



Precision

Survey Report

Client	Bighorn Directional	MWD Operator	Eli Bartz / Andrew Skoog
Well Name	Pappenheim 6-62-23-0164BH	Rig Name	Nabors M37
Location	Weld County, Colorado	End Date	8/17/2013
Start Date	8/9/2013	Proposed Direction	195.0

SUR NUM	MD ft	INC °	AZM °	TVD ft	N-S ft	E-W ft	SECT ft	DLS °/100'
TIE IN	750	0.14	197.31	750.00	0.26	0.11	-0.28	0.5
1	833	0.7	299.4	833.00	0.41	-0.36	-0.30	0.9
2	976	3.0	281.8	975.91	1.61	-4.79	-0.31	1.6
3	1068	4.7	276.0	1067.70	2.49	-10.89	0.41	1.9
4	1161	6.8	279.9	1160.23	3.84	-20.11	1.50	2.3
5	1253	9.4	281.7	1251.31	6.30	-32.83	2.41	2.8
6	1345	11.4	288.9	1341.79	10.77	-48.79	2.23	2.6
7	1437	14.6	287.5	1431.42	17.20	-68.46	1.10	3.5
8	1532	17.1	282.7	1522.81	23.87	-93.51	1.14	3.0
9	1628	17.2	261.8	1614.63	24.95	-121.35	7.31	6.4
10	1723	15.6	255.3	1705.77	19.71	-147.61	19.17	2.6
11	1819	16.3	262.3	1798.08	14.63	-173.45	30.77	2.1
12	1915	16.7	268.7	1890.13	12.51	-200.59	39.84	1.9
13	2011	16.5	270.2	1982.13	12.24	-228.02	47.19	0.5
14	2107	16.2	269.9	2074.25	12.27	-255.04	54.16	0.3
15	2203	17.3	272.7	2166.18	12.92	-282.69	60.69	1.4
16	2299	17.3	270.9	2257.84	13.81	-311.22	67.21	0.6
17	2394	17.1	272.7	2348.59	14.69	-339.30	73.63	0.6
18	2489	16.0	278.5	2439.66	17.29	-366.20	78.08	2.1
19	2585	16.6	278.7	2531.80	21.32	-392.84	81.09	0.6
20	2680	16.1	276.7	2622.96	24.91	-419.34	84.48	0.8
21	2777	17.2	278.5	2715.89	28.59	-446.88	88.04	1.3
22	2873	16.7	275.3	2807.72	31.97	-474.66	91.97	1.1
23	2968	15.9	274.5	2898.90	34.25	-501.22	96.64	0.9
24	3065	15.1	273.6	2992.37	36.08	-527.08	101.56	0.9
25	3161	14.4	270.9	3085.21	37.06	-551.49	106.94	1.0
26	3257	14.1	275.7	3178.26	38.41	-575.06	111.74	1.3



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SUR NUM	MD ft	INC °	AZM °	TVD ft	N-S ft	E-W ft	SECT ft	DLS °/100'
27	3353	14.2	275.7	3271.35	40.74	-598.42	115.53	0.1
28	3449	16.3	278.7	3363.96	43.94	-623.45	118.91	2.3
29	3544	16.6	277.8	3455.07	47.80	-650.08	122.08	0.4
30	3641	17.2	277.4	3547.88	51.53	-678.03	125.71	0.6
31	3736	17.2	276.6	3638.64	54.95	-705.91	129.62	0.2
32	3832	17.1	275.7	3730.37	57.99	-734.05	133.98	0.3
33	3928	16.5	275.5	3822.27	60.70	-761.67	138.51	0.6
34	4023	16.4	279.7	3913.38	64.25	-788.32	141.97	1.3
35	4120	17.1	280.4	4006.27	69.13	-815.84	144.38	0.8
36	4215	15.3	279.9	4097.49	73.81	-841.93	146.62	1.9
37	4311	16.5	279.9	4189.82	78.33	-867.84	148.95	1.3
38	4408	15.7	278.1	4283.01	82.55	-894.40	151.75	1.0
39	4504	17.1	278.0	4375.11	86.34	-921.24	155.04	1.5
40	4599	17.0	278.5	4465.93	90.34	-948.80	158.31	0.2
41	4695	16.4	279.9	4557.88	94.74	-976.03	161.10	0.8
42	4791	16.4	279.9	4649.97	99.40	-1002.73	163.51	0.0
43	4885	16.1	277.8	4740.22	103.45	-1028.72	166.33	0.7
44	4979	17.1	279.9	4830.30	107.60	-1055.25	169.19	1.2
45	5075	14.3	275.2	4922.72	111.10	-1080.97	172.46	3.2
46	5170	11.3	270.4	5015.35	112.23	-1101.96	176.81	3.3
47	5266	12.1	274.1	5109.35	113.01	-1121.40	181.08	1.1
48	5362	12.8	278.0	5203.10	115.21	-1141.97	184.28	1.1
49	5458	10.4	272.5	5297.13	117.07	-1161.16	187.45	2.7
50	5554	7.7	277.8	5391.93	118.32	-1176.19	190.13	2.9
51	5650	6.0	292.2	5487.25	121.09	-1187.21	190.31	2.5
52	5747	4.7	289.7	5583.82	124.35	-1195.65	189.35	1.4
53	5841	1.4	276.7	5677.68	125.78	-1200.42	189.20	3.6



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SUR NUM	MD ft	INC °	AZM °	TVD ft	N-S ft	E-W ft	SECT ft	DLS °/100'
54	5933	2.8	204.0	5769.63	123.86	-1202.45	191.58	3.0
55	5965	7.5	188.3	5801.49	121.07	-1203.07	194.43	15.2
56	5997	11.3	186.2	5833.05	115.89	-1203.71	199.60	11.9
57	6029	13.4	186.9	5864.31	109.09	-1204.49	206.37	6.6
58	6061	16.4	185.7	5895.23	100.91	-1205.39	214.50	9.4
59	6093	17.9	186.0	5925.81	91.53	-1206.35	223.82	4.7
60	6124	20.4	186.0	5955.09	81.41	-1207.41	233.86	8.1
61	6156	24.7	187.8	5984.64	69.24	-1208.90	246.01	13.6
62	6188	28.9	186.9	6013.19	54.93	-1210.74	260.30	13.2
63	6219	30.9	186.0	6040.07	39.57	-1212.47	275.58	6.6
64	6251	35.3	183.6	6066.87	22.17	-1213.91	292.77	14.3
65	6283	37.6	183.7	6092.61	3.19	-1215.12	311.41	7.2
66	6315	41.2	183.6	6117.33	-17.07	-1216.41	331.32	11.3
67	6347	46.3	182.7	6140.44	-39.16	-1217.62	352.97	16.1
68	6379	47.1	180.6	6162.39	-62.44	-1218.29	375.63	5.4
69	6411	49.1	179.9	6183.76	-86.25	-1218.39	398.66	6.5
70	6443	53.6	179.4	6203.74	-111.24	-1218.24	422.75	14.1
71	6475	56.4	178.3	6222.09	-137.44	-1217.71	447.92	9.2
72	6507	60.3	177.1	6238.88	-164.65	-1216.61	473.92	12.6
73	6539	64.2	176.5	6253.77	-192.92	-1215.02	500.82	12.3
74	6571	64.9	176.2	6267.53	-221.76	-1213.18	528.20	2.3
75	6603	65.2	175.8	6281.02	-250.70	-1211.16	555.63	1.5
76	6635	66.7	175.3	6294.06	-279.84	-1208.89	583.18	4.9
77	6667	70.4	173.9	6305.77	-309.48	-1206.08	611.09	12.3
78	6699	73.2	174.1	6315.76	-339.71	-1202.91	639.47	8.8
79	6730	74.7	171.8	6324.33	-369.27	-1199.25	667.08	8.6
80	6762	77.4	172.0	6332.04	-400.02	-1194.87	695.64	8.5



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81	6814	81.6	172.1	6341.52	-450.64	-1187.80	742.71	8.1
82	6907	89.4	173.6	6348.81	-542.56	-1176.28	828.52	8.5
83	6999	92.9	173.7	6346.96	-633.97	-1166.11	914.17	3.8
84	7092	91.9	173.0	6343.07	-726.26	-1155.35	1000.54	1.3
85	7184	91.8	174.4	6340.10	-817.65	-1145.26	1086.20	1.5
86	7278	90.6	173.7	6338.13	-911.12	-1135.52	1173.97	1.5
87	7374	93.2	173.9	6334.95	-1006.50	-1125.15	1263.42	2.7
88	7469	95.0	176.0	6328.16	-1100.88	-1116.81	1352.42	2.9
89	7535	90.4	178.7	6325.05	-1166.71	-1113.77	1415.22	8.1
90	7563	90.5	178.8	6324.83	-1194.70	-1113.16	1442.10	0.5
91	7659	88.4	179.0	6325.75	-1290.68	-1111.32	1534.33	2.2
92	7754	88.2	178.5	6328.57	-1385.61	-1109.24	1625.49	0.6
93	7850	90.2	180.6	6329.91	-1481.59	-1108.49	1718.00	3.0
94	7946	90.2	181.6	6329.57	-1577.57	-1110.33	1811.19	1.0
95	8040	89.5	182.0	6329.82	-1671.52	-1113.29	1902.71	0.9
96	8136	89.3	181.5	6330.82	-1767.47	-1116.22	1996.15	0.6
97	8233	89.1	180.4	6332.18	-1864.45	-1117.83	2090.23	1.2
98	8329	89.3	180.1	6333.52	-1960.44	-1118.24	2183.06	0.4
99	8426	88.9	179.4	6335.04	-2057.42	-1117.82	2276.63	0.8
100	8521	91.1	180.8	6335.04	-2152.42	-1117.99	2368.43	2.7
101	8617	90.0	177.6	6334.12	-2248.39	-1116.65	2460.79	3.5
102	8713	90.0	177.6	6334.12	-2344.30	-1112.63	2552.39	0.0
103	8809	87.5	172.5	6336.22	-2439.88	-1104.35	2642.57	5.9
104	8903	89.4	171.8	6338.76	-2532.96	-1091.52	2729.16	2.2
105	8999	92.2	175.0	6337.42	-2628.30	-1080.49	2818.39	4.4
106	9095	92.4	177.4	6333.56	-2724.00	-1074.13	2909.19	2.5
107	9190	90.7	177.6	6330.99	-2818.87	-1069.99	2999.75	1.8



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108	9287	90.7	181.3	6329.81	-2915.84	-1069.06	3093.18	3.8
109	9383	91.0	180.9	6328.38	-3011.82	-1070.90	3186.36	0.5
110	9480	89.6	180.9	6327.88	-3108.80	-1072.42	3280.43	1.4
111	9576	92.7	184.6	6325.95	-3204.64	-1077.02	3374.20	5.0
112	9672	91.4	184.5	6322.52	-3300.28	-1084.63	3468.55	1.4
113	9766	91.5	183.4	6320.14	-3394.02	-1091.11	3560.77	1.2
114	9862	91.7	183.2	6317.46	-3489.82	-1096.63	3654.74	0.3
115	9957	90.5	183.6	6315.63	-3584.64	-1102.26	3747.78	1.3
116	10052	90.7	182.9	6314.64	-3679.48	-1107.65	3840.78	0.8
117	10148	91.1	182.7	6313.13	-3775.35	-1112.34	3934.60	0.5
118	10245	87.7	182.7	6314.15	-3872.22	-1116.91	4029.36	3.5
119	10340	87.6	182.7	6318.04	-3967.04	-1121.38	4122.10	0.1
120	10437	87.1	181.6	6322.53	-4063.87	-1125.01	4216.57	1.2
121	10533	86.9	181.8	6327.55	-4159.69	-1127.86	4309.87	0.3
122	10629	86.4	179.7	6333.16	-4255.51	-1129.11	4402.75	2.2
123	10691	85.6	179.4	6337.49	-4317.36	-1128.63	4462.36	1.4
PTB	10735	85.6	179.4	6340.86	-4361.23	-1128.17	4504.61	0.0