



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

December 08, 2014

EQT PRODUCTION COMPANY
303 SAND CUT ROAD
CLARKSBURG, WV 26301

Re: Permit Modification Approval for API Number 1706444 , Well #: WV 514391
Modify landing point, bottom hole and lateral length.

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,

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas



July 30, 2014

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

Re: Modification of 47-01706444

Dear Mr. Smith,

EQT would like to modify the landing point, bottom hole and lateral length on the above API #. No additional leases were affected. I have enclosed a new WW-2B, well schematics, mylar plat and copy of rec plan for your review.

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

Sincerely,

A handwritten signature in blue ink, appearing to read 'Vicki Roark'.

Vicki Roark
Permitting Supervisor-WV

Enc.

Received

AUG 5 2014

12/12/14

Office of Oil and Gas
WV Dept. of Environmental Protection

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
Operator ID 017 County 8 District 671 Quadrangle

2) Operator's Well Number: 514391 Well Pad Name WEU49

3) Farm Name/Surface Owner: Mary Farr Secrist Farm Public Road Access: 50/42

4) Elevation, current ground: 1,165.0 Elevation, proposed post-construction: 1,130.0

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 Thicknesses and Associated Pressure(s):
Target formation is Marcellus at a depth of 6648 with the anticipated thickness to be 56 feet and anticipated target pressure of 4484 PSI

8) Proposed Total Vertical Depth: 6,648

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 12,129

11) Proposed Horizontal Leg Length: 4,270

12) Approximate Fresh Water Strata Depths: 243, 292, 352, 487

13) Method to Determine Fresh Water Depth: By offset wells

14) Approximate Saltwater Depths: 1,542

15) Approximate Coal Seam Depths: 340, 483

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: _____

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Office of Oil and Gas
Department of Environmental Protection

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	81	1,050	1,050	910
Coal							
Intermediate	9 5/8	New	MC-50	40	5,239	5,239	2,056
Production	5 1/2	New	P-110	20	12,129	12,129	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	24	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.

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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. The vertical drill to go down to an approximate depth of 5239'.
Then kick off the horizontal leg 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): 37.4

22) Area to be disturbed for well pad only, less access road (acres): 16.3

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 % Calcium 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.

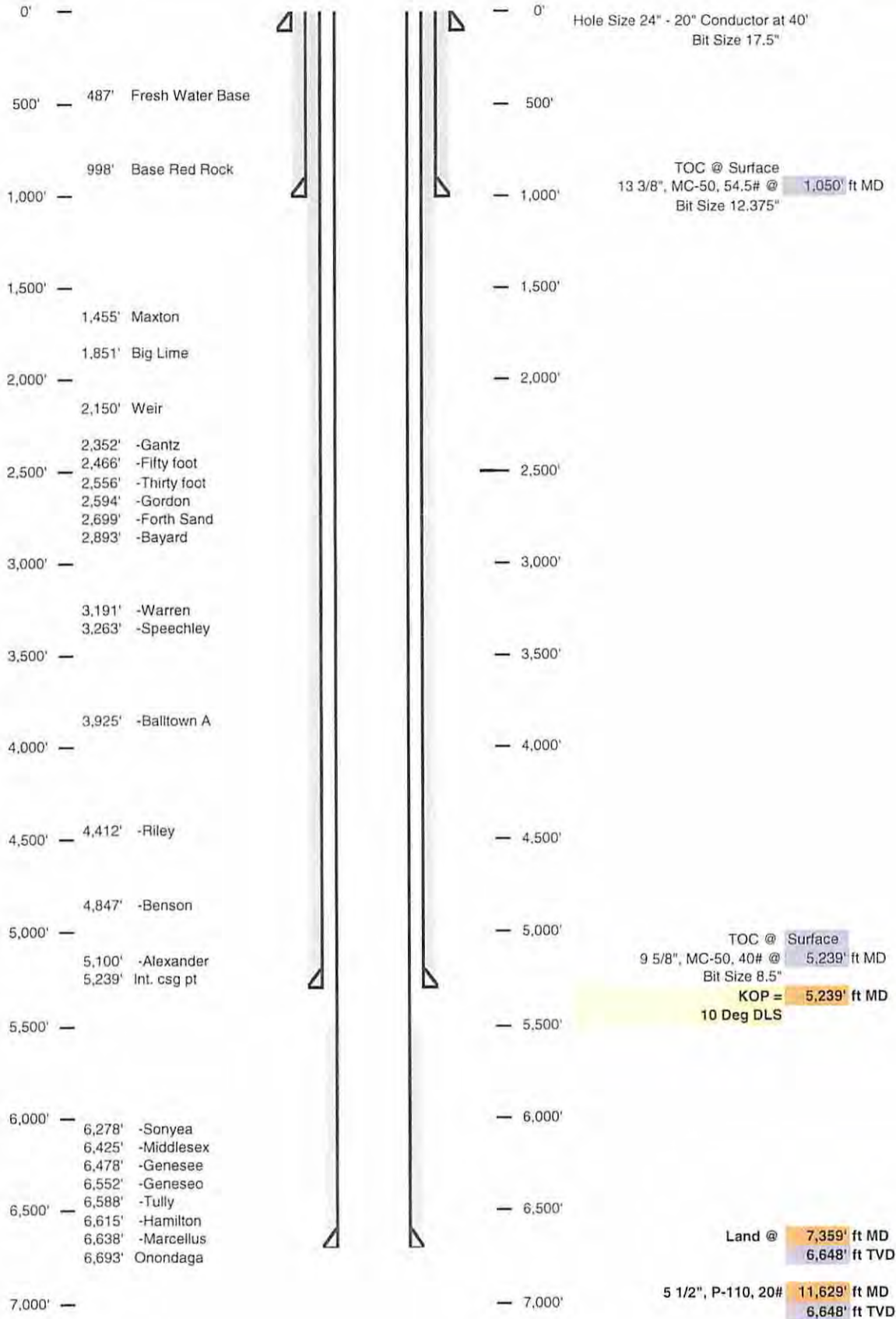
*Note: Attach additional sheets as needed.

Received 12/12/14
APC 5 2014
GAS

Well Schematic
EQT Production

Well Name 514391 (WEU49H2)
County Doddridge
State West Virginia

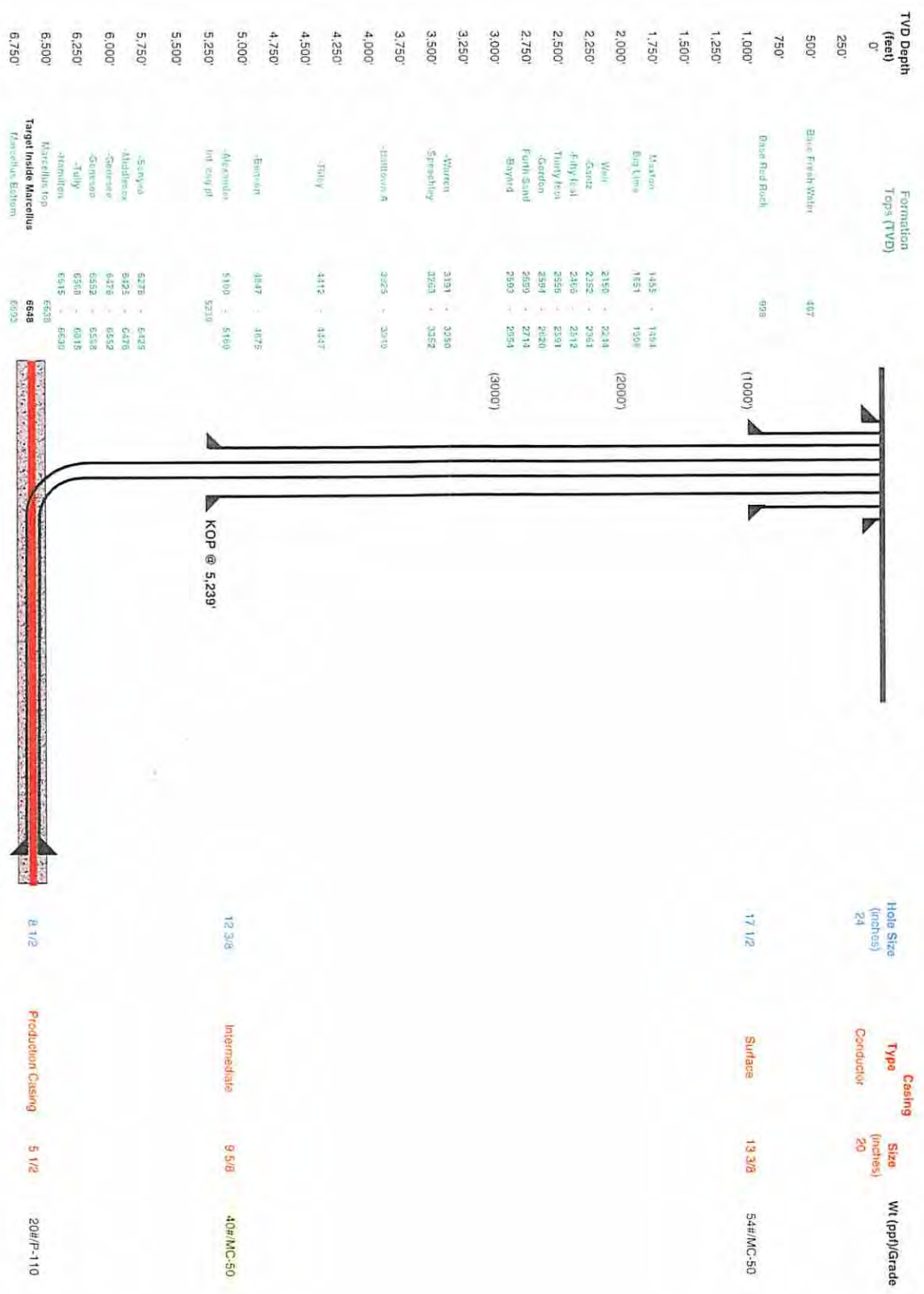
Elevation KB: 1143
Target Marcellus
Prospect
Azimuth 155
Vertical Section 4747



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Office of Oil and Gas
WV Dept. of Environmental Protection

4701706444
DOM

Well 514391 (WEU49H2)
EOT Production
West Union
Doddridge
West Virginia
Azimuth 156
Vertical Section 4717



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 5239'.
Then kick of the horizontal leg into the Marcellus using a slick water frac.

Land curve @ 6,648' ft TVD
7,389' ft MD

Est. TD @ 6,648' ft TVD
11,629' ft MD

4,270' ft Lateral

2 1/2" Production Casing 5 1/2" 20#/P-110

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NOTES ON SURVEY

1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. OR DWELLINGS WERE FOUND WITHIN 825' OF THE CENTER OF PROPOSED WELL PAD.

TOM DAVIES, ET AL 1457.95 ACRES±

EQT PRODUCTION COMPANY LEWIS MAXWELL LEASE 2,654 ACRES± WELL NO. WV 514391

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH) NAD'27 S.P.C.(FT) N. 277,510.0 E. 1,635,668.8 NAD'27 GEO. LAT-(N) 39.254766 LONG-(W) 80.786609 NAD'83 UTM (M) N. 4,345,079.9 E. 518,426.3

LANDING POINT

NAD'27 S.P.C.(FT) N. 277,804.7 E. 1,636,760.1 NAD'27 GEO. LAT-(N) 39.255069 LONG-(W) 80.782761 NAD'83 UTM (M) N. 4,345,114.3 E. 518,758.3

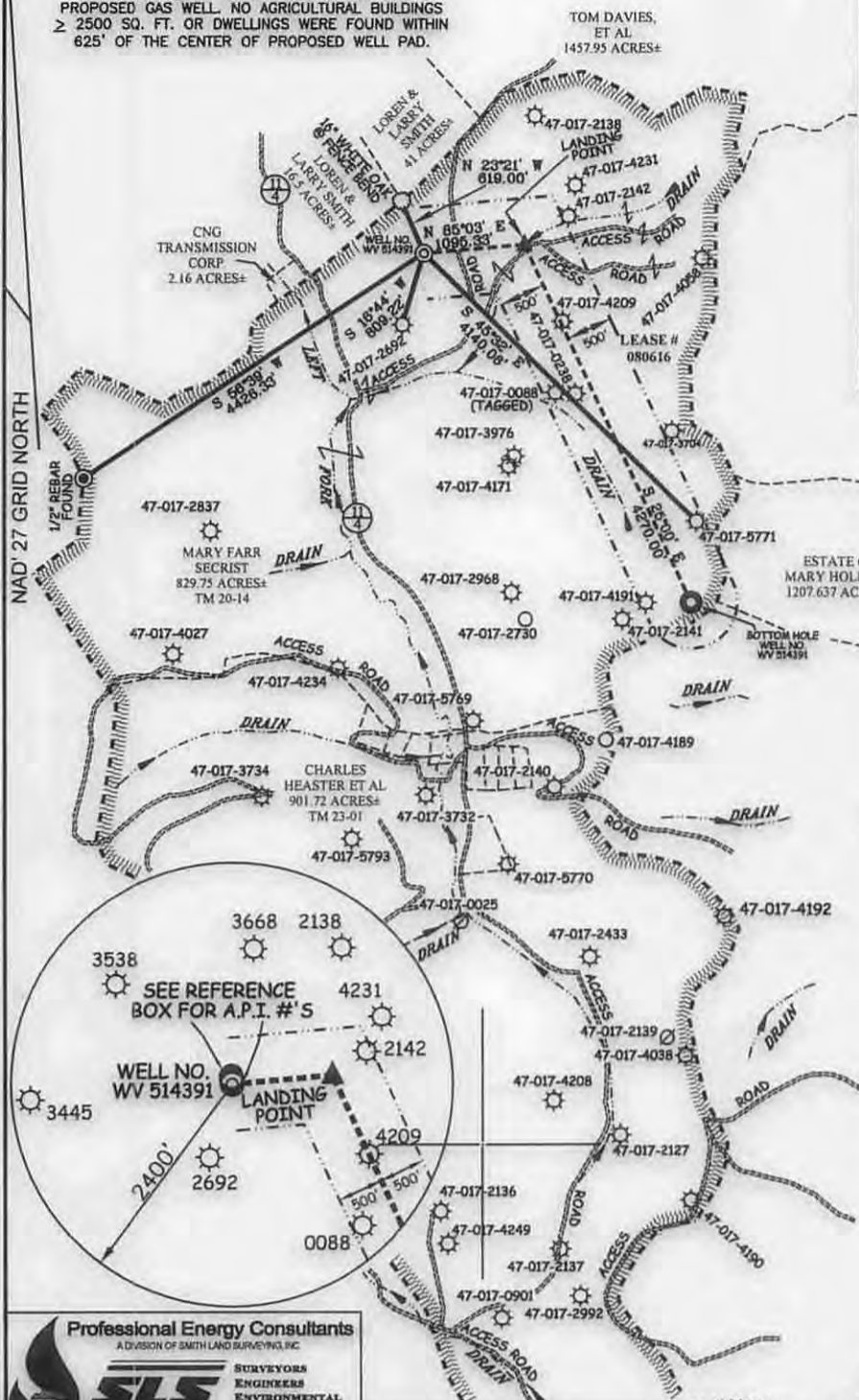
BOTTOM HOLE

NAD'27 S.P.C.(FT) N. 273,734.8 E. 1,638,564.6 NAD'27 GEO. LAT-(N) 39.244515 LONG-(W) 80.776195 NAD'83 UTM (M) N. 4,343,944.5 E. 519,327.7

NAD'27 GRID NORTH

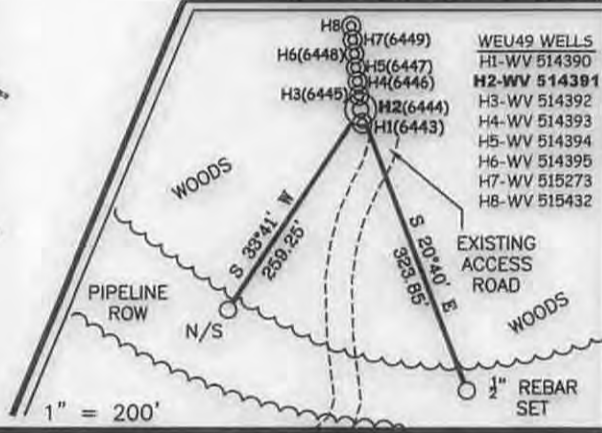
LONGITUDE 80°45'00"

13,440'



LEGEND: LEASE LINE (dashed), SURFACE LINE (dotted), WELL LATERAL (dash-dot), OFFSET LINE (long dash), TIE LINE (short dash), CREEK (wavy), ROAD (solid), TREE LINE (zigzag), COUNTY ROUTE (dashed with cross-ticks), PROPOSED WELL (circle with cross), EXISTING WELL (circle with dot), TAX MAP-PARCEL (circle with number).

REFERENCES



Professional Energy Consultants A DIVISION OF SMITH LAND SURVEYING, INC. SURVEYORS ENGINEERS ENVIRONMENTAL PROJECT MGMT. (304) 482-5834 WWW.SLSURVEYS.COM



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

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS. DATE DECEMBER 03, 20 13. REVISED 12/02/13, 07/01/14 & 07/31/14. OPERATORS WELL NO. WV 514391. API WELL NO. 47-017-06444. STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1/200 FILE NO. 7871P514391R2 SCALE 1" = 2000'. HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK)

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

WELL TYPE: OIL GAS X INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION X STORAGE DEEP SHALLOW X. LOCATION: ELEVATION 1,165'(GROUND) 1,130'(PROPOSED) WATERSHED LEFT FORK OF ARNOLD CREEK. DISTRICT WEST UNION COUNTY DODDRIDGE QUADRANGLE WEST UNION 7.5'. SURFACE OWNER MARY FARR SECRIST ACREAGE 829.75±. ROYALTY OWNER LEWIS MAXWELL HRS ACREAGE 2654± LEASE NO. 080616. 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 TVD 6,622'

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

COUNTY NAME PERMIT

NOTES ON SURVEY

1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. OR DWELLINGS WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.

TOM DAVIES, ET AL 1457.95 ACRES±

EQT PRODUCTION COMPANY LEWIS MAXWELL LEASE 2,654 ACRES± WELL NO. WV 514391

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH) NAD'27 S.P.C.(FT) N. 277,510.0 E. 1,635,668.8 NAD'27 GEO. LAT-(N) 39.254766 LONG-(W) 80.786609 NAD'83 UTM (M) N. 4,345,079.9 E. 518,426.3

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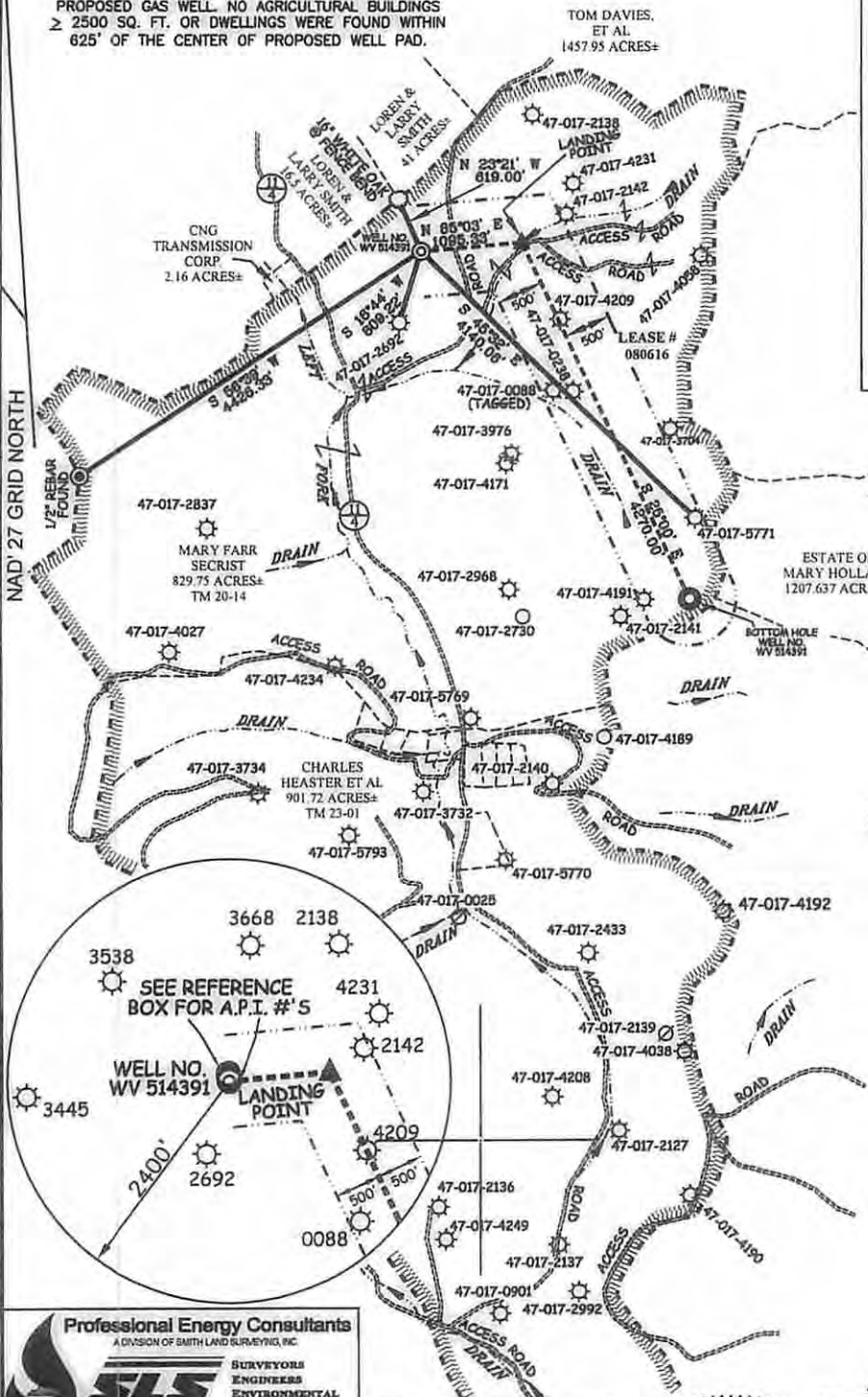
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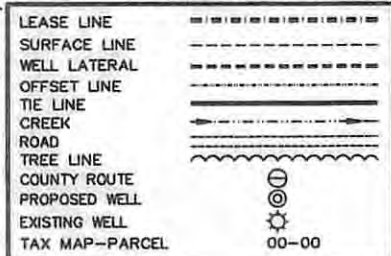
NAD'27 GRID NORTH

LONGITUDE 80°45'00"

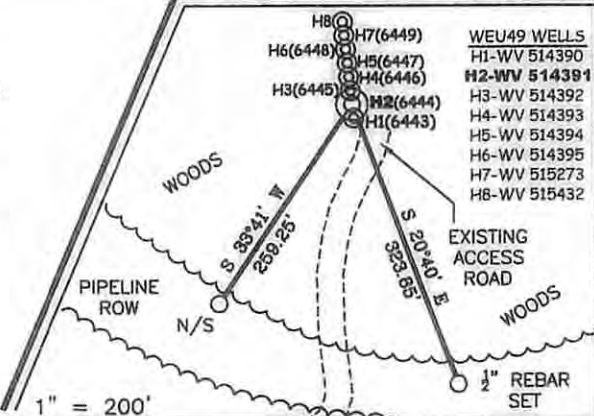
13,440'



LEGEND



REFERENCES



Professional Energy Consultants logo and contact information: (204) 482-5634, www.slsurveys.com



I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAN 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

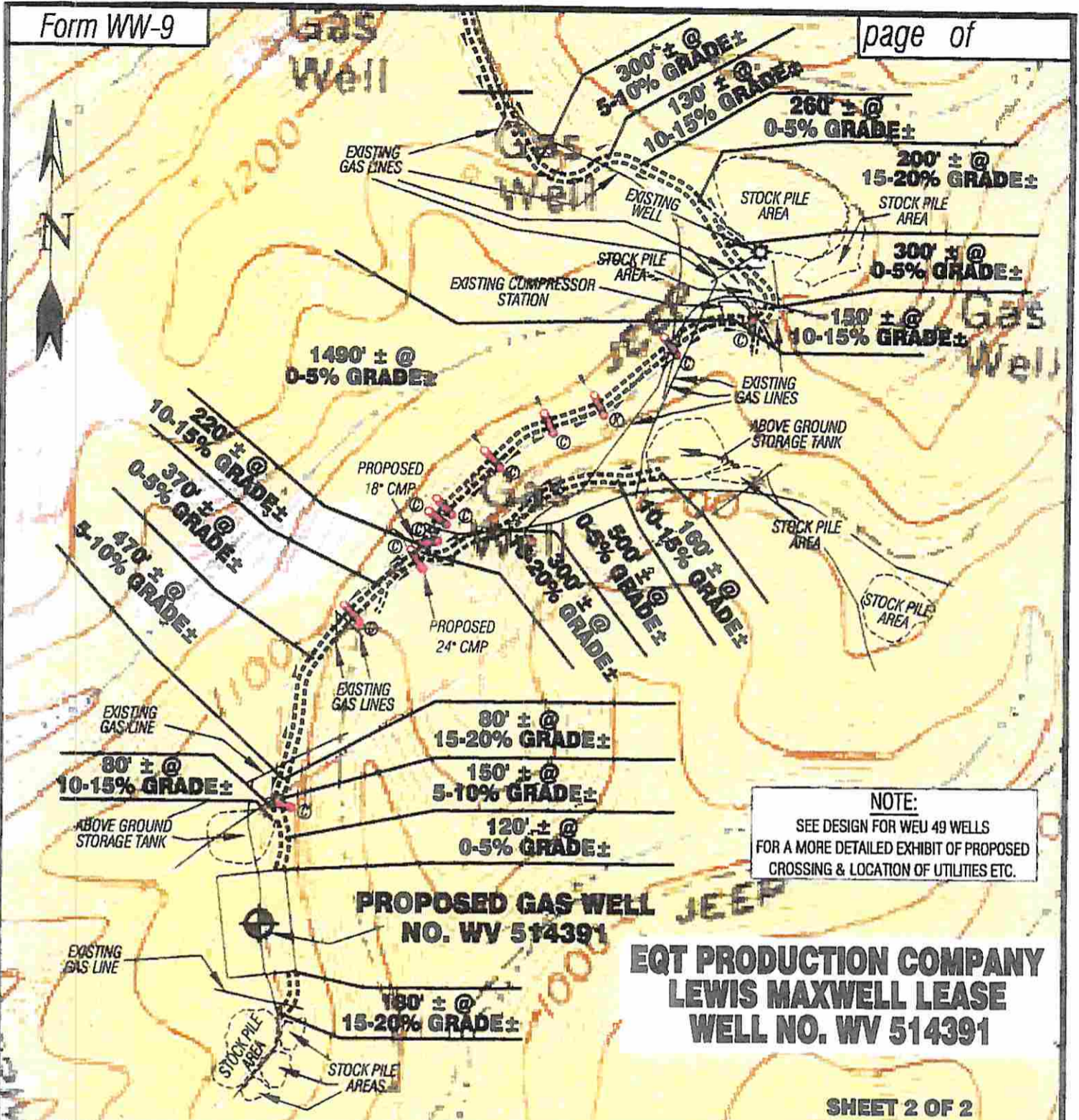
Form fields for DATE (DECEMBER 03, 20 13), REVISED (12/02/13, 07/01/14 & 07/31/14), OPERATORS WELL NO. (WV 514391), API WELL NO. (47-017-06444), STATE (STATE), COUNTY (COUNTY), PERMIT (PERMIT)

Form fields for MINIMUM DEGREE OF ACCURACY (1 / 200), FILE NO. (7871P514391R2), SCALE (1" = 2000'), HORIZONTAL & VERTICAL CONTROL DETERMINED BY (DGPS (SURVEY GRADE TIE TO CORS NETWORK))

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

Form fields for WELL TYPE (OIL GAS X INJECTION), LOCATION (ELEVATION 1,165(GROUND) 1,130(PROPOSED), DISTRICT WEST UNION, COUNTY DODDRIDGE, QUADRANGLE WEST UNION 7.5', SURFACE OWNER MARY FARR SECRIST, ROYALTY OWNER LEWIS MAXWELL HRS, PROPOSED WORK (DRILL X, CONVERT, DRILL DEEPER, REDRILL, FRACTURE OR STIMULATE X, PLUG OFF OLD), PHYSICAL CHANGE IN WELL (SPECIFY), TARGET FORMATION MARCELLUS, ESTIMATED DEPTH TVD 6,622')

Form fields for WELL OPERATOR (EQT PRODUCTION COMPANY), ADDRESS (115 PROFESSIONAL PLACE, BRIDGEPORT, WV 26330), DESIGNATED AGENT (REX C. RAY), ADDRESS (115 PROFESSIONAL PLACE, BRIDGEPORT, WV 26330)



NOTE:
SEE DESIGN FOR WEU 49 WELLS
FOR A MORE DETAILED EXHIBIT OF PROPOSED
CROSSING & LOCATION OF UTILITIES ETC.

**EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
WELL NO. WV 514391**

**SHEET 2 OF 2
SCALE: 1"=500'**

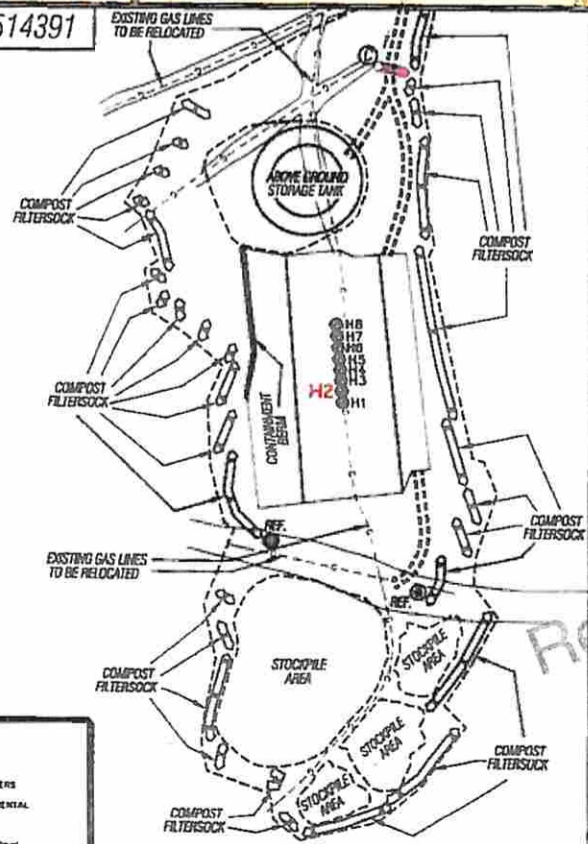


Detail Sketch for Proposed Well WV 514391

- WEU49 WELLS**
 H1-WV 514390
H2-WV 514391
 H3-WV 514392
 H4-WV 514393
 H5-WV 514394
 H6-WV 514395
 H7-WV 515273
 H8- NOT YET DETERMINED

NOTE:
SEE DESIGN FOR WEU 49 WELLS
FOR A MORE DETAILED EXHIBIT OF PROPOSED
CROSSING & LOCATION OF UTILITIES ETC.

Not To Scale



ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P OIL 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. OIL 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.

CLUT & STACK ALL MARKETABLE TIMBER

STACKED BRUSH MAY BE USED FOR SEDIMENT CONTROL

APPLICATIONS FOR SEPARATE PLC PERMITS ON THE ACCESS ROAD STREAM CROSSINGS HAVE BEEN PREPARED (IF APPLIES)

12/12/14
 AUG
 Office of Oil and Gas
 Dept. of Environmental Protection
 - EXISTING CULVERT
 - PROPOSED CULVERT 15" MIN UNLESS OTHERWISE NOTED
 - PROPOSED STREAM CROSSING
 - APPROXIMATE LIMITS OF DISTURBANCE

Professional Energy Consultants
 A DIVISION OF SMITH KELSO SURVEYING
 SURVEYORS PROJECT MGMT. ENGINEERS ENVIRONMENTAL
SLS
 228 Ford Blvd. SE P.O. Box 150 Marietta, GA 30067 (770) 422-3234
 2805 Johns Summit Road Shadydale, GA 30087 (770) 671-9111
 INTEGRITY. INTEGRITY. QUALITY.
 DRAWN BY: K.D.W. FILE NO.: 7871 DATE: 12/04/13 CADD FILE: 7871RECS14.391.dwg

TOPO SECTION OF WEST UNION 7.5' USGS TOPO QUADRANGLE

EQT PRODUCTION COMPANY LEWIS MAXWELL LEASE WELL NO. WV 514391



50
42

EXISTING GATE

APPROXIMATE END
END OF CO. RT. 50/42

NOTE:
SEE DESIGN FOR WEU 49 WELLS
FOR A MORE DETAILED EXHIBIT OF PROPOSED
CROSSING & LOCATION OF UTILITIES ETC.

EXISTING WELL

EXISTING
GAS LINES

TO WELL 2
WELLS

EXISTING
WELL

EXISTING ROAD (PREVIOUSLY UTILIZED)
TO BE RESHAPED AND REGARDED

EXISTING
GAS LINES

EXISTING
WELL

TO WELL 1
WELLS

SHEET 1 OF 2
SCALE: 1"=500'



340' ± @
15-20% GRADE ±

600' ± @
5-10% GRADE ±

350' ± @
0-5% GRADE ±

PROPOSED
18" CMP

EXISTING
GAS LINE

MATCH
LINE

Gas
Well

Gas
Well

ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P. OIL 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.

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APPLICATIONS FOR SEPARATE PLC PERMITS ON THE ACCESS ROAD STREAM CROSSINGS HAVE BEEN PREPARED (IF APPLIES).

Received
AUG 5 2014

Office of Oil and Gas
WV Dept. of Environmental Protection

12/12/14

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

Survivors PROJECT MGMT **SLS** ENGINEERS ENVIRONMENTAL

276 West Union St.
P.O. Box 150
Crown Hill, WV 26031
304-282-3634

30062 Carey Bottom Road
Shelburne, OH 43787
(740) 671-9311

HONESTY. INTEGRITY. QUALITY.

DRAWN BY K.D.W.	FILE NO. 7871	DATE 12/04/13	CADD FILE: 7871PDC514391.dwg
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TOPO SECTION OF WEST UNION 7.5'
USGS TOPO QUADRANGLE

- EXISTING CULVERT
- PROPOSED CULVERT 15' MIN UNLESS OTHERWISE NOTED
- PROPOSED STREAM CROSSING
- APPROXIMATE LIMITS OF DISTURBANCE