



COMPANY/RIG: Noble Energy/Production/CoreTech
 WELL/API: Bird K20-02/05-123-20201
 DECLINATION: 8.27 Degrees
 TD AS DRILLED: 7389 Feet
 COUNTY/STATE: Weld/Colorado
 VS-Azi: 0.000 Degrees
 Latitude: 40.30313, Longitude: -104.79908
 Grid North = True North -0.45 degs (NAD 27)
 Grid Correction Applied = -0.45 degs



DEPTH REFERENCE : RKB = GL Elevation = 4742

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyrosurvey.ut
 Minimum Curvature Method
 Report Date/Time: 12/15/2016 / 13:21

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD
 NORTH REFERENCE: GRID
 HENDERSON, COLORADO
 303-853-4976

Surveyor: JUSTIN WILLIAMS / Bird K20-02

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	****
100.000	0.308	260.693	100.000	-0.043	-0.265	-0.043	0.269	260.693	0.308
200.000	0.341	246.856	199.998	-0.204	-0.804	-0.204	0.829	255.773	0.085
300.000	0.288	299.713	299.997	-0.196	-1.295	-0.196	1.310	261.382	0.284
400.000	0.127	292.492	399.996	-0.030	-1.615	-0.030	1.615	268.953	0.162
500.000	0.225	250.842	499.995	-0.052	-1.903	-0.052	1.904	268.446	0.155
600.000	0.133	222.760	599.995	-0.202	-2.168	-0.202	2.177	264.689	0.125
700.000	0.324	208.688	699.994	-0.535	-2.382	-0.535	2.442	257.349	0.197
800.000	0.157	215.379	799.993	-0.894	-2.597	-0.894	2.747	251.002	0.169
900.000	0.236	200.824	899.993	-1.198	-2.750	-1.198	2.999	246.458	0.093
1000.000	0.285	242.207	999.992	-1.506	-3.043	-1.506	3.395	243.665	0.190
1100.000	0.181	228.444	1099.991	-1.727	-3.381	-1.727	3.797	242.943	0.117
1200.000	0.380	248.598	1199.990	-1.953	-3.809	-1.953	4.281	242.850	0.219
1300.000	0.284	276.984	1299.988	-2.044	-4.364	-2.044	4.819	244.900	0.188
1400.000	0.405	257.768	1399.986	-2.089	-4.955	-2.089	5.378	247.142	0.166
1500.000	0.384	257.303	1499.984	-2.238	-5.628	-2.238	6.056	248.318	0.021
1600.000	0.439	279.520	1599.981	-2.248	-6.332	-2.248	6.719	250.456	0.167
1700.000	0.539	270.309	1699.978	-2.182	-7.180	-2.182	7.504	253.095	0.127
1800.000	0.986	276.990	1799.969	-2.075	-8.504	-2.075	8.754	256.290	0.456

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.000	0.857	280.752	1899.956	-1.830	-10.094	-1.830	10.258	259.722	0.143
2000.000	0.857	268.449	1999.945	-1.711	-11.576	-1.711	11.702	261.592	0.184
2100.000	0.987	290.271	2099.932	-1.433	-13.132	-1.433	13.210	263.773	0.372
2200.000	0.764	277.611	2199.920	-1.046	-14.601	-1.046	14.638	265.902	0.295
2300.000	0.630	253.599	2299.913	-1.113	-15.788	-1.113	15.828	265.968	0.318
2400.000	0.714	250.206	2399.906	-1.479	-16.902	-1.479	16.967	264.998	0.093
2500.000	0.766	246.811	2499.898	-1.953	-18.102	-1.953	18.208	263.841	0.068
2600.000	0.787	243.151	2599.889	-2.527	-19.329	-2.527	19.494	262.553	0.054
2700.000	1.084	248.195	2699.875	-3.188	-20.820	-3.188	21.063	261.295	0.308
2800.000	1.159	263.546	2799.856	-3.653	-22.703	-3.653	22.995	260.859	0.309
2900.000	1.296	278.474	2899.834	-3.600	-24.827	-3.600	25.087	261.750	0.347
3000.000	1.291	276.828	2999.808	-3.299	-27.065	-3.299	27.265	263.050	0.038
3100.000	1.437	298.323	3099.780	-2.570	-29.287	-2.570	29.400	264.984	0.529
3200.000	1.440	300.376	3199.749	-1.340	-31.475	-1.340	31.504	267.563	0.052
3300.000	1.398	297.479	3299.718	-0.141	-33.642	-0.141	33.642	269.759	0.083
3400.000	1.427	295.654	3399.688	0.961	-35.847	0.961	35.860	271.535	0.054
3500.000	1.126	295.799	3499.663	1.928	-37.854	1.928	37.903	272.915	0.301
3600.000	0.876	257.700	3599.649	2.192	-39.486	2.192	39.546	273.178	0.695
3700.000	1.252	255.396	3699.631	1.754	-41.290	1.754	41.327	272.432	0.379
3800.000	1.141	260.193	3799.609	1.309	-43.329	1.309	43.348	271.730	0.150
3900.000	1.192	248.000	3899.589	0.749	-45.274	0.749	45.280	270.948	0.253
4000.000	1.325	255.971	3999.565	0.080	-47.360	0.080	47.360	270.096	0.219
4100.000	1.574	255.146	4099.533	-0.553	-49.809	-0.553	49.812	269.364	0.250
4200.000	2.353	256.028	4199.473	-1.400	-53.129	-1.400	53.147	268.490	0.779
4300.000	2.108	258.089	4299.397	-2.276	-56.920	-2.276	56.965	267.711	0.257
4400.000	2.119	255.086	4399.329	-3.131	-60.506	-3.131	60.586	267.038	0.111
4500.000	2.139	255.156	4499.260	-4.085	-64.096	-4.085	64.226	266.353	0.021
4600.000	2.155	262.475	4599.190	-4.809	-67.764	-4.809	67.935	265.941	0.274
4700.000	1.366	251.750	4699.143	-5.429	-70.760	-5.429	70.968	265.613	0.852
4800.000	1.117	230.585	4799.120	-6.421	-72.646	-6.421	72.929	264.949	0.517
4900.000	1.074	235.001	4899.101	-7.578	-74.166	-7.578	74.552	264.166	0.095
5000.000	0.680	236.948	4999.089	-8.439	-75.431	-8.439	75.902	263.617	0.394
5100.000	0.407	265.404	5099.085	-8.791	-76.282	-8.791	76.787	263.426	0.376
5200.000	0.372	256.868	5199.083	-8.893	-76.952	-8.893	77.465	263.408	0.067
5300.000	0.623	273.229	5299.079	-8.936	-77.811	-8.936	78.323	263.449	0.286
5400.000	0.560	327.929	5399.074	-8.492	-78.614	-8.492	79.071	263.835	0.546
5500.000	0.578	327.598	5499.069	-7.652	-79.143	-7.652	79.512	264.477	0.018
5600.000	0.725	244.894	5599.065	-7.495	-79.986	-7.495	80.336	264.647	0.867
5700.000	1.354	237.484	5699.048	-8.398	-81.555	-8.398	81.986	264.121	0.643
5800.000	1.650	227.054	5799.014	-10.015	-83.605	-10.015	84.203	263.169	0.402

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5900.000	0.983	224.869	5898.987	-11.604	-85.264	-11.604	86.050	262.250	0.669
6000.000	1.033	252.278	5998.972	-12.486	-86.728	-12.486	87.622	261.808	0.480
6100.000	0.684	265.518	6098.960	-12.807	-88.181	-12.807	89.106	261.737	0.399
6200.000	0.722	271.106	6198.953	-12.841	-89.406	-12.841	90.324	261.827	0.078
6300.000	0.781	259.497	6298.944	-12.953	-90.706	-12.953	91.627	261.873	0.163
6400.000	0.631	276.630	6398.937	-13.014	-91.923	-13.014	92.840	261.942	0.257
6500.000	0.830	283.188	6498.929	-12.785	-93.175	-12.785	94.048	262.187	0.216
6600.000	0.678	292.134	6598.920	-12.397	-94.428	-12.397	95.238	262.521	0.192
6700.000	0.749	281.231	6698.912	-12.047	-95.617	-12.047	96.373	262.819	0.153
6800.000	0.857	282.440	6798.902	-11.758	-96.989	-11.758	97.699	263.087	0.108
6900.000	0.720	265.373	6898.893	-11.648	-98.345	-11.648	99.032	263.245	0.270
7000.000	0.482	270.514	6998.888	-11.695	-99.392	-11.695	100.078	263.289	0.244
7100.000	0.377	252.547	7098.885	-11.790	-100.127	-11.790	100.819	263.284	0.170
7150.000	0.386	243.503	7148.884	-11.915	-100.435	-11.915	101.139	263.235	0.122