



US ROCKIES WATTENBERG PLANNING

WELD-NAD83-UTMFT13N

3N-67W-33 Babcock 6-4HZ Pad

Babcock 22N-33HZ

Original Hole

Design: Original Hole

Standard Survey Report

05 June, 2017

Precision Drilling Corporation

Survey Report

Company:	US ROCKIES WATTENBERG PLANNING	Local Co-ordinate Reference:	Well Babcock 22N-33HZ
Project:	WELD-NAD83-UTMFT13N	TVD Reference:	4886'GL + 21'KB @ 4907.00usft (PD464)
Site:	3N-67W-33 Babcock 6-4HZ Pad	MD Reference:	4886'GL + 21'KB @ 4907.00usft (PD464)
Well:	Babcock 22N-33HZ	North Reference:	True
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Original Hole	Database:	Local Database

Project	WELD-NAD83-UTMFT13N		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Zone 13N (108 W to 102 W)		

Site	3N-67W-33 Babcock 6-4HZ Pad				
Site Position:		Northing:	14,588,357.65 usft	Latitude:	40.169184°N
From:	Lat/Long	Easting:	1,669,071.31 usft	Longitude:	104.897427°W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.07 °

Well		Babcock 22N-33HZ				
Well Position	+N-S	0.00 usft	Northing:	14,588,357.08 usft	Latitude:	40.169182°N
	+E-W	0.00 usft	Easting:	1,669,206.24 usft	Longitude:	104.896944°W
Position Uncertainty		3.28 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,886.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	04/04/16	8.27	66.68	52,490

Design	Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	359.74	

Survey Program	Date	06/04/17			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
9.00	1,821.00	Survey #1 (Original Hole)	APC_ISCWSA REV 2 MV Fixed:v2:crustal field declination		
1,925.00	12,165.00	Survey #2 (Original Hole)	APC_ISCWSA REV 2 MV Fixed:v2:crustal field declination		
12,220.00	12,220.00	Survey #3 (Original Hole)	APC_BLIND	OWSG BLIND	

Survey										
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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	
174.00	0.27	103.43	174.00	-0.09	0.38	-0.09	0.16	0.16	0.00	
291.00	1.50	211.09	290.99	-1.47	-0.14	-1.47	1.37	1.05	92.02	
380.00	2.72	199.87	379.92	-4.45	-1.46	-4.44	1.44	1.37	-12.61	
469.00	4.01	201.25	468.77	-9.34	-3.31	-9.32	1.45	1.45	1.55	
554.00	5.56	192.10	553.47	-16.13	-5.25	-16.11	2.03	1.82	-10.76	
640.00	6.32	199.38	639.01	-24.67	-7.69	-24.64	1.24	0.88	8.47	
729.00	8.28	203.90	727.29	-35.15	-11.92	-35.10	2.29	2.20	5.08	

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Well:	Babcock 22N-33HZ	North Reference:	True
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Original Hole	Database:	Local Database

Survey									
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)
816.00	8.68	208.89	813.34	-46.63	-17.63	-46.55	0.96	0.46	5.74
904.00	9.13	203.02	900.28	-58.87	-23.56	-58.76	1.15	0.51	-6.67
1,033.00	11.30	205.37	1,027.22	-79.71	-32.98	-79.56	1.71	1.68	1.82
1,122.00	12.30	205.12	1,114.34	-96.17	-40.74	-95.99	1.13	1.12	-0.28
1,258.00	15.00	206.12	1,246.49	-125.10	-54.64	-124.85	1.99	1.99	0.74
1,344.00	16.59	204.37	1,329.24	-146.27	-64.61	-145.98	1.93	1.85	-2.03
1,430.00	16.81	206.45	1,411.61	-168.59	-75.22	-168.25	0.74	0.26	2.42
1,517.00	16.61	210.61	1,494.94	-190.56	-87.15	-190.16	1.39	-0.23	4.78
1,648.00	14.45	212.50	1,621.15	-220.46	-105.47	-219.98	1.69	-1.65	1.44
1,737.00	13.46	211.23	1,707.53	-238.68	-116.81	-238.15	1.16	-1.11	-1.43
1,821.00	12.64	214.79	1,789.36	-254.59	-127.12	-254.01	1.37	-0.98	4.24
1,925.00	12.44	215.71	1,890.88	-273.03	-140.15	-272.39	0.27	-0.19	0.88
2,015.00	13.56	209.12	1,978.57	-290.12	-150.94	-289.43	2.06	1.24	-7.32
2,104.00	14.90	204.46	2,064.84	-309.65	-160.76	-308.92	1.98	1.51	-5.24
2,194.00	13.47	203.15	2,152.10	-329.83	-169.67	-329.05	1.63	-1.59	-1.46
2,283.00	14.59	201.04	2,238.44	-349.82	-177.77	-349.01	1.38	1.26	-2.37
2,373.00	14.53	201.65	2,325.55	-370.89	-186.01	-370.04	0.18	-0.07	0.68
2,462.00	15.03	202.00	2,411.61	-391.97	-194.45	-391.08	0.57	0.56	0.39
2,552.00	15.76	204.11	2,498.38	-413.95	-203.81	-413.02	1.02	0.81	2.34
2,642.00	14.88	203.96	2,585.18	-435.66	-213.50	-434.69	0.98	-0.98	-0.17
2,731.00	16.09	203.94	2,670.94	-457.38	-223.14	-456.36	1.36	1.36	-0.02
2,821.00	15.14	202.97	2,757.62	-479.60	-232.79	-478.54	1.09	-1.06	-1.08
2,911.00	14.77	210.44	2,844.58	-500.31	-243.19	-499.20	2.18	-0.41	8.30
3,000.00	14.94	206.93	2,930.61	-520.32	-254.14	-519.16	1.03	0.19	-3.94
3,090.00	16.92	212.99	3,017.15	-541.65	-266.52	-540.44	2.87	2.20	6.73
3,180.00	15.49	210.35	3,103.58	-563.01	-279.73	-561.74	1.79	-1.59	-2.93
3,270.00	15.47	212.20	3,190.31	-583.54	-292.20	-582.21	0.55	-0.02	2.06
3,359.00	13.05	211.06	3,276.57	-602.19	-303.71	-600.81	2.74	-2.72	-1.28
3,449.00	14.83	211.67	3,363.91	-620.70	-315.00	-619.27	1.98	1.98	0.68
3,538.00	15.18	211.58	3,449.88	-640.32	-327.08	-638.83	0.39	0.39	-0.10
3,628.00	15.91	209.03	3,536.58	-661.15	-339.24	-659.60	1.11	0.81	-2.83
3,717.00	13.21	206.13	3,622.72	-680.95	-349.64	-679.35	3.14	-3.03	-3.26
3,807.00	14.55	204.20	3,710.09	-700.49	-358.80	-698.86	1.58	1.49	-2.14
3,896.00	15.73	205.96	3,796.00	-721.54	-368.67	-719.86	1.42	1.33	1.98
3,986.00	16.02	203.59	3,882.57	-743.89	-378.98	-742.16	0.79	0.32	-2.63
4,076.00	16.77	203.67	3,968.91	-767.16	-389.16	-765.39	0.83	0.83	0.09
4,165.00	14.61	202.35	4,054.59	-789.30	-398.58	-787.49	2.46	-2.43	-1.48
4,255.00	11.05	203.41	4,142.33	-807.72	-406.33	-805.87	3.96	-3.96	1.18
4,345.00	9.19	202.62	4,230.92	-822.27	-412.52	-820.39	2.07	-2.07	-0.88
4,434.00	7.82	197.08	4,318.94	-834.62	-417.03	-832.72	1.79	-1.54	-6.22
4,524.00	5.05	193.65	4,408.37	-844.33	-419.77	-842.41	3.11	-3.08	-3.81
4,614.00	3.93	183.02	4,498.09	-851.26	-420.86	-849.34	1.55	-1.24	-11.81
4,704.00	2.11	180.29	4,587.96	-855.99	-421.03	-854.07	2.03	-2.02	-3.03

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Design:	Original Hole	Database:	Local Database

Survey

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)
4,793.00	0.97	163.95	4,676.93	-858.36	-420.83	-856.44	1.36	-1.28	-18.36
4,883.00	0.51	35.54	4,766.92	-858.76	-420.39	-856.84	1.50	-0.51	-142.68
4,972.00	0.18	299.03	4,855.92	-858.37	-420.28	-856.46	0.63	-0.37	-108.44
5,086.00	2.13	10.93	4,969.90	-856.20	-420.04	-854.29	1.83	1.71	63.07
5,176.00	1.93	16.20	5,059.84	-853.11	-419.30	-851.19	0.30	-0.22	5.86
5,266.00	1.69	0.82	5,149.80	-850.32	-418.86	-848.41	0.60	-0.27	-17.09
5,355.00	1.49	347.64	5,238.76	-847.88	-419.08	-845.97	0.47	-0.22	-14.81
5,445.00	1.67	12.86	5,328.73	-845.46	-419.04	-843.55	0.79	0.20	28.02
5,534.00	1.21	1.79	5,417.70	-843.26	-418.72	-841.35	0.60	-0.52	-12.44
5,624.00	1.58	53.64	5,507.68	-841.57	-417.70	-839.67	1.40	0.41	57.61
5,713.00	1.43	40.64	5,596.65	-840.00	-415.98	-838.10	0.42	-0.17	-14.61
5,803.00	1.03	32.02	5,686.63	-838.46	-414.82	-836.57	0.49	-0.44	-9.58
5,893.00	0.88	24.64	5,776.61	-837.15	-414.11	-835.26	0.22	-0.17	-8.20
5,982.00	0.94	354.32	5,865.60	-835.80	-413.89	-833.91	0.54	0.07	-34.07
6,072.00	0.79	336.83	5,955.59	-834.50	-414.21	-832.61	0.34	-0.17	-19.43
6,162.00	0.57	323.99	6,045.59	-833.56	-414.72	-831.67	0.30	-0.24	-14.27
6,251.00	0.70	328.65	6,134.58	-832.74	-415.26	-830.85	0.16	0.15	5.24
6,341.00	0.70	303.96	6,224.57	-831.96	-416.00	-830.07	0.33	0.00	-27.43
6,430.00	1.01	286.11	6,313.56	-831.44	-417.21	-829.54	0.46	0.35	-20.06
6,520.00	0.35	165.88	6,403.56	-831.49	-417.90	-829.58	1.36	-0.73	-133.59
6,610.00	0.31	248.06	6,493.56	-831.85	-418.06	-829.94	0.48	-0.04	91.31
6,699.00	6.92	352.12	6,582.34	-826.62	-419.02	-824.71	7.87	7.43	116.92
6,789.00	12.09	351.94	6,671.08	-811.91	-421.09	-809.99	5.74	5.74	-0.20
6,879.00	17.98	358.10	6,757.96	-788.67	-422.87	-786.74	6.77	6.54	6.84
6,968.00	24.17	357.39	6,840.97	-756.71	-424.16	-754.78	6.96	6.96	-0.80
7,058.00	29.03	358.71	6,921.42	-716.45	-425.49	-714.51	5.44	5.40	1.47
7,148.00	34.41	2.32	6,997.96	-669.17	-424.95	-667.23	6.34	5.98	4.01
7,238.00	42.15	4.43	7,068.56	-613.56	-421.58	-611.64	8.72	8.60	2.34
7,327.00	52.10	4.69	7,129.04	-548.63	-416.39	-546.73	11.18	11.18	0.29
7,417.00	62.34	3.11	7,177.70	-473.24	-411.31	-471.37	11.47	11.38	-1.76
7,507.00	71.35	2.67	7,213.05	-390.68	-407.16	-388.82	10.02	10.01	-0.49
7,596.00	80.30	3.81	7,234.83	-304.61	-402.27	-302.79	10.13	10.06	1.28
7,686.00	89.42	5.48	7,242.88	-215.37	-395.01	-213.57	10.30	10.13	1.86
7,690.00	89.51	5.34	7,242.92	-211.39	-394.63	-209.59	4.13	2.17	-3.51
Land Box Entry									
7,776.00	91.37	2.32	7,242.26	-125.60	-388.89	-123.83	4.13	2.17	-3.51
7,831.00	91.64	0.90	7,240.82	-70.64	-387.34	-68.88	2.62	0.49	-2.57
Landing Point									
7,865.00	91.81	0.03	7,239.79	-36.65	-387.06	-34.90	2.62	0.49	-2.57
7,955.00	91.59	359.68	7,237.12	53.31	-387.29	55.06	0.46	-0.24	-0.39
8,044.00	91.07	359.06	7,235.06	142.28	-388.27	144.04	0.91	-0.58	-0.70
8,134.00	90.41	358.45	7,233.89	232.25	-390.22	234.01	1.00	-0.73	-0.68
8,224.00	91.62	358.62	7,232.30	322.20	-392.52	323.98	1.36	1.34	0.19
8,314.00	91.15	358.01	7,230.12	412.13	-395.17	413.92	0.86	-0.52	-0.68

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Well:	Babcock 22N-33HZ	North Reference:	True
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Original Hole	Database:	Local Database

Survey

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)
8,403.00	90.52	357.57	7,228.83	501.06	-398.60	502.86	0.86	-0.71	-0.49
8,493.00	91.99	359.42	7,226.86	591.00	-400.97	592.81	2.63	1.63	2.06
8,582.00	91.81	359.59	7,223.90	679.95	-401.73	681.76	0.28	-0.20	0.19
8,672.00	91.97	359.77	7,220.94	769.90	-402.24	771.71	0.27	0.18	0.20
8,762.00	91.75	0.03	7,218.02	859.85	-402.39	861.67	0.38	-0.24	0.29
8,851.00	91.11	0.03	7,215.79	948.82	-402.35	950.64	0.72	-0.72	0.00
8,911.00	90.58	359.44	7,214.91	1,008.81	-402.62	1,010.63	1.31	-0.88	-0.98
460' Heel Exit									
8,941.00	90.32	359.15	7,214.67	1,038.81	-402.99	1,040.63	1.31	-0.88	-0.98
9,031.00	91.73	359.94	7,213.06	1,128.79	-403.71	1,130.61	1.80	1.57	0.88
9,120.00	91.53	359.59	7,210.53	1,217.75	-404.07	1,219.57	0.45	-0.22	-0.39
9,210.00	91.55	359.85	7,208.11	1,307.72	-404.51	1,309.54	0.29	0.02	0.29
9,300.00	91.13	359.94	7,206.01	1,397.69	-404.67	1,399.52	0.48	-0.47	0.10
9,389.00	91.04	0.03	7,204.32	1,486.68	-404.70	1,488.50	0.14	-0.10	0.10
9,479.00	91.51	0.56	7,202.32	1,576.65	-404.23	1,578.47	0.79	0.52	0.59
9,569.00	90.76	358.10	7,200.54	1,666.62	-405.29	1,668.44	2.86	-0.83	-2.73
9,658.00	89.92	357.48	7,200.01	1,755.55	-408.72	1,757.39	1.17	-0.94	-0.70
9,748.00	91.57	358.80	7,198.84	1,845.49	-411.64	1,847.34	2.35	1.83	1.47
9,838.00	90.93	358.27	7,196.87	1,935.44	-413.94	1,937.30	0.92	-0.71	-0.59
9,927.00	90.27	357.92	7,195.94	2,024.39	-416.90	2,026.26	0.84	-0.74	-0.39
10,017.00	92.05	357.75	7,194.12	2,114.30	-420.30	2,116.19	1.99	1.98	-0.19
10,107.00	91.35	357.48	7,191.45	2,204.18	-424.04	2,206.08	0.83	-0.78	-0.30
10,196.00	91.24	358.98	7,189.44	2,293.11	-426.79	2,295.03	1.69	-0.12	1.69
10,286.00	91.04	358.62	7,187.65	2,383.08	-428.67	2,385.00	0.46	-0.22	-0.40
10,376.00	91.79	1.00	7,185.42	2,473.04	-428.97	2,474.96	2.77	0.83	2.64
10,465.00	91.97	1.09	7,182.51	2,561.98	-427.35	2,563.89	0.23	0.20	0.10
10,555.00	91.99	1.17	7,179.40	2,651.91	-425.58	2,653.81	0.09	0.02	0.09
10,644.00	91.81	1.35	7,176.44	2,740.84	-423.62	2,742.73	0.29	-0.20	0.20
10,734.00	90.93	0.91	7,174.29	2,830.79	-421.85	2,832.68	1.09	-0.98	-0.49
10,824.00	90.05	0.03	7,173.52	2,920.79	-421.11	2,922.67	1.38	-0.98	-0.98
10,913.00	90.21	0.12	7,173.32	3,009.78	-420.99	3,011.66	0.21	0.18	0.10
11,003.00	88.93	359.94	7,174.00	3,099.78	-420.94	3,101.66	1.44	-1.42	-0.20
11,063.00	88.11	359.65	7,175.55	3,159.76	-421.16	3,161.64	1.45	-1.37	-0.49
460' Toe Entry									
11,093.00	87.70	359.50	7,176.64	3,189.74	-421.38	3,191.62	1.45	-1.37	-0.49
11,182.00	90.05	359.42	7,178.39	3,278.71	-422.22	3,280.59	2.64	2.64	-0.09
11,272.00	89.24	359.24	7,178.95	3,368.70	-423.28	3,370.59	0.92	-0.90	-0.20
11,362.00	92.21	358.10	7,177.81	3,458.66	-425.36	3,460.55	3.53	3.30	-1.27
11,451.00	91.00	359.68	7,175.32	3,547.60	-427.09	3,549.50	2.24	-1.36	1.78
11,541.00	90.54	359.59	7,174.11	3,637.59	-427.66	3,639.50	0.52	-0.51	-0.10
11,631.00	89.92	358.89	7,173.75	3,727.58	-428.85	3,729.49	1.04	-0.69	-0.78
11,720.00	89.92	358.98	7,173.87	3,816.57	-430.51	3,818.48	0.10	0.00	0.10
11,810.00	89.18	358.01	7,174.58	3,906.53	-432.87	3,908.46	1.36	-0.82	-1.08

Precision Drilling Corporation

Survey Report

Company:	US ROCKIES WATTENBERG PLANNING	Local Co-ordinate Reference:	Well Babcock 22N-33HZ
Project:	WELD-NAD83-UTMFT13N	TVD Reference:	4886'GL + 21'KB @ 4907.00usft (PD464)
Site:	3N-67W-33 Babcock 6-4HZ Pad	MD Reference:	4886'GL + 21'KB @ 4907.00usft (PD464)
Well:	Babcock 22N-33HZ	North Reference:	True
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Original Hole	Database:	Local Database

Survey

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)
11,900.00	91.07	358.01	7,174.38	3,996.47	-436.00	3,998.41	2.10	2.10	0.00
11,989.00	91.02	358.19	7,172.76	4,085.41	-438.95	4,087.36	0.21	-0.06	0.20
12,079.00	89.92	357.31	7,172.02	4,175.34	-442.48	4,177.30	1.57	-1.22	-0.98
12,165.00	89.11	357.22	7,172.75	4,261.23	-446.58	4,263.22	0.95	-0.94	-0.10
12,220.00	89.11	357.22	7,173.60	4,316.16	-449.25	4,318.16	0.00	0.00	0.00

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
Surface 22N-33HZ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	14,588,357.08	1,669,206.24	40.169182°N	104.896944°W
BHL 22N-33HZ - actual wellpath hits target center - Point	0.00	0.00	7,173.60	4,316.16	-449.25	14,592,672.72	1,668,751.99	40.181035°N	104.898553°W
460' Toe Entry 22N-33 - actual wellpath hits target center - Point	0.00	0.00	7,175.55	3,159.76	-421.16	14,591,516.35	1,668,781.42	40.177859°N	104.898452°W
PBHL 22N-33HZ - actual wellpath misses target center by 14.62usft at 12220.00usft MD (7173.60 TVD, 4316.16 N, -449.25 E) - Point	0.00	0.00	7,178.00	4,318.12	-435.44	14,592,674.68	1,668,765.79	40.181040°N	104.898503°W
460' Heel Exit 22N-33 - actual wellpath hits target center - Point	0.00	0.00	7,214.91	1,008.81	-402.62	14,589,365.42	1,668,802.45	40.171952°N	104.898386°W
Landing Point 22N-33 - actual wellpath hits target center - Point	0.00	0.00	7,240.82	-70.64	-387.34	14,588,285.99	1,668,818.99	40.168988°N	104.898331°W
Land Box Entry 22N-33 - actual wellpath hits target center - Point	0.00	0.00	7,242.92	-211.39	-394.63	14,588,145.23	1,668,811.86	40.168602°N	104.898357°W

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
7,690.00	7,242.92	-211.39	-394.63	Land Box Entry
7,831.00	7,240.82	-70.64	-387.34	Landing Point
8,911.00	7,214.91	1,008.81	-402.62	460' Heel Exit
11,063.00	7,175.55	3,159.76	-421.16	460' Toe Entry

Checked By: _____ Approved By: _____ Date: _____