

Project: WELD-NAD83-UTMFT13N  
 Site: 3N-65W-29 RW 15-29HZ P2  
 Well: RW 37N-32HZ  
 Wellbore: Original Wellbore  
 Design: Final Surveys



# US ROCKIES WATTENBERG PLANNING

West(-)/East(+) (1000 usft/in)  
 -2500 -2000 -1500 -1000 -500 0 500 1000 1500

WELL DETAILS: RW 37N-32HZ		Design: Final Surveys (RW 37N-32HZ/Original Wellbore)	
Ground Level: 4869.00 RKB 21' @ 4890.00usft (Precision 464)		Created By: Jerry Popp Date: 13:15, September 29 2017	

ANNOTATIONS						
MD	Inc	Azi	TVD	+N/-S	+E/-W	Annotation
13.00	0.00	0.00	13.00	0.00	0.00	Tie-On to Surface @ 0.00' MD (KB 8')
163.00	0.35	62.47	163.00	0.21	0.41	First Total MWD+IFR Survey @ 150.00' MD (KB 8')
1809.00	11.95	47.09	1779.24	181.29	216.40	Last Total MWD+IFR Survey @ 1796.00' MD (KB 8')
1809.00	11.95	47.09	1779.24	181.29	216.40	Tie-On to Last Surface Survey @ 1809.00' MD
1933.00	12.26	46.27	1900.48	199.13	235.31	First Sperry MWD+IFR+SC Survey @ 1933.00' MD
7692.00	90.92	179.64	7098.72	66.21	970.02	Landed Curve @ 7692.00' MD, 90.92° INC, 7098.72' TVD
8592.00	91.30	180.89	7086.75	-833.39	972.61	Exit 460' FNL 8592.00' MD, 7086.75' TVD
12958.00	91.45	181.21	7086.43	-5197.86	972.73	Enter 460' FSL 12958.00' MD, 7086.43' TVD
13244.00	92.71	180.55	7075.28	-5483.60	968.29	Last Sperry MWD+IFR+SC Survey @ 13244.00' MD
13292.00	92.71	180.55	7073.01	-5531.54	967.83	Straight Line Projection to TD @ 13292.00' MD

Sec. 29, T3N R65W

SHL: 372' FSL, 1561' FEL

Landed Curve @ 7692.00' MD, 90.92° INC, 7098.72' TVD

Lat: 40.190372  
 Long: -104.680028  
 ~439' FSL, ~590' FEL

Exit 460' FNL 8592.00' MD, 7086.75' TVD  
 ~460' FNL, ~584' FEL

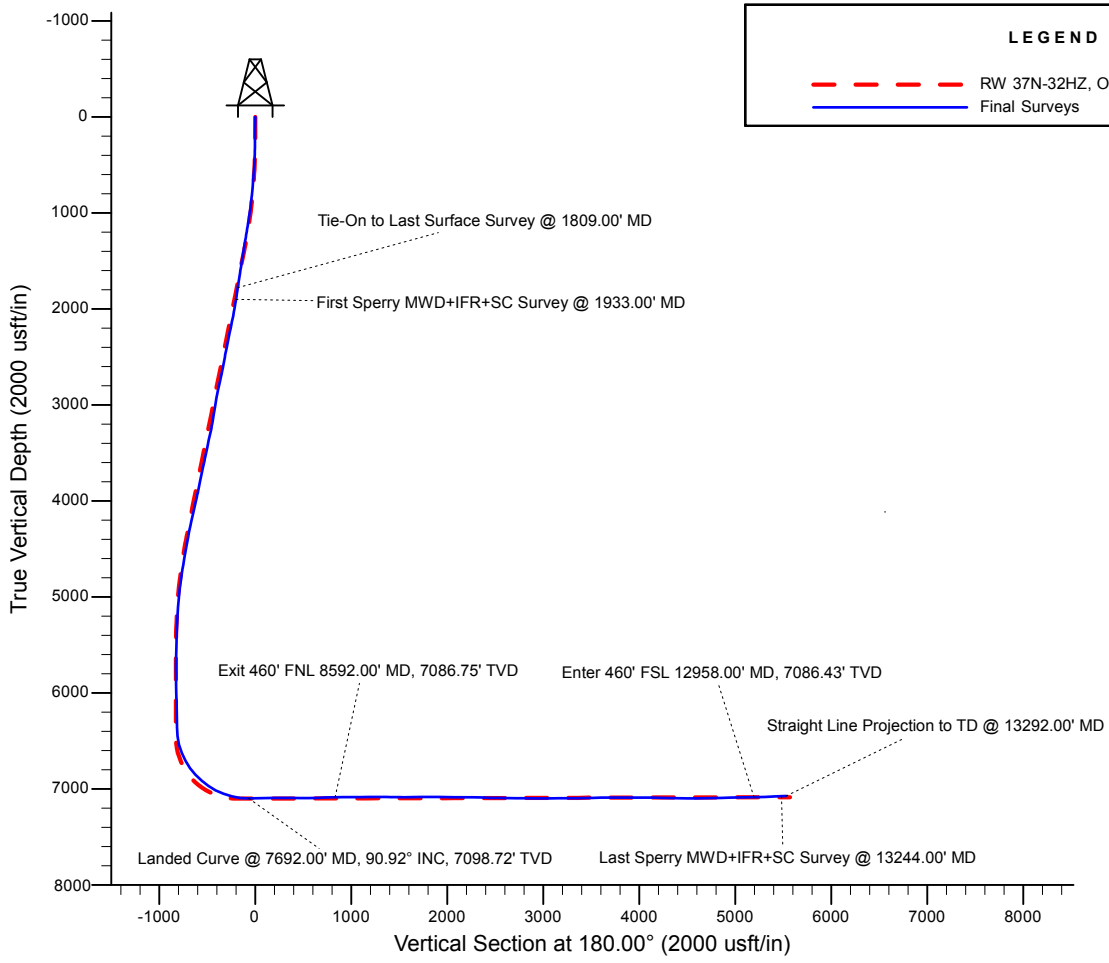
Sec. 32, T3N R65W

~460' FSL, ~552' FEL  
 Enter 460' FSL 12958.00' MD, 7086.43' TVD

Last Sperry MWD+IFR+SC Survey @ 13244.00' MD

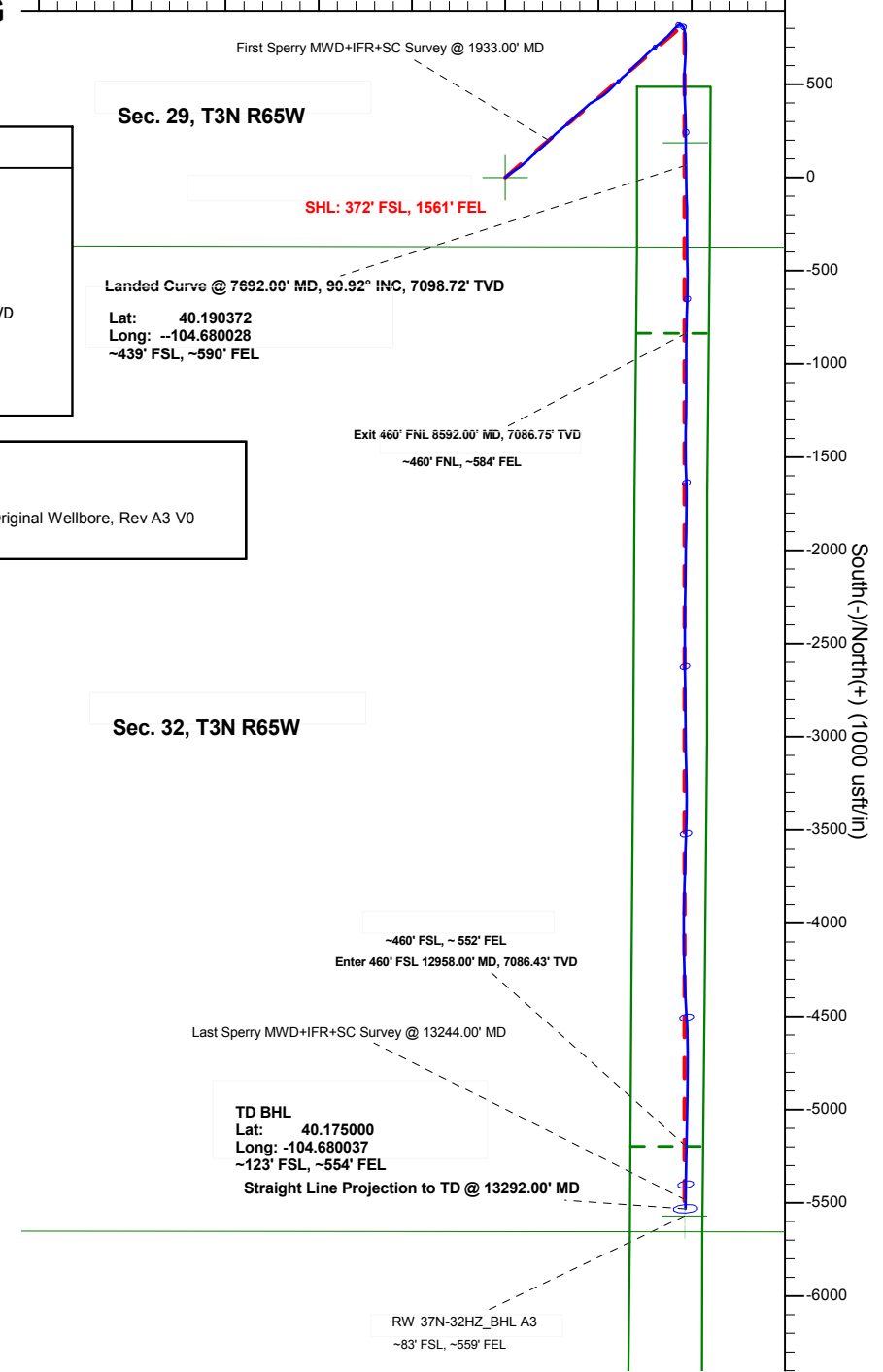
TD BHL  
 Lat: 40.175000  
 Long: -104.680037  
 ~123' FSL, ~554' FEL  
 Straight Line Projection to TD @ 13292.00' MD

RW 37N-32HZ\_BHL A3  
 ~83' FSL, ~559' FEL



**LEGEND**

- RW 37N-32HZ, Original Wellbore, Rev A3 V0
- Final Surveys



Job# 904218783

Precision 464

# US ROCKIES WATTENBERG PLANNING

WELD-NAD83-UTMFT13N 3N-65W-29 RW 15-29HZ Pad

API# 05-123-44748

RW 37N-32HZ

Original Wellbore

Design: Final Surveys

## Sperry Drilling Services

### Combo Report

29 September, 2017

Well Coordinates: 40° 11' 24.68" N  
104° 41' 00.60" W

North American Datum 1983  
Zone 13N (108 W to 102 W)  
14,596,148.02 N  
1,728,806.19 E

Ground Level: 4,869.00 usft

Local Coordinate Origin:

Centered on Well RW 37N-32HZ

Viewing Datum:

RKB 21' @ 4890.00usft (Precision 464)

TVDs to System:

N

**North Reference:**

**True**

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Version: 5000.1 Build: 81D

Report Version: Midcon Combo v1.11

**HALLIBURTON**



Design Report for RW 37N-32HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
0.00	0.00	0.00	-4,890.00	0.00	0.00 N	0.00 E	14,596,148.02	1,728,806.19	0.00	0.00	
13.00	0.00	0.00	-4,877.00	13.00	0.00 N	0.00 E	14,596,148.02	1,728,806.19	0.00	0.00	Tie-On to Surface @ 0.00' MD (KB 8')
163.00	0.35	62.47	-4,727.00	163.00	0.21 N	0.41 E	14,596,148.24	1,728,806.59	0.23	-0.21	First Total MWD+IFR Survey @ 150.00' MD (KB 8')
195.00	0.35	60.36	-4,695.00	195.00	0.31 N	0.58 E	14,596,148.33	1,728,806.77	0.04	-0.31	
227.00	0.62	30.83	-4,663.00	227.00	0.50 N	0.75 E	14,596,148.53	1,728,806.94	1.12	-0.50	
259.00	1.27	51.75	-4,631.01	258.99	0.87 N	1.12 E	14,596,148.90	1,728,807.30	2.27	-0.87	
290.00	1.41	45.42	-4,600.02	289.98	1.35 N	1.66 E	14,596,149.38	1,728,807.84	0.66	-1.35	
322.00	2.11	64.32	-4,568.03	321.97	1.88 N	2.47 E	14,596,149.92	1,728,808.65	2.81	-1.88	
354.00	2.29	56.06	-4,536.05	353.95	2.49 N	3.53 E	14,596,150.53	1,728,809.71	1.14	-2.49	
385.00	3.03	63.97	-4,505.09	384.91	3.20 N	4.78 E	14,596,151.24	1,728,810.96	2.66	-3.20	
417.00	3.56	56.94	-4,473.14	416.86	4.11 N	6.38 E	14,596,152.16	1,728,812.55	2.08	-4.11	
449.00	4.22	46.21	-4,441.21	448.79	5.47 N	8.06 E	14,596,153.52	1,728,814.23	3.06	-5.47	
512.00	5.19	45.34	-4,378.43	511.57	9.08 N	11.76 E	14,596,157.14	1,728,817.91	1.54	-9.08	
544.00	5.93	45.07	-4,346.58	543.42	11.26 N	13.96 E	14,596,159.34	1,728,820.11	2.31	-11.26	
575.00	6.24	42.35	-4,315.75	574.25	13.64 N	16.23 E	14,596,161.72	1,728,822.37	1.37	-13.64	
607.00	6.54	45.78	-4,283.95	606.05	16.19 N	18.70 E	14,596,164.28	1,728,824.84	1.52	-16.19	
638.00	6.90	51.40	-4,253.16	636.84	18.59 N	21.42 E	14,596,166.69	1,728,827.55	2.42	-18.59	
670.00	7.55	55.27	-4,221.42	668.58	20.98 N	24.65 E	14,596,169.10	1,728,830.77	2.54	-20.98	
702.00	8.39	56.41	-4,189.73	700.27	23.47 N	28.33 E	14,596,171.60	1,728,834.43	2.67	-23.47	
765.00	9.31	56.06	-4,127.48	762.52	28.86 N	36.38 E	14,596,177.01	1,728,842.47	1.46	-28.86	
797.00	9.62	56.23	-4,095.91	794.09	31.79 N	40.75 E	14,596,179.96	1,728,846.83	0.97	-31.79	
860.00	12.52	56.67	-4,034.09	855.91	38.47 N	50.84 E	14,596,186.68	1,728,856.89	4.61	-38.47	
892.00	13.23	58.87	-4,002.90	887.10	42.27 N	56.87 E	14,596,190.50	1,728,862.91	2.70	-42.27	
923.00	12.35	56.76	-3,972.67	917.33	45.92 N	62.68 E	14,596,194.17	1,728,868.70	3.21	-45.92	
955.00	12.79	55.09	-3,941.43	948.57	49.83 N	68.45 E	14,596,198.09	1,728,874.46	1.78	-49.83	
987.00	12.96	54.47	-3,910.24	979.76	53.94 N	74.27 E	14,596,202.23	1,728,880.27	0.68	-53.94	
1,018.00	13.84	52.89	-3,880.08	1,009.92	58.20 N	80.06 E	14,596,206.50	1,728,886.04	3.07	-58.20	
1,050.00	14.15	52.72	-3,849.03	1,040.97	62.87 N	86.22 E	14,596,211.20	1,728,892.19	0.98	-62.87	
1,082.00	13.93	50.25	-3,817.99	1,072.01	67.71 N	92.30 E	14,596,216.06	1,728,898.24	1.99	-67.71	
1,113.00	13.62	49.99	-3,787.88	1,102.12	72.44 N	97.96 E	14,596,220.81	1,728,903.89	1.02	-72.44	
1,145.00	13.27	48.24	-3,756.76	1,133.24	77.31 N	103.59 E	14,596,225.70	1,728,909.50	1.68	-77.31	
1,177.00	12.88	47.71	-3,725.59	1,164.41	82.15 N	108.96 E	14,596,230.56	1,728,914.86	1.28	-82.15	
1,208.00	13.45	45.42	-3,695.40	1,194.60	87.01 N	114.09 E	14,596,235.44	1,728,919.97	2.49	-87.01	
1,240.00	14.28	46.04	-3,664.33	1,225.67	92.36 N	119.58 E	14,596,240.81	1,728,925.44	2.63	-92.36	
1,272.00	14.41	46.21	-3,633.33	1,256.67	97.86 N	125.29 E	14,596,246.32	1,728,931.13	0.43	-97.86	
1,303.00	14.04	46.74	-3,603.28	1,286.72	103.10 N	130.82 E	14,596,251.59	1,728,936.64	1.27	-103.10	
1,335.00	13.36	45.95	-3,572.19	1,317.81	108.33 N	136.30 E	14,596,256.84	1,728,942.10	2.20	-108.33	
1,366.00	13.14	48.24	-3,542.02	1,347.98	113.17 N	141.50 E	14,596,261.70	1,728,947.29	1.84	-113.17	
1,398.00	13.23	48.15	-3,510.86	1,379.14	118.03 N	146.94 E	14,596,266.58	1,728,952.71	0.29	-118.03	
1,430.00	13.93	48.24	-3,479.76	1,410.24	123.04 N	152.55 E	14,596,271.61	1,728,958.29	2.19	-123.04	
1,461.00	14.06	49.11	-3,449.68	1,440.32	127.99 N	158.18 E	14,596,276.58	1,728,963.91	0.80	-127.99	



Design Report for RW 37N-32HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
1,493.00	13.53	47.45	-3,418.60	1,471.40	133.07 N	163.87 E	14,596,281.68	1,728,969.59	2.07	-133.07	
1,525.00	13.10	48.06	-3,387.46	1,502.54	138.02 N	169.33 E	14,596,286.65	1,728,975.02	1.41	-138.02	
1,557.00	12.66	46.83	-3,356.26	1,533.74	142.85 N	174.58 E	14,596,291.49	1,728,980.26	1.62	-142.85	
1,588.00	12.39	47.88	-3,326.00	1,564.00	147.40 N	179.53 E	14,596,296.06	1,728,985.19	1.14	-147.40	
1,620.00	12.79	48.59	-3,294.77	1,595.23	152.05 N	184.73 E	14,596,300.73	1,728,990.38	1.34	-152.05	
1,650.00	13.67	48.76	-3,265.57	1,624.43	156.58 N	189.89 E	14,596,305.28	1,728,995.52	2.94	-156.58	
1,682.00	14.19	47.09	-3,234.51	1,655.49	161.74 N	195.60 E	14,596,310.46	1,729,001.21	2.05	-161.74	
1,714.00	13.36	46.74	-3,203.43	1,686.57	166.95 N	201.17 E	14,596,315.69	1,729,006.76	2.61	-166.95	
1,746.00	13.14	46.30	-3,172.28	1,717.72	171.99 N	206.49 E	14,596,320.75	1,729,012.06	0.76	-171.99	
1,778.00	12.35	47.01	-3,141.07	1,748.93	176.84 N	211.62 E	14,596,325.62	1,729,017.18	2.52	-176.84	
1,809.00	11.95	47.09	-3,110.76	1,779.24	181.29 N	216.40 E	14,596,330.08	1,729,021.94	1.29	-181.29	Last Total MWD+IFR Survey @ 1796.00' MD (KB 8') - Tie-On to Last Surface Survey @ 1809.00' MD
1,933.00	12.26	46.27	-2,989.52	1,900.48	199.13 N	235.31 E	14,596,347.99	1,729,040.79	0.29	-199.13	First Sperry MWD+IFR+SC Survey @ 1933.00' MD
2,023.00	14.18	45.77	-2,901.91	1,988.09	213.42 N	250.12 E	14,596,362.34	1,729,055.55	2.14	-213.42	
2,112.00	16.01	45.65	-2,815.99	2,074.01	229.61 N	266.71 E	14,596,378.58	1,729,072.08	2.06	-229.61	
2,202.00	17.84	49.60	-2,729.88	2,160.12	247.22 N	286.08 E	14,596,396.26	1,729,091.39	2.40	-247.22	
2,291.00	16.67	48.86	-2,644.89	2,245.11	264.46 N	306.08 E	14,596,413.57	1,729,111.32	1.34	-264.46	
2,380.00	18.00	51.19	-2,559.93	2,330.07	281.47 N	326.41 E	14,596,430.66	1,729,131.59	1.69	-281.47	
2,470.00	17.16	49.79	-2,474.14	2,415.86	298.76 N	347.39 E	14,596,448.02	1,729,152.51	1.04	-298.76	
2,560.00	15.17	45.25	-2,387.70	2,502.30	315.63 N	365.89 E	14,596,464.95	1,729,170.95	2.62	-315.63	
2,649.00	15.22	46.68	-2,301.81	2,588.19	331.84 N	382.66 E	14,596,481.22	1,729,187.66	0.42	-331.84	
2,739.00	17.76	47.39	-2,215.52	2,674.48	349.24 N	401.36 E	14,596,498.69	1,729,206.30	2.83	-349.24	
2,828.00	18.77	49.66	-2,131.00	2,759.00	367.70 N	422.27 E	14,596,517.23	1,729,227.14	1.39	-367.70	
2,918.00	18.12	47.68	-2,045.62	2,844.38	386.49 N	443.65 E	14,596,536.10	1,729,248.46	1.00	-386.49	
3,007.00	18.11	58.17	-1,961.01	2,928.99	403.11 N	465.64 E	14,596,552.79	1,729,270.39	3.66	-403.11	
3,097.00	17.39	59.50	-1,875.30	3,014.70	417.32 N	489.12 E	14,596,567.08	1,729,293.81	0.92	-417.32	
3,187.00	17.03	56.68	-1,789.33	3,100.67	431.38 N	511.72 E	14,596,581.23	1,729,316.36	1.01	-431.38	
3,276.00	15.31	54.13	-1,703.85	3,186.15	445.43 N	532.13 E	14,596,595.35	1,729,336.73	2.09	-445.43	
3,366.00	16.98	46.21	-1,617.39	3,272.61	461.49 N	551.25 E	14,596,611.47	1,729,355.79	3.07	-461.49	
3,455.00	18.04	45.01	-1,532.52	3,357.48	480.22 N	570.38 E	14,596,630.28	1,729,374.85	1.26	-480.22	
3,635.00	16.47	47.42	-1,360.62	3,529.38	517.20 N	608.88 E	14,596,667.39	1,729,413.22	0.96	-517.20	
3,724.00	18.61	48.80	-1,275.76	3,614.24	535.09 N	628.86 E	14,596,685.35	1,729,433.13	2.45	-535.09	
3,814.00	16.90	47.84	-1,190.05	3,699.95	553.33 N	649.36 E	14,596,703.66	1,729,453.57	1.93	-553.33	
3,903.00	16.43	44.42	-1,104.79	3,785.21	571.00 N	667.76 E	14,596,721.40	1,729,471.91	1.22	-571.00	
3,993.00	15.83	44.66	-1,018.33	3,871.67	588.82 N	685.30 E	14,596,739.29	1,729,489.38	0.67	-588.82	
4,082.00	18.75	47.87	-933.36	3,956.64	607.06 N	704.44 E	14,596,757.59	1,729,508.46	3.45	-607.06	
4,172.00	18.06	46.77	-847.96	4,042.04	626.32 N	725.34 E	14,596,776.92	1,729,529.29	0.86	-626.32	
4,261.00	17.71	44.97	-763.26	4,126.74	645.34 N	744.95 E	14,596,796.02	1,729,548.84	0.74	-645.34	
4,351.00	16.78	44.77	-677.31	4,212.69	664.25 N	763.78 E	14,596,814.99	1,729,567.59	1.04	-664.25	
4,441.00	17.96	49.87	-591.41	4,298.59	682.42 N	783.54 E	14,596,833.23	1,729,587.29	2.14	-682.42	
4,530.00	16.94	51.04	-506.51	4,383.49	699.42 N	804.11 E	14,596,850.30	1,729,607.80	1.21	-699.42	

## Design Report for RW 37N-32HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
4,620.00	16.06	50.89	-420.22	4,469.78	715.51 N	823.97 E	14,596,866.47	1,729,627.60	0.98	-715.51	
4,823.00	13.40	46.69	-223.90	4,666.10	749.37 N	862.88 E	14,596,900.46	1,729,666.39	1.41	-749.37	
4,912.00	11.88	43.47	-137.06	4,752.94	763.09 N	876.69 E	14,596,914.24	1,729,680.15	1.88	-763.09	
5,002.00	10.20	42.65	-48.73	4,841.27	775.68 N	888.46 E	14,596,926.86	1,729,691.88	1.87	-775.68	
5,092.00	8.48	41.35	40.08	4,930.08	786.52 N	898.24 E	14,596,937.74	1,729,701.62	1.93	-786.52	
5,181.00	6.86	42.55	128.28	5,018.28	795.36 N	906.18 E	14,596,946.61	1,729,709.52	1.83	-795.36	
5,271.00	6.04	44.19	217.71	5,107.71	802.72 N	913.11 E	14,596,953.99	1,729,716.43	0.93	-802.72	
5,361.00	5.06	45.33	307.28	5,197.28	808.90 N	919.23 E	14,596,960.20	1,729,722.53	1.10	-808.90	
5,450.00	4.33	49.28	395.99	5,285.99	813.86 N	924.57 E	14,596,965.17	1,729,727.85	0.90	-813.86	
5,540.00	3.32	55.35	485.78	5,375.78	817.55 N	929.29 E	14,596,968.88	1,729,732.56	1.21	-817.55	
5,630.00	2.24	61.69	575.68	5,465.68	819.87 N	932.98 E	14,596,971.21	1,729,736.24	1.25	-819.87	
5,809.00	1.34	45.09	754.59	5,644.59	823.01 N	937.55 E	14,596,974.37	1,729,740.79	0.58	-823.01	
5,899.00	1.00	63.94	844.57	5,734.57	824.09 N	939.00 E	14,596,975.46	1,729,742.24	0.57	-824.09	
5,989.00	0.95	129.28	934.56	5,824.56	823.97 N	940.28 E	14,596,975.34	1,729,743.52	1.17	-823.97	
6,078.00	1.34	132.64	1,023.54	5,913.54	822.79 N	941.62 E	14,596,974.17	1,729,744.87	0.44	-822.79	
6,168.00	1.64	138.22	1,113.51	6,003.51	821.12 N	943.25 E	14,596,972.50	1,729,746.50	0.37	-821.12	
6,258.00	1.63	135.99	1,203.47	6,093.47	819.24 N	945.00 E	14,596,970.63	1,729,748.26	0.07	-819.24	
6,347.00	0.77	124.27	1,292.45	6,182.45	817.99 N	946.37 E	14,596,969.39	1,729,749.64	1.00	-817.99	
6,527.00	3.48	128.59	1,472.31	6,362.31	813.90 N	951.64 E	14,596,965.32	1,729,754.92	1.51	-813.90	
6,617.00	6.42	143.33	1,561.97	6,451.97	808.16 N	956.78 E	14,596,959.59	1,729,760.08	3.53	-808.16	
6,706.00	15.94	170.57	1,649.23	6,539.23	792.07 N	961.77 E	14,596,943.52	1,729,765.13	11.95	-792.07	
6,796.00	22.24	173.87	1,734.24	6,624.24	762.91 N	965.62 E	14,596,914.37	1,729,769.08	7.10	-762.91	
6,886.00	26.83	176.24	1,816.10	6,706.10	725.69 N	968.77 E	14,596,877.16	1,729,772.36	5.21	-725.69	
6,975.00	35.90	182.55	1,892.03	6,782.03	679.47 N	968.93 E	14,596,830.95	1,729,772.69	10.83	-679.47	
7,065.00	43.61	184.39	1,961.17	6,851.17	622.08 N	965.37 E	14,596,773.54	1,729,769.34	8.67	-622.08	
7,154.00	48.84	181.95	2,022.73	6,912.73	557.94 N	961.88 E	14,596,709.39	1,729,766.07	6.20	-557.94	
7,244.00	54.70	178.36	2,078.41	6,968.41	487.29 N	961.78 E	14,596,638.74	1,729,766.22	7.22	-487.29	
7,334.00	62.35	178.10	2,125.37	7,015.37	410.63 N	964.15 E	14,596,562.09	1,729,768.87	8.50	-410.63	
7,424.00	70.24	176.92	2,161.52	7,051.52	328.37 N	967.76 E	14,596,479.84	1,729,772.77	8.85	-328.37	
7,513.00	75.27	180.26	2,187.90	7,077.90	243.44 N	969.81 E	14,596,394.91	1,729,775.13	6.69	-243.44	
7,603.00	83.55	179.92	2,204.43	7,094.43	155.05 N	969.68 E	14,596,306.53	1,729,775.31	9.21	-155.05	
7,692.00	90.92	179.64	2,208.72	7,098.72	66.21 N	970.02 E	14,596,217.69	1,729,775.97	8.29	-66.21	Landed Curve @ 7692.00' MD, 90.92° INC, 7098.72' TVD
7,782.00	91.26	178.63	2,207.01	7,097.01	23.76 S	971.38 E	14,596,127.73	1,729,777.64	1.18	23.76	
7,872.00	91.69	178.16	2,204.69	7,094.69	113.70 S	973.90 E	14,596,037.80	1,729,780.48	0.71	113.70	
7,961.00	91.02	179.60	2,202.59	7,092.59	202.65 S	975.64 E	14,595,948.85	1,729,782.54	1.78	202.65	
8,051.00	89.48	180.19	2,202.19	7,092.19	292.65 S	975.80 E	14,595,858.86	1,729,783.03	1.83	292.65	
8,141.00	89.14	179.40	2,203.28	7,093.28	382.64 S	976.12 E	14,595,768.87	1,729,783.67	0.96	382.64	
8,230.00	88.86	178.37	2,204.83	7,094.83	471.61 S	977.85 E	14,595,679.91	1,729,785.72	1.20	471.61	
8,320.00	91.20	180.41	2,204.78	7,094.78	561.59 S	978.81 E	14,595,589.93	1,729,787.00	3.45	561.59	
8,410.00	91.26	181.87	2,202.85	7,092.85	651.55 S	977.02 E	14,595,499.96	1,729,785.53	1.62	651.55	



Design Report for RW 37N-32HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
8,499.00	92.56	181.41	2,199.89	7,089.89	740.46 S	974.48 E	14,595,411.04	1,729,783.30	1.55	740.46	
8,592.00	91.30	180.89	2,196.75	7,086.75	833.39 S	972.61 E	14,595,318.11	1,729,781.77	1.47	833.39	Exit 460' FNL 8592.00' MD, 7086.75' TVD
8,679.00	90.12	180.40	2,195.68	7,085.68	920.37 S	971.64 E	14,595,231.12	1,729,781.10	1.47	920.37	
8,768.00	90.49	179.72	2,195.20	7,085.20	1,009.37 S	971.54 E	14,595,142.12	1,729,781.32	0.87	1,009.37	
8,858.00	90.74	179.72	2,194.24	7,084.24	1,099.37 S	971.98 E	14,595,052.13	1,729,782.08	0.28	1,099.37	
8,948.00	89.75	180.82	2,193.85	7,083.85	1,189.36 S	971.56 E	14,594,962.13	1,729,781.98	1.64	1,189.36	
9,038.00	90.31	180.92	2,193.81	7,083.81	1,279.35 S	970.19 E	14,594,872.14	1,729,780.93	0.63	1,279.35	
9,127.00	89.85	180.86	2,193.68	7,083.68	1,368.34 S	968.81 E	14,594,783.15	1,729,779.87	0.52	1,368.34	
9,217.00	88.61	179.56	2,194.89	7,084.89	1,458.33 S	968.48 E	14,594,693.16	1,729,779.86	2.00	1,458.33	
9,307.00	89.91	178.57	2,196.05	7,086.05	1,548.30 S	969.95 E	14,594,603.19	1,729,781.65	1.82	1,548.30	
9,396.00	90.89	178.42	2,195.43	7,085.43	1,637.27 S	972.28 E	14,594,514.23	1,729,784.30	1.11	1,637.27	
9,486.00	91.45	179.72	2,193.59	7,083.59	1,727.24 S	973.75 E	14,594,424.27	1,729,786.09	1.57	1,727.24	
9,575.00	89.69	181.27	2,192.71	7,082.71	1,816.22 S	972.98 E	14,594,335.28	1,729,785.63	2.63	1,816.22	
9,665.00	89.20	181.11	2,193.58	7,083.58	1,906.20 S	971.11 E	14,594,245.30	1,729,784.09	0.57	1,906.20	
9,754.00	89.04	180.89	2,194.95	7,084.95	1,995.18 S	969.55 E	14,594,156.32	1,729,782.85	0.31	1,995.18	
9,844.00	89.23	180.70	2,196.31	7,086.31	2,085.16 S	968.31 E	14,594,066.33	1,729,781.92	0.30	2,085.16	
9,934.00	90.43	180.79	2,196.57	7,086.57	2,175.15 S	967.14 E	14,593,976.34	1,729,781.07	1.34	2,175.15	
10,023.00	88.83	181.11	2,197.15	7,087.15	2,264.13 S	965.66 E	14,593,887.35	1,729,779.91	1.83	2,264.13	
10,113.00	88.06	180.11	2,199.59	7,089.59	2,354.09 S	964.70 E	14,593,797.39	1,729,779.28	1.40	2,354.09	
10,292.00	89.14	179.99	2,203.96	7,093.96	2,533.03 S	964.55 E	14,593,618.44	1,729,779.76	0.61	2,533.03	
10,381.00	89.05	179.70	2,205.37	7,095.37	2,622.02 S	964.79 E	14,593,529.46	1,729,780.32	0.34	2,622.02	
10,471.00	89.26	179.42	2,206.70	7,096.70	2,712.01 S	965.48 E	14,593,439.47	1,729,781.33	0.39	2,712.01	
10,561.00	89.66	179.50	2,207.54	7,097.54	2,802.00 S	966.33 E	14,593,349.48	1,729,782.50	0.45	2,802.00	
10,651.00	89.69	179.43	2,208.05	7,098.05	2,892.00 S	967.17 E	14,593,259.49	1,729,783.66	0.08	2,892.00	
10,740.00	89.91	179.18	2,208.37	7,098.37	2,980.99 S	968.25 E	14,593,170.51	1,729,785.06	0.37	2,980.99	
10,830.00	90.25	178.93	2,208.24	7,098.24	3,070.98 S	969.73 E	14,593,080.52	1,729,786.86	0.47	3,070.98	
10,919.00	90.59	178.90	2,207.59	7,097.59	3,159.96 S	971.42 E	14,592,991.55	1,729,788.86	0.38	3,159.96	
11,009.00	90.52	179.00	2,206.72	7,096.72	3,249.94 S	973.06 E	14,592,901.57	1,729,790.83	0.14	3,249.94	
11,098.00	90.15	178.98	2,206.20	7,096.20	3,338.92 S	974.63 E	14,592,812.60	1,729,792.72	0.42	3,338.92	
11,188.00	91.14	182.20	2,205.18	7,095.18	3,428.90 S	973.71 E	14,592,722.62	1,729,792.11	3.74	3,428.90	
11,278.00	90.96	181.71	2,203.53	7,093.53	3,518.83 S	970.64 E	14,592,632.67	1,729,789.36	0.58	3,518.83	
11,367.00	91.51	181.78	2,201.61	7,091.61	3,607.77 S	967.93 E	14,592,543.73	1,729,786.97	0.62	3,607.77	
11,457.00	89.88	181.71	2,200.52	7,090.52	3,697.72 S	965.19 E	14,592,453.77	1,729,784.55	1.81	3,697.72	
11,547.00	90.15	181.73	2,200.50	7,090.50	3,787.68 S	962.49 E	14,592,363.80	1,729,782.17	0.30	3,787.68	
11,636.00	90.15	181.18	2,200.27	7,090.27	3,876.65 S	960.23 E	14,592,274.82	1,729,780.23	0.62	3,876.65	
11,726.00	90.18	180.99	2,200.01	7,090.01	3,966.63 S	958.52 E	14,592,184.83	1,729,778.85	0.21	3,966.63	
11,816.00	89.41	179.42	2,200.33	7,090.33	4,056.63 S	958.20 E	14,592,094.84	1,729,778.84	1.94	4,056.63	
11,905.00	89.11	178.79	2,201.48	7,091.48	4,145.61 S	959.59 E	14,592,005.86	1,729,780.55	0.78	4,145.61	
11,995.00	89.32	178.95	2,202.71	7,092.71	4,235.58 S	961.36 E	14,591,915.90	1,729,782.65	0.29	4,235.58	
12,085.00	88.46	177.45	2,204.45	7,094.45	4,325.52 S	964.19 E	14,591,825.97	1,729,785.79	1.92	4,325.52	
12,264.00	88.43	176.34	2,209.31	7,099.31	4,504.19 S	973.88 E	14,591,647.34	1,729,796.12	0.62	4,504.19	



Design Report for RW 37N-32HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
12,354.00	91.08	178.83	2,209.70	7,099.70	4,594.09 S	977.67 E	14,591,557.45	1,729,800.23	4.04	4,594.09	
12,443.00	91.30	178.99	2,207.85	7,097.85	4,683.05 S	979.37 E	14,591,468.49	1,729,802.24	0.31	4,683.05	
12,533.00	91.76	180.81	2,205.45	7,095.45	4,773.02 S	979.52 E	14,591,378.53	1,729,802.72	2.09	4,773.02	
12,623.00	91.88	180.65	2,202.59	7,092.59	4,862.97 S	978.38 E	14,591,288.58	1,729,801.90	0.22	4,862.97	
12,712.00	91.05	180.92	2,200.31	7,090.31	4,951.93 S	977.16 E	14,591,199.61	1,729,801.00	0.98	4,951.93	
12,802.00	90.77	180.89	2,198.88	7,088.88	5,041.91 S	975.74 E	14,591,109.63	1,729,799.89	0.31	5,041.91	
12,891.00	90.74	181.18	2,197.71	7,087.71	5,130.88 S	974.13 E	14,591,020.65	1,729,798.60	0.33	5,130.88	
12,958.00	91.45	181.21	2,196.43	7,086.43	5,197.86 S	972.73 E	14,590,953.67	1,729,797.45	1.06	5,197.86	Enter 460' FSL 12958.00' MD, 7086.43' TVD
12,981.00	91.69	181.22	2,195.80	7,085.80	5,220.84 S	972.25 E	14,590,930.68	1,729,797.04	1.06	5,220.84	
13,071.00	92.71	181.07	2,192.35	7,082.35	5,310.76 S	970.45 E	14,590,840.76	1,729,795.56	1.15	5,310.76	
13,161.00	91.97	180.61	2,188.67	7,078.67	5,400.67 S	969.13 E	14,590,750.84	1,729,794.57	0.97	5,400.67	
13,244.00	92.71	180.55	2,185.28	7,075.28	5,483.60 S	968.29 E	14,590,667.91	1,729,794.02	0.89	5,483.60	Last Sperry MWD+IFR+SC Survey @ 13244.00' MD
13,292.00	92.71	180.55	2,183.01	7,073.01	5,531.54 S	967.83 E	14,590,619.97	1,729,793.73	0.00	5,531.54	Straight Line Projection to TD @ 13292.00' MD

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Comment
		+N/-S	+E/-W	
13.00	13.00	0.00	0.00	Tie-On to Surface @ 0.00' MD (KB 8')
163.00	163.00	0.21	0.41	First Total MWD+IFR Survey @ 150.00' MD (KB 8')
1,809.00	1,779.24	181.29	216.40	Last Total MWD+IFR Survey @ 1796.00' MD (KB 8')
1,809.00	1,779.24	181.29	216.40	Tie-On to Last Surface Survey @ 1809.00' MD
1,933.00	1,900.48	199.13	235.31	First Sperry MWD+IFR+SC Survey @ 1933.00' MD
7,692.00	7,098.72	66.21	970.02	Landed Curve @ 7692.00' MD, 90.92° INC, 7098.72' TVD
8,592.00	7,086.75	-833.39	972.61	Exit 460' FNL 8592.00' MD, 7086.75' TVD
12,958.00	7,086.43	-5,197.86	972.73	Enter 460' FSL 12958.00' MD, 7086.43' TVD
13,244.00	7,075.28	-5,483.60	968.29	Last Sperry MWD+IFR+SC Survey @ 13244.00' MD
13,292.00	7,073.01	-5,531.54	967.83	Straight Line Projection to TD @ 13292.00' MD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	180.00	Slot	0.00	0.00	0.00

**Design Report for RW 37N-32HZ - Final Surveys**

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,809.00	Total MWD+IFR Surface Surveys	APC_ISCWSA REV 2 MWD+IFR1
1,809.00	13,244.00	Sperry MWD+IFR+SC Surveys	APC_ISCWSA REV 2 MWD+IFR1+SC
13,292.00	13,292.00	PTB	APC_BLIND

**Design Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
RW 37N-32HZ_BHL PLAT () - actual wellpath misses target center by 5698.07usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	-5,616.14	962.80	14,590,535.36	1,729,789.00	40.174768	-104.680054
RW 37N-32HZ_SHL () - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	14,596,148.02	1,728,806.19	40.190190	-104.683501
RW 37N-32HZ_HEEL PLAT () - actual wellpath misses target center by 985.55usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	186.83	967.68	14,596,338.30	1,729,773.20	40.190703	-104.680036
RW 37N-32HZ_BHL A3 () - actual wellpath misses target center by 41.88usft at 13292.00usft MD (7073.01 TVD, -5531.54 N, 967.83 E) - Point	0.00	0.00	7,086.12	-5,571.00	962.80	14,590,580.50	1,729,788.84	40.174892	-104.680054

**Directional Difficulty Index**

Average Dogleg over Survey:	1.87 °/100usft	Maximum Dogleg over Survey:	11.95 °/100usft at 6,706.00 usft
Net Tortosity applicable to Plans:	0.93 °/100usft	Directional Difficulty Index:	6.550

**Audit Info**

**North Reference Sheet for 3N-65W-29 RW 15-29HZ Pad - RW 37N-32HZ - Original Wellbore**

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

Vertical Depths are relative to RKB 21' @ 4890.00usft (Precision 464). Northing and Easting are relative to RW 37N-32HZ

Coordinate System is Universal Transverse Mercator (US Survey Feet), Zone 13N (108 W to 102 W) using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Transverse Mercator (Gauss-Kruger)

Central Meridian is -105.000000°, Longitude Origin:0.000000°, Latitude Origin:0.000000°

False Easting: 1,640,416.67usft, False Northing: 0.00usft, Scale Reduction: 0.99960893

Grid Coordinates of Well: 14,596,148.02 usft N, 1,728,806.19 usft E

Geographical Coordinates of Well: 40° 11' 24.68" N, 104° 41' 00.60" W

Grid Convergence at Surface is: 0.20°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,292.00usft the Bottom Hole Displacement is 5,615.57usft in the Direction of 170.08° ( True).

Magnetic Convergence at surface is: -8.10° ( 4 September 2017, , BGGM2017)

