

51-01639



Noble Energy SHL13BHS Gyro+MWD 0ft to 13685ft MD Survey Report



(Def Survey)

Report Date: November 11, 2013 - 08:09 AM
Client: Noble Energy
Field: WV Marshall County (NAD 27)
Structure / Slot: Noble Energy SHL 13 Pad / SHL 13BHS
Well: SHL 13BHS
Borehole: Original Borehole
UWI / API#: Unknown / Unknown
Survey Name: Noble Energy SHL 13BHS Gyro+MWD 0ft to 13685ft MD
Survey Date: October 24, 2013
Tort / AHD / DD / ERD Ratio: 350 569 / 7542 564 R / 6 729 / 1 113
Coordinate Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long: N 40° 0' 14.7105" W 80° 32' 8.73348"
Location Grid NE YX: N 540502 976 RUJ, E 1709645 537 RIUS
CRS Grid Convergence Angle: -0.6606 °
Grid Scale Factor: 0.9999247
Version / Patch: 2.7.998.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 219.627 ° (Grid North)
Vertical Section Origin: 0 000 0, 0 000 0
TVD Reference Datum: KB
TVD Reference Elevation: 1500 450 ft above MSL
Sasab / Ground Elevation: 1281 010 ft above MSL
Magnetic Declination: -8.431 °
Total Gravity Field Strength: 999.3406mg (0.0055 Based)
Gravity Model: GARM
Total Magnetic Field Strength: 53175.298 nT
Magnetic Dip Angle: 67.582 °
Declination Date: October 24, 2013
Magnetic Declination Model: HDGM 2013
North Reference: Grid North
Grid Convergence Used: -0.6600 °
Total Corr Mag North-Grid North: -7.7701 °
Local Corq Referenced To: Well Head

Table with columns: Comments, MD (ft), Incl (°), Azim Grid (°), TVD (ft), TVDSS (ft), VSEC (ft), NS (ft), EW (ft), DR (ft), BR (ft), TR (ft), Northing (ft), Easting (ft), Latitude (N/S °), Longitude (E/W °), Directional Difficulty Index. Rows contain survey data points for well SHL 13BHS.

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| Comments | MD (ft) | Incl (°) | Azim Grid (°) | TYD (ft) | TVDS (ft) | VSEC (ft) | NS (ft) | EW (ft) | DL3 (ft/1000) | BR (ft/1000) | TR (ft/1000) | Northing (ft) | Easting (ft) | Latitude (N/S) | Longitude (E/W) | Directional Difficulty Index |
|----------|----------|----------|---------------|----------|-----------|-----------|---------|----------|---------------|--------------|--------------|---------------|--------------|----------------|-----------------|------------------------------|
| | 7064.00 | 70.64 | 316.66 | 6725.73 | 5435.28 | 302.94 | -148.54 | -440.02 | 9.30 | 7.24 | 7.87 | 549252.44 | 1709205.54 | N 40° 01.35' W | 80 32 18.94 | 5.18 |
| | 7109.00 | 73.27 | 312.28 | 6739.67 | 5438.22 | 345.33 | -117.03 | -471.72 | 8.08 | 5.84 | 5.84 | 549385.05 | 1709173.74 | N 40° 01.38' W | 80 32 17.35 | 5.19 |
| | 7154.00 | 78.71 | 316.95 | 6761.33 | 5450.68 | 388.02 | -87.41 | -402.75 | 9.55 | 7.64 | 5.83 | 549415.57 | 1709142.82 | N 40° 01.37' W | 80 32 15.74 | 5.23 |
| | 7195.00 | 80.16 | 318.87 | 6759.55 | 5459.10 | 428.75 | -57.84 | -729.92 | 10.93 | 8.41 | 7.12 | 549445.14 | 1709115.65 | N 40° 01.40' W | 80 32 16.10 | 5.26 |
| | 7240.00 | 83.21 | 320.53 | 6768.05 | 5465.00 | 473.27 | -23.83 | -758.71 | 7.70 | 9.78 | 3.89 | 549478.00 | 1709088.86 | N 40° 01.43' W | 80 32 18.48 | 5.29 |
| | 7329.00 | 89.52 | 324.31 | 6771.69 | 5471.24 | 561.92 | 48.48 | -812.84 | 8.29 | 7.09 | 4.25 | 549542.44 | 1709032.73 | N 40° 01.50' W | 80 32 18.19 | 5.34 |
| | 7419.00 | 88.07 | 329.22 | 6772.80 | 5472.35 | 651.19 | 121.71 | -862.14 | 5.48 | -0.50 | 5.46 | 549624.69 | 1708983.43 | N 40° 01.58' W | 80 32 18.83 | 5.39 |
| | 7508.00 | 88.87 | 327.01 | 6774.40 | 5473.95 | 739.20 | 197.27 | -909.14 | 2.49 | -0.22 | -2.48 | 549700.24 | 1708936.43 | N 40° 01.55' W | 80 32 20.44 | 5.43 |
| | 7598.00 | 89.03 | 324.35 | 6775.53 | 5475.08 | 828.88 | 271.59 | -959.88 | 3.09 | 0.91 | -2.96 | 549774.55 | 1708885.70 | N 40° 01.72' W | 80 32 21.11 | 5.47 |
| | 7687.00 | 90.79 | 325.03 | 6775.18 | 5474.71 | 917.33 | 344.21 | -1011.32 | 1.45 | 1.24 | 0.78 | 549847.17 | 1708834.28 | N 40° 01.79' W | 80 32 21.78 | 5.51 |
| | 7777.00 | 90.89 | 325.13 | 6774.00 | 5473.55 | 1006.91 | 418.00 | -1062.83 | 0.18 | -0.11 | 0.11 | 549920.96 | 1708782.75 | N 40° 01.71' W | 80 32 22.45 | 5.54 |
| | 7868.00 | 90.72 | 324.34 | 6772.90 | 5472.45 | 1095.55 | 490.05 | -1114.21 | 0.89 | 0.00 | -0.89 | 549993.62 | 1708731.37 | N 40° 01.82' W | 80 32 23.12 | 5.57 |
| | 7959.00 | 90.72 | 322.72 | 6771.77 | 5471.32 | 1185.33 | 563.03 | -1167.70 | 1.80 | 0.00 | -1.80 | 550065.98 | 1708677.88 | N 40° 02.10' W | 80 32 23.82 | 5.60 |
| | 8045.00 | 90.24 | 320.03 | 6771.03 | 5470.58 | 1274.28 | 632.55 | -1223.25 | 3.07 | -0.54 | -3.02 | 550135.00 | 1708622.33 | N 40° 02.01' W | 80 32 24.55 | 5.63 |
| | 8135.00 | 90.72 | 318.71 | 6770.27 | 5469.82 | 1364.27 | 700.65 | -1281.65 | 1.56 | 0.53 | -1.47 | 550203.80 | 1708563.73 | N 40° 02.18' W | 80 32 25.31 | 5.68 |
| | 8224.00 | 90.41 | 314.48 | 6769.39 | 5468.94 | 1453.12 | 765.49 | -1342.99 | 4.77 | -0.35 | -4.75 | 550268.44 | 1708502.00 | N 40° 02.21' W | 80 32 26.10 | 5.69 |
| | 8314.00 | 90.24 | 316.09 | 6768.88 | 5468.43 | 1542.86 | 829.44 | -1408.31 | 1.80 | -0.19 | 1.79 | 550332.39 | 1708439.28 | N 40° 02.24' W | 80 32 26.90 | 5.72 |
| | 8403.00 | 90.58 | 322.33 | 6768.25 | 5467.80 | 1631.81 | 896.79 | -1464.43 | 7.02 | 0.38 | 7.01 | 550399.73 | 1708381.17 | N 40° 02.40' W | 80 32 27.68 | 5.75 |
| | 8493.00 | 91.10 | 326.91 | 6767.93 | 5467.48 | 1721.44 | 970.14 | -1516.52 | 5.12 | 0.58 | 5.09 | 550473.08 | 1708329.08 | N 40° 02.41' W | 80 32 28.38 | 5.78 |
| | 8583.00 | 90.38 | 321.87 | 6765.78 | 5465.31 | 1811.09 | 1043.28 | -1568.90 | 5.68 | -0.80 | -5.60 | 550546.22 | 1708278.70 | N 40° 02.45' W | 80 32 29.05 | 5.82 |
| | 8672.00 | 90.30 | 318.32 | 6765.47 | 5465.02 | 1900.07 | 1111.55 | -1623.98 | 4.01 | -0.42 | -3.89 | 550614.48 | 1708219.82 | N 40° 02.50' W | 80 32 29.79 | 5.84 |
| | 8762.00 | 90.96 | 324.02 | 6764.71 | 5464.26 | 1990.00 | 1181.82 | -1685.38 | 6.42 | 1.07 | 6.33 | 550684.55 | 1708163.21 | N 40° 02.59' W | 80 32 30.53 | 5.87 |
| | 8851.00 | 91.89 | 328.80 | 6762.50 | 5462.05 | 2078.51 | 1254.86 | -1732.89 | 3.29 | 1.04 | 3.12 | 550757.79 | 1708112.71 | N 40° 02.80' W | 80 32 31.19 | 5.90 |
| | 8941.00 | 90.03 | 330.90 | 6760.99 | 5460.54 | 2167.31 | 1331.55 | -1779.43 | 5.00 | -2.07 | 4.50 | 550834.78 | 1708060.18 | N 40° 02.76' W | 80 32 31.80 | 5.93 |
| | 9030.00 | 89.86 | 335.68 | 6761.08 | 5460.63 | 2253.77 | 1411.33 | -1819.44 | 5.35 | -0.19 | 5.35 | 550914.25 | 1708020.17 | N 40° 02.84' W | 80 32 32.32 | 5.95 |
| | 9120.00 | 89.78 | 338.56 | 6761.38 | 5460.93 | 2339.60 | 1494.24 | -1854.42 | 3.25 | -0.11 | 3.24 | 550991.10 | 1707981.19 | N 40° 02.85' W | 80 32 32.78 | 5.98 |
| | 9210.00 | 89.55 | 336.88 | 6761.92 | 5461.47 | 2425.14 | 1574.55 | -1888.53 | 1.90 | -0.23 | -1.89 | 551069.43 | 1707937.50 | N 40° 02.87' W | 80 32 33.23 | 6.00 |
| | 9299.00 | 90.34 | 333.62 | 6762.00 | 5461.55 | 2510.84 | 1656.33 | -1925.78 | 3.77 | 0.89 | -3.85 | 551141.24 | 1707819.83 | N 40° 03.00' W | 80 32 33.73 | 6.02 |
| | 9388.00 | 90.27 | 332.05 | 6761.53 | 5461.08 | 2597.48 | 1737.51 | -1966.42 | 1.77 | -0.08 | -1.76 | 551240.42 | 1707819.20 | N 40° 03.16' W | 80 32 34.26 | 6.04 |
| | 9478.00 | 90.27 | 331.37 | 6761.10 | 5460.65 | 2685.48 | 1816.76 | -2008.07 | 0.78 | 0.00 | -0.78 | 551319.86 | 1707836.55 | N 40° 03.32' W | 80 32 34.82 | 6.06 |
| | 9567.00 | 90.58 | 330.09 | 6760.03 | 5460.15 | 2772.81 | 1894.39 | -2052.58 | 1.44 | 0.12 | -1.44 | 551397.30 | 1707802.04 | N 40° 03.19' W | 80 32 35.33 | 6.07 |
| | 9657.00 | 90.07 | 324.18 | 6760.25 | 5459.80 | 2862.00 | 1969.98 | -2101.40 | 6.58 | -0.34 | -6.57 | 551472.85 | 1707744.22 | N 40° 03.38' W | 80 32 36.03 | 6.10 |
| | 9746.00 | 89.83 | 320.42 | 6760.32 | 5459.67 | 2950.89 | 2040.38 | -2155.62 | 4.23 | -0.27 | -4.22 | 551543.20 | 1707689.81 | N 40° 03.42' W | 80 32 36.74 | 6.12 |
| | 9836.00 | 90.55 | 323.83 | 6760.03 | 5459.58 | 3040.79 | 2111.39 | -2211.08 | 3.87 | 0.80 | 3.79 | 551614.26 | 1707634.56 | N 40° 03.51' W | 80 32 37.46 | 6.14 |
| | 9925.00 | 90.52 | 328.70 | 6759.19 | 5458.74 | 3129.35 | 2184.52 | -2261.78 | 3.22 | -0.63 | 3.22 | 551687.41 | 1707583.86 | N 40° 03.63' W | 80 32 38.12 | 6.18 |
| | 10015.00 | 90.58 | 325.20 | 6758.33 | 5457.88 | 3218.78 | 2259.09 | -2312.15 | 1.87 | 0.07 | -1.87 | 551761.97 | 1707533.48 | N 40° 03.78' W | 80 32 38.78 | 6.18 |
| | 10104.00 | 90.48 | 324.95 | 6757.51 | 5457.06 | 3307.39 | 2332.05 | -2363.10 | 0.30 | -0.11 | -0.28 | 551834.94 | 1707482.03 | N 40° 03.78' W | 80 32 39.45 | 6.19 |
| | 10194.00 | 90.55 | 328.18 | 6756.70 | 5456.25 | 3396.90 | 2406.28 | -2413.99 | 1.37 | 0.08 | 1.37 | 551909.10 | 1707431.84 | N 40° 03.80' W | 80 32 40.11 | 6.21 |
| | 10284.00 | 90.55 | 325.79 | 6756.78 | 5455.51 | 3486.34 | 2489.67 | -2464.34 | 0.45 | 0.11 | -0.43 | 551983.75 | 1707381.30 | N 40° 03.83' W | 80 32 40.77 | 6.22 |
| | 10373.00 | 89.83 | 319.04 | 6756.38 | 5454.93 | 3575.18 | 2551.36 | -2518.59 | 7.84 | -0.92 | -7.58 | 552054.23 | 1707327.05 | N 40° 03.82' W | 80 32 41.48 | 6.24 |
| | 10463.00 | 89.80 | 315.80 | 6756.59 | 5455.14 | 3665.10 | 2611.82 | -2578.48 | 3.60 | 0.08 | -3.80 | 552129.40 | 1707266.16 | N 40° 04.02' W | 80 32 42.27 | 6.26 |
| | 10552.00 | 89.87 | 313.12 | 6755.70 | 5455.25 | 3753.73 | 2679.95 | -2642.99 | 3.01 | 0.08 | -3.01 | 552202.82 | 1707202.95 | N 40° 04.08' W | 80 32 43.09 | 6.28 |
| | 10642.00 | 90.10 | 313.72 | 6755.64 | 5455.19 | 3843.20 | 2741.81 | -2708.38 | 0.88 | 0.14 | 0.87 | 552244.68 | 1707137.28 | N 40° 04.19' W | 80 32 43.94 | 6.29 |
| | 10732.00 | 90.52 | 316.01 | 6755.15 | 5454.70 | 3933.01 | 2808.71 | -2770.88 | 5.45 | 0.47 | 5.43 | 552309.58 | 1707074.87 | N 40° 04.32' W | 80 32 44.75 | 6.31 |
| | 10821.00 | 90.72 | 324.11 | 6754.19 | 5453.74 | 4021.80 | 2876.20 | -2826.23 | 6.18 | 0.22 | 6.18 | 552379.00 | 1707019.42 | N 40° 04.28' W | 80 32 45.48 | 6.33 |
| | 10911.00 | 90.58 | 323.71 | 6753.17 | 5452.72 | 4111.07 | 2948.92 | -2879.24 | 0.47 | -0.18 | -0.44 | 552451.78 | 1706966.41 | N 40° 04.31' W | 80 32 46.17 | 6.35 |
| | 11000.00 | 90.00 | 323.82 | 6752.72 | 5452.27 | 4200.44 | 3020.71 | -2931.84 | 0.66 | -0.85 | 0.12 | 552523.58 | 1706913.81 | N 40° 04.42' W | 80 32 46.86 | 6.36 |
| | 11090.00 | 90.07 | 323.62 | 6752.60 | 5452.21 | 4290.21 | 3093.26 | -2985.10 | 0.24 | 0.08 | -0.22 | 552598.11 | 1706860.56 | N 40° 04.49' W | 80 32 47.55 | 6.37 |
| | 11180.00 | 90.31 | 327.28 | 6752.38 | 5451.91 | 4379.73 | 3167.37 | -3038.13 | 4.08 | 0.27 | 4.07 | 552670.22 | 1706809.52 | N 40° 04.55' W | 80 32 48.22 | 6.39 |
| | 11269.00 | 90.41 | 324.64 | 6751.80 | 5451.35 | 4469.00 | 3245.20 | -3079.17 | 8.49 | 0.11 | 8.49 | 552748.05 | 1706760.49 | N 40° 04.62' W | 80 32 48.78 | 6.41 |
| | 11359.00 | 90.52 | 341.82 | 6751.07 | 5450.62 | 4552.14 | 3328.73 | -3112.53 | 7.53 | 0.12 | 7.53 | 552821.58 | 1706713.13 | N 40° 04.74' W | 80 32 49.23 | 6.43 |
| | 11448.00 | 90.55 | 338.39 | 6750.24 | 5449.79 | 4635.56 | 3412.35 | -3142.95 | 3.33 | 0.03 | -3.63 | 552895.19 | 1706670.71 | N 40° 04.68' W | 80 32 49.83 | 6.44 |
| | 11538.00 | 89.82 | 333.14 | 6750.11 | 5449.66 | 4721.98 | 3494.38 | -3179.88 | 5.92 | -1.03 | -5.83 | 552967.23 | 1706625.78 | N 40° 04.87' W | 80 32 50.12 | 6.48 |
| | 11627.00 | 90.89 | 331.20 | 6749.87 | 5449.42 | 4809.85 | 3573.09 | -3221.43 | 2.49 | -2.18 | -2.55 | 553075.93 | 1706584.24 | N 40° 04.94' W | 80 32 50.66 | 6.48 |
| | 11717.00 | 90.45 | 327.77 | 6748.97 | 5448.52 | 4897.51 | 3650.61 | -3267.12 | 3.82 | -0.27 | -3.81 | 553133.44 | 1706537.55 | N 40° 05.00' W | 80 32 51.26 | 6.49 |
| | 11806.00 | 89.14 | 324.25 | 6749.29 | 5448.84 | 4985.94 | 3724.39 | -3316.85 | 4.22 | -1.47 | -3.86 | 553227.22 | 1706485.80 | N 40° 05.12' W | 80 32 51.91 | 6.51 |
| | 11896.00 | 89.73 | 320.48 | 6749.18 | 5448.73 | 5075.81 | 3798.74 | -3371.89 | 4.02 | 0.68 | -3.97 | 553326.56 | 1706437.88 | N 40° 05.12' W | 80 32 52.63 | 6.52 |
| | 11985.00 | 89.80 | 317.43 | 6750.47 | 5450.02 | 5164.79 | 3882.96 | -3430.00 | 3.88 | 0.19 | -3.85 | 553385.78 | 1706415.07 | N 40° 05.24' W | 80 32 53.39 | 6.54 |
| | 12075.00 | 89.21 | 314.78 | 6751.16 | 5450.71 | 5254.61 | 3927.79 | -3482.41 | 3.06 | -0.77 | -2.97 | 553430.61 | 1706353.27 | N 40° 05.31' W | 80 32 54.20 | 6.55 |
| | 12165.00 | 89.82 | 314.41 | 6751.14 | 5450.69 | 5344.26 | 3990.97 | -3536.59 | 1.83 | -0.59 | -1.79 | 553483.79 | 1706289.16 | N 40° 05.33' W | 80 32 54.93 | 6.56 |
| | 12254.00 | 90.52 | 314.99 | 6750.02 | 5449.87 | 5433.90 | 4055.49 | -3592.73 | 0.68 | -0.31 | 0.60 | 5535 | | | | |

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Noble Energy



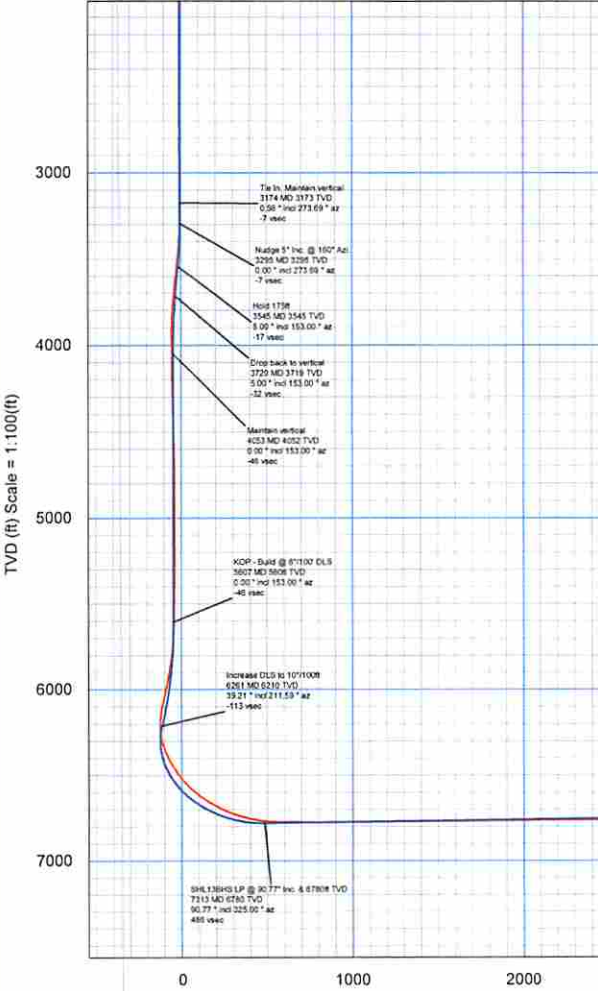
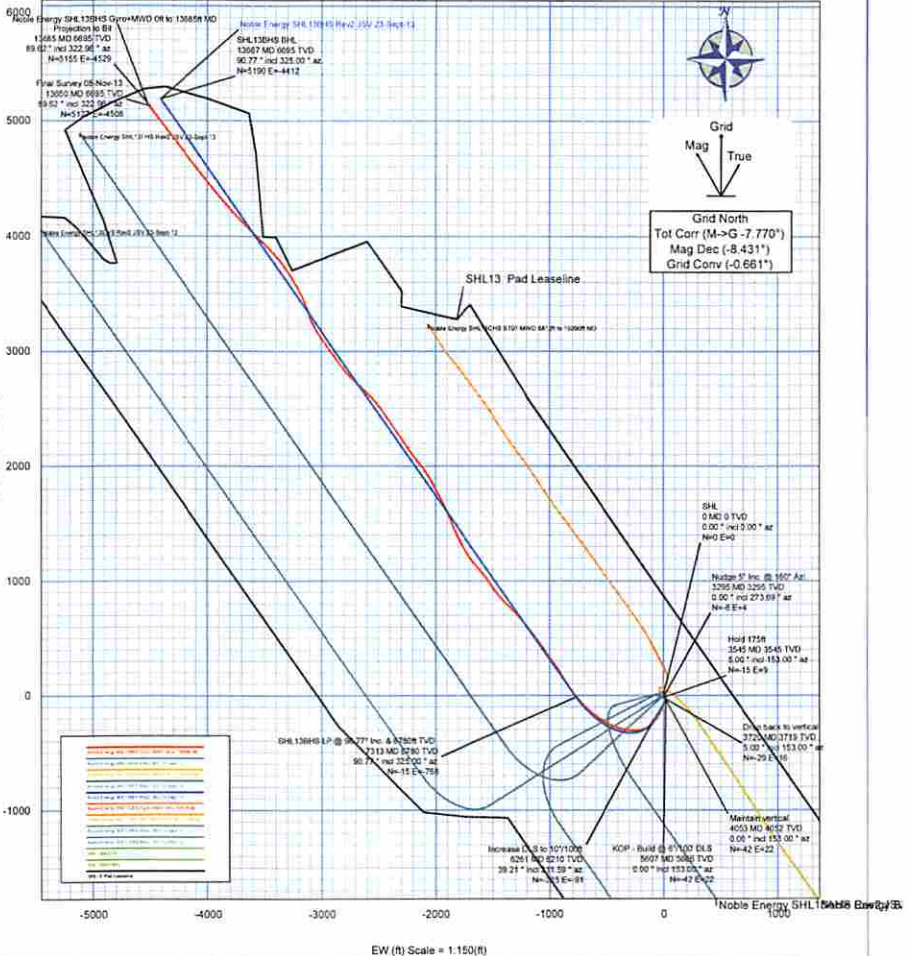
| | | | |
|--|--------------------------|---|------------------------------------|
| Borehole: Original Borehole | Well: SHL13BHS | Field: WV Marshall County (NAD 27) | Structure: Precision 543 |
| Gravity & Magnetic Parameters Mode: HDGM 2013 Dip: 67.582° Date: 10/24/2013 MagDec: -8.431° FS: 53175.238mT Gravity FS: 939.33-mg (9.80665 BaseM) | | Surface Location NAD27 West Virginia State Plane, Northern Zone, US Feet Lat: N 40 0 14.70 Northing: 549502.976MUS Grid Conv: -0.661° Lon: W 80 32 8.73 Easting: 1709845.537MUS Scale Fact: 1 Miscellaneours: Plan: Noble Energy SHL13BHS Gyro-MWD DR to 13655R MD | |

| Surface Location | | | | | | | | | |
|------------------|-------------|--------------|--------------|--------|--------|--------|--------|--------|--------|
| Northing | Easting | Latitude | Longitude | UIC | UIC | UIC | UIC | UIC | UIC |
| 549502.976 | 1709845.537 | N 40 0 14.70 | W 80 32 8.73 | 13655R | 13655R | 13655R | 13655R | 13655R | 13655R |

| Well Name | State | Dimension | Location | Longitude | Latitude | UIC | UIC | UIC | UIC | Low Control |
|-----------------|-------|--------------|---------------|-----------|------------|---------|---------|------------|---------|-------------|
| SHL13 Pad Lease | NA | W 42 0 14.38 | W 80 32 8.85 | 549501.04 | 1709846.71 | 136545 | 136545 | 136545 | 136545 | 8.82 |
| SHL13BHS BHL | NA | W 41 0 5.49 | W 80 33 8.21 | 549502.28 | 1709843.22 | 6800.00 | 6811.68 | 1709843.22 | 6811.68 | 447.24 |
| SHL13BHS LP | NA | W 41 0 17.44 | W 80 32 78.88 | 549497.87 | 1709817.58 | 6791.08 | 6811.68 | 1709817.58 | 6811.68 | 267.08 |

| Well Name | State | Dimension | Location | Longitude | Latitude | UIC | UIC | UIC | UIC | Low Control |
|-------------|-------|--------------|---------------|-----------|------------|---------|---------|------------|---------|-------------|
| SHL13BHS LP | NA | W 41 0 17.44 | W 80 32 78.88 | 549497.87 | 1709817.58 | 6791.08 | 6811.68 | 1709817.58 | 6811.68 | 267.08 |

| Well Name | State | Dimension | Location | Longitude | Latitude | UIC | UIC | UIC | UIC | Low Control |
|-------------|-------|--------------|---------------|-----------|------------|---------|---------|------------|---------|-------------|
| SHL13BHS LP | NA | W 41 0 17.44 | W 80 32 78.88 | 549497.87 | 1709817.58 | 6791.08 | 6811.68 | 1709817.58 | 6811.68 | 267.08 |



Vertical Section (ft) Azim = 319.627° Scale = 1:100(ft) Origin = 0N/-S, 0E/-W

10/31/2014