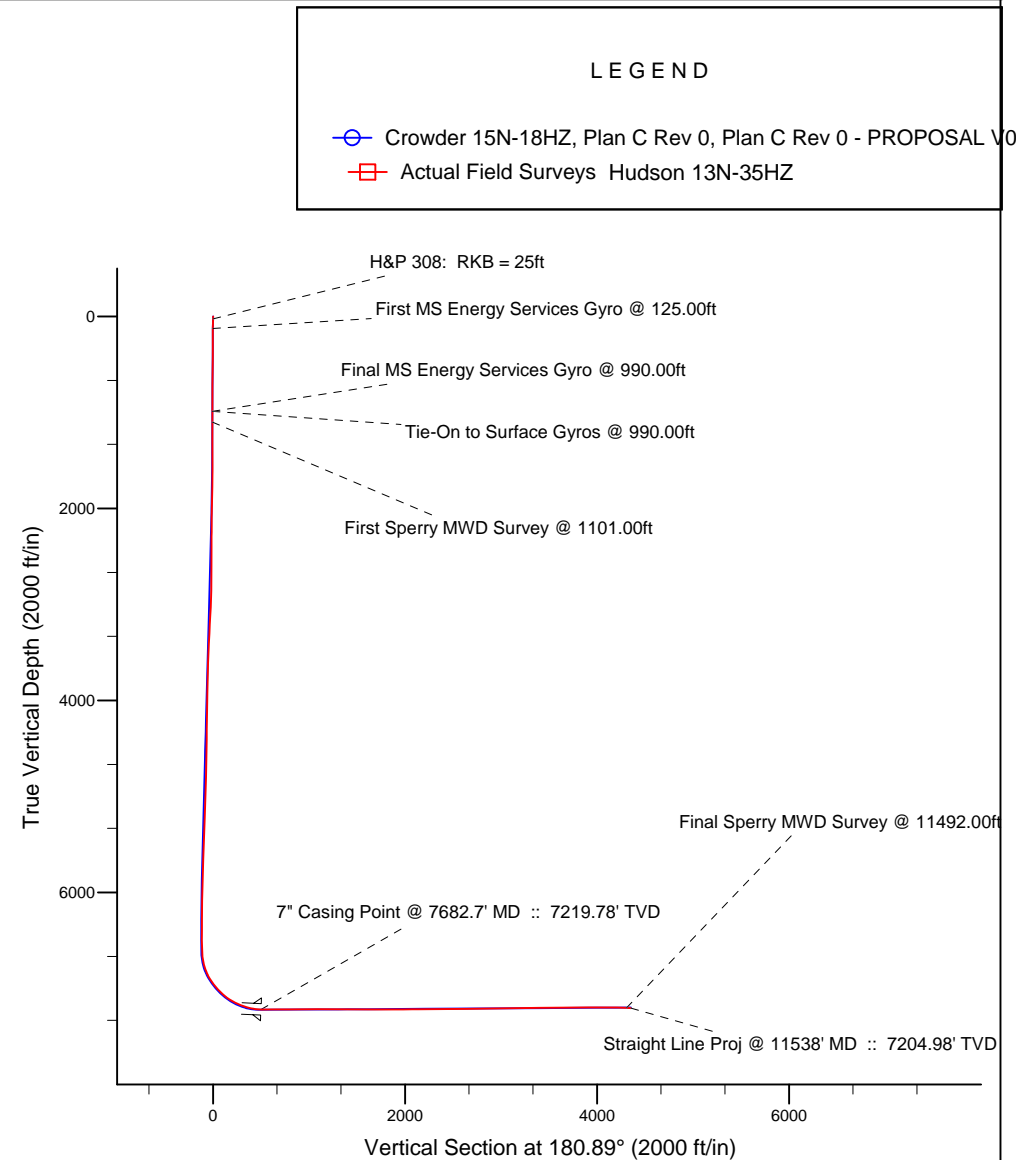
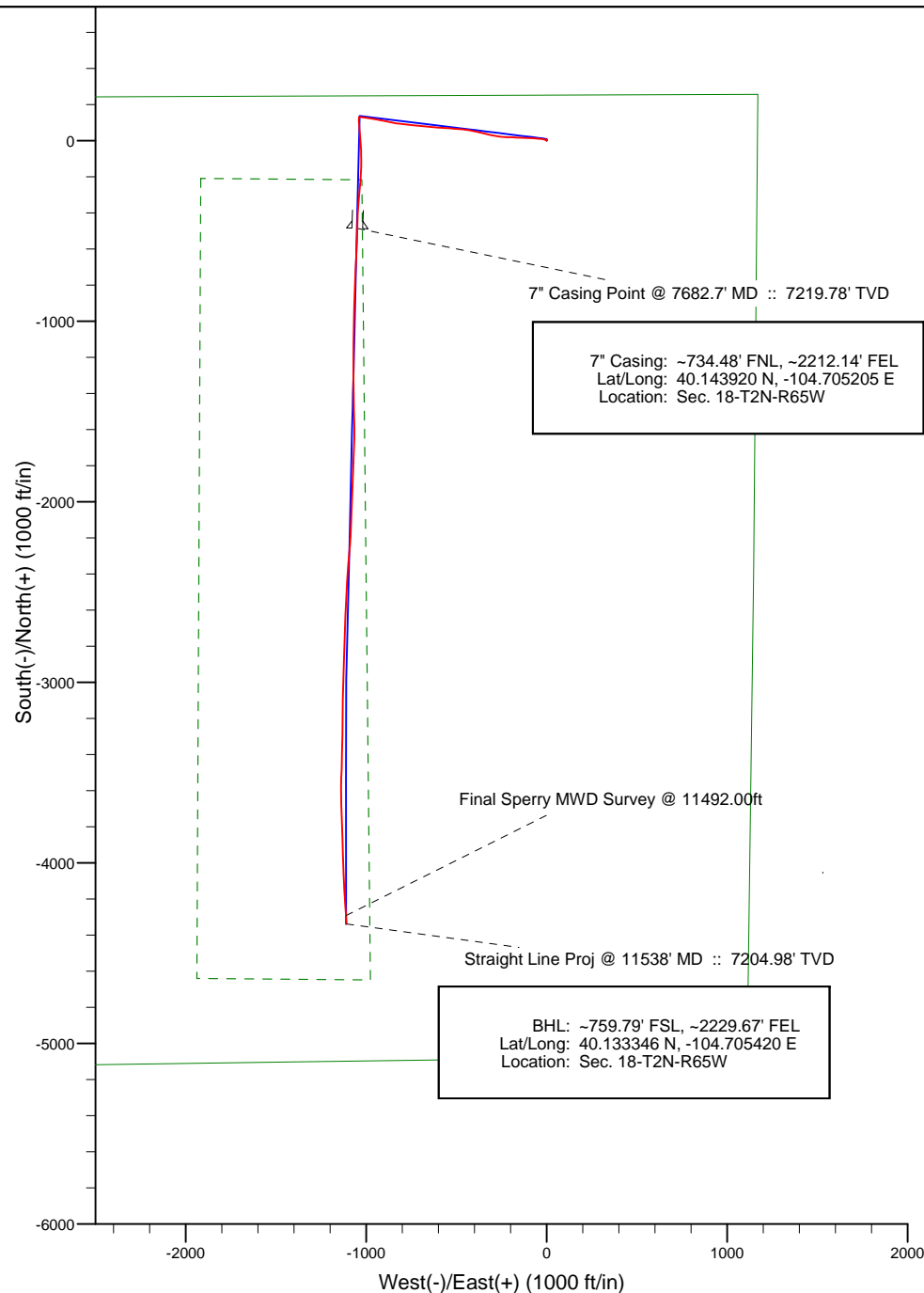


Project: Weld County, CO (NAD 83)  
 Site: Sec. 18-T2N-R65W  
 Well: Crowder 15N-18HZ  
 Wellbore: Plan C Rev 0  
 Design: Actual Field Surveys



WELL DETAILS: Crowder 15N-18HZ	
Ground Level:	4958.00
RKB=25 @ 4983.00ft (HP 308)	
Design: Actual Field Surveys (Crowder 15N-18HZ/Plan C Rev 0)	
Created By: Fred Hartmann	Date: 05/14/2013
Reviewed: _____	Date: _____

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 15N-18HZ

Plan C Rev 0

Design: Actual Field Surveys

## Sperry Drilling Services

### Standard Report

14 May, 2013

Well Coordinates: 1,296,764.29 N, 3,223,235.74 E (40° 08' 42.91" N, 104° 42' 05.24" W)

Ground Level: 4,958.00 ft

Local Coordinate Origin:

Centered on Well Crowder 15N-18HZ

Viewing Datum:

RKB=25 @ 4983.00ft (HP 308)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

**HALLIBURTON**

**Design Report for Crowder 15N-18HZ - Actual Field Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
<b>H&amp;P 308: RKB = 25ft</b>							
125.00	0.23	345.45	125.00	0.19	-0.05	-0.19	0.23
<b>First MS Energy Services Gyro @ 125.00ft</b>							
225.00	0.17	289.68	225.00	0.44	-0.24	-0.43	0.19
325.00	0.38	4.12	325.00	0.82	-0.36	-0.81	0.37
425.00	0.68	25.52	424.99	1.69	-0.08	-1.68	0.35
525.00	0.76	6.95	524.99	2.88	0.26	-2.88	0.25
625.00	0.55	26.58	624.98	3.97	0.55	-3.98	0.30
725.00	0.60	6.19	724.97	4.92	0.83	-4.93	0.21
825.00	0.38	51.25	824.97	5.64	1.14	-5.66	0.43
925.00	0.16	344.56	924.97	5.99	1.36	-6.01	0.35
990.00	0.29	339.43	989.97	6.23	1.28	-6.25	0.20
<b>Tie-On to Surface Gyros @ 990.00ft - Final MS Energy Services Gyro @ 990.00ft</b>							
1,101.00	0.39	200.94	1,100.97	6.14	1.05	-6.15	0.57
<b>First Sperry MWD Survey @ 1101.00ft</b>							
1,284.00	0.34	129.87	1,283.97	5.21	1.24	-5.23	0.23
1,469.00	0.15	140.01	1,468.96	4.67	1.82	-4.70	0.10
1,560.00	1.96	270.75	1,559.95	4.60	0.34	-4.61	2.26
1,652.00	3.97	280.13	1,651.82	5.18	-4.37	-5.11	2.24
1,744.00	5.91	284.08	1,743.47	6.89	-12.10	-6.71	2.14
1,836.00	7.80	278.92	1,834.81	9.01	-22.86	-8.66	2.16
1,928.00	10.17	276.53	1,925.68	10.91	-37.10	-10.33	2.61
2,020.00	11.17	272.20	2,016.09	12.17	-54.08	-11.33	1.39
2,111.00	10.94	274.08	2,105.40	13.12	-71.50	-12.01	0.47
2,206.00	12.50	273.81	2,198.42	14.45	-90.75	-13.04	1.64
2,301.00	14.12	273.54	2,290.86	15.85	-112.58	-14.10	1.71
2,396.00	12.45	272.17	2,383.32	16.95	-134.38	-14.86	1.79
2,490.00	15.19	271.40	2,474.59	17.64	-156.82	-15.20	2.92
2,585.00	13.66	272.75	2,566.59	18.48	-180.46	-15.67	1.65
2,680.00	14.49	273.25	2,658.74	19.69	-203.54	-16.53	0.88
2,774.00	12.80	271.14	2,750.08	20.56	-225.69	-17.06	1.87
2,869.00	12.98	272.99	2,842.69	21.33	-246.87	-17.49	0.47
2,964.00	12.42	278.91	2,935.37	23.47	-267.61	-19.31	1.49
3,058.00	14.13	283.15	3,026.85	27.65	-288.78	-23.16	2.09
3,153.00	13.63	283.52	3,119.08	32.90	-310.95	-28.07	0.53
3,248.00	13.06	282.93	3,211.51	37.92	-332.30	-32.75	0.62
3,342.00	13.74	283.27	3,302.95	42.86	-353.51	-37.36	0.73
3,437.00	13.00	283.27	3,395.38	47.90	-374.89	-42.07	0.78
3,532.00	13.44	281.68	3,487.86	52.59	-396.10	-46.43	0.60
3,626.00	13.93	278.31	3,579.19	56.44	-418.00	-49.94	1.00
3,721.00	12.76	278.89	3,671.63	59.71	-439.68	-52.87	1.24
3,816.00	13.72	275.58	3,764.10	62.43	-461.26	-55.25	1.29
3,910.00	15.36	275.73	3,855.09	64.75	-484.74	-57.22	1.75
4,005.00	13.59	273.38	3,947.07	66.67	-508.40	-58.76	1.96
4,100.00	15.19	274.61	4,039.09	68.33	-531.95	-60.06	1.71
4,194.00	15.53	275.36	4,129.73	70.49	-556.76	-61.83	0.42
4,289.00	15.55	274.14	4,221.26	72.60	-582.12	-63.55	0.34
4,384.00	15.12	272.22	4,312.87	74.00	-607.20	-64.56	0.70

**Design Report for Crowder 15N-18HZ - Actual Field Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,478.00	14.46	274.99	4,403.76	75.49	-631.14	-65.68	1.03
4,573.00	14.37	275.47	4,495.77	77.65	-654.70	-67.47	0.16
4,667.00	13.87	272.29	4,586.93	79.21	-677.57	-68.68	0.98
4,762.00	14.85	277.32	4,678.96	81.22	-701.02	-70.32	1.67
4,857.00	15.18	278.54	4,770.72	84.62	-725.39	-73.34	0.48
4,951.00	14.55	275.19	4,861.58	87.51	-749.32	-75.86	1.13
5,046.00	13.44	272.98	4,953.76	89.16	-772.23	-77.16	1.30
5,141.00	13.87	278.82	5,046.07	91.48	-794.51	-79.13	1.52
5,235.00	12.82	275.72	5,137.54	94.25	-816.02	-81.57	1.35
5,330.00	14.11	281.32	5,229.93	97.58	-837.87	-84.55	1.93
5,425.00	13.11	280.99	5,322.26	101.90	-859.80	-88.54	1.06
5,519.00	13.49	282.44	5,413.74	106.30	-880.97	-92.60	0.54
5,614.00	12.62	281.62	5,506.28	110.77	-901.96	-96.75	0.94
5,709.00	10.77	280.70	5,599.31	114.51	-920.85	-100.20	1.96
5,803.00	10.91	277.43	5,691.63	117.29	-938.30	-102.71	0.67
5,898.00	9.19	276.57	5,785.17	119.32	-954.75	-104.48	1.82
5,993.00	9.30	279.73	5,878.93	121.49	-969.85	-106.41	0.55
6,088.00	9.56	281.16	5,972.65	124.31	-985.16	-109.00	0.37
6,182.00	8.54	282.14	6,065.48	127.29	-999.64	-111.75	1.10
6,277.00	7.30	279.65	6,159.57	129.79	-1,012.49	-114.05	1.35
6,372.00	5.40	273.72	6,253.99	131.09	-1,022.90	-115.19	2.11
6,467.00	3.64	272.64	6,348.69	131.52	-1,030.37	-115.50	1.85
6,562.00	1.77	274.30	6,443.58	131.77	-1,034.85	-115.68	1.97
6,657.00	1.15	230.79	6,538.55	131.28	-1,037.05	-115.15	1.29
6,688.00	1.00	238.37	6,569.54	130.94	-1,037.52	-114.81	0.67
6,720.00	2.67	213.22	6,601.52	130.17	-1,038.17	-114.03	5.67
6,751.00	5.13	192.52	6,632.45	128.21	-1,038.86	-112.06	9.02
6,783.00	6.36	191.01	6,664.29	125.07	-1,039.51	-108.91	3.87
6,815.00	8.56	186.50	6,696.02	120.97	-1,040.12	-104.80	7.11
6,846.00	11.25	180.73	6,726.55	115.65	-1,040.42	-99.47	9.24
6,878.00	14.65	174.94	6,757.74	108.49	-1,040.10	-92.33	11.36
6,909.00	17.86	175.02	6,787.49	99.85	-1,039.34	-83.70	10.36
6,941.00	21.71	175.64	6,817.60	89.06	-1,038.47	-72.92	12.05
6,973.00	24.88	175.09	6,846.99	76.45	-1,037.44	-60.32	9.93
7,004.00	28.07	175.58	6,874.73	62.67	-1,036.32	-46.57	10.31
7,036.00	31.38	175.57	6,902.52	46.86	-1,035.10	-30.77	10.34
7,068.00	34.17	176.29	6,929.42	29.58	-1,033.87	-13.52	8.80
7,099.00	36.56	174.82	6,954.70	11.69	-1,032.47	4.35	8.18
7,131.00	40.80	174.98	6,979.67	-8.22	-1,030.70	24.23	13.25
7,162.00	43.53	176.09	7,002.65	-28.97	-1,029.08	44.95	9.13
7,194.00	44.63	177.55	7,025.64	-51.19	-1,027.85	67.15	4.68
7,226.00	45.91	179.48	7,048.16	-73.91	-1,027.27	89.86	5.86
7,257.00	48.23	180.63	7,069.27	-96.61	-1,027.29	112.56	7.96
7,289.00	52.06	180.05	7,089.78	-121.17	-1,027.44	137.12	12.05
7,320.00	55.75	180.21	7,108.04	-146.22	-1,027.49	162.16	11.91
7,352.00	59.28	182.17	7,125.22	-173.20	-1,028.06	189.14	12.18
7,384.00	61.94	184.39	7,140.92	-201.03	-1,029.66	217.00	10.28
7,415.00	64.51	185.43	7,154.89	-228.60	-1,032.04	244.60	8.81
7,447.00	66.97	186.08	7,168.04	-257.62	-1,034.96	273.67	7.91
7,479.00	69.66	185.65	7,179.86	-287.20	-1,038.00	303.29	8.50
7,510.00	71.72	184.92	7,190.11	-316.33	-1,040.69	332.46	7.01

**Design Report for Crowder 15N-18HZ - Actual Field Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
7,542.00	74.20	183.63	7,199.49	-346.84	-1,042.97	363.00	8.66
7,574.00	77.54	182.48	7,207.30	-377.82	-1,044.62	394.00	11.00
7,605.00	81.57	181.93	7,212.92	-408.28	-1,045.79	424.47	13.12
7,641.00	85.11	181.95	7,217.09	-444.01	-1,047.00	460.22	9.83
7,682.70	87.51	182.15	7,219.78	-485.59	-1,048.49	501.82	5.77
<b>7" Casing Point @ 7682.7' MD :: 7219.78' TVD</b>							
7,740.00	90.80	182.43	7,220.62	-542.83	-1,050.78	559.09	5.77
7,835.00	90.12	182.43	7,219.86	-637.74	-1,054.81	654.05	0.72
7,930.00	91.08	182.76	7,218.87	-732.64	-1,059.11	749.00	1.07
8,025.00	90.00	181.65	7,217.97	-827.56	-1,062.77	843.97	1.63
8,120.00	90.03	181.73	7,217.95	-922.52	-1,065.57	938.96	0.09
8,215.00	90.34	181.45	7,217.64	-1,017.48	-1,068.21	1,033.95	0.44
8,310.00	90.31	180.55	7,217.10	-1,112.47	-1,069.86	1,128.95	0.95
8,404.00	89.57	180.27	7,217.20	-1,206.46	-1,070.54	1,222.95	0.84
8,499.00	89.63	179.95	7,217.86	-1,301.46	-1,070.72	1,317.93	0.34
8,594.00	90.25	179.10	7,217.96	-1,396.46	-1,069.93	1,412.91	1.11
8,689.00	89.29	177.75	7,218.34	-1,491.42	-1,067.32	1,507.81	1.74
8,784.00	89.88	179.70	7,219.03	-1,586.38	-1,065.21	1,602.74	2.14
8,879.00	89.91	182.26	7,219.20	-1,681.36	-1,066.83	1,697.73	2.69
8,974.00	89.97	182.01	7,219.30	-1,776.30	-1,070.37	1,792.71	0.27
9,069.00	90.37	182.51	7,219.02	-1,871.22	-1,074.12	1,887.68	0.67
9,164.00	90.71	181.34	7,218.13	-1,966.16	-1,077.31	1,982.66	1.28
9,258.00	90.40	183.10	7,217.22	-2,060.08	-1,080.95	2,076.62	1.90
9,353.00	88.34	181.57	7,218.26	-2,154.99	-1,084.82	2,171.58	2.70
9,448.00	91.17	185.18	7,218.67	-2,249.80	-1,090.41	2,266.47	4.83
9,543.00	91.94	184.32	7,216.09	-2,344.44	-1,098.27	2,361.21	1.21
9,638.00	90.37	183.73	7,214.17	-2,439.18	-1,104.94	2,456.05	1.77
9,732.00	90.06	183.42	7,213.82	-2,533.00	-1,110.80	2,549.94	0.47
9,827.00	90.83	181.53	7,213.08	-2,627.90	-1,114.90	2,644.90	2.15
9,922.00	91.27	181.79	7,211.34	-2,722.84	-1,117.66	2,739.88	0.54
10,017.00	91.54	182.11	7,209.01	-2,817.76	-1,120.89	2,834.83	0.44
10,111.00	91.11	181.64	7,206.84	-2,911.68	-1,123.96	2,928.79	0.68
10,206.00	90.80	182.13	7,205.26	-3,006.62	-1,127.09	3,023.76	0.61
10,301.00	90.28	181.08	7,204.36	-3,101.58	-1,129.75	3,118.75	1.23
10,396.00	89.63	180.32	7,204.44	-3,196.57	-1,130.91	3,213.75	1.05
10,490.00	89.94	180.54	7,204.79	-3,290.56	-1,131.61	3,307.74	0.40
10,585.00	91.17	181.20	7,203.87	-3,385.55	-1,133.06	3,402.74	1.47
10,680.00	91.02	182.32	7,202.05	-3,480.48	-1,135.97	3,497.71	1.19
10,774.00	91.26	180.49	7,200.18	-3,574.43	-1,138.28	3,591.68	1.96
10,869.00	90.19	178.20	7,198.98	-3,669.41	-1,137.19	3,686.63	2.66
10,964.00	89.85	178.53	7,198.95	-3,764.37	-1,134.48	3,781.54	0.50
11,059.00	89.94	178.16	7,199.12	-3,859.33	-1,131.74	3,876.44	0.40
11,154.00	90.31	178.35	7,198.91	-3,954.29	-1,128.84	3,971.34	0.44
11,249.00	90.25	177.79	7,198.45	-4,049.23	-1,125.64	4,066.23	0.59
11,344.00	89.32	176.80	7,198.81	-4,144.12	-1,121.16	4,161.04	1.43
11,438.00	87.96	176.07	7,201.04	-4,237.91	-1,115.32	4,254.72	1.64
11,492.00	87.66	176.17	7,203.10	-4,291.75	-1,111.67	4,308.50	0.59
<b>Final Sperry MWD Survey @ 11492.00ft</b>							
11,538.00	87.66	176.17	7,204.98	-4,337.61	-1,108.60	4,354.30	0.00
<b>Straight Line Proj @ 11538' MD :: 7204.98' TVD</b>							

**Design Report for Crowder 15N-18HZ - Actual Field Surveys****Design Annotations**

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
25.00	25.00	0.00	0.00	H&P 308: RKB = 25ft
125.00	125.00	0.19	-0.05	First MS Energy Services Gyro @ 125.00ft
990.00	989.97	6.23	1.28	Tie-On to Surface Gyros @ 990.00ft
990.00	989.97	6.23	1.28	Final MS Energy Services Gyro @ 990.00ft
1,101.00	1,100.97	6.14	1.05	First Sperry MWD Survey @ 1101.00ft
11,492.00	7,203.10	-4,291.75	-1,111.67	Final Sperry MWD Survey @ 11492.00ft
11,538.00	7,204.98	-4,337.61	-1,108.60	Straight Line Proj @ 11538' MD :: 7204.98' TVD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/_S (ft)	+E/-W (ft)	
User	No Target (Freehand)	180.89	Slot	0.00	0.00	0.00

**Survey tool program**

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	990.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,101.00	7,641.00	Sperry MWD Surveys - Vert/Build	MWD+SC
7,740.00	11,492.00	Sperry MWD Surveys - Lateral	MWD+SC

**Casing Details**

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,682.70	7,219.78	7" Casing Point @ 7682.7' MD :: 7219.78' TVD	7	8-3/4

**Design Report for Crowder 15N-18HZ - Actual Field Surveys****Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Crowder 15N-18HZ_ - actual wellpath misses target center by 16.80ft at 10224.34ft MD (7205.02 TVD, -3024.94 N, -1127.74 E) - Point	0.00	0.00	7,207.40	-3,025.43	-1,111.11	1,293,729.10	3,222,151.96	40.136948	-104.705429
Crowder 27-18HZ P; - actual wellpath misses target center by 324.60ft at 11538.00ft MD (7204.98 TVD, -4337.61 N, -1108.60 E) - Circle (radius 175.00)	0.00	0.00	7,353.00	-4,549.65	-912.40	1,292,206.79	3,222,364.38	40.132764	-104.704718
Crowder 15N-18HZ_ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,296,764.29	3,223,235.74	40.145253	-104.701455
Crowder 27-18HZ P; - actual wellpath misses target center by 246.13ft at 10230.67ft MD (7204.94 TVD, -3031.27 N, -1127.94 E) - Circle (radius 175.00)	0.00	0.00	7,351.00	-3,038.20	-929.96	1,293,717.97	3,222,333.22	40.136913	-104.704781
Crowder 15N-18HZ_ - actual wellpath misses target center by 146.46ft at 11529.47ft MD (7204.63 TVD, -4329.10 N, -1109.17 E) - Point	0.00	0.00	7,199.80	-4,339.08	-1,255.20	1,292,414.26	3,222,019.71	40.133342	-104.705944
Crowder 15N-18HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,764.29	3,223,235.74	40.145253	-104.701455
Point 1				-1,940.10	-208.63	1,296,538.20	3,221,297.68		
Point 2				-1,941.24	-2,419.17	1,294,327.83	3,221,316.44		
Point 3				-1,937.23	-4,639.18	1,292,108.04	3,221,340.44		
Point 4				-1,074.33	-4,646.95	1,292,108.04	3,222,203.34		
Point 5				-1,041.72	-2,427.27	1,294,327.83	3,222,215.96		
Point 6				-1,023.28	-216.89	1,296,538.20	3,222,214.50		
Point 7				-1,940.10	-208.63	1,296,538.20	3,221,297.68		
Crowder 15N-18HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,764.29	3,223,235.74	40.145253	-104.701455
Point 1				-4,041.26	237.06	1,296,964.94	3,219,192.68		
Point 2				-4,046.71	-2,452.00	1,294,276.05	3,219,211.44		
Point 3				-4,046.91	-5,139.75	1,291,588.52	3,219,235.44		
Point 4				-1,527.31	-5,103.04	1,291,647.91	3,221,754.51		
Point 5				1,111.06	-5,067.10	1,291,707.61	3,224,392.34		
Point 6				1,147.76	-2,393.75	1,294,381.07	3,224,404.96		
Point 7				1,158.83	-1,067.44	1,295,707.37	3,224,404.09		
Point 8				1,170.17	257.48	1,297,032.28	3,224,403.50		
Point 9				-1,475.74	247.27	1,296,998.25	3,221,757.89		
Point 10				-4,041.26	237.06	1,296,964.94	3,219,192.68		

## North Reference Sheet for Sec. 18-T2N-R65W - Crowder 15N-18HZ - Plan C Rev 0

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB=25 @ 4983.00ft (HP 308). Northing and Easting are relative to Crowder 15N-18HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99995853

Grid Coordinates of Well: 1,296,764.29 ft N, 3,223,235.74 ft E

Geographical Coordinates of Well: 40° 08' 42.91" N, 104° 42' 05.24" W

Grid Convergence at Surface is: 0.52°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,538.00ft  
the Bottom Hole Displacement is 4,477.03ft in the Direction of 194.34° (True).

Magnetic Convergence at surface is: -8.10° ( 1 May 2013, , BGGM2012)

