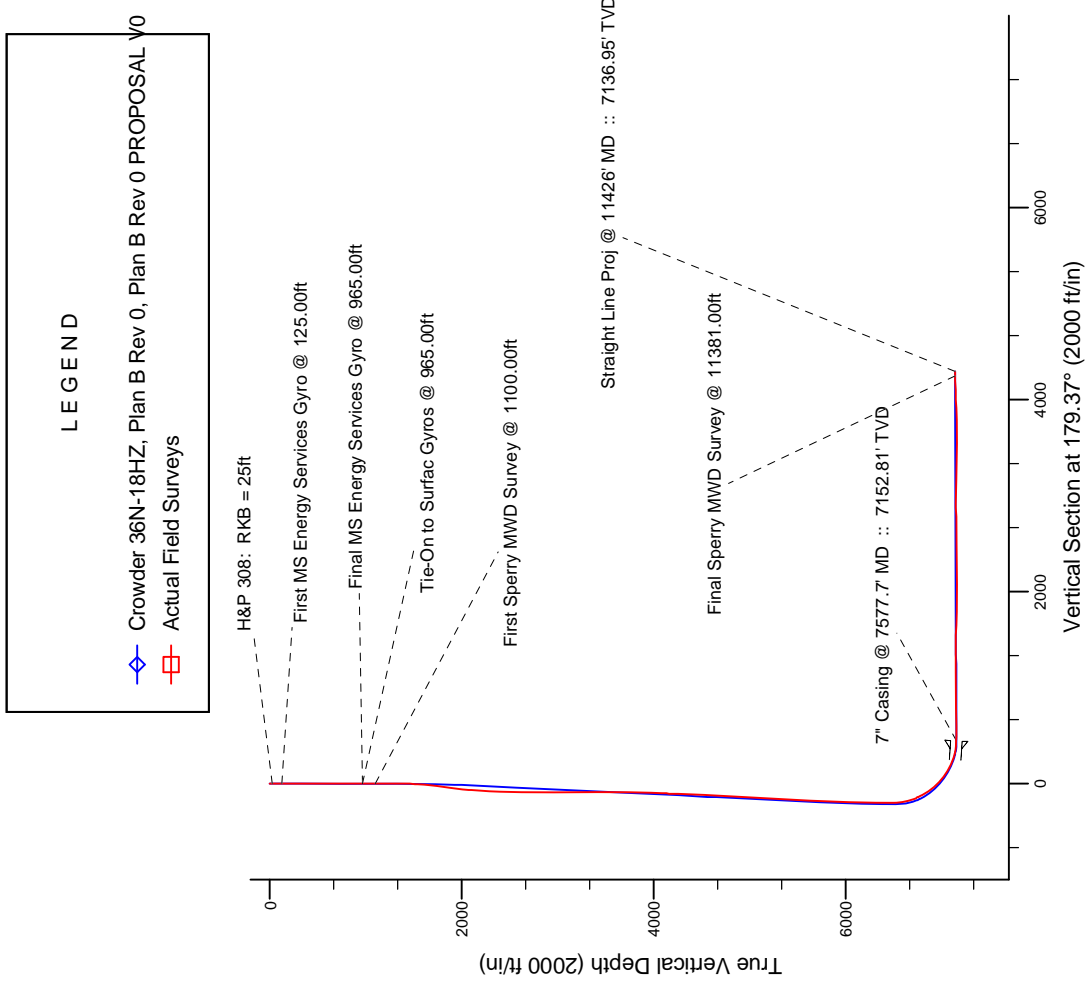
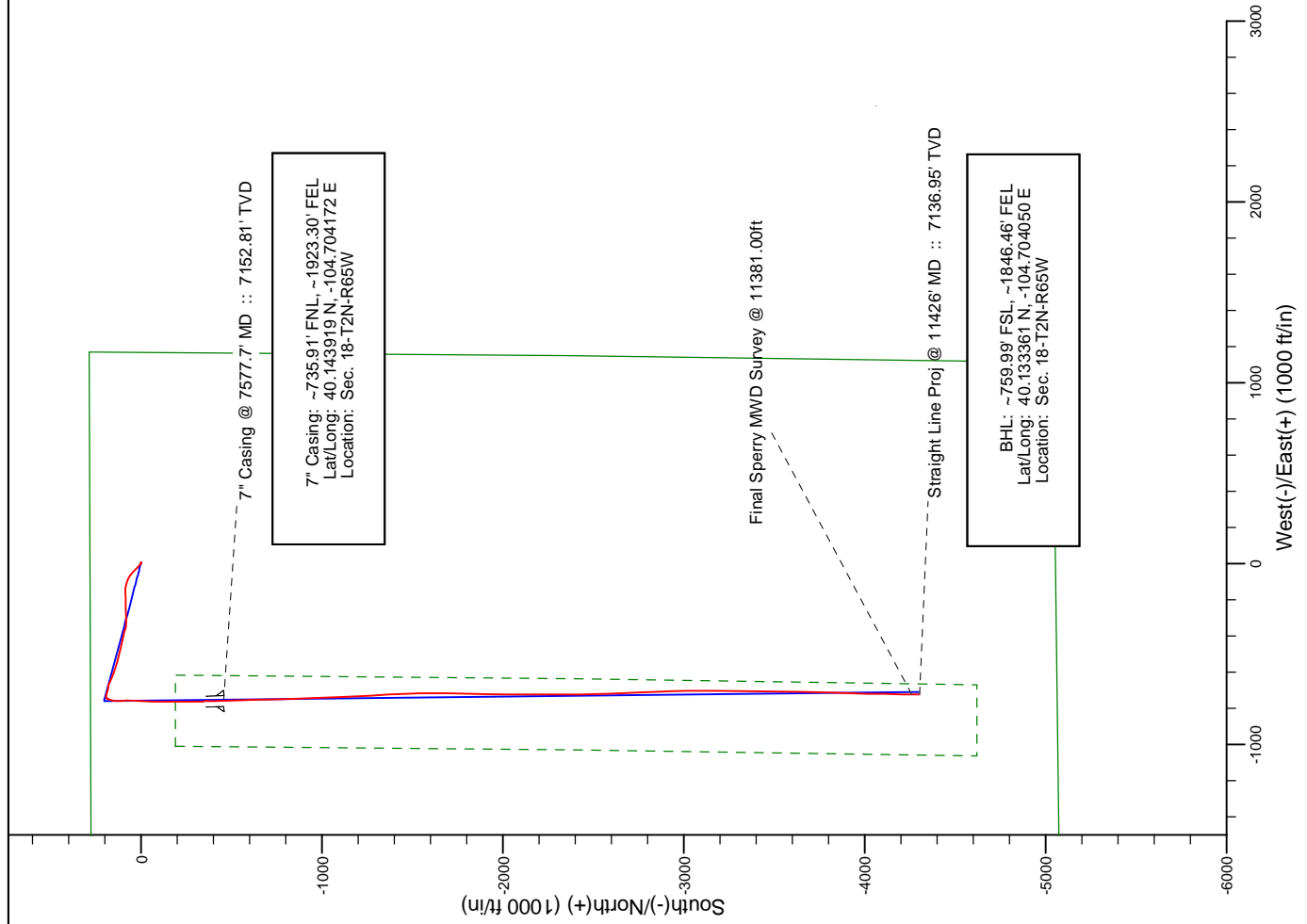


Project: Weld County, CO (NAD 83)  
 Site: Sec. 18-T2N-R65W  
 Well: Crowder 36N-18HZ  
 Wellbore: Plan B Rev 0  
 Design: Actual Field Surveys



# LEGEND

- Crowder 36N-18HZ, Plan B Rev 0, Plan B Rev 0 PROPOSAL V0
- Actual Field Surveys

WELL DETAILS: Crowder 36N-18HZ

Ground Level: 4958.00

RKB=25 @ 4983.00ft (HP 308)

Design: Actual Field Surveys (Crowder 36N-18HZ/Plan B Rev 0)

Created By: Fred Hartmann Date: 05/01/2013  
 Reviewed: Date:

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 36N-18HZ

Plan B Rev 0

Design: Actual Field Surveys

## Sperry Drilling Services

## Standard Report

01 May, 2013

Well Coordinates: 1,296,734.42 N, 3,223,235.73 E (40° 08' 42.62" N, 104° 42' 05.24" W)

Ground Level: 4,958.00 ft

Local Coordinate Origin:

Centered on Well Crowder 36N-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 36N-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	0.11	133.92	125.00	-0.07	0.07	0.07	0.11
<b>First MS Energy Services Gyro @ 125.00ft</b>							
225.00	0.29	79.14	225.00	-0.09	0.39	0.09	0.24
325.00	0.73	75.64	325.00	0.12	1.25	-0.11	0.44
425.00	0.53	71.76	424.99	0.42	2.31	-0.40	0.20
525.00	0.56	38.18	524.98	0.95	3.05	-0.92	0.32
625.00	0.14	57.27	624.98	1.40	3.46	-1.36	0.43
725.00	0.35	75.36	724.98	1.55	3.85	-1.50	0.22
825.00	0.16	347.57	824.98	1.76	4.12	-1.71	0.38
925.00	0.14	201.57	924.98	1.78	4.04	-1.74	0.29
965.00	0.24	262.92	964.98	1.73	3.94	-1.68	0.53
<b>Final MS Energy Services Gyro @ 965.00ft - Tie-On to Surfac Gyros @ 965.00ft</b>							
1,100.00	0.33	145.39	1,099.98	1.37	3.88	-1.33	0.36
<b>First Sperry MWD Survey @ 1100.00ft</b>							
1,284.00	0.26	207.14	1,283.98	0.56	3.99	-0.52	0.17
1,515.00	3.65	305.97	1,514.82	4.42	-2.20	-4.44	1.60
1,652.00	8.40	310.68	1,651.03	13.51	-13.32	-13.65	3.48
1,744.00	10.97	314.86	1,741.71	24.06	-24.63	-24.33	2.89
1,835.00	11.05	314.96	1,831.03	36.33	-36.93	-36.74	0.09
1,927.00	11.09	316.38	1,921.32	48.97	-49.28	-49.51	0.30
2,019.00	11.21	304.38	2,011.60	60.42	-62.76	-61.11	2.52
2,111.00	9.82	291.70	2,102.06	68.38	-77.44	-69.22	2.93
2,206.00	9.06	288.90	2,195.78	73.80	-92.04	-74.80	0.93
2,301.00	8.81	289.26	2,289.62	78.62	-105.98	-79.78	0.27
2,395.00	8.64	281.34	2,382.54	82.38	-119.70	-83.69	1.29
2,490.00	8.12	282.50	2,476.53	85.24	-133.25	-86.70	0.58
2,585.00	8.68	267.16	2,570.52	86.33	-146.96	-87.94	2.42
2,680.00	9.51	270.43	2,664.32	86.04	-161.97	-87.81	1.03
2,774.00	8.80	267.34	2,757.13	85.76	-176.92	-87.70	0.92
2,869.00	10.63	271.19	2,850.76	85.61	-192.94	-87.72	2.04
2,964.00	10.19	272.46	2,944.20	86.15	-210.09	-88.45	0.52
3,058.00	9.36	269.78	3,036.83	86.48	-226.05	-88.96	1.01
3,153.00	9.12	268.35	3,130.60	86.23	-241.30	-88.88	0.35
3,248.00	8.78	267.59	3,224.44	85.71	-256.07	-88.52	0.38
3,342.00	8.22	262.37	3,317.41	84.51	-269.89	-87.48	1.01
3,437.00	10.26	269.41	3,411.18	83.53	-285.09	-86.65	2.45
3,532.00	9.28	273.36	3,504.80	83.89	-301.20	-87.19	1.25
3,626.00	9.06	260.41	3,597.61	83.10	-316.06	-86.57	2.20
3,721.00	10.10	274.43	3,691.29	82.50	-331.74	-86.14	2.68
3,816.00	11.49	285.69	3,784.62	85.70	-349.16	-89.53	2.65
4,005.00	8.61	280.94	3,970.70	93.48	-381.18	-97.66	1.58
4,100.00	8.04	281.72	4,064.70	96.17	-394.67	-100.51	0.61
4,194.00	11.21	286.71	4,157.37	100.14	-409.86	-104.64	3.48
4,383.00	9.63	280.00	4,343.25	108.17	-443.03	-113.03	1.05
4,573.00	11.59	283.49	4,530.00	115.38	-477.24	-120.62	1.09
4,762.00	10.84	281.34	4,715.39	123.30	-513.13	-128.94	0.45
4,951.00	11.22	290.06	4,900.91	133.10	-547.83	-139.12	0.90

**Design Report for Crowder 36N-18HZ - Actual Field Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,140.00	8.09	286.76	5,087.21	143.25	-577.84	-149.59	1.68
5,330.00	8.14	293.47	5,275.31	152.46	-602.98	-159.08	0.50
5,519.00	8.27	292.20	5,462.38	162.93	-627.84	-169.82	0.12
5,708.00	6.49	287.17	5,649.81	171.22	-650.63	-178.36	1.00
5,803.00	7.21	292.88	5,744.13	175.12	-661.26	-182.38	1.04
5,898.00	7.09	286.51	5,838.39	179.10	-672.37	-186.49	0.84
5,993.00	8.56	280.58	5,932.51	182.07	-684.94	-189.59	1.76
6,088.00	9.40	286.54	6,026.34	185.58	-699.33	-193.25	1.32
6,182.00	7.42	284.77	6,119.33	189.31	-712.56	-197.13	2.12
6,277.00	6.07	284.25	6,213.67	192.11	-723.36	-200.05	1.42
6,372.00	4.65	278.29	6,308.25	193.90	-732.04	-201.94	1.60
6,467.00	3.74	277.75	6,403.00	194.87	-738.92	-202.99	0.96
6,562.00	1.63	219.51	6,497.90	194.25	-742.85	-202.40	3.37
6,593.00	4.40	211.64	6,528.85	192.90	-743.75	-201.06	9.01
6,625.00	8.09	211.90	6,560.66	189.94	-745.59	-198.12	11.53
6,657.00	11.71	209.19	6,592.18	185.19	-748.36	-193.41	11.40
6,688.00	15.43	207.45	6,622.31	178.78	-751.80	-187.04	12.07
6,720.00	17.85	200.18	6,652.97	170.40	-755.45	-178.69	9.96
6,751.00	19.33	192.08	6,682.35	160.92	-758.17	-169.25	9.59
6,783.00	22.04	187.88	6,712.29	149.79	-760.10	-158.14	9.65
6,815.00	23.38	181.80	6,741.81	137.50	-761.12	-145.86	8.44
6,846.00	26.09	175.52	6,769.97	124.55	-760.78	-132.90	12.17
6,878.00	28.28	174.03	6,798.43	109.99	-759.45	-118.33	7.17
6,909.00	29.76	176.20	6,825.54	95.01	-758.17	-103.34	5.86
6,941.00	32.41	178.45	6,852.95	78.51	-757.41	-86.83	9.04
6,973.00	35.93	181.97	6,879.42	60.55	-757.50	-68.87	12.61
7,004.00	39.50	182.03	6,903.94	41.60	-758.17	-49.93	11.52
7,036.00	42.65	182.90	6,928.06	20.59	-759.08	-28.94	10.00
7,068.00	44.97	183.52	6,951.15	-1.52	-760.32	-6.84	7.37
7,099.00	47.56	182.75	6,972.58	-23.89	-761.54	15.51	8.55
7,131.00	49.92	182.21	6,993.68	-47.92	-762.58	39.53	7.48
7,162.00	52.56	181.67	7,013.09	-72.07	-763.39	63.68	8.62
7,194.00	54.93	181.08	7,032.01	-97.87	-764.01	89.46	7.55
7,226.00	57.67	180.13	7,049.76	-124.49	-764.29	116.08	8.91
7,257.00	59.97	180.28	7,065.81	-151.01	-764.38	142.59	7.43
7,289.00	62.50	180.34	7,081.21	-179.06	-764.54	170.64	7.91
7,320.00	65.05	179.89	7,094.91	-206.86	-764.59	198.44	8.33
7,352.00	67.81	179.74	7,107.70	-236.19	-764.50	227.77	8.64
7,384.00	71.17	179.48	7,118.91	-266.16	-764.29	257.74	10.53
7,415.00	73.92	178.98	7,128.21	-295.72	-763.89	287.31	9.00
7,447.00	76.57	179.08	7,136.36	-326.66	-763.37	318.25	8.29
7,479.00	79.72	178.02	7,142.93	-357.96	-762.58	349.56	10.36
7,510.00	83.40	178.02	7,147.48	-388.60	-761.52	380.21	11.87
7,527.00	84.92	178.15	7,149.21	-405.51	-760.95	397.11	8.97
7,577.70	86.94	178.25	7,152.81	-456.05	-759.36	447.67	3.99
<b>7" Casing @ 7577.7' MD :: 7152.81' TVD</b>							
7,639.00	89.38	178.37	7,154.78	-517.29	-757.56	508.93	3.99
7,734.00	90.62	178.73	7,154.78	-612.25	-755.15	603.91	1.36
7,828.00	91.79	178.85	7,152.80	-706.21	-753.17	697.89	1.25
7,923.00	90.80	177.59	7,150.66	-801.14	-750.22	792.84	1.69
8,018.00	90.68	178.12	7,149.43	-896.06	-746.66	887.80	0.57

**Design Report for Crowder 36N-18HZ - Actual Field Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,113.00	91.17	178.09	7,147.90	-991.00	-743.52	982.76	0.52
8,208.00	89.32	177.37	7,147.49	-1,085.92	-739.76	1,077.72	2.09
8,303.00	90.62	177.35	7,147.54	-1,180.82	-735.38	1,172.66	1.37
8,398.00	90.93	176.98	7,146.25	-1,275.69	-730.68	1,267.58	0.51
8,493.00	89.63	177.06	7,145.79	-1,370.56	-725.75	1,362.50	1.37
8,587.00	88.52	177.42	7,147.31	-1,464.44	-721.22	1,456.42	1.24
8,682.00	89.51	178.46	7,148.94	-1,559.36	-717.81	1,551.37	1.51
8,777.00	88.70	181.03	7,150.42	-1,654.34	-717.38	1,646.35	2.84
8,872.00	88.52	181.11	7,152.73	-1,749.29	-719.16	1,741.28	0.21
8,967.00	89.07	181.27	7,154.73	-1,844.25	-721.13	1,836.21	0.60
9,061.00	89.51	181.04	7,155.89	-1,938.22	-723.02	1,930.16	0.53
9,156.00	89.63	180.98	7,156.60	-2,033.21	-724.70	2,025.12	0.14
9,251.00	90.49	179.76	7,156.51	-2,128.20	-725.31	2,120.10	1.57
9,346.00	90.74	180.03	7,155.49	-2,223.20	-725.14	2,215.09	0.39
9,441.00	90.68	179.76	7,154.31	-2,318.19	-724.96	2,310.08	0.29
9,536.00	90.43	178.93	7,153.39	-2,413.18	-723.88	2,405.07	0.91
9,630.00	90.80	178.79	7,152.38	-2,507.15	-722.01	2,499.06	0.42
9,725.00	90.31	177.79	7,151.46	-2,602.10	-719.17	2,594.04	1.17
9,820.00	90.25	177.36	7,150.99	-2,697.02	-715.15	2,688.99	0.46
9,915.00	90.74	177.00	7,150.17	-2,791.90	-710.48	2,783.92	0.64
10,009.00	90.93	178.50	7,148.80	-2,885.81	-706.79	2,877.87	1.61
10,104.00	89.13	178.73	7,148.75	-2,980.78	-704.49	2,972.86	1.91
10,199.00	88.70	180.29	7,150.55	-3,075.76	-703.68	3,067.84	1.70
10,294.00	88.52	180.51	7,152.86	-3,170.73	-704.34	3,162.79	0.30
10,389.00	88.83	180.50	7,155.05	-3,265.70	-705.18	3,257.75	0.33
10,483.00	89.81	181.10	7,156.17	-3,359.68	-706.49	3,351.71	1.22
10,576.00	89.51	180.10	7,156.72	-3,452.67	-707.47	3,444.69	1.12
10,673.00	91.05	181.01	7,156.25	-3,549.66	-708.41	3,541.66	1.84
10,767.00	90.25	180.46	7,155.18	-3,643.65	-709.61	3,635.63	1.03
10,852.00	90.93	181.76	7,154.31	-3,728.63	-711.26	3,720.58	1.73
10,947.00	90.99	181.50	7,152.71	-3,823.57	-713.96	3,815.49	0.28
11,042.00	91.48	181.68	7,150.67	-3,918.52	-716.60	3,910.40	0.55
11,137.00	91.54	181.30	7,148.16	-4,013.45	-719.07	4,005.30	0.40
11,232.00	92.04	181.21	7,145.20	-4,108.38	-721.14	4,100.20	0.53
11,326.00	92.41	181.28	7,141.55	-4,202.29	-723.19	4,194.08	0.40
11,381.00	92.72	181.17	7,139.09	-4,257.22	-724.36	4,249.00	0.60
<b>Final Sperry MWD Survey @ 11381.00ft</b>							
11,426.00	92.72	181.17	7,136.95	-4,302.16	-725.28	4,293.92	0.00
<b>Straight Line Proj @ 11426' MD :: 7136.95' TVD</b>							

**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	-0.07	0.07	First MS Energy Services Gyro @ 125.00ft
965.00	964.98	1.73	3.94	Final MS Energy Services Gyro @ 965.00ft
965.00	964.98	1.73	3.94	Tie-On to Surfac Gyros @ 965.00ft
1,100.00	1,099.98	1.37	3.88	First Sperry MWD Survey @ 1100.00ft
11,381.00	7,139.09	-4,257.22	-724.36	Final Sperry MWD Survey @ 11381.00ft
11,426.00	7,136.95	-4,302.16	-725.28	Straight Line Proj @ 11426' MD :: 7136.95' TVD

## Design Report for Crowder 36N-18HZ - Actual Field Surveys

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
User	No Target (Freehand)	179.37	Slot	0.00	0.00	0.00

### Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	965.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,100.00	7,527.00	Sperry MWD Surveys - Vert/Build	MWD+IFR1+SC
7,639.00	11,381.00	Sperry MWD Surveys - Lateral	MWD+IFR1+SC

### Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,577.70	7,152.81	7" Casing @ 7577.7' MD :: 7152.81' TVD	7	8-3/4