

# **Anadarko Petroleum Corp.**

**Weld County, CO (NAD 83)**

**Sec. 21-T4N-R65W**

**JR 30-21 - Slot A2**

**Plan A Rev 0**

**Survey: Sperry MWD Surveys**

## **Standard Survey Report**

**11 May, 2011**

**HALLIBURTON**

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**Sperry Drilling**

# SPERRY-SUN DRILLING SERVICES


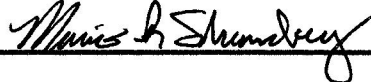
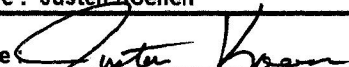
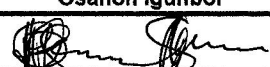
## CERTIFIED SURVEY WORK SHEET

<b>OPERATOR:</b>	Anadarko
<b>WELL:</b>	JR 30-21
<b>FIELD:</b>	Sec. 21-T4N-R65W
<b>RIG:</b>	Xtreme 8
<b>LEGALS:</b>	Sec. 21-T4N-R65W
<b>COUNTY:</b>	Weld
<b>STATE:</b>	Colorado
<b>CAL. METHOD:</b>	Minimum Curvature
<b>MAG. DECL. APPLIED:</b>	8.26
<b>VERTICAL SEC. DIR. :</b>	329.955

<b>SSDS Job Number :</b>	CA-MJ-0008058538
<b>Start Date of Job :</b>	3/24/2011
<b>End Date of Job :</b>	3/29/2011
<b>Lead Directional Driller:</b>	Justen Koenen
	Wade Tobin
<b>Other SSDS DD's :</b>	
<b>SSDS MWD Engineers :</b>	Mario Schonsberg
	Osahon Igunbor

	Main Hole =====>		1st Side Track =====>		2nd Side Track =====>		3rd Side Track =====>		4th Side Track =====>	
ESS Survey		Tie On		Tie On		Tie On		Tie On		Tie On
First Survey Depth		Gyro								
Last Survey Depth										
KOP Depth/Sidetrack MD		KOP		KOP-ST1		KOP-ST2		KOP-ST3		KOP-ST4
First Survey Depth	137.00	MWD		MWD		MWD		MWD		MWD
Last Survey Depth	8196.00	MWD		MWD		MWD		MWD		MWD
Bit Extrapolation to TD	8255.00	T.D.		T.D.		T.D.		T.D.		T.D.

The following Sperry Sun Drilling Services personnel listed below, do certify the above survey information to be accurate :

Print Name : Wade Tobin	Print Name : Mario Schonsberg	Print Name :
Sign Name : 	Sign Name : 	Sign Name :
Print Name : Justen Koenen	Print Name : Osahon Igunbor	Print Name :
Sign Name : 	Sign Name : 	Sign Name :

<b>Examples of</b>	TieOn	Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)
<b>Survey Types:</b>	MWD	Sperry Sun Drilling Services (SSDS) Measurement While Drilling (MWD) Survey's
	ESS	Sperry Sun Drilling Services (SSDS) Electronic Survey System (ESS) Survey's
	Gyro	Gyro Survey's ; Provided by third party vendor, or by Sperry Sun Drilling Services (SSDS)
	SS	Single Shot (SS) Survey's ; Provided by Sperry Sun Drilling Services (SSDS) or third party vendor.

<b>Company:</b>	Anadarko Petroleum Corp.	<b>Local Co-ordinate Reference:</b>	Well JR 30-21 - Slot A2
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	RKB 17' @ 4866.00ft (Extreme 8)
<b>Site:</b>	Sec. 21-T4N-R65W	<b>MD Reference:</b>	RKB 17' @ 4866.00ft (Extreme 8)
<b>Well:</b>	JR 30-21	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Plan A Rev 0	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sperry MWD Survey	<b>Database:</b>	EDM 2003.16 Single User Db

<b>Project</b>	Weld County, CO (NAD 83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

<b>Site</b>	Sec. 21-T4N-R65W		
<b>Site Position:</b>		<b>Northing:</b>	1,353,152.22 ft
<b>From:</b>	Lat/Long	<b>Easting:</b>	3,230,525.51 ft
<b>Position Uncertainty:</b>	0.00 ft	<b>Slot Radius:</b>	"
		<b>Latitude:</b>	40.299854
		<b>Longitude:</b>	-104.673500
		<b>Grid Convergence:</b>	0.53 °

<b>Well</b>	JR 30-21 - Slot A2		
<b>Well Position</b>	<b>+N/-S</b>	0.00 ft	<b>Northing:</b> 1,353,168.24 ft
	<b>+E/-W</b>	0.00 ft	<b>Easting:</b> 3,230,525.64 ft
<b>Position Uncertainty</b>	0.00 ft	<b>Wellhead Elevation:</b>	4,849.00 ft
		<b>Ground Level:</b>	4,849.00 ft

<b>Wellbore</b>	Plan A Rev 0				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	BGGM2010	3/18/2011	8.80	67.01	53,092

<b>Design</b>	Sperry MWD Survey			
<b>Audit Notes:</b>				
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b> 0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>
	0.00	0.00	0.00	329.955

<b>Survey Program</b>	<b>Date</b> 5/11/2011			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
137.00	8,255.00	Sperry MWD Surveys (Plan A Rev 0)	MWD	MWD - Standard

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
137.00	0.46	88.170	137.00	0.02	0.55	-0.26	0.34	0.34	0.00
<b>First Sperry MWD Survey at 137.00 ft</b>									
198.00	0.74	109.170	198.00	-0.10	1.17	-0.67	0.58	0.46	34.43
229.00	0.51	104.650	228.99	-0.20	1.49	-0.92	0.76	-0.74	-14.58
260.00	0.47	99.600	259.99	-0.26	1.75	-1.10	0.19	-0.13	-16.29
291.00	0.47	38.760	290.99	-0.18	1.95	-1.14	1.54	0.00	-196.26
322.00	0.77	16.540	321.99	0.12	2.09	-0.95	1.22	0.97	-71.68
353.00	1.22	336.280	352.99	0.62	2.02	-0.48	2.60	1.45	-129.87
399.00	2.09	341.420	398.97	1.86	1.55	0.83	1.92	1.89	11.17
443.00	3.73	334.100	442.91	3.91	0.67	3.05	3.81	3.73	-16.64
487.00	4.49	329.670	486.79	6.68	-0.82	6.20	1.87	1.73	-10.07
531.00	5.86	329.580	530.61	10.11	-2.83	10.17	3.11	3.11	-0.20

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<b>Well:</b>	JR 30-21	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Plan A Rev 0	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sperry MWD Survey	<b>Database:</b>	EDM 2003.16 Single User 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)	Turn Rate (°/100ft)
572.00	7.20	330.280	571.35	14.14	-5.16	14.83	3.27	3.27	1.71
709.00	7.70	329.040	707.19	29.47	-14.14	32.59	0.38	0.36	-0.91
797.00	9.56	328.680	794.19	40.77	-20.97	45.79	2.11	2.11	-0.41
885.00	9.40	330.970	880.99	53.30	-28.26	60.28	0.47	-0.18	2.60
973.00	11.40	327.890	967.54	66.95	-36.37	76.16	2.36	2.27	-3.50
1,059.00	13.23	329.010	1,051.56	82.58	-45.95	94.50	2.15	2.13	1.30
1,149.00	14.88	326.590	1,138.86	101.06	-57.62	116.33	1.95	1.83	-2.69
1,237.00	16.33	328.120	1,223.61	121.00	-70.38	139.98	1.71	1.65	1.74
1,327.00	16.90	328.140	1,309.86	142.85	-83.97	165.70	0.63	0.63	0.02
1,415.00	18.36	327.670	1,393.72	165.43	-98.13	192.33	1.67	1.66	-0.53
1,501.00	19.75	329.860	1,475.01	189.44	-112.67	220.40	1.82	1.62	2.55
1,589.00	21.60	329.390	1,557.34	216.24	-128.38	251.47	2.11	2.10	-0.53
1,677.00	19.30	329.660	1,639.79	242.74	-143.98	282.21	2.62	-2.61	0.31
1,765.00	20.36	329.480	1,722.57	268.48	-159.10	312.06	1.21	1.20	-0.20
1,855.00	20.75	333.700	1,806.84	296.26	-174.12	343.63	1.70	0.43	4.69
1,943.00	21.12	334.900	1,889.03	324.59	-187.75	374.98	0.64	0.42	1.36
2,031.00	21.28	332.720	1,971.08	353.14	-201.79	406.72	0.91	0.18	-2.48
2,119.00	21.83	331.020	2,052.92	381.65	-217.04	439.03	0.95	0.62	-1.93
2,206.00	21.42	329.350	2,133.80	409.46	-232.98	471.09	0.85	-0.47	-1.92
2,296.00	21.98	328.550	2,217.42	437.97	-250.14	504.36	0.70	0.62	-0.89
2,384.00	21.90	328.910	2,299.05	466.07	-267.21	537.24	0.18	-0.09	0.41
2,473.00	20.62	325.380	2,381.99	493.19	-284.68	569.45	2.03	-1.44	-3.97
2,562.00	20.26	328.010	2,465.39	519.15	-301.75	600.48	1.11	-0.40	2.96
2,651.00	21.54	328.780	2,548.53	546.20	-318.39	632.21	1.47	1.44	0.87
2,738.00	21.85	328.670	2,629.37	573.68	-335.08	664.37	0.36	0.36	-0.13
2,828.00	24.09	329.980	2,712.23	603.90	-352.98	699.48	2.55	2.49	1.46
2,918.00	23.67	330.240	2,794.53	635.48	-371.14	735.92	0.48	-0.47	0.29
3,006.00	23.54	330.210	2,875.16	666.07	-388.64	771.16	0.15	-0.15	-0.03
3,093.00	22.79	330.960	2,955.15	695.88	-405.45	805.38	0.93	-0.86	0.86
3,181.00	18.39	331.760	3,037.51	723.02	-420.30	836.31	5.01	-5.00	0.91
3,269.00	20.18	331.050	3,120.57	748.54	-434.21	865.36	2.05	2.03	-0.81
3,359.00	19.66	329.560	3,205.18	775.17	-449.40	896.02	0.81	-0.58	-1.66
3,447.00	17.95	332.650	3,288.48	799.98	-463.13	924.37	2.25	-1.94	3.51
3,536.00	16.79	328.810	3,373.43	823.16	-476.09	950.92	1.83	-1.30	-4.31
3,624.00	17.58	325.990	3,457.50	845.05	-490.10	976.89	1.30	0.90	-3.20
3,710.00	18.55	328.050	3,539.26	867.43	-504.61	1,003.52	1.35	1.13	2.40
3,799.00	18.19	327.750	3,623.72	891.19	-519.51	1,031.55	0.42	-0.40	-0.34
3,887.00	18.40	327.370	3,707.27	914.50	-534.33	1,059.15	0.27	0.24	-0.43
3,976.00	21.10	333.530	3,791.04	940.68	-549.05	1,089.18	3.83	3.03	6.92
4,063.00	24.52	332.870	3,871.23	970.77	-564.27	1,122.85	3.94	3.93	-0.76
4,151.00	24.70	332.740	3,951.23	1,003.37	-581.02	1,159.45	0.21	0.20	-0.15
4,238.00	23.70	332.750	4,030.59	1,035.07	-597.35	1,195.07	1.15	-1.15	0.01
4,328.00	20.41	333.100	4,113.99	1,065.15	-612.73	1,228.82	3.66	-3.66	0.39
4,416.00	18.99	330.600	4,196.84	1,091.31	-626.71	1,258.46	1.88	-1.61	-2.84
4,504.00	20.98	328.290	4,279.53	1,117.19	-642.02	1,288.52	2.43	2.26	-2.62
4,594.00	21.15	326.650	4,363.52	1,144.46	-659.41	1,320.84	0.68	0.19	-1.82
4,683.00	21.91	327.120	4,446.31	1,171.82	-677.25	1,353.45	0.88	0.85	0.53
4,770.00	23.70	330.450	4,526.51	1,200.67	-694.69	1,387.15	2.54	2.06	3.83
4,859.00	21.98	331.730	4,608.53	1,230.90	-711.40	1,421.69	2.01	-1.93	1.44
4,946.00	22.36	328.070	4,689.10	1,259.28	-727.87	1,454.50	1.65	0.44	-4.21
5,034.00	20.67	330.070	4,770.97	1,286.95	-744.47	1,486.77	2.09	-1.92	2.27
5,122.00	20.98	331.900	4,853.22	1,314.31	-759.64	1,518.04	0.82	0.35	2.08
5,212.00	22.10	328.980	4,936.93	1,343.03	-775.95	1,551.08	1.72	1.24	-3.24
5,300.00	22.25	327.270	5,018.43	1,371.23	-793.49	1,584.27	0.75	0.17	-1.94

# Halliburton Company

## Survey Report



<b>Company:</b>	Anadarko Petroleum Corp.	<b>Local Co-ordinate Reference:</b>	Well JR 30-21 - Slot A2
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	RKB 17' @ 4866.00ft (Extreme 8)
<b>Site:</b>	Sec. 21-T4N-R65W	<b>MD Reference:</b>	RKB 17' @ 4866.00ft (Extreme 8)
<b>Well:</b>	JR 30-21	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Plan A Rev 0	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sperry MWD Survey	<b>Database:</b>	EDM 2003.16 Single User 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)	Turn Rate (°/100ft)
5,389.00	23.07	328.240	5,100.56	1,400.24	-811.78	1,618.53	1.01	0.92	1.09
5,479.00	24.31	328.970	5,182.97	1,431.10	-830.61	1,654.68	1.42	1.38	0.81
5,567.00	19.74	328.200	5,264.53	1,459.27	-847.79	1,687.67	5.20	-5.19	-0.87
5,653.00	20.61	328.560	5,345.25	1,484.53	-863.34	1,717.31	1.02	1.01	0.42
5,741.00	20.89	328.260	5,427.54	1,511.09	-879.67	1,748.48	0.34	0.32	-0.34
5,829.00	20.01	330.480	5,510.00	1,537.53	-895.35	1,779.22	1.33	-1.00	2.52
5,917.00	19.22	330.650	5,592.89	1,563.26	-909.86	1,808.76	0.90	-0.90	0.19
6,006.00	17.86	332.730	5,677.27	1,588.16	-923.30	1,837.04	1.70	-1.53	2.34
6,093.00	18.51	332.540	5,759.92	1,612.27	-935.78	1,864.16	0.75	0.75	-0.22
6,183.00	19.73	332.490	5,844.96	1,638.42	-949.38	1,893.61	1.36	1.36	-0.06
6,271.00	17.59	336.700	5,928.33	1,663.82	-961.51	1,921.66	2.87	-2.43	4.78
6,360.00	15.71	332.400	6,013.60	1,686.85	-972.41	1,947.06	2.52	-2.11	-4.83
6,449.00	14.93	329.400	6,099.44	1,707.40	-983.83	1,970.56	1.25	-0.88	-3.37
6,537.00	13.80	332.180	6,184.68	1,726.44	-994.50	1,992.38	1.50	-1.28	3.16
6,624.00	11.75	336.820	6,269.53	1,743.76	-1,002.83	2,011.55	2.63	-2.36	5.33
6,711.00	11.15	337.110	6,354.80	1,759.65	-1,009.59	2,028.69	0.69	-0.69	0.33
6,801.00	12.16	335.470	6,442.94	1,776.29	-1,016.91	2,046.76	1.18	1.12	-1.82
6,890.00	11.63	331.900	6,530.03	1,792.73	-1,025.02	2,065.06	1.02	-0.60	-4.01
6,980.00	11.43	327.960	6,618.21	1,808.29	-1,034.03	2,083.04	0.90	-0.22	-4.38
7,070.00	8.80	326.360	6,706.81	1,821.59	-1,042.57	2,098.82	2.94	-2.92	-1.78
7,158.00	7.19	328.790	6,793.95	1,831.90	-1,049.16	2,111.05	1.87	-1.83	2.76
7,246.00	6.21	328.940	6,881.35	1,840.69	-1,054.47	2,121.31	1.11	-1.11	0.17
7,334.00	3.68	331.820	6,969.01	1,847.26	-1,058.26	2,128.89	2.89	-2.87	3.27
7,423.00	2.57	327.880	7,057.88	1,851.47	-1,060.67	2,133.74	1.27	-1.25	-4.43
7,513.00	1.66	324.420	7,147.82	1,854.24	-1,062.50	2,137.06	1.02	-1.01	-3.84
7,601.00	1.60	328.040	7,235.78	1,856.31	-1,063.89	2,139.55	0.14	-0.07	4.11
7,689.00	1.45	331.070	7,323.75	1,858.33	-1,065.08	2,141.90	0.19	-0.17	3.44
7,777.00	0.99	322.170	7,411.73	1,859.91	-1,066.08	2,143.76	0.56	-0.52	-10.11
7,865.00	0.73	334.320	7,499.72	1,861.01	-1,066.79	2,145.07	0.36	-0.30	13.81
7,951.00	0.72	343.330	7,585.71	1,862.02	-1,067.19	2,146.15	0.13	-0.01	10.48
8,039.00	1.23	347.0	7,673.70	1,863.50	-1,067.29	2,147.47	0.69	0.58	22.89
8,127.00	0.85	337.870	7,761.69	1,865.04	-1,067.48	2,148.90	0.67	-0.43	-29.09
8,196.00	1.15	336.130	7,830.68	1,866.15	-1,067.95	2,150.10	0.44	0.43	-2.52
<b>Final Sperry MWD Survey at 8196.00 ft</b>									
8,255.00	1.15	336.130	7,889.66	1,867.23	-1,068.43	2,151.28	0.00	0.00	0.00
<b>Straight Line Projection to TD at 8255.00 ft</b>									

<b>Company:</b>	Anadarko Petroleum Corp.	<b>Local Co-ordinate Reference:</b>	Well JR 30-21 - Slot A2
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<b>Well:</b>	JR 30-21	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Plan A Rev 0	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Sperry MWD Survey	<b>Database:</b>	EDM 2003.16 Single User Db

## 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
JR 30-21 W. Sec. Line	0.00	0.00	0.00	0.00	0.00	1,353,168.24	3,230,525.64	40.299898	-104.673499
- survey hits target center									
- Polygon									
Point 1			0.00	1,915.00	-1,137.00	1,355,083.16	3,229,388.69		
Point 2			0.00	-707.00	-1,158.00	1,352,461.27	3,229,367.69		
JR 30-21 Plan A Rev	0.00	0.00	7,813.00	1,844.84	-1,067.07	1,355,013.01	3,229,458.62	40.304989	-104.677263
- survey misses target center by 21.00ft at 8177.98ft MD (7812.66 TVD, 1865.83 N, -1067.81 E)									
- Point									
JR 30-21 N. Sec. Line	0.00	0.00	0.00	0.00	0.00	1,353,168.24	3,230,525.64	40.299898	-104.673499
- survey hits target center									
- Polygon									
Point 1			0.00	1,915.00	-1,137.00	1,355,083.16	3,229,388.69		
Point 2			0.00	1,934.00	1,532.00	1,355,102.16	3,232,057.57		
JR 30-21 Plan A Rev	0.00	0.00	6,946.00	1,844.84	-1,067.07	1,355,013.01	3,229,458.62	40.304989	-104.677263
- survey misses target center by 9.64ft at 7311.27ft MD (6946.34 TVD, 1845.87 N, -1057.49 E)									
- Circle (radius 50.00)									

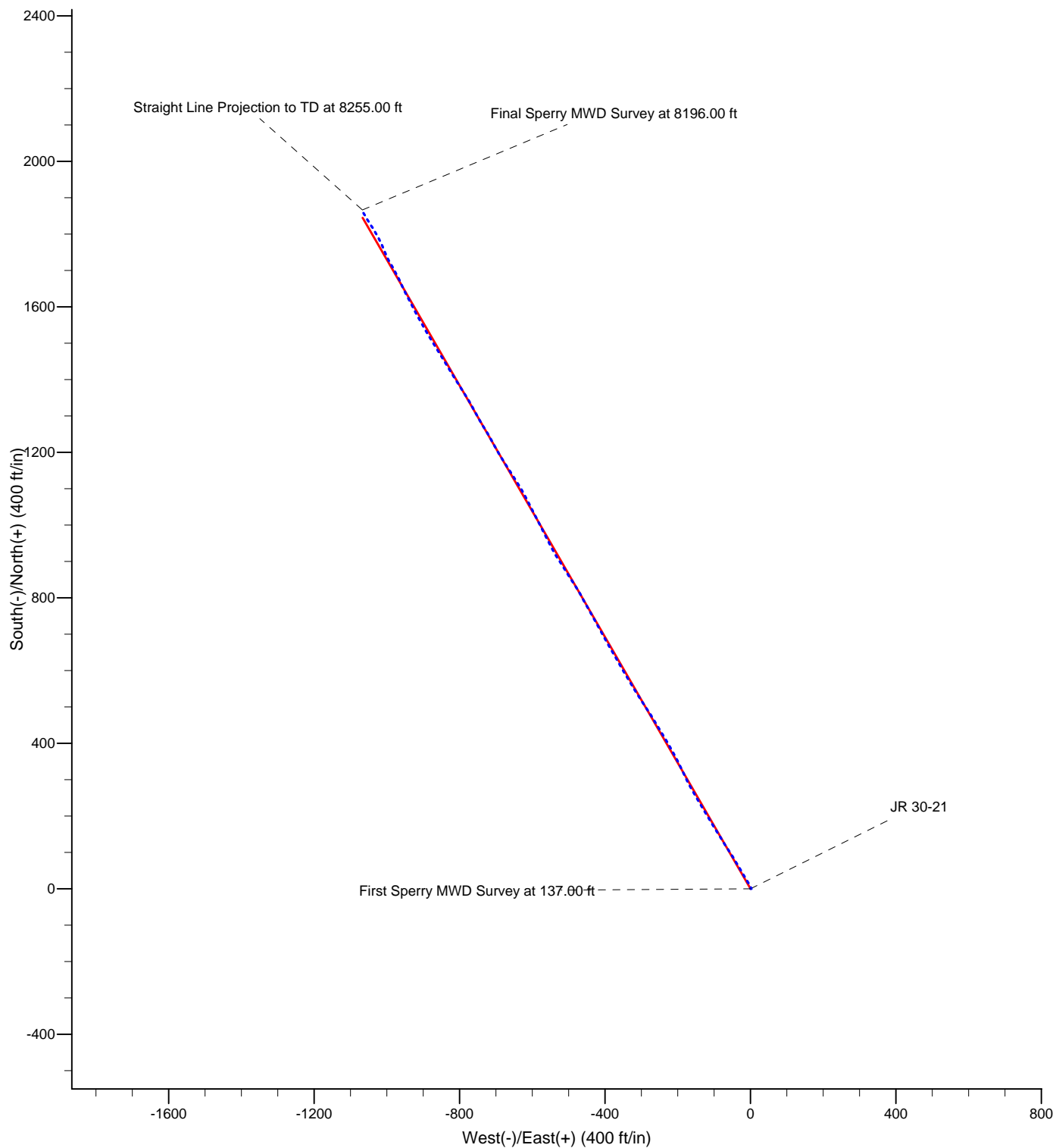
## Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N-S (ft)	+E-W (ft)	
137.00	137.00	0.02	0.55	First Sperry MWD Survey at 137.00 ft
8,196.00	7,830.68	1,866.15	-1,067.95	Final Sperry MWD Survey at 8196.00 ft
8,255.00	7,889.66	1,867.23	-1,068.43	Straight Line Projection to TD at 8255.00 ft

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

## LEGEND

- JR 30-21, Plan A Rev 0, Plan A Rev 0 Proposal V0
- Sperry MWD Surveys



Project: Weld County, CO (NAD 83)  
Site: Sec. 21-T4N-R65W  
Well: JR 30-21

# Anadarko Petroleum Corp.

**HALLIBURTON**  
Sperry Drilling

