



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 29, 2015

NOBLE ENERGY, INC.
333 TECHNOLOGY DRIVE, SUITE 116
CANONSBURG, PA 15317

Re: Permit Modification Approval for API Number 8510109 , Well #: PEN 20 BHS

Modify 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,

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas



December 18, 2014

West Virginia Department of Environmental Protection

601 57th Street, SE

Charleston, WV 25304-2345

Re: PEN20 BHS API # 47- 085-10109

Dear Office of Oil & Gas:

Enclosed please find a casing modification for the above referenced well. The modification was approved verbally by Dave Cowan on location and follow up with paper copy.

Should you have any questions, or desire any additional information, please do not hesitate to contact me at 724-820-3061 or via email at dswiger@nobleenergyinc.com.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Dee Swiger', written over the printed name.

Dee Swiger

Regulatory Analyst III

DS/

Enclosures:

Received
Office of Oil & Gas
DEC 22 2014

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

1) Well Operator: Noble Energy, Inc.

<u>494501907</u>	<u>085-Ritchie</u>	<u>Clay</u>	<u>Ellenboro</u>
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Operator ID County District Quadrangle

2) Operator's Well Number: PEN 20 BHS Well Pad Name: PEN 20

3) Farm Name/Surface Owner: Lawrence B. and Angela Cokley Public Road Access: Bonds Creek

4) Elevation, current ground: _____ Elevation, proposed post-construction: 1028.7

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 Thickness and Associated Pressure(s):
Marcellus 6178 - 6239 / 61' Thick / 4118 psi

8) Proposed Total Vertical Depth: 5095'

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 15247'

11) Proposed Horizontal Leg Length: 8234'

12) Approximate Fresh Water Strata Depths: 398'

13) Method to Determine Fresh Water Depths: nearest offset wells

14) Approximate Saltwater Depths: 1244'

15) Approximate Coal Seam Depths: none

16) Approximate Depth to Possible Void (coal mine, karst, other): none

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 & Gas

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	LS	94	40'	40'	GTS
Fresh Water	13 3/8"	New	J-55	54.5	575'	575'	15.6 ppg Type 1 40% excess Yield = 1.18
Coal		New					
Intermediate	9 5/8"	New	HCK-55	36.0	5095'	5095'	15.6 ppg Class A tail slurry CTS
Production	5 1/2"	New	HCP-110	20.0	15247'	15247'	14.8 ppg Class A tail slurry to inside intermediate casing
Tubing							
Liners							

**See enclosed schematic for cement information.

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	26"	0.25		GTS	GTS
Fresh Water	13 3/8"	17.5"	.380	2730	Type 1	15.6 ppg Type 1 40% excess Yield = 1.18
Coal						
Intermediate	9 5/8"	12.25"	.352	3520	Class A	50 bbls 10 ppg spacer, 12.0 ppg lead slurry, (800') of 15.6 ppg Class A tail slurry cemented to surface.
Production	5 1/2"	8.75"	.361	12,640	Class A	lead slurry to 2000' to recover SOBM. 14.8 ppg Class A tail slurry to inside intermediate casing
Tubing						
Liners						

PACKERS

Kind:				
Sizes:				
Depths Set:				

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DEC 22 2014

David A. Owen
12-17-14



PENS-20B WELLBORE DIAGRAM
 Marcellus Shale Horizontal
 Ritchie County, WV
 Ground Elevation 1029'

Ground Elevation	1029'	PENS-20B SHL (Lat/Long)		(305261.86N, 1568220.28E) (NAD 27)		(306061.82N, 1570371.18E) (NAD 27)		(299754.51N, 1575663.64E) (NAD 27)																												
Azm	140°	PENS-20B LP (Lat/Long)		(306061.82N, 1570371.18E) (NAD 27)		(299754.51N, 1575663.64E) (NAD 27)		(299754.51N, 1575663.64E) (NAD 27)																												
HOLE	CASING	GEOLOGY	TVD Top	TVD Bottom	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS																											
28"	20" 52#	Conductor		40	AIR	Grouted to surface	N/A	Ensure the hole is clean at TD.	Stabilize surface fill/soil. Conductor casing = 0.25" wall thickness																											
17.5"	13-9/8" 54.5# J-55 BTC	Surface Casing		575	AIR	15.6 ppg Type 1 + 2% CaCl ₂ 0.25# Lost Circ 40% Excess Yield = 1.18	Bow Spring every 3 joints to surface	Fill with KCl water once drilled to TD. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement.	Protect freshwater. Surface casing = 0.380" thick. Burst=2730 psi																											
12.25"	9-5/8" 36# HCK-55 BTC	<table border="1"> <tr><td>Maxion Sand</td><td>1670.5</td><td>1739.5</td></tr> <tr><td>Big Lime</td><td>1870.5</td><td>2342</td></tr> <tr><td>Big Injun</td><td>1930.5</td><td>2477.5</td></tr> <tr><td>Weir Sand</td><td>2349</td><td>2383.5</td></tr> <tr><td>Gordon Sand</td><td>2652</td><td>2658</td></tr> <tr><td>5th Sand</td><td>2853.5</td><td>2865.5</td></tr> <tr><td>Warren Sand</td><td>3440.5</td><td>3503.5</td></tr> <tr><td>Benson</td><td>4852</td><td>4914</td></tr> <tr><td>Alexander</td><td>5064</td><td>5129</td></tr> </table>	Maxion Sand	1670.5	1739.5	Big Lime	1870.5	2342	Big Injun	1930.5	2477.5	Weir Sand	2349	2383.5	Gordon Sand	2652	2658	5th Sand	2853.5	2865.5	Warren Sand	3440.5	3503.5	Benson	4852	4914	Alexander	5064	5129			SOBM 8.0 - 8.5 ppg	50 bbis 10 ppg spacer, 12.0 ppg lead slurry, (800') of 15.6 ppg Class A tail slurry	Bow Spring centralizers on every joint to KOP, one every third joint from KOP to 100' from surface	Once at TD, circulate at least 2x bottoms up. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement	Casing was attempted to be ran below the Alexander, but would not go past (5446' MD) 5095' TVD. Verbal approval was obtained from David Cowan to cement casing without setting it below the Alexander.
Maxion Sand	1670.5	1739.5																																		
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		Intermediate Casing	5095' TVD			120 bbis spacer with density and rheology hierarchy, lead slurry to 2000', 14.8 ppg Class A tail slurry to inside intermediate casing	Rigid Bow Spring every third joint from KOP to TOC	Once at TD, circulate at max allowable pump rate for at least 6x bottoms up. Once on bottom with casing, circulate a minimum of one hole volume prior to pumping cement.	Production casing = 0.361" wall thickness Burst=12640 psi Note: Actual centralizer schedules may be changed due to hole conditions																											
8.75/8.5"	5-1/2" 20# HCP-110 TXP BTC	Marcellus	6178	6239	SOBM 12.5- 13.0 ppg		Rigid Bow Spring every joint to KOP																													
		TD	15247																																	

8.75/8.5" Hole - Cemented Long String 5-1/2" 20# HCP-110 TXP BTC