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

January 28, 2015

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

Re: Permit Modification Approval for API Number 9502176 , Well #: BALL 2H
Revise intermediate casing depth and drilling fluid.

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

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

4709502176 MOD

Statoil

December 16, 2014

West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street, SE
Charleston, WV 23504-2345

Attention: Ms. Laura Cooper

Reference: Ball Unit 2H (47-095-02176)
WW-6B Casing Revision, Tyler County, WV

Ms. Cooper:

Attached for your approval please find the revised WW-6B and schematic for the Ball 2H (47-095-02176). Statoil is requesting approval to revise the intermediate casing setting depth.

Our standard well design in West Virginia was modified to set the Intermediate Casing below the base of the Big Injun. This change was as a result of successful field Leak-Off Tests in the general region, confirming design assumptions concerning subsurface characterization. This modification continues to allow for necessary well control while drilling the production hole section and is aligned with general practice in the region of offset operators.

In addition, the drilling fluid scheme was modified to include drilling with freshwater instead of air in the surface hole and drilling with air misting with 5%KCL and soap from surface casing shoe to TD of the pilot hole. The curve and lateral will be drilled with synthetic oil based mud.

If you have any questions or require additional information, please contact the undersigned at 713-485-2640 or at BEKW@statoil.com.

Sincerely,

Bekki Winfree
Sr. Regulatoy Advisor – Marcellus

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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) | Tyler (County) | Ellsworth (District) | Porter Falls (Quadrangle)

2) Operator's Well Number: 2H Well Pad Name: Ball

3) Farm Name/Surface Owner: Ball Farm Public Road Access: CR 42/Scales Road

4) Elevation, current ground: 1169' Elevation, proposed post-construction: 1169' (as-built)

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

6) Existing Pad: Yes or No Yes

MDG 12-16-14

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus, 6918', 50', 4500 psi

8) Proposed Total Vertical Depth: 6,930'

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 13,800'

11) Proposed Horizontal Leg Length: 6100'

12) Approximate Fresh Water Strata Depths: 337'

13) Method to Determine Fresh Water Depths: Identify lowest elevation within 1500' of pad site and project 200' beyond that depth

14) Approximate Saltwater Depths: 587'

15) Approximate Coal Seam Depths: 395'-398', 855'-858'

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

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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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	H40	94.0	120	120	cement to surface
Fresh Water	13.375	New	J/K55	54.5	450	430	cement to surface 456 cu-ft
Coal							
Intermediate	9.625	New	J/K55	36.0	2612	2597	cement to surface 1093 cu-ft
Production	5.50	New	P110	20.0	13800	13780	1000 ft into previous shoe 3112 cu-ft
Tubing	2.375	New	L80	4.7		6121	production tubing
Liners							

MAG
12-16-14

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20	24	0.438	1530	Class A	2.31
Fresh Water	13.375	17.5	0.380	2730	Class A-BondCem	2.31
Coal						
Intermediate	9.625	12.25	0.352	3520	Class A-BondCem	2.31
Production	5.50	8.50	0.361	12640	Class A-ShaleCem	1.37
Tubing	2.375		0.19	11200		
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): Existing Pad - 16.88 acres

22) Area to be disturbed for well pad only, less access road (acres): Existing Pad - 5.53 acres

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 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.
Production - 1 centek centralizer w/ stop collar 10ft above shoe. 1 centek centralizer 10ft above float collar. 1 centek centralizer every joint

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, (See attached "Cement Additives" for remainder)

25) Proposed borehole conditioning procedures:

Surface – Drilled with 9.2 freshwater. At TD pump 40 bbls viscous pill and circulate hole clean. Intermediate – Drilled with air misting with 5%KCL at 25 GPM and soap at 1 GPH. At section total depth,blow hole clean with 4600 CFM, displace to water. Production - Drilled with air misting with 5%KCL at 25 GPM and soap at 1 GPH. At kick-off point,blow hole clean with 4600 CFM, displace to 5%KCL mud to section total depth of the pilot hole. Spot two 600 ft st plugs. Curve and lateral drilled with 12.0-12.5 ppg synthetic oil based mud . Approximately 500ft from total depth, pump 20 bbl heavy weight pill for hole cleaning. At section total depth pump another 20bbl heavy weight pill and continue to circulate at least bottoms up. Pump rates will be maintained in excess of 600 GPM, and rotation in excess of 100 RPM to assist cuttings transport. A 50 bbl weighted spacer will be pumped ahead of the cement to assist in mud removal and reduction of cement contamination.

*Note: Attach additional sheets as needed.

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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 120ft. A 17 ½" surface hole will be drilled with air to approximately 450'md/vd. 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 Synthetic Based Mud (SBM) and a conventional mud motor to approximately 2612'md/vd through the base of the Big Injun. 9 5/8" Intermediate casing will be installed and cemented to surface in order to isolate the Big Injun from lower hydrocarbon bearing zones and provide a competent shoe for well control while drilling deeper horizons. An 8 ½" pilot hole section will be drilled vertically, and potentially cored over the Marcellus horizon, and TD'd into the Onodaga at approximately 7068'vd, at which point wireline formation evaluation logs will be taken. The vertical pilot hole will be plugged back and permanently abandoned with cement plugs from total depth to planned kick-off point. The wellbore will be open-hole sidetracked, deviated, and landed horizontally in the Marcellus Target horizon and extended laterally to total depth of 13,800'md/ 6930'vd using SBM and conventional mud motors. A 5 ½" production casing will be installed and cemented to surface, at which point the rig will be released to the next well.

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Statoil — Marcellus - Drilling Well Schematic

Well Name:	Ball 2H		GLE (ft): 1,195	TVD(ft):	6,930
Field Name:	Marcellus		DF(ft): 22	TMD(ft):	13,800
County:	Tyler, WV	BHL:	X = 520791.00 Y= 4374994.42	Profile:	Horizontal
API #:	0	SHL:	X = 520988.06 Y= 4372965.72	AFE No.:	n/a

Formations & Csg Points	Depth, ft MD	TVD	SS	Form. Temp. (F)	Pore Press. (EMW)	Frac Gradient (EMW)	Planned MW	Measure Depth (ft)
Conductor	120	120	1,097					120
Casing Point	450	450	767	65	-	-	Air/Mist	450
Approximate fresh water strata ~337'								
				-	-	-	8.6	
Big Lime	2,057	2,057	840				8.6	
Big Injun (Base)	2,512	2,512	-1,595				8.6	
Casing Point	2,612	2,612	-1,695	82	>16.0	Air/Mist		
Berea Sand	2,705	2,705	-1,788				8.6	0
Gordon Sand	2,944	2,944	-1,727				8.6	
Riley	4,804	4,804	-3,587				8.6	
KOP1	6,140	6,140	-4,923		-	-	12.0	
Genesen		6,823	-5,606		-	-	12.0	
Tully		6,848	-5,631	117	-	-	12.0	
Marcellus		6,918	-5,701	118	-	-	12.0	
Tgt Landing Point	7,400	6,942	-5,725	118			12.0	
					-	-	-	
Onondaga		6,968	-5,751	-	-	-	-	

Program / Details

20" Conductor

17 1/2" Surface

Profile:	Vertical
Bit Type:	17-1/2" SMITH MSi716
BHA:	
Mud:	Fresh Water
Surveys:	n/a
Logging:	n/a
Casing:	13.375in 54.5 # J-55 BTC set @ ~ 450 MD/450 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 BondCem gas tight single slurry tail design to surface
Potential Drilling Problems:	

12 1/4" Intermediate

FIT/LOT: 14.0 ppg EMW

Profile:	Nudge and hold for anticollission
Bit Type:	12-1/4" SMITH TCI F47YA (IADC:627Y)
BHA:	Bit 7/8 Lobe 2.0 Stg 1.5 ABH (0.10 rpg/375 Diff)
Mud:	Air/Mist
Surveys:	Gyro MS, MWD EM Pulse
Logging:	n/a
Casing/Liner:	9.625in 36# J55 BTC set at MD/ TVD.
Liner Hanger:	n/a
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 BondCem gas tight, single slurry tail design to surface
Potential Drilling Problems:	Slow ROP, DHR Int matrix

8 1/2" Production

FIT/LOT: 15.0 ppg EMW

Profile:	KO from Vertical, Land HZ
Bit Type:	8-1/2" SMITH TCI F47YAPS (IADC: 617Y) - Vert 8 1/2" Smith SDia513 (curve & lateral)
BHA:	Directional Assembly (Steerable Motor) + EM w/ GR 6.75in 7/8 lobe 2.9 stg 1.5 ABH (0.17 rpg 560 DIFF) - Vert 6.75in 6/7 lobe 5.0 stg 1.95 FBH (0.29 rpg, 715 DIFF) - C&L
Mud:	Vertical on Air. Curve & Lateral using 12.7ppg SBM
Surveys:	MWD EM Pulse w/ 30ft surveys in curve, 100ft surveys in lateral
Logging:	n/a
Casing/Liner:	5.5in 20# P110EC Vam Top HT to 0' to TD @ 13800 ft MD
Csg Hanger:	Fluted 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:	15.0 ppg Gas tight, single slurry tail design to surface
Potential Drilling Problems:	Wellbore instability in lateral w/ MW < 11.5 ppg
Notes / Comments:	

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TMD: 13,800
TVD: 6,930

Last Revision Date: 12/9/2014
Revised by: Ryan Cardenas

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

Cement Outside Casing

MDG
12/16/2014