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

March 25, 2014

EQT PRODUCTION COMPANY
POST OFFICE BOX 280
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 1706331 , Well #: WV 513142
Modified Casing

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

03/28/2014

17-06331
MOD

December 17, 2013

Mr. Gene Smith
West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304

Re: Modification of (OXF156) 47-017-06331

Dear Mr. Smith,

Attached is a modification to the casing program for the above well. A new WW-6B & schematics are enclosed for your review. Due to problems encountered drilling the WEU8 wells, we have decided to set the intermediate casing deeper.

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.
cc: Douglas Newlon
4060 Dutchman Road
Macfarlan, WV 26148

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DEC 19 2013
WV Department of
Environmental Protection

03/28/2014

NW - 6B
9/13)

4701706331 12/19
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 | 8 | 526
Operator ID | County | District | Quadrangle

2) Operator's Well Number: 513142 Well Pad Name: OXF156

3) Farm Name/Surface Owner : Heaster et al Public Road Access: CR10

4) Elevation, current ground: 1244' Elevation, proposed post-construction: 1203'

5) Well Type: (a) Gas • Oil _____ Underground Storage _____

Other _____

(b) If Gas: Shallow • Deep _____

Horizontal •

6) Existing Pad? Yes or No: no

7) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):
Target formation is Marcellus at a depth of 6608' with the anticipated thickness to be 4447feet and anticipated target pressure of 54 PSI

8) Proposed Total Vertical Depth: 6608'
9) Formation at Total Vertical Depth: Marcellus
10) Proposed Total Measured Depth 12,134
11) Proposed Horizontal Leg Length 3,920
12) Approximate Fresh Water Strata Depths: 163, 210, 314, 380, 456, 594, 1078
13) Method to Determine Fresh Water Depth: By offset wells
14) Approximate Saltwater Depths: 1382, 1450
15) Approximate Coal Seam Depths: 1266, 1306
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?
(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

DCN
1-2-2014

03/28/2014

4701706331

MOD

NW - 6B
3/13)

CASING AND TUBING PROGRAM

18)

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: for Drilling	INTERVALS: Left in Well	CEMENT: Fill- up (Cu.Ft.)
Conductor	20	New	Varies	Varies	40	40	38
Fresh Water	13 3/8	new	MC-50	54	1,178	1,178	1,017
Coal							
Intermediate	9 5/8	New	MC-50	40	5,267	5,267	2,063
Production	5 1/2	New	P-110	20	12,134	12,134	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 (cu. ft./k)
Conductor	20	26	0.375	-	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.

DCN
1-2-2014

WW - 6B

(3/13)

4701706331

MOD

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

Drill and complet a new horizontal well in the Marcellus formation. The vertical drill to go down to an approximate depth of 5732'.

Then kick off the horizontal leg into the Marcellus using a slick water frac.

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 treating pressures are expected to average approximately 8500 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 200,000 barrels of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 200,000 pounds of sand per stage.

21) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 37.43

22) Area to be disturbed for well pad only, less access road (acres): 26.22

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 spaced every 1000' from KOP to Int csg shoe

24) 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.

25) 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.

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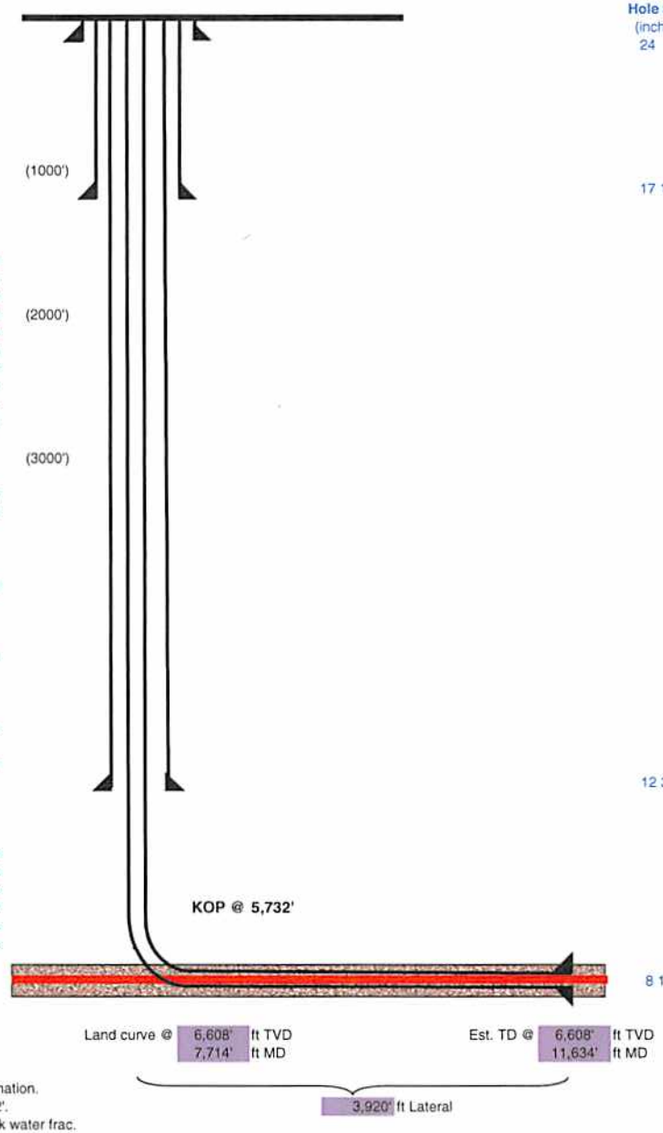
03/28/2014

4701706331 MOD

Well 513142 (OXF156H5)
EQT Production
Oxford
Doddridge West Virginia

Azimuth 155
Vertical Section 4462



TVD Depth (feet)	Formation Tops (TVD)	
0'		
250'		
500'		
750'		
1,000'	Base Fresh Water	1078
	Base Red Rock	1154
1,250'		
1,500'		
	Maxton	1654 - 1723
1,750'	Big Lime	1835 - 1885
	Big Injun	1950 - 1972
2,000'	Weir	2119 - 2235
	-Gantz	2334 - 2394
2,250'	-Fifty foot	2429 - 2478
	-Thirty foot	2526 - 2574
2,500'	-Gordon	2574 - 2674
	-Forth Sand	2674 - 2765
2,750'	-Bayard	2846 - 2910
3,000'		
3,250'	-Warren	3211 - 3281
	-Speechley	3281 - 3792
3,500'		
3,750'		
	-Balltown A	3792 - 4423
4,000'		
4,250'		
	-Riley	4423 - 4859
4,500'		
4,750'		
	-Benson	4859 - 5112
5,000'		
	-Alexander	5112 - 5217
5,250'	Int. csg pt	5267
5,500'		
5,750'	-Sonyea	6217 - 6379
	-Middlesex	6379 - 6430
6,000'	-Genesee	6430 - 6498
	-Geneseo	6498 - 6540
6,250'	-Tully	6540 - 6565
	-Hamilton	6565 - 6583
6,500'	Marcellus top	6583
	Target Inside Marcellus	**6608**
6,750'	Marcellus Bottom	6637
7,000'		

(1000')
(2000')
(3000')

Hole Size (inches)	Casing Type	Size (inches)	Wt (ppf)/Grade
24	Conductor	20	
17 1/2	Surface	13 3/8	54#/MC-50
12 3/8	Intermediate	9 5/8	40#/MC-50
8 1/2	Production Casing	5 1/2	20#/P-110

Land curve @ 6,608' ft TVD
7,714' ft MD

Est. TD @ 6,608' ft TVD
11,634' ft MD

3,920' ft Lateral

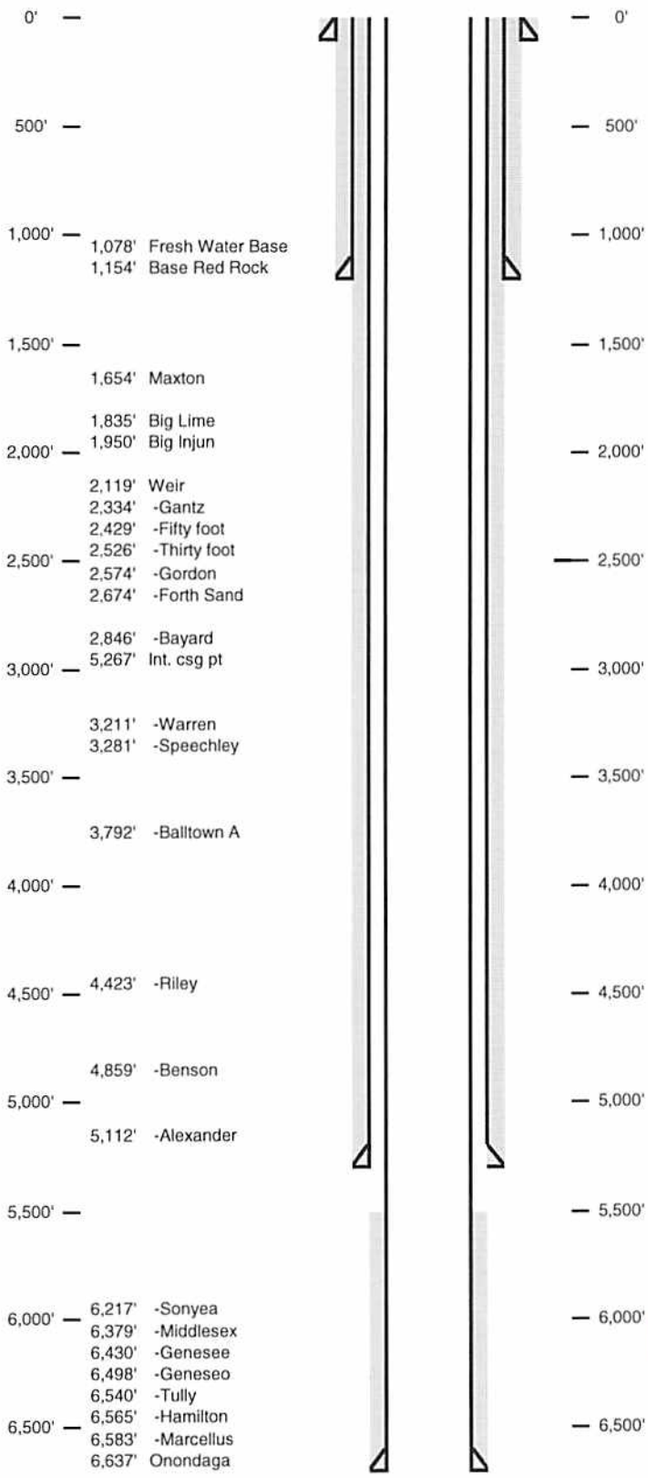
Proposed Well Work:
Drill and complete a new horizontal well in the Marcellus formation.
The vertical drill to go down to an approximate depth of 5732'.
Then kick of the horizontal leg into the Marcellus using a slick water frac.

4701706331
MOD

Well Schematic
EQT Production

Well Name	513142 (OXF156H5)
County	Doddridge
State	West Virgina

Elevation KB:	1212
Target	Marcellus
Prospect	
Azimuth	155
Vertical Section	4462



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

TOC @ Surface
13 3/8", MC-50, 54.5# @ 1,178' ft MD
Bit Size 12.375"

TOC @ Surface
9 5/8", MC-50, 40# @ 5,267' ft MD
Bit Size 8.5"

KOP = 5,732' ft MD
10 Deg DLS

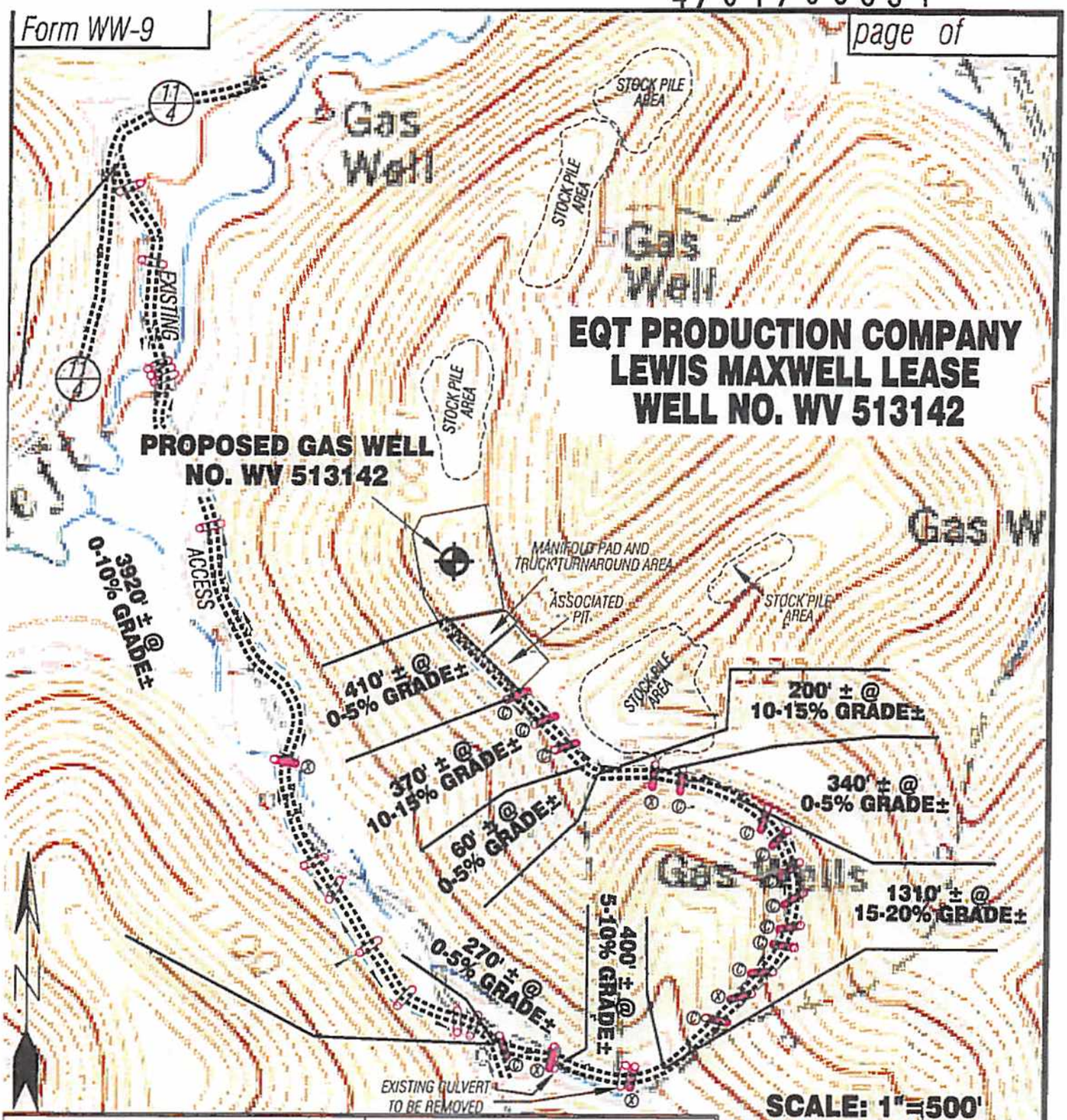
Land @ 7,714' ft MD
6,608' ft TVD

5 1/2", P-110, 20# ... 11,634' ft MD
6,608' ft TVD

03/28/2014

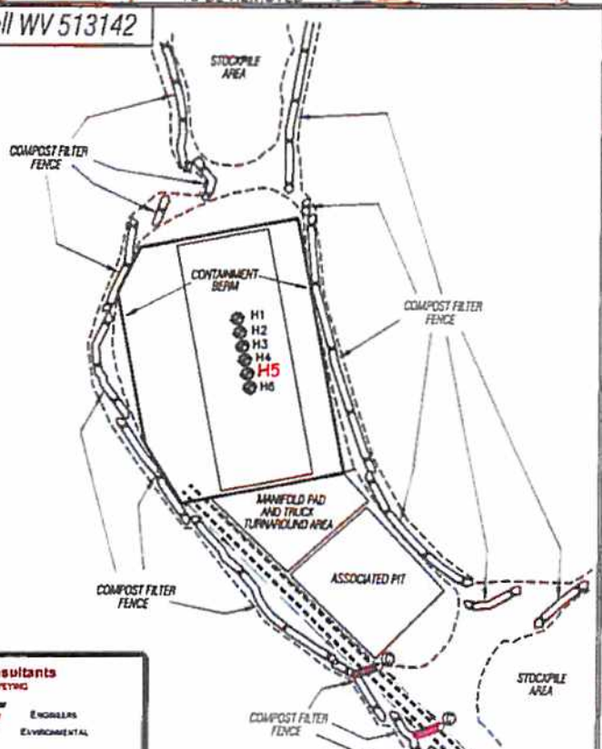
4701706331

Form WW-9 page of



Detail Sketch for Proposed Well WV 513142

DCW
8-16-2013



OXF156 WELLS
H1-WV 513138
H2-WV 513139
H3-WV 513140
H4-WV 513141
H5-WV 513142
H6-WV 513143

Not To Scale

TOPO SECTION OF OXFORD 7.5' USGS TOPO QUADRANGLE

ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P. O/L AND GAS BMP MANUAL. ENTRANCES AT COUNTY/STATE ROADS SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATION. SEPARATE PERMITS MAY BE REQUIRED BY THE D.O.T.

SEDIMENT BASINS (TRAPS) AND APPROPRIATE EROSION CONTROL BARRIERS ARE TO BE CONSTRUCTED AT ALL CULVERT AND CROSS DRAIN INLETS AND OUTLETS AS REQUIRED IN THE WV D.E.P. O/L AND GAS BMP MANUAL. FIELD CONDITIONS (ROCK OUTCROPS AND BEDROCK) MAY PROHIBIT INLET TRAPS BEING INSTALLED. WHEN THESE CONDITIONS EXIST ADDITIONAL EROSION CONTROL MEASURES SHALL BE EVALUATED AND UTILIZED AS NEEDED.

EARTHWORK CONTRACTORS ARE RESPONSIBLE FOR NOTIFICATION TO THE OPERATOR AND INSPECTOR PRIOR TO ANY DEVIATION FROM THIS PLAN.

TEMPORARY SEED & MULCH ALL SLOPES AFTER CONSTRUCTION OF LOCATION.

CUT & STACK ALL MARKETABLE TIMBER.

STACKED BRUSH MAY BE USED FOR SEDIMENT CONTROL.

APPLICATIONS FOR SEPARATE PLUGGING PERMITS FOR ANY STREAM CROSSINGS HAVE BEEN MADE.

= EXISTING CULVERT

= PROPOSED CULVERT

= PROPOSED STREAM CROSSING

ASSOCIATE LIMIT OF DISTURBANCE

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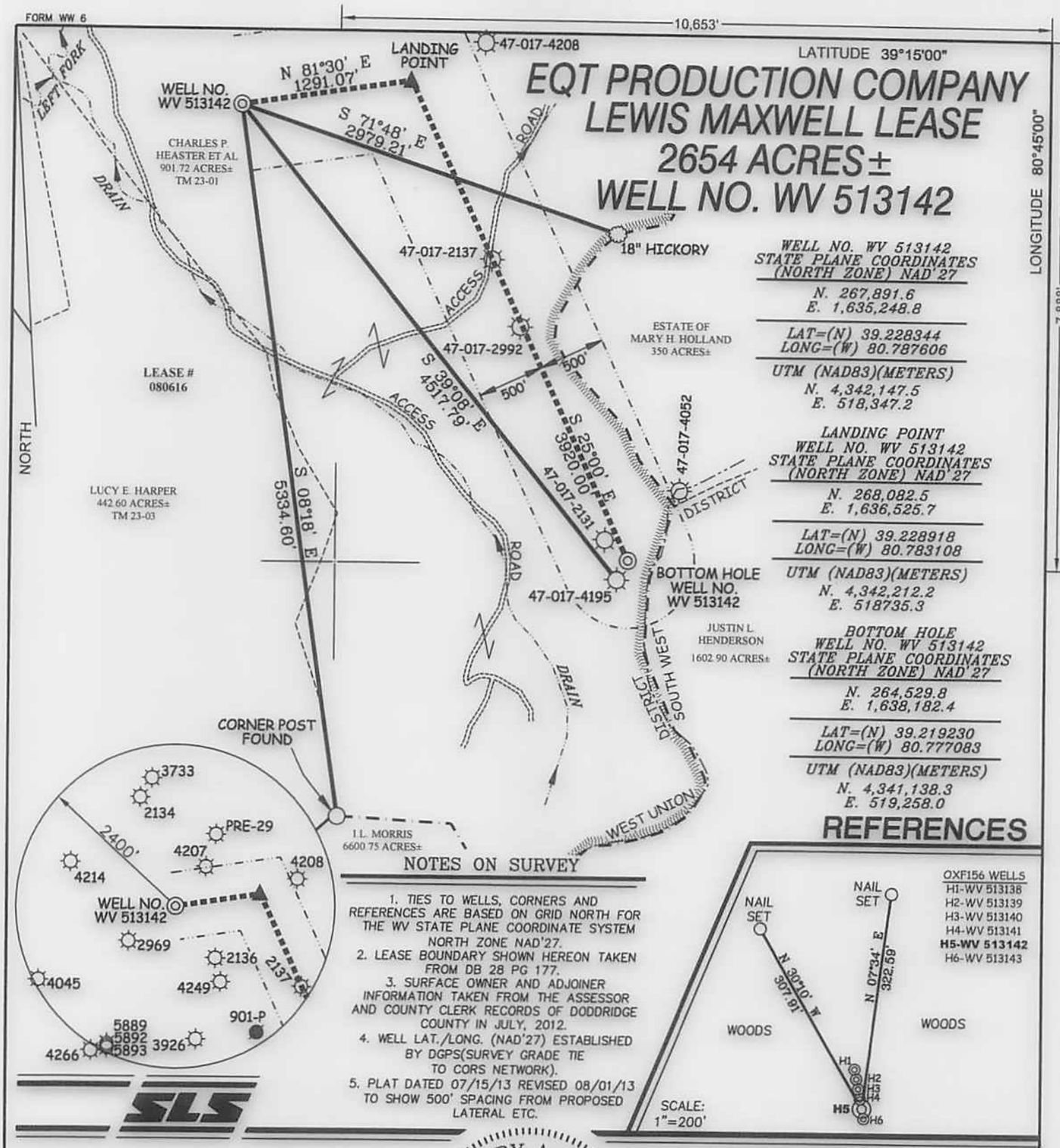
03/28/2014

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT SLS ENGINEERS ENVIRONMENTAL

DRAWN BY	FILE NO.	DATE	CADD FILE:
K.D.W.	6980	07/15/13	6980RECS\513142.dwg

FORM WW 6

EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
2654 ACRES±
WELL NO. WV 513142



WELL NO. WV 513142
STATE PLANE COORDINATES
(NORTH ZONE) NAD'27
N. 267,891.6
E. 1,635,248.8
LAT=(N) 39.228344
LONG=(W) 80.787606
UTM (NAD83)(METERS)
N. 4,342,147.5
E. 518,347.2

LANDING POINT
WELL NO. WV 513142
STATE PLANE COORDINATES
(NORTH ZONE) NAD'27
N. 268,082.5
E. 1,636,525.7
LAT=(N) 39.228918
LONG=(W) 80.783108
UTM (NAD83)(METERS)
N. 4,342,212.2
E. 518735.3

BOTTOM HOLE
WELL NO. WV 513142
STATE PLANE COORDINATES
(NORTH ZONE) NAD'27
N. 264,529.8
E. 1,638,182.4
LAT=(N) 39.219230
LONG=(W) 80.777083
UTM (NAD83)(METERS)
N. 4,341,138.3
E. 519,258.0

NOTES ON SURVEY

1. TIES TO WELLS, CORNERS AND REFERENCES ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM NORTH ZONE NAD'27.
2. LEASE BOUNDARY SHOWN HEREON TAKEN FROM DB 28 PG 177.
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 TIE TO CORS NETWORK).
5. PLAT DATED 07/15/13 REVISED 08/01/13 TO SHOW 500' SPACING FROM PROPOSED LATERAL ETC.

REFERENCES

OXF156 WELLS
H1-WV 513138
H2-WV 513139
H3-WV 513140
H4-WV 513141
H5-WV 513142
H6-WV 513143

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 AUGUST 1 , 20 13

OPERATORS WELL NO. WV 513142

API WELL NO. 47 — 017 — 08331 H6A
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 200 FILE NO. 6980P513142R

PROVEN SOURCE OF ELEVATION DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 1000'

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 1,244'(GROUND) 1,202'(PROPOSED) WATERSHED LEFT FORK ARNOLDS CREEK
DISTRICT WEST UNION COUNTY DODDRIDGE QUADRANGLE OXFORD 7.5'
SURFACE OWNER CHARLES P. HEASTER ET AL ACREAGE 901.72 ±
ROYALTY OWNER LEWIS MAXWELL HRS ACREAGE 2654± 03/28/2014
PROPOSED WORK : LEASE NO. 080616
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 ____

COUNTY NAME

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