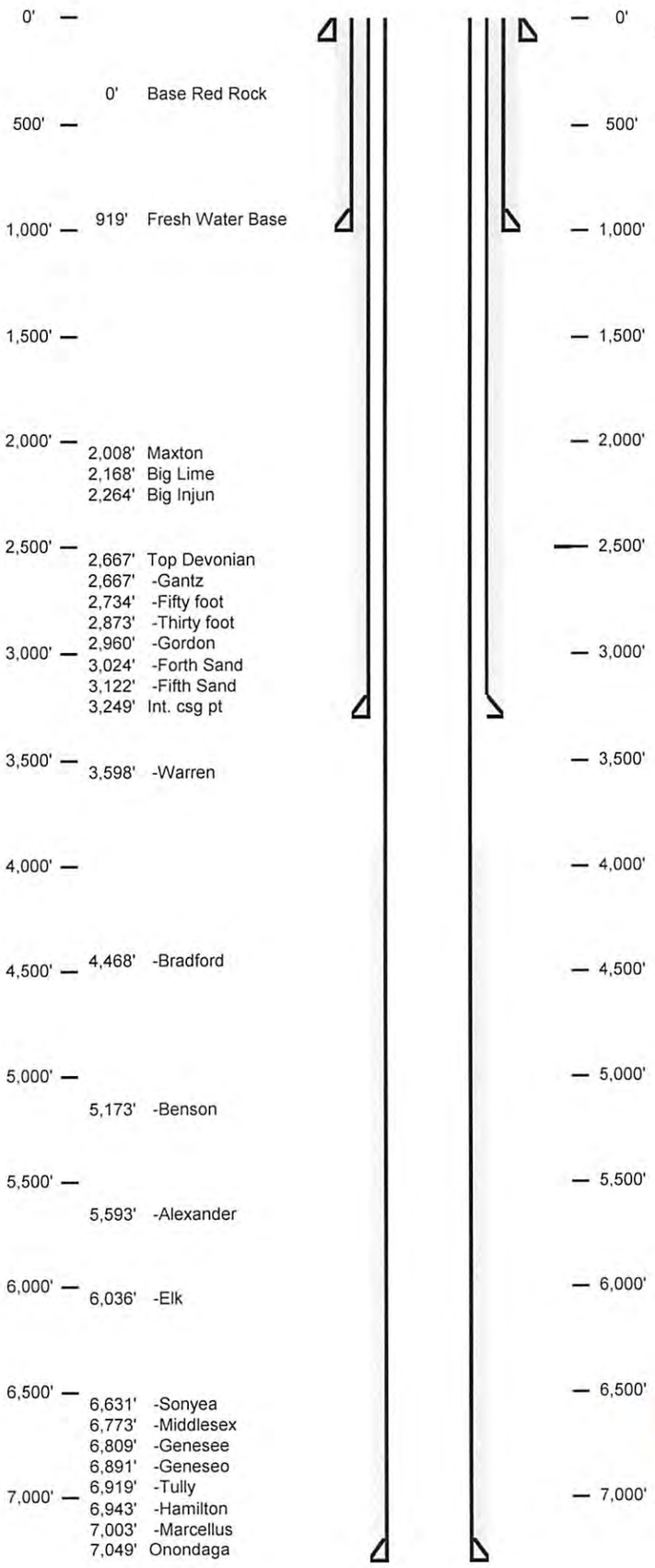
TD Pilot Hole @ 7149
100' below top of Onondaga
Run Logs, Plug back to KOP at 4877
Kick off for horizontal well in Marcellus

API 47-017-06062 MOD

Well Schematic
EQT Production

Well Name	514210 (SMI27H12)
County	Doddridge
State	West Virgina

Elevation KB:	1189
Target	Marcellus
Prospect	
Azimuth	155
Vertical Section	7752



Hole Size 24" - 20" Conductor at 40'
Bit Size 17.5"

TOC @ Surface
13 3/8", MC-50, 54.5# @ 1,019' ft MD
Bit Size 12.375"

TOC @ Surface
9 5/8", MC-50, 40# @ 3,249' ft MD
Bit Size 8.5"

KOP = 4,877' ft MD
10 Deg DLS

Land @ 7,959' ft MD
7,024' ft TVD

5 1/2", P-110, 20# 15,160' ft MD
7,009' ft TVD

08/09/2013

FORM WW 6

8,659'

LATITUDE 39° 22' 30"

LONGITUDE 80° 40' 00"

2,840'

EQT PRODUCTION COMPANY
WELL NO. WV 514210
CARR LEASE 351 AC±

WELL NO. WV 514210
STATE PLANE COORDINATES
NORTH ZONE (NAD'27)
N. 318,108.8
E. 1,661,504.7

LAT=(N) 39.367204
LONG=(W) 80.697294

UTM (NAD'83)(METERS)
N. 4,357,579.9
E. 526,091.0

LANDING POINT
WELL NO. WV 514210
STATE PLANE COORDINATES
NORTH ZONE (NAD'27)
N. 317,070.0
E. 1,660,156.8

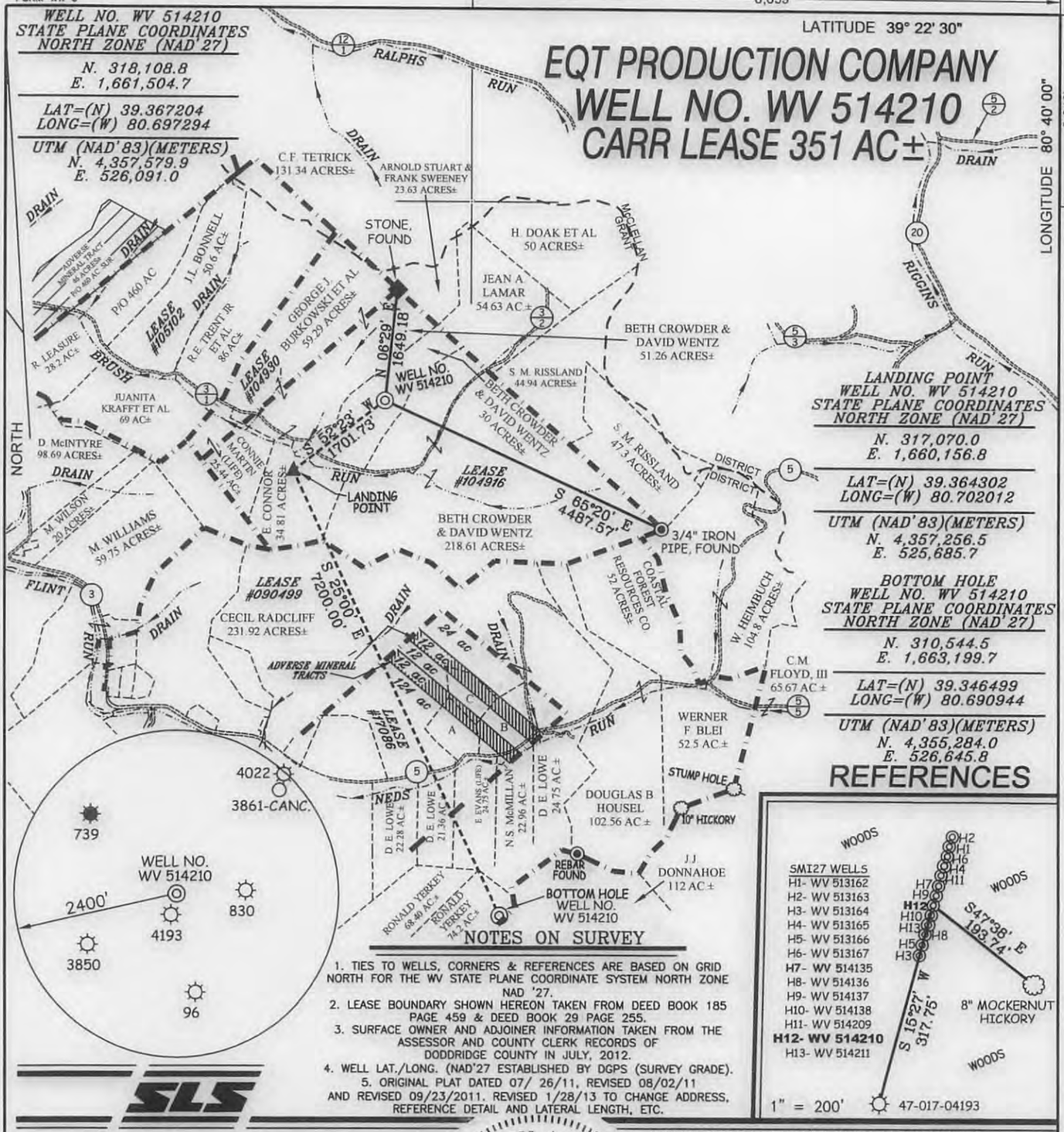
LAT=(N) 39.364302
LONG=(W) 80.702012

UTM (NAD'83)(METERS)
N. 4,357,256.5
E. 525,685.7

BOTTOM HOLE
WELL NO. WV 514210
STATE PLANE COORDINATES
NORTH ZONE (NAD'27)
N. 310,544.5
E. 1,663,199.7

LAT=(N) 39.346499
LONG=(W) 80.690944

UTM (NAD'83)(METERS)
N. 4,355,284.0
E. 526,645.8



REFERENCES

NOTES ON SURVEY

1. TIES TO WELLS, CORNERS & REFERENCES ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM NORTH ZONE NAD '27.
2. LEASE BOUNDARY SHOWN HEREON TAKEN FROM DEED BOOK 185 PAGE 459 & DEED BOOK 29 PAGE 255.
3. SURFACE OWNER AND ADJOINER INFORMATION TAKEN FROM THE ASSESSOR AND COUNTY CLERK RECORDS OF DODDRIDGE COUNTY IN JULY, 2012.
4. WELL LAT./LONG. (NAD'27 ESTABLISHED BY DGPS (SURVEY GRADE).
5. ORIGINAL PLAT DATED 07/ 26/11, REVISED 08/02/11 AND REVISED 09/23/2011. REVISED 1/28/13 TO CHANGE ADDRESS, REFERENCE DETAIL AND LATERAL LENGTH, ETC.

SLS

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. 677 Gregory A. Smith

GREGORY A. SMITH LICENSED No. 677 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.

DATE SEPTEMBER 23 , 20 11

REVISED DATE JANUARY 28 , 20 13

OPERATORS WELL NO. WV 514210

API WELL NO. 47 — 017 — 06062H MOD

STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 200

PROVEN SOURCE OF ELEVATION DGPS (SURVEY GRADE TIE TO CORS NETWORK)

FILE NO. 7584P514210R4F2 (329-71)

SCALE 1" = 2000'

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

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___ IF "GAS" PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X

LOCATION:

ELEVATION 1,194' (GROUND) / 1,179' (PROPOSED) WATERSHED BRUSH RUN

DISTRICT GRANT COUNTY DODDRIDGE QUADRANGLE SMITHBURG 7.5'

SURFACE OWNER BETH CROWDER & DAVID WENTZ ACREAGE 30±

ROYALTY OWNER PATTY J. & R. KEITH CRIHFIELD (351 AC.±) / NEVA RITTER ET AL (907 AC.±) / EDISON RITTER ET AL (160 AC.±)

PROPOSED WORK:

LEASE NO. 104916 / 090499 / 17086

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 ___

08/09/2013

COUNTY SAME

PERMIT

WELL OPERATOR EQT PRODUCTION COMPANY

ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280
BRIDGEPORT, WV 26330

DESIGNATED AGENT REX C. RAY

ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280
BRIDGEPORT, WV 26330

SLS

134648