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

April 27, 2015

STATOIL USA ONSHORE PROPERTIES, INC.
2103 CITYWEST BOULEVARD - SUITE 800
HOUSTON, TX 77042

Re: Permit Modification Approval for API Number 10303068, Well #: NORTH HENDERSON N(
Casing Revised

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
Assistant Chief of Permitting
Office of Oil and Gas

LeMasters, Ashley E

4710303068 MDD

From: Bekki Winfree <BEKW@statoil.com>
Sent: Friday, April 24, 2015 7:18 AM
To: Adkins, Laura L; LeMasters, Ashley E
Cc: Ryan Cardenas
Subject: CASING REVISION - N. Henderson N 3H, 4H, 5H
Attachments: 2_WW-6B N Henderson N 3H Rev 4-22-15-signed.pdf; 2_WW-6B N Henderson N 4H Rev 4-22-15-signed.pdf; 2_WW-6B N Henderson N 5H Rev 4-22-15-signed.pdf

Importance: High

Laura/Ashley,

In preparing to move to the N. Henderson North wells (rig move to start 4/27/15) we discovered that the 3H and 5H surface locations were flipped. The well slots were permitted as 2-3-5-4 but they should have been 2-5-3-4. We can still drill the wells from the permitted slots but it requires that we revise the setting depth of the production casing slightly on the 3H, 4H & 5H. I sent the revised WW-6B's to Derek Haught and he has approved. He recommended checking with you to verify if we need to revise the permit. As noted below, he has no problem with us moving forward as planned and with the rig move. If it is easier, we can switch the surface locations for the 3 and 5 which would alleviate the need to revise the casing (they are 7.5' from each other). Whatever works best and is fastest we can do. Please advise at your earliest convenience if we need to revise the permits.

THANK YOU<

Bekki Winfree
Statoil USA Onshore Properties Inc.
Office: 713.485.2640
Cell: 713.240.9015

From: Haught, Derek M [mailto:Derek.M.Haught@wv.gov]
Sent: Friday, April 24, 2015 6:09 AM
To: Bekki Winfree
Subject: RE: CASING REVISION - N. Henderson N 3H, 4H, 5H FOR YOUR APPROVAL

Bekki,

I have reviewed and approved the casing changes. You need to contact the permitting folks in Charleston, and explain your situation to find out for sure whether or not you need a modification in this case. They have made quite a few changes recently to when a modification is needed and when it is not. Explain to them that I have signed off on the casing changes and don't have a problem with you moving forward as planned with the rig move next week. It is my understanding that if the lateral is extended or if the azimuth changes then a modification is required. I have attached the WW-6B's for your use if needed. Be sure to let them know that the rig is coming next week and they should be able to help you in not having any delays. Please let me know if I can be of any further assistance.

Thanks,
Derek

From: Bekki Winfree [mailto:BEKW@statoil.com]
Sent: Wednesday, April 22, 2015 2:16 PM
To: Haught, Derek M
Cc: Bekki Winfree; Ryan Cardenas

Subject: CASING REVISION - N. Henderson N 3H, 4H, 5H FOR YOUR APPROVAL
Importance: High

4710303068MOD

Derek,

In preparing to move to the N. Henderson North wells (rig move to start 4/27/15) we discovered that the 3H and 5H surface locations were flipped. The well slots were permitted as 2-3-5-4 but they should have been 2-5-3-4. We can still drill the wells from the permitted slots but it requires that we revise the setting depth of the production casing slightly on the 3H, 4H & 5H. I wasn't sure if this is something you could approve in the field or if I need to submit to the Charleston Office to revise the permit. Attached please find revised WW-6B's with new setting depths and cement information. Please advise if I need to submit them to the Charleston Office and if you would please review and return at your earliest convenience.

Thank you for your help and I apologize for the inconvenience.

Bekki Winfree
Sr. Regulatory Advisor
Marcellus Asset
Statoil USA Onshore Properties Inc.

Office: +1.713.485.2640
Cell: +1.713.240.9015
e-mail: bekw@statoil.com

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Thank you

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Thank you

47 1 0 3 0 3 0 6 8 MOD

WW-6B
(9/13)

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

1) Well Operator: Statoil USA Onshore Properties Inc. | 494505083 (Operator ID) | Wetzel (County) | Center (District) | Littleton (Quadrangle)

2) Operator's Well Number: North Henderson North Unit 4H Well Pad Name: North Henderson (existing pad)

3) Farm Name/Surface Owner: Howard Henderson Public Road Access: Low Gap Rocky Run Road

4) Elevation, current ground: 1,342' Elevation, proposed post-construction: 1,342' (existing pad)

5) Well Type (a) Gas _____ Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow ■ Deep _____
Horizontal ■

DMH 4-28-15

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus: Formation Top-7465' TVD, Target Depth-7502' TVD, 47' thick, 5258 psi, *Intermediate Casing MASP 2300 psi

8) Proposed Total Vertical Depth: 7502' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 15,451' MD

11) Proposed Horizontal Leg Length: 7249'

12) Approximate Fresh Water Strata Depths: 622' TVD

13) Method to Determine Fresh Water Depths: offset wells

14) Approximate Saltwater Depths: 2077'

15) Approximate Coal Seam Depths: 755-764, 822-834, 882-919, 1102-1160, 1182-1183, 1222-1287

16) Approximate Depth to Possible Void (coal mine, karst, other): NA

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: _____

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Office of Oil and Gas
WV Dept. of Environmental Protection

WW-6B
(9/13)

18) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	20"	New	H-40	94#	120'	120'	Cmt to surface-150 cu ft
Fresh Water	13.375"	New	J-55	54.4#	700'	700'	Cmt to surface-512 cuft
Coal							
Intermediate	9.625"	New	J-55	36#	2900'	2900'	Cmt to surface-1205 cuft
Production	5.5"	New	P-110	20#	15451'	15451'	Cmt to 1900'-3457 cuft
Tubing							
Liners							

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TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	26"	.438"	1530 psi	Class A	1.3 cu ft/sk
Fresh Water	13.375"	17.5"	.380"	2730 psi	Class A	1.29 cu ft/sk
Coal						
Intermediate	9.625"	12.25"	.352"	*3520 psi	Class A	1.29 cu ft/sk
Production	5.5	8.5"	.361"	12640 psi	Class A	2.42 cu ft/sk
Tubing						
Liners						

PACKERS

Kind:				
Sizes:				
Depths Set:				

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WW-6B
(9/13)

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

See Attached

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

Well will fractured through the plug-n-perf method with +/- 25 fracturing stages per well. Each fracturing treatment will have 400,000 lbs of sand mixed in 7500 Bbls. of fresh water. The fracturing rate will be between 80 and 100 bpm at a pressure lower than a maximum pressure of 10,000 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 3.3 acres

22) Area to be disturbed for well pad only, less access road (acres): 2.9 acres

23) Describe centralizer placement for each casing string: DMH 4-28-15

See attached

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

See attached

25) Proposed borehole conditioning procedures:

Surface – Drilled with fresh water to section total depth. Prior to tripping, hole will circulated clean of cuttings and back-reamed if necessary.
Intermediate – Drilled with 9.0 ppg 5% KCL Polymer Water Based Mud (WBM) to section total depth. At section total depth, pump 40bbl viscous pill and circulate hole clean.
Production - Drilled with 12.5-13.0 ppg Synthetic Based Mud (SBM) to section total depth. At section total depth pump 2-3 20bbl heavy weighted pill sweeps to transport excess cutting from the hole until clean. Pump rates will be maintained in excess of 600 GPM, and rotation in excess of 100 RPM to assist cuttings transport. A 60 bbl tuned weighted spacer will be pumped ahead of the cement to assist in mud cake removal and water wett both casing and formation.

*Note: Attach additional sheets as needed.

WW-6B – North Henderson North 4H

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

20" conductor will be pre-set prior to start of operations and cemented in place to surface at approximately **120** ft. A 17 ½" surface hole will be drilled with fresh water to approximately 700'md/tvd. 13 3/8" surface casing will be installed and cemented to surface in order to isolate fresh water zones and provide a competent shoe for well control while drilling deeper horizons. A 12 ¼" intermediate hole section will be drilled with 5% KCL Polymer (WBM) and a conventional mud motor to approximately **2900'md/tvd** through the base of the Big Injun formation. 9 5/8" Intermediate casing will be installed and cemented to surface in order to isolate the Red Beds and Big Injun formation from lower hydrocarbon bearing zones while providing a competent shoe for well control. An 8 ½" vertical hole section will be to planned kick-off point using Synthetic Based Mud (SBM) and a conventional mud motor. The wellbore will be deviated from vertical and landed horizontally in the Marcellus Target horizon, and extended laterally to total depth of **15,451' MD/7502' VD** using SBM and conventional mud motors. A 5 ½" production casing will be installed and cemented so estimated top of cement is at least 300ft inside the previous casing shoe. The Drilling Rig will then be released to the next well.

23) Describe centralizer placement for each casing string

Surface - 1 centralizer w/ stop collar 10 ft above float shoe. One Single Bow every joint to 100ft below surface.

Intermediate – 1 centralizer w/ stop collar 10 ft above float shoe. 1 centralizer w/ stop collar 10 ft above float collar. 1 centralizer every joint for the first 15 joints. One centralizer every 3 jnts to 100ft below surface.

Production - 1 centralizer w/ stop collar 10ft above shoe. 1 centralizer 10ft above float collar. 1 centralizer every joint (floating) until KOP. 1 centralizer every 3 joints (floating) until 200ft inside intermediate shoe. 1 centralizer 50ft below mandrel hanger.

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

Surface - Class A + 3% $CaCl_2$

Intermediate - Class A cmt, 0.05% Retarder, 0.25% Defoamer, 1% Accelerator, 0.25% Dispersant, 0.65% Retarder, 9.10 gal/sk Fresh Water.

Production - Class A cmt, 10% bwow Dispersent, 0.6% bwoc Fluid Loss, 0.4% bwoc Retarder, 0.1% bwoc Free water control agent, 0.25% bwoc Defoamer, 0.1% bwoc Fluid Loss, 6.32 gal/sk Fresh Water.

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Office of Oil and Gas
WV Dept. of Environmental Protection

Marcellus - Drilling Well Schematic

47 10 303068 MOD

Well Name:	North Henderson North Unit 4H		GLE (ft): 1,342.8		TVD(ft): 7,502
Field Name:	Marcellus		DF(ft): 1364.8		TMD(ft): 15,451
County:	Wetzel Co., WV	BHL:	X = 1754280.0	Y= 14420947.0	Profile: Horizontal
API #:	47-10303068	SHL:	X = 1759184.9	Y= 14414699.3	AFE No.: 1001930

Formations & Csg Points	Depth, ft MD	Depth, ft TVD	Depth, ft SS	Form. Temp. (F)	Pore Press. (EMW)	Frac Gradient (EMW)	Planned MW	Measure Depth (ft)
Conductor	*120*	*120*	*2,588*	-	-	-	-	120
							Fresh Water	
							8.6	
Approximate Fresh Water Strata ~622'								
							8.6	
Casing Point	*700*	*700*	*2,008*	*65*	-	-		700
Washington Coal	758	758	1,950				Air/Mist	
Pittsburgh Coal	1,225	1,225	1,483				Air/Mist	
				-	-	-		
Top Salt Water	2,077	2,077	631				Air/Mist	TOC @ 1900' MD
Big Injun Base	2,807	2,807	-99				Air/Mist	
Weir		2,843						
Casing Point	*2,900*	*2,900*	*-192*	*82*	-	*>18.0*		2,900
Weir			2,708				Air/Mist	
Berea		3,014	-306					
Gordon		3,283	-575				Air/Mist	
Fifth Sand		3,568	-860					
Warren		3,963	-1,255				Air/Mist	
Java		5,675	-2,967				Air/Mist	
Benson		5,698	-2,990				Air/Mist	
KOP	**6,765**	**6,737**					Air/Mist	
Middlesex		7,229	-4,521				12.5-13.0	
West River		7,262	-4,554					
Tully		7,362	-4,654					
Hamilton		7,386	-4,678				12.5-13.0	
Marcellus		7,481	-4,773		-	-		
							12.5-13.0	
							12.5-13.0	
					-	-		
							12.5-13.0	
					-	-		
							12.5-13.0	
Target Window		7,494	-4,786					
Landing point	8,204	7,502	-4,794					
Cherry Valley		7,510	-4,802					
Onondaga		7,513	-4,805		-	-		

Program / Details

20" Conductor

17-1/2" Surface

Profile:	Vertical
Bit Type:	17-1/2" SMITH MSi716
BHA:	9 5/8" Motor with Shock Sub
Mud:	8.6 ppg Fresh Water
Surveys:	n/a
Logging:	n/a
Casing:	13.375 54.5 J-55 BTC at 700' MD/700' TVD
Centralizers:	1 centralizer w/ stop collar 10 ft above float shoe. One Single Bow every joint to 100ft below surface.
Cement:	15.8 ppg Tail slurry w/ TOC @ Surface
Potential Drilling Problems:	Collision, , ,

FIT/LOT: 14.0 ppg EMW

12-1/4" Intermediate

Profile:	Vertical
Bit Type:	12-1/4" Hughes TCI VG-35ADX1 (IADC:547) w/ 3x22's
BHA:	8" Directional Assy 7:8 Lobe 2.0 Stg .07 rpg 1.15ABH (0.10 rpg/375 Diff)
Mud:	Air/Mist
Surveys:	Gyro SS, MWD - EM Pulse
Logging:	n/a
Casing/Liner:	9.625 36 J-55 BTC at ' MD/' TVD
Csg Hanger:	Mandrel Hanger
Centralizers:	1 centek centralizer w/ stop collar 10 ft above float shoe. 1 centek centralizer w/ stop collar 10 ft above float collar. 1 centralizer every joint for the first 15 joints. One centralizer every 3 jnts to 100ft below surface.
Cement:	15.8 ppg Tail slurry w/ TOC @ Surface
Potential Drilling Problems:	Hole Cleaning , Stuck Pipe, Lost Cones,

LOT: 20 ppg Max

8-1/2" Production

Profile:	
Bit Type:	8-1/2" Hughes VG-30ADX1 (IADC: 547) w/ 3x22's 8 1/2" Smith SDAi513 Curve Lateral w/ 7 x16's
BHA:	Directional Assembly (Steerable Motor) + EM w/ GR 6.75in 7:8 Lobe, 2.9 Stg (1.15 deg 0.17rpg, 560 Diff) - Vert 6.75in 4/5 Lobe, 7.0 Stg (1.95 deg Fixed, 0.5rpg, 915 Diff) - HZ
Mud:	Air/Mist to KOP and 12.5-13.0 ppg SOBM Curve Lateral
Surveys:	MWD - EM Pulse w/ 30ft surveys in curve, 100ft surveys in lateral
Logging:	GR
Casing/Liner:	5.5 20 P110EC VAM TOP HT at 15451 ft MD/7502 ft TVD
Csg Hanger:	Mandrel Hanger
Centralizers:	1 centek centralizer w/ stop collar 10ft above shoe. 1 centek centralizer 10ft above float collar. 1 centek centralizer every joint (floating) until KOP. 1 centek centralizer every 3 joints (floating) until 200ft inside intermediate shoe. 1 centek centralizer 50ft below mandrel hanger.
Cement:	15 ppg Tail slurry w/ TOC @ 1900' MD'
Potential Drilling Problems:	Lost Coes, Hole Cleaning , Torque & Drag,
Notes / Comments:	

DMH 4-28-15

TMD: 15,451
TVD: 7,502

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Last Revision Date: 4/28/2015
Revised by: Ryan Cardenas

Note: Depths are referenced to RKB
Note: Not Drawn to Scale

Cement Outside Casing

Office of Oil and Gas
WV Dept. of Environmental Protection

North Henderson North Unit 4H_Well Schematic_Detail Summary NAD 27

10,117'

Latitude: N 39°42'30"

Longitude: W 80°32'30"

5,395'

LEGEND

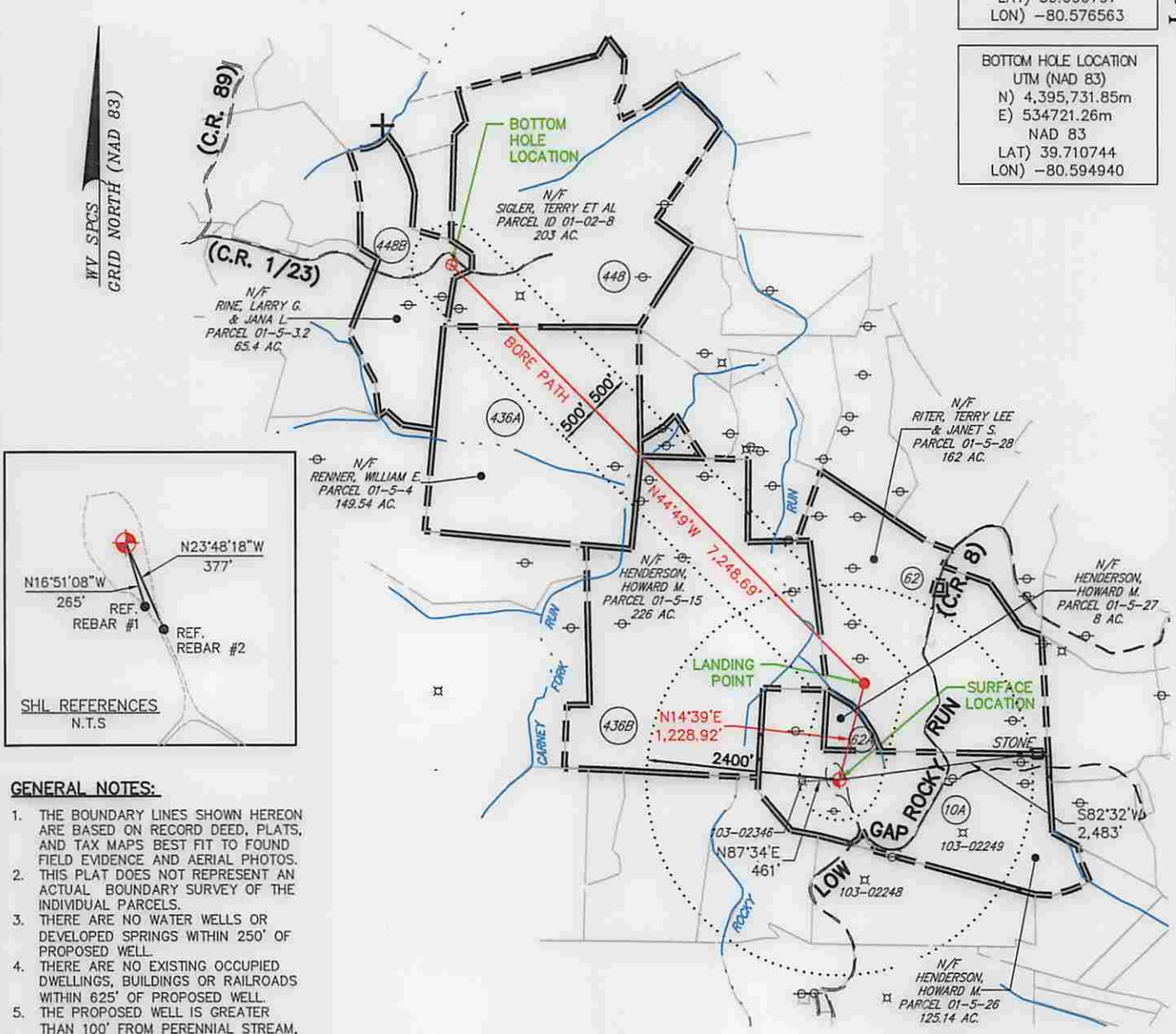
- PROPOSED GAS WELL
- EXISTING GAS WELLS
- PRE-29 WELLS
- PROPOSED BORE
- MINERAL TRACT BOUNDARY
- 500'/2,400' BUFFER
- STREAM LINE
- SURFACE TRACT BOUNDARY
- ROADS
- TOPO MAP POINT

MINERAL TRACT NUMBER	TAX MAP PARCEL NUMBER	TAX GROSS ACRES	MINERAL OWNERSHIP
10A	01-5-26	125.14	MAXINE HENDERSON
62A	01-5-27	8.00	MAXINE HENDERSON
62	01-5-28	170.00	TERRY RITER et al
436B	01-5-15	226.00	CHARLES E. HORNER et al
436A	01-5-4	149.54	ANN MARIE HOVIK et al
448	01-2-8	133.83	SHIBEN ESTATES INC.
448B	01-5-3.2	66.40	MARGARET ANN MYERS, et al

SURFACE LOCATION
UTM (NAD 83) METERS
N) 4,393,827.41m
E) 536,215.31m
NAD 83
LAT) 39.693523
LON) -80.577616

LANDING POINT LOCATION
UTM (NAD 83)
N) 4,394,191.23m
E) 536,303.91m
NAD 83
LAT) 39.696797
LON) -80.576563

BOTTOM HOLE LOCATION
UTM (NAD 83)
N) 4,395,731.85m
E) 534721.26m
NAD 83
LAT) 39.710744
LON) -80.594940



GENERAL NOTES:

1. THE BOUNDARY LINES SHOWN HEREON ARE BASED ON RECORD DEED, PLATS, AND TAX MAPS BEST FIT TO FOUND FIELD EVIDENCE AND AERIAL PHOTOS.
2. THIS PLAT DOES NOT REPRESENT AN ACTUAL BOUNDARY SURVEY OF THE INDIVIDUAL PARCELS.
3. THERE ARE NO WATER WELLS OR DEVELOPED SPRINGS WITHIN 250' OF PROPOSED WELL.
4. THERE ARE NO EXISTING OCCUPIED DWELLINGS, BUILDINGS OR RAILROADS WITHIN 625' OF PROPOSED WELL.
5. THE PROPOSED WELL IS GREATER THAN 100' FROM PERENNIAL STREAM, WETLAND, POND, RESERVOIR OR LAKE.
6. THERE ARE NO NATIVE TROUT STREAMS WITHIN 300' OF PROPOSED WELL.

FILE #: 099912016

DRAWING #: 099912016_WELL PLAT

SCALE: 1" = 2,000'

MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING GPS

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 RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

SIGNED: [signature]

R.P.E.: _____ L.L.S.: 2241

CRAIG ROBERT WEST
LICENSED
No. 2241
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR

PLACE SEAL HERE

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

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25304

DATE: OCTOBER 20, 2014 – REVISED

OPERATOR'S WELL #: NORTH HENDERSON NORTH UNIT 4H

API WELL #: 47 (STATE) 103 (COUNTY) 03068 MOD (PERMIT)

WELL TYPE: ☐ OIL ☒ GAS ☐ WASTE DISPOSAL ☐ LIQUID INJECTION ☒ PRODUCTION ☐ STORAGE ☐ DEEP ☒ SHALLOW

WATERSHED: LOWER WEST VIRGINIA FORK FISH CREEK

ELEVATION: 1,342' (AS-BUILT)

COUNTY/DISTRICT: WETZEL / CENTER

QUADRANGLE: LITTLETON

SURFACE OWNER: HOWARD HENDERSON

ACREAGE: 125±

OIL & GAS ROYALTY OWNER: MAXINE HENDERSON

LEASE ACREAGE: SEE MINERAL INTEREST TABLE

CONVERT ☐ DRILL DEEPER ☐ REDRILL ☐ FRACTURE OR STIMULATE ☒ PERFORATE NEW FORMATION ☐ PLUG & ABANDON ☐

DRILL ☒ PLUG OFF OLD FORMATION ☐ CLEAN OUT & REPLUG ☐ OTHER CHANGE ☐ (SPECIFY): _____

TARGET FORMATION: MARCELLUS

ESTIMATED DEPTH: 7,502'

WELL OPERATOR: STATOIL USA ONSHORE PROPERTIES INC.

DESIGNATED AGENT: RICHARD PYLES

ADDRESS: 2103 CITYWEST BLVD., SUITE 800

ADDRESS: 803 NASH ROAD

CITY: HOUSTON STATE: TX ZIP CODE: 77042

CITY: MIDDLEBOURNE STATE: WV ZIP CODE: 26149