

51-01655



Noble Energy SHL13CHS ST01 MWD 5812ft to 10290ft MD Survey Geodetic



Report (Def Survey)

Report Date: October 11, 2013 - 11:42 AM
Client: Noble Energy
Field: WV Marshall County (NAD 27)
Structure / Slot: Noble Energy SHL13 Pad / SHL13CHS
Well: SHL13CHS
Borehole: ST01
UWI / API#: Unknown / Unknown
Survey Name: Noble Energy SHL13CHS ST01 MWD 5812ft to 10290ft MD
Survey Date: October 05, 2013
Tort / AHD / DDI / ERD Ratio: 204.777 \* 1/3996.036 ft / 0.091 / 0.585
Coordinate Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long: N 40° 0' 15.12105", W 80° 32' 8.91348"
Location Grid N/E Y/X: N 549545.933 NUS, E 17099332.021 NUS
CRS Grid Convergence Angle: -0.6506 \*
Grid Scale Factor: 0.99998249
Version / Patch: 2.7.998.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 327.496 \* (Grid North)
Vertical Section Origin: 0.000 ft, 0.000 ft
TVD Reference Datum: KB
TVD Reference Elevation: 1300.560 ft above MSL
Seabed / Ground Elevation: 1281.910 ft above MSL
Magnetic Declination: -8.429 \*
Total Gravity Field Strength: 999.4510mg (g 80965 Based)
Gravity Model: DOX
Total Magnetic Field Strength: 53182.243 nT
Magnetic Dip Angle: 67.537 \*
Declination Date: October 05, 2013
Magnetic Declination Model: HDGM 2013
North Reference: Grid North
Grid Convergence Used: -0.6506 \*
Total Corr Mag North->Grid North: -7.7694 \*
Local Coord Referenced To: Well Head

Table with columns: 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 (NUS), Easting (EUS), Latitude (N/S ° ' " ), Longitude (E/W ° ' " ). Rows include data points for MD values from 0.00 to 5770.00.

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| Comments         | MD (ft)  | Incl (°) | Asm Grid (°) | TVD (ft) | TVDSS (ft) | VSEC (ft) | NS (ft) | EW (ft)  | DLS (ft/100ft) | BR (ft/100ft) | TR (ft/100ft) | Northing (ftUS) | Easting (ftUS) | Latitude (N/S ° ' ") | Longitude (E/W ° ' ") |
|------------------|----------|----------|--------------|----------|------------|-----------|---------|----------|----------------|---------------|---------------|-----------------|----------------|----------------------|-----------------------|
|                  | 0752.00  | 52.95    | 332.90       | 6060.29  | 5359.73    | 288.10    | 313.55  | -44.09   | 12.08          | 12.04         | -1.10         | 540859.17       | 1700767.93     | N 40 0 18.21 W       | 80 32 9.53            |
|                  | 0767.00  | 57.87    | 332.47       | 6685.83  | 5385.27    | 324.98    | 348.45  | -61.09   | 10.96          | 10.93         | -0.96         | 540892.07       | 1700770.94     | N 40 0 18.54 W       | 80 32 9.75            |
|                  | 0841.00  | 61.48    | 332.50       | 6708.04  | 5407.48    | 382.81    | 380.13  | -78.83   | 8.20           | 8.20          | 0.07          | 540925.75       | 1700753.40     | N 40 0 18.87 W       | 80 32 9.98            |
|                  | 0856.00  | 65.48    | 331.24       | 6728.12  | 5427.50    | 422.05    | 415.83  | -67.82   | 9.26           | 8.91          | -2.80         | 540961.24       | 1700754.41     | N 40 0 19.22 W       | 80 32 10.23           |
|                  | 0931.00  | 69.89    | 330.03       | 6745.20  | 5444.84    | 444.51    | 451.00  | -118.03  | 10.09          | 9.78          | -2.89         | 540997.51       | 1700713.99     | N 40 0 19.57 W       | 80 32 10.50           |
|                  | 0970.00  | 74.90    | 329.61       | 6758.78  | 5458.22    | 487.36    | 485.97  | -139.59  | 11.37          | 11.33         | -0.93         | 550354.55       | 1700902.43     | N 40 0 19.94 W       | 80 32 10.76           |
|                  | 7020.00  | 79.81    | 328.82       | 6788.37  | 5407.81    | 530.27    | 525.85  | -161.57  | 11.09          | 10.95         | -1.80         | 550071.46       | 1700970.46     | N 40 0 20.30 W       | 80 32 11.07           |
|                  | 7005.00  | 84.40    | 327.23       | 6774.55  | 5473.99    | 574.83    | 563.65  | -185.17  | 10.76          | 10.20         | -3.53         | 550109.26       | 1700946.05     | N 40 0 20.67 W       | 80 32 11.38           |
|                  | 7110.00  | 88.51    | 325.03       | 6777.33  | 5476.77    | 619.72    | 600.93  | -210.19  | 10.35          | 9.13          | -4.89         | 550146.54       | 1700921.84     | N 40 0 21.04 W       | 80 32 11.70           |
|                  | 7155.00  | 90.82    | 324.72       | 6775.38  | 5477.82    | 654.65    | 637.72  | -230.08  | 0.97           | 0.99          | -0.69         | 550183.33       | 1700895.95     | N 40 0 21.40 W       | 80 32 12.04           |
|                  | 7244.00  | 89.70    | 324.41       | 6779.53  | 5478.97    | 753.53    | 719.23  | -287.87  | 1.05           | 0.99          | -0.35         | 550255.83       | 1700944.30     | N 40 0 22.11 W       | 80 32 12.72           |
|                  | 7334.00  | 90.41    | 323.44       | 6779.44  | 5478.88    | 843.36    | 782.97  | -340.87  | 1.34           | 0.79          | -1.08         | 550328.57       | 1700949.37     | N 40 0 22.82 W       | 80 32 13.41           |
|                  | 7424.00  | 90.26    | 325.12       | 6778.90  | 5478.34    | 933.21    | 856.04  | -393.21  | 1.87           | -0.14         | 1.67          | 550401.84       | 1700948.83     | N 40 0 23.54 W       | 80 32 14.00           |
|                  | 7513.00  | 89.88    | 323.53       | 6778.78  | 5478.22    | 1022.07   | 929.33  | -445.11  | 1.84           | -0.45         | -1.79         | 550473.93       | 1700986.80     | N 40 0 24.24 W       | 80 32 14.77           |
|                  | 7602.00  | 89.79    | 323.53       | 6779.03  | 5478.47    | 1110.88   | 999.90  | -498.01  | 0.10           | -0.10         | 0.00          | 550545.50       | 1700933.40     | N 40 0 24.95 W       | 80 32 15.46           |
|                  | 7692.00  | 89.70    | 325.43       | 6779.44  | 5478.88    | 1200.73   | 1073.15 | -550.30  | 2.11           | -0.10         | 2.11          | 550618.74       | 1700921.74     | N 40 0 25.50 W       | 80 32 16.14           |
|                  | 7782.00  | 89.22    | 322.83       | 6780.26  | 5479.72    | 1290.57   | 1149.07 | -603.03  | 2.94           | -0.53         | -2.89         | 550691.86       | 1700922.02     | N 40 0 26.38 W       | 80 32 16.83           |
|                  | 7871.00  | 89.22    | 324.94       | 6781.50  | 5480.84    | 1379.38   | 1217.98 | -655.48  | 2.37           | 0.00          | 2.37          | 550763.54       | 17009176.57    | N 40 0 27.08 W       | 80 32 17.52           |
|                  | 7960.00  | 88.82    | 322.91       | 6783.02  | 5482.48    | 1468.19   | 1289.88 | -707.87  | 2.32           | -0.45         | -2.28         | 550835.48       | 17009124.18    | N 40 0 27.79 W       | 80 32 18.20           |
|                  | 8050.00  | 89.70    | 322.74       | 6784.18  | 5483.62    | 1557.89   | 1361.58 | -782.25  | 1.00           | 0.88          | -0.19         | 550907.16       | 17009009.80    | N 40 0 28.48 W       | 80 32 19.91           |
|                  | 8140.00  | 90.99    | 324.83       | 6783.64  | 5483.08    | 1647.68   | 1434.10 | -815.55  | 2.54           | 1.43          | 2.10          | 550979.67       | 1700916.51     | N 40 0 29.20 W       | 80 32 19.91           |
|                  | 8229.00  | 91.99    | 322.65       | 6781.50  | 5481.00    | 1736.45   | 1505.75 | -868.29  | 2.30           | 0.79          | -2.22         | 551051.32       | 1700893.78     | N 40 0 29.90 W       | 80 32 20.29           |
|                  | 8319.00  | 91.78    | 324.24       | 6778.83  | 5478.27    | 1826.16   | 1578.01 | -921.87  | 1.77           | 0.10          | 1.77          | 551123.58       | 1700910.19     | N 40 0 30.61 W       | 80 32 20.99           |
|                  | 8408.00  | 91.89    | 324.41       | 6778.14  | 5475.58    | 1915.00   | 1650.27 | -973.75  | 0.22           | -0.10         | 0.19          | 551195.84       | 1700859.31     | N 40 0 31.32 W       | 80 32 21.67           |
|                  | 8498.00  | 91.82    | 326.84       | 6773.62  | 5473.06    | 2004.91   | 1724.52 | -1024.54 | 2.71           | -0.19         | 2.70          | 551270.06       | 1700867.52     | N 40 0 32.05 W       | 80 32 22.33           |
|                  | 8587.00  | 91.12    | 325.34       | 6771.57  | 5471.01    | 2093.85   | 1708.38 | -1074.18 | 1.74           | -0.45         | -1.69         | 551343.92       | 1700857.69     | N 40 0 32.77 W       | 80 32 22.98           |
|                  | 8677.00  | 90.59    | 327.45       | 6770.22  | 5469.86    | 2183.63   | 1873.30 | -1123.98 | 2.42           | -0.59         | 2.34          | 551418.88       | 1700708.08     | N 40 0 33.50 W       | 80 32 23.83           |
|                  | 8767.00  | 90.26    | 325.05       | 6769.54  | 5468.98    | 2273.81   | 1948.39 | -1173.59 | 2.03           | -0.34         | -2.00         | 551493.95       | 1700856.46     | N 40 0 34.24 W       | 80 32 24.26           |
|                  | 8856.00  | 90.10    | 322.03       | 6769.24  | 5468.68    | 2362.61   | 2020.24 | -1228.09 | 4.07           | -0.20         | -4.07         | 551565.79       | 1700865.98     | N 40 0 34.94 W       | 80 32 24.87           |
|                  | 8945.00  | 90.10    | 324.32       | 6769.06  | 5468.53    | 2451.36   | 2091.47 | -1279.43 | 2.57           | 0.00          | 2.57          | 551637.02       | 1700852.84     | N 40 0 35.64 W       | 80 32 25.89           |
|                  | 9035.00  | 90.99    | 324.94       | 6768.23  | 5467.87    | 2541.24   | 2164.88 | -1331.53 | 1.21           | 0.99          | 0.89          | 551710.40       | 1700850.55     | N 40 0 36.36 W       | 80 32 26.34           |
|                  | 9125.00  | 90.81    | 326.13       | 6766.62  | 5466.26    | 2631.18   | 2238.95 | -1382.45 | 1.34           | -0.20         | 1.32          | 551784.59       | 1700849.63     | N 40 0 37.09 W       | 80 32 27.01           |
|                  | 9214.00  | 90.80    | 326.62       | 6765.49  | 5464.93    | 2720.15   | 2313.15 | -1431.73 | 0.58           | 0.10          | 0.55          | 551858.89       | 1700840.35     | N 40 0 37.82 W       | 80 32 27.85           |
|                  | 9304.00  | 90.99    | 329.92       | 6764.01  | 5463.45    | 2810.11   | 2389.88 | -1479.05 | 3.67           | 0.10          | 3.67          | 551935.21       | 1700833.03     | N 40 0 38.57 W       | 80 32 28.27           |
|                  | 9393.00  | 90.99    | 325.82       | 6762.47  | 5461.91    | 2899.08   | 2465.02 | -1526.36 | 4.81           | 0.00          | -4.81         | 552010.55       | 1700830.72     | N 40 0 39.31 W       | 80 32 28.89           |
|                  | 9483.00  | 90.72    | 323.53       | 6761.12  | 5460.56    | 2988.88   | 2538.43 | -1578.39 | 2.56           | -0.30         | -2.54         | 552083.97       | 1700825.89     | N 40 0 40.03 W       | 80 32 29.57           |
|                  | 9572.00  | 90.61    | 322.83       | 6759.94  | 5459.38    | 3077.70   | 2609.67 | -1631.73 | 0.79           | 0.10          | -0.79         | 552155.20       | 1700820.38     | N 40 0 40.72 W       | 80 32 30.27           |
|                  | 9661.00  | 91.38    | 324.15       | 6758.24  | 5457.88    | 3166.46   | 2681.19 | -1684.87 | 1.82           | 0.84          | 1.48          | 552226.72       | 1700817.42     | N 40 0 41.42 W       | 80 32 30.98           |
|                  | 9751.00  | 90.81    | 323.05       | 6756.52  | 5456.06    | 3256.24   | 2753.82 | -1738.06 | 1.38           | -0.63         | -1.22         | 552299.14       | 1700804.03     | N 40 0 42.13 W       | 80 32 31.68           |
|                  | 9840.00  | 90.19    | 319.92       | 6755.74  | 5455.18    | 3344.73   | 2823.24 | -1793.46 | 3.59           | -0.70         | -3.52         | 552398.77       | 1700803.61     | N 40 0 42.81 W       | 80 32 32.38           |
|                  | 9930.00  | 91.91    | 321.42       | 6754.09  | 5453.53    | 3434.00   | 2892.84 | -1850.51 | 2.54           | 1.81          | 1.67          | 552458.36       | 1700798.19     | N 40 0 43.50 W       | 80 32 33.12           |
|                  | 10020.00 | 91.21    | 324.94       | 6751.84  | 5451.06    | 3523.78   | 2964.85 | -1904.41 | 3.99           | -0.78         | 3.91          | 552510.37       | 1700792.68     | N 40 0 44.20 W       | 80 32 33.83           |
|                  | 10109.00 | 90.90    | 327.94       | 6750.00  | 5449.44    | 3612.73   | 3039.00 | -1953.80 | 3.39           | -0.35         | 3.37          | 552564.51       | 1700787.50     | N 40 0 44.90 W       | 80 32 34.47           |
| Final Survey     | 10213.00 | 90.72    | 327.94       | 6748.53  | 5447.97    | 3718.72   | 3127.13 | -2008.80 | 0.17           | -0.17         | 0.00          | 552627.84       | 1700782.30     | N 40 0 45.79 W       | 80 32 35.19           |
| Projection to TD | 10290.00 | 90.72    | 327.94       | 6747.56  | 5447.00    | 3793.71   | 3192.38 | -2049.87 | 0.00           | 0.00          | 0.00          | 552737.89       | 1700776.44     | N 40 0 46.43 W       | 80 32 35.73           |

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) | EDU Freq (ft) | Hole Size (in) | Casing Diameter (in) | Survey Tool Type | Borehole / Survey        |  |
|-------------|------|--------------|------------|---------------|----------------|----------------------|------------------|--------------------------|--|
|             | 1    | 0 000        | 18 650     |               | Act Stns       | 30 000               | 30 000           | SLB_NSG+MSHOT-Depth Only | Original Borehole / Noble Energy SHL13CHS Gyro+MWD Off to 6002ft MD  |
|             | 1    | 18 650       | 3198 500   |               | Act Stns       | 30 000               | 30 000           | SLB_NSG+MSHOT            | Original Borehole / Noble Energy SHL13CHS Gyro+MWD Off to Original Borehole / Noble Energy SHL13CHS Gyro+MWD Off to  |
|             | 1    | 3198 500     | 5833 000   |               | Act Stns       | 30 000               | 30 000           | SLB_MWD-STD              | Original Borehole / Noble Energy SHL13CHS Gyro+MWD Off to ST01 / Noble Energy SHL13CHS ST01 MWD 5812ft to 10290ft MD |
|             | 1    | 5833 000     | 10290 000  |               | Act Stns       | 30 000               | 30 000           | SLB_MWD-STD              |  |

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# Noble Energy

|   |  |                       |  |  |  |                                 |  |  |  |  |  |
|---|--|-----------------------|--|--|--|---------------------------------|--|--|--|--|--|
| Borehole: <b>ST01</b>   |  | Well: <b>SHL13CHS</b> |  | Field: <b>WV Marshall County (NAD 27)</b>  |  | Structure: <b>Precision 543</b> |  |  |  |  |  |
| <b>Gravity &amp; Magnetic Parameters</b><br>Model: HDGM 2013 Dip: 67.587° Date: 10/5/2013<br>MagDec: -8.429° FB: 53182.243nT Gravity FS: 999.451mg<br>(3,80663 Baselet) |  |                       |  | <b>Surface Location</b> NAD27 West Virginia State Plane, Northern Zone, US Feet<br>Lat: N 40 0 15.12 Northing: 549545.63178US Grid Conv: -0.661°<br>Lon: W 80 32 8.91 Easting: 1709832.02178US Scale Fact: 1 |  |                                 |  | <b>Miscellaneous</b><br>Slot: SHL13CHS TVD Ref: KB(1300.56ft above MSL)<br>Plan: MWD Surveys |  |  |  |



| Northing: 549545.63178US |       | Easting: 1709832.02178US |                            | Surface Location |                |
|--------------------------|-------|--------------------------|----------------------------|------------------|----------------|
| Target Description       | Shape | Dimension                | Lat/Long                   | Length           | Area           |
| SHL13 Pad LeaseLine      | Point | N/A                      | N 40 0 15.12 W 80 32 8.91  | 1709832.02178US  | 549545.63178US |
| SHL13CHS LP              | Point | N/A                      | N 40 0 35.75 W 80 32 11.57 | 1709832.02178US  | 549545.63178US |

| FAULT | Seq | Survey Elev    | Survey Tool Code | Vertical Int | True Dip | MD From | MD To  | Survey Frequency | ECV Size (Inch) | ECV Size (mm) | Comments/Contingency |
|-------|-----|----------------|------------------|--------------|----------|---------|--------|------------------|-----------------|---------------|----------------------|
| 1     | 1   | SLR_N50-MWD-DL | DL               | 30           | 30       | 0       | 19.05  | Act Site         | 1.25            | 1.25          |                      |
| 1     | 2   | SLR_N50-MWD-DL | DL               | 30           | 30       | 14.85   | 3195.5 | Act Site         | 6.63            | 6.63          |                      |
| 1     | 3   | SLR_MWD-DL     | DL               | 30           | 30       | 3195.3  | 3533   | Act Site         | 8.79            | 8.79          |                      |
| 1     | 4   | SLR_MWD-DL     | DL               | 30           | 30       | 3532    | 1026   | Act Site         | 104.68          | 8.4           |                      |

| Critical Points  |          |       |        |         |         |         |         |
|------------------|----------|-------|--------|---------|---------|---------|---------|
| Critical Point   | NEI      | MSL   | ADW    | TVD     | VSEC    | NWPR1   | EWPR1   |
| True             | 8033.56  | 0.00  | 140.04 | 9027.20 | 31.56   | 31.57   | 24.62   |
| Final Survey     | 10213.00 | 80.72 | 327.94 | 6784.32 | 1776.72 | 3277.13 | 2088.00 |
| Projection to TD | 10200.00 | 80.72 | 327.94 | 6784.32 | 1780.71 | 3282.28 | 2094.57 |

