



Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020'

Page 1 of 9



REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot C
Area	Ritchie County, WV	Well	PEN-20C-HS
Field	Ritchie	Wellbore	PEN-20C-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	Edsaryar
Scale	0.999954	Report Generated	02/Dec/2014 at 12:12
Convergence at slot	0.97° West	Database/Source file	WellArchitectEasternDB/PEN-20C-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	-27.09	29.25	1568235.05	305248.49	39°19'40.861"N	81°01'34.928"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 C)	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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 Department of Environmental Protection



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Page 2 of 9



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Field	Ritchie	Wellbore	PEN-20C-HS AWB
Facility	PEN-20 Pad		

WELLPATH DATA (160 stations) † = interpolated/extrapolated station

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]	Build Rate [°/100ft]	Turn Rate [°/100ft]
0.00†	0.000	185.040	0.00	0.00	0.00	0.00	1568235.05	305248.49	39°19'40.861"N	81°01'34.928"W	0.00	0.000	0.00	0.00	0.00
26.00	0.000	185.040	26.00	0.00	0.00	0.00	1568235.05	305248.49	39°19'40.861"N	81°01'34.928"W	0.00	0.000	0.00	0.00	0.00
100.00	0.100	185.040	100.00	0.05	-0.06	-0.01	1568235.04	305248.43	39°19'40.861"N	81°01'34.928"W	0.06	185.040	0.14	0.14	0.00
200.00	0.140	219.580	200.00	0.13	-0.25	-0.09	1568234.96	305248.24	39°19'40.859"N	81°01'34.929"W	0.26	200.382	0.08	0.04	34.54
300.00	0.090	268.520	300.00	0.10	-0.34	-0.25	1568234.80	305248.15	39°19'40.858"N	81°01'34.931"W	0.42	215.928	0.11	-0.05	48.94
400.00	0.200	227.400	400.00	0.06	-0.46	-0.45	1568234.60	305248.03	39°19'40.857"N	81°01'34.934"W	0.65	224.547	0.14	0.11	-41.12
500.00	0.160	169.600	500.00	0.19	-0.72	-0.56	1568234.49	305247.77	39°19'40.854"N	81°01'34.935"W	0.91	217.872	0.18	-0.04	-57.80
505.00	0.220	180.000	505.00	0.20	-0.73	-0.56	1568234.49	305247.76	39°19'40.854"N	81°01'34.935"W	0.92	217.181	1.38	1.20	208.00
715.00	0.310	207.540	715.00	0.73	-1.64	-0.82	1568234.23	305246.85	39°19'40.845"N	81°01'34.938"W	1.83	206.534	0.07	0.04	13.11
811.00	0.640	264.620	810.99	0.52	-1.92	-1.47	1568233.58	305246.57	39°19'40.842"N	81°01'34.947"W	2.42	217.480	0.56	0.34	59.46
907.00	0.900	281.410	906.99	-0.37	-1.82	-2.75	1568232.30	305246.67	39°19'40.843"N	81°01'34.963"W	3.30	236.431	0.36	0.27	17.49
1002.00	0.070	94.490	1001.98	-0.91	-1.68	-3.42	1568231.63	305246.81	39°19'40.844"N	81°01'34.972"W	3.81	243.845	1.02	-0.87	182.19
1098.00	0.690	85.980	1097.98	-0.53	-1.64	-2.78	1568232.27	305246.85	39°19'40.844"N	81°01'34.963"W	3.23	239.452	0.65	0.65	-8.86
1194.00	2.480	73.250	1193.94	0.63	-1.00	-0.22	1568234.83	305247.49	39°19'40.851"N	81°01'34.931"W	1.03	192.285	1.89	1.86	-13.26
1289.00	4.090	55.970	1288.78	1.79	1.48	4.56	1568239.61	305249.97	39°19'40.877"N	81°01'34.871"W	4.79	71.960	1.97	1.69	-18.19
1385.00	4.770	45.440	1384.50	1.83	6.20	10.24	1568245.29	305254.69	39°19'40.924"N	81°01'34.799"W	11.97	58.800	1.10	0.71	-10.97
1481.00	5.550	51.540	1480.11	1.64	11.89	16.72	1568251.77	305260.38	39°19'40.981"N	81°01'34.718"W	20.51	54.581	0.99	0.81	6.35
1576.00	9.330	48.800	1574.29	1.60	19.82	26.11	1568261.16	305268.31	39°19'41.061"N	81°01'34.600"W	32.78	52.799	4.00	3.98	-2.88
1672.00	12.250	51.780	1668.58	1.75	31.25	39.97	1568275.02	305279.74	39°19'41.177"N	81°01'34.427"W	50.74	51.981	3.10	3.04	3.10
1768.00	14.980	58.220	1761.88	3.84	44.09	58.53	1568293.57	305292.58	39°19'41.307"N	81°01'34.193"W	73.27	53.008	3.25	2.84	6.71
1863.00	17.860	59.590	1853.00	8.03	57.93	81.53	1568316.58	305306.42	39°19'41.447"N	81°01'33.904"W	100.02	54.604	3.06	3.03	1.44
1959.00	21.730	59.270	1943.31	13.35	74.47	109.51	1568344.56	305322.96	39°19'41.616"N	81°01'33.551"W	132.44	55.783	4.03	4.03	-0.33
2054.00	22.600	56.670	2031.29	18.30	93.49	139.88	1568374.93	305341.97	39°19'41.809"N	81°01'33.169"W	168.25	56.244	1.38	0.92	-2.74
2150.00	22.420	53.610	2119.98	21.59	114.49	170.03	1568405.08	305362.97	39°19'42.021"N	81°01'32.790"W	204.98	56.047	1.23	-0.19	-3.19
2246.00	20.430	47.900	2209.35	22.13	136.58	197.21	1568432.25	305385.07	39°19'42.244"N	81°01'32.449"W	239.89	55.294	3.00	-2.07	-5.95
2341.00	19.920	43.980	2298.52	19.83	159.35	220.75	1568455.79	305407.83	39°19'42.473"N	81°01'32.154"W	272.25	54.177	1.52	-0.54	-4.13
2437.00	18.490	45.100	2389.18	16.81	181.86	242.89	1568477.93	305430.34	39°19'42.699"N	81°01'31.877"W	303.43	53.176	1.54	-1.49	1.17
2533.00	16.730	49.140	2480.68	15.30	201.65	264.13	1568499.16	305450.13	39°19'42.898"N	81°01'31.611"W	332.30	52.640	2.23	-1.83	4.21
2627.00	17.470	50.570	2570.53	15.24	219.46	285.26	1568520.29	305467.94	39°19'43.078"N	81°01'31.346"W	359.91	52.427	0.91	0.79	1.52
2723.00	17.520	52.790	2662.09	16.09	237.35	307.90	1568542.93	305485.83	39°19'43.258"N	81°01'31.062"W	388.76	52.372	0.70	0.05	2.31



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Page 3 of 9



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

WELLPATH DATA (160 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]	Build Rate [°/100ft]	Turn Rate [°/100ft]
2818.00	18.110	51.580	2752.53	17.19	255.18	330.85	1568565.89	305503.65	39°19'43.438"N	81°01'30.774"W	417.83	52.358	0.73	0.62	-1.27
2913.00	18.620	55.270	2842.69	18.99	272.99	354.89	1568589.92	305521.47	39°19'43.619"N	81°01'30.472"W	447.74	52.431	1.34	0.54	3.88
3009.00	20.140	55.530	2933.25	21.99	291.08	381.11	1568616.14	305539.55	39°19'43.802"N	81°01'30.142"W	479.55	52.629	1.59	1.58	0.27
3105.00	20.840	53.690	3023.18	24.68	310.54	408.49	1568643.53	305559.02	39°19'43.999"N	81°01'29.798"W	513.13	52.757	0.99	0.73	-1.92
3200.00	21.610	51.250	3111.74	26.15	331.54	435.76	1568670.79	305579.98	39°19'44.210"N	81°01'29.456"W	547.52	52.738	1.23	0.81	-2.57
3295.00	20.940	50.640	3200.26	26.72	353.22	462.52	1568697.55	305601.69	39°19'44.429"N	81°01'29.120"W	581.97	52.632	0.74	-0.71	-0.64
3391.00	20.810	49.090	3289.96	26.65	375.26	488.68	1568723.70	305623.74	39°19'44.652"N	81°01'28.792"W	616.14	52.479	0.59	-0.14	-1.61
3486.00	20.090	49.700	3378.97	26.29	396.87	513.87	1568748.90	305645.34	39°19'44.869"N	81°01'28.476"W	649.29	52.321	0.79	-0.76	0.64
3582.00	19.110	50.610	3469.41	26.37	417.51	538.59	1568773.62	305665.98	39°19'45.077"N	81°01'28.166"W	681.47	52.218	1.07	-1.02	0.95
3677.00	18.120	52.060	3559.44	27.07	436.46	562.26	1568797.29	305684.93	39°19'45.269"N	81°01'27.869"W	711.78	52.180	1.15	-1.04	1.53
3773.00	17.710	50.580	3650.79	27.75	454.91	585.32	1568820.34	305703.38	39°19'45.455"N	81°01'27.579"W	741.31	52.146	0.64	-0.43	-1.54
3868.00	18.670	50.200	3741.04	27.95	473.82	608.16	1568843.18	305722.29	39°19'45.646"N	81°01'27.293"W	770.95	52.078	1.02	1.01	-0.40
3964.00	19.940	56.480	3831.65	29.85	492.70	633.62	1568868.64	305741.16	39°19'45.836"N	81°01'26.973"W	802.63	52.132	2.53	1.32	6.54
4060.00	21.350	57.770	3921.48	34.07	511.06	662.05	1568897.07	305759.52	39°19'46.023"N	81°01'26.615"W	836.35	52.334	1.54	1.47	1.34
4155.00	21.690	55.840	4009.86	38.19	530.14	691.21	1568926.22	305778.60	39°19'46.216"N	81°01'26.248"W	871.10	52.513	0.83	0.36	-2.03
4251.00	22.000	53.250	4098.97	41.01	550.86	720.29	1568955.31	305799.32	39°19'46.426"N	81°01'25.883"W	906.79	52.592	1.05	0.32	-2.70
4347.00	21.440	51.570	4188.15	42.51	572.52	748.45	1568983.46	305820.98	39°19'46.645"N	81°01'25.529"W	942.31	52.586	0.87	-0.58	-1.75
4442.00	21.510	50.480	4276.56	43.14	594.40	775.48	1569010.49	305842.86	39°19'46.865"N	81°01'25.190"W	977.08	52.530	0.43	0.07	-1.15
4538.00	20.400	44.640	4366.22	41.72	617.50	800.82	1569035.83	305865.97	39°19'47.098"N	81°01'24.872"W	1011.25	52.364	2.46	-1.16	-6.08
4634.00	21.400	43.240	4455.90	38.10	642.17	824.57	1569059.58	305890.63	39°19'47.346"N	81°01'24.575"W	1045.13	52.089	1.16	1.04	-1.46
4730.00	22.480	49.290	4544.96	35.81	666.90	850.49	1569085.50	305915.36	39°19'47.594"N	81°01'24.251"W	1080.78	51.899	2.61	1.12	6.30
4826.00	22.820	49.820	4633.55	35.52	690.88	878.62	1569113.63	305939.34	39°19'47.836"N	81°01'23.898"W	1117.72	51.821	0.41	0.35	0.55
4921.00	21.130	50.080	4721.65	35.49	713.76	905.83	1569140.84	305962.22	39°19'48.067"N	81°01'23.557"W	1153.25	51.763	1.78	-1.78	0.27
5017.00	20.150	50.210	4811.48	35.57	735.45	931.81	1569166.81	305983.90	39°19'48.285"N	81°01'23.231"W	1187.08	51.717	1.02	-1.02	0.14
5112.00	19.510	55.440	4900.86	37.13	754.92	957.45	1569192.45	306003.37	39°19'48.482"N	81°01'22.909"W	1219.27	51.745	1.98	-0.67	5.51
5207.00	18.840	57.140	4990.59	40.55	772.24	983.40	1569218.40	306020.69	39°19'48.658"N	81°01'22.583"W	1250.37	51.858	0.92	-0.71	1.79
5302.00	18.270	56.840	5080.65	44.23	788.71	1008.75	1569243.75	306037.16	39°19'48.825"N	81°01'22.264"W	1280.48	51.979	0.61	-0.60	-0.32
5398.00	17.640	59.820	5171.98	48.50	804.25	1033.92	1569268.92	306052.70	39°19'48.982"N	81°01'21.947"W	1309.89	52.122	1.16	-0.66	3.10
5441.00	17.020	58.550	5213.02	50.55	810.81	1044.92	1569279.92	306059.26	39°19'49.049"N	81°01'21.808"W	1322.60	52.190	1.69	-1.44	-2.95
5542.00	16.270	61.170	5309.79	55.48	825.35	1069.93	1569304.93	306073.80	39°19'49.197"N	81°01'21.493"W	1351.27	52.353	1.05	-0.74	2.59

02/03/2017



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Page 4 of 9



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Field	Ritchie		Wellbore	PEN-20C-HS AWB
Facility	PEN-20 Pad			

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5636.00	19.020	70.690	5399.38	63.45	836.77	1095.93	1569330.93	306085.22	39°19'49.314"N	81°01'21.165"W	1378.85	52.637	4.23	2.93	10.13
5730.00	19.700	71.040	5488.06	74.55	846.98	1125.37	1569360.37	306095.43	39°19'49.420"N	81°01'20.792"W	1408.48	53.034	0.73	0.72	0.37
5826.00	19.210	68.470	5578.58	85.36	858.03	1155.36	1569390.36	306106.48	39°19'49.534"N	81°01'20.413"W	1439.13	53.401	1.03	-0.51	-2.68
5920.00	22.740	70.600	5666.34	96.66	869.75	1186.90	1569421.89	306118.19	39°19'49.655"N	81°01'20.014"W	1471.46	53.766	3.84	3.76	2.27
6015.00	22.280	76.820	5754.12	111.25	879.95	1221.75	1569456.75	306128.40	39°19'49.762"N	81°01'19.573"W	1505.66	54.237	2.55	-0.48	6.55
6110.00	24.660	94.340	5841.36	133.25	882.56	1259.10	1569494.09	306131.01	39°19'49.794"N	81°01'19.098"W	1537.61	54.972	7.73	2.51	18.44
6205.00	32.690	112.750	5924.80	170.04	871.10	1302.68	1569537.67	306119.55	39°19'49.688"N	81°01'18.541"W	1567.10	56.229	12.48	8.45	19.38
6303.00	43.810	118.860	6001.67	225.40	844.40	1356.98	1569591.97	306092.85	39°19'49.433"N	81°01'17.845"W	1598.25	58.107	11.97	11.35	6.23
6395.00	50.180	120.270	6064.39	288.43	811.19	1415.45	1569650.43	306059.64	39°19'49.115"N	81°01'17.094"W	1631.41	60.183	7.01	6.92	1.53
6489.00	59.440	121.790	6118.50	361.01	771.58	1481.17	1569716.15	306020.03	39°19'48.734"N	81°01'16.249"W	1670.09	62.484	9.94	9.85	1.62
6584.00	64.890	124.580	6162.85	441.40	725.58	1551.41	1569786.39	305974.04	39°19'48.292"N	81°01'15.345"W	1712.70	64.935	6.30	5.74	2.94
6679.00	71.060	132.070	6198.50	527.55	670.95	1620.33	1569855.30	305919.40	39°19'47.763"N	81°01'14.456"W	1753.75	67.506	9.77	6.49	7.88
6773.00	80.340	140.010	6221.73	618.25	605.42	1683.34	1569918.31	305853.88	39°19'47.126"N	81°01'13.641"W	1788.90	70.219	12.82	9.87	8.45
6869.00	85.870	141.160	6233.25	713.51	531.82	1743.82	1569978.79	305780.28	39°19'46.409"N	81°01'12.855"W	1823.11	73.040	5.88	5.76	1.20
6964.00	88.920	142.180	6237.57	808.36	457.38	1802.67	1570037.63	305705.85	39°19'45.683"N	81°01'12.090"W	1859.79	75.763	3.38	3.21	1.07
7060.00	88.980	142.060	6239.33	904.28	381.62	1861.60	1570096.56	305630.09	39°19'44.944"N	81°01'11.324"W	1900.32	78.415	0.14	0.06	-0.13
7155.00	88.430	138.870	6241.48	999.24	308.38	1922.05	1570157.01	305556.85	39°19'44.231"N	81°01'10.539"W	1946.63	80.885	3.41	-0.58	-3.36
7251.00	89.260	137.280	6243.41	1095.16	236.97	1986.18	1570221.13	305485.45	39°19'43.536"N	81°01'09.708"W	2000.27	83.196	1.87	0.86	-1.66
7347.00	89.660	135.780	6244.32	1190.98	167.31	2052.22	1570287.17	305415.79	39°19'42.858"N	81°01'08.853"W	2059.03	85.339	1.62	0.42	-1.56
7442.00	90.150	137.560	6244.47	1285.81	98.20	2117.41	1570352.36	305346.69	39°19'42.186"N	81°01'08.008"W	2119.68	87.345	1.94	0.52	1.87
7538.00	89.600	136.240	6244.68	1381.67	28.11	2183.00	1570417.94	305276.60	39°19'41.505"N	81°01'07.159"W	2183.18	89.262	1.49	-0.57	-1.37
7633.00	89.820	137.750	6245.16	1476.54	-41.36	2247.79	1570482.73	305207.13	39°19'40.829"N	81°01'06.319"W	2248.17	91.054	1.61	0.23	1.59
7729.00	89.940	138.740	6245.36	1572.49	-112.97	2311.72	1570546.66	305135.52	39°19'40.132"N	81°01'05.491"W	2314.48	92.798	1.04	0.12	1.03
7824.00	89.780	135.690	6245.60	1667.37	-182.69	2376.24	1570611.18	305065.81	39°19'39.454"N	81°01'04.655"W	2383.25	94.396	3.21	-0.17	-3.21
7920.00	89.540	141.410	6246.17	1763.29	-254.61	2439.76	1570674.70	304993.89	39°19'38.754"N	81°01'03.831"W	2453.01	95.958	5.96	-0.25	5.96
8015.00	89.200	143.220	6247.21	1858.21	-329.78	2497.83	1570732.76	304918.72	39°19'38.020"N	81°01'03.076"W	2519.51	97.521	1.94	-0.36	1.91
8111.00	89.410	143.280	6248.38	1954.04	-406.70	2555.27	1570790.20	304841.81	39°19'37.270"N	81°01'02.329"W	2587.43	99.043	0.23	0.22	0.06
8206.00	89.260	140.050	6249.48	2048.99	-481.20	2614.18	1570849.11	304767.31	39°19'36.543"N	81°01'01.563"W	2658.10	100.430	3.40	-0.16	-3.40
8302.00	89.910	140.010	6250.17	2144.98	-554.77	2675.85	1570910.77	304693.74	39°19'35.827"N	81°01'00.763"W	2732.75	101.713	0.68	0.68	-0.04
8398.00	89.380	141.650	6250.77	2240.97	-629.19	2736.48	1570971.40	304619.33	39°19'35.101"N	81°00'59.975"W	2807.88	102.949	1.80	-0.55	1.71



**BAKER
HUGHES**

Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020

Page 5 of 9



REFERENCE WELLPATH IDENTIFICATION

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

WELLPATH DATA (160 stations)

MD	Inclination	Azimuth	TVD	Vert Sect	North	East	Grid East	Grid North	Latitude	Longitude	Closure Dist	Closure Dir	DLS	Build Rate	Turn Rate
[ft]	[°]	[°]	[ft]	[ft]	[ft]	[ft]	[US ft]	[US ft]			[ft]	[°]	[%/100ft]	[%/100ft]	[%/100ft]
8493.00	90.280	144.340	6251.05	2335.83	-705.05	2793.65	1571028.57	304543.47	39°19'34.361"N	81°00'59.232"W	2881.25	104.164	2.99	0.95	2.83
8589.00	89.570	145.870	6251.18	2431.44	-783.79	2848.57	1571083.48	304464.74	39°19'33.592"N	81°00'58.516"W	2954.43	105.384	1.76	-0.74	1.59
8684.00	90.220	143.120	6251.35	2526.14	-861.12	2903.74	1571138.65	304387.42	39°19'32.837"N	81°00'57.797"W	3028.73	106.518	2.97	0.68	-2.89
8780.00	89.660	143.750	6251.45	2621.97	-938.22	2960.93	1571195.84	304310.31	39°19'32.085"N	81°00'57.053"W	3106.02	107.582	0.88	-0.58	0.66
8875.00	89.170	146.340	6252.42	2716.59	-1016.07	3015.35	1571250.26	304232.47	39°19'31.325"N	81°00'56.344"W	3181.94	108.622	2.77	-0.52	2.73
8970.00	90.860	149.670	6252.40	2810.64	-1096.63	3065.68	1571300.58	304151.92	39°19'30.537"N	81°00'55.686"W	3255.91	109.683	3.93	1.78	3.51
9066.00	90.740	145.190	6251.05	2905.80	-1177.50	3117.34	1571352.24	304071.05	39°19'29.746"N	81°00'55.012"W	3332.31	110.693	4.67	-0.13	-4.67
9161.00	89.940	139.610	6250.49	3000.68	-1252.74	3175.28	1571410.17	303995.81	39°19'29.013"N	81°00'54.258"W	3413.46	111.531	5.93	-0.84	-5.87
9257.00	89.140	136.960	6251.26	3096.62	-1324.39	3239.15	1571474.04	303924.17	39°19'28.315"N	81°00'53.430"W	3499.44	112.238	2.88	-0.83	-2.76
9353.00	89.200	141.210	6252.65	3192.58	-1396.91	3302.00	1571536.89	303851.65	39°19'27.609"N	81°00'52.615"W	3585.33	112.931	4.43	0.06	4.43
9448.00	90.310	139.500	6253.06	3287.57	-1470.06	3362.61	1571597.50	303778.50	39°19'26.896"N	81°00'51.828"W	3669.91	113.614	2.15	1.17	-1.80
9544.00	89.880	137.420	6252.90	3383.53	-1541.91	3426.27	1571661.16	303706.66	39°19'26.197"N	81°00'51.003"W	3757.23	114.229	2.21	-0.45	-2.17
9639.00	89.600	139.600	6253.33	3478.49	-1613.06	3489.20	1571724.08	303635.50	39°19'25.504"N	81°00'50.187"W	3844.02	114.811	2.31	-0.29	2.29
9735.00	89.690	140.070	6253.93	3574.49	-1686.42	3551.12	1571786.00	303562.15	39°19'24.789"N	81°00'49.384"W	3931.22	115.403	0.50	0.09	0.49
9830.00	89.650	141.460	6254.49	3669.48	-1760.00	3611.20	1571846.08	303488.57	39°19'24.072"N	81°00'48.603"W	4017.26	115.983	1.46	-0.06	1.46
9926.00	89.450	139.460	6255.26	3765.47	-1834.03	3672.31	1571907.19	303414.55	39°19'23.351"N	81°00'47.810"W	4104.82	116.539	2.09	-0.19	-2.08
10021.00	89.570	142.610	6256.07	3860.44	-1907.88	3732.05	1571966.92	303340.70	39°19'22.631"N	81°00'47.034"W	4191.44	117.077	3.32	0.13	3.32
10117.00	89.630	143.810	6256.74	3956.28	-1984.76	3789.54	1572024.40	303263.82	39°19'21.881"N	81°00'46.286"W	4277.83	117.643	1.25	0.06	1.25
10212.00	89.630	143.450	6257.36	4051.09	-2061.25	3845.87	1572080.74	303187.33	39°19'21.134"N	81°00'45.553"W	4363.42	118.190	0.38	0.00	-0.38
10308.00	89.940	142.940	6257.72	4146.94	-2138.12	3903.38	1572138.24	303110.47	39°19'20.384"N	81°00'44.805"W	4450.61	118.712	0.62	0.32	-0.53
10403.00	90.460	138.040	6257.39	4241.91	-2211.39	3963.80	1572198.66	303037.21	39°19'19.670"N	81°00'44.021"W	4538.94	119.157	5.19	0.55	-5.16
10499.00	89.570	136.560	6257.36	4337.80	-2281.94	4028.90	1572263.76	302966.66	39°19'18.984"N	81°00'43.177"W	4630.26	119.527	1.80	-0.93	-1.54
10595.00	89.910	138.880	6257.80	4433.71	-2352.96	4093.48	1572328.34	302895.64	39°19'18.293"N	81°00'42.341"W	4721.55	119.891	2.44	0.35	2.42
10690.00	89.970	138.840	6257.90	4528.69	-2424.50	4155.98	1572390.83	302824.10	39°19'17.596"N	81°00'41.530"W	4811.49	120.258	0.08	0.06	-0.04
10786.00	89.630	136.970	6258.23	4624.62	-2495.74	4220.33	1572455.18	302752.87	39°19'16.993"N	81°00'40.696"W	4903.05	120.598	1.98	-0.35	-1.95
10881.00	90.000	144.000	6258.54	4719.56	-2568.98	4280.74	1572515.59	302679.63	39°19'16.189"N	81°00'39.912"W	4992.44	120.969	7.41	0.39	7.40
10977.00	90.180	147.670	6258.39	4815.05	-2648.40	4334.64	1572569.49	302606.22	39°19'15.413"N	81°00'39.209"W	5079.68	121.424	3.83	0.19	3.82
11072.00	90.150	145.390	6258.11	4909.42	-2727.64	4387.03	1572621.87	302520.98	39°19'14.639"N	81°00'38.526"W	5165.86	121.871	2.40	-0.03	-2.40
11167.00	89.480	142.630	6258.42	5004.18	-2804.50	4442.85	1572677.69	302444.13	39°19'13.889"N	81°00'37.799"W	5253.97	122.262	2.99	-0.71	-2.91
11263.00	89.850	143.220	6258.98	5100.05	-2881.09	4500.73	1572735.56	302367.54	39°19'13.141"N	81°00'37.046"W	5343.89	122.625	0.73	0.39	0.61



Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020'
Page 6 of 9



REFERENCE WELLPATH IDENTIFICATION

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

WELLPATH DATA (160 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]	Build Rate [°/100ft]	Turn Rate [°/100ft]
11359.00	90.550	138.300	6258.65	5196.01	-2955.42	4561.43	1572796.27	302293.21	39°19'12.417"N	81°00'36.258"W	5435.18	122.940	5.18	0.73	-5.12
11454.00	90.000	137.660	6258.19	5290.95	-3025.99	4625.03	1572859.85	302222.64	39°19'11.730"N	81°00'35.434"W	5526.98	123.195	0.89	-0.58	-0.67
11550.00	90.030	135.890	6258.16	5386.80	-3095.94	4690.77	1572925.60	302152.70	39°19'11.050"N	81°00'34.583"W	5620.34	123.425	1.84	0.03	-1.84
11645.00	90.520	138.300	6257.71	5481.67	-3165.52	4755.44	1572990.26	302083.12	39°19'10.373"N	81°00'33.745"W	5712.68	123.650	2.59	0.52	2.54
11741.00	90.120	137.410	6257.17	5577.60	-3236.70	4819.85	1573054.67	302011.95	39°19'09.680"N	81°00'32.910"W	5805.79	123.883	1.02	-0.42	-0.93
11837.00	90.120	138.380	6256.97	5673.53	-3307.92	4884.22	1573119.04	301940.73	39°19'08.987"N	81°00'32.076"W	5898.98	124.108	1.01	0.00	1.01
11932.00	90.220	140.890	6256.69	5768.52	-3380.30	4945.74	1573180.56	301868.35	39°19'08.282"N	81°00'31.278"W	5990.56	124.352	2.64	0.11	2.64
12028.00	89.820	143.650	6256.66	5864.44	-3456.22	5004.48	1573239.29	301792.44	39°19'07.541"N	81°00'30.515"W	6081.96	124.630	2.91	-0.42	2.88
12123.00	89.230	143.680	6257.44	5959.24	-3532.74	5060.77	1573295.58	301715.92	39°19'06.794"N	81°00'29.782"W	6171.84	124.918	0.62	-0.62	0.03
12231.00	89.880	142.430	6258.28	6067.08	-3619.05	5125.68	1573360.48	301629.61	39°19'05.952"N	81°00'28.938"W	6274.56	125.225	1.30	0.60	-1.16
12314.00	90.000	139.890	6258.37	6150.05	-3683.70	5177.73	1573412.53	301564.97	39°19'05.322"N	81°00'28.262"W	6354.41	125.430	3.06	0.14	-3.06
12410.00	90.550	140.360	6257.91	6246.05	-3757.37	5239.27	1573474.07	301491.30	39°19'04.604"N	81°00'27.463"W	6447.31	125.646	0.75	0.57	0.49
12506.00	89.850	137.260	6257.57	6342.02	-3829.60	5302.49	1573537.28	301419.07	39°19'03.901"N	81°00'26.644"W	6540.81	125.838	3.31	-0.73	-3.23
12602.00	90.180	138.470	6257.55	6437.95	-3900.79	5366.89	1573601.68	301347.88	39°19'03.208"N	81°00'25.809"W	6634.73	126.011	1.31	0.34	1.26
12698.00	89.970	139.920	6257.42	6533.94	-3973.46	5429.62	1573664.41	301275.22	39°19'02.500"N	81°00'24.996"W	6728.24	126.197	1.53	-0.22	1.51
12793.00	89.380	140.120	6257.96	6628.94	-4046.25	5490.66	1573725.45	301202.43	39°19'01.791"N	81°00'24.204"W	6820.52	126.388	0.66	-0.62	0.21
12889.00	89.780	141.060	6258.67	6724.93	-4120.42	5551.60	1573786.39	301128.27	39°19'01.068"N	81°00'23.412"W	6913.62	126.583	1.06	0.42	0.98
12984.00	90.400	140.810	6258.52	6819.91	-4194.18	5611.47	1573846.26	301054.51	39°19'00.349"N	81°00'22.635"W	7005.70	126.776	0.70	0.65	-0.26
13080.00	91.050	142.960	6257.30	6915.85	-4269.70	5670.72	1573905.50	300978.99	39°18'59.613"N	81°00'21.865"W	7098.41	126.977	2.34	0.68	2.24
13175.00	90.370	142.780	6256.12	7010.72	-4345.43	5728.06	1573962.84	300903.26	39°18'58.874"N	81°00'21.120"W	7189.82	127.185	0.74	-0.72	-0.19
13271.00	90.310	143.950	6255.55	7106.55	-4422.47	5785.34	1574020.12	300826.23	39°18'58.122"N	81°00'20.374"W	7282.06	127.395	1.22	-0.06	1.22
13366.00	89.750	143.660	6255.50	7201.34	-4499.13	5841.44	1574076.21	300749.57	39°18'57.374"N	81°00'19.644"W	7373.24	127.604	0.66	-0.59	-0.31
13461.00	89.850	142.350	6255.84	7296.21	-4575.01	5898.61	1574133.38	300673.70	39°18'56.633"N	81°00'18.901"W	7464.87	127.797	1.38	0.11	-1.38
13557.00	89.510	139.560	6256.37	7392.18	-4649.56	5959.07	1574193.84	300599.16	39°18'55.907"N	81°00'18.116"W	7558.37	127.963	2.93	-0.35	-2.91
13653.00	89.140	141.230	6257.50	7488.17	-4723.51	6020.27	1574255.03	300525.20	39°18'55.186"N	81°00'17.322"W	7652.13	128.118	1.78	-0.39	1.74
13747.00	89.140	140.550	6258.91	7582.15	-4796.44	6079.56	1574314.31	300452.28	39°18'54.475"N	81°00'16.552"W	7743.83	128.272	0.72	0.00	-0.72
13843.00	89.260	140.240	6260.25	7678.14	-4870.40	6140.75	1574375.51	300378.33	39°18'53.754"N	81°00'15.758"W	7837.70	128.419	0.35	0.13	-0.32
13938.00	89.110	138.910	6261.61	7773.12	-4942.71	6202.34	1574437.10	300306.02	39°18'53.050"N	81°00'14.959"W	7930.92	128.552	1.41	-0.16	-1.40
14034.00	89.480	138.750	6262.79	7869.10	-5014.97	6265.54	1574500.29	300233.76	39°18'52.346"N	81°00'14.140"W	8025.39	128.674	0.42	0.39	-0.17
14129.00	90.090	144.710	6263.14	7964.01	-5089.52	6324.35	1574559.10	300159.22	39°18'51.619"N	81°00'13.375"W	8117.92	128.825	6.31	0.64	6.27



Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020'

Page 7 of 9



REFERENCE WELLPATH IDENTIFICATION

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

WELLPATH DATA (160 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]	Build Rate [°/100ft]	Turn Rate [°/100ft]
14225.00	89.510	144.490	6263.48	8059.70	-5167.77	6379.96	1574614.70	300080.97	39°18'50.855"N	81°00'12.651"W	8210.34	129.007	0.65	-0.60	-0.23
14321.00	89.880	146.080	6263.99	8155.29	-5246.68	6434.63	1574669.37	300002.06	39°18'50.085"N	81°00'11.939"W	8302.53	129.193	1.70	0.39	1.66
14417.00	89.660	143.820	6264.38	8250.92	-5325.26	6489.76	1574724.49	299923.48	39°18'49.317"N	81°00'11.221"W	8394.96	129.371	2.37	-0.23	-2.35
14512.00	90.150	141.660	6264.53	8345.81	-5400.87	6547.27	1574782.00	299847.88	39°18'48.579"N	81°00'10.473"W	8487.41	129.519	2.33	0.52	-2.27
14608.00	89.480	140.710	6264.84	8441.78	-5475.67	6607.44	1574842.17	299773.09	39°18'47.850"N	81°00'09.692"W	8581.44	129.649	1.21	-0.70	-0.99
14703.00	90.120	142.810	6265.17	8536.73	-5550.28	6666.24	1574900.97	299698.48	39°18'47.123"N	81°00'08.928"W	8674.35	129.781	2.31	0.67	2.21
14799.00	90.120	141.560	6264.97	8632.66	-5626.11	6725.09	1574959.82	299622.65	39°18'46.383"N	81°00'08.163"W	8768.13	129.915	1.30	0.00	-1.30
14894.00	89.630	134.480	6265.18	8727.54	-5696.69	6788.60	1575023.32	299552.07	39°18'45.696"N	81°00'07.341"W	8862.13	130.002	7.47	-0.52	-7.45
14990.00	89.660	129.910	6265.78	8822.63	-5761.15	6859.70	1575094.42	299487.62	39°18'45.071"N	81°00'06.422"W	8958.03	130.025	4.76	0.03	-4.76
15020.00	89.660	129.910	6265.95	8852.16	-5780.40	6882.71	1575117.43	299468.37	39°18'44.884"N	81°00'06.126"W	8988.03	130.025	0.00	0.00	0.00



Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020'

Page 8 of 9



REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot C
Area	Ritchie County, WV	Well	PEN-20C-HS
Field	Ritchie	Wellbore	PEN-20C-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-20C-HS LP Plat		6168.00	465.00	1645.00	1569879.97	305713.47	39°19'45.732"N	81°01'14.098"W	point
PEN-20C-HS BHL Rev-3		6225.00	-5764.47	6872.15	1575106.87	299484.30	39°18'45.040"N	81°00'06.263"W	point
PEN-20C-HS LP Rev-3		6225.00	537.38	1732.49	1569967.46	305785.84	39°19'46.462"N	81°01'13.001"W	point
PEN-20 ALT Vertices		6948.00	-44.31	13.67	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 1		6948.00	-44.31	13.67	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 2		6948.00	-44.31	13.67	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 LL		6948.00	-44.31	13.67	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Parcel 3.12-1.2		6948.00	-44.31	13.67	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon

WELLPATH COMPOSITION - Ref Wellbore: PEN-20C-HS AWB Ref Wellpath: PEN-20C-HS AWP Proj: 15020'

Start MD [ft]	End MD [ft]	Positional Uncertainty Model	Log Name/Comment	Wellbore
26.00	505.00	Generic gyro - northseeking (Standard)	01_Gyrodata MS Gyro <17-1/2"> (100'-505')	PEN-20C-HS AWB
505.00	5441.00	ISCWSA MWD, Rev. 2 (Standard)	02_APS EM <12-1/4"> (505')(715'-5441') Proj:5515'	PEN-20C-HS AWB
5441.00	14990.00	NaviTrak (AT Curve Short Spaced)	03_BHI AT Curve <8-3/4"> (5441')(5542'-14990')	PEN-20C-HS AWB
14990.00	15020.00	Blind Drilling (std)	Projection to bit	PEN-20C-HS AWB



Actual Wellpath Report

PEN-20C-HS AWP Proj: 15020'
Page 9 of 9



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

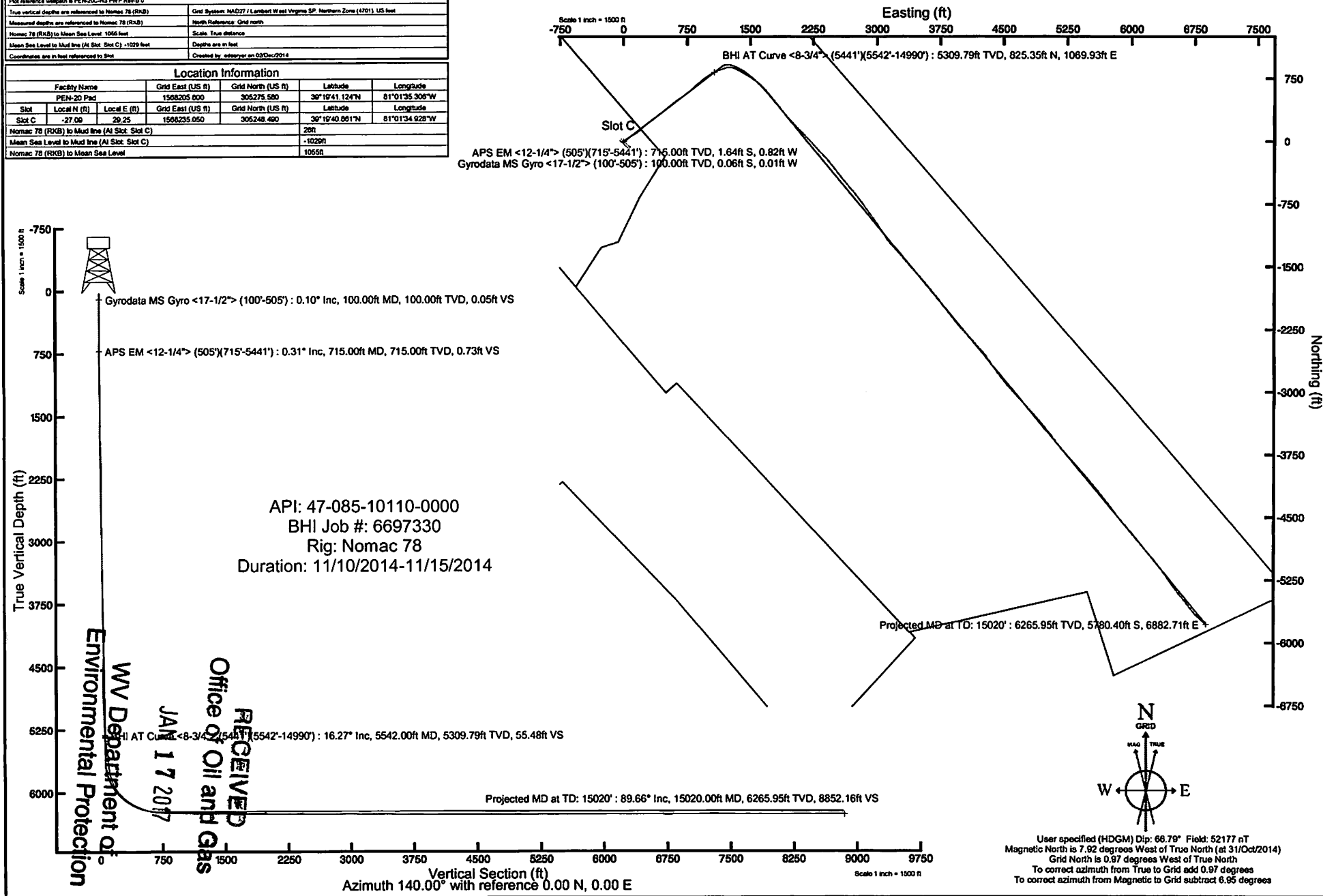
COMMENTS
<p>Wellpath general comments API: 47-085-10110-0000 BHI Job #: 6697330 Rig: Nomac 78 Duration: 11/10/2014-11/15/2014 Gyrodatta MS Gyro <17-1/2"> (100'-505') APS EM <12-1/4"> (505')(715'-5441') BHI AT Curve <8-3/4"> (5441')(5542'-14990') Projected MD at TD: 15020'</p>

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

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

Plot reference wellpath is PEN-20C-HS PWP Rev-B 0	
True vertical depths are referenced to Nomac 78 (R&B)	Grid System: NAD27 / Lambert West Virginia SP, Northern Zone (4701) US feet
Measured depths are referenced to Nomac 78 (R&B)	North Reference: Grid north
Nomac 78 (R&B) to Mean Sea Level: 1056 feet	Scale: True distance
Mean Sea Level to Mud line (At Slot, Slot C) : -1029 feet	Depths are in feet
Coordinates are in feet referenced to Slot	Created by: adseyer on 03Dec2014

Location Information						
Facility Name	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude		
PEN-20 Pad	1508205.000	305275.500	30°19'41.1247N	81°01'35.300"W		
Slot	Local N (ft)	Local E (ft)	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Slot C	-27.00	20.25	1508235.050	305248.490	30°19'40.8617N	81°01'34.928"W
Nomac 78 (R&B) to Mud line (At Slot, Slot C)						26ft
Mean Sea Level to Mud line (At Slot, Slot C)						-1029ft
Nomac 78 (R&B) to Mean Sea Level						1056ft



GRID TRUE

W E N S

User specified (HDGM) Dip: 66.78° Field: 52177 nT
 Magnetic North is 7.92 degrees West of True North (at 31/Oct/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 6.95 degrees