

Minimum Curvature Calculation

CLIENT:	Conch Oil & Gas	MWD OPERATORS:	J. Scheffey / A. Castro
WELL:	Submarine 11 Federal Com	DIRECTIONAL DRILLER:	N. Tenney / L. Saiz
COUNTY/STATE:	Eddy Co, NM	TOOL AZIMUTH TO GRID NORTH:	7.54
RIG:	Unit #40	SURVEY TOOL:	SENSOR MWD
SURF LOCATION:	Lat: 32.849972 Long:-104.053136	JOB#:	PB-12749
API NUMBER:	30-015-40360	RKB:	3638
VS DIRECTION:	90.27	GL:	3624
FINAL SVY DATE:			15-40360

TOOL	Meas. Depth	Inc.	Azm.	T.V.D.	Ver.Sect.	+N/-S	+E/-W	DLS
TIE IN	4590	0.36	198.94	4589.76	-6.84	7.74	-6.70	0.00
MWD	4611	0.20	143.80	4610.76	-6.74	7.65	-6.70	1.41
MWD	4643	0.00	339.10	4642.76	-6.70	7.60	-6.67	0.63
MWD	4675	0.80	72.80	4674.76	-6.49	7.67	-6.45	2.50
MWD	4707	3.90	74.20	4706.73	-5.23	8.03	-5.19	9.69
MWD	4738	7.20	76.40	4737.58	-2.33	8.78	-2.29	10.67
MWD	4770	10.70	76.10	4769.18	2.50	9.96	2.55	10.94
MWD	4802	14.50	75.60	4800.41	9.26	11.67	9.31	11.88
MWD	4833	18.50	76.10	4830.12	17.78	13.82	17.85	12.91
MWD	4865	22.30	76.80	4860.11	28.61	16.43	28.69	11.90
MWD	4897	26.00	78.60	4889.31	41.39	19.20	41.48	11.79
MWD	4929	29.50	80.70	4917.62	56.03	21.86	56.14	11.35
MWD	4960	32.60	82.40	4944.18	71.84	24.20	71.95	10.39
MWD	4992	35.60	84.40	4970.67	89.65	26.25	89.77	10.01
MWD	5024	38.40	86.10	4996.23	108.83	27.83	108.96	9.32
MWD	5055	41.40	87.30	5020.01	128.67	28.97	128.81	9.99
MWD	5087	44.60	88.00	5043.41	150.47	29.86	150.61	10.11
MWD	5119	47.60	88.90	5065.60	173.51	30.48	173.66	9.59
MWD	5151	50.50	89.10	5086.57	197.67	30.90	197.82	9.07
MWD	5182	53.30	88.40	5105.69	222.06	31.44	222.21	9.21
MWD	5214	56.30	88.60	5124.14	248.19	32.12	248.34	9.39
MWD	5245	59.00	90.00	5140.72	274.37	32.44	274.53	9.51
MWD	5277	61.30	91.60	5156.65	302.12	32.04	302.28	8.39
MWD	5309	63.30	91.60	5171.52	330.45	31.25	330.60	6.25
MWD	5341	64.70	91.60	5185.55	359.20	30.45	359.35	4.38
MWD	5372	67.90	91.20	5198.01	387.57	29.76	387.72	10.39
MWD	5404	71.00	90.20	5209.24	417.53	29.39	417.68	10.12
MWD	5436	74.00	88.90	5218.86	448.05	29.64	448.19	10.14
MWD	5467	77.10	87.70	5226.60	478.04	30.53	478.19	10.68
MWD	5499	80.10	87.00	5232.92	509.37	31.98	509.52	9.62
MWD	5531	83.70	88.00	5237.43	541.00	33.36	541.17	11.67
MWD	5560	86.50	90.30	5239.91	569.89	33.79	570.05	12.48
MWD	5592	88.10	91.60	5241.42	601.85	33.26	602.01	6.44
MWD	5623	88.30	91.80	5242.39	632.82	32.34	632.98	0.91
MWD	5655	88.50	91.60	5243.28	664.80	31.39	664.96	0.88
MWD	5687	88.40	91.50	5244.15	696.78	30.52	696.93	0.44
MWD	5718	88.50	91.70	5244.99	727.76	29.66	727.91	0.72
MWD	5750	88.50	91.60	5245.83	759.74	28.74	759.89	0.31
MWD	5782	88.70	91.70	5246.61	791.72	27.82	791.86	0.70
MWD	5813	88.90	91.80	5247.26	822.71	26.87	822.84	0.72
MWD	5845	89.20	91.50	5247.79	854.69	25.95	854.82	1.33
MWD	5877	89.00	91.50	5248.29	886.68	25.11	886.81	0.63
MWD	5908	89.00	91.90	5248.83	917.67	24.19	917.79	1.29
MWD	5940	89.60	92.20	5249.22	949.65	23.05	949.77	2.10



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FINAL SVY DATE:			

TOOL	Meas. Depth	Inc.	Azm.	T.V.D.	Ver.Sect.	+N / -S	+E / -W	DLS
MWD	5972	90.20	92.20	5249.28	981.63	21.82	981.74	1.88
MWD	6004	91.00	91.80	5248.94	1013.61	20.70	1013.72	2.80



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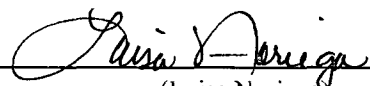
TOOL	Meas. Depth	Inc.	Azm.	T.V.D.	Ver.Sect.	+N/-S	+E/-W	DLS
MWD	6035	91.50	91.60	5248.27	1044.60	19.78	1044.70	1.74
MWD	6067	91.90	91.70	5247.32	1076.57	18.86	1076.67	1.29
MWD	6099	92.20	91.50	5246.17	1108.54	17.97	1108.64	1.13
MWD	6130	92.50	91.30	5244.90	1139.51	17.21	1139.61	1.16
MWD	6162	92.90	91.30	5243.39	1171.47	16.49	1171.56	1.25
MWD	6257	92.00	91.20	5239.33	1266.37	14.42	1266.45	0.95
MWD	6352	92.30	91.00	5235.77	1361.29	12.59	1361.37	0.38
MWD	6447	91.30	90.90	5232.78	1456.24	11.02	1456.31	1.06
MWD	6543	90.30	91.20	5231.44	1552.22	9.26	1552.28	1.09
MWD	6638	90.90	90.50	5230.45	1647.21	7.85	1647.26	0.97
MWD	6733	91.40	89.90	5228.54	1742.19	7.52	1742.24	0.82
MWD	6828	91.30	89.90	5226.30	1837.16	7.69	1837.21	0.11
MWD	6923	90.30	90.00	5224.98	1932.15	7.77	1932.20	1.06
MWD	7018	90.30	89.50	5224.48	2027.14	8.18	2027.20	0.53
MWD	7113	91.20	89.80	5223.24	2122.13	8.76	2122.19	1.00
MWD	7208	91.90	90.20	5220.67	2217.09	8.76	2217.16	0.85
MWD	7303	91.50	91.10	5217.85	2312.04	7.69	2312.11	1.04
MWD	7399	90.30	91.60	5216.34	2408.01	5.42	2408.07	1.35
MWD	7494	90.00	91.10	5216.09	2503.00	3.19	2503.04	0.61
MWD	7589	90.70	91.20	5215.51	2597.98	1.28	2598.02	0.74
MWD	7684	90.50	90.90	5214.52	2692.97	-0.46	2693.00	0.38
MWD	7779	92.10	90.60	5212.36	2787.94	-1.70	2787.96	1.71
MWD	7875	91.90	90.70	5209.01	2883.88	-2.79	2883.90	0.23
MWD	7969	90.70	90.30	5206.88	2977.85	-3.61	2977.87	1.35
MWD	8065	91.00	90.20	5205.45	3073.84	-4.03	3073.85	0.33
MWD	8160	91.60	89.50	5203.30	3168.81	-3.78	3168.83	0.97
MWD	8255	91.60	90.80	5200.65	3263.77	-4.03	3263.79	1.37
MWD	8350	90.40	90.90	5198.99	3358.75	-5.44	3358.76	1.27
MWD	8445	90.60	90.90	5198.16	3453.74	-6.93	3453.75	0.21
MWD	8540	91.00	90.70	5196.83	3548.73	-8.26	3548.73	0.47
MWD	8635	91.20	90.20	5195.01	3643.71	-9.00	3643.71	0.57
MWD	8730	91.60	89.90	5192.69	3738.68	-9.09	3738.68	0.53
MWD	8826	90.40	90.20	5191.01	3834.66	-9.17	3834.66	1.29
MWD	8921	90.80	89.50	5190.02	3929.65	-8.92	3929.66	0.85
MWD	9016	89.90	89.90	5189.44	4024.65	-8.43	4024.65	1.04
MWD	9111	87.80	90.20	5191.34	4119.62	-8.51	4119.63	2.23
MWD	9206	88.90	88.10	5194.08	4214.56	-7.10	4214.57	2.49
MWD	9301	90.50	88.80	5194.58	4309.50	-4.53	4309.53	1.84
MWD	9396	91.30	89.60	5193.09	4404.47	-3.20	4404.51	1.19
MWD	9491	92.20	90.90	5190.18	4499.43	-3.62	4499.46	1.66
MWD	9587	92.70	90.60	5186.08	4595.34	-4.87	4595.36	0.61
MWD	9682	93.30	90.40	5181.11	4690.20	-5.70	4690.23	0.67
MWD	9753	93.40	90.00	5176.96	4761.08	-5.95	4761.11	0.58
PTB	9810	93.40	90.00	5173.58	4817.98	-5.95	4818.01	0.00

WELL NAME AND NUMBER Submarine II Federal Com 4H
LOCATION Section 2, T17S, R29E, Lot E, 2285 FNL, 130 FWL, Eddy County
OPERATOR COG Operating LLC
DRILLING CONTRACTOR United Drilling, Inc.

The undersigned hereby certifies that he is an authorized representative of the drilling contractor who drilled the above described well and had conducted deviation test and obtained the following results:

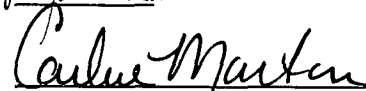
Degrees @ Depth	Degrees @ Depth	Degrees @ Depth
.5° @ 110'		
1.6° @ 333'		
1.0° @ 546'		
.2° @ 792'		
.4° @ 1038'		
.3° @ 1281'		
.4° @ 1621'		
.5° @ 2121'		
.4° @ 2566'		
.7° @ 2862'		
.2° @ 3009'		
.3° @ 3454'		
.2° @ 3898'		
.6° @ 4342'		
90.7° @ 7969'		

Drilling Contractor- UNITED DRILLING, INC.

By: 
(Luisa Noriega)

Title: Asst. Office Manager

Subscribed and sworn to before me this 20th day of November 2012.


Notary Public

Charles Martin
County State

My Commission Expires: 10/8/14



Company: COG Operating, LLC (Concho)
Lease/Well: Submarine 11 Federal Com / No. 004H
Location: S11 T17s R29e
Rig Name: UDI 40
State/County: New Mexico / Eddy
Latitude: 32.85, Longitude: -104.05
GRID North is 0.15 Degrees East of True North
VS-Azi: 91.00 Degrees



RECEIVED
FEB 15 2013
NMOCD ARTESIA

RKB : 14'

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: ...11 fed com #4h gyro survey.ut

Minimum Curvature Method

Report Date/Time: 11/20/2012 / 08:16

Vaughn Energy Services

Gardendale, Texas

432-563-5444

Surveyor: Dustin Wedel

Submarine 11 Federal Com No. 004H / API 30-015-40360

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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	1.20	328.15	99.99	0.89	-0.55	-0.57	1.04	328.15	1.20
200.00	1.19	296.29	199.97	2.23	-2.03	-2.07	3.02	317.68	0.65
300.00	1.39	305.17	299.95	3.39	-3.96	-4.01	5.21	310.61	0.28
400.00	1.59	314.06	399.91	5.06	-5.95	-6.03	7.81	310.38	0.31
500.00	1.09	323.81	499.89	6.79	-7.51	-7.62	10.12	312.13	0.55
600.00	0.59	333.56	599.87	8.02	-8.30	-8.43	11.54	314.02	0.52
700.00	0.50	7.14	699.87	8.91	-8.47	-8.62	12.29	316.44	0.32
800.00	0.41	40.72	799.87	9.61	-8.18	-8.35	12.62	319.60	0.28
900.00	0.36	26.28	899.86	10.17	-7.81	-7.98	12.82	322.48	0.11
1000.00	0.31	11.85	999.86	10.71	-7.61	-7.80	13.14	324.60	0.10
1100.00	0.50	24.85	1099.86	11.37	-7.38	-7.57	13.55	327.02	0.21
1200.00	0.69	37.86	1199.86	12.24	-6.82	-7.04	14.01	330.85	0.23
1300.00	0.50	33.69	1299.85	13.07	-6.21	-6.44	14.47	334.58	0.19
1400.00	0.31	41.52	1399.85	13.64	-5.79	-6.03	14.82	336.99	0.20
1500.00	0.44	36.32	1499.85	14.15	-5.38	-5.63	15.14	339.18	0.13
1600.00	0.57	29.12	1599.84	14.90	-4.91	-5.17	15.69	341.76	0.14
1700.00	0.50	22.51	1699.84	15.74	-4.50	-4.78	16.37	344.04	0.10
1800.00	0.43	15.91	1799.83	16.50	-4.23	-4.52	17.03	345.61	0.09

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
1900.00	0.36	1.96	1899.83	17.17	-4.12	-4.42	17.66	346.51	0.11
2000.00	0.30	348.02	1999.83	17.75	-4.16	-4.47	18.23	346.80	0.10
2100.00	0.31	330.94	2099.83	18.25	-4.35	-4.67	18.76	346.59	0.09
2200.00	0.31	321.87	2199.83	18.69	-4.65	-4.97	19.26	346.04	0.05
2300.00	0.40	314.04	2299.82	19.15	-5.06	-5.40	19.81	345.18	0.10
2400.00	0.48	302.20	2399.82	19.62	-5.67	-6.01	20.42	343.87	0.13
2500.00	0.33	314.10	2499.82	20.04	-6.24	-6.59	20.99	342.71	0.17
2600.00	0.18	325.99	2599.82	20.38	-6.54	-6.89	21.40	342.22	0.16
2700.00	0.15	293.06	2699.82	20.56	-6.75	-7.11	21.64	341.83	0.10
2800.00	0.13	260.13	2799.82	20.59	-6.98	-7.34	21.74	341.27	0.08
2900.00	0.20	226.71	2899.82	20.46	-7.22	-7.58	21.69	340.56	0.11
3000.00	0.27	193.28	2999.82	20.11	-7.40	-7.75	21.43	339.80	0.15
3100.00	0.31	170.59	3099.82	19.62	-7.41	-7.75	20.97	339.32	0.12
3200.00	0.36	147.90	3199.81	19.09	-7.20	-7.53	20.40	339.34	0.14
3300.00	0.49	158.24	3299.81	18.43	-6.87	-7.19	19.67	339.54	0.15
3400.00	0.63	168.58	3399.81	17.49	-6.61	-6.91	18.70	339.31	0.17
3500.00	0.63	173.74	3499.80	16.41	-6.44	-6.72	17.63	338.58	0.06
3600.00	0.63	176.89	3599.79	15.32	-6.35	-6.62	16.58	337.49	0.03
3700.00	0.65	180.30	3699.79	14.20	-6.32	-6.57	15.54	336.00	0.04
3800.00	0.68	181.72	3799.78	13.04	-6.34	-6.57	14.50	334.06	0.03
3900.00	0.41	172.39	3899.78	12.09	-6.31	-6.52	13.64	332.42	0.28
4000.00	0.15	163.06	3999.78	11.60	-6.23	-6.43	13.17	331.78	0.27
4100.00	0.29	186.69	4099.77	11.23	-6.22	-6.41	12.83	331.02	0.16
4200.00	0.43	210.32	4199.77	10.65	-6.44	-6.62	12.45	328.86	0.20
4300.00	0.46	188.92	4299.77	9.93	-6.69	-6.86	11.98	326.05	0.17
4400.00	0.49	167.52	4399.77	9.12	-6.66	-6.82	11.29	323.86	0.18
4500.00	0.42	184.05	4499.76	8.33	-6.59	-6.73	10.62	321.66	0.15
4590.00	0.36	198.94	4589.76	7.74	-6.70	-6.84	10.24	319.09	0.13