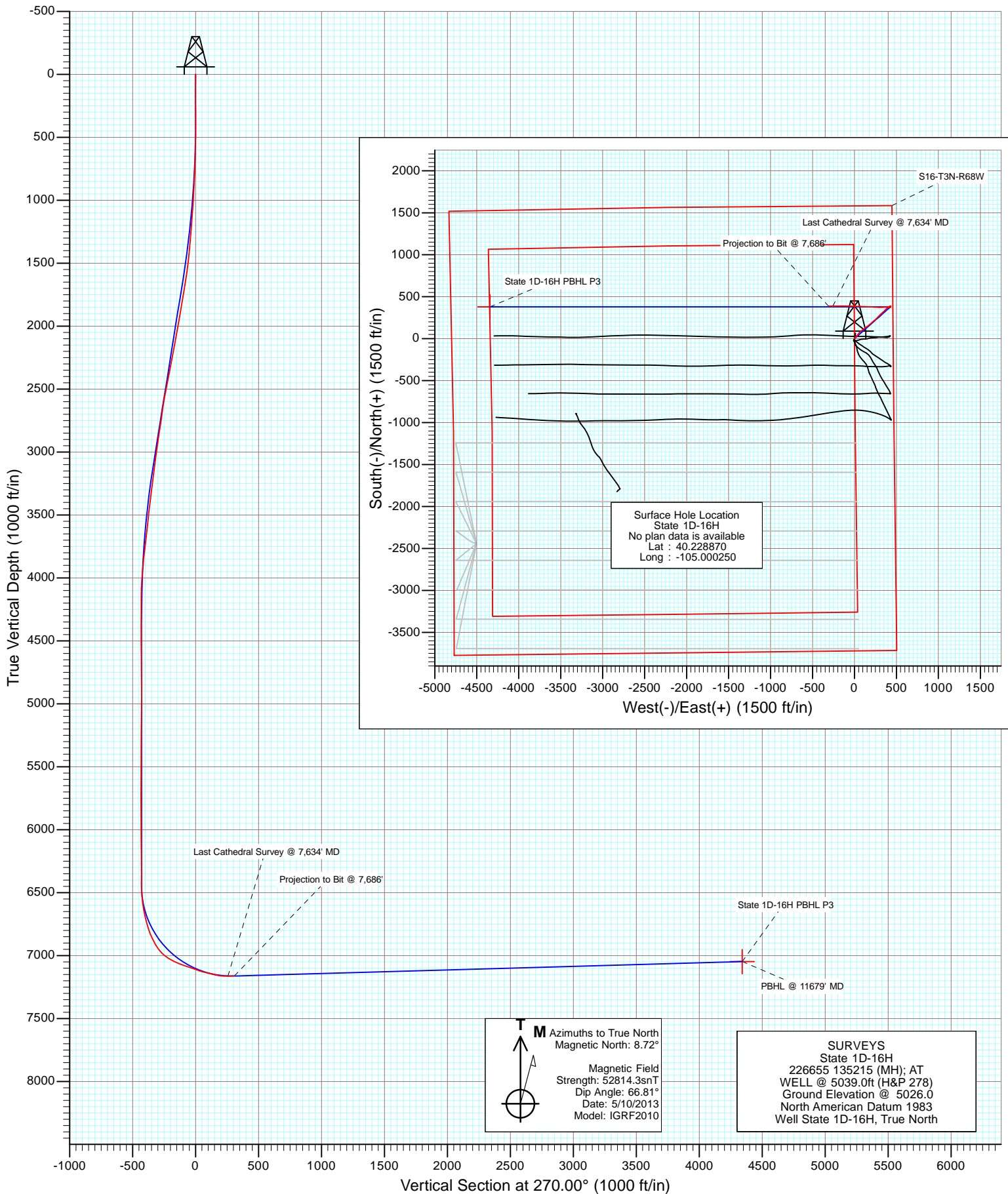




Project: DJ Wattenberg
Site: S16-T3N-R68W (State)
Well: State 1D-16H
Wellbore: Hz
Design: SURVEYS



Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well State 1D-16H
Project:	DJ Wattenberg	TVD Reference:	WELL @ 5039.0ft (H&P 278)
Site:	S16-T3N-R68W (State)	MD Reference:	WELL @ 5039.0ft (H&P 278)
Well:	State 1D-16H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	SURVEYS	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		S16-T3N-R68W (State)			
Site Position:		Northing:	1,326,575.12 ft	Latitude:	40.228760
From:	Lat/Long	Easting:	3,139,542.66 ft	Longitude:	-105.000250
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.32 °

Well	State 1D-16H					
Well Position	+N/-S	0.0 ft	Northing:	1,326,615.17 ft	Latitude:	40.228870
	+E/-W	0.0 ft	Easting:	3,139,542.43 ft	Longitude:	-105.000250
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	5,026.0 ft

Wellbore	Hz				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	5/10/2013	8.72	66.81	52,814

Design	SURVEYS				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	270.00	

Survey Program	Date	5/20/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
123.0	7,686.0	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		
123.0	0.10	55.80	123.0	0.1	0.1	-0.1	0.08	0.08		
215.0	0.10	250.00	215.0	0.1	0.1	-0.1	0.22	0.00		
307.0	0.10	317.00	307.0	0.1	-0.1	0.1	0.12	0.00		
399.0	0.50	278.70	399.0	0.2	-0.5	0.5	0.46	0.43		
491.0	1.00	11.30	491.0	1.1	-0.7	0.7	1.24	0.54		
583.0	2.20	28.70	583.0	3.4	0.3	-0.3	1.39	1.30		
675.0	2.90	34.00	674.9	6.9	2.4	-2.4	0.80	0.76		
767.0	3.74	42.40	766.7	11.0	5.7	-5.7	1.05	0.91		
788.0	4.00	34.67	787.7	12.1	6.6	-6.6	2.77	1.24		
868.0	4.00	38.60	867.5	16.6	9.9	-9.9	0.34	0.00		
929.0	4.00	61.90	928.3	19.3	13.1	-13.1	2.65	0.00		
1,021.0	5.60	52.90	1,020.0	23.5	19.6	-19.6	1.92	1.74		

Cathedral Energy Services

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Site:	S16-T3N-R68W (State)	MD Reference:	WELL @ 5039.0ft (H&P 278)
Well:	State 1D-16H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	SURVEYS	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
1,113.0	6.20	37.10	1,111.5	30.2	26.1	-26.1	1.87	0.65	
1,205.0	6.90	39.90	1,202.9	38.4	32.7	-32.7	0.84	0.76	
1,297.0	7.60	37.40	1,294.2	47.4	39.9	-39.9	0.83	0.76	
1,389.0	8.70	34.70	1,385.2	58.0	47.6	-47.6	1.27	1.20	
1,481.0	9.40	37.90	1,476.1	69.7	56.2	-56.2	0.94	0.76	
1,573.0	10.30	50.20	1,566.8	80.8	67.1	-67.1	2.48	0.98	
1,665.0	11.30	51.20	1,657.1	91.8	80.4	-80.4	1.11	1.09	
1,757.0	12.00	54.70	1,747.2	102.9	95.3	-95.3	1.08	0.76	
1,849.0	13.00	51.30	1,837.1	114.9	111.1	-111.1	1.35	1.09	
1,942.0	12.50	54.50	1,927.8	127.3	127.5	-127.5	0.93	-0.54	
2,034.0	11.70	51.70	2,017.7	138.9	142.9	-142.9	1.08	-0.87	
2,127.0	12.60	52.90	2,108.6	150.8	158.4	-158.4	1.01	0.97	
2,219.0	13.90	51.60	2,198.2	163.8	175.1	-175.1	1.45	1.41	
2,313.0	14.20	48.10	2,289.4	178.5	192.5	-192.5	0.96	0.32	
2,408.0	15.40	47.80	2,381.2	194.7	210.5	-210.5	1.27	1.26	
2,503.0	14.00	51.90	2,473.1	210.3	228.9	-228.9	1.84	-1.47	
2,597.0	13.10	48.30	2,564.5	224.4	245.8	-245.8	1.31	-0.96	
2,692.0	11.50	45.40	2,657.3	238.2	260.6	-260.6	1.80	-1.68	
2,787.0	12.40	40.70	2,750.3	252.6	274.0	-274.0	1.39	0.95	
2,881.0	11.80	47.30	2,842.2	266.8	287.6	-287.6	1.60	-0.64	
2,976.0	11.50	44.00	2,935.2	280.2	301.4	-301.4	0.77	-0.32	
3,070.0	11.50	44.50	3,027.3	293.6	314.4	-314.4	0.11	0.00	
3,165.0	8.40	49.90	3,120.9	304.8	326.4	-326.4	3.40	-3.26	
3,260.0	9.50	50.90	3,214.7	314.2	337.8	-337.8	1.17	1.16	
3,354.0	9.90	48.40	3,307.4	324.5	349.8	-349.8	0.62	0.43	
3,449.0	10.40	43.80	3,400.9	336.1	361.9	-361.9	1.00	0.53	
3,544.0	8.30	41.40	3,494.6	347.4	372.4	-372.4	2.25	-2.21	
3,638.0	8.70	43.10	3,587.6	357.7	381.7	-381.7	0.50	0.43	
3,733.0	8.70	53.40	3,681.5	367.2	392.4	-392.4	1.64	0.00	
3,827.0	8.20	50.00	3,774.5	375.8	403.2	-403.2	0.75	-0.53	
3,922.0	6.80	61.10	3,868.7	382.9	413.3	-413.3	2.11	-1.47	
4,017.0	5.20	77.60	3,963.2	386.5	422.5	-422.5	2.46	-1.68	
4,111.0	2.40	85.70	4,056.9	387.6	428.6	-428.6	3.03	-2.98	
4,206.0	0.70	5.80	4,151.9	388.3	430.6	-430.6	2.50	-1.79	
4,300.0	0.90	351.80	4,245.9	389.6	430.6	-430.6	0.30	0.21	
4,395.0	1.00	341.90	4,340.9	391.1	430.2	-430.2	0.20	0.11	
4,490.0	0.70	153.70	4,435.9	391.4	430.2	-430.2	1.79	-0.32	
4,584.0	0.70	201.10	4,529.9	390.3	430.3	-430.3	0.60	0.00	
4,679.0	0.80	205.90	4,624.9	389.2	429.8	-429.8	0.12	0.11	
4,773.0	0.70	213.30	4,718.9	388.1	429.2	-429.2	0.15	-0.11	
4,868.0	0.70	213.80	4,813.9	387.2	428.5	-428.5	0.01	0.00	
4,963.0	1.10	224.40	4,908.8	386.0	427.6	-427.6	0.45	0.42	
5,057.0	1.10	76.20	5,002.8	385.6	427.8	-427.8	2.25	0.00	
5,152.0	0.70	79.80	5,097.8	385.9	429.3	-429.3	0.43	-0.42	
5,247.0	0.30	76.10	5,192.8	386.1	430.1	-430.1	0.42	-0.42	
5,341.0	0.50	115.10	5,286.8	386.0	430.7	-430.7	0.35	0.21	
5,436.0	0.50	135.10	5,381.8	385.5	431.4	-431.4	0.18	0.00	
5,530.0	0.60	189.20	5,475.8	384.7	431.6	-431.6	0.54	0.11	
5,625.0	1.00	169.10	5,570.8	383.4	431.6	-431.6	0.51	0.42	
5,720.0	1.90	170.10	5,665.8	381.1	432.1	-432.1	0.95	0.95	
5,814.0	0.20	228.00	5,759.8	379.4	432.2	-432.2	1.92	-1.81	
5,909.0	0.10	164.70	5,854.8	379.2	432.1	-432.1	0.19	-0.11	
6,004.0	0.30	301.60	5,949.8	379.3	431.9	-431.9	0.40	0.21	

Cathedral Energy Services

Survey Report

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Project:	DJ Wattenberg	TVD Reference:	WELL @ 5039.0ft (H&P 278)
Site:	S16-T3N-R68W (State)	MD Reference:	WELL @ 5039.0ft (H&P 278)
Well:	State 1D-16H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	SURVEYS	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
6,098.0	0.50	245.70	6,043.8	379.2	431.3	-431.3	0.44	0.21	
6,193.0	0.90	227.00	6,138.7	378.5	430.4	-430.4	0.48	0.42	
6,288.0	1.20	217.00	6,233.7	377.2	429.3	-429.3	0.37	0.32	
6,382.0	1.10	185.10	6,327.7	375.6	428.6	-428.6	0.68	-0.11	
6,445.0	0.70	187.50	6,390.7	374.6	428.5	-428.5	0.64	-0.63	
6,477.0	0.70	184.90	6,422.7	374.2	428.5	-428.5	0.10	0.00	
6,508.0	0.50	118.60	6,453.7	373.9	428.6	-428.6	2.18	-0.65	
6,540.0	1.00	256.60	6,485.7	373.8	428.4	-428.4	4.41	1.56	
6,572.0	4.00	269.80	6,517.7	373.7	427.0	-427.0	9.48	9.37	
6,603.0	6.80	277.20	6,548.5	374.0	424.1	-424.1	9.29	9.03	
6,635.0	9.60	279.60	6,580.2	374.6	419.6	-419.6	8.81	8.75	
6,666.0	9.60	279.70	6,610.8	375.5	414.5	-414.5	0.05	0.00	
6,698.0	9.60	279.80	6,642.3	376.4	409.3	-409.3	0.05	0.00	
6,729.0	11.20	278.70	6,672.8	377.3	403.7	-403.7	5.20	5.16	
6,761.0	12.50	273.60	6,704.1	378.0	397.2	-397.2	5.21	4.06	
6,792.0	14.90	266.50	6,734.2	378.0	389.9	-389.9	9.44	7.74	
6,824.0	16.70	262.50	6,765.0	377.1	381.2	-381.2	6.57	5.62	
6,855.0	18.80	259.90	6,794.6	375.7	371.9	-371.9	7.24	6.77	
6,887.0	21.50	262.90	6,824.6	374.0	361.0	-361.0	9.03	8.44	
6,918.0	25.00	268.40	6,853.1	373.1	348.8	-348.8	13.28	11.29	
6,950.0	26.50	272.70	6,881.9	373.3	334.9	-334.9	7.48	4.69	
6,982.0	30.40	271.50	6,910.0	373.8	319.7	-319.7	12.32	12.19	
7,013.0	34.90	271.50	6,936.1	374.3	302.9	-302.9	14.52	14.52	
7,045.0	39.70	271.80	6,961.6	374.8	283.6	-283.6	15.01	15.00	
7,076.0	46.20	271.70	6,984.3	375.5	262.5	-262.5	20.97	20.97	
7,108.0	51.80	272.20	7,005.2	376.3	238.3	-238.3	17.54	17.50	
7,139.0	56.80	272.60	7,023.3	377.4	213.2	-213.2	16.16	16.13	
7,171.0	63.30	271.80	7,039.3	378.4	185.5	-185.5	20.43	20.31	
7,202.0	67.20	272.30	7,052.3	379.4	157.4	-157.4	12.67	12.58	
7,234.0	68.40	272.30	7,064.4	380.6	127.8	-127.8	3.75	3.75	
7,265.0	69.70	272.90	7,075.4	381.9	98.9	-98.9	4.57	4.19	
7,297.0	70.00	273.00	7,086.5	383.5	68.9	-68.9	0.98	0.94	
7,328.0	70.20	272.20	7,097.0	384.8	39.7	-39.7	2.51	0.65	
7,360.0	70.40	271.80	7,107.8	385.8	9.6	-9.6	1.33	0.62	
7,392.0	71.80	271.50	7,118.2	386.7	-20.6	20.6	4.46	4.37	
7,423.0	74.00	270.60	7,127.3	387.3	-50.3	50.3	7.62	7.10	
7,455.0	75.90	270.10	7,135.6	387.5	-81.2	81.2	6.13	5.94	
7,486.0	76.40	270.00	7,143.0	387.5	-111.3	111.3	1.64	1.61	
7,518.0	76.80	269.50	7,150.4	387.3	-142.4	142.4	1.97	1.25	
7,549.0	78.90	269.80	7,157.0	387.2	-172.7	172.7	6.84	6.77	
7,581.0	83.80	270.70	7,161.8	387.3	-204.3	204.3	15.56	15.31	
7,613.0	89.30	270.30	7,163.7	387.6	-236.2	236.2	17.23	17.19	
7,634.0	91.90	270.10	7,163.5	387.6	-257.2	257.2	12.42	12.38	Last Cathedral Survey @ 7,634' MD Projection to Bit @ 7,686'
7,686.0	92.10	269.60	7,161.7	387.5	-309.2	309.2	1.04	0.38	

Cathedral Energy Services

Survey Report

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Site:	S16-T3N-R68W (State)	MD Reference:	WELL @ 5039.0ft (H&P 278)
Well:	State 1D-16H	North Reference:	True
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	SURVEYS	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
- Shape									
State 1D-16H PBHL	0.00	0.00	7,048.2	379.3	-4,341.7	1,326,969.95	3,135,198.65	40.229910	-105.015800
- actual wellpath misses target center by 4034.1ft at 7686.0ft MD (7161.7 TVD, 387.5 N, -309.2 E)									
- Point									
State 1D-16H PBHL P3	0.00	0.00	7,048.0	379.3	-4,341.7	1,326,969.95	3,135,198.65	40.229910	-105.015800
- actual wellpath misses target center by 4034.1ft at 7686.0ft MD (7161.7 TVD, 387.5 N, -309.2 E)									
- Point									

Design Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S	+E/-W		
		(ft)	(ft)	Comment	
7,634.0	7,163.5	387.6	-257.2	Last Cathedral Survey @ 7,634' MD	
7,686.0	7,161.7	387.5	-309.2	Projection to Bit @ 7,686'	

Checked By: _____ Approved By: _____ Date: _____