

Actual Wellpath Report

PEN-20D-HS AWP Proj: 14852'

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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot D
Area	Ritchie County, WV	Well	PEN-20D-HS
Field	Ritchie	Wellbore	PEN-20D-HS AWB
Facility	PEN-20 Pad		

REPORT SETUP INFORMATION			
Projection System	NAD27 / Lambert West Virginia SP, Northern Zone (4701), US feet	Software System	WellArchitect® 4.0.1
North Reference	Grid	User	Gotfbral
Scale	0.999954	Report Generated	1/5/2015 at 9:48:25 AM
Convergence at slot	0.97° West	Database/Source file	WANorthEast/PEN-20D-HS_AWB.xml

WELLPATH LOCATION	Local coordinates		Grid coordinates		Geographic coordinates	
	North[ft]	East[ft]	Easting[US ft]	Northing[US ft]	Latitude	Longitude
Slot Location	-40.82	44.01	1568249.81	305234.76	39°19'40.728"N	81°01'34.738"W
Facility Reference Pt			1568205.80	305275.58	39°19'41.124"N	81°01'35.306"W
Field Reference Pt			0.00	0.00	38°17'12.460"N	86°28'23.077"W

WELLPATH DATUM			
Calculation method	Minimum curvature	Nomac 78 (RKB) to Facility Vertical Datum	1055.00ft
Horizontal Reference Pt	Slot	Nomac 78 (RKB) to Mean Sea Level	1055.00ft
Vertical Reference Pt	Nomac 78 (RKB)	Nomac 78 (RKB) to Mud Line at Slot (Slot D)	26.00ft
MD Reference Pt	Nomac 78 (RKB)	Section Origin	N 0.00, E 0.00 ft
Field Vertical Reference	Mean Sea Level	Section Azimuth	140.00°

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REFERENCE WELLPATH IDENTIFICATION		Slot	Slot D
Operator	NOBLE ENERGY	Well	PEN-20D-HS
Area	Ritchie County, WV	Wellbore	PEN-20D-HS AWB
Field	Ritchie		
Facility	PEN-20 Pad		

WELLPATH DATA (157 stations) † = interpolated/extrapolated station													
MD [ft]	Inclination [°]	Altimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS P/[100ft]
0.00†	0.000	212.580	0.00	0.00	0.00	0.00	1568249.81	305234.76	39°19'40.728"N	81°01'34.738"W	0.00	0.000	0.00
26.00	0.000	212.580	26.00	0.00	0.00	0.00	1568249.81	305234.76	39°19'40.728"N	81°01'34.738"W	0.00	0.000	0.00
100.00	0.260	212.580	100.00	0.05	-0.14	-0.09	1568249.72	305234.62	39°19'40.727"N	81°01'34.739"W	0.17	212.580	0.35
200.00	0.390	241.180	200.00	0.05	-0.50	-0.51	1568249.30	305234.26	39°19'40.723"N	81°01'34.744"W	0.71	225.798	0.20
300.00	0.220	45.400	300.00	-0.03	-0.53	-0.67	1568249.14	305234.23	39°19'40.723"N	81°01'34.746"W	0.85	231.959	0.60
400.00	0.120	62.780	400.00	-0.02	-0.34	-0.44	1568249.37	305234.42	39°19'40.724"N	81°01'34.743"W	0.56	232.192	0.11
500.00	0.270	59.510	500.00	0.04	-0.18	-0.15	1568249.66	305234.58	39°19'40.726"N	81°01'34.739"W	0.23	219.756	0.15
600.00	0.260	56.780	600.00	0.11	0.07	0.25	1568250.06	305234.83	39°19'40.729"N	81°01'34.734"W	0.26	74.579	0.02
700.00	0.270	60.590	699.99	0.18	0.31	0.64	1568250.45	305235.07	39°19'40.731"N	81°01'34.729"W	0.71	64.356	0.02
800.00	0.360	54.360	799.99	0.24	0.61	1.10	1568250.91	305235.37	39°19'40.734"N	81°01'34.724"W	1.26	61.167	0.16
900.00	0.320	79.300	899.99	0.40	0.84	1.63	1568251.44	305235.60	39°19'40.737"N	81°01'34.717"W	1.84	62.717	0.15
1000.00	0.290	100.060	999.99	0.73	0.85	2.16	1568251.97	305235.61	39°19'40.737"N	81°01'34.710"W	2.32	68.494	0.11
1100.00	0.180	31.950	1099.99	0.88	0.94	2.49	1568252.30	305235.70	39°19'40.738"N	81°01'34.706"W	2.66	69.333	0.28
1200.00	0.470	33.080	1199.99	0.71	1.42	2.79	1568252.60	305236.18	39°19'40.742"N	81°01'34.702"W	3.13	63.141	0.29
1300.00	0.490	86.170	1299.98	0.85	1.79	3.45	1568253.26	305236.55	39°19'40.746"N	81°01'34.694"W	3.88	62.578	0.43
1400.00	0.280	76.350	1399.98	1.21	1.87	4.11	1568253.92	305236.63	39°19'40.747"N	81°01'34.686"W	4.52	65.488	0.22
1500.00	0.310	357.390	1499.98	1.10	2.20	4.33	1568254.14	305236.96	39°19'40.750"N	81°01'34.683"W	4.86	63.072	0.38
1600.00	0.380	345.510	1599.98	0.59	2.79	4.24	1568254.05	305237.55	39°19'40.756"N	81°01'34.684"W	5.08	56.621	0.10
1700.00	0.460	356.280	1699.98	-0.04	3.51	4.13	1568253.94	305238.27	39°19'40.763"N	81°01'34.686"W	5.42	49.603	0.11
1800.00	0.430	355.740	1799.97	-0.67	4.29	4.08	1568253.89	305239.05	39°19'40.771"N	81°01'34.687"W	5.92	43.540	0.03
1900.00	0.280	343.260	1899.97	-1.19	4.90	3.98	1568253.79	305239.66	39°19'40.777"N	81°01'34.688"W	6.31	39.085	0.17
2000.00	0.090	303.910	1999.97	-1.49	5.18	3.84	1568253.65	305239.94	39°19'40.780"N	81°01'34.690"W	6.45	36.592	0.22
2100.00	0.130	293.300	2099.97	-1.67	5.26	3.67	1568253.48	305240.02	39°19'40.781"N	81°01'34.692"W	6.42	34.906	0.04
2200.00	0.120	212.890	2199.97	-1.74	5.22	3.51	1568253.32	305239.98	39°19'40.780"N	81°01'34.694"W	6.29	33.927	0.16
2300.00	0.130	197.860	2299.97	-1.65	5.03	3.42	1568253.23	305239.78	39°19'40.778"N	81°01'34.695"W	6.08	34.241	0.03
2400.00	0.180	289.700	2399.97	-1.73	4.97	3.24	1568253.05	305239.73	39°19'40.778"N	81°01'34.697"W	5.93	33.081	0.23
2500.00	0.230	260.250	2499.97	-1.96	4.99	2.89	1568252.70	305239.75	39°19'40.778"N	81°01'34.702"W	5.77	30.099	0.11
2600.00	0.190	300.750	2599.97	-2.22	5.04	2.55	1568252.36	305239.80	39°19'40.778"N	81°01'34.706"W	5.65	26.853	0.15
2700.00	0.180	338.810	2699.97	-2.53	5.27	2.35	1568252.16	305240.03	39°19'40.780"N	81°01'34.709"W	5.77	24.051	0.12
2800.00	0.180	288.460	2799.97	-2.81	5.47	2.15	1568251.96	305240.23	39°19'40.782"N	81°01'34.711"W	5.87	21.437	0.15

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Operator	NOBLE ENERGY
Area	Richie County, WV
Field	Richie
Facility	PEN-20 Pad
Well	PEN-20D-HS
Wellbore	PEN-20D-HS AWR
Slot D	

REFERENCE WELLPATH IDENTIFICATION

MID	Inchation	Azimuth	TYP	Vert Sect	North	East	Grid East	Grid East	Latitude	Longitude	Closure Dist	Closure Dir	DLS
[ft]	[ft]	[°]	[ft]	[ft]	[ft]	[ft]	[US ft]	[US ft]	[ft]	[ft]	[ft]	[°/100ft]	
2900.00	0.140	330.240	2899.97	-3.06	5.62	1.94	1568251.75	305240.38	39°19'40.784"N	81°01'34.714"W	5.95	19.007	0.12
3000.00	0.250	319.510	2999.97	-3.40	5.90	1.73	1568251.58	305240.98	39°19'40.787"N	81°01'34.717"W	6.15	16.397	0.12
3100.00	0.270	48.680	3099.97	-3.62	6.22	1.77	1568251.84	305240.98	39°19'40.790"N	81°01'34.716"W	6.46	15.893	0.37
3200.00	0.230	24.330	3199.97	-3.72	6.56	2.03	1568251.84	305241.31	39°19'40.793"N	81°01'34.713"W	6.86	17.204	0.11
3300.00	0.280	73.940	3299.96	-3.70	6.81	2.35	1568252.16	305241.57	39°19'40.796"N	81°01'34.709"W	7.20	19.029	0.22
3400.00	0.340	110.450	3399.96	-3.35	6.77	2.86	1568252.67	305241.53	39°19'40.795"N	81°01'34.703"W	7.35	22.903	0.20
3500.00	0.390	107.950	3499.96	-2.80	6.56	3.46	1568253.27	305241.32	39°19'40.793"N	81°01'34.695"W	7.42	27.818	0.05
3600.00	0.390	3599.96	3599.96	-2.24	6.39	4.12	1568253.93	305241.15	39°19'40.792"N	81°01'34.687"W	7.60	32.818	0.04
3700.00	0.340	60.740	3699.96	-1.92	6.46	4.71	1568254.52	305241.22	39°19'40.793"N	81°01'34.679"W	8.00	36.091	0.26
3800.00	0.320	3799.96	3799.96	-1.88	6.80	5.17	1568254.98	305241.56	39°19'40.796"N	81°01'34.673"W	8.54	37.287	0.08
3900.00	0.440	3899.95	3899.95	-1.79	7.15	5.73	1568255.54	305241.91	39°19'40.800"N	81°01'34.666"W	9.16	38.718	0.17
4000.00	0.360	3999.95	3999.95	-1.74	7.54	6.29	1568256.10	305242.30	39°19'40.804"N	81°01'34.659"W	9.82	39.814	0.18
4042.00	0.290	4041.95	4041.95	-1.79	7.73	6.43	1568256.24	305242.49	39°19'40.805"N	81°01'34.657"W	10.06	39.753	0.21
4166.00	1.990	4165.92	4165.92	-1.79	9.31	8.30	1568258.11	305244.07	39°19'40.821"N	81°01'34.644"W	12.47	41.740	1.39
4261.00	7.270	4260.58	4260.58	-1.31	13.85	14.48	1568264.29	305248.61	39°19'40.867"N	81°01'34.556"W	20.04	46.261	5.56
4356.00	14.340	4353.84	4443.08	-0.90	24.81	28.49	1568278.30	305259.57	39°19'40.978"N	81°01'34.380"W	37.78	48.953	7.46
4450.00	21.990	52.060	4443.08	0.14	42.99	51.45	1568301.26	305277.74	39°19'41.161"N	81°01'34.092"W	67.05	50.124	8.15
4545.00	21.180	49.250	4531.42	0.56	65.12	78.48	1568328.29	305299.88	39°19'41.385"N	81°01'33.753"W	101.98	50.314	1.38
4640.00	20.720	45.790	4631.15	-0.90	88.05	103.53	1568353.34	305322.80	39°19'41.615"N	81°01'33.439"W	135.91	49.621	1.39
4735.00	21.190	42.410	4708.87	-4.40	112.44	127.16	1568376.96	305347.20	39°19'41.861"N	81°01'33.144"W	169.74	48.514	1.37
4830.00	20.620	42.560	4797.61	-8.83	137.44	150.05	1568399.85	305372.19	39°19'42.111"N	81°01'32.858"W	203.48	47.512	0.60
4925.00	21.610	45.890	4886.24	-12.25	161.94	173.93	1568423.73	305396.69	39°19'42.357"N	81°01'32.560"W	237.65	47.044	1.64
5020.00	22.750	50.880	4974.21	-13.23	185.71	200.74	1568450.54	305420.46	39°19'42.597"N	81°01'32.224"W	273.47	47.238	2.32
5114.00	22.820	53.810	5060.88	-11.74	207.94	229.56	1568479.36	305442.69	39°19'42.821"N	81°01'31.862"W	309.73	47.828	1.21
5208.00	22.680	56.520	5147.54	-8.46	228.74	259.43	1568509.23	305463.48	39°19'43.032"N	81°01'31.486"W	345.87	48.598	1.12
5344.00	21.600	52.390	5282.71	-4.13	260.78	304.36	1568554.15	305495.52	39°19'43.356"N	81°01'30.921"W	400.80	49.410	1.30
5449.00	26.090	57.950	5369.56	-0.51	282.58	335.98	1568585.78	305517.33	39°19'43.577"N	81°01'30.524"W	439.02	49.934	5.21
5544.00	27.120	55.450	5454.50	4.51	305.89	371.57	1568621.36	305540.64	39°19'43.813"N	81°01'30.076"W	481.28	50.537	1.54
5699.00	29.710	54.720	5538.05	8.58	331.71	408.67	1568658.46	305566.46	39°19'44.075"N	81°01'29.610"W	526.35	50.934	2.76
5733.00	31.690	55.840	5618.88	13.01	359.03	448.12	1568697.90	305593.78	39°19'44.351"N	81°01'29.113"W	574.21	51.298	2.19

WELLPATH DATA (157 stations)

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PEN-20D-HS AWP Proj: 14852

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY
Area	Richie County, WV
Field	Richie
Facility	PEN-20 Pad
Slot	PEN-20D-HS
Well	PEN-20D-HS
Wellbore	PEN-20D-HS AWB
Slot ID	PEN-20D-HS

MID	Inclination	Azimuth	TVD	Vert Sect	North	East	Grid East	Grid East	Grid North	Latitude	Longitude	Closure Dist	Closure Dir	DLS
[ft]	[°]	[°]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[°/100ft]	[ft]
5828.00	33.960	63.470	5698.74	21.73	384.91	492.53	1568742.32	1568742.32	305619.65	39°19'44.614"N	81°01'28.554"W	625.09	51.992	4.96
5923.00	40.750	77.110	5474.71	40.79	404.76	545.83	1568795.61	1568795.61	305639.50	39°19'44.819"N	81°01'27.880"W	679.52	53.441	9.77
6018.00	49.750	77.110	5847.11	419.62	419.62	605.50	1568855.28	1568855.28	305654.36	39°19'44.976"N	81°01'27.124"W	736.69	55.277	1.73
6113.00	43.320	88.940	5917.78	102.43	427.16	668.42	1568918.20	1568918.20	305661.90	39°19'45.061"N	81°01'26.325"W	793.25	57.419	8.76
6211.00	46.470	109.630	5987.57	154.50	415.78	735.87	1568985.65	1568985.65	305650.52	39°19'44.960"N	81°01'25.464"W	845.21	60.533	15.20
6306.00	51.390	125.210	6050.18	220.37	382.67	798.89	1569048.67	1569048.67	305617.42	39°19'44.644"N	81°01'24.655"W	885.82	64.405	13.38
6397.00	54.010	127.870	6105.33	290.76	339.56	857.02	1569106.79	1569106.79	305574.31	39°19'44.227"N	81°01'23.906"W	921.84	68.386	3.70
6491.00	60.570	127.720	6156.09	368.03	291.12	919.49	1569169.26	1569169.26	305525.87	39°19'43.759"N	81°01'23.101"W	964.48	76.454	6.98
6586.00	70.580	128.250	6195.33	452.52	237.94	987.57	1569237.33	1569237.33	305472.69	39°19'43.245"N	81°01'22.223"W	1015.83	80.311	10.55
6681.00	77.910	129.190	6221.11	542.13	180.78	1058.85	1569308.61	1569308.61	305415.53	39°19'42.692"N	81°01'21.304"W	1074.17	83.941	17.77
6776.00	86.330	131.320	6234.12	634.79	120.01	1130.58	1569380.34	1569380.34	305354.77	39°19'42.104"N	81°01'20.378"W	1136.94	87.457	9.14
6871.00	89.570	131.220	6237.52	729.26	53.20	1197.93	1569447.68	1569447.68	305287.96	39°19'41.455"N	81°01'19.507"W	1199.11	90.963	8.02
6966.00	144.840	6238.26	824.17	-21.14	1257.00	1309.83	1569599.57	1569599.57	305133.49	39°19'40.730"N	81°01'18.739"W	1257.17	94.421	6.97
7062.00	89.570	148.370	6239.01	919.52	-101.27	1309.83	1569608.22	1569608.22	305051.90	39°19'39.149"N	81°01'17.413"W	1313.73	97.666	3.68
7157.00	90.920	150.020	6238.60	1013.29	-182.86	1358.47	1569661.96	1569661.96	304970.07	39°19'38.349"N	81°01'16.712"W	1370.73	100.616	2.24
7255.00	89.570	136.730	6234.76	1204.46	-336.72	1412.22	1569722.26	1569722.26	304898.05	39°19'37.647"N	81°01'15.929"W	1436.81	102.880	6.86
7349.00	89.570	136.730	6234.76	1395.05	-474.78	1604.49	1569854.23	1569854.23	304760.01	39°19'36.305"N	81°01'14.220"W	1436.81	104.794	7.55
7445.00	89.200	136.270	6235.79	1300.28	-406.35	1538.60	1569788.34	1569788.34	304828.43	39°19'36.970"N	81°01'15.073"W	1591.36	106.484	7.55
7540.00	89.140	135.890	6237.17	1395.05	-541.95	1671.65	1569921.38	1569921.38	304692.84	39°19'35.652"N	81°01'13.351"W	1673.26	107.963	8.02
7635.00	89.230	134.120	6238.52	1489.67	-741.41	1877.95	1570127.67	1570127.67	304493.39	39°19'33.716"N	81°01'10.684"W	1757.31	108.880	1.87
7731.00	89.140	134.310	6239.88	1585.17	-608.89	1740.45	1569990.18	1569990.18	304625.90	39°19'35.002"N	81°01'12.462"W	1843.88	110.448	0.22
7826.00	89.110	133.130	6241.34	1679.59	-674.53	1809.10	1570058.82	1570058.82	304560.26	39°19'34.365"N	81°01'11.574"W	1930.76	111.544	1.24
7922.00	89.050	133.200	6242.88	1775.08	-741.41	1942.37	1570192.09	1570192.09	304423.60	39°19'33.037"N	81°01'09.849"W	2019.01	112.667	2.16
8017.00	89.690	139.380	6243.92	1869.94	-811.19	1999.55	1570249.26	1570249.26	304346.60	39°19'32.286"N	81°01'09.105"W	2104.96	113.951	4.45
8113.00	88.830	147.430	6245.16	1965.69	-888.20	2052.01	1570301.72	1570301.72	304267.42	39°19'31.512"N	81°01'08.420"W	2187.94	115.241	8.43
8208.00	90.310	145.520	6245.88	2060.07	-967.39	2052.01	1570301.72	1570301.72	304267.42	39°19'31.512"N	81°01'08.420"W	2268.61	116.256	2.54
8304.00	89.970	136.570	6245.64	2155.96	-1041.96	2112.31	1570362.02	1570362.02	304192.85	39°19'30.785"N	81°01'07.637"W	2355.32	117.049	9.33
8400.00	90.550	137.210	6245.21	2251.81	-1112.05	2177.91	1570427.62	1570427.62	304122.77	39°19'30.103"N	81°01'06.787"W	2445.39	117.823	0.90
8495.00	90.460	139.140	6244.37	2346.76	-1182.83	2241.26	1570490.96	1570490.96	304051.98	39°19'29.414"N	81°01'05.966"W	2534.23	118.578	2.03
8591.00	89.850	138.730	6244.11	2442.74	-1255.21	2304.32	1570554.02	1570554.02	303979.61	39°19'28.710"N	81°01'05.148"W	2624.02	118.578	0.77

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Actual Wellpath Report PEN-20D-HS AWP Proj: 14852 Page 5 of 9



REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY
Area	Ritchie County, WV
Field	Ritchie
Facility	PEN-20 Pad
Slot	Slot D
Well	PEN-20D-HS
Wellbore	PEN-20D-HS AWB

WELLPATH DATA (157 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TYD	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°/100ft]	DLS
8866.00	89.880	138.540	6244.33	2577.71	-126.51	2367.10	1570616.80	303908.31	39°19'28.015"N	81°01'04.334"W	2713.45	119.266	0.20
8877.00	89.600	139.600	6245.28	2728.68	-1470.70	2492.36	1570427.09	303836.13	39°19'27.611"N	81°01'02.710"W	2893.93	119.920	0.49
8972.00	89.660	139.210	6245.89	2823.67	-1542.83	2554.18	1570803.86	303692.00	39°19'25.909"N	81°01'01.908"W	2983.98	121.134	0.42
9068.00	89.540	140.090	6246.57	2919.67	-1615.99	2616.33	1570866.01	303618.85	39°19'25.196"N	81°01'01.101"W	3075.16	121.702	0.93
9163.00	89.910	141.260	6247.02	3014.66	-1689.48	2676.53	1570926.21	303545.36	39°19'24.480"N	81°01'00.319"W	3165.15	122.261	1.29
9259.00	90.150	142.080	6246.97	3110.61	-1764.78	2736.07	1570985.75	303470.06	39°19'23.746"N	81°00'59.546"W	3255.85	122.822	0.89
9354.00	90.220	141.740	6246.66	3205.56	-1839.55	2794.67	1571044.35	303395.29	39°19'23.017"N	81°00'58.784"W	3345.77	123.354	0.37
9450.00	90.180	142.070	6246.33	3301.51	-1915.10	2853.90	1571103.58	303319.75	39°19'22.280"N	81°00'58.014"W	3436.91	123.863	0.35
9546.00	90.090	140.680	6246.10	3397.48	-1990.10	2913.83	1571163.50	303244.75	39°19'21.549"N	81°00'57.236"W	3528.58	124.333	1.45
9642.00	89.720	136.760	6246.26	3493.43	-2062.23	2977.15	1571226.82	303173.63	39°19'20.847"N	81°00'56.415"W	3621.63	124.710	4.10
9737.00	89.570	133.710	6246.85	3588.09	-2129.67	3044.04	1571293.70	303105.19	39°19'20.191"N	81°00'55.549"W	3715.06	125.080	3.21
9833.00	89.570	133.960	6247.57	3683.53	-2196.16	3113.28	1571362.95	303038.71	39°19'19.546"N	81°00'54.654"W	3809.94	125.200	0.26
9928.00	89.820	134.590	6248.08	3778.06	-2262.48	3181.30	1571430.96	302972.39	39°19'18.902"N	81°00'53.774"W	3903.78	125.420	0.71
10023.00	90.120	134.700	6248.13	3872.64	-2329.23	3248.89	1571498.55	302905.64	39°19'18.253"N	81°00'52.906"W	3997.58	125.638	0.34
10118.00	90.030	138.920	6248.00	3967.48	-2398.48	3313.90	1571563.55	302836.39	39°19'17.580"N	81°00'52.058"W	4090.80	125.896	4.44
10214.00	89.450	142.160	6248.44	4063.46	-2472.59	3374.90	1571624.55	302762.29	39°19'16.858"N	81°00'51.266"W	4183.74	126.228	3.43
10310.00	89.350	136.380	6249.44	4159.40	-2545.30	3437.51	1571687.16	302689.58	39°19'16.150"N	81°00'50.454"W	4277.27	126.518	6.02
10405.00	89.290	129.860	6250.57	4253.66	-2610.20	3506.81	1571756.45	302624.69	39°19'15.520"N	81°00'49.559"W	4371.60	126.661	6.86
10501.00	89.880	132.200	6251.27	4348.48	-2673.21	3579.22	1571828.86	302561.68	39°19'14.909"N	81°00'48.624"W	4467.31	126.755	2.51
10597.00	91.050	132.640	6250.49	4443.63	-2737.97	3650.09	1571899.72	302496.93	39°19'14.281"N	81°00'47.708"W	4562.85	126.874	1.30
10692.00	90.030	141.400	6249.59	4538.41	-2807.40	3714.79	1571964.42	302427.50	39°19'13.606"N	81°00'46.870"W	4656.30	127.080	9.28
10788.00	90.220	147.820	6249.38	4634.05	-2885.62	3770.35	1572019.98	302349.28	39°19'12.842"N	81°00'46.147"W	4747.88	127.428	6.69
10883.00	89.820	147.910	6249.35	4728.15	-2966.06	3820.89	1572070.51	302268.84	39°19'12.055"N	81°00'45.487"W	4837.01	127.821	0.43
10979.00	89.660	145.650	6249.79	4823.47	-3046.37	3873.48	1572123.10	302188.54	39°19'11.270"N	81°00'44.800"W	4927.90	128.184	2.36
11074.00	89.600	145.800	6250.40	4918.00	-3124.87	3926.98	1572176.60	302110.04	39°19'10.504"N	81°00'44.103"W	5018.56	128.511	0.17
11169.00	89.510	153.010	6251.14	5011.66	-3206.59	3975.29	1572224.91	302028.33	39°19'09.704"N	81°00'43.471"W	5107.36	128.891	7.59
11265.00	92.650	147.450	6249.33	5106.06	-3289.86	4022.92	1572272.54	301945.06	39°19'08.889"N	81°00'42.847"W	5196.84	129.276	6.65
11361.00	90.180	143.400	6246.96	5201.58	-3368.86	4077.37	1572326.99	301866.06	39°19'08.117"N	81°00'42.137"W	5289.06	129.565	4.94
11456.00	90.090	142.650	6246.73	5296.45	-3444.75	4134.51	1572384.12	301790.17	39°19'07.377"N	81°00'41.394"W	5381.50	129.800	0.80

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Operator	Area	Field	Facility
NOBLE ENERGY	Richie County, WV	Richie	PEN-20 Pad
		Well	PEN-20D-HS
		Wellbore	PEN-20D-HS AWP
		Slot	Slot D

REFERENCE WELLPATH IDENTIFICATION

MID	Inclination	Azimuth	TVD	Vert Sect	North	East	Grid East	Grid North	Latitude	Longitude	Closure Dist	Closure Dir	DLS
[ft]	[°]	[°]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft]	[ft/100ft]
11552.00	89.880	140.380	6246.76	5392.41	-519.89	4194.25	157244.86	301715.04	39°19'06.64"N	81°00'40.618"W	5475.52	130.004	2.37
11647.00	89.970	138.020	6246.88	5487.39	-3591.80	4256.93	1572505.93	301643.13	39°19'05.944"N	81°00'38.974"W	5569.32	130.160	2.49
11743.00	89.820	137.080	6247.06	5583.30	-3662.64	4321.11	1572570.72	301572.30	39°19'05.255"N	81°00'38.974"W	5664.53	130.285	0.99
11839.00	89.630	137.560	6247.52	5679.19	-3733.21	4386.19	1572655.79	301501.73	39°19'04.586"N	81°00'38.130"W	5759.82	130.402	0.54
11934.00	89.510	138.870	6248.23	5774.14	-3804.04	4449.49	1572699.09	301430.90	39°19'03.879"N	81°00'37.310"W	5853.95	130.528	1.38
12030.00	89.660	140.650	6248.93	5870.14	-3877.32	4511.50	1572761.10	301357.63	39°19'03.165"N	81°00'36.506"W	5948.72	130.677	1.86
12125.00	89.630	137.790	6249.51	5965.12	-3949.25	4573.54	1572823.13	301285.70	39°19'02.464"N	81°00'35.701"W	6042.67	130.811	3.01
12221.00	89.690	137.030	6250.08	6061.01	-4019.92	4638.51	1572888.10	301215.03	39°19'01.777"N	81°00'34.859"W	6138.04	130.914	0.79
12316.00	89.660	139.600	6250.62	6155.96	-4090.86	4701.68	1572951.27	301144.09	39°19'01.086"N	81°00'34.040"W	6232.25	131.026	2.71
12412.00	90.000	139.280	6250.91	6251.96	-4163.79	4764.10	1573013.69	301071.16	39°19'00.376"N	81°00'33.231"W	6327.23	131.153	0.49
12508.00	89.200	144.410	6251.06	6251.06	-4239.26	4823.99	1573072.97	300995.70	39°18'59.640"N	81°00'32.460"W	6421.56	131.212	5.35
12604.00	90.220	142.210	6251.03	6443.71	-4316.23	4880.75	1573130.32	300918.73	39°18'58.889"N	81°00'31.714"W	6515.49	131.488	2.33
12700.00	90.430	141.060	6250.48	6539.67	-4391.50	4940.33	1573189.90	300843.47	39°18'58.155"N	81°00'30.940"W	6610.00	131.634	1.22
12795.00	90.250	137.480	6249.92	6634.64	-4463.48	5002.31	1573251.88	300771.49	39°18'57.454"N	81°00'30.136"W	6704.16	131.742	3.77
12891.00	90.460	128.140	6249.32	6729.78	-4528.64	5072.65	1573322.22	300706.33	39°18'56.821"N	81°00'29.228"W	6800.03	131.757	9.73
12986.00	90.030	132.560	6248.91	6823.41	-4590.14	5145.03	1573394.60	300644.84	39°18'56.226"N	81°00'28.294"W	6894.98	131.738	4.67
13082.00	90.180	142.660	6248.74	6919.20	-4660.95	5209.67	1573459.23	300574.03	39°18'55.537"N	81°00'27.456"W	6990.36	131.818	10.52
13177.00	90.520	146.760	6248.16	7013.86	-4738.47	5264.54	1573514.10	300496.51	39°18'54.780"N	81°00'26.742"W	7082.97	131.990	4.33
13273.00	90.340	137.280	6247.44	7109.69	-4814.05	5323.55	1573573.10	300420.94	39°18'54.043"N	81°00'25.975"W	7177.41	132.123	9.88
13368.00	91.720	140.900	6245.73	7204.64	-4885.82	5385.74	1573635.29	300349.17	39°18'53.344"N	81°00'25.168"W	7271.69	132.214	4.08
13463.00	90.310	147.290	6244.04	7299.34	-4962.72	5441.41	1573690.96	300272.28	39°18'52.593"N	81°00'24.444"W	7364.61	132.266	6.89
13559.00	89.880	145.900	6243.88	7394.70	-5042.86	5494.26	1573743.81	300192.14	39°18'51.810"N	81°00'23.754"W	7457.70	132.547	1.52
13655.00	89.880	139.610	6244.08	7490.54	-5119.24	5552.34	1573801.88	300115.76	39°18'51.065"N	81°00'22.999"W	7552.16	132.676	6.55
13750.00	89.380	138.860	6244.70	7585.53	-5191.19	5614.37	1573863.91	300043.82	39°18'50.364"N	81°00'22.195"W	7646.54	132.757	0.95
13845.00	89.380	141.900	6245.73	7680.51	-5264.36	5674.94	1573924.47	299970.66	39°18'49.651"N	81°00'21.409"W	7740.69	132.851	3.20
13940.00	89.600	140.690	6246.57	7775.48	-5338.49	5734.34	1573983.87	299896.53	39°18'48.928"N	81°00'20.637"W	7834.67	132.953	1.29
14036.00	89.690	140.160	6247.17	7871.47	-5412.48	5795.50	1574045.03	299822.54	39°18'48.207"N	81°00'19.844"W	7929.86	133.043	0.56
14131.00	90.000	141.400	6247.35	7966.46	-5486.08	5855.56	1574105.09	299748.94	39°18'47.490"N	81°00'19.064"W	8024.01	133.134	1.37
14227.00	90.000	139.830	6247.27	8062.45	-5560.27	5916.48	1574166.00	299674.75	39°18'46.766"N	81°00'18.273"W	8119.19	133.222	1.64
14323.00	90.030	141.250	6247.25	8158.45	-5634.39	5977.49	1574227.01	299600.64	39°18'46.044"N	81°00'17.481"W	8214.42	133.308	1.48

WELLPATH DATA (157 stations)

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot D
Area	Ritchie County, WV	Well	PEN-20D-HS
Field	Ritchie	Wellbore	PEN-20D-HS AWB
Facility	PEN-20 Pad		

WELLPATH DATA (157 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]
14419.00	89.630	139.150	6247.53	8254.44	-5708.14	6038.93	1574288.45	299526.89	39°18'45.325"N	81°00'16.684"W	8309.73	133.387	2.23
14514.00	89.630	138.360	6248.15	8349.42	-5779.57	6101.56	1574351.08	299455.47	39°18'44.630"N	81°00'15.872"W	8404.31	133.448	0.83
14610.00	89.570	139.060	6248.82	8445.39	-5851.70	6164.91	1574414.42	299383.34	39°18'43.928"N	81°00'15.051"W	8499.91	133.507	0.73
14705.00	89.380	140.600	6249.69	8540.38	-5924.29	6226.18	1574475.70	299310.76	39°18'43.220"N	81°00'14.256"W	8594.33	133.577	1.63
14801.00	88.950	141.710	6251.09	8636.35	-5999.05	6286.39	1574535.90	299236.00	39°18'42.492"N	81°00'13.474"W	8689.49	133.660	1.24
14825.00	88.800	141.540	6251.56	8660.34	-6017.86	6301.29	1574550.79	299217.19	39°18'42.308"N	81°00'13.280"W	8713.26	133.682	0.94
14852.00	88.800	141.540	6252.12	8687.32	-6039.00	6318.07	1574567.58	299196.05	39°18'42.102"N	81°00'13.062"W	8740.00	133.706	0.00

REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot D
Area	Ritchie County, WV	Well	PEN-20D-HS
Field	Ritchie	Wellbore	PEN-20D-HS AWB
Facility	PEN-20 Pad		

TARGETS									
Name	MD [ft]	TVD [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Shape
PEN-20D-HS LP Rev-3		6235.00	115.01	1151.50	1569401.25	305349.76	39°19'42.058"N	81°01'20.111"W	point
PEN-20D-HS BHL Rev-3		6262.72	-6017.57	6297.33	1574546.84	299217.48	39°18'42.310"N	81°00'13.331"W	point
PEN-20 ALT Vertices		6948.00	-30.58	-1.09	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 1		6948.00	-30.58	-1.09	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 2		6948.00	-30.58	-1.09	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 LL		6948.00	-30.58	-1.09	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Parcel 3.12-1.2		6948.00	-30.58	-1.09	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon

WELLPATH COMPOSITION - Ref Wellbore: PEN-20D-HS AWB Ref Wellpath: PEN-20D-HS AWP Proj: 14852'				
Start MD [ft]	End MD [ft]	Positional Uncertainty Model	Log Name/Comment	Wellbore
26.00	4042.00	Generic gyro - northseeking (Standard)	01 Gyrodata MS Gyro <17-1/2"> (100'-4042')	PEN-20D-HS AWB
4042.00	5208.00	ISCWSA MWD, Rev. 2 (Standard)	02 Scientific EM <12-1/4"> (4042')(4166'-5208')	PEN-20D-HS AWB
5208.00	14825.00	NaviTrak (AT Curve Short Spaced)	03 BHH AT Curve <8-3/4"> (5208')(5354'-14825')	PEN-20D-HS AWB
14825.00	14852.00	Blind Drilling (std)	Projection to bit	PEN-20D-HS AWB

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot D
Area	Ritchie County, WV	Well	PEN-20D-HS
Field	Ritchie	Wellbore	PEN-20D-HS AWB
Facility	PEN-20 Pad		

COMMENTS

Wellpath general comments
API: 47-085-10111-0000
Rig: Nomac 78
BHH Job #: 6697359
Duration: 12/20/2014 – 12/28/2014
Gyrodatta MS Gyro <17-1/2"> (100'-4042')
Scientific EM <12-1/4"> (4042')(4166'-5208')
BHH AT Curve <8-3/4"> (5208')(5354'-14825')
Projected MD at TD: 14852'

NOBLE ENERGY



Location: Ritchie County, WV
 Field: Ritchie
 Facility: PEN-20 Pad

Slot: Slot D
 Well: PEN-20D-HS
 Wellbore: PEN-20D-HS PWB

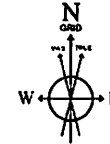
Scale 1 inch = 1000 ft



Gyrodatta MS Gyro <17-1/2"> (100'-4042') : 0.26° Inc, 100.00ft MD, 100.00ft TVD, 0.05ft VS

Plot reference wellpath is PEN-20D-HS PWP Rev-C0	
True vertical depths are referenced to Nomac 78 (RKB)	Grid System: NAD27 / Lambert West Virginia SP, Northern Zone (4701), US feet
Measured depths are referenced to Nomac 78 (RKB)	North Reference: Grid north
Nomac 78 (RKB) to Mean Sea Level: 1025 feet	Scale: True distance
Mean Sea Level to Mud line (At Slot: Slot D) : -1029 feet	Depths are in feet
Coordinates and ft feet referenced to Slot	Checked by: jgobral on 1/5/2015

Location Information					
Facility Name	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude	
PEN-20 Pad	1568205.800	305275.580	39°19'41.124"N	81°01'35.306"W	
Slot	Local N (ft)	Local E (ft)	Grid East (US ft)	Grid North (US ft)	Latitude
Slot D	-40.82	44.01	1568249.810	305234.760	39°19'40.726"N
Nomac 78 (RKB) to Mud line (At Slot: Slot D)			26ft		
Mean Sea Level to Mud line (At Slot: Slot D)			-1029ft		
Nomac 78 (RKB) to Mean Sea Level			1055ft		



User specified (NIDGM) Dip: 65.78° Field: 52100 mT
 Magnetic North is 7.93 degrees West of True North (at 12/16/2014)
 Grid North is 0.97 degrees West of True North
 To correct azimuth from True to Grid add 0.97 degrees
 To correct azimuth from Magnetic to Grid subtract 0.96 degrees

True Vertical Depth (ft)

WV Department of Environmental Protection

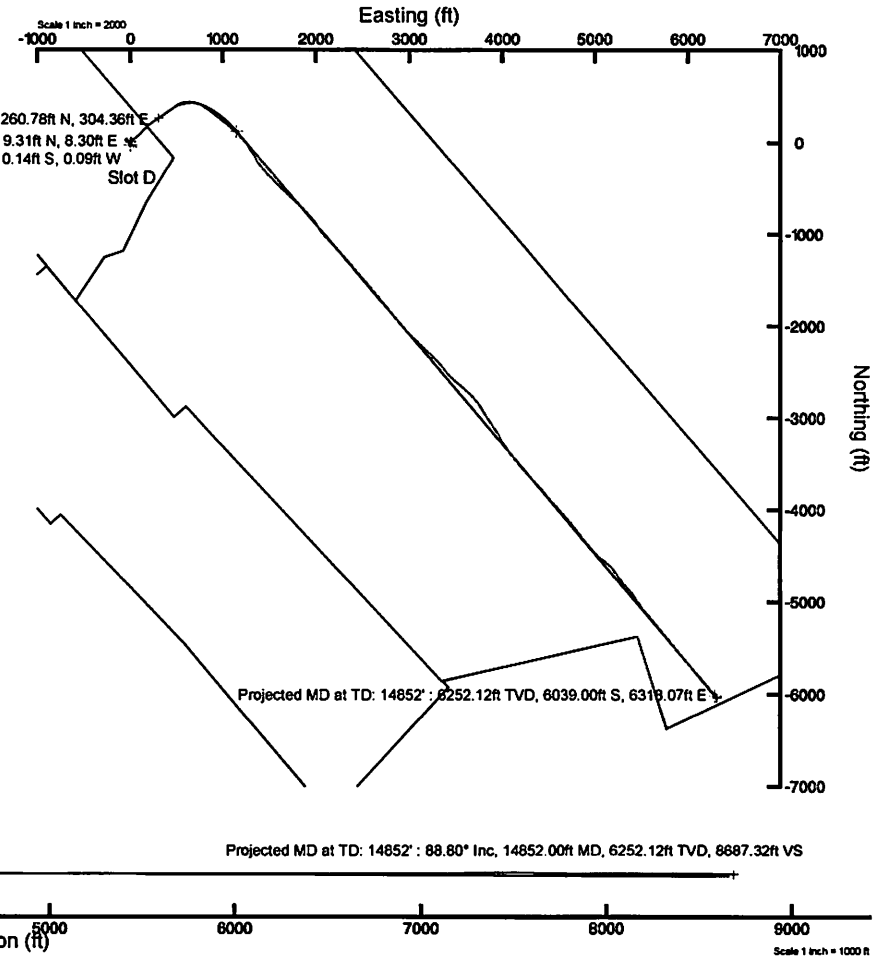
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Office of Oil and Gas
 JAN 17 2017

API: 47-085-10111-0000
 Rig: Nomac 78
 BHI Job #: 6697359
 Duration: 12/20/2014 – 12/28/2014

Scientific EM <12-1/4"> (4042')(4166'-5208') : 1.99° Inc, 4166.00ft MD, 4165.92ft TVD, -1.79ft VS

BHI AT Curve <8-3/4"> (5208')(5354'-14825') : 21.68° Inc, 5354.00ft MD, 5282.71ft TVD, -4.13ft VS

BHI AT Curve <8-3/4"> (5208')(5354'-14825') : 5282.71ft TVD, 260.78ft N, 304.36ft E
 Scientific EM <12-1/4"> (4042')(4166'-5208') : 4165.92ft TVD, 9.31ft N, 8.30ft E
 Gyrodatta MS Gyro <17-1/2"> (100'-4042') : 100.00ft TVD, 0.14ft S, 0.09ft W



Azimuth 140.00° with reference 0.00 N, 0.00 E