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**west virginia** department of environmental protection

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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

January 09, 2014

**WELL WORK PERMIT**

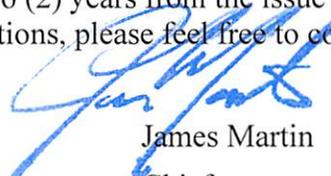
**Horizontal 6A Well**

This permit, API Well Number: 47-10302926, issued to STATOIL USA ONSHORE PROPERTIES, INC., is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.



James Martin  
Chief

Operator's Well No: SHREVE-WATSON UNIT 2H  
Farm Name: SHREVE, KENNETH & SONDR  
**API Well Number: 47-10302926**  
**Permit Type: Horizontal 6A Well**  
Date Issued: 01/09/2014

**Promoting a healthy environment.**

## PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

### CONDITIONS

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1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACOE). Through this permit, you are hereby being advised to consult with USACOE regarding this proposed activity.
2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

103 02926

**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: Statoil USA Onshore Properties Inc. 494505083 Wetzel 103 Clay 03 Littleton 7.5' 438  
Operator ID County District Quadrangle

2) Operator's Well Number: Shreve-Watson Unit 2H Well Pad Name: Shreve-Watson Unit

3 Elevation, current ground: 1471' Elevation, proposed post-construction: 1471' \*\*already built\*\*

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):  
Marcellus Shale; Formation Top - 7647' TVD, 50' Thick, 0.67 psi/ft

7) Proposed Total Vertical Depth: 7673'

8) Formation at Total Vertical Depth: Marcellus Shale

9) Proposed Total Measured Depth: 14,190'

10) Approximate Fresh Water Strata Depths: 130' - 320'

11) Method to Determine Fresh Water Depth: Local water well data

12) Approximate Saltwater Depths: 2150'

13) Approximate Coal Seam Depths: 755'

14) Approximate Depth to Possible Void (coal mine, karst, other): N/A

15) Does land contain coal seams tributary or adjacent to, active mine? No

16) Describe proposed well work: Drill and stimulate a horizontal well in the Marcellus Shale.

17) Describe fracturing/stimulating methods in detail:  
The well will be stimulated by multi-stage fracturing using a slickwater fluid.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 2.05 ac \*\*pad already built\*\*

19) Area to be disturbed for well pad only, less access road (acres): 1.89 ac \*\*pad already built\*\*

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20)

CASING AND TUBING PROGRAM

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft.</u>	<u>FOOTAGE: For Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill -up (Cu. Ft.)</u>
Conductor	20"	New	H-40	94#	80'	80'	Grouted to surface 120 cu. ft.
Fresh Water	13-3/8"	New	J-55	54.5#	500'	500'	Cement to surface 350 cu. ft.
Coal	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Intermediate	9-5/8"	New	J-55	36#	2,772'	2,772'	Cement to surface 860 cu. ft.
Production	5-1/2"	New	P-110	20#	14,190'	14,190'	Cement to 2000 ft., 3250 cu. ft.
Tubing							
Liners							

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<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield</u>
Conductor	20"	26"	.876"	1530 psi	Class "A"	1.3 cuft/sk
Fresh Water	13-3/8"	17-1/2"	.76"	2730 psi	Class "A"	1.29 cuft/sk
Coal	N/A	N/A	N/A	N/A	N/A	N/A
Intermediate	9-5/8"	12-1/4"	.704"	3520 psi	Class "A"	1.29 cuft/sk
Production	5-1/2"	8-1/2"	.722"	12,640 psi	Class "A"	2.42 cuft/sk
Tubing						
Liners						

PACKERS

Kind:				
Sizes:				
Depths Set:				

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21) Describe centralizer placement for each casing string. \_\_\_\_\_

Conductor - None

Fresh Water - 1 bow spring centralizer 10' from shoe, 1 bow spring centralizer every 4 joints to surface

Intermediate - 1 bow spring centralizer 10' from shoe, 1 bow spring centralizer every 3 joints to surface

Production - 1 spiroglide centralizer 10' from shoe, 1 spiroglide centralizer mid joint on second joint

1 spiroglide centralizer every joint to 45 deg, 1 bowspring centralizer every other joint to KOP, double bow spring centralizers every fourth joint to 2000'.

22) Describe all cement additives associated with each cement type. \_\_\_\_\_

Conductor - None

Fresh Water - Class A Cement with 3% Calcium Chloride

Intermediate - Accelerator (CaCl<sub>2</sub>), Expansion / Thixotropic (W-60), Retarder (HR-7)

Production (lead) - Gel / Extender (Bentonite), Fluid Loss / Gas Migration (CFL-117), Retarder (HR-7), Defoamer

Production (tail) - Gel / Extender (Bentonite), Fluid Loss / Gas Migration (CFL-117), Retarder (HR-7), solubility enhancer (for acid solubility)

\*\*Note\*\* Names and types of additives may vary depending on vendor availability

23) Proposed borehole conditioning procedures. \_\_\_\_\_

Conductor - Circulate clean

Fresh Water - Circ. hole clean at TD, Fill casing with water, Pump 20 bbl water, 25 bbl gel spacer, and 5 bbl water.

Intermediate - Circ. hole clean at TD, Fill casing with water, Pump 20 bbl water, 25 bbl gel spacer, and 5 bbl water.

Production - Circ. hole clean at TD, Pump 50 bbl tuned spacer, 5 bbl water

\*\*Note\*\* tuned spacer is a combination gelled / weighted mud flush spacer, can be substituted with alternating gelled spacers and weighted mud flushes. Borehole conditioning will be dictated by hole conditions.

\*Note: Attach additional sheets as needed.

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**Cement Additives**

Freshwater – Class A Cement with 3% Calcium Chloride

Intermediate - Accelerator (CaCl<sub>2</sub>), Expansion / Thixotropic (W-60), Retarder (HR-7)

Production (Lead) – Gel / Extender (Bentonite), Fluid Loss / Gas Migration (CFL-117), Retarder (HR-7), Defoamer

Production (Tail) – Gel / Extender (Bentonite), Fluid Loss / Gas Migration (CFL-117), Retarder (HR-7), solubility enhancer (for acid solubility)

NOTE: Names and types of additives may vary depending on vendor availability

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103-02926

**Statoil** **Marcellus - Drilling Well Schematic**

Well Name: Shreve-Watson 2H H2S: No GLE (ft): 1,471 TVD(ft): 7,673  
 Field Name: Marcellus Op Area:  RKB (ft): 22 TMD(ft): 14,190  
 County: Wetzel BHL:  X = 1765163.79 Y = 14411346.85 Profile: Horizontal  
 API #:  SHL:  X = 1768347.19 Y = 14406765.15 AFE No.: 00000000

Formations & Csg Points	Depth, ft			Form. Temp. (F)	Pore Press. (EMW)	Frac Gradient (EMW)	Planned MW	Measure Depth (ft)	Program	Details
	MD	TVD	SS							
Conductor	80	80	1.413	-	-	-	-	80		<b>20" Conductor</b>
										<b>17 1/2" Surface</b>
										Profile: Vertical Bit Type: Flat bottom hammer bit BHA: Air Hammer Mud: Air Surveys: Singel shot Logging: none Casing: 13 3/8 in 54.5 # J-55 BTC set @ - 500 MD/500 TVD 1 every 4 joints Centralizers: Cement: 15.8 ppg <i>CLASS A cement w/ 3% CALL 2</i> sks Potential Drilling Problems:
Casing Point	500	500	993	65	-	-	Ar Mist	500		<b>FIT/LOT: 15.0 ppg EMW</b>
										<b>12 1/4" Intermediate</b>
										Profile: Nudge for anticollision Bit Type: PDC BHA: Directional Mud: Air and load hole with 10 ppg SOBm from 1650' TVD Surveys: MWD/EM Logging: Casing/Liner: 9 5/8 in 36# J-55 LTC/BTC set at 2772ft MD/2768 ft TVD. Liner Hanger: N/A Centralizers: 1 every 3 joints Cement: 15.8 ppg Halliburton BondCem™ with 0.35% HR-7 (retarder) ~400 sks Potential Drilling Problems:
Red Rocks	1,678									<b>FIT/LOT: 16.0 ppg EMW</b>
Big Injun	2,515									<b>8 1/2" Production</b>
Big Injun (Base)	2,695									Profile: Horizontal; KOP@ 2900' with a 4 deg/100 ft build/turn Bit Type: 8 1/2" PDC BHA: Directional Assembly (Steerable Motor) + MWD w/ GR Mud: Air/Mist to KOP and SOBm to TD Surveys: MWD + GR Logging: Mud Logging the whole interval Casing/Liner: 5 1/2 in 20# P-110 Vam Top HT to 0' to TD @ 14190 ft MD Liner Hanger: Centralizers: 70% stand-off in OH section Cement: Single slurry design: 15.0 ppg to 2,000' Halliburton ShaleCem™ ~ 2320 sks Potential Drilling Problems:
Casing Point	2,772	2,768	-1,275	82	-	>15	10.0	2,772		Notes / Comments:
KOP1	3,822	3,822	1,493	105	-	-	12.0			
Genesee Shale	7,496	-6,003	117	-	-	12.0				
Marcellus	7,647	-6,154	118	-	-	12.0				
Target Top	7,663	-6,170	118	-	-	12.0				
Landing point	8,893	7,673								TMD: 14,190 TVD: 7,673
Target Btm		7,683	-6,190	119	-	-				

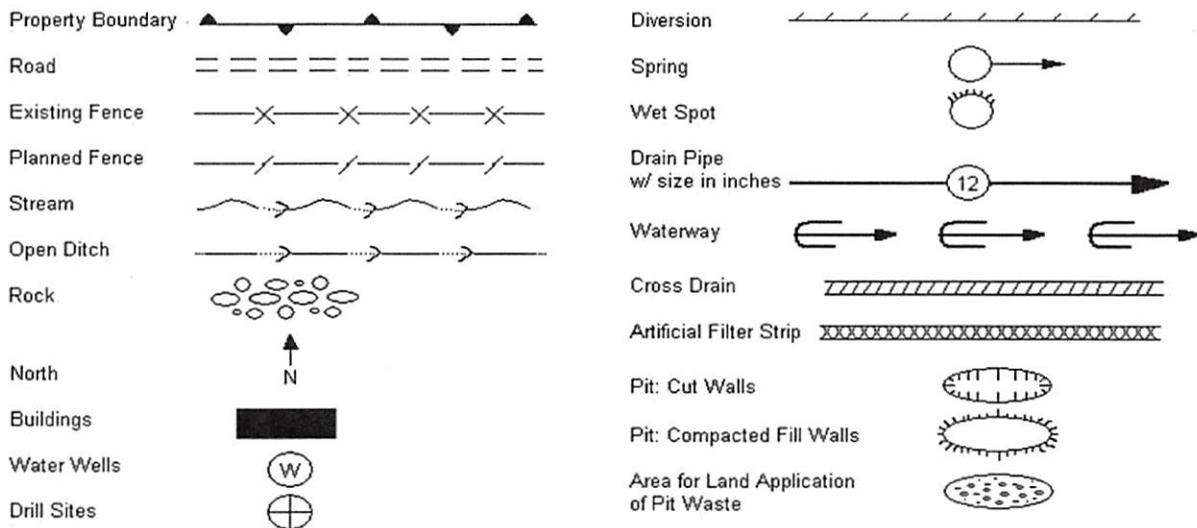
*DmH  
6-14-13*

Last Revision Date: 05/20/13 **RECEIVED** Office of Oil and Gas  
 Revised by: KGL Note: Depths are referenced to RKB Note: Not Drawn to Scale  
 Cement Outside Casing

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WV Department of Environmental Protection





Proposed Revegetation Treatment: Acres Disturbed N/A Prevegetation pH 5.5

Lime 2 Tons/acre or to correct to pH \_\_\_\_\_

Fertilizer (10-20-20 or equivalent) 500 lbs/acre (500 lbs minimum)

Mulch 2 Tons/acre

Seed Mixtures

Seed Type	Area I lbs/acre	Seed Type	Area II lbs/acre
67.29% Orchard Grass	40		
19.89% Timothy, 9.87% Kentucky Bluegrass			
2.95% Inert Matter			

Attach:  
Drawing(s) of road, location, pit and proposed area for land application.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [Signature]

Comments: \_\_\_\_\_

Title: Oil + Gas Inspector Date: 6-14-13

Field Reviewed? (  ) Yes (  ) No

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## Water Management Plan: Secondary Water Sources



WMP-01428

API/ID Number 047-103-02926

Operator: Statoil USA Onshore Properties Inc.

Shreve-Watson 2H

### Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.
- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

### Multi-site impoundment

Source ID:	23940	Source Name	Jolliffe Centralized Freshwater Impoundment		Source start date:	11/1/2013
					Source end date:	11/1/2014
Source Lat:	39.656286	Source Long:	-80.551964	County	Wetzel	
Max. Daily Purchase (gal)		Total Volume from Source (gal):	6,720,000			
DEP Comments:	103-FWC-00005					

The intake identified above has been defined in a previous water management plan. The thresholds established in that plan govern this water management plan unless otherwise noted.

Reference: WMP-1289

**APPROVED SEP 20 2013**

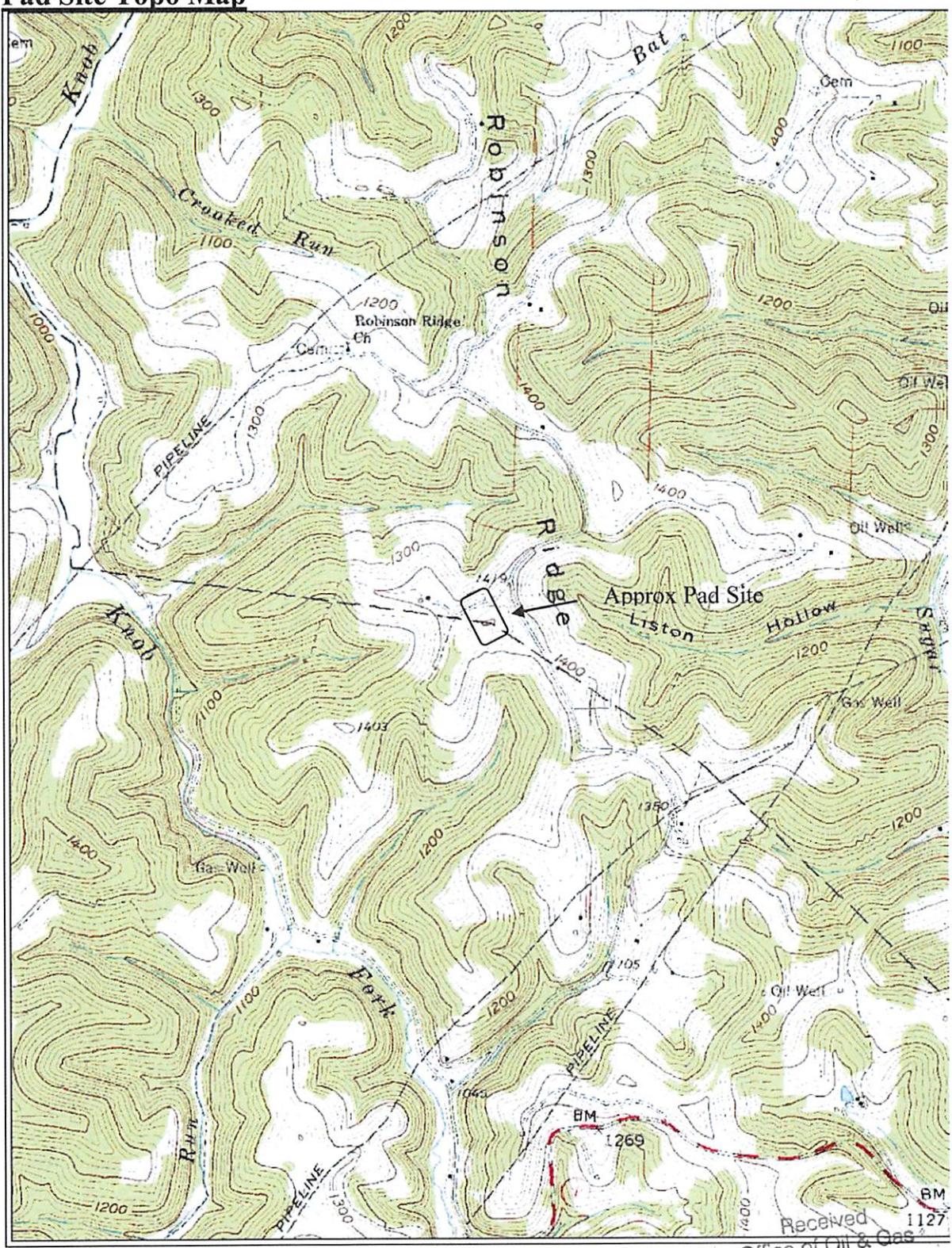
# SHREVE-WATSON UNIT 2H



<b>PREPARED BY:</b> DMH 6-14-17	<b>OPERATOR</b> STATOIL USA ONSHORE PROPERTIES INC. 2103 CITYWEST BLVD., STE 800 HOUSTON, TX 77042	<b>TOPO SECTION</b> LITTLETON 7.5'	<b>WELL NAME</b> SHREVE-WATSON UNIT 2H
<b>ANGLE RIGHT LAND SURVEYING, LLC</b> PO BOX 681 GRANTSVILLE, WV 26147 (304) 354-0066  G100473		<b>SCALE:</b> 1"=2000'	<b>DATE:</b> 04/26/2013

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# Pad Site Topo Map

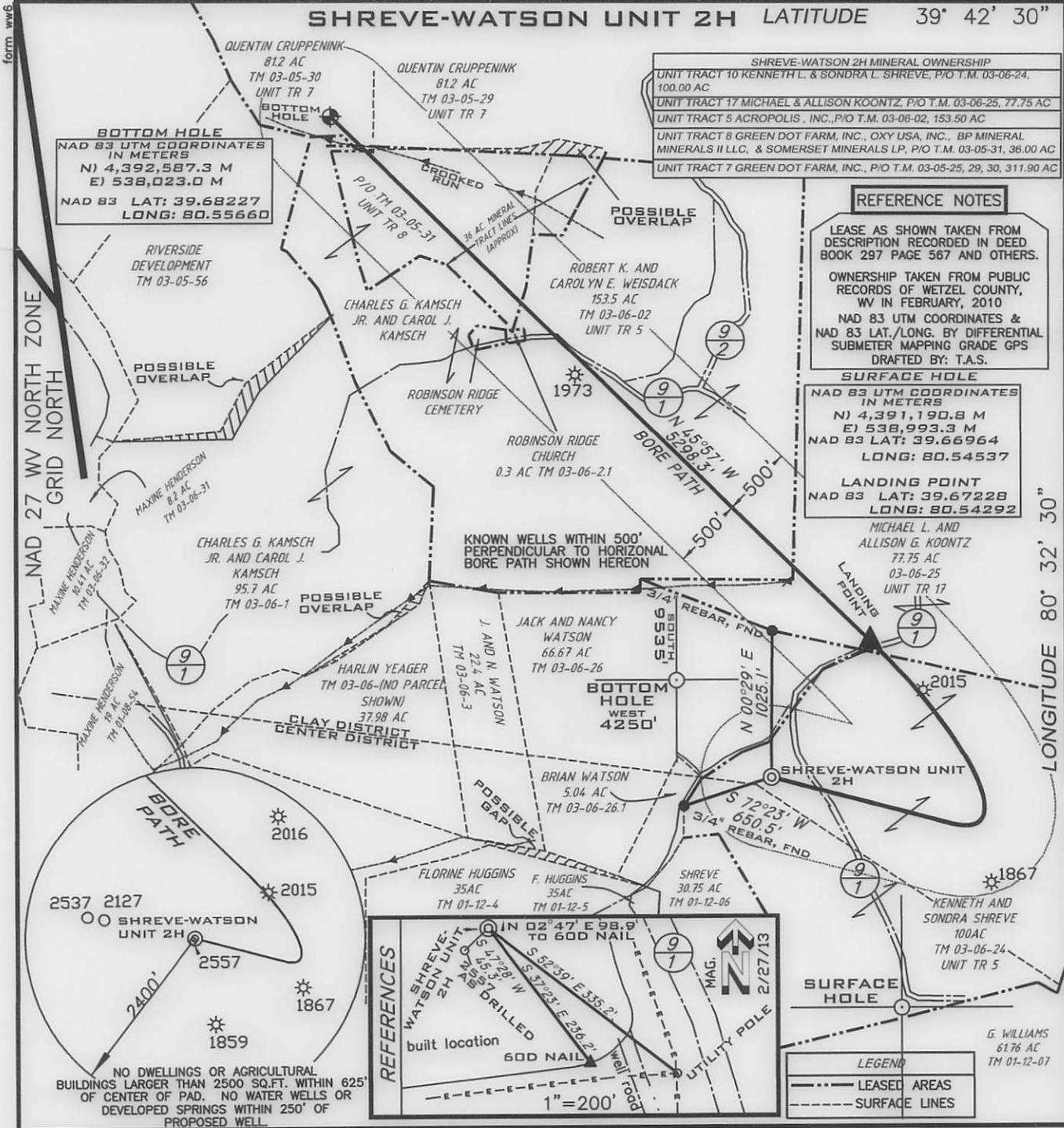


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-1,085-

# SHREVE-WATSON UNIT 2H LATITUDE 39° 42' 30"



**SHREVE-WATSON 2H MINERAL OWNERSHIP**

- UNIT TRACT 10 KENNETH L. & SONDRAL SHREVE, P/O T.M. 03-06-24, 100.00 AC
- UNIT TRACT 17 MICHAEL & ALLISON KOONTZ, P/O T.M. 03-06-25, 77.75 AC
- UNIT TRACT 5 ACROPOLIS, INC., P/O T.M. 03-06-02, 153.50 AC
- UNIT TRACT 8 GREEN DOT FARM, INC., OXY USA, INC., BP MINERAL MINERALS II LLC, & SOMERSET MINERALS LP, P/O T.M. 03-05-31, 36.00 AC
- UNIT TRACT 7 GREEN DOT FARM, INC., P/O T.M. 03-05-25, 29, 30, 311.90 AC

**REFERENCE NOTES**

LEASE AS SHOWN TAKEN FROM DESCRIPTION RECORDED IN DEED BOOK 297 PAGE 567 AND OTHERS.

OWNERSHIP TAKEN FROM PUBLIC RECORDS OF WETZEL COUNTY, WV IN FEBRUARY, 2010

NAD 83 UTM COORDINATES & NAD 83 LAT./LONG. BY DIFFERENTIAL SUBMETER MAPPING GRADE GPS DRAFTED BY: T.A.S.

**SURFACE HOLE**

NAD 83 UTM COORDINATES IN METERS  
 N) 4,391,190.8 M  
 E) 538,993.3 M  
 NAD 83 LAT: 39.66964  
 LONG: 80.54537

**LANDING POINT**

NAD 83 LAT: 39.67228  
 LONG: 80.54292

MICHAEL L. AND ALLISON G. KOONTZ  
 77.75 AC  
 03-06-25  
 UNIT TR 17

KENNETH AND SONDRAL SHREVE  
 100 AC  
 TM 03-06-24  
 UNIT TR 5

G. WILLIAMS  
 61.76 AC  
 TM 01-12-07

**LEGEND**

- LEASED AREAS
- - - SURFACE LINES

FILE NUMBER G100473(WB9-51)

DRAWING NUMBER G100473WP2H.dwg

SCALE 1" = 1000'

MINIMUM DEGREE OF ACCURACY 1/200

PROVEN SOURCE OF ELEVATION SUBMETER MAPPING  
GRADE 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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION

P.S. 1006

*Terry A. Shreve*



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

REVISED DATE: NOVEMBER 19, 2013

DATE: JULY 8, 2013

OPERATORS WELL NO. SHREVE-WATSON

API WELL NO. UNIT 2H

47-103-02926 H6A

STATE COUNTY PERMIT

WELL TYPE: OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL   
 (IF "GAS") PRODUCTION  STORAGE  DEEP  SHALLOW

LOCATION ELEVATION 1471' WATERSHED KNOB FORK AND LISTON HOLLOW OF SUGAR RUN

DISTRICT CLAY & CENTER COUNTY WETZEL

QUADRANGLE LITTLETON 7.5' LEASE NUMBER \_\_\_\_\_

SURFACE OWNER KENNETH AND SONDRAL SHREVE ACREAGE 100±

OIL & GAS ROYALTY OWNER KENNETH AND SONDRAL SHREVE et al LEASE ACREAGE SEE MINERAL OWNERSHIP TABLE

PROPOSED WORK: DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION   
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE (SPECIFY) \_\_\_\_\_

PLUG & ABANDON  CLEAN OUT & REPLUG

TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7673' + Horizontal Leg

WELL OPERATOR STATOIL USA ONSHORE PROPERTIES INC. DESIGNATED AGENT WILLIAM T. FAHEY II

ADDRESS 2103 CITYWEST BLVD., STE. 800 HOUSTON, TX 77042 ADDRESS FAHEY LAW OFFICE, 2116 PENNSYLVANIA AVE. WEIRTON, WV 26062

form ww6

A.R.L.S

14,135'

LONGITUDE 80° 32' 30"

COUNTY NAME PERMIT