

# Noble Energy SHL-26D-HS Gyro+MWD 0ft to 16108ft MD Survey Report

(Def Survey)

Report Date: December 10, 2013 - 10:20 AM  
 Client: Noble Energy  
 Field: WV Marshall County (NAD 27)  
 Structure / Slot: Noble Energy SHL-26D-HS / SHL-26D-HS  
 Well: SHL-26D-HS  
 Borehole: Original Borehole  
 UWI / API# : Unknown / Unknown  
 Survey Name: Noble Energy SHL-26D-HS Gyro+MWD 0ft to 16108ft MD  
 Survey Date: November 22, 2013  
 Tilt / AHD / ODI / ERO Ratio: 297.079 / 11020.897 ft / 6.888 / 1.645  
 Coordinate Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet  
 Location Lat / Long: N 39° 58' 23.61422", W 80° 32' 54.27486"  
 Location Grid N/E Y/D: N 538304.570 ftUS, E 1706170.683 ftUS  
 CRS Grid Convergence Angle: -0.6686 °  
 Grid Scale Factor: 0.99996907  
 Version / Patch: 2.7.998.0

Survey / DLS Computation: Minimum Curvature / Lubinski  
 Vertical Section Azimuth: 339.997 ° (Grid North)  
 Vertical Section Origin: 0.000 ft 0.000 ft  
 TVD Reference Datum: KB  
 TVD Reference Elevation: 1331.690 ft above MSL  
 Seabed / Ground Elevation: 1309.180 ft above MSL  
 Magnetic Declination: -8.413 °  
 Total Gravity Field Strength: 999.3453mgals (9.80665 Based)  
 Gravity Model: GARM  
 Total Magnetic Field Strength: 53134.650 nT  
 Magnetic Dip Angle: 67.516 °  
 Declination Date: November 22, 2013  
 Magnetic Declination Model: HDGM 2013  
 North Reference: Grid North  
 Grid Convergence Used: -0.6686 °  
 Total Corr Mag North-Grid: -7.7443 °  
 North: -7.7443 °  
 Local Coord Reference To: Well Head

Comments	MD (ft)	Incl (°)	Azin Grid (°)	TVD (ft)	TVDOSS (ft)	YSEC (ft)	NS (ft)	EW (ft)	DLS (ft/100ft)	BR (ft/100ft)	TR (ft/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S °'")	Longitude (E/W °'")	Directional Difficulty Index
SHL	0.00	0.00	0.00	0.00	-1331.69	0.00	0.00	0.00	N/A	N/A	N/A	538304.57	1706170.68	N 39 58 23.61 W	80 32 54.27	0.00
	123.00	0.25	104.06	123.00	-1209.66	-0.15	-0.07	0.26	0.20	0.20	0.00	538304.50	1706170.94	N 39 58 23.61 W	80 32 54.27	0.00
	223.00	0.31	140.41	223.00	-1108.89	-0.53	-0.33	0.84	0.18	0.06	36.35	538304.24	1706171.33	N 39 58 23.61 W	80 32 54.27	0.00
	323.00	0.41	149.48	323.00	-1008.89	-1.13	-0.64	1.00	0.11	0.10	9.07	538303.73	1706171.68	N 39 58 23.61 W	80 32 54.26	0.00
	423.00	0.35	164.95	422.99	-908.90	-1.79	-1.45	1.26	0.12	-0.05	15.47	538303.12	1706171.94	N 39 58 23.60 W	80 32 54.26	0.13
	523.00	0.51	170.47	522.99	-808.90	-2.53	-2.18	1.41	0.17	0.16	5.52	538302.39	1706172.10	N 39 58 23.59 W	80 32 54.26	0.36
	623.00	0.29	173.26	622.99	-708.90	-3.22	-2.87	1.52	0.22	-0.22	2.79	538301.70	1706172.20	N 39 58 23.59 W	80 32 54.25	0.56
	723.00	0.34	190.91	722.99	-608.90	-3.72	-3.41	1.49	0.11	0.05	17.65	538301.16	1706172.17	N 39 58 23.58 W	80 32 54.26	0.67
	823.00	0.10	254.46	822.99	-508.90	-3.96	-3.73	1.35	0.31	-0.24	63.55	538300.84	1706172.03	N 39 58 23.58 W	80 32 54.26	0.81
	923.00	0.05	307.84	922.99	-408.90	-3.97	-3.72	1.23	0.09	-0.05	53.38	538300.85	1706171.91	N 39 58 23.58 W	80 32 54.26	0.84
	1023.00	0.13	330.48	1022.99	-308.90	-3.77	-3.68	1.14	0.09	0.08	22.62	538300.97	1706171.82	N 39 58 23.58 W	80 32 54.26	0.88
	1123.00	0.17	334.55	1122.99	-208.90	-3.51	-3.37	1.02	0.04	0.04	4.09	538301.20	1706171.70	N 39 58 23.58 W	80 32 54.26	0.92
	1223.00	0.27	337.49	1222.99	-108.90	-3.13	-3.01	0.87	0.10	0.10	2.94	538301.56	1706171.55	N 39 58 23.58 W	80 32 54.26	0.97
	1323.00	0.42	334.20	1322.98	-8.91	-2.44	-2.39	0.58	0.25	0.25	-3.29	538302.18	1706171.20	N 39 58 23.56 W	80 32 54.27	1.08
	1423.00	0.62	341.01	1422.98	91.09	-1.62	-1.63	0.26	0.11	-0.10	6.81	538302.94	1706170.95	N 39 58 23.60 W	80 32 54.27	1.16
	1523.00	0.36	353.91	1522.98	191.09	0.95	-0.97	0.11	-0.06	-0.06	12.90	538303.60	1706170.79	N 39 58 23.60 W	80 32 54.27	1.23
	1623.00	0.49	370.80	1622.97	291.08	-0.28	-0.24	0.16	0.18	0.13	16.80	538304.33	1706170.64	N 39 58 23.61 W	80 32 54.27	1.30
	1723.00	0.71	333.75	1722.97	391.08	0.45	0.09	0.58	0.32	0.22	22.95	538305.28	1706171.20	N 39 58 23.62 W	80 32 54.27	1.41
	1823.00	0.48	54.25	1822.96	491.07	0.93	1.45	1.26	0.31	-0.29	20.50	538306.02	1706171.99	N 39 58 23.63 W	80 32 54.26	1.50
	1923.00	0.86	40.46	1922.96	591.07	1.42	2.28	2.10	0.43	0.40	-13.79	538306.85	1706172.79	N 39 58 23.64 W	80 32 54.25	1.60
	2023.00	0.67	22.43	2022.95	691.06	2.23	3.41	2.82	0.32	-0.21	-18.03	538307.98	1706173.61	N 39 58 23.65 W	80 32 54.24	1.69
	2123.00	0.71	359.77	2122.94	791.05	3.25	4.57	3.05	0.27	0.04	-22.66	538309.14	1706173.73	N 39 58 23.66 W	80 32 54.24	1.78
	2223.00	0.58	359.91	2222.93	891.04	4.31	5.68	3.04	0.13	-0.13	0.14	538310.26	1706173.72	N 39 58 23.67 W	80 32 54.24	1.86
	2323.00	0.47	358.60	2322.93	991.04	5.17	6.61	-1.03	0.11	-0.11	-1.41	538311.10	1706173.71	N 39 58 23.68 W	80 32 54.24	1.84
	2423.00	0.34	331.94	2422.93	1091.04	5.86	7.28	2.88	0.23	-0.13	-26.56	538311.85	1706173.50	N 39 58 23.69 W	80 32 54.24	1.88
	2523.00	0.36	346.92	2522.93	1191.04	6.48	7.85	2.67	0.09	0.02	14.58	538312.42	1706173.35	N 39 58 23.69 W	80 32 54.24	1.91
	2623.00	0.30	344.61	2622.92	1291.03	7.03	8.41	2.53	0.06	-0.06	-2.31	538312.98	1706173.21	N 39 58 23.70 W	80 32 54.24	1.93
	2723.00	0.22	326.75	2722.92	1391.03	7.48	8.82	2.35	0.11	-0.08	-17.86	538313.39	1706173.04	N 39 58 23.70 W	80 32 54.25	1.95
	2823.00	0.14	302.60	2822.92	1491.03	7.77	9.05	2.15	0.11	-0.08	-24.15	538313.62	1706172.83	N 39 58 23.70 W	80 32 54.25	1.96
	2923.00	0.13	306.92	2922.92	1591.03	7.96	9.19	1.95	0.01	-0.01	-4.22	538313.75	1706172.64	N 39 58 23.71 W	80 32 54.25	1.97
	3023.00	0.26	308.32	3022.92	1691.02	8.25	9.39	1.68	0.13	0.13	-1.40	538313.96	1706172.37	N 39 58 23.71 W	80 32 54.25	1.99
	3123.00	0.17	282.70	3122.92	1791.02	8.52	9.56	1.36	0.13	-0.09	-25.62	538314.13	1706172.04	N 39 58 23.71 W	80 32 54.26	2.01
	3188.00	0.19	267.72	3187.92	1856.03	8.60	9.58	1.16	0.09	0.03	-23.05	538314.15	1706171.84	N 39 58 23.71 W	80 32 54.28	2.02
	3297.00	0.29	286.52	3296.92	1965.03	8.62	9.65	0.71	0.12	0.09	-17.25	538314.22	1706171.40	N 39 58 23.71 W	80 32 54.27	2.04
	3392.00	1.56	38.04	3391.91	2069.02	9.65	10.74	1.28	1.78	1.34	117.39	538315.31	1706171.99	N 39 58 21.72 W	80 32 54.20	2.18
	3487.00	1.43	29.41	3486.88	2154.99	11.11	12.79	2.68	0.27	-0.14	-9.08	538317.36	1706173.34	N 39 58 23.74 W	80 32 54.24	2.25
	3581.00	4.14	43.56	3580.76	2248.67	13.38	16.27	5.57	2.95	2.88	15.05	538320.84	1706170.20	N 39 58 23.76 W	80 32 54.21	2.46
	3675.00	11.10	40.88	3673.87	2341.98	10.33	25.60	13.82	7.41	7.40	-3.08	538330.17	1706168.50	N 39 58 23.87 W	80 32 54.10	2.85
	3770.00	15.94	45.88	3766.21	2434.32	29.14	41.63	29.18	5.25	5.09	5.47	538346.20	1706169.64	N 39 58 24.03 W	80 32 53.91	3.14

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Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (ft/100ft)	BR (ft/100ft)	TR (ft/100ft)	Northing (ft)	Easting (ft)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")	Directional Difficulty Index
	14528.00	91.12	323.36	6665.33	5333.44	7511.38	7201.20	-2176.73	0.67	-0.33	0.59	545505.46	1703904.04	N 39 59 34.52 W	80 33 23.32	6.74
	14623.00	90.26	323.90	6664.19	5332.30	7602.52	7277.69	-2233.06	1.07	-0.01	0.57	545581.95	1703937.71	N 39 59 35.27 W	80 33 24.05	6.75
	14718.00	89.57	324.19	6664.33	5332.44	7603.88	7354.59	-2268.84	0.79	0.11	0.31	545658.84	1703881.94	N 39 59 36.03 W	80 33 24.78	6.76
	14812.00	89.57	324.30	6665.04	5333.15	7784.33	7430.87	-2343.77	0.12	0.00	0.12	545735.12	1703827.02	N 39 59 36.77 W	80 33 25.50	6.77
	14907.00	89.68	324.04	6665.67	5333.78	7875.73	7507.89	-2389.38	0.29	0.09	-0.27	545812.14	1703771.41	N 39 59 37.53 W	80 33 26.23	6.77
	15002.00	90.09	325.99	6665.88	5333.99	7987.49	7585.72	-2453.84	2.10	0.45	2.05	545889.96	1703718.94	N 39 59 38.29 W	80 33 26.94	6.78
	15096.00	89.43	327.68	6666.28	5334.39	8059.02	7664.40	-2505.26	1.93	-0.70	1.80	545968.64	1703665.53	N 39 59 39.06 W	80 33 27.61	6.79
	15101.00	88.71	324.51	6667.82	5335.93	8151.21	7743.23	-2558.24	3.42	-0.76	-3.34	546047.46	1703612.55	N 39 59 39.84 W	80 33 28.30	6.81
	15288.00	90.74	323.20	6668.27	5336.38	8242.46	7819.04	-2614.27	2.84	2.14	-1.38	546124.17	1703560.52	N 39 59 40.59 W	80 33 29.03	6.82
	15380.00	90.49	322.05	6667.26	5335.37	8332.16	7894.63	-2671.33	1.25	-0.27	-1.22	546168.88	1703499.47	N 39 59 41.32 W	80 33 29.78	6.82
	15475.00	90.20	321.29	6666.69	5334.80	8422.34	7969.15	-2730.25	0.60	-0.31	-0.80	546273.38	1703440.50	N 39 59 42.05 W	80 33 30.55	6.83
	15569.00	90.09	322.35	6666.45	5334.66	8511.05	8043.04	-2788.35	1.13	-0.12	1.13	546347.27	1703382.45	N 39 59 42.77 W	80 33 31.30	6.84
	15664.00	92.49	324.32	6664.32	5332.43	8602.83	8119.21	-2845.06	3.27	2.53	2.07	546423.44	1703325.75	N 39 59 43.52 W	80 33 32.04	6.85
	15758.00	89.84	326.12	6662.32	5330.43	8693.49	8196.39	-2898.66	3.32	-2.71	1.91	546500.61	1703272.15	N 39 59 44.27 W	80 33 32.74	6.86
	15853.00	89.40	326.30	6662.87	5330.98	8785.75	8275.35	-2951.49	0.60	-0.57	0.19	546579.56	1703219.32	N 39 59 45.05 W	80 33 33.44	6.87
	15948.00	90.14	330.18	6663.25	5331.36	8878.74	8356.10	-3001.48	4.16	0.78	4.03	546660.32	1703169.33	N 39 59 45.84 W	80 33 34.09	6.88
	16042.00	89.14	330.09	6663.84	5331.95	8971.34	8437.62	-3048.29	1.07	-1.06	-0.10	546741.83	1703122.52	N 39 59 46.64 W	80 33 34.70	6.89
Final Survey 09-Dec-13 PTB	16073.00	88.88	329.03	6664.38	5332.49	9001.83	8464.34	-3063.99	3.52	-0.84	-3.42	546766.55	1703106.82	N 39 59 46.90 W	80 33 34.01	6.89
	16108.00	88.88	329.03	6665.06	5333.17	9036.18	8404.35	-3082.00	0.00	0.00	0.00	546798.55	1703088.81	N 39 59 47.20 W	80 33 35.15	0.90

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Survey Type: 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	22 710	Act Sns	30.000	30.000	SLB_NSG+MSHOT-Depth Only	Original Borehole / Noble Energy SHL-26D-HS Gyro+MWD 0ft to 16108ft MD
	1	22 710	3188 000	Act Sns	30.000	30.000	SLB_NSG+MSHOT	Original Borehole / Noble Energy SHL-26D-HS Gyro+MWD 0ft to Original Borehole / Noble Energy
	1	3188 000	16073.000	Act Sns	30.000	30.000	SLB_MWD-STD	SHL-26D-HS Gyro+MWD 0ft to Original Borehole / Noble Energy
	1	16073 000	16108 000	Act Sns	30.000	30.000	SLB_BLND+TREND	SHL-26D-HS Gyro+MWD 0ft to

51-01661



# Noble Energy



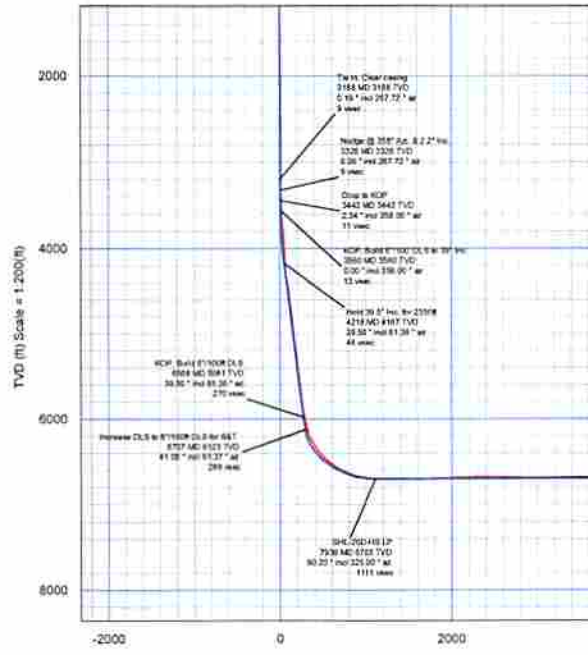
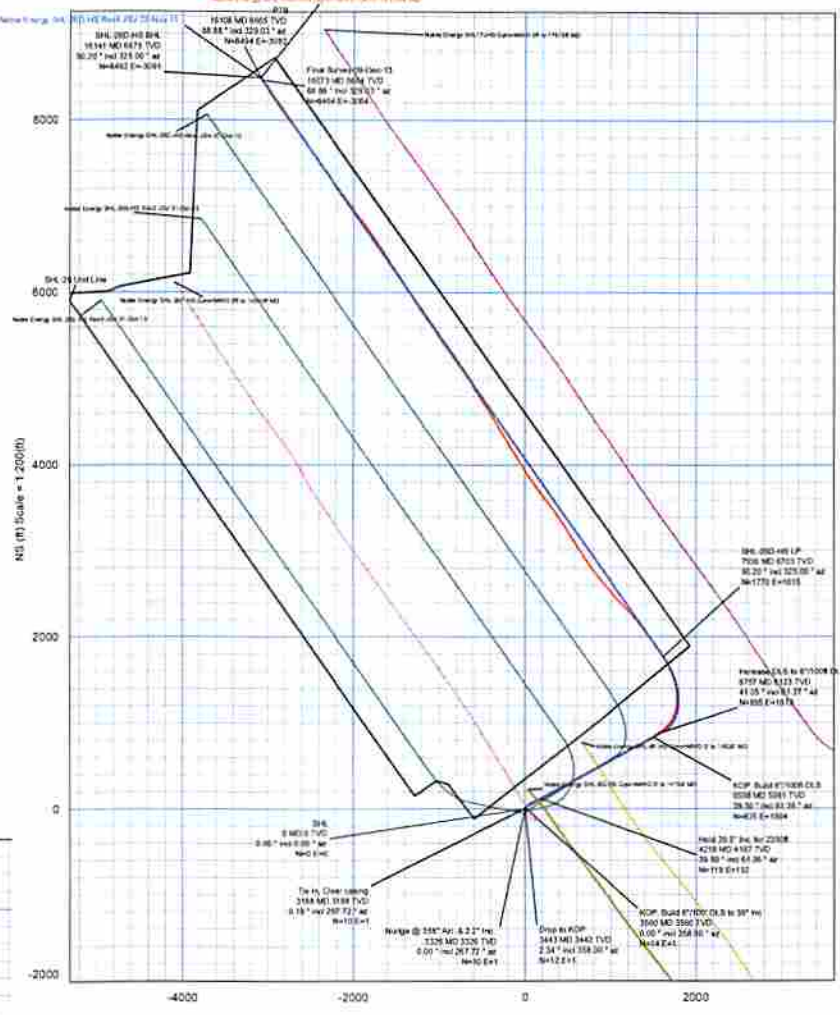
<b>Borehole:</b> Original Borehole	<b>Well:</b> SHL-26D-HS	<b>Field:</b> WV Marshall County (NAD 27)	<b>Structure:</b> Nabors M59
<b>Gravity &amp; Magnetic Parameters</b> Model: HDGM 2012 MagDec: -8.413°	Dip: 67.514° Date: 11/22/2012 Grav: 978.345mgals	<b>Surface Location</b> NADEP West Virginia State Plane, Northern Zone, US Feet Lat: N 39 58 23.81 Long: W 80 32 54.27	<b>Elevation</b> Elev: 541.200+HS TYD Ref: KN1331.891 above MSL Plan: Noble Energy SHL-26D-HS Gyro-MWD on to 141028 MD



Point	Log	Survey Code	Instrument	Start Date	End Date	MD from	MD to	Survey	MD from	MD to	Comments
1	1	SHL-26D-HS SHL	Survey	11/22/2012	11/22/2012	0	1000	SHL-26D-HS SHL	0	1000	
1	2	SHL-26D-HS SHL	Survey	11/22/2012	11/22/2012	0	1000	SHL-26D-HS SHL	0	1000	
1	3	SHL-26D-HS SHL	Survey	11/22/2012	11/22/2012	0	1000	SHL-26D-HS SHL	0	1000	
1	4	SHL-26D-HS SHL	Survey	11/22/2012	11/22/2012	0	1000	SHL-26D-HS SHL	0	1000	

Survey	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
SHL-26D-HS SHL	11/22/2012	11/22/2012	0	1000	0	1000	0	1000	0	1000	0	1000

Log Name	MD	MDL	MDH	MDL	MDH	MDL	MDH	MDL	MDH
SHL-26D-HS SHL	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00



Grid North  
 Tot Corr (M-G) = 7.744"  
 Mag Dec (-8.413°)  
 Grid Conv (+0.669")

Vertical Section (ft) Azim = 339.997° Scale = 1:200(ft) Origin = 0N1-S, 0E1-W