



Job Number: 15093
Company: Black Hills Plateau Production LLC
Lease/Well: Homer Deep Unit 7-23CH
Location: Garfield County, CO
Rig Name: Ensign 161
State/Country: CO/ Garfield
Country: USA

Elev. GL: 5674.00 ft
System: US State Plane 1983
Group: Colorado Central Zone
Datum: GRS80
Mag. Decl.: 10.09° (C:\HawkEye\IGRF2015.MIF)
Grid Conv.: -1.80981 W
Date: Wednesday, April 08, 2015

NOVA Directional Inc. Survey Report

Calculated by HawkEye Software

Minimum Curvature Method

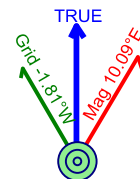
Vertical Section Plane 147.70°

Northing (US ft): 1573232.93 Easting (US ft): 2188915.52

Latitude: 39°22'19.5960" N Longitude: -108°22'10.4520" W

Well Location: 1886.0 FSL, 2471.0 FWL, Section 7, T8S, R98W, Sixth Principal Meridian, Garfield County, CO

Direction Reference: True North



Measured Depth (Ft)	INC Deg	AZM Deg	TVD (Ft)	NS (Ft)	EW (Ft)	VS (Ft)	DLS %/100 Ft	Latitude Dec. Deg	Longitude Dec. Deg
Surface Casing tie-in									
1012.00	2.30	170.50	1011.77	-15.68	5.55	16.22	0.00	39.3720670	-108.3695504
1042.00	2.00	170.50	1041.75	-16.79	5.74	17.26	1.00	39.3720639	-108.3695497
1072.00	1.70	170.50	1071.73	-17.75	5.90	18.15	1.00	39.3720613	-108.3695491
1102.00	1.40	170.50	1101.72	-18.55	6.03	18.90	1.00	39.3720591	-108.3695487
1132.00	1.10	170.50	1131.71	-19.19	6.14	19.50	1.00	39.3720573	-108.3695483
1162.00	0.80	170.50	1161.71	-19.68	6.22	19.96	1.00	39.3720560	-108.3695480
1192.00	0.50	170.50	1191.71	-20.02	6.28	20.27	1.00	39.3720550	-108.3695478
1222.00	0.20	170.50	1221.71	-20.20	6.31	20.44	1.00	39.3720545	-108.3695477
Hold Vertical									
1242.00	0.00	0.00	1241.71	-20.23	6.31	20.47	1.00	39.3720545	-108.3695477
2242.00	0.00	0.00	2241.71	-20.23	6.31	20.47	0.00	39.3720545	-108.3695477
3242.00	0.00	0.00	3241.71	-20.23	6.31	20.47	0.00	39.3720545	-108.3695477
4242.00	0.00	0.00	4241.71	-20.23	6.31	20.47	0.00	39.3720545	-108.3695477
5242.00	0.00	0.00	5241.71	-20.23	6.31	20.47	0.00	39.3720545	-108.3695477
KOP-Begin Build @ 8.00%/ 100 Ft									
6169.00	0.00	0.00	6168.71	-20.23	6.31	20.47	0.00	39.3720545	-108.3695477
6199.00	2.40	110.00	6198.70	-20.45	6.90	20.97	8.00	39.3720539	-108.3695456
6229.00	4.80	110.00	6228.64	-21.09	8.67	22.46	8.00	39.3720521	-108.3695393
6259.00	7.20	110.00	6258.47	-22.16	11.62	24.94	8.00	39.3720491	-108.3695289
6289.00	9.60	110.00	6288.15	-23.66	15.74	28.41	8.00	39.3720450	-108.3695143
6319.00	12.00	110.00	6317.61	-25.59	21.02	32.86	8.00	39.3720398	-108.3694956
6349.00	14.40	110.00	6346.82	-27.93	27.46	38.28	8.00	39.3720333	-108.3694729
6379.00	16.80	110.00	6375.71	-30.69	35.04	44.66	8.00	39.3720257	-108.3694461
6409.00	19.20	110.00	6404.24	-33.86	43.75	51.99	8.00	39.3720170	-108.3694153
6439.00	21.60	110.00	6432.36	-37.43	53.57	60.27	8.00	39.3720072	-108.3693805
6469.00	24.00	110.00	6460.01	-41.41	64.50	69.47	8.00	39.3719963	-108.3693419
6499.00	26.40	110.00	6487.15	-45.78	76.50	79.57	8.00	39.3719843	-108.3692994
6529.00	28.80	110.00	6513.74	-50.53	89.56	90.57	8.00	39.3719713	-108.3692532
6559.00	31.20	110.00	6539.72	-55.66	103.65	102.44	8.00	39.3719572	-108.3692033
6589.00	33.60	110.00	6565.05	-61.16	118.76	115.15	8.00	39.3719421	-108.3691499
6619.00	36.00	110.00	6589.68	-67.01	134.84	128.70	8.00	39.3719260	-108.3690930
6649.00	38.40	110.00	6613.57	-73.22	151.89	143.05	8.00	39.3719090	-108.3690327
6679.00	40.80	110.00	6636.69	-79.76	169.86	158.18	8.00	39.3718910	-108.3689692
6709.00	43.20	110.00	6658.98	-86.62	188.72	174.06	8.00	39.3718722	-108.3689024
6739.00	45.60	110.00	6680.41	-93.80	208.44	190.67	8.00	39.3718525	-108.3688327
6769.00	48.00	110.00	6700.95	-101.28	228.99	207.97	8.00	39.3718319	-108.3687600
6799.00	50.40	110.00	6720.55	-109.05	250.33	225.94	8.00	39.3718106	-108.3686845
6829.00	52.80	110.00	6739.18	-117.09	272.42	244.54	8.00	39.3717885	-108.3686064
6859.00	55.20	110.00	6756.81	-125.39	295.22	263.74	8.00	39.3717657	-108.3685257
6889.00	57.60	110.00	6773.41	-133.93	318.70	283.51	8.00	39.3717423	-108.3684426
6919.00	60.00	110.00	6788.95	-142.71	342.81	303.81	8.00	39.3717182	-108.3683574
6949.00	62.40	110.00	6803.40	-151.70	367.52	324.61	8.00	39.3716935	-108.3682700

Measured Depth (Ft)	INC Deg	AZM Deg	TVD (Ft)	NS (Ft)	EW (Ft)	VS (Ft)	DLS °/100 Ft	Latitude Dec. Deg	Longitude Dec. Deg
Build and Turn @ 8.00°/100 Ft									
6956.50	63.00	110.00	6806.84	-153.98	373.78	329.88	8.00	39.3716872	-108.3682478
6986.50	64.26	112.28	6820.17	-163.67	398.84	351.47	8.00	39.3716606	-108.3681592
7016.50	65.55	114.51	6832.90	-174.46	423.77	373.91	8.00	39.3716310	-108.3680710
7046.50	66.87	116.70	6845.00	-186.33	448.53	397.17	8.00	39.3715984	-108.3679834
7076.50	68.23	118.85	6856.45	-199.25	473.05	421.20	8.00	39.3715629	-108.3678967
7106.50	69.61	120.95	6867.25	-213.21	497.32	445.96	8.00	39.3715246	-108.3678108
7136.50	71.02	123.02	6877.35	-228.17	521.27	471.40	8.00	39.3714835	-108.3677261
7166.50	72.44	125.05	6886.76	-244.11	544.88	497.49	8.00	39.3714398	-108.3676426
7196.50	73.89	127.05	6895.45	-261.01	568.09	524.18	8.00	39.3713934	-108.3675605
7226.50	75.36	129.02	6903.40	-278.83	590.87	551.42	8.00	39.3713444	-108.3674799
7256.50	76.84	130.96	6910.61	-297.54	613.18	579.16	8.00	39.3712931	-108.3674010
7286.50	78.34	132.88	6917.05	-317.12	634.98	607.35	8.00	39.3712393	-108.3673239
7316.50	79.85	134.78	6922.73	-337.52	656.23	635.95	8.00	39.3711833	-108.3672487
7346.50	81.37	136.66	6927.62	-358.71	676.89	664.90	8.00	39.3711251	-108.3671756
7376.50	82.90	138.53	6931.73	-380.65	696.93	694.16	8.00	39.3710649	-108.3671047
7406.50	84.44	140.38	6935.03	-403.31	716.31	723.66	8.00	39.3710027	-108.3670362
7436.50	85.98	142.23	6937.54	-426.64	735.00	753.37	8.00	39.3709386	-108.3669701
7466.50	87.53	144.06	6939.23	-450.60	752.97	783.22	8.00	39.3708728	-108.3669065
7496.50	89.08	145.90	6940.12	-475.16	770.17	813.18	8.00	39.3708054	-108.3668457
Target - Hold @ 90.55°,147.63° Azm									
7524.86	90.55	147.63	6940.21	-498.87	785.71	841.53	8.00	39.3707403	-108.3667907
8524.86	90.55	147.63	6930.63	-1343.41	1321.13	1841.48	0.00	39.3684215	-108.3648970
9524.86	90.55	147.63	6921.05	-2187.95	1856.54	2841.43	0.00	39.3661027	-108.3630033
10524.86	90.55	147.63	6911.46	-3032.48	2391.95	3841.39	0.00	39.3637839	-108.3611098
11524.86	90.55	147.63	6901.88	-3877.02	2927.36	4841.34	0.00	39.3614650	-108.3592165
12524.86	90.55	147.63	6892.30	-4721.56	3462.77	5841.29	0.00	39.3591461	-108.3573232
13524.86	90.55	147.63	6882.72	-5566.10	3998.18	6841.25	0.00	39.3568272	-108.3554301
14524.86	90.55	147.63	6873.14	-6410.63	4533.59	7841.20	0.00	39.3545082	-108.3535371
15524.86	90.55	147.63	6863.56	-7255.17	5069.00	8841.15	0.00	39.3521892	-108.3516442
16524.86	90.55	147.63	6853.98	-8099.71	5604.41	9841.11	0.00	39.3498702	-108.3497515
CH - Proposed End of Lateral									
17044.64	90.55	147.63	6848.99	-8538.68	5882.71	10360.86	0.00	39.3486648	-108.3487677