

# Anadarko Petroleum Corporation

Weld County, CO (NAD 83)

Sec. 15-T3N-R68W

RMF 31C-15HZ

Plan B

Plan: Permit Rev-2

## Sperry Drilling Services

### Proposal Report

11 December, 2014

Well Coordinates: 1,327,102.18 N, 3,144,746.29 E (40° 13' 48.48" N, 104° 58' 53.69" W)

Ground Level: 4,967.00 usft

Local Coordinate Origin:

Centered on Well RMF 31C-15HZ

Viewing Datum:

RKB = 17' @ 4984.00usft (Drilling Rig)

TVDs to System:

N

North Reference:

True

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

**HALLIBURTON**



## Plan Report for RMF 31C-15HZ - Permit Rev-2

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>RMF 31C-15HZ_SEC - RMF 31C-15HZ_SHL</b>										
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,015.00	0.00	0.00	1,015.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Fox Hills Base</b>										
1,065.00	0.00	0.00	1,065.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>9 5/8"</b>										
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Begin Nudge @ 2100.00ft</b>										
2,200.00	2.00	114.00	2,199.98	-0.71	1.59	-1.59	2.00	2.00	0.00	114.00
2,300.00	4.00	114.00	2,299.84	-2.84	6.38	-6.38	2.00	2.00	0.00	0.00
2,400.00	6.00	114.00	2,399.45	-6.38	14.34	-14.34	2.00	2.00	0.00	0.00
2,500.00	8.00	114.00	2,498.70	-11.34	25.47	-25.47	2.00	2.00	0.00	0.00
2,600.00	10.00	114.00	2,597.47	-17.70	39.76	-39.76	2.00	2.00	0.00	0.00
2,700.00	12.00	114.00	2,695.62	-25.46	57.19	-57.19	2.00	2.00	0.00	0.00
2,800.00	14.00	114.00	2,793.06	-34.61	77.74	-77.74	2.00	2.00	0.00	0.00
2,850.00	15.00	114.00	2,841.46	-39.70	89.18	-89.18	2.00	2.00	0.00	0.00
<b>End Nudge @ 2850.00ft</b>										
2,900.00	15.00	114.00	2,889.76	-44.97	101.00	-101.00	0.00	0.00	0.00	0.00
3,000.00	15.00	114.00	2,986.35	-55.49	124.64	-124.64	0.00	0.00	0.00	0.00
3,100.00	15.00	114.00	3,082.94	-66.02	148.29	-148.29	0.00	0.00	0.00	0.00
3,200.00	15.00	114.00	3,179.54	-76.55	171.93	-171.93	0.00	0.00	0.00	0.00
3,300.00	15.00	114.00	3,276.13	-87.08	195.58	-195.58	0.00	0.00	0.00	0.00
3,400.00	15.00	114.00	3,372.72	-97.60	219.22	-219.22	0.00	0.00	0.00	0.00
3,500.00	15.00	114.00	3,469.31	-108.13	242.86	-242.86	0.00	0.00	0.00	0.00
3,600.00	15.00	114.00	3,565.91	-118.66	266.51	-266.51	0.00	0.00	0.00	0.00
3,700.00	15.00	114.00	3,662.50	-129.18	290.15	-290.15	0.00	0.00	0.00	0.00
3,800.00	15.00	114.00	3,759.09	-139.71	313.80	-313.80	0.00	0.00	0.00	0.00
3,900.00	15.00	114.00	3,855.68	-150.24	337.44	-337.44	0.00	0.00	0.00	0.00
4,000.00	15.00	114.00	3,952.28	-160.77	361.09	-361.09	0.00	0.00	0.00	0.00
4,100.00	15.00	114.00	4,048.87	-171.29	384.73	-384.73	0.00	0.00	0.00	0.00
4,110.49	15.00	114.00	4,059.00	-172.40	387.21	-387.21	0.00	0.00	0.00	0.00
<b>Sussex</b>										
4,200.00	15.00	114.00	4,145.46	-181.82	408.37	-408.37	0.00	0.00	0.00	0.00
4,300.00	15.00	114.00	4,242.05	-192.35	432.02	-432.02	0.00	0.00	0.00	0.00
4,400.00	15.00	114.00	4,338.65	-202.87	455.66	-455.66	0.00	0.00	0.00	0.00
4,500.00	15.00	114.00	4,435.24	-213.40	479.31	-479.31	0.00	0.00	0.00	0.00
4,600.00	15.00	114.00	4,531.83	-223.93	502.95	-502.95	0.00	0.00	0.00	0.00
4,661.26	15.00	114.00	4,591.00	-230.38	517.43	-517.43	0.00	0.00	0.00	0.00

## Plan Report for RMF 31C-15HZ - Permit Rev-2

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
<b>Shannon</b>										
4,700.00	15.00	114.00	4,628.42	-234.46	526.60	-526.60	0.00	0.00	0.00	0.00
4,800.00	15.00	114.00	4,725.02	-244.98	550.24	-550.24	0.00	0.00	0.00	0.00
4,900.00	15.00	114.00	4,821.61	-255.51	573.88	-573.88	0.00	0.00	0.00	0.00
5,000.00	15.00	114.00	4,918.20	-266.04	597.53	-597.53	0.00	0.00	0.00	0.00
5,100.00	15.00	114.00	5,014.80	-276.56	621.17	-621.17	0.00	0.00	0.00	0.00
5,200.00	15.00	114.00	5,111.39	-287.09	644.82	-644.82	0.00	0.00	0.00	0.00
5,300.00	15.00	114.00	5,207.98	-297.62	668.46	-668.46	0.00	0.00	0.00	0.00
5,400.00	15.00	114.00	5,304.57	-308.15	692.11	-692.11	0.00	0.00	0.00	0.00
5,500.00	15.00	114.00	5,401.17	-318.67	715.75	-715.75	0.00	0.00	0.00	0.00
5,600.00	15.00	114.00	5,497.76	-329.20	739.39	-739.39	0.00	0.00	0.00	0.00
5,700.00	15.00	114.00	5,594.35	-339.73	763.04	-763.04	0.00	0.00	0.00	0.00
5,800.00	15.00	114.00	5,690.94	-350.25	786.68	-786.68	0.00	0.00	0.00	0.00
5,900.00	15.00	114.00	5,787.54	-360.78	810.33	-810.33	0.00	0.00	0.00	0.00
6,000.00	15.00	114.00	5,884.13	-371.31	833.97	-833.97	0.00	0.00	0.00	0.00
6,020.00	15.00	114.00	5,903.45	-373.41	838.70	-838.70	0.00	0.00	0.00	0.00
<b>Begin Drop @ 6020.00ft</b>										
6,100.00	13.40	114.00	5,981.00	-381.40	856.63	-856.63	2.00	-2.00	0.00	180.00
6,200.00	11.40	114.00	6,078.66	-390.13	876.24	-876.24	2.00	-2.00	0.00	180.00
6,300.00	9.40	114.00	6,177.01	-397.47	892.73	-892.73	2.00	-2.00	0.00	180.00
6,400.00	7.40	114.00	6,275.94	-403.41	906.08	-906.08	2.00	-2.00	0.00	180.00
6,500.00	5.40	114.00	6,375.31	-407.95	916.26	-916.26	2.00	-2.00	0.00	180.00
6,600.00	3.40	114.00	6,475.01	-411.07	923.27	-923.27	2.00	-2.00	0.00	180.00
6,700.00	1.40	114.00	6,574.92	-412.77	927.10	-927.10	2.00	-2.00	0.00	180.00
6,770.00	0.00	0.00	6,644.91	-413.12	927.88	-927.88	2.00	-2.00	-162.86	-180.00
<b>End Drop @ 6770.00ft</b>										
6,772.15	0.00	0.00	6,647.06	-413.12	927.88	-927.88	0.00	0.00	0.00	180.00
<b>Top of 4.5" Liner @ 6772.15ft</b>										
6,800.00	0.00	0.00	6,674.91	-413.12	927.88	-927.88	0.00	0.00	0.00	0.00
6,872.15	0.00	0.00	6,747.06	-413.12	927.88	-927.88	0.00	0.00	0.00	0.00
<b>KOP @ 6872.15ft</b>										
6,900.00	2.78	270.00	6,774.90	-413.12	927.20	-927.20	10.00	10.00	0.00	270.00
7,000.00	12.78	270.00	6,873.85	-413.12	913.67	-913.67	10.00	10.00	0.00	0.00
7,100.00	22.78	270.00	6,968.95	-413.12	883.17	-883.17	10.00	10.00	0.00	0.00
7,145.32	27.32	270.00	7,010.00	-413.12	863.98	-863.98	10.00	10.00	0.00	0.00
<b>Sharon Springs</b>										
7,189.00	31.68	270.00	7,048.00	-413.12	842.48	-842.48	10.00	10.00	0.00	0.00
<b>Niobrara A</b>										
7,200.00	32.78	270.00	7,057.31	-413.12	836.61	-836.61	10.00	10.00	0.00	0.00
7,274.31	40.22	270.00	7,117.00	-413.13	792.44	-792.44	10.00	10.00	0.00	0.00
<b>Niobrara B</b>										
7,300.00	42.78	270.00	7,136.24	-413.13	775.42	-775.42	10.00	10.00	0.00	0.00
<b>DLS = 10/100'</b>										
7,378.46	50.63	270.00	7,190.00	-413.13	718.35	-718.35	10.00	10.00	0.00	0.00
<b>Niobrara C</b>										
7,400.00	52.78	270.00	7,203.35	-413.13	701.45	-701.45	10.00	10.00	0.00	0.00
7,500.00	62.78	270.00	7,256.59	-413.14	616.95	-616.95	10.00	10.00	0.00	0.00
7,600.00	72.78	270.00	7,294.35	-413.14	524.49	-524.49	10.00	10.00	0.00	0.00
7,640.68	76.85	270.00	7,305.00	-413.15	485.23	-485.23	10.00	10.00	0.00	0.00
<b>Fort Hays</b>										
7,689.04	81.69	270.00	7,314.00	-413.15	437.73	-437.73	10.00	10.00	0.00	0.00
<b>Codell</b>										
7,700.00	82.78	270.00	7,315.48	-413.15	426.88	-426.88	10.00	10.00	0.00	0.00
7,776.72	90.46	270.00	7,320.00	-413.16	350.35	-350.35	10.00	10.00	0.00	0.00
<b>End Build @ 7776.72ft - Landing Target (Heel) - 7"</b>										
7,800.00	90.46	270.00	7,319.81	-413.16	327.07	-327.07	0.00	0.00	0.00	0.00
7,900.00	90.46	270.00	7,319.01	-413.16	227.07	-227.07	0.00	0.00	0.00	0.00
8,000.00	90.46	270.00	7,318.22	-413.17	127.08	-127.08	0.00	0.00	0.00	0.00

## Plan Report for RMF 31C-15HZ - Permit Rev-2

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
8,100.00	90.46	270.00	7,317.42	-413.18	27.08	-27.08	0.00	0.00	0.00	0.00
8,200.00	90.46	270.00	7,316.62	-413.18	-72.92	72.92	0.00	0.00	0.00	0.00
8,300.00	90.46	270.00	7,315.82	-413.19	-172.91	172.91	0.00	0.00	0.00	0.00
8,400.00	90.46	270.00	7,315.03	-413.20	-272.91	272.91	0.00	0.00	0.00	0.00
8,500.00	90.46	270.00	7,314.23	-413.20	-372.91	372.91	0.00	0.00	0.00	0.00
8,600.00	90.46	270.00	7,313.43	-413.21	-472.91	472.91	0.00	0.00	0.00	0.00
8,700.00	90.46	270.00	7,312.63	-413.22	-572.90	572.90	0.00	0.00	0.00	0.00
8,800.00	90.46	270.00	7,311.83	-413.22	-672.90	672.90	0.00	0.00	0.00	0.00
8,900.00	90.46	270.00	7,311.04	-413.23	-772.90	772.90	0.00	0.00	0.00	0.00
9,000.00	90.46	270.00	7,310.24	-413.24	-872.89	872.89	0.00	0.00	0.00	0.00
9,100.00	90.46	270.00	7,309.44	-413.24	-972.89	972.89	0.00	0.00	0.00	0.00
9,200.00	90.46	270.00	7,308.64	-413.25	-1,072.89	1,072.89	0.00	0.00	0.00	0.00
9,300.00	90.46	270.00	7,307.85	-413.26	-1,172.88	1,172.88	0.00	0.00	0.00	0.00
9,400.00	90.46	270.00	7,307.05	-413.26	-1,272.88	1,272.88	0.00	0.00	0.00	0.00
9,500.00	90.46	270.00	7,306.25	-413.27	-1,372.88	1,372.88	0.00	0.00	0.00	0.00
9,600.00	90.46	270.00	7,305.45	-413.28	-1,472.87	1,472.87	0.00	0.00	0.00	0.00
9,700.00	90.46	270.00	7,304.65	-413.28	-1,572.87	1,572.87	0.00	0.00	0.00	0.00
9,800.00	90.46	270.00	7,303.86	-413.29	-1,672.87	1,672.87	0.00	0.00	0.00	0.00
9,900.00	90.46	270.00	7,303.06	-413.30	-1,772.86	1,772.86	0.00	0.00	0.00	0.00
10,000.00	90.46	270.00	7,302.26	-413.30	-1,872.86	1,872.86	0.00	0.00	0.00	0.00
10,100.00	90.46	270.00	7,301.46	-413.31	-1,972.86	1,972.86	0.00	0.00	0.00	0.00
10,200.00	90.46	270.00	7,300.66	-413.32	-2,072.85	2,072.85	0.00	0.00	0.00	0.00
10,300.00	90.46	270.00	7,299.87	-413.32	-2,172.85	2,172.85	0.00	0.00	0.00	0.00
10,400.00	90.46	270.00	7,299.07	-413.33	-2,272.85	2,272.85	0.00	0.00	0.00	0.00
10,500.00	90.46	270.00	7,298.27	-413.34	-2,372.84	2,372.84	0.00	0.00	0.00	0.00
10,600.00	90.46	270.00	7,297.47	-413.34	-2,472.84	2,472.84	0.00	0.00	0.00	0.00
10,700.00	90.46	270.00	7,296.68	-413.35	-2,572.84	2,572.84	0.00	0.00	0.00	0.00
10,800.00	90.46	270.00	7,295.88	-413.36	-2,672.84	2,672.84	0.00	0.00	0.00	0.00
10,900.00	90.46	270.00	7,295.08	-413.36	-2,772.83	2,772.83	0.00	0.00	0.00	0.00
11,000.00	90.46	270.00	7,294.28	-413.37	-2,872.83	2,872.83	0.00	0.00	0.00	0.00
11,100.00	90.46	270.00	7,293.48	-413.38	-2,972.83	2,972.83	0.00	0.00	0.00	0.00
11,200.00	90.46	270.00	7,292.69	-413.38	-3,072.82	3,072.82	0.00	0.00	0.00	0.00
11,300.00	90.46	270.00	7,291.89	-413.39	-3,172.82	3,172.82	0.00	0.00	0.00	0.00
11,400.00	90.46	270.00	7,291.09	-413.40	-3,272.82	3,272.82	0.00	0.00	0.00	0.00
11,500.00	90.46	270.00	7,290.29	-413.40	-3,372.81	3,372.81	0.00	0.00	0.00	0.00
11,600.00	90.46	270.00	7,289.50	-413.41	-3,472.81	3,472.81	0.00	0.00	0.00	0.00
11,700.00	90.46	270.00	7,288.70	-413.42	-3,572.81	3,572.81	0.00	0.00	0.00	0.00
11,800.00	90.46	270.00	7,287.90	-413.42	-3,672.80	3,672.80	0.00	0.00	0.00	0.00
11,900.00	90.46	270.00	7,287.10	-413.43	-3,772.80	3,772.80	0.00	0.00	0.00	0.00
12,000.00	90.46	270.00	7,286.30	-413.44	-3,872.80	3,872.80	0.00	0.00	0.00	0.00
12,100.00	90.46	270.00	7,285.51	-413.45	-3,972.79	3,972.79	0.00	0.00	0.00	0.00
12,200.00	90.46	270.00	7,284.71	-413.45	-4,072.79	4,072.79	0.00	0.00	0.00	0.00
12,300.00	90.46	270.00	7,283.91	-413.46	-4,172.79	4,172.79	0.00	0.00	0.00	0.00
12,400.00	90.46	270.00	7,283.11	-413.47	-4,272.78	4,272.78	0.00	0.00	0.00	0.00
12,414.15	90.46	270.00	7,283.00	-413.47	-4,286.93	4,286.93	0.00	0.00	0.00	0.00
Total Depth (Toe)										
12,414.16	90.46	270.00	7,283.00	-413.47	-4,286.94	4,286.94	0.00	0.00	0.00	0.00
TD Well @ 12414.16ft - RMF 31C-15HZ_BHL										

**Plan Report for RMF 31C-15HZ - Permit Rev-2****Plan Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,100.00	2,100.00	0.00	0.00	Begin Nudge @ 2100.00ft
2,850.00	2,841.46	-39.70	89.18	End Nudge @ 2850.00ft
6,020.00	5,903.45	-373.41	838.70	Begin Drop @ 6020.00ft
6,770.00	6,644.91	-413.12	927.88	End Drop @ 6770.00ft
6,772.15	6,647.06	-413.12	927.88	Top of 4.5" Liner @ 6772.15ft
6,872.15	6,747.06	-413.12	927.88	KOP @ 6872.15ft
7,300.00	7,136.24	-413.13	775.42	DLS = 10/100'
7,776.72	7,320.00	-413.16	350.35	End Build @ 7776.72ft
12,414.16	7,283.00	-413.47	-4,286.94	TD Well @ 12414.16ft

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	270.00	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
0.00	7,776.72	Permit Rev-2	MWD+IFR1
7,776.72	12,414.16	Permit Rev-2	MWD+IFR1

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,065.00	1,065.00	9 5/8"	9-5/8	13-1/2
7,776.72	7,320.00	7"	7	8-3/4

**Formation Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,015.00	1,015.00	Fox Hills Base		0.00	
4,110.49	4,059.00	Sussex		0.00	
4,661.26	4,591.00	Shannon		0.00	
7,145.32	7,010.00	Sharon Springs		0.00	
7,189.00	7,048.00	Niobrara A		0.00	
7,274.31	7,117.00	Niobrara B		0.00	
7,378.46	7,190.00	Niobrara C		0.00	
7,640.68	7,305.00	Fort Hays		0.00	
7,689.04	7,314.00	Codell		0.00	
7,776.72	7,320.00	Landing Target (Heel)		0.00	
12,414.15	7,283.00	Total Depth (Toe)		0.00	

## Plan Report for RMF 31C-15HZ - Permit Rev-2

### Targets associated with this wellbore

Target Name	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Shape
RMF 31C-15HZ_SEC	0.00	0.00	0.00	Polygon
RMF 31C-15HZ_SHL	0.00	0.00	0.00	Point
RMF 31C-15HZ_BHL	7,283.00	-413.47	-4,286.94	Point

**North Reference Sheet for Sec. 15-T3N-R68W - RMF 31C-15HZ - Plan B**

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

Vertical Depths are relative to RKB = 17' @ 4984.00usft (Drilling Rig). Northing and Easting are relative to RMF 31C-15HZ

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 -105.50°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99995691

Grid Coordinates of Well: 1,327,102.18 usft N, 3,144,746.29 usft E

Geographical Coordinates of Well: 40° 13' 48.48" N, 104° 58' 53.69" W

Grid Convergence at Surface is: 0.33°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,414.16usft  
the Bottom Hole Displacement is 4,306.83usft in the Direction of 264.49° ( True).

Magnetic Convergence at surface is: -8.35° ( 7 October 2013, , BGGM2013)

