



**Scientific Drilling**

## **OXY USA RMAT**

**Garfield County, CO NAD27  
Cascade Creek 609-14 Pad  
CC 697-09-33B - Slot D**

**OH**

**Design: OH**

## **Standard Survey Report**

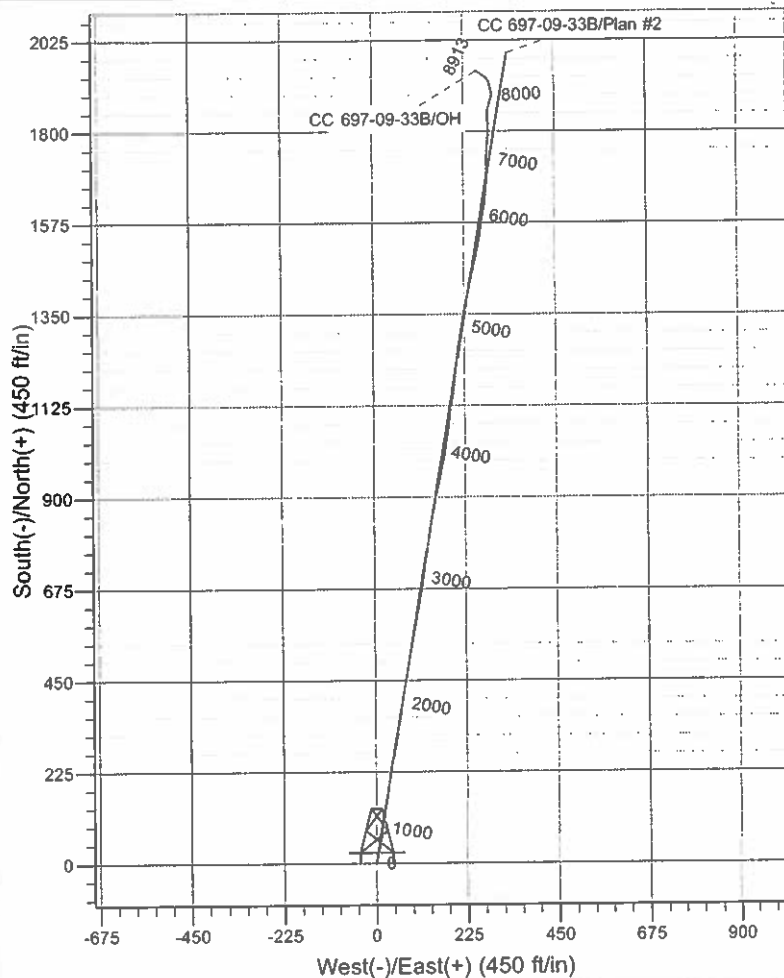
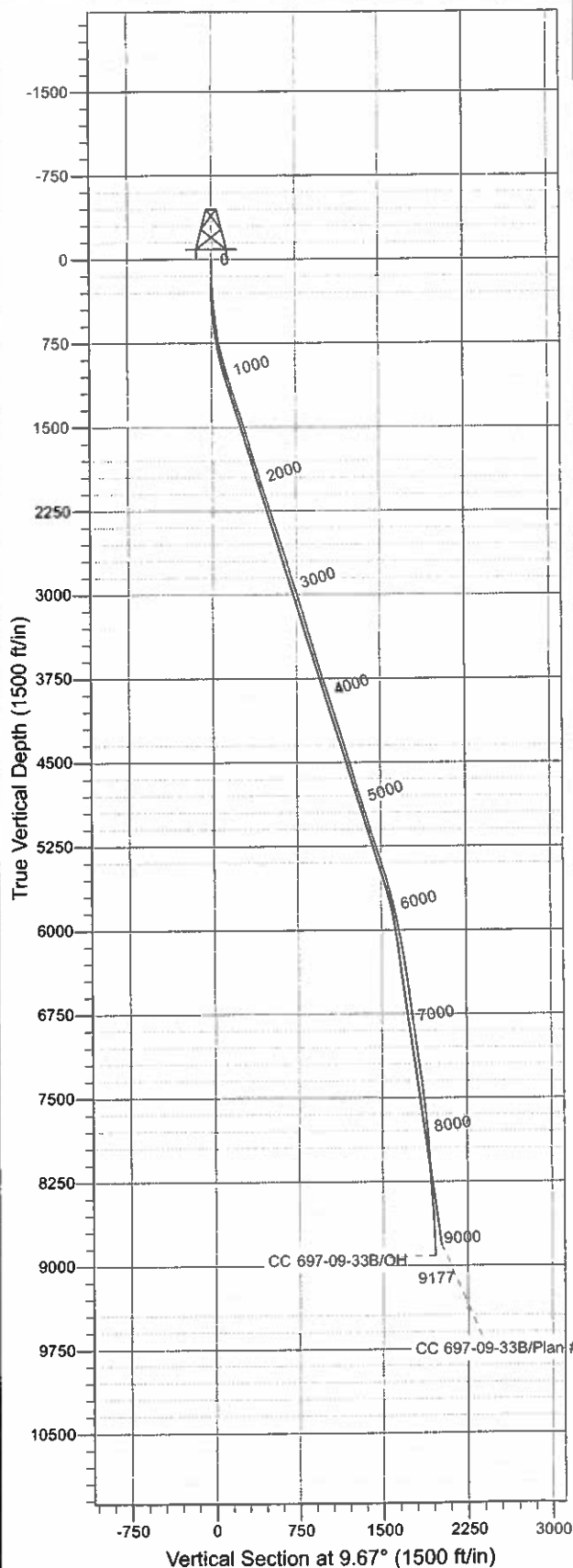
**06 October, 2010**





Scientific Drilling

Project: Garfield County, CO NAD27  
Site: Cascade Creek 609-14 Pad  
Well: CC 697-09-33B  
Wellbore: OH  
Design: OH



#### WELL DETAILS: CC 697-09-33B

Ground Level: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)			
0.00	0.00	629765.15	1229353.64
Northing		Easting	
Latitude		Longitude	
39° 31' 50.528 N		108° 13' 57.127 W	
D		D	

#### REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well CC 697-09-33B - Slot D, True North  
Vertical (TVD) Reference: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)  
Section (VS) Reference: Slot - D(0.00N, 0.00E)  
Measured Depth Reference: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)  
Calculation Method: Minimum Curvature  
Local North: True  
Location: Sec 9 T6S R97W

#### PROJECT DETAILS: Garfield County, CO NAD27

Geodetic System: US State Plane 1927 (Exact solution)  
Datum: NAD 1927 (NADCON CONUS)  
Ellipsoid: Clarke 1866  
Zone: Colorado Central 502

#### Design: OH (CC 697-09-33B/OH)

Created By: Julie Cruse Date: 2010-10-06



# Scientific Drilling Survey Report



Company:	OXY USA RMAT	Local Co-ordinate Reference:	Well CC 697-09-33B - Slot D
Project:	Garfield County, CO NAD27	TVD Reference:	GL 8393' & RKB 30' @ 8423.00ft (H&P 330)
Site:	Cascade Creek 609-14 Pad	MD Reference:	GL 8393' & RKB 30' @ 8423.00ft (H&P 330)
Well:	CC 697-09-33B	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Project	Garfield County, CO NAD27		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	Colorado Central 502		

Site	Cascade Creek 609-14 Pad, Sec 9 T6S R97W		
Site Position:		Northing:	629,789.23 usft
From:	Map	Easting:	1,229,350.88 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in
		Latitude:	39° 31' 50.765 N
		Longitude:	108° 13' 57.172 W
		Grid Convergence:	-1.72 °

Well	CC 697-09-33B - Slot D		
Well Position	+N/-S	0.00 ft	Northing:
	+E/-W	0.00 ft	Easting:
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft
		Latitude:	39° 31' 50.528 N
		Longitude:	108° 13' 57.127 W
		Ground Level:	8,393.00 ft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2010	2009-12-08	10.66
			Dip Angle (°)
			65.76
			Field Strength (nT)
			52,371

Design	OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)
	0.00	0.00	0.00
			Direction (°)
			9.67

Survey Program	Date 2010-10-06		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name
89.00	643.00	Survey #1 - Surface Gyro (OH)	Standard Keeper 103
708.00	2,675.00	Survey #2 - Surface MWD (OH)	MWD-SDI
2,787.00	9,177.00	Survey #3 - Production (OH)	MWD-SDI
			Description
			Standard Wireline Keeper ver 1.0.3
			MWD - Standard ISCWSA
			MWD - Standard ISCWSA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89.00	0.46	125.64	89.00	-0.21	0.29	-0.16	0.52	0.52	0.00
First Gyro Survey									
120.00	0.37	86.43	120.00	-0.27	0.49	-0.19	0.94	-0.29	-126.48
151.00	0.71	48.47	151.00	-0.14	0.74	-0.02	1.54	1.10	-122.45
182.00	1.40	27.80	181.99	0.32	1.06	0.49	2.51	2.23	-66.68
212.00	1.92	26.22	211.98	1.10	1.45	1.32	1.74	1.73	-5.27
243.00	2.54	24.27	242.96	2.19	1.96	2.49	2.01	2.00	-6.29
274.00	2.92	20.28	273.92	3.56	2.52	3.93	1.37	1.23	-12.87



# Scientific Drilling Survey Report



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Project: Garfield County, CO NAD27  
Site: Cascade Creek 609-14 Pad  
Well: CC 697-09-33B  
Wellbore: OH  
Design: OH

Local Co-ordinate Reference: Well CC 697-09-33B - Slot D  
TVD Reference: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)  
MD Reference: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)  
North Reference: True  
Survey Calculation Method: Minimum Curvature  
Database: Rockies-R5000.1

## Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
304.00	4.03	11.74	303.86	5.30	3.00	5.73	4.07	3.70	-28.47
335.00	4.53	7.70	334.78	7.58	3.38	8.04	1.88	1.61	-13.03
366.00	5.21	7.10	365.67	10.19	3.72	10.67	2.20	2.19	-1.94
397.00	5.58	5.37	396.53	13.09	4.03	13.58	1.30	1.19	-5.58
427.00	5.92	8.87	426.38	16.07	4.41	16.58	1.63	1.13	11.67
458.00	5.98	11.93	457.21	19.23	4.99	19.80	1.04	0.19	9.87
489.00	6.07	10.51	488.04	22.42	5.62	23.05	0.56	0.29	-4.58
550.00	6.89	13.83	548.65	29.15	7.09	29.92	1.48	1.34	5.44
643.00	8.76	10.87	640.78	41.52	9.75	42.57	2.06	2.01	-3.18
Last Gyro Survey									
708.00	9.87	11.80	704.92	51.83	11.83	53.08	1.72	1.71	1.43
First SDI MWD Survey									
800.00	11.74	7.25	795.29	68.84	14.62	70.32	2.23	2.03	-4.95
894.00	13.96	7.36	886.93	89.57	17.28	91.20	2.36	2.36	0.12
987.00	15.56	8.69	976.86	113.03	20.60	114.89	1.76	1.72	1.43
1,081.00	16.71	8.45	1,067.15	138.86	24.49	141.00	1.23	1.22	-0.26
1,176.00	18.11	7.83	1,157.80	167.00	28.51	169.42	1.49	1.47	-0.65
1,270.00	18.03	9.33	1,247.16	195.83	32.86	198.57	0.50	-0.09	1.60
1,365.00	18.11	10.47	1,337.48	224.85	37.93	228.03	0.38	0.08	1.20
1,460.00	18.11	10.56	1,427.77	253.89	43.32	257.56	0.03	0.00	0.09
1,554.00	17.67	10.47	1,517.23	282.28	48.59	286.43	0.47	-0.47	-0.10
1,649.00	16.62	9.86	1,608.00	309.84	53.53	314.43	1.12	-1.11	-0.64
1,744.00	16.09	8.45	1,699.16	336.25	57.79	341.18	0.70	-0.56	-1.48
1,838.00	16.80	8.01	1,789.31	362.59	61.60	367.78	0.77	0.76	-0.47
1,933.00	16.53	8.89	1,880.32	389.53	65.60	395.02	0.39	-0.28	0.93
2,028.00	17.59	8.80	1,971.14	417.07	69.89	422.89	1.12	1.12	-0.09
2,123.00	18.38	9.15	2,061.50	446.05	74.47	452.22	0.84	0.83	0.37
2,217.00	17.76	10.47	2,150.86	474.78	79.43	481.37	0.79	-0.66	1.40
2,312.00	18.47	9.33	2,241.15	503.87	84.50	510.91	0.84	0.75	-1.20
2,407.00	18.82	9.06	2,331.17	533.86	89.35	541.28	0.38	0.37	-0.28
2,501.00	18.73	10.65	2,420.17	563.66	94.53	571.53	0.55	-0.10	1.69
2,596.00	18.29	11.09	2,510.25	593.28	100.22	601.68	0.49	-0.46	0.46
2,675.00	17.41	10.73	2,585.45	617.06	104.80	625.89	1.12	-1.11	-0.46
Last Survey in 14 3/4" Hole									
2,787.00	16.45	12.20	2,692.59	649.02	111.27	658.49	0.94	-0.86	1.31
First Survey in 8 3/4" Hole									
2,882.00	17.50	9.07	2,783.46	676.27	116.37	686.21	1.46	1.11	-3.29
2,977.00	17.85	9.15	2,873.97	704.75	120.93	715.05	0.37	0.37	0.08
3,072.00	16.97	7.13	2,964.62	732.89	124.97	743.46	1.12	-0.93	-2.13
3,166.00	16.27	5.90	3,054.69	759.60	128.03	770.31	0.83	-0.74	-1.31
3,261.00	17.32	9.33	3,145.64	786.79	131.69	797.73	1.52	1.11	3.61
3,356.00	17.23	10.47	3,236.35	814.58	136.54	825.94	0.37	-0.09	1.20
3,450.00	16.80	11.18	3,326.24	841.59	141.70	853.44	0.51	-0.46	0.76
3,545.00	17.23	10.82	3,417.08	868.88	147.00	881.23	0.47	0.45	-0.38



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Wellbore: OH  
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MD Reference: GL 8393' & RKB 30' @ 8423.00ft (H&P 330)  
North Reference: True  
Survey Calculation Method: Minimum Curvature  
Database: Rockies-R5000.1

## Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,640.00	16.80	10.65	3,507.92	896.20	152.18	909.02	0.46	-0.45	-0.18
3,734.00	16.18	12.02	3,598.06	922.36	157.42	935.69	0.78	-0.66	1.46
3,829.00	16.88	12.67	3,689.13	948.76	163.20	962.69	0.76	0.74	0.68
3,924.00	18.55	10.21	3,779.62	977.09	168.91	991.58	1.93	1.76	-2.59
4,019.00	18.29	10.65	3,869.76	1,006.61	174.34	1,021.59	0.31	-0.27	0.46
4,113.00	18.20	8.10	3,959.03	1,035.64	179.13	1,051.02	0.85	-0.10	-2.71
4,208.00	17.67	8.27	4,049.41	1,064.60	183.30	1,080.26	0.56	-0.56	0.18
4,303.00	17.23	8.36	4,140.04	1,092.79	187.42	1,108.74	0.46	-0.46	0.09
4,397.00	17.06	8.98	4,229.87	1,120.18	191.59	1,136.45	0.27	-0.18	0.66
4,492.00	16.53	9.15	4,320.81	1,147.29	195.92	1,163.89	0.56	-0.56	0.18
4,587.00	17.06	6.34	4,411.76	1,174.48	199.61	1,191.32	1.02	0.56	-2.96
4,682.00	17.15	6.17	4,502.56	1,202.26	202.65	1,219.21	0.11	0.09	-0.18
4,776.00	16.36	4.58	4,592.57	1,229.23	205.20	1,246.23	0.97	-0.84	-1.69
4,871.00	17.15	6.96	4,683.54	1,256.47	207.96	1,273.55	1.10	0.83	2.51
4,966.00	17.76	10.47	4,774.16	1,284.62	212.29	1,302.03	1.28	0.64	3.69
5,060.00	17.15	9.68	4,863.84	1,312.38	217.23	1,330.22	0.70	-0.65	-0.84
5,155.00	16.88	9.59	4,954.68	1,339.79	221.88	1,358.02	0.29	-0.28	-0.09
5,250.00	17.67	11.44	5,045.39	1,367.52	227.04	1,386.23	1.01	0.83	1.95
5,345.00	17.76	12.49	5,135.89	1,395.80	233.03	1,415.11	0.35	0.09	1.11
5,439.00	17.85	12.49	5,225.38	1,423.86	239.25	1,443.82	0.10	0.10	0.00
5,534.00	18.11	11.79	5,315.75	1,452.53	245.41	1,473.12	0.36	0.27	-0.74
5,628.00	17.67	12.76	5,405.20	1,480.75	251.55	1,501.96	0.57	-0.47	1.03
5,723.00	17.23	12.58	5,495.83	1,508.54	257.80	1,530.41	0.47	-0.46	-0.19
5,818.00	15.65	9.33	5,586.94	1,534.92	262.94	1,557.28	1.92	-1.66	-3.42
5,913.00	13.98	8.63	5,678.78	1,558.91	266.74	1,581.57	1.77	-1.76	-0.74
6,007.00	13.28	9.86	5,770.13	1,580.77	270.29	1,603.72	0.81	-0.74	1.31
6,102.00	12.93	10.56	5,862.66	1,601.97	274.11	1,625.25	0.40	-0.37	0.74
6,197.00	11.08	7.57	5,955.58	1,621.47	277.26	1,645.01	2.05	-1.95	-3.15
6,292.00	10.38	5.37	6,048.92	1,639.04	279.26	1,662.66	0.85	-0.74	-2.32
6,386.00	10.46	4.06	6,141.37	1,655.98	280.66	1,679.60	0.27	0.09	-1.39
6,481.00	10.02	3.53	6,234.85	1,672.84	281.78	1,696.40	0.47	-0.46	-0.56
6,576.00	9.23	4.67	6,328.52	1,688.68	282.91	1,712.21	0.86	-0.83	1.20
6,670.00	8.27	359.66	6,421.42	1,702.95	283.48	1,726.37	1.30	-1.02	-5.33
6,765.00	7.83	357.46	6,515.49	1,716.25	283.16	1,739.43	0.57	-0.46	-2.32
6,860.00	7.21	3.35	6,609.67	1,728.67	283.22	1,751.68	1.04	-0.65	6.20
6,955.00	6.68	359.13	6,703.97	1,740.14	283.48	1,763.03	0.77	-0.56	-4.44
7,050.00	7.56	359.05	6,798.24	1,751.92	283.29	1,774.61	0.93	0.93	-0.08
7,144.00	8.18	7.40	6,891.36	1,764.73	284.05	1,787.37	1.38	0.66	8.88
7,239.00	8.00	5.81	6,985.41	1,778.01	285.59	1,800.72	0.30	-0.19	-1.67
7,334.00	8.09	3.44	7,079.48	1,791.26	286.66	1,813.96	0.36	0.09	-2.49
7,429.00	8.27	1.16	7,173.51	1,804.76	287.20	1,827.36	0.39	0.19	-2.40
7,523.00	7.83	357.38	7,266.59	1,817.92	287.05	1,840.30	0.73	-0.47	-4.02
7,618.00	7.74	354.65	7,360.71	1,830.75	286.15	1,852.80	0.40	-0.09	-2.87



# Scientific Drilling Survey Report



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Project:	Garfield County, CO NAD27	TVD Reference:	GL 8393' & RKB 30' @ 8423.00ft (H&P 330)
Site:	Cascade Creek 609-14 Pad	MD Reference:	GL 8393' & RKB 30' @ 8423.00ft (H&P 330)
Well:	CC 697-09-33B	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
7,713.00	7.03	0.45	7,454.92	1,842.94	285.60	1,864.72	1.08	-0.75	6.11
7,807.00	6.86	9.94	7,548.24	1,854.22	286.62	1,876.01	1.23	-0.18	10.10
7,902.00	6.42	19.52	7,642.60	1,864.81	289.37	1,886.92	1.25	-0.46	10.08
7,997.00	5.54	17.06	7,737.08	1,874.20	292.49	1,896.70	0.96	-0.93	-2.59
8,091.00	4.66	14.69	7,830.71	1,882.23	294.79	1,905.01	0.96	-0.94	-2.52
8,186.00	4.04	6.69	7,925.44	1,889.29	296.16	1,912.19	0.91	-0.65	-8.42
8,281.00	3.17	353.16	8,020.25	1,895.22	296.24	1,918.05	1.27	-0.92	-14.24
8,376.00	2.81	340.68	8,115.12	1,900.03	295.15	1,922.61	0.78	-0.38	-13.14
8,470.00	3.61	341.64	8,208.97	1,905.01	293.46	1,927.24	0.85	0.85	1.02
8,565.00	4.22	348.15	8,303.75	1,911.27	291.80	1,933.13	0.79	0.64	6.85
8,660.00	5.10	346.39	8,398.44	1,918.80	290.09	1,940.26	0.94	0.93	-1.85
8,755.00	4.48	329.43	8,493.11	1,926.09	287.21	1,946.97	1.62	-0.65	-17.85
8,850.00	5.10	309.48	8,587.78	1,931.97	282.06	1,951.90	1.86	0.65	-21.00
8,944.00	5.28	306.84	8,681.40	1,937.22	275.37	1,955.95	0.32	0.19	-2.81
9,039.00	5.72	303.06	8,775.96	1,942.43	267.91	1,959.83	0.60	0.46	-3.98
9,119.00	5.10	295.41	8,855.61	1,946.13	261.35	1,962.37	1.19	-0.78	-9.56
Last SDI MWD Survey									
9,177.00	5.10	295.41	8,913.38	1,948.34	256.70	1,963.77	0.00	0.00	0.00
Projection to TD - BHL = 631704.89 ft N, 1229668.82 ft E									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
89.00	89.00	-0.21	0.29	First Gyro Survey
643.00	640.78	41.52	9.75	Last Gyro Survey
708.00	704.92	51.83	11.83	First SDI MWD Survey
2,675.00	2,585.45	617.06	104.80	Last Survey in 14 3/4" Hole
2,787.00	2,692.59	649.02	111.27	First Survey in 8 3/4" Hole
9,119.00	8,855.61	1,946.13	261.35	Last SDI MWD Survey
9,177.00	8,913.38	1,948.34	256.70	Projection to TD
9,177.00	8,913.38	1,948.34	256.70	BHL = 631704.89 ft N, 1229668.82 ft E

Checked By: _____	Approved By: _____	Date: _____
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