



Cathedral Energy Services

Survey Report

| | | | |
|------------------|--------------------------------|-------------------------------------|-------------------------------|
| Company: | Anadarko Petroleum Corporation | Local Co-ordinate Reference: | Well Pehr 19-1 |
| Project: | DJ Wattenberg | TVD Reference: | KB=15' @ 4959.0ft (Xtreme 11) |
| Site: | NWSW Sec1-T1N-R67W (Pehr 33-1) | MD Reference: | KB=15' @ 4959.0ft (Xtreme 11) |
| Well: | Pehr 19-1 | North Reference: | True |
| Wellbore: | DD | Survey Calculation Method: | Minimum Curvature |
| Design: | DD | Database: | USA EDM 5000 Multi Users DB |

| | | | |
|--------------------|---------------------------|----------------------|----------------|
| Project | DJ Wattenberg | | |
| Map System: | US State Plane 1983 | System Datum: | Mean Sea Level |
| Geo Datum: | North American Datum 1983 | | |
| Map Zone: | Colorado Northern Zone | | |

| Site | | NWSW Sec1-T1N-R67W (Pehr 33-1) | | | |
|-----------------------|----------|--------------------------------|-----------------|-------------------|-------------|
| Site Position: | | Northing: | 1,271,518.81 ft | Latitude: | 40.076861 |
| From: | Lat/Long | Easting: | 3,182,472.99 ft | Longitude: | -104.847950 |
| Position Uncertainty: | 0.0 ft | Slot Radius: | 13.200 in | Grid Convergence: | 0.42 ° |

| | | | | | | |
|----------------------|-----------|--------|---------------------|-----------------|---------------|-------------|
| Well | Pehr 19-1 | | | | | |
| Well Position | +N/-S | 0.0 ft | Northing: | 1,271,523.97 ft | Latitude: | 40.076874 |
| | +E/-W | 0.0 ft | Easting: | 3,182,532.84 ft | Longitude: | -104.847736 |
| Position Uncertainty | | 0.0 ft | Wellhead Elevation: | ft | Ground Level: | 4,944.0 ft |

| | | | | | |
|------------------|-------------------|--------------------|------------------------|----------------------|----------------------------|
| Wellbore | DD | | | | |
| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
| | IGRF2010 | 8/28/2012 | 8.72 | 66.73 | 52,825 |

| | | | | | |
|--------------------------|-------------------------|-------------------|-------------------|----------------------|-----|
| Design | DD | | | | |
| Audit Notes: | | | | | |
| Version: | 1.0 | Phase: | ACTUAL | Tie On Depth: | 0.0 |
| Vertical Section: | Depth From (TVD) | +N/-S (ft) | +E/-W (ft) | Direction (°) | |
| | 0.0 | 0.0 | 0.0 | 83.41 | |

| | | | | | |
|-----------------------|----------------|--------------------------|------------------|--------------------|--|
| Survey Program | Date | 9/1/2012 | | | |
| From (ft) | To (ft) | Survey (Wellbore) | Tool Name | Description | |
| 77.0 | 7,875.0 | Survey #1 (DD) | MWD | Geolink MWD | |

| | | | | | | | | | | |
|----------------------------|------------------------|--------------------|----------------------------|-------------------|-------------------|------------------------------|------------------------------|-----------------------------|------------------------------|--|
| Survey | | | | | | | | | | |
| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments | |
| 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | | |
| 77.0 | 0.30 | 292.40 | 77.0 | 0.1 | -0.2 | -0.2 | 0.39 | 0.39 | | |
| 165.0 | 1.30 | 98.70 | 165.0 | 0.0 | 0.6 | 0.6 | 1.81 | 1.14 | | |
| 253.0 | 2.80 | 76.30 | 252.9 | 0.4 | 3.7 | 3.7 | 1.90 | 1.70 | | |
| 341.0 | 3.80 | 75.80 | 340.8 | 1.6 | 8.6 | 8.7 | 1.14 | 1.14 | | |
| 417.0 | 5.10 | 81.20 | 416.6 | 2.7 | 14.4 | 14.6 | 1.80 | 1.71 | | |
| 508.0 | 7.40 | 89.60 | 507.0 | 3.4 | 24.2 | 24.4 | 2.71 | 2.53 | | |
| 599.0 | 9.30 | 88.60 | 597.0 | 3.6 | 37.4 | 37.6 | 2.09 | 2.09 | | |
| 689.0 | 10.90 | 87.40 | 685.6 | 4.2 | 53.2 | 53.3 | 1.79 | 1.78 | | |
| 780.0 | 12.20 | 80.10 | 774.8 | 6.2 | 71.3 | 71.5 | 2.15 | 1.43 | | |
| 870.0 | 12.90 | 77.70 | 862.7 | 10.0 | 90.5 | 91.0 | 0.97 | 0.78 | | |
| 888.0 | 12.40 | 78.00 | 880.2 | 10.8 | 94.3 | 94.9 | 2.80 | -2.78 | | |
| 945.0 | 11.80 | 77.50 | 936.0 | 13.4 | 106.0 | 106.8 | 1.07 | -1.05 | | |

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| Project: | DJ Wattenberg | TVD Reference: | KB=15' @ 4959.0ft (Xtreme 11) |
| Site: | NWSW Sec1-T1N-R67W (Pehr 33-1) | MD Reference: | KB=15' @ 4959.0ft (Xtreme 11) |
| Well: | Pehr 19-1 | North Reference: | True |
| Wellbore: | DD | Survey Calculation Method: | Minimum Curvature |
| Design: | DD | Database: | USA EDM 5000 Multi Users DB |

| Survey | | | | | | | | | |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|----------------------|-----------------------|
| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
| 1,022.0 | 13.90 | 80.10 | 1,011.0 | 16.7 | 122.8 | 123.9 | 2.83 | 2.73 | |
| 1,113.0 | 13.10 | 86.80 | 1,099.5 | 19.1 | 143.8 | 145.1 | 1.93 | -0.88 | |
| 1,203.0 | 16.20 | 88.50 | 1,186.6 | 20.0 | 166.6 | 167.8 | 3.48 | 3.44 | |
| 1,294.0 | 17.60 | 83.30 | 1,273.6 | 21.9 | 192.9 | 194.2 | 2.26 | 1.54 | |
| 1,385.0 | 18.50 | 83.20 | 1,360.2 | 25.3 | 220.9 | 222.4 | 0.99 | 0.99 | |
| 1,476.0 | 17.70 | 81.80 | 1,446.7 | 28.9 | 249.0 | 250.6 | 1.00 | -0.88 | |
| 1,566.0 | 17.10 | 80.80 | 1,532.5 | 33.0 | 275.6 | 277.5 | 0.74 | -0.67 | |
| 1,657.0 | 18.40 | 85.90 | 1,619.2 | 36.2 | 303.1 | 305.3 | 2.23 | 1.43 | |
| 1,748.0 | 17.00 | 84.80 | 1,705.9 | 38.4 | 330.7 | 332.9 | 1.58 | -1.54 | |
| 1,839.0 | 17.90 | 84.90 | 1,792.7 | 40.9 | 357.9 | 360.2 | 0.99 | 0.99 | |
| 1,930.0 | 16.10 | 81.70 | 1,879.7 | 43.9 | 384.3 | 386.8 | 2.23 | -1.98 | |
| 2,020.0 | 17.30 | 84.00 | 1,965.9 | 47.1 | 409.9 | 412.6 | 1.52 | 1.33 | |
| 2,111.0 | 17.40 | 86.90 | 2,052.8 | 49.3 | 437.0 | 439.8 | 0.96 | 0.11 | |
| 2,202.0 | 18.90 | 84.70 | 2,139.3 | 51.4 | 465.2 | 468.1 | 1.81 | 1.65 | |
| 2,292.0 | 16.70 | 81.20 | 2,225.0 | 54.7 | 492.5 | 495.6 | 2.72 | -2.44 | |
| 2,383.0 | 17.10 | 83.60 | 2,312.0 | 58.2 | 518.8 | 522.0 | 0.88 | 0.44 | |
| 2,474.0 | 16.50 | 87.30 | 2,399.2 | 60.3 | 545.0 | 548.3 | 1.35 | -0.66 | |
| 2,564.0 | 17.80 | 87.70 | 2,485.2 | 61.4 | 571.5 | 574.8 | 1.45 | 1.44 | |
| 2,655.0 | 17.90 | 87.80 | 2,571.8 | 62.5 | 599.4 | 602.6 | 0.11 | 0.11 | |
| 2,746.0 | 16.40 | 83.30 | 2,658.7 | 64.6 | 626.1 | 629.4 | 2.20 | -1.65 | |
| 2,837.0 | 15.80 | 84.30 | 2,746.2 | 67.3 | 651.2 | 654.6 | 0.73 | -0.66 | |
| 2,927.0 | 17.70 | 85.80 | 2,832.3 | 69.5 | 677.0 | 680.5 | 2.16 | 2.11 | |
| 3,018.0 | 18.50 | 85.70 | 2,918.8 | 71.6 | 705.2 | 708.8 | 0.88 | 0.88 | |
| 3,109.0 | 18.40 | 84.00 | 3,005.2 | 74.2 | 733.9 | 737.6 | 0.60 | -0.11 | |
| 3,200.0 | 17.50 | 79.80 | 3,091.7 | 78.1 | 761.6 | 765.6 | 1.73 | -0.99 | |
| 3,290.0 | 15.10 | 78.20 | 3,178.1 | 82.9 | 786.4 | 790.8 | 2.71 | -2.67 | |
| 3,381.0 | 14.10 | 81.80 | 3,266.2 | 86.9 | 809.0 | 813.6 | 1.48 | -1.10 | |
| 3,472.0 | 14.10 | 86.20 | 3,354.4 | 89.2 | 831.0 | 835.8 | 1.18 | 0.00 | |
| 3,563.0 | 14.80 | 80.40 | 3,442.6 | 91.9 | 853.6 | 858.5 | 1.77 | 0.77 | |
| 3,653.0 | 14.80 | 82.40 | 3,529.6 | 95.3 | 876.3 | 881.4 | 0.57 | 0.00 | |
| 3,744.0 | 17.40 | 84.30 | 3,617.0 | 98.2 | 901.4 | 906.7 | 2.91 | 2.86 | |
| 3,835.0 | 17.70 | 86.80 | 3,703.8 | 100.4 | 928.7 | 934.1 | 0.89 | 0.33 | |
| 3,926.0 | 16.30 | 83.90 | 3,790.8 | 102.5 | 955.2 | 960.7 | 1.80 | -1.54 | |
| 4,016.0 | 15.70 | 81.70 | 3,877.3 | 105.6 | 979.8 | 985.5 | 0.95 | -0.67 | |
| 4,107.0 | 16.00 | 78.90 | 3,964.8 | 109.8 | 1,004.3 | 1,010.3 | 0.90 | 0.33 | |
| 4,198.0 | 15.10 | 75.20 | 4,052.5 | 115.2 | 1,028.1 | 1,034.5 | 1.47 | -0.99 | |
| 4,289.0 | 14.40 | 81.30 | 4,140.5 | 120.0 | 1,050.7 | 1,057.6 | 1.87 | -0.77 | |
| 4,379.0 | 12.40 | 80.70 | 4,228.1 | 123.2 | 1,071.3 | 1,078.4 | 2.23 | -2.22 | |
| 4,470.0 | 13.20 | 85.00 | 4,316.8 | 125.7 | 1,091.3 | 1,098.5 | 1.37 | 0.88 | |
| 4,561.0 | 11.30 | 82.40 | 4,405.7 | 127.8 | 1,110.5 | 1,117.8 | 2.17 | -2.09 | |
| 4,652.0 | 9.80 | 87.50 | 4,495.2 | 129.3 | 1,127.1 | 1,134.5 | 1.94 | -1.65 | |
| 4,742.0 | 7.80 | 87.10 | 4,584.1 | 129.9 | 1,140.8 | 1,148.2 | 2.22 | -2.22 | |
| 4,833.0 | 5.40 | 85.50 | 4,674.5 | 130.6 | 1,151.3 | 1,158.7 | 2.64 | -2.64 | |
| 4,924.0 | 4.70 | 85.90 | 4,765.2 | 131.2 | 1,159.3 | 1,166.7 | 0.77 | -0.77 | |
| 5,015.0 | 1.80 | 65.50 | 4,856.0 | 132.1 | 1,164.3 | 1,171.8 | 3.38 | -3.19 | |
| 5,105.0 | 1.10 | 54.60 | 4,946.0 | 133.1 | 1,166.3 | 1,173.9 | 0.83 | -0.78 | |
| 5,196.0 | 0.80 | 42.10 | 5,037.0 | 134.1 | 1,167.4 | 1,175.1 | 0.40 | -0.33 | |
| 5,287.0 | 0.60 | 29.20 | 5,128.0 | 135.0 | 1,168.1 | 1,175.9 | 0.28 | -0.22 | |
| 5,377.0 | 0.40 | 18.70 | 5,218.0 | 135.7 | 1,168.4 | 1,176.3 | 0.24 | -0.22 | |
| 5,468.0 | 0.10 | 327.60 | 5,308.9 | 136.1 | 1,168.5 | 1,176.4 | 0.38 | -0.33 | |
| 5,559.0 | 0.40 | 328.90 | 5,399.9 | 136.4 | 1,168.3 | 1,176.2 | 0.33 | 0.33 | |
| 5,649.0 | 0.30 | 284.90 | 5,489.9 | 136.8 | 1,167.9 | 1,175.8 | 0.31 | -0.11 | |
| 5,740.0 | 0.40 | 259.90 | 5,580.9 | 136.8 | 1,167.3 | 1,175.3 | 0.20 | 0.11 | |

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| Well: | Pehr 19-1 | North Reference: | True |
| Wellbore: | DD | Survey Calculation Method: | Minimum Curvature |
| Design: | DD | Database: | USA EDM 5000 Multi Users DB |

Survey

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
|---------------------|-----------------|-------------|---------------------|------------|------------|-----------------------|-----------------------|----------------------|-----------------------|
| 5,831.0 | 0.60 | 243.30 | 5,671.9 | 136.5 | 1,166.6 | 1,174.5 | 0.27 | 0.22 | |
| 5,921.0 | 0.70 | 246.60 | 5,761.9 | 136.1 | 1,165.7 | 1,173.6 | 0.12 | 0.11 | |
| 6,012.0 | 0.70 | 35.90 | 5,852.9 | 136.3 | 1,165.5 | 1,173.4 | 1.48 | 0.00 | |
| 6,103.0 | 0.80 | 23.80 | 5,943.9 | 137.3 | 1,166.1 | 1,174.1 | 0.21 | 0.11 | |
| 6,194.0 | 0.80 | 13.20 | 6,034.9 | 138.5 | 1,166.5 | 1,174.7 | 0.16 | 0.00 | |
| 6,284.0 | 0.90 | 3.70 | 6,124.9 | 139.8 | 1,166.7 | 1,175.0 | 0.19 | 0.11 | |
| 6,375.0 | 0.70 | 337.40 | 6,215.9 | 141.1 | 1,166.5 | 1,175.0 | 0.45 | -0.22 | |
| 6,466.0 | 0.50 | 332.60 | 6,306.9 | 141.9 | 1,166.1 | 1,174.7 | 0.23 | -0.22 | |
| 6,557.0 | 0.30 | 28.20 | 6,397.9 | 142.5 | 1,166.0 | 1,174.7 | 0.45 | -0.22 | |
| 6,647.0 | 0.20 | 314.70 | 6,487.9 | 142.8 | 1,166.0 | 1,174.7 | 0.34 | -0.11 | |
| 6,738.0 | 0.80 | 312.60 | 6,578.9 | 143.4 | 1,165.4 | 1,174.2 | 0.66 | 0.66 | |
| 6,829.0 | 1.20 | 300.20 | 6,669.9 | 144.3 | 1,164.1 | 1,173.0 | 0.50 | 0.44 | |
| 6,919.0 | 0.80 | 162.60 | 6,759.9 | 144.1 | 1,163.5 | 1,172.4 | 2.08 | -0.44 | |
| 7,010.0 | 0.60 | 161.00 | 6,850.9 | 143.1 | 1,163.9 | 1,172.6 | 0.22 | -0.22 | |
| 7,101.0 | 0.50 | 23.60 | 6,941.9 | 143.0 | 1,164.2 | 1,172.9 | 1.13 | -0.11 | |
| 7,192.0 | 1.00 | 311.20 | 7,032.9 | 143.9 | 1,163.7 | 1,172.6 | 1.07 | 0.55 | |
| 7,282.0 | 0.80 | 274.50 | 7,122.8 | 144.4 | 1,162.5 | 1,171.4 | 0.66 | -0.22 | |
| 7,373.0 | 0.40 | 241.60 | 7,213.8 | 144.3 | 1,161.6 | 1,170.5 | 0.56 | -0.44 | |
| 7,463.0 | 0.40 | 165.20 | 7,303.8 | 143.9 | 1,161.4 | 1,170.3 | 0.55 | 0.00 | |
| 7,554.0 | 0.50 | 144.00 | 7,394.8 | 143.3 | 1,161.7 | 1,170.5 | 0.21 | 0.11 | |
| 7,645.0 | 0.50 | 143.00 | 7,485.8 | 142.6 | 1,162.2 | 1,170.9 | 0.01 | 0.00 | |
| 7,735.0 | 0.50 | 125.30 | 7,575.8 | 142.1 | 1,162.8 | 1,171.4 | 0.17 | 0.00 | |
| 7,817.0 | 0.50 | 130.70 | 7,657.8 | 141.6 | 1,163.3 | 1,171.9 | 0.06 | 0.00 | |
| 7,875.0 | 0.50 | 134.52 | 7,715.8 | 141.3 | 1,163.7 | 1,172.2 | 0.06 | 0.00 | |

Targets

| Target Name | Dip Angle (°) | Dip Dir. (°) | TVD (ft) | +N/-S (ft) | +E/-W (ft) | Northing (ft) | Easting (ft) | Latitude | Longitude |
|--|---------------|--------------|----------|------------|------------|---------------|--------------|-----------|-------------|
| - hit/miss target | | | | | | | | | |
| - Shape | | | | | | | | | |
| Legal Box #19 | 0.00 | 0.00 | -5,000.0 | -179.2 | 1,025.2 | 1,271,352.31 | 3,183,559.31 | 40.076382 | -104.844073 |
| - survey misses target center by 5107.2ft at 0.0ft MD (0.0 TVD, 0.0 N, 0.0 E) | | | | | | | | | |
| - Rectangle (sides W800.0 H800.0 D0.0) | | | | | | | | | |
| Pehr 19-1 PBHL | 0.00 | 0.00 | 7,681.0 | 135.6 | 1,174.2 | 1,271,668.16 | 3,183,706.00 | 40.077246 | -104.843540 |
| - survey misses target center by 26.3ft at 7817.0ft MD (7657.8 TVD, 141.6 N, 1163.3 E) | | | | | | | | | |
| - Circle (radius 50.0) | | | | | | | | | |

Survey Annotations

| | Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates | | Comment |
|--|---------------------------|---------------------------|-------------------|---------------|----------------------------------|
| | | | +N/-S (ft) | +E/-W (ft) | |
| | 7,817.0 | 7,657.8 | 141.6 | 1,163.3 | Last Cathedral Survey @ 7817' MD |
| | 7,875.0 | 7,715.8 | 141.3 | 1,163.7 | Projection to Bit @ 7875' MD |

Checked By: _____ Approved By: _____ Date: _____