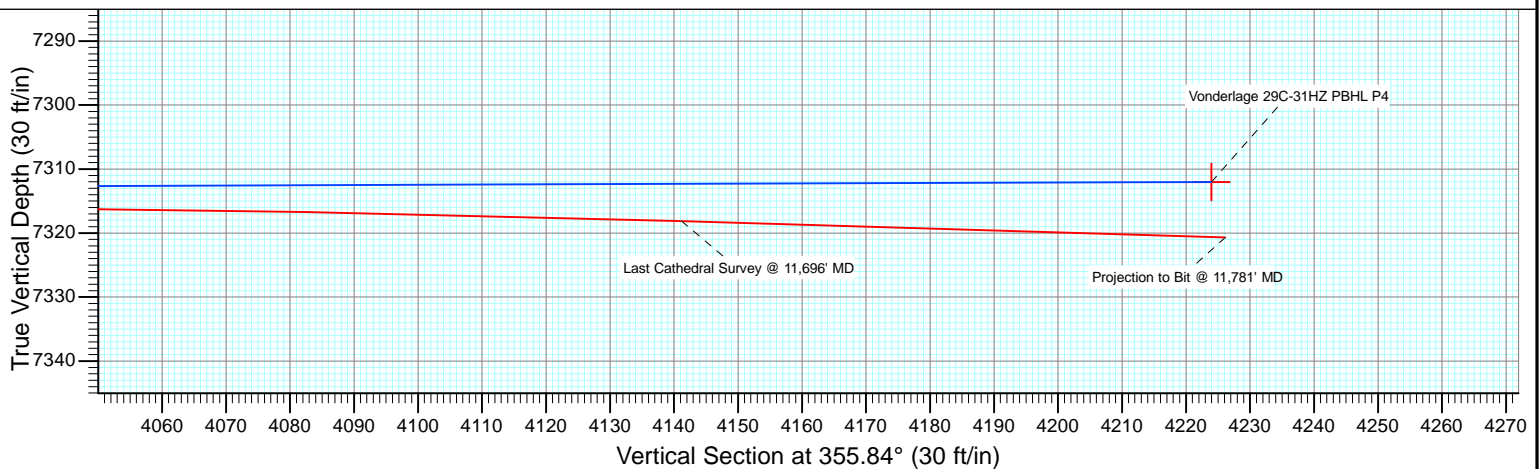
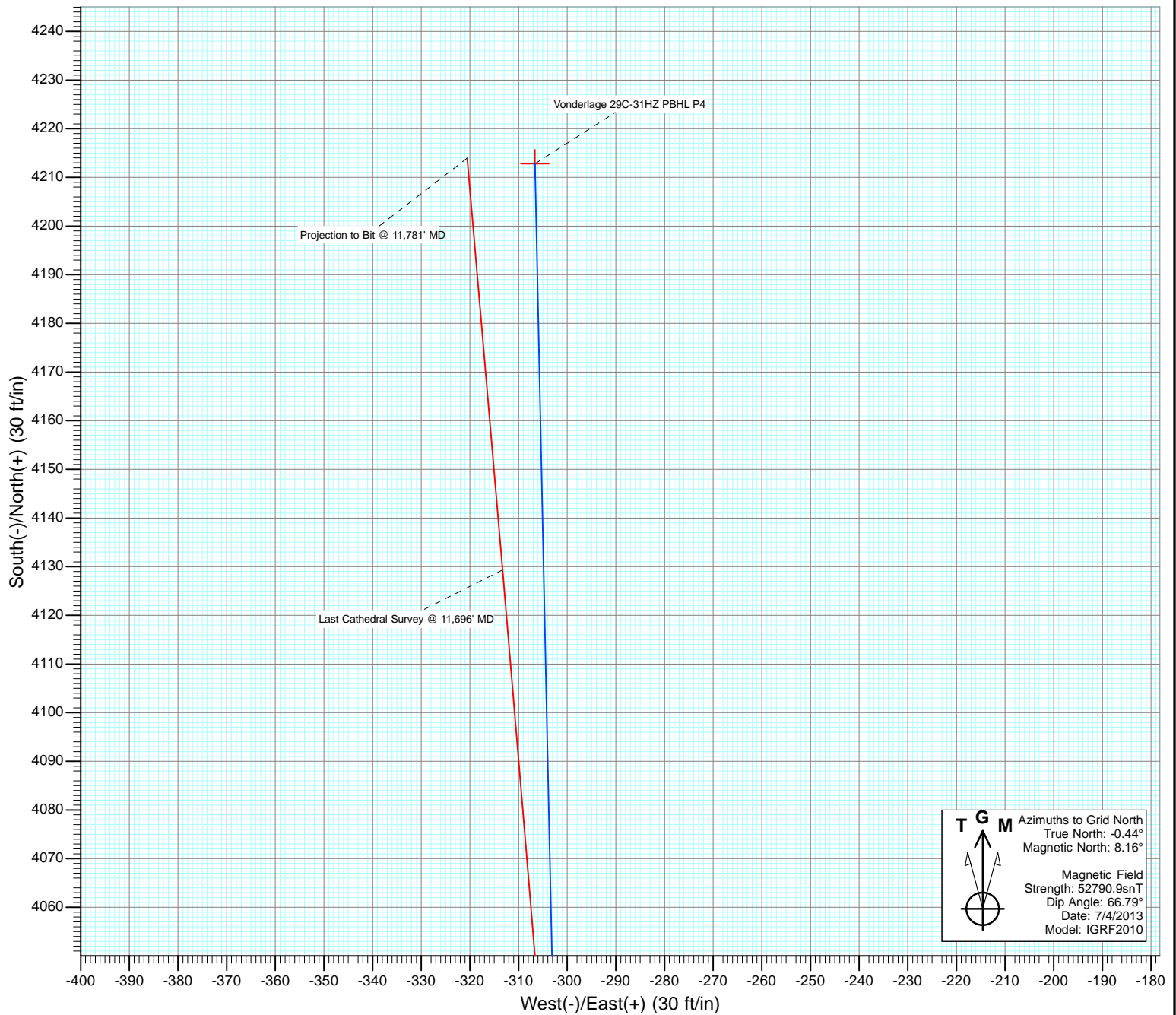


Surface Hole Location
Vonderlage 29C-31HZ
Lat : 40.175335
Long : -104.823165

T G M Azimuths to Grid North
True North: -0.44°
Magnetic North: 8.16°
Magnetic Field
Strength: 52790.9snT
Dip Angle: 66.79°
Date: 7/4/2013
Model: IGRF2010

BHL: 505' FNL, 1,576' FWL
Lat/Long: 40.186909 / -104.824197
State Plan - CO Northern: 1,311,655.8 / 3,188,814.24
Location: S31-T3N-R66W
Last Cathedral Survey @ 11,696' MD
Projection to Bit @ 11,781' MD
Vonderlage 29C-31HZ PBHL P4



Cathedral Energy Services

Survey Report

Company:	Anadarko Petroleum Corporation	Local Co-ordinate Reference:	Well Vonderlage 29C-31HZ
Project:	DJ Wattenberg	TVD Reference:	Surface Gyros @ 4843.0ft
Site:	Vonderlage Pad (SESW S31-T3N-R66W)	MD Reference:	Surface Gyros @ 4843.0ft
Well:	Vonderlage 29C-31HZ	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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		Vonderlage Pad (SESW S31-T3N-R66W)			
Site Position:		Northing:	1,307,441.84 ft	Latitude:	40.175335
From:	Lat/Long	Easting:	3,189,134.79 ft	Longitude:	-104.823165
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.44 °

Well		Vonderlage 29C-31HZ				
Well Position	+N/-S	0.0 ft	Northing:	1,307,441.83 ft	Latitude:	40.175335
	+E/-W	0.0 ft	Easting:	3,189,134.79 ft	Longitude:	-104.823165
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,843.0 ft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	7/4/2013	8.60	66.79	52,791

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	725.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	355.84	

Survey Program	Date	8/13/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.0	725.0	Survey #1 (Surface Gyros)	Gyro	Gyro	
738.0	11,781.0	Survey #1 (HZ)	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		
100.0	0.36	300.31	100.0	0.2	-0.3	0.2	0.36	0.36		
200.0	0.44	291.83	200.0	0.5	-0.9	0.5	0.10	0.08		
300.0	0.50	297.64	300.0	0.8	-1.6	0.9	0.08	0.06		
400.0	0.34	338.67	400.0	1.3	-2.1	1.4	0.33	-0.16		
500.0	0.78	320.06	500.0	2.1	-2.7	2.3	0.47	0.44		
600.0	0.81	336.87	600.0	3.3	-3.4	3.5	0.23	0.03		
700.0	1.31	338.53	700.0	5.0	-4.1	5.3	0.50	0.50		
725.0	1.34	346.43	725.0	5.5	-4.3	5.8	0.74	0.12	Last Surface Gyro @ 725' MD	
738.0	1.34	346.43	737.9	5.8	-4.3	6.1	0.00	0.00	First Cathedral Survey @ 738' MD	
940.0	1.40	327.00	939.9	10.2	-6.2	10.6	0.23	0.03		
1,033.0	1.20	248.90	1,032.9	10.8	-7.8	11.3	1.77	-0.22		

Cathedral Energy Services

Survey Report

Company:	Anadarko Petroleum Corporation	Local Co-ordinate Reference:	Well Vonderlage 29C-31HZ
Project:	DJ Wattenberg	TVD Reference:	Surface Gyros @ 4843.0ft
Site:	Vonderlage Pad (SESW S31-T3N-R66W)	MD Reference:	Surface Gyros @ 4843.0ft
Well:	Vonderlage 29C-31HZ	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
1,127.0	3.60	213.50	1,126.8	8.0	-10.3	8.7	2.89	2.55	
1,220.0	5.20	201.90	1,219.5	1.6	-13.5	2.6	1.96	1.72	
1,314.0	6.30	203.00	1,313.0	-7.1	-17.1	-5.8	1.18	1.17	
1,407.0	7.10	209.80	1,405.4	-16.8	-21.9	-15.1	1.21	0.86	
1,501.0	8.40	212.40	1,498.5	-27.6	-28.5	-25.5	1.43	1.38	
1,594.0	6.90	216.10	1,590.7	-37.9	-35.4	-35.2	1.70	-1.61	
1,688.0	7.40	196.10	1,684.0	-48.2	-40.5	-45.2	2.69	0.53	
1,781.0	8.30	194.90	1,776.1	-60.5	-43.8	-57.1	0.98	0.97	
1,875.0	7.70	196.10	1,869.2	-73.1	-47.3	-69.5	0.66	-0.64	
1,968.0	8.80	201.20	1,961.2	-85.7	-51.6	-81.7	1.42	1.18	
2,058.0	9.50	199.90	2,050.1	-99.1	-56.6	-94.7	0.81	0.78	
2,148.0	11.30	204.20	2,138.6	-114.1	-62.8	-109.3	2.18	2.00	
2,238.0	12.20	201.60	2,226.7	-131.0	-69.9	-125.6	1.16	1.00	
2,328.0	13.90	203.10	2,314.4	-149.8	-77.6	-143.8	1.93	1.89	
2,418.0	14.90	201.30	2,401.6	-170.5	-86.1	-163.8	1.22	1.11	
2,508.0	14.90	205.40	2,488.6	-191.8	-95.3	-184.3	1.17	0.00	
2,689.0	15.70	203.40	2,663.1	-235.3	-115.0	-226.3	0.53	0.44	
2,779.0	16.90	202.20	2,749.5	-258.5	-124.7	-248.8	1.38	1.33	
2,869.0	16.70	197.70	2,835.7	-283.0	-133.6	-272.5	1.46	-0.22	
2,959.0	16.20	195.40	2,922.0	-307.4	-140.9	-296.4	0.91	-0.56	
3,049.0	14.20	194.80	3,008.8	-330.2	-147.0	-318.6	2.23	-2.22	
3,139.0	12.90	188.10	3,096.3	-350.8	-151.3	-338.9	2.26	-1.44	
3,229.0	12.20	180.60	3,184.2	-370.3	-152.8	-358.2	1.97	-0.78	
3,319.0	11.90	182.80	3,272.2	-389.0	-153.3	-376.9	0.61	-0.33	
3,409.0	11.40	190.60	3,360.4	-407.0	-155.4	-394.7	1.83	-0.56	
3,499.0	8.50	195.10	3,449.0	-422.2	-158.8	-409.6	3.33	-3.22	
3,589.0	7.60	208.80	3,538.1	-433.9	-163.4	-420.9	2.35	-1.00	
3,679.0	7.40	222.00	3,627.4	-443.4	-170.2	-429.9	1.92	-0.22	
3,769.0	6.00	232.00	3,716.8	-450.6	-177.7	-436.5	2.02	-1.56	
3,859.0	4.80	240.10	3,806.4	-455.4	-184.7	-440.8	1.58	-1.33	
3,950.0	4.20	267.50	3,897.1	-457.4	-191.3	-442.3	2.43	-0.66	
4,040.0	3.40	278.40	3,986.9	-457.2	-197.3	-441.6	1.19	-0.89	
4,130.0	2.40	309.10	4,076.8	-455.6	-201.4	-439.8	2.01	-1.11	
4,220.0	4.20	312.00	4,166.6	-452.2	-205.3	-436.1	2.01	2.00	
4,310.0	2.90	332.20	4,256.4	-448.0	-208.8	-431.6	1.98	-1.44	
4,400.0	2.10	24.30	4,346.4	-444.4	-209.2	-428.1	2.57	-0.89	
4,490.0	1.80	35.00	4,436.3	-441.8	-207.7	-425.6	0.52	-0.33	
4,760.0	1.00	324.60	4,706.3	-436.4	-206.6	-420.2	0.64	-0.30	
4,850.0	0.90	321.30	4,796.2	-435.2	-207.5	-419.0	0.13	-0.11	
4,940.0	1.10	301.40	4,886.2	-434.2	-208.7	-417.9	0.44	0.22	
5,030.0	0.80	300.00	4,976.2	-433.4	-210.0	-417.1	0.33	-0.33	
5,120.0	0.90	306.70	5,066.2	-432.7	-211.1	-416.2	0.16	0.11	
5,210.0	1.00	285.30	5,156.2	-432.1	-212.4	-415.5	0.41	0.11	
5,300.0	1.10	268.40	5,246.2	-431.9	-214.0	-415.2	0.36	0.11	
5,390.0	1.40	259.30	5,336.2	-432.1	-216.0	-415.3	0.40	0.33	
5,480.0	1.60	220.80	5,426.1	-433.3	-217.9	-416.3	1.12	0.22	
5,570.0	1.70	157.40	5,516.1	-435.4	-218.2	-418.5	1.93	0.11	
5,660.0	1.10	147.80	5,606.1	-437.4	-217.2	-420.5	0.71	-0.67	
5,750.0	1.00	121.10	5,696.1	-438.5	-216.1	-421.7	0.55	-0.11	
5,840.0	0.80	125.40	5,786.0	-439.3	-214.9	-422.6	0.23	-0.22	
5,930.0	0.50	63.80	5,876.0	-439.5	-214.0	-422.8	0.79	-0.33	
6,021.0	0.80	78.20	5,967.0	-439.2	-213.1	-422.6	0.37	0.33	
6,111.0	0.90	75.20	6,057.0	-438.9	-211.8	-422.4	0.12	0.11	

Cathedral Energy Services

Survey Report

Company:	Anadarko Petroleum Corporation	Local Co-ordinate Reference:	Well Vonderlage 29C-31HZ
Project:	DJ Wattenberg	TVD Reference:	Surface Gyros @ 4843.0ft
Site:	Vonderlage Pad (SESW S31-T3N-R66W)	MD Reference:	Surface Gyros @ 4843.0ft
Well:	Vonderlage 29C-31HZ	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
6,201.0	0.80	68.10	6,147.0	-438.5	-210.5	-422.1	0.16	-0.11	
6,291.0	0.90	59.90	6,237.0	-437.9	-209.3	-421.6	0.17	0.11	
6,381.0	0.40	55.70	6,327.0	-437.4	-208.4	-421.1	0.56	-0.56	
6,471.0	0.20	11.50	6,417.0	-437.0	-208.1	-420.8	0.32	-0.22	
6,561.0	0.80	7.60	6,507.0	-436.3	-208.0	-420.0	0.67	0.67	
6,651.0	0.70	11.60	6,597.0	-435.1	-207.8	-418.9	0.13	-0.11	
6,741.0	0.70	11.10	6,687.0	-434.0	-207.6	-417.8	0.01	0.00	
6,801.0	0.90	12.70	6,747.0	-433.2	-207.4	-417.0	0.34	0.33	
6,831.0	2.20	7.10	6,777.0	-432.4	-207.3	-416.2	4.36	4.33	
6,861.0	5.70	1.40	6,806.9	-430.3	-207.2	-414.2	11.73	11.67	
6,891.0	9.70	358.50	6,836.6	-426.3	-207.2	-410.2	13.39	13.33	
6,921.0	13.10	358.70	6,866.0	-420.4	-207.4	-404.2	11.33	11.33	
6,951.0	16.90	357.30	6,895.0	-412.6	-207.7	-396.5	12.72	12.67	
6,981.0	18.20	356.50	6,923.6	-403.6	-208.2	-387.4	4.41	4.33	
7,011.0	19.60	357.80	6,952.0	-393.9	-208.6	-377.7	4.87	4.67	
7,041.0	23.10	359.30	6,979.9	-383.0	-208.9	-366.8	11.81	11.67	
7,071.0	26.70	359.40	7,007.1	-370.3	-209.0	-354.2	12.00	12.00	
7,101.0	30.10	0.00	7,033.5	-356.1	-209.1	-340.0	11.37	11.33	
7,131.0	34.30	0.30	7,058.9	-340.1	-209.1	-324.0	14.01	14.00	
7,161.0	38.40	358.70	7,083.0	-322.3	-209.2	-306.3	14.03	13.67	
7,191.0	41.90	358.40	7,106.0	-303.0	-209.7	-287.0	11.68	11.67	
7,221.0	45.50	358.50	7,127.7	-282.3	-210.3	-266.3	12.00	12.00	
7,251.0	46.70	357.50	7,148.5	-260.7	-211.0	-244.7	4.67	4.00	
7,281.0	47.90	356.80	7,168.8	-238.6	-212.1	-222.6	4.35	4.00	
7,311.0	50.30	356.70	7,188.4	-216.0	-213.4	-200.0	8.00	8.00	
7,341.0	53.70	358.00	7,206.9	-192.4	-214.5	-176.3	11.84	11.33	
7,371.0	56.30	0.00	7,224.1	-167.8	-214.9	-151.8	10.24	8.67	
7,401.0	59.10	1.50	7,240.1	-142.5	-214.6	-126.5	10.25	9.33	
7,431.0	61.40	1.40	7,255.0	-116.4	-213.9	-100.6	7.67	7.67	
7,461.0	63.90	1.50	7,268.8	-89.8	-213.3	-74.1	8.34	8.33	
7,491.0	66.80	0.90	7,281.3	-62.6	-212.7	-47.0	9.84	9.67	
7,521.0	69.20	0.20	7,292.6	-34.7	-212.4	-19.2	8.29	8.00	
7,551.0	71.00	0.20	7,302.8	-6.5	-212.3	8.9	6.00	6.00	
7,581.0	72.30	359.70	7,312.2	21.9	-212.4	37.3	4.61	4.33	
7,611.0	75.00	358.90	7,320.7	50.7	-212.7	66.0	9.36	9.00	
7,641.0	78.10	358.60	7,327.6	79.9	-213.3	95.2	10.38	10.33	
7,692.0	86.70	357.30	7,334.4	130.4	-215.2	145.6	17.05	16.86	
7,766.0	92.68	356.12	7,334.8	204.2	-219.4	219.6	8.24	8.08	
7,856.0	89.87	355.07	7,332.8	293.9	-226.3	309.5	3.33	-3.12	
7,946.0	87.67	353.39	7,334.7	383.4	-235.4	399.5	3.08	-2.44	
8,036.0	88.20	354.14	7,337.9	472.8	-245.1	489.4	1.02	0.59	
8,126.0	88.55	353.66	7,340.5	562.3	-254.7	579.3	0.66	0.39	
8,216.0	88.55	355.46	7,342.8	651.8	-263.2	669.2	2.00	0.00	
8,306.0	89.59	356.95	7,344.2	741.6	-269.2	759.2	2.02	1.16	
8,396.0	90.57	356.52	7,344.1	831.5	-274.3	849.2	1.19	1.09	
8,486.0	91.19	358.70	7,342.7	921.4	-278.1	939.1	2.52	0.69	
8,576.0	91.80	0.17	7,340.4	1,011.3	-278.9	1,028.9	1.77	0.68	
8,666.0	91.19	359.33	7,338.0	1,101.3	-279.3	1,118.7	1.15	-0.68	
8,756.0	90.22	357.07	7,336.9	1,191.3	-282.2	1,208.6	2.73	-1.08	
8,847.0	90.84	359.03	7,336.1	1,282.2	-285.3	1,299.5	2.26	0.68	
8,937.0	90.48	358.08	7,335.0	1,372.2	-287.5	1,389.4	1.13	-0.40	
9,027.0	90.22	358.18	7,334.5	1,462.1	-290.5	1,479.3	0.31	-0.29	
9,117.0	90.04	358.69	7,334.3	1,552.1	-292.9	1,569.2	0.60	-0.20	

Cathedral Energy Services

Survey Report

Company:	Anadarko Petroleum Corporation	Local Co-ordinate Reference:	Well Vonderlage 29C-31HZ
Project:	DJ Wattenberg	TVD Reference:	Surface Gyros @ 4843.0ft
Site:	Vonderlage Pad (SESW S31-T3N-R66W)	MD Reference:	Surface Gyros @ 4843.0ft
Well:	Vonderlage 29C-31HZ	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	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
9,207.0	90.66	0.72	7,333.7	1,642.1	-293.4	1,659.0	2.36	0.69	
9,297.0	90.57	359.16	7,332.8	1,732.1	-293.5	1,748.8	1.74	-0.10	
9,387.0	90.04	359.46	7,332.3	1,822.1	-294.6	1,838.6	0.68	-0.59	
9,477.0	89.96	359.60	7,332.3	1,912.1	-295.3	1,928.4	0.18	-0.09	
9,567.0	89.43	0.85	7,332.8	2,002.0	-294.9	2,018.2	1.51	-0.59	
9,657.0	89.69	0.97	7,333.5	2,092.0	-293.5	2,107.8	0.32	0.29	
9,747.0	89.69	359.67	7,334.0	2,182.0	-293.0	2,197.5	1.44	0.00	
9,837.0	90.48	1.88	7,333.8	2,272.0	-291.8	2,287.2	2.61	0.88	
9,927.0	90.13	2.34	7,333.3	2,361.9	-288.5	2,376.7	0.64	-0.39	
10,017.0	91.28	2.87	7,332.2	2,451.8	-284.4	2,466.0	1.41	1.28	
10,107.0	91.01	1.26	7,330.4	2,541.8	-281.1	2,555.5	1.81	-0.30	
10,197.0	90.31	1.18	7,329.4	2,631.7	-279.2	2,645.1	0.78	-0.78	
10,287.0	89.16	0.89	7,329.8	2,721.7	-277.6	2,734.7	1.32	-1.28	
10,377.0	90.13	0.82	7,330.4	2,811.7	-276.3	2,824.3	1.08	1.08	
10,467.0	91.54	359.91	7,329.1	2,901.7	-275.7	2,914.1	1.86	1.57	
10,557.0	91.89	0.16	7,326.4	2,991.7	-275.6	3,003.8	0.48	0.39	
10,647.0	91.63	359.39	7,323.6	3,081.6	-276.0	3,093.5	0.90	-0.29	
10,737.0	92.07	0.10	7,320.7	3,171.6	-276.4	3,183.3	0.93	0.49	
10,827.0	91.63	0.35	7,317.8	3,261.5	-276.0	3,272.9	0.56	-0.49	
10,917.0	91.10	358.94	7,315.7	3,351.5	-276.6	3,362.7	1.67	-0.59	
11,007.0	91.36	358.15	7,313.7	3,441.4	-278.9	3,452.6	0.92	0.29	
11,097.0	89.08	358.64	7,313.4	3,531.4	-281.4	3,542.5	2.59	-2.53	
11,187.0	88.99	359.39	7,314.9	3,621.4	-282.9	3,632.4	0.84	-0.10	
11,277.0	89.60	357.28	7,316.0	3,711.3	-285.6	3,722.3	2.44	0.68	
11,367.0	90.22	356.72	7,316.1	3,801.2	-290.3	3,812.2	0.93	0.69	
11,457.0	90.40	357.23	7,315.7	3,891.1	-295.0	3,902.2	0.60	0.20	
11,547.0	89.69	355.27	7,315.6	3,980.9	-300.9	3,992.2	2.32	-0.79	
11,637.0	88.90	355.26	7,316.7	4,070.6	-308.3	4,082.2	0.88	-0.88	
11,696.0	88.29	355.10	7,318.1	4,129.3	-313.3	4,141.2	1.07	-1.03	Last Cathedral Survey @ 11,696' MD Projection to Bit @ 11,781' MD
11,781.0	88.29	355.10	7,320.7	4,214.0	-320.5	4,226.1	0.00	0.00	

Cathedral Energy Services

Survey Report

Company:	Anadarko Petroleum Corporation	Local Co-ordinate Reference:	Well Vonderlage 29C-31HZ
Project:	DJ Wattenberg	TVD Reference:	Surface Gyros @ 4843.0ft
Site:	Vonderlage Pad (SESW S31-T3N-R66W)	MD Reference:	Surface Gyros @ 4843.0ft
Well:	Vonderlage 29C-31HZ	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
Vonderlage 29C-31HZ F	0.00	0.00	7,312.0	4,262.8	-306.6	1,311,704.65	3,188,828.16	40.187043	-104.824146
- actual wellpath misses target center by 51.5ft at 11781.0ft MD (7320.7 TVD, 4214.0 N, -320.5 E)									
- Point									
VP	0.00	0.00	3,639.5	-444.6	-206.7	1,306,997.22	3,188,928.09	40.174119	-104.823917
- actual wellpath misses target center by 35.4ft at 3694.2ft MD (3642.5 TVD, -444.8 N, -171.5 E)									
- Point									
Vonderlage 29C-31HZ F	0.00	0.00	7,312.0	4,212.8	-306.6	1,311,654.63	3,188,828.16	40.186906	-104.824147
- actual wellpath misses target center by 16.2ft at 11778.4ft MD (7320.6 TVD, 4211.4 N, -320.3 E)									
- Point									

Casing Points				
Measured Depth	Vertical Depth		Casing Diameter	Hole Diameter
(ft)	(ft)	Name	(in)	(in)
7,736.0	7,335.5	7"		

Design Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	
725.0	725.0	5.5	-4.3	Last Surface Gyro @ 725' MD
738.0	737.9	5.8	-4.3	First Cathedral Survey @ 738' MD
11,696.0	7,318.1	4,129.3	-313.3	Last Cathedral Survey @ 11,696' MD
11,781.0	7,320.7	4,214.0	-320.5	Projection to Bit @ 11,781' MD

Checked By: _____ Approved By: _____ Date: _____