

Results of Directional Survey

API number:	30-025-40193		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LUSK DEEP UNIT A # 25H

surface	ULSTR:	E	20	T 19S	R 32E
				1800 FNL	330 FWL

BH Loc	ULSTR:	H	20	T 19S	R 32E
13706	MD	9320.4	TVD	1806 FNL	4950 FWL
					330 FEL

Top Perf/OH	ULSTR:	E	20	T 19S	R 32E
9400	MD	9227.0	TVD	1744 FNL	649 FWL

Bot Perf/OH	ULSTR:	H	20	T 19S	R 32E
13640	MD	9322.3	TVD	1804 FNL	4884 FWL
					396 FWL

	MD	N/S	E/W	VD
	9378	56.63	297.20	9221.62
TOP PERFS/OH	9400	56.06	318.53	9226.98
	9410	55.80	328.22	9229.42
	13628	-3.07	4541.72	9322.64
BOT PERFS/OH	13640	-3.53	4553.71	9322.30
	13706	-6.06	4619.63	9320.42

NEXT TO LAST	13628	-3.07	4541.72	9322.64
LAST READING	13706	-6.06	4619.63	9320.42
TD	13706	-6.06	4619.63	9320.42

Surface Location	1800	FN	330	FW
Projected BHL	1806	FN	4950	FW
Location of				
Top Perfs/OH	1744	FN	649	FW
Bottom Perfs/OH	1804	FN	4884	FW

SUMMARY of Subsurface Locations

Surface Location	E-20-19S-32E	1800	FN	330	FW	Vert. Depth
Top Perfs/OH	E-20-19S-32E	1744	FN	649	FW	9226.98
Bottom Perfs/OH	H-20-19S-32E	1804	FN	4884	FW	9322.30
Projected TD	H-20-19S-32E	1806	FN	4950	FW	9320.42

MAR 29 2012



McVAY DRILLING COMPANY
P.O. Box 2450
Hobbs, New Mexico 88241
(575) 397-3311
FAX: 39-DRILL

SUR: E-20-19s-32e, 1800/N & 330/W
BHL: H-20-19s-32e, 1806/N & 4950/W
API # 30-025-40193

Well Name and Num: Lusk Deep Unit A 25H
Location: Sec. 20, T19S, R32E
Operator: COG
Drilling Contractor: McVay Drilling Company

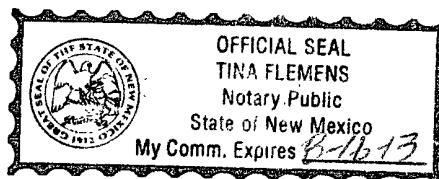
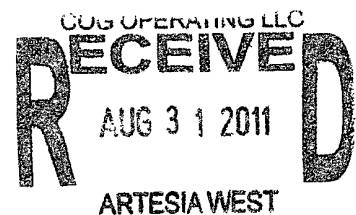
The undersigned certifies that he is an authorized representative of the drilling contractor who drilled the above described well and that he has conducted deviation tests and obtained the following results:

<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>	<u>Degrees @</u>	<u>Depth</u>
0.15	385	0.79	6848	89.78	9853
0.67	721	1.89	7348	89.34	10286
0.62	1154	2.18	7606	88.99	10844
0.31	1531	1.73	7859	82.81	10937
2.91	2033	0.76	8398	89.69	11401
3.85	2127	1.49	8659	88.37	11777
1.69	2446	1.67	8691	89.34	12435
0.78	2754	2.29	8755	87.49	12807
0.57	3230	9.06	8850	91.36	13487
0.48	3762	11.17	8881	89.52	13457
2.23	4234	26.03	9009	91.89	13550
1.70	4310	39.31	9104	91.63	13628
0.72	4593	48.28	9168		
1.38	4554	64.72	9285		
1.08	5371	77.73	9410		
0.86	5871	79.32	9442		
1.59	6371	83.01	9505		

By: [Signature]

Subscribed and sworn to before me this 29th day of August, 2011

[Signature]
Notary Public, Lea County, New Mexico





Scientific Drilling

Gyroscopic Survey Report for COG

Well Location	EDDY COUNTY, NEW MEXICO
Well Name	CROSSMAN 25 STATE #1H
Rig Name	PATRIOT #2
Survey Date	8/31/2011
Latitude	32.11 deg
North Reference	Grid North
Grid Correction	0.10 deg
Depth Reference	RKB
Calculation Method	Minimum Curvature
Section (VS) Ref	0.00N (ft), 0.00E (ft), 180.21Azim (deg)
Definitive Survey	FINAL GYRO SURVEY
Operator	J.PENA

Comments

17 FT KB

SUR: E-20-19s-32e, 1800/N & 330/W
BHL: H-20-19s-32e, 1806/N & 4950/W
API # 30-025-40193



Well Name: CROSSMAN 25 STATE #1H
 Survey: FINAL GYRO SURVEY
 Survey Date: 8/31/2011

MD ft	Inc deg	Azim deg	TVD ft	VS ft	Northing ft	Easting ft	DLS deg/100ft	Closure Distance ft	Closure Angle deg
0.00	0.00	0.00	0 00	0 00	0.00	0 00	Invalid	0 00	0.00
100.00	0.74	322 30	100 00	-0.51	0.51	-0.40	0.74	0.65	322.30
200.00	1.13	295 17	199 98	-1.44	1 44	-1.69	0.58	2.22	310 57
300.00	1.57	275 77	299.96	-1.99	2.00	-3.94	0 63	4 42	296.91
400.00	0 61	321 93	399.94	-2.54	2.56	-5 64	1 23	6 19	294.43
500.00	0.61	317.64	499.93	-3.35	3 38	-6.33	0.05	7.17	298.08
600.00	0.35	295 01	599.93	-3.87	3 90	-6 97	0.32	7.98	299.25
700.00	0 28	288 02	699.93	-4.08	4 11	-7.48	0.08	8 53	298 78
800.00	0.41	244 89	799.93	-4 00	4 03	-8.03	0.28	8.99	296.63
900 00	0.38	251.52	899 92	-3.74	3.77	-8 67	0 06	9 46	293.49
1000.00	0 40	233.86	999.92	-3.42	3.46	-9 27	0 12	9.90	290.45
1100.00	0.34	245.88	1099 92	-3.09	3.13	-9 83	0 10	10.32	287 65
1200.00	0.22	263.33	1199.92	-2 94	2 98	-10.30	0 15	10.72	286.15
1300.00	0.22	3 91	1299.92	-3 12	3 15	-10.48	0.34	10.94	286 76
1400.00	0.31	338.59	1399.92	-3 56	3 60	-10 56	0 14	11.16	288.83
1500 00	0.97	54.44	1499.91	-4.31	4 34	-9.97	0 94	10.87	293 54
1600 00	1.38	75.83	1599 89	-5.10	5 13	-8.11	0 59	9.60	302.32
1700.00	1 52	74.23	1699.86	-5.76	5.79	-5.67	0.14	8.10	315 59
1800 00	3 06	70.48	1799.78	-7.03	7 04	-1.88	1 55	7.28	345.04
1900 00	3.64	75.57	1899.60	-8.73	8 72	3.71	0 65	9.48	23.05
2000 00	3.76	82.99	1999.40	-9.95	9.91	10.04	0 49	14.11	45 37
2100.00	3.18	92.58	2099.21	-10.24	10 19	16.07	0.81	19 02	57.63
2200.00	1 99	94.50	2199 11	-10 00	9 92	20 57	1.20	22 84	64.24
2300 00	1.66	95 40	2299 06	-9.74	9.65	23.74	0.33	25.63	67.88
2400 00	1.44	95.40	2399.02	-9.49	9.40	26.43	0.22	28.05	70.43
2500.00	1.18	92 45	2499 00	-9.34	9.23	28 71	0.27	30.16	72.17
2600 00	1.07	98.66	2598.98	-9 16	9.05	30.66	0.17	31 96	73.55
2700.00	1.08	101.99	2698.96	-8 83	8.72	32.49	0.06	33.64	74 99
2800 00	0.99	99.62	2798.94	-8.50	8.38	34.27	0.10	35.28	76.27
2900.00	0 69	99 15	2898.93	-8.27	8.14	35.71	0.31	36.63	77 17
3000.00	0 37	114 83	2998 93	-8.04	7 90	36.60	0.34	37.44	77 81
3100 00	0.09	309.41	3098 93	-7 95	7.82	36 83	0.46	37.65	78.02
3200.00	0.18	282.79	3198.93	-8.04	7 90	36 61	0 11	37.46	77.82
3300.00	0 26	316.40	3298.93	-8.24	8.11	36.30	0.15	37.19	77 41
3400.00	0.43	308 01	3398.92	-8.63	8.50	35.85	0 17	36.84	76.66
3500.00	0.56	317.38	3498 92	-9.22	9.09	35.22	0.16	36.38	75.53
3600.00	0.67	309.24	3598.92	-9.95	9.82	34.44	0.13	35.81	74.08
3700 00	0 72	302.39	3698 91	-10.65	10.52	33.46	0.10	35.07	72.54
3800.00	0.80	282.33	3798 90	-11.13	11.01	32.24	0.28	34.07	71.15



Well Name: CROSSMAN 25 STATE #1H

Survey: FINAL GYRO SURVEY

Survey Date: 8/31/2011

MD	Inc	Azim	TVD	VS	Northing	Easting	DLS	Closure Distance	Closure Angle
ft	deg	deg	ft	ft	ft	ft	deg/100ft	ft	deg
3900.00	0.85	269.67	3898.89	-11.27	11.16	30.82	0.19	32.78	70.10
4000.00	0.83	268.59	3998.88	-11.24	11.13	29.35	0.03	31.39	69.23
4100.00	0.87	269.67	4098.87	-11.21	11.11	27.87	0.05	30.00	68.26
4200.00	1.02	267.94	4198.85	-11.17	11.08	26.21	0.15	28.46	67.09
4300.00	0.87	265.44	4298.84	-11.07	10.98	24.57	0.16	26.91	65.91
4400.00	1.04	245.76	4398.83	-10.63	10.55	22.99	0.37	25.29	65.35
4500.00	1.15	241.32	4498.81	-9.77	9.69	21.27	0.14	23.38	65.50
4600.00	1.30	229.85	4598.79	-8.55	8.48	19.52	0.28	21.28	66.53
4700.00	1.32	233.26	4698.76	-7.13	7.06	17.74	0.08	19.09	68.29
4800.00	1.12	233.79	4798.74	-5.85	5.80	16.03	0.19	17.04	70.12
4900.00	1.06	224.85	4898.72	-4.61	4.56	14.58	0.18	15.28	72.63
5000.00	0.77	236.94	4998.71	-3.59	3.54	13.37	0.34	13.83	75.17
5100.00	0.79	218.46	5098.70	-2.67	2.63	12.37	0.25	12.65	78.01
5200.00	0.89	219.48	5198.69	-1.53	1.48	11.45	0.10	11.54	82.61
5300.00	0.96	213.20	5298.67	-0.22	0.18	10.49	0.12	10.49	89.01
5400.00	1.02	206.79	5398.66	1.28	-1.32	9.63	0.13	9.72	97.78
5500.00	1.17	202.97	5498.64	3.02	-3.05	8.83	0.16	9.34	109.04
5600.00	1.16	199.70	5598.62	4.91	-4.94	8.09	0.07	9.48	121.40
5700.00	1.12	206.01	5698.60	6.74	-6.77	7.32	0.13	9.97	132.76
5800.00	1.11	198.65	5798.58	8.54	-8.57	6.58	0.14	10.80	142.45
5900.00	1.32	191.01	5898.56	10.59	-10.61	6.06	0.26	12.22	150.29
6000.00	2.09	192.69	5998.51	13.50	-13.52	5.44	0.78	14.57	158.10
6100.00	1.95	199.25	6098.45	16.89	-16.91	4.47	0.27	17.49	165.18
6200.00	1.56	204.97	6198.40	19.74	-19.75	3.34	0.43	20.03	170.42
6300.00	1.36	235.98	6298.37	21.65	-21.65	1.78	0.81	21.73	175.30
6313.00	1.33	232.77	6311.37	21.82	-21.83	1.53	0.62	21.88	175.99

30-025-40193

COG OPERATING

Lusk
Lea County, NM
Lusk Deep Unit A #25H
VH - Job #32K0811768

SUR: E-20-19s-32e, 1800/N & 330/W
BHL: H-20-19s-32e, 1806/N & 4950/W
API # 30-025-40193

Survey: Actual

SDI Standard Survey Report

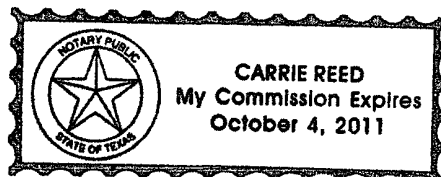
This survey is correct to the best of my knowledge and is supported by actual field data.

[Signature]

Notarized this date 27th of September, 2011.

[Signature]

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lusk Deep Unit A #25H
Project:	Lusk	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lusk Deep Unit A #25H	North Reference:	Grid
Wellbore:	VH - Job #32K0811768	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0811768	Database:	EDM-Regulatory

Project	Lusk		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site: Lea County, NM					
Site Position:		Northing:	608,010 37 usft	Latitude:	32° 40' 13 174 N
From:	Lat/Long	Easting:	668,500 03 usft	Longitude:	103° 47' 8 729 W
Position Uncertainty:		0 0 usft	Slot Radius:	13-3/16"	Grid Convergence: 0 30 °

Well:	Lusk Deep Unit A #25H, Directional (Pathfinder)					
Well Position	+N-S	0 0 usft	Northing:	599,927 55 usft	Latitude:	32° 38' 53 340 N
	+E-W	0 0 usft	Easting:	665,576 91 usft	Longitude:	103° 47' 43 404 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	0 0 usft

Wellbore	VH - Job #32K0811768				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/18/2011	7 70	60 54	48,856

Design:	VH - Job #32K0811768				
Audit Notes:					
Version:	1 0	Phase:	ACTUAL	Tie On Depth:	0 0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0 0	0 0	0 0	89 79	

Survey Program		Date	10/9/2011		
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100 0	8,540 9	Actual (VH - Job #32K0811768)	Keeper	Keeper Gyro	

Survey									
Measured Depth	Inclination	Azimuth	True Vertical	North/South	East/West	Closure Azimuth	Closure Distance		
(usft)	(°)	(°)	Depth	(usft)	(usft)	(°)	(usft)		
0 0	0 00	0 00	0 0	0 0	0 0	0 00	0 0		
100 0	0 04	218 46	100 0	0 0	0 0	218 46	0 0		
200 0	0 13	349 59	200 0	0 1	-0 1	311 68	0 1		
300 0	0 12	244 46	300 0	0 1	-0 2	304 58	0 2		
400 0	0 34	273 18	400 0	0 1	-0 6	279 43	0 6		
500 0	0 50	258 35	500 0	0 0	-1 3	271 02	1 3		
600 0	0 56	253 31	600 0	-0 2	-2 2	264 64	2 2		
700 0	0 42	259 42	700 0	-0 4	-3 0	262 20	3 0		
800 0	0 54	241 18	800 0	-0 7	-3 8	259 43	3 9		
900 0	0 23	187 94	900 0	-1 1	-4 2	255 00	4 4		
1,000 0	0 26	181 43	1,000 0	-1 6	-4 3	249 92	4 5		
1,100 0	0 21	191 83	1,100 0	-2 0	-4 3	245 47	4 7		

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lusk Deep Unit A #25H
Project:	Lusk	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lusk Deep Unit A #25H	North Reference:	Grid
Wellbore:	VH - Job #32K0811768	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0811768	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,200 0	0 26	209 60	1,200 0	-2 3	-4 5	242 28	5 0
1,300 0	0 29	163 35	1,300 0	-2 8	-4 5	238 26	5 3
1,400 0	0 10	136 38	1,400 0	-3 1	-4 4	234 72	5 3
1,500 0	0 17	112 13	1,500 0	-3 2	-4 2	232 42	5 3
1,600 0	0 17	73 14	1,600 0	-3 2	-3 9	230 37	5 0
1,700 0	1 36	62 75	1,700 0	-2 6	-2 7	225 61	3 8
1,800 0	2 24	64 41	1,799 9	-1 2	0 1	174 14	1 3
1,900 0	2 65	64 87	1,899 8	0 6	4 0	81 71	4 0
2,000 0	2 71	63 49	1,999 7	2 6	8 2	72 28	8 6
2,100 0	2 85	65 45	2,099 6	4 7	12 6	69 47	13 4
2,200 0	2 66	66 67	2,199 5	6 7	17 0	68 57	18 2
2,300 0	2 69	65 52	2,299 4	8 5	21 2	68 06	22 9
2,400 0	2 16	70 70	2,399 3	10 1	25 1	68 03	27 1
2,500 0	1 73	70 16	2,499 2	11 3	28 3	68 30	30 5
2,600 0	1 41	74 74	2,599 2	12 1	30 9	68 62	33 2
2,700 0	1 03	74 85	2,699 2	12 7	33 0	68 99	35 4
2,800 0	0 72	78 88	2,799 2	13 0	34 5	69 30	36 9
2,900 0	0 69	76 31	2,899 1	13 3	35 7	69 57	38 1
3,000 0	0 66	62 89	2,999 1	13 7	36 8	69 57	39 3
3,100 0	0 50	80 98	3,099 1	14 0	37 7	69 60	40 3
3,200 0	0 50	92 67	3,199 1	14 1	38 6	69 96	41 1
3,300 0	0 38	109 64	3,299 1	13 9	39 3	70 48	41 7
3,400 0	0 26	123 88	3,399 1	13 7	39 8	71 01	42 1
3,500 0	0 13	177 01	3,499 1	13 5	40 0	71 41	42 2
3,600 0	0 21	224 15	3,599 1	13 2	39 9	71 67	42 0
3,700 0	0 73	277 75	3,699 1	13 2	39 2	71 40	41 3
3,800 0	1 25	319 15	3,799 1	14 1	37 8	69 56	40 4
3,900 0	1 51	326 51	3,899 1	16 0	36 4	66 24	39 7
4,000 0	2 41	332 29	3,999 0	19 0	34 7	61 31	39 5
4,100 0	3 05	333 92	4,098 9	23 2	32 5	54 47	40 0
4,200 0	2 32	334 90	4,198 8	27 4	30 5	48 01	41 0
4,300 0	1 56	2 95	4,298 7	30 6	29 7	44 11	42 7
4,400 0	1 17	0 86	4,398 7	33 0	29 8	42 06	44 5
4,500 0	1 01	357 05	4,498 7	34 9	29 8	40 44	45 9
4,600 0	0 95	352 25	4,598 7	36 6	29 6	38 95	47 1
4,700 0	0 94	354 26	4,698 7	38 3	29 4	37 55	48 3
4,800 0	0 83	8 87	4,798 7	39 8	29 4	36 49	49 5
4,900 0	0 86	22 17	4,898 6	41 2	29 8	35 91	50 9
5,000 0	0 95	23 49	4,998 6	42 7	30 4	35 52	52 4
5,100 0	0 96	12 37	5,098 6	44 2	31 0	34 98	54 0
5,200 0	1 31	341 75	5,198 6	46 1	30 8	33 71	55 5
5,300 0	1 45	340 38	5,298 6	48 4	30 0	31 78	57 0
5,400 0	1 17	349 67	5,398 5	50 6	29 4	30 14	58 5
5,500 0	0 87	327 35	5,498 5	52 3	28 8	28 86	59 7

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lusk Deep Unit A #25H
Project:	Lusk	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lusk Deep Unit A #25H	North Reference:	Grid
Wellbore:	VH - Job #32K0811768	Survey/Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0811768	Database:	EDM-Regulatory

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
5,600 0	0 95	327 78	5,598 5	53 6	27 9	27 53	60 4	
5,700 0	0 93	332 18	5,698 5	55 0	27 1	26 24	61 3	
5,800 0	1 06	330 57	5,798 5	56 5	26 3	24 94	62 4	
5,900 0	0 97	326 12	5,898 5	58 0	25 4	23 60	63 3	
6,000 0	1 16	327 76	5,998 5	59 6	24 4	22 22	64 4	
6,100 0	1 28	324 07	6,098 4	61 4	23 2	20 67	65 6	
6,200 0	1 35	319 26	6,198 4	63 2	21 7	18 98	66 8	
6,300 0	1 39	321 00	6,298 4	65 0	20 2	17 26	68 1	
6,400 0	1 40	319 34	6,398 3	66 9	18 6	15 58	69 4	
6,500 0	1 37	319 28	6,498 3	68 7	17 1	13 95	70 8	
6,600 0	1 16	316 10	6,598 3	70 3	15 6	12 49	72 0	
6,700 0	0 84	323 32	6,698 3	71 7	14 4	11 40	73 1	
6,800 0	0 70	300 26	6,798 3	72 5	13 5	10 52	73 8	
6,900 0	0 86	291 70	6,898 3	73 1	12 3	9 51	74 2	
7,000 0	1 02	278 61	6,998 2	73 5	10 7	8 26	74 3	
7,100 0	1 06	281 31	7,098 2	73 9	8 9	6 86	74 4	
7,200 0	1 19	274 41	7,198 2	74 1	6 9	5 35	74 4	
7,300 0	1 79	257 93	7,298 2	73 9	4 4	3 39	74 0	
7,400 0	2 35	255 73	7,398 1	73 0	0 9	0 68	73 0	
7,500 0	2 45	254 13	7,498 0	72 0	-3 2	357 47	72 0	
7,600 0	2 28	268 34	7,597 9	71 3	-7 2	354 22	71 7	
7,700 0	1 94	283 37	7,697 9	71 6	-10 9	351 39	72 5	
7,800 0	1 82	300 44	7,797 8	72 8	-13 9	349 22	74 1	
7,900 0	1 96	325 50	7,897 8	75 1	-16 2	347 81	76 8	
8,000 0	1 63	319 19	7,997 7	77 5	-18 1	346 86	79 6	
8,100 0	2 01	314 65	8,097 7	79 8	-20 3	345 75	82 4	
8,200 0	1 62	311 11	8,197 6	82 0	-22 6	344 60	85 1	
8,300 0	1 45	310 89	8,297 6	83 8	-24 6	343 62	87 3	
8,400 0	0 81	309 89	8,397 6	85 1	-26 1	342 93	89 0	
8,500 0	1 02	274 27	8,497 5	85 6	-27 5	342 16	89 9	
8,540 9	0 91	272 62	8,538 4	85 6	-28 2	341 75	90 1	



Scientific Drilling
Directional Drilling Operations

Project: Lusk
Lea County, NM
Well: Lusk Deep Unit A #25H
Wellbore: VH - Job #32K0811768
Design: VH - Job #32K0811768



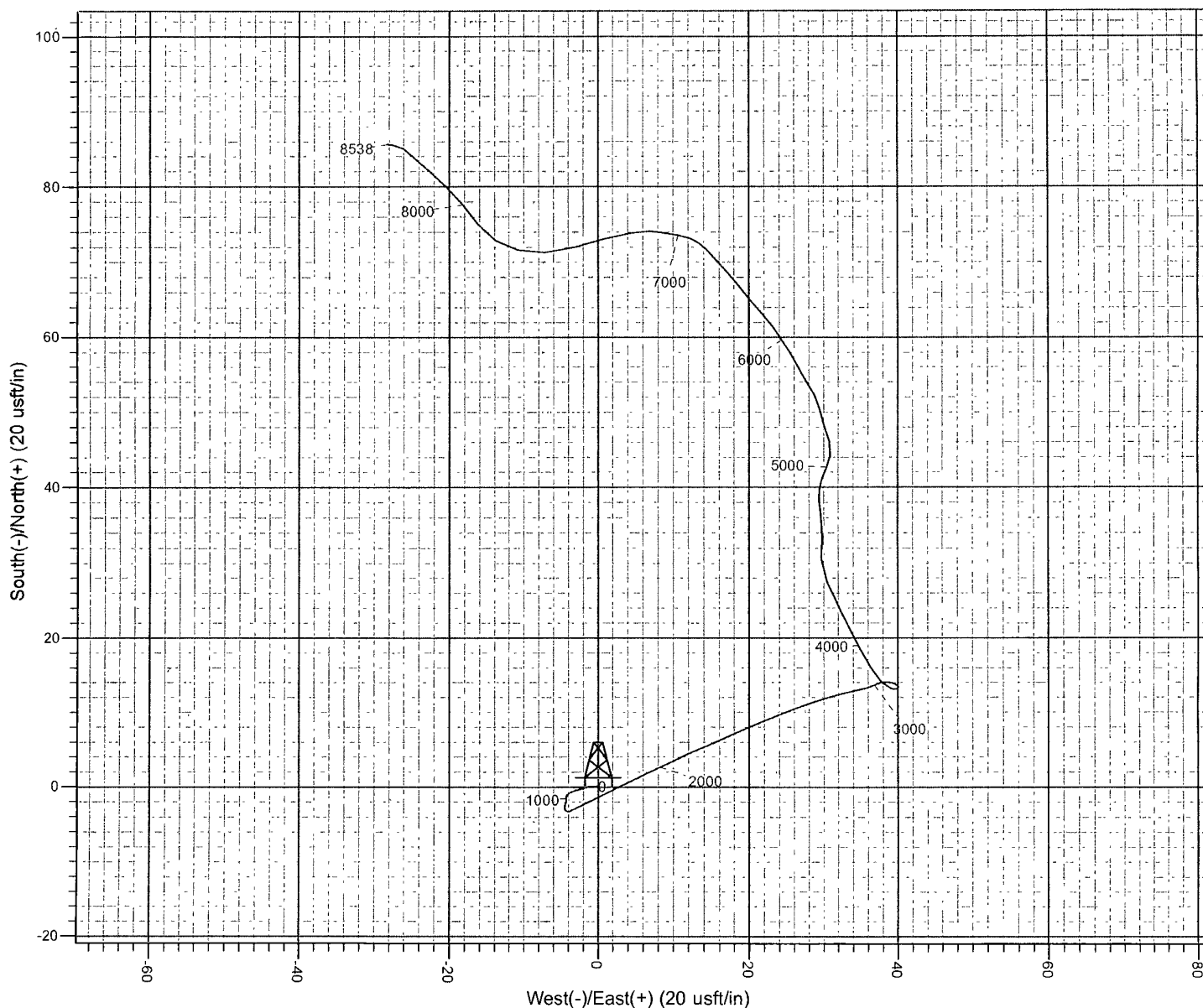
Azimuths to Grid North
True North -0 29°
Magnetic North 7 41°

Magnetic Field
Strength 48855 9snT
Dip Angle 60 54°
Date 8/18/2011
Model IGRF2010

WELL DETAILS: Lusk Deep Unit A #25H
WELL @ 0.0usft (Original Well Elev)

Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	599927.55	665576.91	32° 38' 53.340 N	103° 47' 43.404 W	



PROJECT DETAILS: Lusk
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

SITE DETAILS: Lea County, NM
Site Centre Latitude: 32° 40' 13.174 N
Longitude: 103° 47' 8.729 W
Positional Uncertainty: 0 0
Convergence: 0.30
Local North: Grid



COG Operating LLC

**Lea County, NM
Lusk Deep Unit A
No.25H
OH**

Design: OH

PathFinder X & Y

02 September, 2011

The logo for PATHFINDER, with "PATH" in a bold, sans-serif font and "FINDER" in a larger, bolder, sans-serif font. A stylized line graphic curves under the word "FINDER".

PATHFINDER®

A Schlumberger Company



Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Plan: Plan No.2 (No.25H/OH)



A Schlumberger Company

WELL DETAILS No.25H

Ground Elevation: 3576.00
RKB Elevation: 17' RKB - 3576 GL @ 3593.00ft (Original Well Elev)
Rig Name: Original Well Elev

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	599927.40	665577.00	32° 38' 53.3385311 N	103° 47' 43.4029535 W

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
KOP	8765.02	85.78	-31.83	600013.18	665545.17	Point
EOC	9250.00	79.07	437.56	600006.47	666014.56	Point
PBHL	9320.00	17.10	4629.60	599944.50	670206.60	Point

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	DLeg	TFace	VSec	Target
8540.89	0.91	272.62	8538.43	85.61	-28.23	0.00	0.00	-29.50	
8767.51	0.91	272.62	8765.02	85.78	-31.83	0.00	0.00	-33.10	
9517.12	89.04	90.85	9250.00	79.07	437.56	12.00	178.23	436.33	
13710.20	89.04	90.85	9320.00	17.10	462				

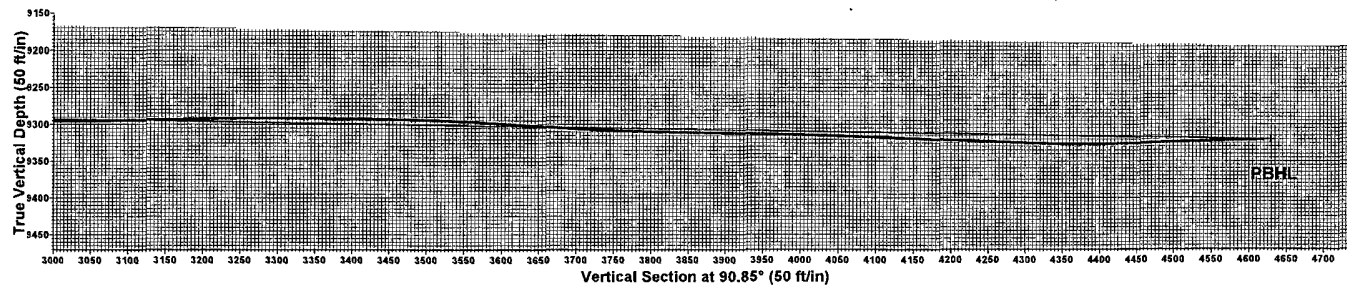
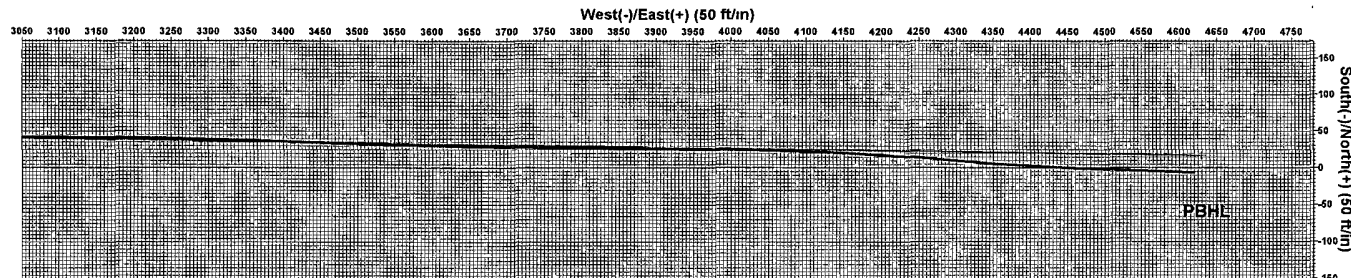
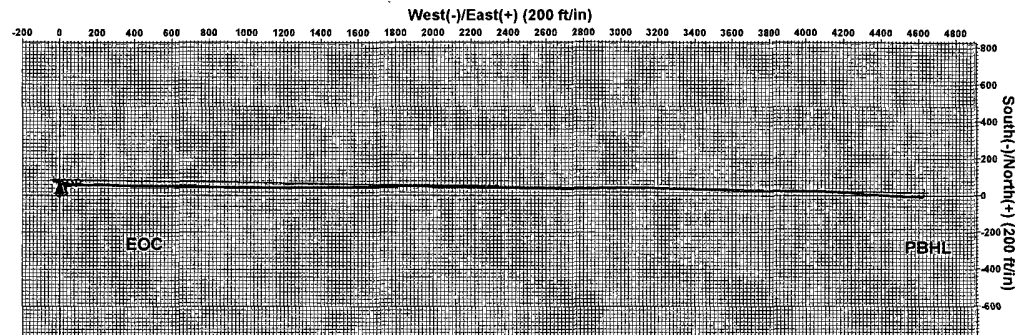
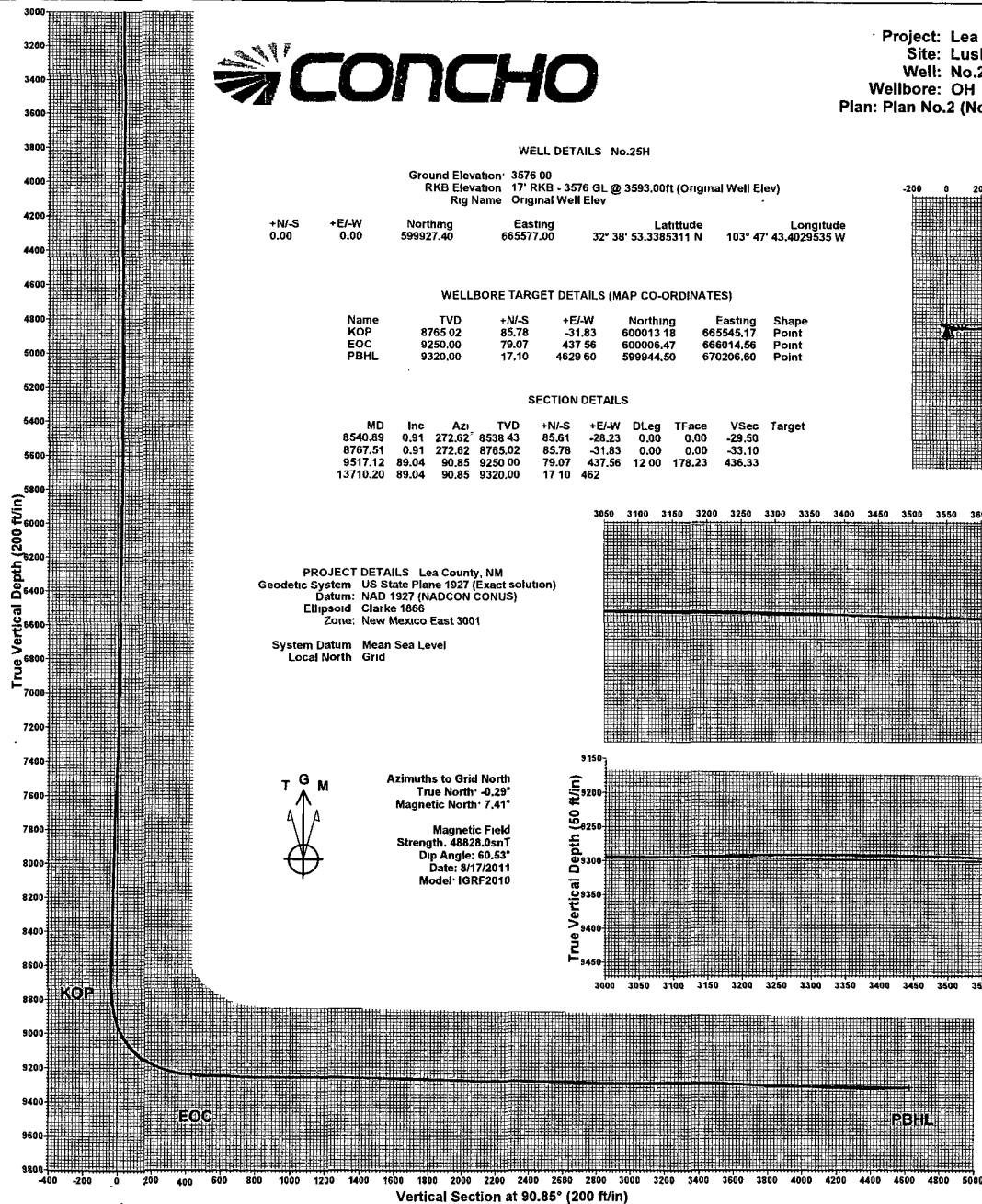
PROJECT DETAILS Lea County, NM
Geodetic System US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001

System Datum Mean Sea Level
Local North Grid



Azimuths to Grid North
True North: -0.29°
Magnetic North: 7.41°

Magnetic Field
Strength: 48828.0nT
Dip Angle: 60.53°
Date: 8/17/2011
Model: IGRF2010



EOW Comparison

Plan Plan No.2 (No 25H/OH)
Created By: James Anderson Date 11 09, August 26 2011



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well: No.25H
Project:	Lea County, NM	TVD Reference:	17" RKB - 3576 GL @ 3593.00ft (Original Well Ele
Site:	Lusk Deep Unit A	MD Reference:	17" RKB - 3576 GL @ 3593.00ft (Original Well Ele
Well:	No.25H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	1 Smith DB

Project:	Lea County, NM	System Datum:	Mean Sea Level
Map System:	US State Plane 1927 (Exact solution)		
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site:	Lusk Deep Unit A		
Site Position:		Northing:	599,927.40 ft
From:	Map	Easting:	665,577.00 ft
Position Uncertainty:	0.00 ft	Slot Radius:	"
		Latitude:	32° 38' 53.3385311 N
		Longitude:	103° 47' 43.4029535 W
		Grid Convergence:	0.29 °

Well:	No.25H					
Well Position	+N/-S	0.00 ft	Northing:	599,927.40 ft	Latitude:	32° 38' 53.3385311 N
	+E/-W	0.00 ft	Easting:	665,577.00 ft	Longitude:	103° 47' 43.4029535 W
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	3,576.00 ft	

Wellbore:	OH				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2010	8/17/2011	(°)	(°)	(nT)
			7.70	60.54	48,828

Design:	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.00	0.00	0.00	90.85	



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well No.25H
Project:	Lea County, NM	TVD Reference:	17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
Site:	Lusk Deep Unit A	MD Reference:	17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
Well:	No.25H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	1 Smith DB

Survey Program		Date 9/2/2011		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
100.00	8,540.89	Survey No.1 (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s
8,659.00	13,706.00	Survey No.2 (OH)	MWD	MWD - Standard

Survey	MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)
	0.00	0.00	0.00	0.00	-3,593.00	0.00	0.00	0.00	0.00	599,927.40	665,577.00
	100.00	0.04	218.46	100.00	-3,493.00	-0.03	-0.02	-0.02	0.04	599,927.37	665,576.98
	200.00	0.13	349.59	200.00	-3,393.00	0.06	-0.06	-0.06	0.16	599,927.46	665,576.94
	300.00	0.12	244.46	300.00	-3,293.00	0.12	-0.18	-0.18	0.20	599,927.52	665,576.82
	400.00	0.34	273.18	400.00	-3,193.00	0.09	-0.57	-0.57	0.24	599,927.49	665,576.43
	500.00	0.50	258.35	500.00	-3,093.00	0.02	-1.29	-1.29	0.19	599,927.42	665,575.71
	600.00	0.56	253.31	599.99	-2,993.01	-0.21	-2.19	-2.19	0.08	599,927.19	665,574.81
	700.00	0.42	259.42	699.99	-2,893.01	-0.41	-3.02	-3.01	0.15	599,926.99	665,573.98
	800.00	0.54	241.18	799.98	-2,793.02	-0.71	-3.79	-3.78	0.19	599,926.69	665,573.21
	900.00	0.23	187.94	899.98	-2,693.02	-1.13	-4.23	-4.21	0.44	599,926.27	665,572.77
	1,000.00	0.26	181.43	999.98	-2,593.02	-1.56	-4.26	-4.24	0.04	599,925.84	665,572.74
	1,100.00	0.21	191.83	1,099.98	-2,493.02	-1.97	-4.31	-4.28	0.07	599,925.43	665,572.69
	1,200.00	0.26	209.60	1,199.98	-2,393.02	-2.34	-4.46	-4.42	0.09	599,925.06	665,572.54
	1,300.00	0.29	163.35	1,299.98	-2,293.02	-2.78	-4.50	-4.45	0.22	599,924.62	665,572.50
	1,400.00	0.10	136.38	1,399.98	-2,193.02	-3.09	-4.36	-4.32	0.21	599,924.31	665,572.64
	1,500.00	0.17	112.13	1,499.98	-2,093.02	-3.21	-4.17	-4.12	0.09	599,924.19	665,572.83
	1,600.00	0.17	73.14	1,599.98	-1,993.02	-3.22	-3.89	-3.84	0.11	599,924.18	665,573.11
	1,700.00	1.36	62.75	1,699.97	-1,893.03	-2.63	-2.69	-2.65	1.19	599,924.77	665,574.31
	1,800.00	2.24	64.41	1,799.92	-1,793.08	-1.25	0.13	0.15	0.88	599,926.15	665,577.13
	1,900.00	2.65	64.87	1,899.83	-1,693.17	0.58	3.98	3.97	0.41	599,927.98	665,580.98
	2,000.00	2.71	63.49	1,999.72	-1,593.28	2.62	8.19	8.15	0.09	599,930.02	665,585.19



PathFinder A Schlumberger Company

PathFinder X & Y



A Schlumberger Company

Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well No.25H
TVD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
MD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1 Smith DB

Survey											
MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)	
2,100.00	2.85	65.45	2,099.60	-1,493.40	4.71	12.57	12.50	0.17	599,932.11	665,589.57	
2,200.00	2.66	66.67	2,199.48	-1,393.52	6.66	16.96	16.86	0.20	599,934.06	665,593.96	
2,300.00	2.69	65.52	2,299.37	-1,293.63	8.55	21.23	21.10	0.06	599,935.95	665,598.23	
2,400.00	2.16	70.70	2,399.28	-1,193.72	10.14	25.14	24.99	0.57	599,937.54	665,602.14	
2,500.00	1.73	70.16	2,499.23	-1,093.77	11.28	28.34	28.17	0.43	599,938.68	665,605.34	
2,600.00	1.41	74.74	2,599.19	-993.81	12.12	30.95	30.76	0.34	599,939.52	665,607.95	
2,700.00	1.03	74.85	2,699.17	-893.83	12.67	33.00	32.81	0.38	599,940.07	665,610.00	
2,800.00	0.72	78.88	2,799.15	-793.85	13.03	34.49	34.29	0.32	599,940.43	665,611.49	
2,900.00	0.69	76.31	2,899.15	-693.85	13.29	35.69	35.49	0.04	599,940.69	665,612.69	
3,000.00	0.66	62.89	2,999.14	-593.86	13.70	36.78	36.58	0.16	599,941.10	665,613.78	
3,100.00	0.50	80.98	3,099.13	-493.87	14.03	37.73	37.52	0.24	599,941.43	665,614.73	
3,200.00	0.50	92.67	3,199.13	-393.87	14.08	38.59	38.38	0.10	599,941.48	665,615.59	
3,300.00	0.38	109.64	3,299.13	-293.87	13.95	39.34	39.13	0.18	599,941.35	665,616.34	
3,400.00	0.26	123.88	3,399.13	-193.87	13.71	39.84	39.64	0.14	599,941.11	665,616.84	
3,500.00	0.13	177.01	3,499.13	-93.87	13.47	40.04	39.83	0.21	599,940.87	665,617.04	
3,600.00	0.21	224.15	3,599.13	6.13	13.22	39.92	39.72	0.15	599,940.62	665,616.92	
3,700.00	0.73	277.75	3,699.12	106.12	13.18	39.16	38.96	0.63	599,940.58	665,616.16	
3,800.00	1.25	319.15	3,799.11	206.11	14.09	37.81	37.60	0.85	599,941.49	665,614.81	
3,900.00	1.51	326.51	3,899.08	306.08	16.01	36.37	36.13	0.31	599,943.41	665,613.37	
4,000.00	2.41	332.29	3,999.02	406.02	18.97	34.67	34.38	0.92	599,946.37	665,611.67	
4,100.00	3.05	333.92	4,098.91	505.91	23.22	32.52	32.17	0.64	599,950.62	665,609.52	
4,200.00	2.32	334.90	4,198.79	605.79	27.45	30.49	30.08	0.73	599,954.85	665,607.49	
4,300.00	1.56	2.95	4,298.74	705.74	30.64	29.70	29.25	1.19	599,958.04	665,606.70	
4,400.00	1.17	0.86	4,398.71	805.71	33.02	29.79	29.30	0.39	599,960.42	665,606.79	
4,500.00	1.01	357.05	4,498.69	905.69	34.92	29.76	29.24	0.18	599,962.32	665,606.76	
4,600.00	0.95	352.25	4,598.68	1,005.68	36.62	29.60	29.06	0.10	599,964.02	665,606.60	
4,700.00	0.94	354.26	4,698.66	1,105.66	38.26	29.41	28.84	0.03	599,965.66	665,606.41	



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well No.25H
TVD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
MD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1 Smith DB

Survey											
MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)	
4,800.00	0.83	8.87	4,798.65	1,205.65	39.79	29.44	28.84	0.25	599,967.19	665,606.44	
4,900.00	0.86	22.17	4,898.64	1,305.64	41.20	29.83	29.22	0.20	599,968.60	665,606.83	
5,000.00	0.95	23.49	4,998.63	1,405.63	42.66	30.45	29.81	0.09	599,970.06	665,607.45	
5,100.00	0.96	12.37	5,098.62	1,505.62	44.24	30.96	30.30	0.19	599,971.64	665,607.96	
5,200.00	1.31	341.75	5,198.60	1,605.60	46.14	30.78	30.09	0.69	599,973.54	665,607.78	
5,300.00	1.45	340.38	5,298.57	1,705.57	48.42	29.99	29.27	0.14	599,975.82	665,606.99	
5,400.00	1.17	349.67	5,398.54	1,805.54	50.61	29.39	28.63	0.35	599,978.01	665,606.39	
5,500.00	0.87	327.35	5,498.53	1,905.53	52.26	28.79	28.02	0.49	599,979.66	665,605.79	
5,600.00	0.95	327.78	5,598.51	2,005.51	53.60	27.94	27.14	0.08	599,981.00	665,604.94	
5,700.00	0.93	332.18	5,698.50	2,105.50	55.02	27.12	26.30	0.07	599,982.42	665,604.12	
5,800.00	1.06	330.57	5,798.48	2,205.48	56.54	26.29	25.45	0.13	599,983.94	665,603.29	
5,900.00	0.97	326.12	5,898.47	2,305.47	58.05	25.36	24.50	0.12	599,985.45	665,602.36	
6,000.00	1.16	327.76	5,998.45	2,405.45	59.61	24.35	23.46	0.19	599,987.01	665,601.35	
6,100.00	1.28	324.07	6,098.43	2,505.43	61.37	23.15	22.24	0.14	599,988.77	665,600.15	
6,200.00	1.35	319.26	6,198.40	2,605.40	63.16	21.73	20.79	0.13	599,990.56	665,598.73	
6,300.00	1.39	321.00	6,298.37	2,705.37	65.00	20.20	19.23	0.06	599,992.40	665,597.20	
6,400.00	1.40	319.34	6,398.34	2,805.34	66.87	18.64	17.65	0.04	599,994.27	665,595.64	
6,500.00	1.37	319.28	6,498.32	2,905.32	68.70	17.06	16.04	0.03	599,996.10	665,594.06	
6,600.00	1.16	316.10	6,598.29	3,005.29	70.34	15.58	14.54	0.22	599,997.74	665,592.58	
6,700.00	0.84	323.32	6,698.28	3,105.28	71.65	14.44	13.38	0.34	599,999.05	665,591.44	
6,800.00	0.70	300.26	6,798.27	3,205.27	72.55	13.48	12.40	0.34	599,999.95	665,590.48	
6,900.00	0.86	291.70	6,898.26	3,305.26	73.13	12.25	11.17	0.20	600,000.53	665,589.25	
7,000.00	1.02	278.61	6,998.24	3,405.24	73.55	10.67	9.58	0.27	600,000.95	665,587.67	
7,100.00	1.06	281.31	7,098.23	3,505.23	73.86	8.89	7.79	0.06	600,001.26	665,585.89	
7,200.00	1.19	274.41	7,198.21	3,605.21	74.12	6.94	5.84	0.19	600,001.52	665,583.94	
7,300.00	1.79	257.93	7,298.17	3,705.17	73.87	4.38	3.29	0.73	600,001.27	665,581.38	
7,400.00	2.35	255.73	7,398.11	3,805.11	73.04	0.87	-0.22	0.57	600,000.44	665,577.87	



PathFinder A Schlumberger Company
PathFinder X & Y



Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well: No.25H
TVD Reference: 17: RKB - 3576 GL @ 3593.00ft (Original Well Ele
MD Reference: 17: RKB - 3576 GL @ 3593.00ft (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1-Smith DB

Survey											
MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)	
7,500.00	2.45	254.13	7,498.02	3,905.02	71.95	-3.17	-4.24	0.12	599,999.35	665,573.83	
7,600.00	2.28	268.34	7,597.94	4,004.94	71.31	-7.22	-8.28	0.61	599,998.71	665,569.78	
7,700.00	1.94	283.37	7,697.87	4,104.87	71.64	-10.85	-11.92	0.65	599,999.04	665,566.15	
7,800.00	1.82	300.44	7,797.82	4,204.82	72.84	-13.87	-14.95	0.57	600,000.24	665,563.13	
7,900.00	1.96	325.50	7,897.76	4,304.76	75.05	-16.21	-17.32	0.83	600,002.45	665,560.79	
8,000.00	1.63	319.19	7,997.71	4,404.71	77.54	-18.11	-19.25	0.38	600,004.94	665,558.89	
8,100.00	2.01	314.65	8,097.66	4,504.66	79.85	-20.28	-21.47	0.41	600,007.25	665,556.72	
8,200.00	1.62	311.11	8,197.61	4,604.61	82.01	-22.60	-23.81	0.41	600,009.41	665,554.40	
8,300.00	1.45	310.89	8,297.58	4,704.58	83.77	-24.62	-25.86	0.17	600,011.17	665,552.38	
8,400.00	0.81	309.89	8,397.56	4,804.56	85.05	-26.12	-27.37	0.64	600,012.45	665,550.88	
8,500.00	1.02	274.27	8,497.55	4,904.55	85.57	-27.55	-28.81	0.59	600,012.97	665,549.45	
8,540.89	0.91	272.62	8,538.43	4,945.43	85.61	-28.23	-29.50	0.28	600,013.01	665,548.77	
8,659.00	1.49	234.61	8,656.52	5,063.52	84.77	-30.42	-31.68	0.81	600,012.17	665,546.58	
8,691.00	1.67	236.14	8,688.50	5,095.50	84.26	-31.15	-32.40	0.58	600,011.66	665,545.85	
8,723.00	1.76	217.63	8,720.49	5,127.49	83.62	-31.84	-33.07	1.75	600,011.02	665,545.16	
8,755.00	2.29	155.30	8,752.47	5,159.47	82.65	-31.87	-33.09	6.70	600,010.05	665,545.13	
8,767.41	2.81	139.93	8,764.87	5,171.87	82.19	-31.57	-32.79	6.86	600,009.59	665,545.43	
KOP											
8,787.00	3.87	125.60	8,784.43	5,191.43	81.44	-30.72	-31.93	6.86	600,008.84	665,546.28	
8,818.00	6.33	115.70	8,815.30	5,222.30	80.09	-28.33	-29.52	8.40	600,007.49	665,548.67	
8,850.00	9.06	108.28	8,847.01	5,254.01	78.53	-24.35	-25.51	9.06	600,005.93	665,552.65	
8,881.00	11.17	104.57	8,877.53	5,284.53	77.01	-19.13	-20.27	7.12	600,004.41	665,557.87	
8,914.00	13.81	105.44	8,909.75	5,316.75	75.16	-12.23	-13.35	8.02	600,002.56	665,564.77	
8,945.00	16.97	105.03	8,939.63	5,346.63	73.00	-4.30	-5.38	10.20	600,000.40	665,572.70	
8,977.00	21.37	104.18	8,969.85	5,376.85	70.36	5.87	4.83	13.78	599,997.76	665,582.87	
9,009.00	26.03	101.83	8,999.14	5,406.14	67.49	18.40	17.40	14.86	599,994.89	665,595.40	
9,041.00	30.25	102.30	9,027.35	5,434.35	64.33	33.16	32.20	13.21	599,991.73	665,610.16	



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well No.25H
TVD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
MD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1 Smith DB

Survey

MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V:Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)
9,072.00	34.21	97.54	9,053.58	5,460.58	61.52	49.44	48.52	15.17	599,988.92	665,626.44
9,104.00	39.31	95.28	9,079.20	5,486.20	59.41	68.46	67.57	16.49	599,986.81	665,645.46
9,136.00	44.14	93.49	9,103.08	5,510.08	57.79	89.69	88.82	15.54	599,985.19	665,666.69
9,168.00	48.28	91.04	9,125.22	5,532.22	56.90	112.76	111.91	14.07	599,984.30	665,689.76
9,200.00	52.41	89.97	9,145.64	5,552.64	56.69	137.39	136.54	13.16	599,984.09	665,714.39
9,224.00	56.81	88.69	9,159.54	5,566.54	56.92	156.95	156.09	18.84	599,984.32	665,733.95
9,255.00	61.03	88.32	9,175.54	5,582.54	57.62	183.49	182.61	13.65	599,985.02	665,760.49
9,285.00	64.72	88.64	9,189.21	5,596.21	58.32	210.17	209.28	12.34	599,985.72	665,787.17
9,317.00	68.15	90.98	9,202.00	5,609.00	58.41	239.50	238.60	12.64	599,985.81	665,816.50
9,346.00	71.23	92.26	9,212.07	5,619.07	57.64	266.68	265.79	11.40	599,985.04	665,843.68
9,378.00	74.04	91.55	9,221.62	5,628.62	56.63	297.20	296.33	9.03	599,984.03	665,874.20
9,410.00	77.73	91.52	9,229.42	5,636.42	55.80	328.22	327.35	11.53	599,983.20	665,905.22
9,442.00	79.32	90.87	9,235.79	5,642.79	55.14	359.57	358.71	5.35	599,982.54	665,936.57
9,473.00	81.43	91.78	9,240.97	5,647.97	54.44	390.12	389.27	7.40	599,981.84	665,967.12
9,505.00	83.01	91.57	9,245.30	5,652.30	53.51	421.81	420.97	4.98	599,980.91	665,998.81
9,520.57	83.99	91.30	9,247.07	5,654.07	53.12	437.28	436.45	6.55	599,980.52	666,014.28
EOC										
9,537.00	85.03	91.01	9,248.64	5,655.64	52.79	453.63	452.80	6.55	599,980.19	666,030.63
9,569.00	87.05	90.21	9,250.85	5,657.85	52.45	485.55	484.72	6.79	599,979.85	666,062.55
9,601.00	90.22	90.13	9,251.61	5,658.61	52.36	517.54	516.70	9.91	599,979.76	666,094.54
9,633.00	90.66	90.26	9,251.36	5,658.36	52.25	549.54	548.70	1.43	599,979.65	666,126.54
9,729.00	87.14	90.80	9,253.21	5,660.21	51.36	645.50	644.67	3.71	599,978.76	666,222.50
9,760.00	86.53	91.19	9,254.92	5,661.92	50.83	676.45	675.62	2.33	599,978.23	666,253.45
9,792.00	86.26	91.13	9,256.93	5,663.93	50.18	708.38	707.55	0.86	599,977.58	666,285.38
9,853.00	89.78	91.14	9,259.04	5,666.04	48.97	769.32	768.51	5.77	599,976.37	666,346.32
9,915.00	89.52	91.29	9,259.41	5,666.41	47.66	831.30	830.50	0.48	599,975.06	666,408.30
9,997.00	89.25	91.47	9,260.30	5,667.30	45.68	913.27	912.50	0.40	599,973.08	666,490.27



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well No.25H
TVD Reference: 17' RKB - 3576 GL @ 3593.00ft. (Original Well Ele
MD Reference: 17' RKB - 3576 GL @ 3593.00ft. (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1 Smith DB

Survey											
MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)	
10,039.00	90.75	90.13	9,260.30	5,667.30	45.10	955.27	954.49	4.79	599,972.50	666,532.27	
10,101.00	90.57	90.19	9,259.58	5,666.58	44.92	1,017.26	1,016.49	0.31	599,972.32	666,594.26	
10,193.00	90.48	90.63	9,258.74	5,665.74	44.26	1,109.26	1,108.48	0.49	599,971.66	666,686.26	
10,286.00	89.34	89.47	9,258.88	5,665.88	44.18	1,202.25	1,201.47	1.75	599,971.58	666,779.25	
10,378.00	88.64	89.43	9,260.51	5,667.51	45.07	1,294.24	1,293.42	0.76	599,972.47	666,871.24	
10,472.00	88.55	89.62	9,262.81	5,669.81	45.84	1,388.20	1,387.37	0.22	599,973.24	666,965.20	
10,564.00	88.20	89.51	9,265.42	5,672.42	46.54	1,480.16	1,479.31	0.40	599,973.94	667,057.16	
10,751.00	88.99	89.36	9,270.00	5,677.00	48.39	1,667.10	1,666.20	0.43	599,975.79	667,244.10	
10,844.00	88.99	88.90	9,271.64	5,678.64	49.80	1,760.07	1,759.14	0.49	599,977.20	667,337.07	
10,937.00	88.81	88.74	9,273.43	5,680.43	51.71	1,853.03	1,852.06	0.26	599,979.11	667,430.03	
11,030.00	87.49	90.31	9,276.43	5,683.43	52.48	1,945.98	1,944.99	2.20	599,979.88	667,522.98	
11,123.00	87.67	91.12	9,280.36	5,687.36	51.32	2,038.89	2,037.90	0.89	599,978.72	667,615.89	
11,154.00	87.93	91.50	9,281.55	5,688.55	50.62	2,069.86	2,068.88	1.48	599,978.02	667,646.86	
11,215.00	90.04	91.12	9,282.63	5,689.63	49.22	2,130.83	2,129.86	3.51	599,976.62	667,707.83	
11,308.00	90.22	91.13	9,282.42	5,689.42	47.40	2,223.81	2,222.86	0.19	599,974.80	667,800.81	
11,401.00	89.69	91.00	9,282.49	5,689.49	45.67	2,316.79	2,315.86	0.59	599,973.07	667,893.79	
11,495.00	89.08	91.04	9,283.50	5,690.50	43.99	2,410.77	2,409.85	0.65	599,971.39	667,987.77	
11,591.00	88.02	90.40	9,285.93	5,692.93	42.79	2,506.73	2,505.82	1.29	599,970.19	668,083.73	
11,622.00	88.02	90.49	9,287.00	5,694.00	42.55	2,537.71	2,536.80	0.29	599,969.95	668,114.71	
11,685.00	89.52	90.70	9,288.35	5,695.35	41.89	2,600.69	2,599.78	2.40	599,969.29	668,177.69	
11,777.00	88.37	90.17	9,290.05	5,697.05	41.20	2,692.67	2,691.76	1.38	599,968.60	668,269.67	
11,871.00	88.64	90.03	9,292.50	5,699.50	41.03	2,786.64	2,785.72	0.32	599,968.43	668,363.64	
11,903.00	88.46	90.17	9,293.31	5,700.31	40.98	2,818.63	2,817.71	0.71	599,968.38	668,395.63	
11,964.00	88.90	89.50	9,294.71	5,701.71	41.15	2,879.61	2,878.69	1.31	599,968.55	668,456.61	
11,996.00	89.60	89.45	9,295.13	5,702.13	41.44	2,911.61	2,910.67	2.19	599,968.84	668,488.61	
12,058.00	89.60	89.46	9,295.57	5,702.57	42.03	2,973.60	2,972.65	0.02	599,969.43	668,550.60	
12,151.00	90.57	90.47	9,295.43	5,702.43	42.09	3,066.60	3,065.64	1.51	599,969.49	668,643.60	



PathFinder A Schlumberger Company
PathFinder X & Y

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County, NM
Site: Lusk Deep Unit A
Well: No.25H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well No.25H
TVD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
MD Reference: 17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: 1 Smith DB

Survey

MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V.Sec (ft)	DLeg (%/100ft)	Northing (ft)	Easting (ft)
12,246.00	91.54	90.16	9,293.68	5,700.68	41.57	3,161.58	3,160.62	1.07	599,968.97	668,738.58
12,340.00	90.66	91.32	9,291.87	5,698.87	40.35	3,255.55	3,254.60	1.55	599,967.75	668,832.55
12,435.00	89.34	91.83	9,291.87	5,698.87	37.74	3,350.52	3,349.59	1.49	599,965.14	668,927.52
12,528.00	89.16	91.88	9,293.09	5,700.09	34.73	3,443.46	3,442.57	0.20	599,962.13	669,020.46
12,621.00	87.41	91.60	9,295.87	5,702.87	31.91	3,536.37	3,535.51	1.91	599,959.31	669,113.37
12,715.00	86.26	91.11	9,301.06	5,708.06	29.69	3,630.20	3,629.36	1.33	599,957.09	669,207.20
12,777.00	85.91	91.03	9,305.30	5,712.30	28.54	3,692.04	3,691.22	0.58	599,955.94	669,269.04
12,807.00	87.49	90.82	9,307.02	5,714.02	28.05	3,721.99	3,721.16	5.31	599,955.45	669,298.99
12,900.00	88.90	90.62	9,309.95	5,716.95	26.88	3,814.93	3,814.12	1.53	599,954.28	669,391.93
12,992.00	88.81	90.49	9,311.79	5,718.79	25.99	3,906.91	3,906.10	0.17	599,953.39	669,483.91
13,086.00	88.64	90.66	9,313.88	5,720.88	25.05	4,000.88	4,000.07	0.26	599,952.45	669,577.88
13,116.00	88.29	91.38	9,314.69	5,721.69	24.52	4,030.87	4,030.06	2.67	599,951.92	669,607.87
13,209.00	87.49	92.07	9,318.11	5,725.11	21.72	4,123.76	4,122.99	1.14	599,949.12	669,700.76
13,240.00	87.41	93.24	9,319.49	5,726.49	20.29	4,154.70	4,153.94	3.78	599,947.69	669,731.70
13,271.00	87.23	93.20	9,320.94	5,727.94	18.55	4,185.61	4,184.88	0.59	599,945.95	669,762.61
13,332.00	88.37	94.15	9,323.28	5,730.28	14.64	4,246.44	4,245.76	2.43	599,942.04	669,823.44
13,362.00	88.02	95.42	9,324.23	5,731.23	12.14	4,276.32	4,275.67	4.39	599,939.54	669,853.32
13,394.00	87.58	95.41	9,325.46	5,732.46	9.12	4,308.16	4,307.55	1.38	599,936.52	669,885.16
13,457.00	89.52	93.31	9,327.05	5,734.05	4.33	4,370.95	4,370.40	4.54	599,931.73	669,947.95
13,487.00	91.36	92.82	9,326.82	5,733.82	2.73	4,400.90	4,400.38	6.35	599,930.13	669,977.90
13,550.00	91.89	92.24	9,325.03	5,732.03	-0.05	4,463.81	4,463.32	1.25	599,927.35	670,040.81
13,628.00	91.63	92.20	9,322.64	5,729.64	-3.07	4,541.72	4,541.26	0.34	599,924.33	670,118.72
13,706.00	91.63	92.20	9,320.42	5,727.42	-6.06	4,619.63	4,619.21	0.00	599,921.34	670,196.63

PBHL



PathFinder A Schlumberger Company

PathFinder X & Y



A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well No:25H
Project:	Lea County, NM	TVD Reference:	17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
Site:	Lusk Deep Unit A	MD Reference:	17' RKB - 3576 GL @ 3593.00ft (Original Well Ele
Well:	No.25H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	1 Smith DB

Targets

Target Name	hit/miss target	Dip Angle	Dip Dir	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
-Shape		(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
EOC		0.00	0.00	9,250.00	79.07	437.56	600,006.47	666,014.56	2° 38' 54.0989896 N	° 47' 38.2807283 W
- actual wellpath misses target center by 26.11ft at 9520.54ft MD (9247.06 TVD, 53.12 N, 437.25 E)										
- Point										
PBHL		0.00	-0.00	9,320.00	17.10	4,629.60	599,944.50	670,206.60	2° 38' 53.2724511 N	° 46' 49.2560210 W
- actual wellpath misses target center by 25.22ft at 13706.00ft MD (9320.42 TVD, -6.06 N, 4619.63 E)										
- Point										
KOP		0.00	0.00	8,765.02	85.78	-31.83	600,013.18	665,545.17	2° 38' 54.1889427 N	° 47' 43.7701439 W
- actual wellpath misses target center by 3.60ft at 8767.41ft MD (8764.87 TVD, 82.19 N, -31.57 E)										
- Point										

Checked By: _____ Approved By: _____ Date: _____