85-10033

PATHFINDER
A Schlumberger Company

Noble Energy PENS1HHS Gyro+MWD 0' MD to TD @ 14670' MD Final Survey Report

(Non-Def Survey)

noble energy

Received
Office of Oil & Gas
NOV 21 2014

Report Date:	January 10, 2014 - 09:24 AM
Client:	Noble Energy
Field:	WV Ritchie County (NAD27)
Structure / Slot:	Noble Energy PENS1 Pad / PENS1HHS
Well:	PENS1HHS
Borehole:	Original Borehole
UWI / API#:	Unknown / Unknown
Survey Name:	Noble Energy PENS1HHS Gyro+MWD 0' MD to update
Survey Date:	August 23, 2013
Tort / AHD / DDI / ERD Ratio:	175.833 ° / 8682.720 ft / 6.546 / 1.363
Coordinate Reference System:	NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long:	N 39° 20' 5.92700", W 80° 59' 34.74600"
Location Grid N/E Y/X:	N 307625.416 ftUS, E 1577719.664 ftUS
CRS Grid Convergence Angle:	-0.9522 °
Grid Scale Factor:	0.99995357
Version / Patch:	2.7.998.0

Survey / DLS Computation:	Minimum Curvature / Lubinski
Vertical Section Azimuth:	320.908 ° (Grid North)
Vertical Section Origin:	0.000 ft, 0.000 ft
TVD Reference Datum:	KB
TVD Reference Elevation:	1137.560 ft above MSL
Seabed / Ground Elevation:	1112.050 ft above MSL
Magnetic Declination:	-7.792 °
Total Gravity Field Strength:	999.3964mgn (9.80665 Based)
Gravity Model:	DOX
Total Magnetic Field Strength:	52330.547 nT
Magnetic Dip Angle:	66.903 °
Declination Date:	August 23, 2013
Magnetic Declination Model:	HDGM 2013
North Reference:	Grid North
Total Corr Mag North->Grid North:	-0.9522 °
Total Corr Mag ->Grid North:	-6.8403 °
Local Coord Referenced To:	Well Head

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	BR (°/100ft)	TR (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
SHL	0.00	0.00	0.00	0.00	-1137.56	0.00	0.00	0.00	N/A	N/A	N/A	307625.42	1577719.66	N 39 20 5.93	W 80 59 34.75
	126.00	0.46	278.14	126.00	-1011.56	0.37	0.07	-0.50	0.37	0.37	0.00	307625.49	1577719.16	N 39 20 5.93	W 80 59 34.75
	226.00	0.44	264.64	226.00	-911.56	0.88	0.09	-1.28	0.11	-0.02	-13.50	307625.51	1577718.38	N 39 20 5.93	W 80 59 34.76
	326.00	0.24	249.15	325.99	-811.57	1.16	-0.02	-1.86	0.22	-0.20	-15.49	307625.40	1577717.81	N 39 20 5.93	W 80 59 34.77
	426.00	0.08	230.30	425.99	-711.57	1.22	-0.14	-2.11	0.17	-0.16	-18.85	307625.28	1577717.56	N 39 20 5.93	W 80 59 34.77
	526.00	0.34	221.20	525.99	-611.57	1.17	-0.40	-2.36	0.26	0.26	-9.10	307625.01	1577717.31	N 39 20 5.92	W 80 59 34.78
	636.00	0.22	216.26	635.99	-501.57	1.06	-0.82	-2.70	0.11	-0.11	-4.49	307624.60	1577716.97	N 39 20 5.92	W 80 59 34.78
	790.00	0.60	215.20	789.99	-347.57	0.77	-1.72	-3.34	0.25	0.25	-0.69	307623.70	1577716.33	N 39 20 5.91	W 80 59 34.79
	884.00	0.71	218.06	883.98	-253.58	0.51	-2.58	-3.98	0.12	0.12	3.04	307622.84	1577715.68	N 39 20 5.90	W 80 59 34.80
	979.00	0.40	189.27	978.98	-158.58	0.16	-3.37	-4.40	0.43	-0.33	-30.31	307622.05	1577715.27	N 39 20 5.89	W 80 59 34.80
	1075.00	1.06	25.65	1074.97	-62.59	0.31	-2.90	-4.07	1.51	0.69	-170.44	307622.52	1577715.60	N 39 20 5.90	W 80 59 34.80
	1171.00	1.91	338.97	1170.94	33.38	2.21	-0.61	-4.25	1.47	0.89	-48.63	307624.81	1577715.41	N 39 20 5.92	W 80 59 34.80
	1265.00	3.58	311.29	1264.83	127.27	6.60	2.79	-7.02	2.22	1.78	-29.45	307628.21	1577712.64	N 39 20 5.95	W 80 59 34.84
	1359.00	4.14	309.24	1358.62	221.06	12.81	6.88	-11.86	0.61	0.60	-2.18	307632.29	1577707.81	N 39 20 5.99	W 80 59 34.90
	1453.00	4.85	306.79	1452.33	314.77	19.99	11.40	-17.67	0.78	0.76	-2.61	307636.82	1577702.00	N 39 20 6.04	W 80 59 34.97
	1549.00	3.50	304.58	1548.07	410.51	26.74	15.50	-23.33	1.42	-1.41	-2.30	307640.91	1577696.34	N 39 20 6.08	W 80 59 35.05
	1644.00	1.85	319.18	1642.97	505.41	31.05	18.30	-26.72	1.87	-1.74	15.37	307643.72	1577692.95	N 39 20 6.10	W 80 59 35.09
	1740.00	1.91	319.95	1738.92	601.36	34.20	20.70	-28.76	0.07	0.06	0.80	307646.11	1577690.90	N 39 20 6.13	W 80 59 35.12
	1834.00	2.37	315.56	1832.85	695.29	37.70	23.29	-31.13	0.52	0.49	-4.67	307648.70	1577688.54	N 39 20 6.15	W 80 59 35.15
	1928.00	1.80	315.30	1926.79	789.23	41.11	25.72	-33.53	0.61	-0.61	-0.28	307651.14	1577686.14	N 39 20 6.18	W 80 59 35.18
	2023.00	0.07	283.29	2021.77	884.21	42.64	26.80	-34.64	1.83	-1.82	-33.69	307652.21	1577685.03	N 39 20 6.19	W 80 59 35.19
	2118.00	0.79	141.21	2116.77	979.21	42.03	26.30	-34.28	0.89	0.76	-149.56	307651.72	1577685.38	N 39 20 6.18	W 80 59 35.19
	2214.00	0.54	144.58	2212.76	1075.20	40.92	25.42	-33.60	0.26	-0.26	3.51	307650.83	1577686.06	N 39 20 6.17	W 80 59 35.18
	2309.00	0.25	225.35	2307.76	1170.20	40.45	24.91	-33.49	0.59	-0.31	85.02	307650.32	1577686.17	N 39 20 6.17	W 80 59 35.18
	2403.00	0.27	226.41	2401.76	1264.20	40.41	24.61	-33.80	0.02	0.02	1.13	307650.02	1577685.87	N 39 20 6.16	W 80 59 35.18
	2499.00	0.28	231.02	2497.76	1360.20	40.40	24.31	-34.15	0.03	0.01	4.80	307649.72	1577685.52	N 39 20 6.16	W 80 59 35.19
	2594.00	0.43	270.82	2592.76	1455.20	40.62	24.16	-34.68	0.29	0.16	41.89	307649.58	1577684.98	N 39 20 6.16	W 80 59 35.19
	2689.00	0.49	238.04	2687.75	1550.19	40.90	23.95	-35.38	0.28	0.06	-34.51	307649.37	1577684.28	N 39 20 6.16	W 80 59 35.20
	2783.00	0.41	250.36	2781.75	1644.19	41.07	23.63	-36.04	0.13	-0.09	13.11	307649.04	1577683.62	N 39 20 6.15	W 80 59 35.21
	2878.00	0.41	7.48	2876.75	1739.19	41.41	23.85	-36.32	0.74	0.00	123.28	307649.27	1577683.35	N 39 20 6.16	W 80 59 35.21
	2974.00	0.78	12.22	2972.75	1835.19	42.06	24.83	-36.13	0.39	0.39	4.94	307650.25	1577683.53	N 39 20 6.17	W 80 59 35.21
	3069.00	0.95	7.75	3067.73	1930.17	43.00	26.24	-35.89	0.19	0.18	-4.71	307651.66	1577683.77	N 39 20 6.18	W 80 59 35.21
	3164.00	0.35	26.27	3162.73	2025.17	43.66	27.28	-35.66	0.66	-0.63	19.49	307652.70	1577684.01	N 39 20 6.19	W 80 59 35.21
	3260.00	0.26	203.40	3258.73	2121.17	43.68	27.35	-35.61	0.64	-0.09	184.51	307652.76	1577684.05	N 39 20 6.19	W 80 59 35.20
	3355.00	0.45	185.33	3353.73	2216.17	43.32	26.78	-35.73	0.23	0.20	-19.02	307652.19	1577683.93	N 39 20 6.19	W 80 59 35.21
	3451.00	0.83	174.56	3449.72	2312.16	42.47	25.71	-35.70	0.41	0.40	-11.22	307651.12	1577683.96	N 39 20 6.18	W 80 59 35.21
	3547.00	0.62	158.04	3545.71	2408.15	41.39	24.54	-35.44	0.31	-0.22	-17.21	307649.95	1577684.22	N 39 20 6.16	W 80 59 35.20
	3642.00	0.65	160.23	3640.71	2503.15	40.39	23.55	-35.07	0.04	0.03	2.31	307648.97	1577684.60	N 39 20 6.15	W 80 59 35.20
	3737.00	0.48	108.68	3735.70	2598.14	39.55	22.92	-34.51	0.54	-0.18	-54.26	307648.33	1577685.16	N 39 20 6.15	W 80 59 35.19
	3833.00	0.37	92.91	3831.70	2694.14	39.00	22.77	-33.82	0.17	-0.11	-16.43	307648.19	1577685.85	N 39 20 6.15	W 80 59 35.18
	3928.00	0.34	79.39	3926.70	2789.14	38.66	22.81	-33.23	0.09	-0.03	-14.23	307648.22	1577686.43	N 39 20 6.15	W 80 59 35.17
	4024.00	0.43	81.73	4022.70	2885.14	38.34	22.91	-32.60	0.10	0.09	2.44	307648.33	1577687.07	N 39 20 6.15	W 80 59 35.17
	4120.00	0.54	74.56	4118.69	2981.13	37.97	23.09	-31.81	0.13	0.11	-7.47	307648.50	1577687.86	N 39 20 6.15	W 80 59 35.16
	4215.00	0.16	356.64	4213.69	3076.13	37.90	23.34	-31.38	0.56	-0.40	-82.02	307648.75	1577688.28	N 39 20 6.15	W 80 59 35.15
	4309.00	0.45	281.24	4307.69	3170.13	38.29	23.54	-31.75	0.47	0.31	-80.21	307648.96	1577687.91	N 39 20 6.15	W 80 59 35.16
	4404.00	0.12	264.95	4402.69	3265.13	38.63	23.60	-32.22	0.35	-0.35	-17.15	307649.02	1577687.45	N 39 20 6.15	W 80 59 35.16
	4498.00	0.22	185.84	4496.69	3359.13	38.56	23.42	-32.33	0.24	0.11	-84.16	307648.83	1577687.33	N 39 20 6.15	W 80 59 35.16
	4594.00	0.17	186.92	4592.69	3455.13	38.33	23.09	-32.37	0.05	-0.05	1.13	307648.51	1577687.30	N 39 20 6.15	W 80 59 35.16
	4688.00	0.40	206.70	4686.69	3549.13	38.10	22.66	-32.53	0.26	0.24	21.04	307648.07	1577687.13	N 39 20 6.15	W 80 59 35.16
	4783.00	0.36	205.67	4781.68	3644.12	37.84	22.09	-32.81	0.04	-0.04	-1.08	307647.51	1577686.85	N 39 20 6.14	W 80 59 35.17
	4878.00	0.52	236.16	4876.68	3739.12	37.75	21.59	-33.30	0.29	0.17	32.09	307647.00	1577686.37	N 39 20 6.13	W 80 59 35.17
	4972.00	0.42	233.97	4970.68	3833.12	37.81	21.15	-33.93	0.11	-0.11	-2.33	307646.56	1577685.73	N 39 20 6.13	W 80 59 35.18
	5066.00	0.09	359.49	5064.68	3927.12	37.88	21.02	-34.21	0.51	-0.35	133.53	307646.43	1577685.45	N 39 20 6.13	W 80 59 35.19
	5160.00	0.01	177.79	5158.68	4021.12	37.94	21.08	-34.21	0.11	-0.09	189.68	307646.50	1577685.45	N 39 20 6.13	W 80 59 35.19
	5254.00	0.24	207.47	5252.68	4115.12	37.85	20.90	-34.30	0.25	0.24	31.57	307646.31	1577685.36	N 39 20 6.13	W 80 59 35.19
	5321.00	0.22	224.25	5319.68	4182.12	37.78	20.68	-34.46	0.10	-0.03	25.04	307646.10	1577685.21	N 39 20 6.13	W 80 59 35.19
	5458.00	0.73	183.25	5456.67	4319.11	37.10	19.62	-34.69	0.42	0.37	-29.93	307645.04	1577684.98	N 39 20 6.12	W 80 59 35.19
	5505.00	0.93	175.14	5503.67	4366.11	36.57	18.94	-34.67	0.49	0.43	-17.26	307644.36	1577684.99	N 39 20 6.11	W 80 59 35.19
	5601.00	0.69	159.14	5599.66	4462.10	35.37	17.63	-34.40	0.34	-0.25	-16.67	307643.04	1577685.26	N 39 20 6.10	W 80 59 35.19
	5648.00	4.75	62.28	5646.60	4509.04	34.72	18.27	-32.58	10.38	8.64	-206.09	307643.68	1577687.09	N 39 20 6.10	W 80 59 35.16
	5697.00	10.40	61.38	5695.16	4557.60	33.52	21.33	-26.89	11.53	11.53	-1.84	307646.75	1577692.77	N 39 20 6.13	W 80 59 35.09
	5744.00	14.41	54.30	5741.05	4603.49	32.40	26.78	-18.42	9.11	8.53	-15.06	307652.19	1577701.25	N 39 20 6.19	W 80 59 34.99
	5793.00	16.00	38.26	5788.36	4650.80	33.52	35.65	-9.28	9.14	3.24	-32.73	307661.06	1577710.38	N 39 20 6.28	W 80 59 34.87
	5840.00	17.39	20.81	5833.40	4695.84	38.46	47.31	-2.77	11.02	2.96	-37.13	307672.72	1577718.89	N 39 20 6.39	W 80 59 34.79
	5889.00	18.58	7.56	5880.03	4742.47	47.50	61.89	0.86	8.67	2.43	-27.04	307687.31	1577720.52	N 39 20 6.54	W 80 59 34.75
	5936.00	20.86	356.77	5924.28	4786.72	59.42	77.68	1.37	9.12	4.85	-22.96	307703.09	1577721.04	N 39 20 6.69	W 80 59 34.74
	5984.00	22.26	350.05	5968.93	4831.37	74.29	95.17	-0.68	5.91	2.92	-14.00	307720.58	1577718.99	N 39 20 6.87	W 80 59 34.77
	6031.00	24.60	344.78	6012.06	4874.50	91.02	113.38	-4.79	6.68	4.98	-11.21	307738.79	1577714.88	N 39 20 7.05	W 80 59 34.83
	6080.00	28.89	340.27	6055.81	4918.25	111.52	134.38	-11.46	9.68	8.76	-9.20	307759.79	1577708.20	N 39 20 7.25	W 80 59 34.92
	6127.00	33.14	337.06	6096.08	4958.52	134.59	156.91	-20.31	9.70	9.04	-6.83	307782.32	1577699.36	N 39 20 7.47	W 80 59 35.04
	6175.00	37.79	333.23	6135.17	4997.61	161.58	182.14	-32.05	10.73	9.69	-7.98	307807.54	1577687.61	N 39 20 7.72	W 80 59 35.19
	6222.00	41.96	330.89	6171.23	5033.67	191.13	208.74	-46.19	9.43	8.87	-4.98	307834.14	1577673.48	N 39 20 7.98	W 80 59 35.38
	6271.00	46.48	329.15	6206.34	5068.78	224.87	238.32	-63.28	9.55	9.22	-3.55	307863.72	1577656.39	N 39 20 8.27	W 80 59 35.60
	6318.00	50.71	327.48	6237.42	5099.86	259.82	268.30	-81.80	9.39	9.00	-3.55	307893.70	1577637.86	N 39 20 8.56	W 80 59 35.84
	6366.00	55.06	324.72	6266.38	5128.82	297.92	300.04	-103.17	10.15	9.06	-5.75	307925.44	1577616.50	N 39 20 8.88	W 80 59 36.12
	6413.00	60.43	322.82	6291.46	5153.90	337.60	332.07	-126.66	11.93	11.43	-4.04	307957.47	1577593.01	N 39 20 9.19	W 80 59 36.43
	6461.00	65.25	322.93	6313.36	5175.80	380.27	366.12	-152.43	10.04	10.04	0.23	307991.51	1577567.24	N 39 20 9.52	W 80 59 36.76
	6508.00	68.81	323.26	6331.70	5194.14	423.51	400.71	-178.41	7.60	7.57	0.70	308026.11	1577541.28	N 39 20 9.86	W 80 59 37.10
	6557.00	73.57	323.48	6347.50	5209.94	469.84	437.93	-206.08	9.72	9.71	0.45	308063.32	1577513.60	N 39 20 10.22	W 80 59 37.46
	6604.00	79.44	322.70	6358.46	5220.90	515.48	474.45	-233.51	12.59	12.49	-1.66	308099.84	1577486.18	N 39 20 10.58	W 80 59 37.82
	6651.00	84.49	321.57	6365.03	5227.47	562.00	511.18	-262.07	11.01	10.74	-2.40	308136.57	1577457.60	N 39 20 10.94	W 80 59 38.19
	6709.00	89.59	321.59	6368.02	5230.46	619.90	556.54	-298.05	8.79	8.79	0.03	308181.93	1577421.62	N 39 20 11.38	W 80 59 38.66
	6747.00	89.59	321.65	6368.29	5230.73	657.89	586.33	-321.65	0.16	0.00	0.16	308211.72	1577398.03	N 39 20 11.67	W 80 59 38.96
	6843.00	90.27	321.35	6368.41	5230.85	753.89	661.46	-381.41	0.77	0.71	-0.31	308286.85	1577338.27	N 39 20 12.40	W 80 59 39.74
	6938.00	90.34	320.38	6367.91	5230.35	848.88	735.15	-441.37	1.02	0.07	-1.02	308360.53	1577278.32	N 39 20 13.12	W 80 59 40.52

12/05/2014

85-10033

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	BR (°/100ft)	TR (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	7034.00	90.24	320.99	6367.42	5229.86	944.88	809.42	-502.19	0.64	-0.10	0.64	308434.60	1577217.50	N 39 20 13.84	W 80 59 41.31
	7129.00	90.17	320.60	6367.08	5229.52	1039.88	883.03	-562.24	0.42	-0.07	-0.41	308508.41	1577157.45	N 39 20 14.56	W 80 59 42.00
	7225.00	90.28	321.10	6366.70	5229.14	1135.88	957.48	-622.85	0.53	0.11	0.52	308582.85	1577096.85	N 39 20 15.29	W 80 59 42.87
	7320.00	90.27	320.63	6366.25	5228.69	1230.88	1031.27	-682.68	0.28	-0.01	-0.28	308656.64	1577037.02	N 39 20 16.01	W 80 59 43.65
	7415.00	90.28	320.89	6365.79	5228.23	1325.88	1104.95	-742.64	0.06	0.01	0.06	308730.31	1576977.06	N 39 20 16.72	W 80 59 44.43
	7511.00	90.24	321.23	6365.36	5227.80	1421.88	1179.62	-802.96	0.36	-0.04	0.35	308804.98	1576916.73	N 39 20 17.45	W 80 59 45.21
	7607.00	90.24	321.06	6364.95	5227.39	1517.87	1254.39	-863.19	0.18	0.00	-0.18	308879.74	1576856.52	N 39 20 18.18	W 80 59 46.00
	7702.00	90.14	320.66	6364.64	5227.08	1612.87	1328.08	-923.14	0.45	-0.11	-0.44	308953.43	1576796.57	N 39 20 18.90	W 80 59 46.77
	7798.00	90.21	319.88	6364.34	5226.78	1708.87	1401.91	-984.50	0.82	0.07	-0.81	309027.26	1576735.21	N 39 20 19.62	W 80 59 47.57
	7893.00	90.24	319.30	6363.97	5226.41	1803.84	1474.25	-1046.08	0.61	0.03	-0.61	309099.59	1576673.63	N 39 20 20.32	W 80 59 48.37
	7989.00	90.24	318.85	6363.57	5226.01	1899.79	1546.78	-1108.97	0.47	0.00	-0.47	309172.12	1576610.75	N 39 20 21.03	W 80 59 49.19
	8085.00	90.27	319.14	6363.14	5225.58	1995.73	1619.23	-1171.96	0.30	0.03	0.30	309244.56	1576547.76	N 39 20 21.74	W 80 59 50.00
	8180.00	90.24	319.03	6362.72	5225.16	2090.69	1691.01	-1234.18	0.12	-0.03	-0.12	309316.35	1576485.55	N 39 20 22.44	W 80 59 50.81
	8276.00	90.27	319.34	6362.29	5224.73	2186.64	1763.67	-1296.92	0.32	0.03	0.32	309389.00	1576422.80	N 39 20 23.14	W 80 59 51.62
	8371.00	90.21	319.32	6361.89	5224.33	2281.60	1835.72	-1358.83	0.07	-0.06	-0.02	309461.05	1576360.90	N 39 20 23.84	W 80 59 52.43
	8466.00	90.21	319.64	6361.55	5223.99	2376.57	1907.94	-1420.56	0.34	0.00	0.34	309533.26	1576299.18	N 39 20 24.55	W 80 59 53.23
	8562.00	90.24	319.31	6361.17	5223.61	2472.54	1980.91	-1482.93	0.35	0.03	-0.34	309606.23	1576236.80	N 39 20 25.26	W 80 59 54.04
	8658.00	90.17	319.00	6360.83	5223.27	2568.50	2053.53	-1545.72	0.33	-0.07	-0.32	309678.85	1576174.02	N 39 20 25.97	W 80 59 54.85
	8753.00	90.31	319.51	6360.43	5222.87	2663.46	2125.51	-1607.72	0.56	0.15	0.54	309750.82	1576112.02	N 39 20 26.67	W 80 59 55.66
	8849.00	90.24	319.38	6359.97	5222.41	2759.42	2198.44	-1670.14	0.15	-0.07	-0.14	309823.75	1576049.60	N 39 20 27.38	W 80 59 56.47
	8944.00	90.21	319.55	6359.50	5222.03	2854.39	2270.64	-1731.88	0.18	-0.03	0.18	309895.95	1575987.87	N 39 20 28.08	W 80 59 57.27
	9040.00	90.27	319.15	6359.19	5221.63	2950.36	2343.48	-1794.42	0.42	0.06	-0.42	309968.78	1575925.33	N 39 20 28.79	W 80 59 58.08
	9136.00	90.28	319.60	6358.73	5221.17	3046.32	2416.34	-1856.92	0.47	0.01	0.47	310041.64	1575862.83	N 39 20 29.50	W 80 59 58.89
	9231.00	90.38	320.10	6358.18	5220.62	3141.30	2488.95	-1918.18	0.54	0.11	0.53	310114.25	1575801.58	N 39 20 30.21	W 80 59 59.68
	9327.00	90.38	320.85	6357.55	5219.99	3237.30	2563.00	-1979.27	0.78	0.00	0.78	310188.29	1575740.49	N 39 20 30.93	W 81 0 0.48
	9423.00	90.34	320.59	6356.94	5219.38	3333.30	2637.31	-2040.05	0.27	-0.04	-0.27	310262.60	1575679.71	N 39 20 31.65	W 81 0 1.27
	9519.00	90.14	319.84	6356.54	5218.98	3429.29	2711.08	-2101.48	0.81	-0.21	-0.78	310336.36	1575618.29	N 39 20 32.37	W 81 0 2.06
	9614.00	90.28	319.77	6356.19	5218.63	3524.27	2783.64	-2162.79	0.16	0.15	-0.07	310408.93	1575556.98	N 39 20 33.08	W 81 0 2.86
	9709.00	90.31	319.93	6355.70	5218.14	3619.25	2856.26	-2224.05	0.17	0.03	0.17	310481.53	1575495.73	N 39 20 33.79	W 81 0 3.65
	9805.00	90.45	320.60	6355.07	5217.51	3715.24	2930.08	-2285.41	0.71	0.15	0.70	310555.35	1575434.36	N 39 20 34.51	W 81 0 4.45
	9900.00	90.52	320.07	6354.26	5216.70	3810.23	3003.21	-2346.05	0.56	0.07	-0.56	310628.48	1575373.73	N 39 20 35.22	W 81 0 5.24
	9995.00	90.21	319.97	6353.66	5216.10	3905.22	3076.00	-2407.09	0.34	-0.33	-0.11	310701.27	1575312.70	N 39 20 35.93	W 81 0 6.03
	10090.00	90.21	319.84	6353.31	5215.75	4000.20	3148.67	-2468.27	0.14	0.00	-0.14	310773.94	1575251.51	N 39 20 36.64	W 81 0 6.82
	10186.00	90.55	320.02	6352.67	5215.11	4096.19	3222.14	-2530.07	0.40	0.35	0.19	310847.40	1575189.72	N 39 20 37.35	W 81 0 7.63
	10282.00	90.24	319.44	6352.01	5214.45	4192.17	3295.38	-2592.12	0.69	-0.32	-0.60	310920.64	1575127.67	N 39 20 38.07	W 81 0 8.43
	10377.00	90.14	319.37	6351.70	5214.14	4287.13	3367.52	-2653.93	0.13	-0.11	-0.07	310992.77	1575065.86	N 39 20 38.77	W 81 0 9.23
	10473.00	90.34	319.88	6351.29	5213.73	4383.11	3440.65	-2716.12	0.57	0.21	0.53	311065.90	1575003.67	N 39 20 39.48	W 81 0 10.04
	10568.00	90.28	319.62	6350.78	5213.22	4478.09	3513.16	-2777.50	0.28	-0.06	-0.27	311138.40	1574942.30	N 39 20 40.19	W 81 0 10.84
	10664.00	90.24	319.45	6350.34	5212.78	4574.06	3586.19	-2839.80	0.18	-0.04	-0.18	311211.44	1574880.00	N 39 20 40.90	W 81 0 11.65
	10750.00	90.28	319.70	6349.91	5212.35	4669.03	3658.51	-2901.41	0.27	0.04	0.26	311283.75	1574818.40	N 39 20 41.60	W 81 0 12.45
	10855.00	90.38	319.40	6349.36	5211.80	4765.00	3731.57	-2963.69	0.33	0.10	-0.31	311356.80	1574756.12	N 39 20 42.31	W 81 0 13.25
	10950.00	89.69	319.53	6349.30	5211.74	4859.97	3803.77	-3025.43	0.74	-0.73	0.14	311429.00	1574694.38	N 39 20 43.02	W 81 0 14.05
	11046.00	90.07	319.69	6349.50	5211.94	4955.95	3876.88	-3087.64	0.43	0.40	0.17	311502.11	1574632.18	N 39 20 43.73	W 81 0 14.86
	11142.00	90.24	320.91	6349.24	5211.68	5051.94	3950.74	-3148.96	1.28	0.18	1.27	311575.97	1574570.86	N 39 20 44.45	W 81 0 15.66
	11238.00	90.07	321.43	6348.98	5211.42	5147.94	4025.53	-3209.15	0.57	-0.18	0.54	311650.75	1574510.67	N 39 20 45.18	W 81 0 16.44
	11334.00	90.62	321.93	6348.41	5210.85	5243.93	4100.85	-3268.67	0.77	0.57	0.52	311726.06	1574451.15	N 39 20 45.91	W 81 0 17.21
	11429.00	90.38	322.23	6347.58	5210.02	5338.90	4175.78	-3327.05	0.40	-0.25	0.32	311801.00	1574392.77	N 39 20 46.64	W 81 0 17.97
	11525.00	90.31	321.59	6347.00	5209.44	5434.89	4251.34	-3386.27	0.67	-0.07	-0.67	311876.55	1574333.55	N 39 20 47.38	W 81 0 18.74
	11621.00	90.48	322.04	6346.34	5208.78	5530.87	4326.79	-3445.62	0.50	0.18	0.47	311952.00	1574274.21	N 39 20 48.12	W 81 0 19.51
	11716.00	90.52	321.82	6345.51	5207.95	5625.85	4401.58	-3504.20	0.24	0.04	-0.23	312026.78	1574215.64	N 39 20 48.85	W 81 0 20.28
	11811.00	90.17	320.33	6344.94	5207.38	5720.85	4475.48	-3563.88	1.61	-0.37	-1.57	312100.68	1574155.95	N 39 20 49.57	W 81 0 21.05
	11907.00	90.31	321.29	6344.53	5206.97	5816.84	4549.89	-3624.54	1.01	0.15	1.00	312175.08	1574095.30	N 39 20 50.29	W 81 0 21.84
	12003.00	90.27	320.91	6344.05	5206.49	5912.84	4624.60	-3684.83	0.40	-0.04	-0.40	312249.79	1574035.01	N 39 20 51.02	W 81 0 22.62
	12098.00	90.03	322.31	6343.60	5206.24	6007.83	4699.06	-3743.82	1.50	-0.25	1.47	312324.25	1573978.02	N 39 20 51.75	W 81 0 23.39
	12194.00	89.21	319.94	6344.44	5206.88	6103.82	4773.79	-3804.07	2.61	-0.85	-2.47	312398.97	1573915.78	N 39 20 52.48	W 81 0 24.17
	12289.00	88.66	317.50	6346.20	5208.64	6198.73	4845.16	-3866.73	2.63	-0.58	-2.57	312470.34	1573853.12	N 39 20 53.17	W 81 0 24.98
	12385.00	88.69	317.79	6348.42	5210.86	6294.55	4916.09	-3931.39	0.30	0.03	0.30	312541.26	1573788.47	N 39 20 53.86	W 81 0 25.82
	12480.00	89.52	318.83	6349.91	5212.35	6389.44	4987.02	-3994.56	1.40	0.87	1.09	312612.19	1573725.30	N 39 20 54.55	W 81 0 26.64
	12576.00	89.52	319.27	6350.71	5213.15	6485.38	5059.52	-4057.48	0.46	0.00	0.46	312684.69	1573662.38	N 39 20 55.26	W 81 0 27.46
	12671.00	90.45	319.57	6350.74	5213.18	6580.35	5131.67	-4119.28	1.03	0.98	0.32	312756.84	1573600.59	N 39 20 55.96	W 81 0 28.26
	12766.00	90.69	319.67	6349.79	5212.23	6675.32	5204.04	-4180.82	0.27	0.25	0.11	312829.20	1573539.05	N 39 20 56.66	W 81 0 29.06
	12862.00	90.72	319.94	6348.61	5211.05	6771.30	5277.36	-4242.77	0.28	0.03	0.28	312902.52	1573477.10	N 39 20 57.38	W 81 0 29.86
	12956.00	90.79	319.72	6347.37	5209.81	6865.27	5349.18	-4303.40	0.25	0.07	-0.23	312974.34	1573416.47	N 39 20 58.08	W 81 0 30.65
	13052.00	90.21	319.49	6346.53	5208.97	6961.24	5422.29	-4365.61	0.65	-0.60	-0.24	313047.45	1573354.26	N 39 20 58.79	W 81 0 31.46
	13148.00	90.21	319.13	6346.18	5208.62	7057.20	5495.08	-4428.20	0.37	0.00	-0.38	313120.23	1573291.68	N 39 20 59.50	W 81 0 32.27
	13243.00	89.66	318.92	6346.29	5208.73	7152.15	5566.81	-4490.49	0.62	-0.58	-0.22	313191.95	1573229.39	N 39 21 0.20	W 81 0 33.08
	13339.00	89.69	318.66	6346.83	5209.27	7248.08	5639.03	-4553.74	0.27	0.03	-0.27	313264.17	1573166.14	N 39 21 0.90	W 81 0 33.90
	13434.00	89.66	318.75	6347.37	5209.81	7343.01	5710.40	-4616.43	0.10	-0.03	0.09	313335.54	1573103.45	N 39 21 1.60	W 81 0 34.71
	13530.00	89.69	318.83	6347.92	5210.36	7438.95	5782.62	-4679.68	0.09	0.03	0.08	313407.76	1573040.21	N 39 21 2.30	W 81 0 35.53
	13625.00	89.62	318.66	6348.49	5210.93	7533.88	5854.04	-4742.32	0.19	-0.07	-0.18	313479.17	1572977.57	N 39 21 2.99	W 81 0 36.34
	13721.00	89.62	318.38	6349.13	5211.57	7629.79	5925.96	-4805.91	0.29	0.00	-0.29	313551.09	1572913.99	N 39 21 3.69	W 81 0 37.17
	13817.00	89.62	318.81	6349.76	5212.20	7725.71	5997.96	-4869.40	0.45	0.00	0.45	313623.09	1572850.50	N 39 21 4.40	W 81 0 37.99
	13912.00	89.69	318.77	6350.33	5212.77	7820.64	6069.43	-4931.98	0.08	0.07	-0.04	313694.55	1572787.92	N 39 21 5.09	W 81 0 38.80
	14008.00	89.72	318.90	6350.83	5213.27	7916.58	6141.70	-4995.17	0.14	0.03	0.14	313766.82	1572724.73	N 39 21 5.80	W 81 0 39.62
	14104.00	89.66	318.77	6351.35	5213.79	8012.51	6213.97	-5058.36	0.15	-0.06	-0.14	313839.08	1572661.55	N 39 21 6.50	W 81 0 40.44
	14196.00	91.00	320.88	6350.81	5213.25	8106.49	6285.79	-5119.00	2.66	1.43	2.24	313910.90	1572600.91	N 39 21 7.20	W 81 0 41.23
	14292.00	90.79	321.21	6349.34	5211.78	8200.48	6358.88	-5178.09	0.42	-0.22	0.35	313983.98	1572541.82	N 39 21 7.91	W 81 0 42.00
	14387.00	90.62	322.57	6348.17	5210.61	8295.45	6433.62	-5236.72	1.44	-0.18	1.43	314058.72	1572483.20	N 39 21 8.64	W 81 0 42.78
	14481.00	90.65	322.67	6347.13	5209.57	8389.41	6508.31	-5293.78	0.11	0.03	0.11	314133.41	1572426.14	N 39 21 9.37	W 81 0 43.50
Last MWD Survey	14576.00	90.17	322.89	6346.45	5208.89	8484.35	6583.95	-5351.24	0.56	-0.51	0.23	314209.05	1572368.68	N 39 21 10.11	W 81 0 44.25
Proj to TD	14670.00	90.17	322.89	6346.17	5208.61	8578.30	6658.92	-5407.96	0.00	0.00	0.00	314284.01	1572311.97	N 39 21 10.84	W 81 0 44.99

Survey Type: Non-Def Survey

Survey Error Model: ISCWSA Rev 0 *** 3-D 95.000% Confidence 2.7955 sigma

Survey Program:

Description	Part	MD From (ft)	MD To (ft)	EOU Freq (ft)	Hole Size (in)	Casing Diameter (in)	Survey Tool Type	Borehole / Survey
	1	0.000	25.510	Act Stns	30.000	30.000	SLB_NSG+MSHOT-Depth Only	Original Borehole / Noble Energy PENS1HHS Gyro+MWD 0' MD to update
	1	25.510	636.000	Act Stns	30.000	30.000	SLB_NSG+MSHOT	Original Borehole / Noble Energy PENS1HHS Gyro+MWD 0' MD to
	1	636.000	14670.000	Act Stns	30.000	30.000	SLB_MWD-STD	Original Borehole / Noble Energy PENS1HHS Gyro+MWD 0' MD to

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NOV 21 2014

12/05/2014

85-10033

PATHFINDER
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Noble Energy

noble energy

Borehole:	Well:	Field:	Structure:
Original Borehole	PENS1HHS	WV Ritchie County (NAD27)	Nomac 78

Gravity & Magnetic Parameters

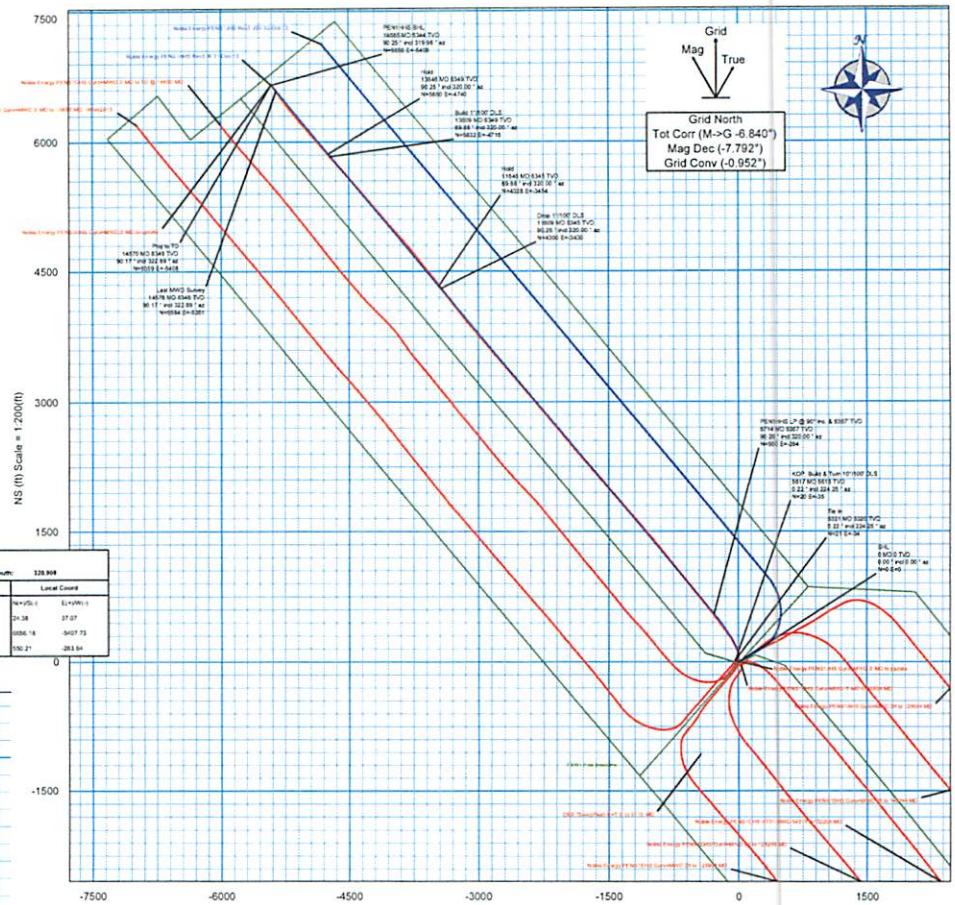
Model:	HDGM 2013	Dip:	66.903°	Date:	8/23/2013
MagDec:	-7.792°	FS:	52330.547nT	Gravity FS:	999.396mgn (9.80665 Based)

Surface Location NAD27 West Virginia State Plane, Northern Zone, US Feet

Lat:	N 39 20 5.93	Northing:	307625.416ftUS	Grid Conv:	-0.952°
Lon:	W 80 59 34.75	Easting:	1577719.664ftUS	Scale Fact:	1

Miscellaneous

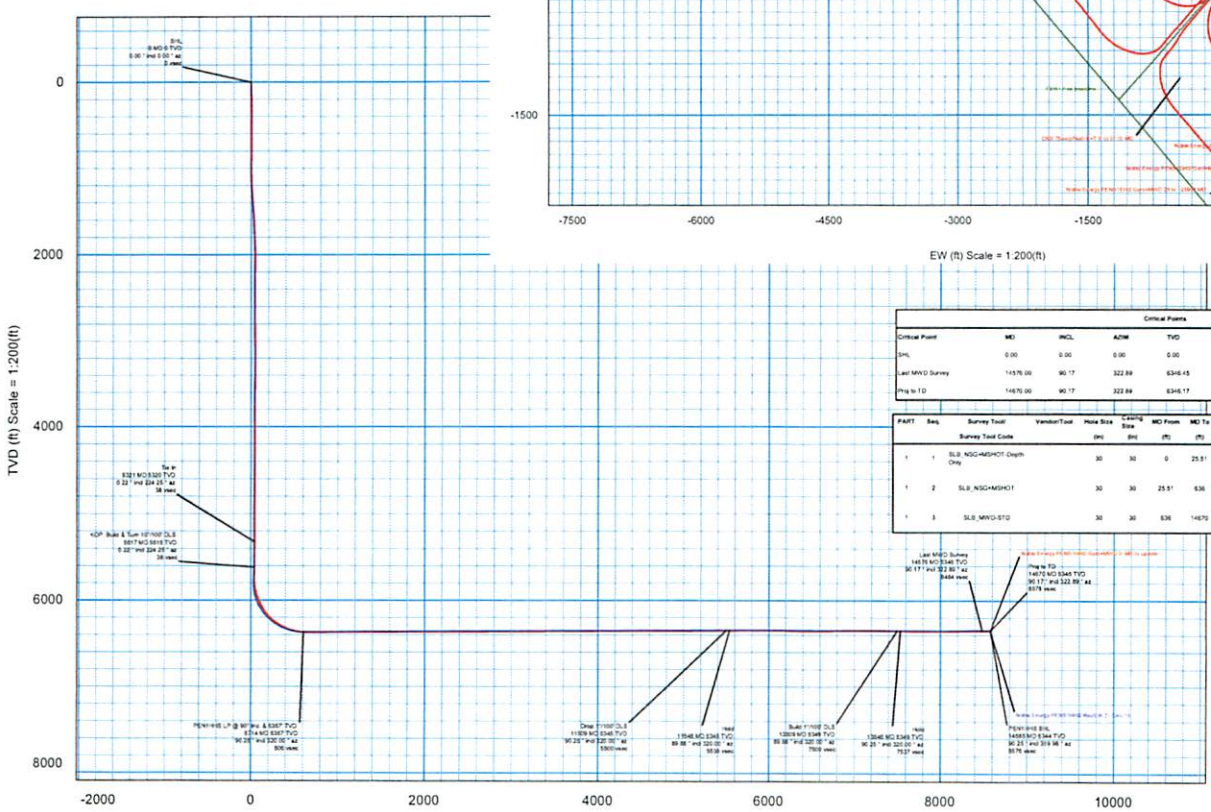
Slot: PENS1HHS TVD Ref: KB(1137.56ft above MSL)
Plan: Noble Energy PENS1HHS Gyro+MWD 0' MD to update



Surface Location

Northing: 307625.416 Easting: 1577719.664 Latitude: N 39 20 5.93 Longitude: W 80 59 34.75 VSec Azimuth: 320.908

Target Description			Grid Coord						Local Coord	
Target Name	Shape	Dimension	Latitude	Longitude	Northing	Easting	TVD	VSec	N(+)/S(-)	E(+)/W(-)
PEN1 Pad baseline	Polyline	N/A	N 39 20 8.17	W 80 59 34.28	307649.79	1577756.73	1137.56	-4.46	24.38	37.07
PEN1HHS BHL	Point	N/A	N 39 21 10.81	W 81 0 44.98	314291.28	1573312.20	6282.50	8576.03	6686.16	-5407.73
PEN1HHS LP	Point	N/A	N 39 20 11.32	W 80 59 38.47	308175.60	1577436.94	6282.50	505.89	550.21	-283.64



Critical Points

Critical Point	MD	INCL	AZIM	TVD	VSEC	N(+)/S(-)	E(+)/W(-)	DLS
SHL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Last MWD Survey	14576.00	90.17	322.89	6346.45	8484.35	6583.95	-5351.24	0.56
Plug to TD	14670.00	90.17	322.89	6346.17	8578.30	6658.92	-5407.96	0.00

PART	Seq.	Survey Tool/ Survey Tool Code	Vendor/Tool	Hole Size (in)	Casing Size (in)	MD From (ft)	MD To (ft)	Survey Frequency (ft)	EOU Size (Semi Major) (ft)	EOU Size (Semi Minor) (ft)	Comments/ Contingency
1	1	SLB_NSG+MSHOT-Depth Only		30	30	0	25.51	Act Srvs	1.25	1.25	
1	2	SLB_NSG+MSHOT		30	30	25.51	636	Act Srvs	2.06	2.02	
1	3	SLB_MWD-STD		30	30	636	14670	Act Srvs	242.94	8.13	

12/05/2014