

<b>Co:</b> NATIVE NAVIGATION	<b>Units:</b> Feet, °, %100ft	<b>VS Az:</b> 132.00	<b>Method:</b> Minimum Curvature
<b>Drillers:</b> WARELL / PENNINGTON	<b>Elevation:</b> 5664.00	<b>Map System:</b> Nad 83, CO Central	
<b>Well Name:</b> SWORDFISH 13-31	<b>Northing:</b> 1188244.21	<b>Latitude:</b> 38.35	
<b>Location:</b> FLORENCE, CO	<b>Easting:</b> 3097605.34	<b>Longitude:</b> -105.16	

**Swordfish\_13-31\_surveys**

No.	MD	CL	Inc.	Azi.	TVD	VS	+N/S-	+E/W-	BR	WR	DLS	Comments
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				Tie in at surface
2	623.00	623.00	0.79	137.41	622.98	4.28	-3.16	2.91	0.13	22.06	0.13	Native EM MWD
3	718.00	95.00	0.79	121.51	717.97	5.57	-3.99	3.91	0.00	-16.74	0.23	Native EM MWD
4	806.00	88.00	0.79	142.07	805.96	6.77	-4.78	4.80	0.00	23.36	0.32	Native EM MWD
5	896.00	90.00	1.14	141.55	895.95	8.26	-5.97	5.74	0.39	-0.58	0.39	Native EM MWD
6	988.00	92.00	1.18	139.79	987.93	10.10	-7.41	6.92	0.04	-1.91	0.06	Native EM MWD
7	1081.00	93.00	1.23	138.47	1080.91	12.04	-8.89	8.20	0.05	-1.42	0.06	Native EM MWD
8	1177.00	96.00	0.75	269.34	1176.90	12.60	-9.67	8.25	-0.50	136.32	1.89	Native EM MWD
9	1268.00	91.00	0.92	269.34	1267.89	11.63	-9.68	6.93	0.19	0.00	0.19	Native EM MWD
10	1359.00	91.00	1.05	242.18	1358.88	10.80	-10.08	5.46	0.14	-29.85	0.53	Native EM MWD
11	1454.00	95.00	0.66	235.50	1453.87	10.37	-10.80	4.24	-0.41	-7.03	0.42	Native EM MWD
12	1549.00	95.00	0.53	217.57	1548.87	10.28	-11.46	3.52	-0.14	-18.87	0.24	Native EM MWD
13	1645.00	96.00	0.70	215.81	1644.86	10.38	-12.28	2.90	0.18	-1.83	0.18	Native EM MWD
14	1739.00	94.00	0.57	201.93	1738.85	10.60	-13.18	2.39	-0.14	-14.77	0.21	Native EM MWD
15	1834.00	95.00	0.70	179.16	1833.85	11.16	-14.20	2.23	0.14	-23.97	0.30	Native EM MWD
16	1929.00	95.00	0.79	190.68	1928.84	11.89	-15.43	2.11	0.09	12.13	0.18	Native EM MWD
17	2024.00	95.00	0.97	133.28	2023.83	13.04	-16.62	2.58	0.19	-60.42	0.91	Native EM MWD
18	2122.00	98.00	1.19	126.87	2121.81	14.88	-17.80	4.00	0.22	-6.54	0.26	Native EM MWD
19	2217.00	95.00	0.70	310.03	2216.81	15.28	-18.02	4.34	-0.52	192.80	1.99	Native EM MWD
20	2312.00	95.00	0.92	285.25	2311.80	14.02	-17.45	3.16	0.23	-26.08	0.43	Native EM MWD
21	2407.00	95.00	0.70	260.64	2406.79	12.98	-17.34	1.85	-0.23	-25.91	0.43	Native EM MWD
22	2502.00	95.00	0.62	255.01	2501.78	12.34	-17.57	0.78	-0.08	-5.93	0.11	Native EM MWD
23	2596.00	94.00	0.57	241.13	2595.78	11.91	-17.92	-0.12	-0.05	-14.77	0.16	Native EM MWD
24	2658.00	62.00	0.70	227.50	2657.77	11.77	-18.33	-0.67	0.21	-21.98	0.32	Native EM MWD
25	2690.00	32.00	1.89	165.28	2689.77	12.19	-18.97	-0.68	3.72	-194.44	5.26	Native EM MWD
26	2722.00	32.00	3.08	149.63	2721.74	13.45	-20.22	-0.11	3.72	-48.91	4.25	Native EM MWD
27	2753.00	31.00	4.35	143.65	2752.67	15.40	-21.89	1.01	4.10	-19.29	4.28	Native EM MWD
28	2785.00	32.00	5.45	145.41	2784.55	18.06	-24.12	2.59	3.44	5.50	3.47	Native EM MWD
29	2817.00	32.00	6.94	140.22	2816.37	21.45	-26.85	4.69	4.66	-16.22	4.97	Native EM MWD
30	2849.00	32.00	8.70	140.40	2848.07	25.76	-30.20	7.47	5.50	0.56	5.50	Native EM MWD
31	2880.00	31.00	10.50	146.55	2878.63	30.82	-34.37	10.52	5.81	19.84	6.67	Native EM MWD
32	2912.00	32.00	13.05	142.16	2909.96	37.20	-39.66	14.35	7.97	-13.72	8.44	Native EM MWD
33	2943.00	31.00	14.85	153.06	2940.05	44.35	-45.96	18.29	5.81	35.16	10.25	Native EM MWD
34	2975.00	32.00	15.95	153.06	2970.90	52.28	-53.54	22.14	3.44	0.00	3.44	Native EM MWD
35	3007.00	32.00	17.36	152.88	3001.55	60.84	-61.71	26.31	4.41	-0.56	4.41	Native EM MWD
36	3039.00	32.00	18.68	151.56	3031.98	70.13	-70.46	30.93	4.12	-4.13	4.32	Native EM MWD
37	3074.00	35.00	20.87	149.19	3064.92	81.37	-80.75	36.79	6.26	-6.77	6.66	Native EM MWD
38	3104.00	30.00	22.50	146.91	3092.79	92.03	-90.15	42.66	5.43	-7.60	6.11	Native EM MWD

No.	MD	CL	Inc.	Azi.	TVD	VS	+N/S-	+E/W-	BR	WR	DLS	Comments
39	3135.00	31.00	24.08	146.91	3121.27	103.87	-100.42	49.36	5.10	0.00	5.10	Native EM MWD
40	3167.00	32.00	26.59	145.50	3150.19	117.14	-111.79	56.98	7.84	-4.41	8.07	Native EM MWD
41	3198.00	31.00	28.74	142.34	3177.64	131.23	-123.41	65.46	6.94	-10.19	8.39	Native EM MWD
42	3227.00	29.00	30.72	141.90	3202.83	145.38	-134.76	74.29	6.83	-1.52	6.87	Native EM MWD
43	3259.00	32.00	33.00	138.29	3230.01	162.10	-147.70	85.14	7.12	-11.28	9.28	Native EM MWD
44	3291.00	32.00	34.76	135.93	3256.57	179.86	-160.76	97.28	5.50	-7.38	6.87	Native EM MWD
45	3322.00	31.00	36.25	134.78	3281.81	197.84	-173.57	109.94	4.81	-3.71	5.27	Native EM MWD
46	3354.00	32.00	37.84	132.49	3307.35	217.10	-186.86	123.89	4.97	-7.16	6.58	Native EM MWD
47	3385.00	31.00	38.54	132.84	3331.71	236.27	-199.85	137.98	2.26	1.13	2.36	Native EM MWD
48	3418.00	33.00	39.95	132.84	3357.27	257.14	-214.05	153.29	4.27	0.00	4.27	Native EM MWD
49	3450.00	32.00	41.26	133.20	3381.56	277.97	-228.26	168.52	4.09	1.12	4.16	Native EM MWD
50	3481.00	31.00	43.37	134.07	3404.49	298.83	-242.66	183.62	6.81	2.81	7.06	Native EM MWD
51	3511.00	30.00	45.62	134.69	3425.88	319.83	-257.36	198.64	7.50	2.07	7.64	Native EM MWD
52	3543.00	32.00	47.46	135.39	3447.89	343.02	-273.80	215.05	5.75	2.19	5.96	Native EM MWD
53	3574.00	31.00	49.17	134.43	3468.51	366.14	-290.14	231.45	5.52	-3.10	5.98	Native EM MWD
54	3607.00	33.00	51.33	134.60	3489.61	391.49	-307.93	249.54	6.55	0.51	6.56	Native EM MWD
55	3638.00	31.00	53.66	133.55	3508.48	416.06	-325.03	267.21	7.52	-3.39	7.98	Native EM MWD
56	3668.00	30.00	56.29	133.63	3525.70	440.62	-341.97	285.00	8.77	0.27	8.77	Native EM MWD
57	3698.00	30.00	58.62	133.72	3541.84	465.90	-359.43	303.29	7.77	0.30	7.77	Native EM MWD
58	3729.00	31.00	60.86	133.11	3557.46	492.66	-377.83	322.74	7.23	-1.97	7.42	Native EM MWD
59	3760.00	31.00	63.37	133.28	3571.96	520.05	-396.59	342.71	8.10	0.55	8.11	Native EM MWD
60	3790.00	30.00	65.39	133.20	3584.93	547.10	-415.12	362.42	6.73	-0.27	6.74	Native EM MWD
61	3822.00	32.00	68.03	133.46	3597.58	576.48	-435.28	383.80	8.25	0.81	8.28	Native EM MWD
62	3853.00	31.00	70.22	133.46	3608.62	605.43	-455.21	404.82	7.06	0.00	7.06	Native EM MWD
63	3884.00	31.00	73.08	133.81	3618.38	634.84	-475.51	426.11	9.23	1.13	9.29	Native EM MWD
64	3915.00	31.00	75.10	133.90	3626.88	664.64	-496.16	447.61	6.52	0.29	6.52	Native EM MWD
65	3945.00	30.00	77.17	133.50	3634.07	693.75	-516.29	468.67	6.90	-1.33	7.02	Native EM MWD
66	3977.00	32.00	79.41	133.11	3640.56	725.07	-537.77	491.47	7.00	-1.22	7.10	Native EM MWD
67	4008.00	31.00	81.87	132.40	3645.60	755.65	-558.54	513.92	7.94	-2.29	8.25	Native EM MWD
68	4040.00	32.00	83.85	131.44	3649.58	787.40	-579.75	537.55	6.19	-3.00	6.87	Native EM MWD
69	4070.00	30.00	86.05	131.88	3652.22	817.29	-599.61	559.87	7.33	1.47	7.48	Native EM MWD
70	4102.00	32.00	88.24	131.70	3653.82	849.24	-620.91	583.70	6.84	-0.56	6.87	Native EM MWD
71	4134.00	32.00	88.99	131.35	3654.59	881.23	-642.12	607.65	2.34	-1.09	2.59	Native EM MWD
72	4165.00	31.00	89.17	131.53	3655.09	912.23	-662.63	630.89	0.58	0.58	0.82	Native EM MWD
73	4197.00	32.00	89.03	131.26	3655.59	944.22	-683.79	654.89	-0.44	-0.84	0.95	Native EM MWD
74	4227.00	30.00	88.42	130.65	3656.26	974.21	-703.45	677.54	-2.03	-2.03	2.88	Native EM MWD
75	4257.00	30.00	88.64	130.29	3657.03	1004.19	-722.91	700.36	0.73	-1.20	1.41	Native EM MWD
76	4288.00	31.00	88.81	130.21	3657.72	1035.17	-742.94	724.01	0.55	-0.26	0.61	Native EM MWD
77	4321.00	33.00	88.51	129.77	3658.49	1068.14	-764.14	749.29	-0.91	-1.33	1.61	Native EM MWD
78	4353.00	32.00	88.59	129.06	3659.30	1100.09	-784.45	774.00	0.25	-2.22	2.23	Native EM MWD
79	4385.00	32.00	88.68	129.24	3660.06	1132.05	-804.65	798.81	0.28	0.56	0.63	Native EM MWD
80	4415.00	30.00	87.98	129.06	3660.93	1162.00	-823.58	822.06	-2.33	-0.60	2.41	Native EM MWD
81	4445.00	30.00	87.23	128.71	3662.19	1191.92	-842.40	845.40	-2.50	-1.17	2.76	Native EM MWD

No.	MD	CL	Inc.	Azi.	TVD	VS	+N/S-	+E/W-	BR	WR	DLS	Comments
82	4476.00	31.00	87.23	128.80	3663.69	1222.84	-861.78	869.54	0.00	0.29	0.29	Native EM MWD
83	4507.00	31.00	87.28	128.89	3665.17	1253.76	-881.20	893.66	0.16	0.29	0.33	Native EM MWD
84	4538.00	31.00	87.06	129.50	3666.70	1284.68	-900.77	917.65	-0.71	1.97	2.09	Native EM MWD
85	4568.00	30.00	86.62	129.86	3668.35	1314.61	-919.89	940.71	-1.47	1.20	1.89	Native EM MWD
86	4629.00	61.00	86.62	130.91	3671.95	1375.48	-959.35	987.09	0.00	1.72	1.72	Native EM MWD
87	4691.00	62.00	86.57	131.61	3675.63	1437.36	-1000.16	1033.61	-0.08	1.13	1.13	Native EM MWD
88	4723.00	32.00	86.48	132.14	3677.57	1469.31	-1021.48	1057.40	-0.28	1.66	1.68	Native EM MWD
89	4787.00	64.00	86.30	132.50	3681.60	1533.18	-1064.49	1104.63	-0.28	0.56	0.63	Proj. @ bit