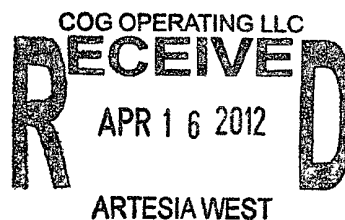




PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288



April 4, 2012

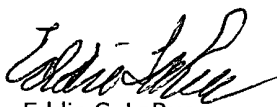
COG, LLC
Fasken Center, Tower II
550 West Texas Ave, Suite 1300
Midland, TX 79701

39791
RE: Copperhead 31 Federal Com #2H
480' FSL & 2140' FEL
Sec. 31, T26S, R29E
Eddy County, New Mexico

Dear Sir,

The attached is the Deviation Survey for the above captioned well.

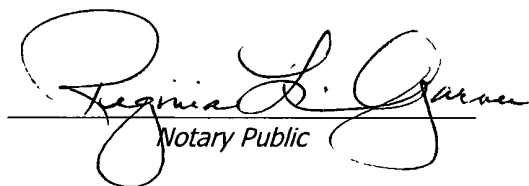
Very truly yours,

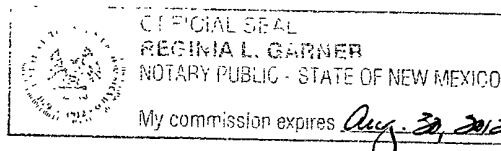

Eddie C. LaRue
Operations Manager

State of New Mexico }
County of Eddy }



The foregoing was acknowledged before me this 4th day of April, 2012.


Regina L. Garner
Notary Public



Copperhead 31 Federal Com #2H

Date	Depth	Deviation	Direction	TVD
3/6/2012	168	0.50	0.00	212.00
3/9/2012	795	1.41	308.37	794.79
3/9/2012	1049	0.97	296.77	1048.73
3/10/2012	1304	0.53	282.21	1303.71
3/10/2012	1559	1.14	113.74	1558.70
3/10/2012	1813	1.06	5.97	1812.67
3/10/2012	2098	2.55	55.30	2097.54
3/10/2012	2320	2.46	74.96	2319.33
3/11/2012	2623	0.79	95.68	2622.20
3/13/2012	2945	0.50	0.00	0.00
3/13/2012	3498	0.50	0.00	0.00
3/13/2012	3901	0.80	0.00	0.00
3/13/2012	4347	1.30	0.00	0.00
3/13/2012	4793	1.20	0.00	4867.00
3/13/2012	5240	1.10	0.00	5314.00
3/14/2012	5717	1.20	0.00	0.00
3/14/2012	6195	1.70	0.00	0.00
3/14/2012	6672	2.10	0.00	6746.00
3/15/2012	7085	2.80	0.00	0.00
3/15/2012	7373	3.00	0.00	0.00
3/15/2012	7851	0.50	0.00	0.00
3/18/2012	8421	0.30	0.00	0.00
3/20/2012	7700	1.45	252.74	7698.77
3/20/2012	7770	1.93	323.93	7768.74
3/21/2012	7802	5.45	356.62	7800.67
3/21/2012	7833	10.46	4.36	7831.37
3/21/2012	7865	15.74	9.19	7862.52
3/21/2012	7897	20.66	10.16	7892.91
3/21/2012	7961	29.90	9.54	7950.72
3/21/2012	7993	33.68	8.40	7977.92
3/21/2012	8025	36.49	8.49	8004.10
3/21/2012	8057	38.16	7.17	8029.55
3/21/2012	8088	40.10	6.03	8053.59
3/22/2012	8120	43.79	5.32	8077.39
3/22/2012	8152	47.57	5.06	8099.74
3/22/2012	8184	49.59	5.32	8120.91
3/22/2012	8215	52.14	3.92	8140.48
3/22/2012	8247	56.28	3.12	8159.19
3/22/2012	8279	61.64	1.72	8175.68
3/22/2012	8311	64.90	0.75	8190.07
3/22/2012	8343	67.01	0.14	8203.11
3/23/2012	8374	69.73	0.31	8214.54
3/23/2012	8405	72.02	358.82	8224.69

Date	Depth	Deviation	Direction	TVD
3/23/2012	8437	73.16	358.73	8234.27
3/23/2012	8469	75.01	359.35	8243.04
3/23/2012	8501	78.52	359.96	8250.37
3/23/2012	8532	80.99	359.96	8255.88
3/23/2012	8564	82.83	359.79	8260.38
3/23/2012	8596	84.24	359.43	8263.99
3/23/2012	8628	85.65	359.35	8266.81
3/24/2012	8659	88.29	359.17	8268.45
3/24/2012	8691	89.60	359.35	8269.03
3/24/2012	8787	89.87	359.17	8269.48
3/24/2012	8883	89.78	358.20	8269.77
3/24/2012	8978	89.87	357.41	8270.06
3/24/2012	9074	90.40	358.99	8269.84
3/24/2012	9170	91.01	359.43	8268.65
3/24/2012	9265	89.60	358.64	8268.15
3/24/2012	9361	90.31	358.47	8268.22
3/24/2012	9457	91.45	0.23	8266.75
3/24/2012	9552	87.23	0.23	8267.84
3/24/2012	9647	87.49	0.84	8272.22
3/24/2012	9743	90.04	2.42	8274.29
3/24/2012	9838	92.15	3.48	8272.47
3/24/2012	9933	89.87	2.95	8270.80
3/24/2012	10028	87.23	1.02	8273.20
3/25/2012	10124	87.93	0.49	8277.26
3/25/2012	10219	89.96	0.84	8279.01
3/25/2012	10314	89.08	359.79	8279.80
3/25/2012	10410	88.20	359.35	8282.08
3/25/2012	10505	87.49	358.20	8285.65
3/25/2012	10601	88.11	357.59	8289.34
3/25/2012	10697	89.69	356.80	8291.18
3/25/2012	10792	94.26	358.82	8287.91
3/25/2012	10888	92.33	1.89	8282.39
3/26/2012	10984	92.42	2.95	8278.41
3/26/2012	11079	90.13	2.60	8276.30
3/26/2012	11175	88.37	2.60	8277.55
3/26/2012	11271	88.81	3.21	8279.91
3/26/2012	11462	88.02	3.12	8285.20
3/26/2012	11558	88.11	3.83	8288.44
3/26/2012	11653	89.78	3.83	8290.19
3/26/2012	11843	90.40	1.81	8289.89
3/26/2012	11939	91.71	0.84	8288.12
3/26/2012	12033	90.22	0.75	8286.54
3/26/2012	12128	89.69	1.63	8286.61
3/27/2012	12224	88.29	2.25	8288.31
3/27/2012	12319	87.76	2.25	8291.58

Date	Depth	Deviation	Direction	TVD
3/27/2012	12415	87.76	3.00	8295.33
3/29/2012	12510	88.99	1.71	8298.03
3/30/2012	12640	90.04	0.18	8299.13
3/30/2012	12734	88.72	358.04	8300.14
3/31/2012	12830	89.96	356.37	8301.25
3/31/2012	12925	88.72	355.71	8302.34
3/31/2012	13020	88.29	357.68	8304.82
3/31/2012	13116	89.52	359.15	8306.66
3/31/2012	13211	89.78	0.14	8307.24
3/31/2012	13306	89.96	0.16	8307.45

COG OPERATING

Wildcat (Eddy County, NM)

Eddy County, NM

Copperhead 31 Federal Com #2H

VH - Job #32K0312307

Survey: Gyro

SDI Standard Survey Report

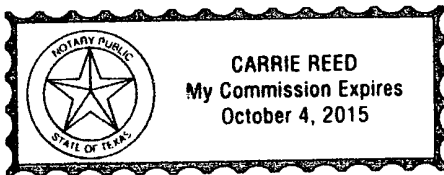
This survey is correct to the best of my knowledge and is supported by actual field data.

Robert

Notarized this date 2nd of April, 2012.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Copperhead 31 Federal Com #2H
Project:	Wildcat (Eddy County, NM)	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Copperhead 31 Federal Com #2H	North Reference:	Grd
Wellbore:	VH - Job #32K0312307	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0312307	Database:	EDM-Regulatory

Project:	Wildcat (Eddy 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 Central 3002		

Site:	Eddy County, NM		
Site Position:		Northing:	695,322 90 usft
From:	Lat/Long	Easting:	1,178,985 29 usft
Position Uncertainty:	0 0 usft	Slot Radius:	0"
		Latitude:	32° 53' 31 090 N
		Longitude:	104° 2' 17 570 W
		Grid Convergence:	1 20 °

Well:	Copperhead 31 Federal Com #2H, Directional (Pathfinder)					
Well Position	+N/-S	0 0 usft	Northing:	371,310 91 usft	Latitude:	32° 0' 4 612 N
	+E/-W	0 0 usft	Easting:	1,190,811 02 usft	Longitude:	104° 1' 18 250 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	0 0 usft

Wellbore						VH - Job #32K0312307					
Magnetics		Model Name		Sample Date		Declination		Dip Angle		Field Strength	
						(°)		(°)		(nT)	
		IGRF2010		3/18/2012		7 68		59 88		48,381	

Design:	VH - Job #32K0312307				
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	0 10	

Survey Program	Date	4/10/2012			
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100 0	8,465 0	Gyro (VH - Job #32K0312307)	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 96	311 10	100 0	0 6	-0 6	311 10	0 8
	200 0	1 54	321 24	200 0	2 1	-2 1	315 61	3 0
	300 0	2 29	322 14	299 9	4 8	-4 2	318 86	6 3
	400 0	2 67	318 64	399 8	8 1	-6 9	319 42	10 7
	500 0	2 12	318 50	499 7	11 2	-9 7	319 19	14 8
	600 0	1 72	307 88	599 7	13 5	-12 1	318 19	18 2
	700 0	1 60	307 29	699 6	15 3	-14 4	316 74	21 0
	800 0	1 43	298 21	799 6	16 7	-16 6	315 22	23 6
	900 0	1 10	295 50	899 6	17 7	-18 6	313 68	25 7
	1,000 0	1 03	299 45	999 6	18 6	-20 2	312 60	27 5
	1,100 0	0 92	299 14	1,099 5	19 4	-21 7	311 83	29 1

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Copperhead 31 Federal Com #2H
Project:	Wildcat (Eddy County, NM)	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Copperhead 31 Federal Com #2H	North Reference:	Grid
Wellbore:	VH - Job #32K0312307	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0312307	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 80	290 45	1,199 5	20 1	-23 1	311 02	30 6	
1,300 0	0 62	293 04	1,299 5	20 5	-24 2	310 28	31 7	
1,400 0	0 46	98 72	1,399 5	20 7	-24 3	310 36	31 9	
1,500 0	0 90	104 72	1,499 5	20 4	-23 2	311 39	30 9	
1,600 0	0 49	94 12	1,599 5	20 2	-22 0	312 56	29 8	
1,700 0	0 52	358 74	1,699 5	20 6	-21 6	313 70	29 8	
1,800 0	1 09	2 55	1,799 5	22 0	-21 5	315 63	30 8	
1,900 0	1 84	24 48	1,899 5	24 4	-20 8	319 55	32 1	
2,000 0	2 38	46 81	1,999 4	27 3	-18 6	325 67	33 1	
2,100 0	2 59	51 19	2,099 3	30 1	-15 4	332 98	33 8	
2,200 0	2 19	50 59	2,199 2	32 8	-12 1	339 68	34 9	
2,300 0	2 25	74 54	2,299 1	34 5	-8 8	345 75	35 6	
2,400 0	2 27	88 43	2,399 1	35 1	-4 9	352 06	35 4	
2,500 0	1 13	95 09	2,499 0	35 1	-1 9	356 84	35 1	
2,600 0	0 82	87 07	2,599 0	35 0	-0 2	359 61	35 0	
2,700 0	0 58	100 31	2,699 0	34 9	1 0	1 60	35 0	
2,800 0	0 69	88 72	2,799 0	34 9	2 1	3 41	34 9	
2,900 0	0 35	48 74	2,899 0	35 1	2 9	4 74	35 2	
3,000 0	0 45	27 62	2,999 0	35 6	3 3	5 32	35 8	
3,100 0	0 69	340 06	3,099 0	36 5	3 3	5 15	36 7	
3,200 0	0 60	325 64	3,199 0	37 5	2 8	4 26	37 7	
3,300 0	0 58	316 07	3,299 0	38 3	2 1	3 21	38 4	
3,400 0	0 71	305 45	3,399 0	39 1	1 3	1 90	39 1	
3,500 0	0 71	285 51	3,499 0	39 6	0 2	0 28	39 6	
3,600 0	0 93	281 89	3,598 9	39 9	-1 2	358 28	39 9	
3,700 0	0 81	275 34	3,698 9	40 2	-2 7	356 16	40 2	
3,800 0	0 99	277 56	3,798 9	40 3	-4 3	353 97	40 6	
3,900 0	0 92	276 90	3,898 9	40 5	-5 9	351 71	41 0	
4,000 0	1 11	277 11	3,998 9	40 8	-7 7	349 34	41 5	
4,100 0	1 02	278 74	4,098 9	41 0	-9 5	346 95	42 1	
4,200 0	1 13	278 13	4,198 9	41 3	-11 4	344 61	42 8	
4,300 0	1 08	264 37	4,298 8	41 3	-13 3	342 19	43 4	
4,400 0	1 01	272 04	4,398 8	41 3	-15 1	339 91	44 0	
4,500 0	1 33	267 06	4,498 8	41 3	-17 1	337 44	44 7	
4,600 0	1 17	266 37	4,598 8	41 1	-19 3	334 84	45 4	
4,700 0	1 07	272 10	4,698 8	41 1	-21 3	332 64	46 3	
4,800 0	1 18	266 98	4,798 7	41 1	-23 2	330 51	47 2	
4,900 0	1 03	251 66	4,898 7	40 7	-25 1	328 35	47 9	
5,000 0	1 11	232 09	4,998 7	39 9	-26 7	326 16	48 0	
5,100 0	1 09	233 62	5,098 7	38 7	-28 3	323 87	47 9	
5,200 0	0 93	214 94	5,198 7	37 5	-29 5	321 80	47 7	
5,300 0	0 98	207 97	5,298 7	36 1	-30 4	319 90	47 1	
5,400 0	1 22	209 70	5,398 6	34 4	-31 3	317 69	46 5	
5,500 0	1 27	215 34	5,498 6	32 5	-32 5	315 08	46 0	

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Copperhead 31 Federal Com #2H
Project:	Wildcat (Eddy County, NM)	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Copperhead 31 Federal Com #2H	North Reference:	Grid
Wellbore:	VH - Job #32K0312307	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0312307	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	1 34	211 82	5,598 6	30 6	-33 7	312 28	45 6
5,700 0	1 34	213 56	5,698 6	28 7	-35 0	309 35	45 2
5,800 0	1 48	213 48	5,798 5	26 6	-36 3	306 24	45 0
5,900 0	1 69	213 82	5,898 5	24 3	-37 9	302 72	45 0
6,000 0	1 86	215 23	5,998 4	21 8	-39 6	298 79	45 2
6,100 0	1 87	220 24	6,098 4	19 2	-41 6	294 77	45 8
6,200 0	1 93	220 18	6,198 3	16 7	-43 8	290 86	46 8
6,300 0	1 96	223 29	6,298 3	14 1	-46 0	287 08	48 1
6,400 0	1 63	229 89	6,398 2	12 0	-48 3	283 94	49 7
6,500 0	2 02	251 73	6,498 2	10 5	-51 0	281 64	52 1
6,600 0	2 08	269 55	6,598 1	9 9	-54 5	280 34	55 4
6,700 0	2 14	276 60	6,698 0	10 1	-58 2	279 89	59 1
6,800 0	1 98	274 35	6,798 0	10 5	-61 8	279 64	62 7
6,900 0	2 17	264 76	6,897 9	10 4	-65 4	279 08	66 2
7,000 0	2 19	259 40	6,997 8	9 9	-69 1	278 17	69 8
7,100 0	2 83	273 60	7,097 8	9 7	-73 5	277 54	74 1
7,200 0	3 21	261 35	7,197 6	9 5	-78 7	276 85	79 3
7,300 0	3 10	265 48	7,297 5	8 8	-84 2	275 99	84 6
7,400 0	2 88	271 48	7,397 3	8 7	-89 4	275 55	89 8
7,500 0	2 36	269 25	7,497 2	8 7	-94 0	275 30	94 4
7,600 0	2 18	257 23	7,597 1	8 3	-97 9	274 83	98 2
7,700 0	1 45	252 74	7,697 1	7 5	-100 9	274 23	101 2
7,800 0	1 02	248 32	7,797 1	6 8	-103 0	273 76	103 2
7,900 0	0 22	284 76	7,897 1	6 5	-104 0	273 57	104 2
8,000 0	0 77	53 45	7,997 1	6 9	-103 6	273 83	103 9
8,100 0	0 71	120 35	8,097 1	7 0	-102 5	273 92	102 8
8,200 0	0 39	109 21	8,197 0	6 6	-101 7	273 71	101 9
8,300 0	0 45	163 92	8,297 0	6 1	-101 3	273 45	101 4
8,400 0	0 40	139 76	8,397 0	5 5	-100 9	273 10	101 1
8,465 0	0 41	71 01	8,462 0	5 4	-100 6	273 06	100 7



Scientific Drilling
Directional Drilling Operations

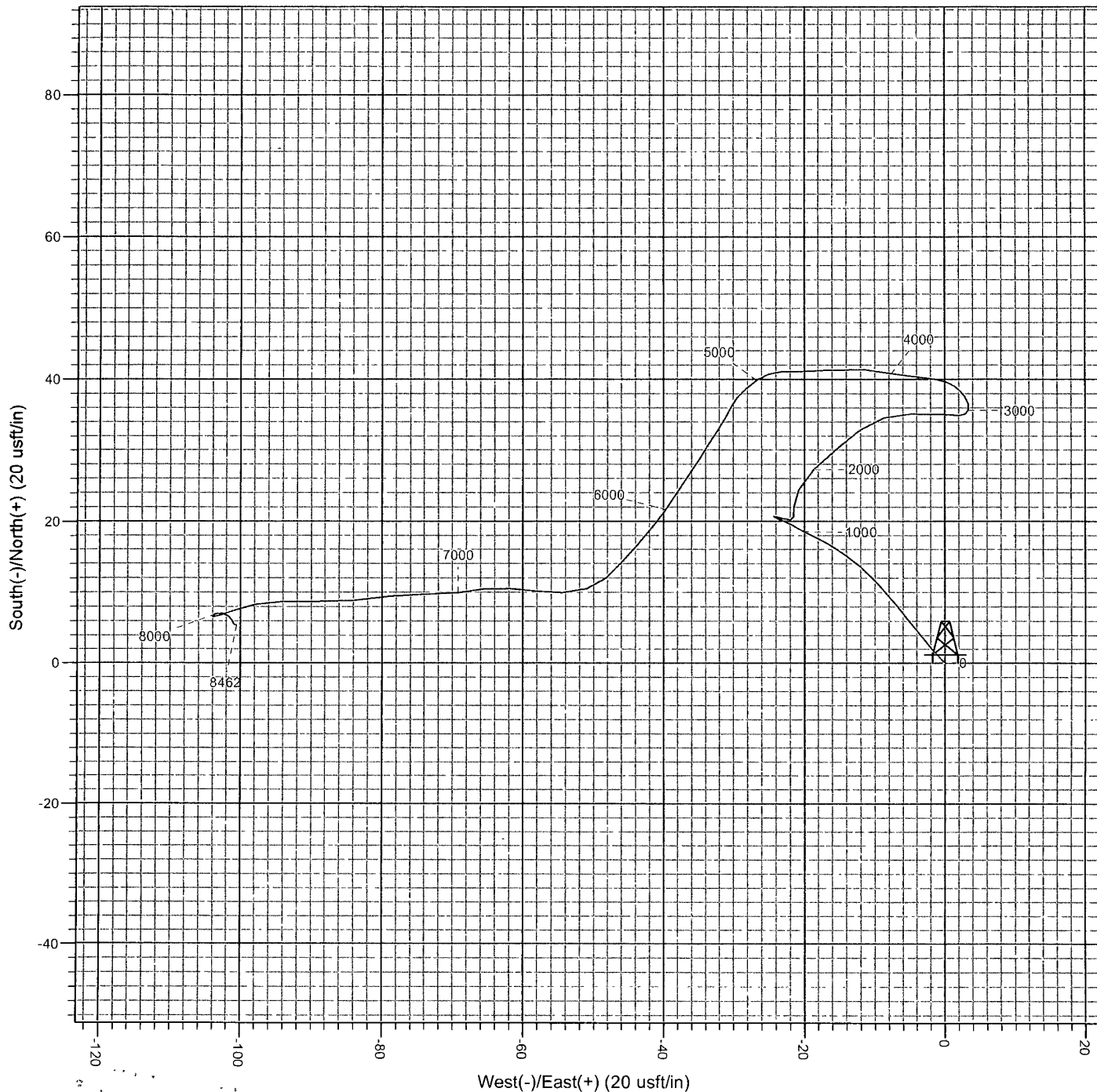
Project: Wildcat (Eddy County, NM)
Eddy County, NM
Well: Copperhead 31 Federal Com #2H
Wellbore: VH - Job #32K0312307
Design: VH - Job #32K0312307

WELL DETAILS: Copperhead 31 Federal Com #2H

WELL @ 0 0usft (Original Well Elev)

Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	371310.91	1190811.02	32° 0' 4.612 N	104° 1' 18.250 W	



PROJECT DETAILS: Wildcat (Eddy County, NM)	SITE DETAILS: Eddy County, NM
Geodetic System: US State Plane 1927 (Exact solution)	Site Centre Latitude: 32° 53' 31.090 N
Datum: NAD 1927 (NADCON CONUS)	Longitude: 104° 2' 17.570 W
Ellipsoid: Clarke 1866	Positional Uncertainty: 0.0
Zone: New Mexico Central 3002	Convergence: 1 20
System Datum: Mean Sea Level	Local North: Grid



COG Operating LLC

Eddy County(NAD27)
Copperhead 31 Fed Com
#2H
OH

Design: OH

Pathfinder X & Y Report

09 April, 2012

PATHFINDER®
A Schlumberger Company



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grd
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User Db

Project	Eddy County(NAD27)		
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	Copperhead 31 Fed Com		
Site Position:		Northing:	364,332.500 usft
From:	Map	Easting:	596,592.300 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32.001
		Longitude:	-104.022
		Grid Convergence:	0.17 °

Well	#2H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32.001
		Longitude:	-104.022
		Ground Level:	2,901.0 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
	IGRF2010	2/23/2012	7.69
			59.88
			48,366

Design	OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
		Direction	0.10
		(°)	



Pathfinder Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey Program		Date	4/9/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	7,700.0	Gyro #1 (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s	
7,738.0	13,498.0	MWD #2 (OH)	MWD	MWD - Standard	

Survey												
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)		
0.0	0.00	0.00	0.0	-2,919.0	0.0	0.0	0.0	0.00	364,332.50	596,592.30		
100.0	0.96	311.10	100.0	-2,819.0	0.6	-0.6	0.5	0.96	364,333.05	596,591.67		
200.0	1.54	321.24	200.0	-2,719.0	2.1	-2.1	2.1	0.62	364,334.65	596,590.20		
300.0	2.29	322.14	299.9	-2,619.1	4.8	-4.2	4.8	0.75	364,337.27	596,588.13		
400.0	2.67	318.64	399.8	-2,519.2	8.1	-6.9	8.1	0.41	364,340.60	596,585.36		
500.0	2.12	318.50	499.7	-2,419.3	11.2	-9.7	11.2	0.55	364,343.73	596,582.60		
600.0	1.72	307.88	599.7	-2,319.3	13.5	-12.1	13.5	0.53	364,346.04	596,580.19		
700.0	1.60	307.29	699.6	-2,219.4	15.3	-14.4	15.3	0.12	364,347.81	596,577.89		
800.0	1.43	298.21	799.6	-2,119.4	16.7	-16.6	16.7	0.29	364,349.24	596,575.68		
900.0	1.10	295.50	899.6	-2,019.4	17.7	-18.6	17.7	0.34	364,350.25	596,573.72		
1,000.0	1.03	299.45	999.6	-1,919.4	18.6	-20.2	18.6	0.10	364,351.10	596,572.07		
1,100.0	0.92	299.14	1,099.5	-1,819.5	19.4	-21.7	19.4	0.11	364,351.93	596,570.58		
1,200.0	0.80	290.45	1,199.5	-1,719.5	20.1	-23.1	20.0	0.18	364,352.57	596,569.23		
1,300.0	0.62	293.04	1,299.5	-1,619.5	20.5	-24.2	20.5	0.18	364,353.02	596,568.08		
1,400.0	0.46	98.72	1,399.5	-1,519.5	20.7	-24.3	20.6	1.07	364,353.18	596,567.98		
1,500.0	0.90	104.72	1,499.5	-1,419.5	20.4	-23.2	20.4	0.45	364,352.92	596,569.13		
1,600.0	0.49	94.12	1,599.5	-1,319.5	20.2	-22.0	20.1	0.43	364,352.69	596,570.32		
1,700.0	0.52	358.74	1,699.5	-1,219.5	20.6	-21.6	20.6	0.75	364,353.11	596,570.73		
1,800.0	1.09	2.55	1,799.5	-1,119.5	22.0	-21.5	22.0	0.57	364,354.51	596,570.77		
1,900.0	1.84	24.48	1,899.5	-1,019.5	24.4	-20.8	24.4	0.92	364,356.92	596,571.47		
2,000.0	2.38	46.81	1,999.4	-919.6	27.3	-18.6	27.3	0.97	364,359.81	596,573.65		



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Database:

Well #2H
KB = 18' @ 2919.0usft (Original Well Elev)
KB = 18' @ 2919.0usft (Original Well Elev)
Grid
Minimum Curvature
EDM 5000.1 Single User Db

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
2,100.0	2.59	51.19	2,099.3	-819.7	30.1	-15.4	30.1	0.28	364,362.64	596,576.93
2,200.0	2.19	50.59	2,199.2	-719.8	32.8	-12.1	32.7	0.40	364,365.27	596,580.17
2,300.0	2.25	74.54	2,299.1	-619.9	34.5	-8.8	34.5	0.92	364,367.01	596,583.53
2,400.0	2.27	88.43	2,399.1	-519.9	35.1	-4.9	35.1	0.55	364,367.59	596,587.41
2,500.0	1.13	95.09	2,499.0	-420.0	35.1	-1.9	35.0	1.16	364,367.55	596,590.37
2,600.0	0.82	87.07	2,599.0	-320.0	35.0	-0.2	35.0	0.34	364,367.50	596,592.06
2,700.0	0.58	100.31	2,699.0	-220.0	34.9	1.0	34.9	0.29	364,367.45	596,593.28
2,800.0	0.69	88.72	2,799.0	-120.0	34.9	2.1	34.9	0.17	364,367.37	596,594.38
2,900.0	0.35	48.74	2,899.0	-20.0	35.1	2.9	35.1	0.48	364,367.59	596,595.21
3,000.0	0.45	27.62	2,999.0	80.0	35.6	3.3	35.6	0.18	364,368.13	596,595.62
3,100.0	0.69	340.06	3,099.0	180.0	36.5	3.3	36.6	0.51	364,369.05	596,595.60
3,200.0	0.60	325.64	3,199.0	280.0	37.5	2.8	37.6	0.18	364,370.05	596,595.10
3,300.0	0.58	316.07	3,299.0	380.0	38.3	2.1	38.3	0.10	364,370.84	596,594.45
3,400.0	0.71	305.45	3,399.0	480.0	39.1	1.3	39.1	0.18	364,371.57	596,593.59
3,500.0	0.71	285.51	3,499.0	580.0	39.6	0.2	39.6	0.25	364,372.09	596,592.49
3,600.0	0.93	281.89	3,598.9	679.9	39.9	-1.2	39.9	0.23	364,372.43	596,591.10
3,700.0	0.81	275.34	3,698.9	779.9	40.2	-2.7	40.2	0.16	364,372.66	596,589.60
3,800.0	0.99	277.56	3,798.9	879.9	40.3	-4.3	40.3	0.18	364,372.84	596,588.04
3,900.0	0.92	276.90	3,898.9	979.9	40.5	-5.9	40.5	0.07	364,373.05	596,586.39
4,000.0	1.11	277.11	3,998.9	1,079.9	40.8	-7.7	40.8	0.19	364,373.26	596,584.63
4,100.0	1.02	278.74	4,098.9	1,179.9	41.0	-9.5	41.0	0.09	364,373.52	596,582.79
4,200.0	1.13	278.13	4,198.9	1,279.9	41.3	-11.4	41.3	0.11	364,373.79	596,580.93
4,300.0	1.08	264.37	4,298.8	1,379.8	41.3	-13.3	41.3	0.27	364,373.84	596,579.02
4,400.0	1.01	272.04	4,398.8	1,479.8	41.3	-15.1	41.3	0.16	364,373.78	596,577.20
4,500.0	1.33	267.06	4,498.8	1,579.8	41.3	-17.1	41.2	0.34	364,373.75	596,575.16
4,600.0	1.17	266.37	4,598.8	1,679.8	41.1	-19.3	41.1	0.16	364,373.63	596,572.98
4,700.0	1.07	272.10	4,698.8	1,779.8	41.1	-21.3	41.1	0.15	364,373.60	596,571.03



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grid
Survey/Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
4,800.0	1.18	266.98	4,798.7	1,879.7	41.1	-23.2	41.0	0.15	364,373.58	596,569.07	
4,900.0	1.03	251.66	4,898.7	1,979.7	40.7	-25.1	40.7	0.33	364,373.24	596,567.19	
5,000.0	1.11	232.09	4,998.7	2,079.7	39.9	-26.7	39.8	0.37	364,372.36	596,565.57	
5,100.0	1.09	233.62	5,098.7	2,179.7	38.7	-28.3	38.7	0.04	364,371.20	596,564.04	
5,200.0	0.93	214.94	5,198.7	2,279.7	37.5	-29.5	37.4	0.36	364,369.97	596,562.81	
5,300.0	0.98	207.97	5,298.7	2,379.7	36.1	-30.4	36.0	0.13	364,368.55	596,561.94	
5,400.0	1.22	209.70	5,398.6	2,479.6	34.4	-31.3	34.3	0.24	364,366.87	596,561.02	
5,500.0	1.27	215.34	5,498.6	2,579.6	32.5	-32.5	32.5	0.13	364,365.04	596,559.85	
5,600.0	1.34	211.82	5,598.6	2,679.6	30.6	-33.7	30.6	0.11	364,363.15	596,558.59	
5,700.0	1.34	213.56	5,698.6	2,779.6	28.7	-35.0	28.6	0.04	364,361.18	596,557.33	
5,800.0	1.48	213.48	5,798.5	2,879.5	26.6	-36.3	26.6	0.14	364,359.13	596,555.97	
5,900.0	1.69	213.82	5,898.5	2,979.5	24.3	-37.9	24.3	0.21	364,356.83	596,554.44	
6,000.0	1.86	215.23	5,998.4	3,079.4	21.8	-39.6	21.7	0.18	364,354.27	596,552.68	
6,100.0	1.87	220.24	6,098.4	3,179.4	19.2	-41.6	19.1	0.16	364,351.70	596,550.69	
6,200.0	1.93	220.18	6,198.3	3,279.3	16.7	-43.8	16.6	0.06	364,349.17	596,548.55	
6,300.0	1.96	223.29	6,298.3	3,379.3	14.1	-46.0	14.1	0.11	364,346.64	596,546.29	
6,400.0	1.63	229.89	6,398.2	3,479.2	12.0	-48.3	11.9	0.39	364,344.48	596,544.03	
6,500.0	2.02	251.73	6,498.2	3,579.2	10.5	-51.0	10.4	0.79	364,343.01	596,541.27	
6,600.0	2.08	269.55	6,598.1	3,679.1	9.9	-54.5	9.8	0.64	364,342.44	596,537.78	
6,700.0	2.14	276.60	6,698.0	3,779.0	10.1	-58.2	10.0	0.27	364,342.64	596,534.11	
6,800.0	1.98	274.35	6,798.0	3,879.0	10.5	-61.8	10.4	0.18	364,342.99	596,530.53	
6,900.0	2.17	264.76	6,897.9	3,978.9	10.4	-65.4	10.3	0.40	364,342.95	596,526.92	
7,000.0	2.19	259.40	6,997.8	4,078.8	9.9	-69.1	9.8	0.20	364,342.42	596,523.16	
7,100.0	2.83	273.60	7,097.8	4,178.8	9.7	-73.5	9.6	0.89	364,342.23	596,518.82	
7,200.0	3.21	261.35	7,197.6	4,278.6	9.5	-78.7	9.3	0.75	364,341.96	596,513.59	
7,300.0	3.10	265.48	7,297.5	4,378.5	8.8	-84.2	8.7	0.25	364,341.33	596,508.12	
7,400.0	2.88	271.48	7,397.3	4,478.3	8.7	-89.4	8.5	0.38	364,341.18	596,502.92	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
7,500.0	2.36	269.25	7,497.2	4,578.2	8.7	-94.0	8.5	0.53	364,341.22	596,498.35	
7,600.0	2.18	257.23	7,597.1	4,678.1	8.3	-97.9	8.1	0.51	364,340.77	596,494.43	
7,700.0	1.45	252.74	7,697.1	4,778.1	7.5	-100.9	7.3	0.74	364,339.97	596,491.37	
7,738.0	1.41	269.26	7,735.1	4,816.1	7.3	-101.9	7.1	1.09	364,339.82	596,490.44	
7,770.0	1.93	323.93	7,767.1	4,848.1	7.8	-102.6	7.6	5.01	364,340.25	596,489.73	
KOP - 7770.0 'MD, 7767.1 'TVD, 323.93 'AZI, 1.93 'INC, 7.8 'N, -102.6 'E											
7,802.0	5.45	356.62	7,799.0	4,880.0	9.7	-103.0	9.5	12.39	364,342.21	596,489.33	
7,833.0	10.46	4.36	7,829.7	4,910.7	14.0	-102.8	13.8	16.49	364,346.49	596,489.45	
7,865.0	15.74	9.19	7,860.8	4,941.8	21.2	-101.9	21.0	16.84	364,353.67	596,490.37	
7,897.0	20.66	10.16	7,891.2	4,972.2	31.0	-100.2	30.8	15.40	364,363.52	596,492.06	
7,929.0	25.41	10.60	7,920.7	5,001.7	43.3	-98.0	43.2	14.85	364,375.83	596,494.32	
7,961.0	29.90	9.54	7,949.0	5,030.0	58.0	-95.4	57.8	14.11	364,390.45	596,496.90	
7,993.0	33.68	8.40	7,976.2	5,057.2	74.6	-92.8	74.4	11.96	364,407.10	596,499.52	
8,025.0	36.49	8.49	8,002.4	5,083.4	92.8	-90.1	92.6	8.78	364,425.29	596,502.22	
8,057.0	38.16	7.17	8,027.8	5,108.8	112.0	-87.4	111.9	5.79	364,444.52	596,504.86	
8,088.0	40.10	6.03	8,051.9	5,132.9	131.4	-85.2	131.3	6.67	364,463.95	596,507.11	
8,120.0	43.79	5.32	8,075.7	5,156.7	152.7	-83.1	152.6	11.63	364,485.23	596,509.22	
8,152.0	47.57	5.06	8,098.0	5,179.0	175.5	-81.0	175.4	11.83	364,508.03	596,511.29	
8,184.0	49.59	5.32	8,119.2	5,200.2	199.4	-78.8	199.3	6.34	364,531.92	596,513.46	
8,215.0	52.14	3.92	8,138.8	5,219.8	223.4	-76.9	223.2	8.94	364,555.89	596,515.39	
8,247.0	56.28	3.12	8,157.5	5,238.5	249.3	-75.3	249.2	13.10	364,581.79	596,516.98	
8,279.0	61.64	1.72	8,174.0	5,255.0	276.7	-74.2	276.5	17.16	364,609.17	596,518.13	
8,311.0	64.90	0.75	8,188.4	5,269.4	305.2	-73.6	305.1	10.54	364,637.74	596,518.74	
8,343.0	67.01	0.14	8,201.4	5,282.4	334.5	-73.3	334.3	6.82	364,666.96	596,518.96	
8,374.0	69.73	0.31	8,212.8	5,293.8	363.3	-73.2	363.1	8.79	364,695.78	596,519.08	
8,388.0	70.61	359.87	8,217.6	5,298.6	376.4	-73.2	376.3	6.95	364,708.95	596,519.10	
8,405.0	72.02	358.82	8,223.0	5,304.0	392.5	-73.4	392.4	10.15	364,725.05	596,518.91	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919 0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919 0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
8,437.0	73.16	358.73	8,232.6	5,313.6	423.1	-74.0	422.9	3.57	364,755.57	596,518.26	
8,469.0	75.01	359.35	8,241.4	5,322.4	453.8	-74.6	453.7	6.07	364,786.34	596,517.75	
8,501.0	78.52	359.96	8,248.7	5,329.7	485.0	-74.7	484.9	11.12	364,817.49	596,517.56	
8,532.0	80.99	359.96	8,254.2	5,335.2	515.5	-74.8	515.4	7.97	364,847.99	596,517.54	
8,564.0	82.83	359.79	8,258.7	5,339.7	547.2	-74.8	547.0	5.77	364,879.67	596,517.47	
8,596.0	84.24	359.43	8,262.3	5,343.3	579.0	-75.0	578.8	4.55	364,911.47	596,517.25	
8,628.0	85.65	359.35	8,265.1	5,346.1	610.8	-75.4	610.7	4.41	364,943.34	596,516.91	
8,659.0	88.29	359.17	8,266.8	5,347.8	641.8	-75.8	641.7	8.54	364,974.29	596,516.51	
8,691.0	89.60	359.35	8,267.4	5,348.4	673.8	-76.2	673.6	4.13	365,006.28	596,516.10	
LP - 8691.0 'MD, 8267.4 'TVD, 359.35 'AZI, 89.60 'INC, 673.8 'N, -76.2 'E											
8,787.0	89.87	359.17	8,267.8	5,348.8	769.8	-77.4	769.6	0.34	365,102.27	596,514.86	
8,883.0	89.78	358.20	8,268.1	5,349.1	865.7	-79.6	865.6	1.01	365,198.24	596,512.66	
8,978.0	89.87	357.41	8,268.4	5,349.4	960.7	-83.3	960.5	0.84	365,293.17	596,509.02	
9,074.0	90.40	358.99	8,268.2	5,349.2	1,056.6	-86.3	1,056.5	1.74	365,389.12	596,506.00	
9,170.0	91.01	359.43	8,267.0	5,348.0	1,152.6	-87.6	1,152.4	0.78	365,485.11	596,504.68	
9,265.0	89.60	358.64	8,266.5	5,347.5	1,247.6	-89.2	1,247.4	1.70	365,580.09	596,503.08	
9,361.0	90.31	358.47	8,266.6	5,347.6	1,343.6	-91.6	1,343.4	0.76	365,676.06	596,500.66	
9,457.0	91.45	0.22	8,265.1	5,346.1	1,439.5	-92.7	1,439.4	2.18	365,772.03	596,499.56	
9,552.0	87.23	0.23	8,266.2	5,347.2	1,534.5	-92.4	1,534.3	4.44	365,867.01	596,499.93	
9,647.0	87.49	0.84	8,270.6	5,351.6	1,629.4	-91.5	1,629.2	0.70	365,961.90	596,500.82	
9,743.0	90.04	2.42	8,272.6	5,353.6	1,725.3	-88.7	1,725.2	3.12	366,057.83	596,503.55	
9,838.0	92.15	3.48	8,270.8	5,351.8	1,820.2	-83.9	1,820.0	2.49	366,152.68	596,508.44	
9,933.0	89.87	2.95	8,269.1	5,350.1	1,915.0	-78.5	1,914.9	2.46	366,247.51	596,513.76	
10,029.0	87.23	1.02	8,271.6	5,352.6	2,010.9	-75.2	2,010.8	3.41	366,343.41	596,517.09	
10,124.0	87.93	0.49	8,275.6	5,356.6	2,105.8	-74.0	2,105.7	0.92	366,438.31	596,518.34	
10,219.0	89.96	0.84	8,277.3	5,358.3	2,200.8	-72.9	2,200.6	2.17	366,533.28	596,519.44	
10,314.0	89.08	359.79	8,278.1	5,359.1	2,295.8	-72.3	2,295.6	1.44	366,628.28	596,519.96	



Pathfinder Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
10,410.0	88.20	359.35	8,280.4	5,361.4	2,391.7	-73.1	2,391.6	1.02	366,724.25	596,519.24	
10,505.0	87.49	358.20	8,284.0	5,365.0	2,486.7	-75.1	2,486.5	1.42	366,819.15	596,517.21	
10,601.0	88.11	357.59	8,287.7	5,368.7	2,582.5	-78.6	2,582.4	0.91	366,915.02	596,513.69	
10,697.0	89.69	356.80	8,289.5	5,370.5	2,678.4	-83.3	2,678.2	1.84	367,010.88	596,508.99	
10,792.0	94.26	358.82	8,286.2	5,367.2	2,773.2	-86.9	2,773.1	5.26	367,105.73	596,505.36	
10,888.0	92.33	1.89	8,280.7	5,361.7	2,869.0	-86.3	2,868.9	3.77	367,201.55	596,505.96	
10,984.0	92.42	2.95	8,276.7	5,357.7	2,964.9	-82.3	2,964.7	1.11	367,297.38	596,510.01	
11,079.0	90.13	2.60	8,274.6	5,355.6	3,059.7	-77.7	3,059.6	2.44	367,392.24	596,514.61	
11,175.0	88.37	2.60	8,275.9	5,356.9	3,155.6	-73.3	3,155.5	1.83	367,488.13	596,518.96	
11,271.0	88.81	3.21	8,278.2	5,359.2	3,251.5	-68.5	3,251.3	0.78	367,583.97	596,523.83	
11,367.0	89.60	2.86	8,279.6	5,360.6	3,347.3	-63.4	3,347.2	0.90	367,679.83	596,528.91	
11,462.0	88.02	3.12	8,281.5	5,362.5	3,442.2	-58.4	3,442.1	1.69	367,774.68	596,533.86	
11,558.0	88.11	3.83	8,284.8	5,365.8	3,537.9	-52.6	3,537.8	0.75	367,870.45	596,539.68	
11,654.0	89.78	3.83	8,286.5	5,367.5	3,633.7	-46.2	3,633.6	1.74	367,966.21	596,546.09	
11,748.0	90.66	3.12	8,286.2	5,367.2	3,727.5	-40.5	3,727.5	1.20	368,060.04	596,551.79	
11,843.0	90.40	1.81	8,285.3	5,366.3	3,822.4	-36.4	3,822.4	1.41	368,154.94	596,555.87	
11,939.0	91.72	0.84	8,283.5	5,364.5	3,918.4	-34.2	3,918.3	1.71	368,250.90	596,558.09	
12,033.0	90.22	0.75	8,281.9	5,362.9	4,012.4	-32.9	4,012.3	1.60	368,344.87	596,559.40	
12,128.0	89.69	1.63	8,282.0	5,363.0	4,107.3	-30.9	4,107.3	1.08	368,439.85	596,561.37	
12,224.0	88.29	2.25	8,283.7	5,364.7	4,203.3	-27.7	4,203.2	1.59	368,535.78	596,564.62	
12,319.0	87.77	2.25	8,287.0	5,368.0	4,298.1	-24.0	4,298.1	0.55	368,630.65	596,568.35	
12,415.0	87.76	3.00	8,290.7	5,371.7	4,394.0	-19.6	4,393.9	0.78	368,726.47	596,572.74	
12,510.0	88.99	1.71	8,293.4	5,374.4	4,488.9	-15.7	4,488.8	1.88	368,821.35	596,576.64	
12,640.0	90.04	0.18	8,294.5	5,375.5	4,618.8	-13.5	4,618.8	1.43	368,951.32	596,578.78	
12,734.0	88.72	358.04	8,295.5	5,376.5	4,712.8	-15.0	4,712.8	2.67	369,045.30	596,577.33	
12,830.0	89.96	356.37	8,296.6	5,377.6	4,808.7	-19.7	4,808.6	2.17	369,141.17	596,572.64	
12,925.0	88.72	355.71	8,297.7	5,378.7	4,903.4	-26.2	4,903.4	1.48	369,235.94	596,566.08	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Eddy County(NAD27)
Site: Copperhead 31 Fed Com
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
MD Reference: KB = 18' @ 2919.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
13,020.0	88.29	357.68	8,300.2	5,381.2	4,998.2	-31.7	4,998.2	2.12	369,330.74	596,560.61
13,116.0	89.52	359.15	8,302.0	5,383.0	5,094.2	-34.3	5,094.1	2.00	369,426.68	596,557.95
13,211.0	89.78	0.14	8,302.6	5,383.6	5,189.2	-34.9	5,189.1	1.08	369,521.68	596,557.37
13,306.0	89.96	0.16	8,302.8	5,383.8	5,284.2	-34.7	5,284.1	0.19	369,616.68	596,557.61
13,401.0	90.13	359.68	8,302.8	5,383.8	5,379.2	-34.8	5,379.1	0.54	369,711.68	596,557.48
13,498.0	90.13	359.68	8,302.5	5,383.5	5,476.2	-35.4	5,476.1	0.00	369,808.68	596,556.94

BHL - 13498.0 'MD, 8302.5 'TVD, 359.68 'AZI, 90.13 'INC, 5476.2 'N, -35.4 'E

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
7,770.0	7,767.1	7.8	-102.6	KOP - 7770.0 'MD, 7767.1 'TVD, 323.93 'AZI, 1.93 'INC, 7.8 'N, -102.6 'E
8,691.0	8,267.4	673.8	-76.2	LP - 8691.0 'MD, 8267.4 'TVD, 359.35 'AZI, 89.60 'INC, 673.8 'N, -76.2 'E
13,498.0	8,302.5	5,476.2	-35.4	BHL - 13498.0 'MD, 8302.5 'TVD, 359.68 'AZI, 90.13 'INC, 5476.2 'N, -35.4 'E

Checked By: _____ Approved By: _____ Date: _____



Project: Eddy County(NAD27)
Site: Copperhead 31 Fed
Well: #2H
Wellbore: OH
Plan: Post Gyro Plan #3 (#2H/OH)

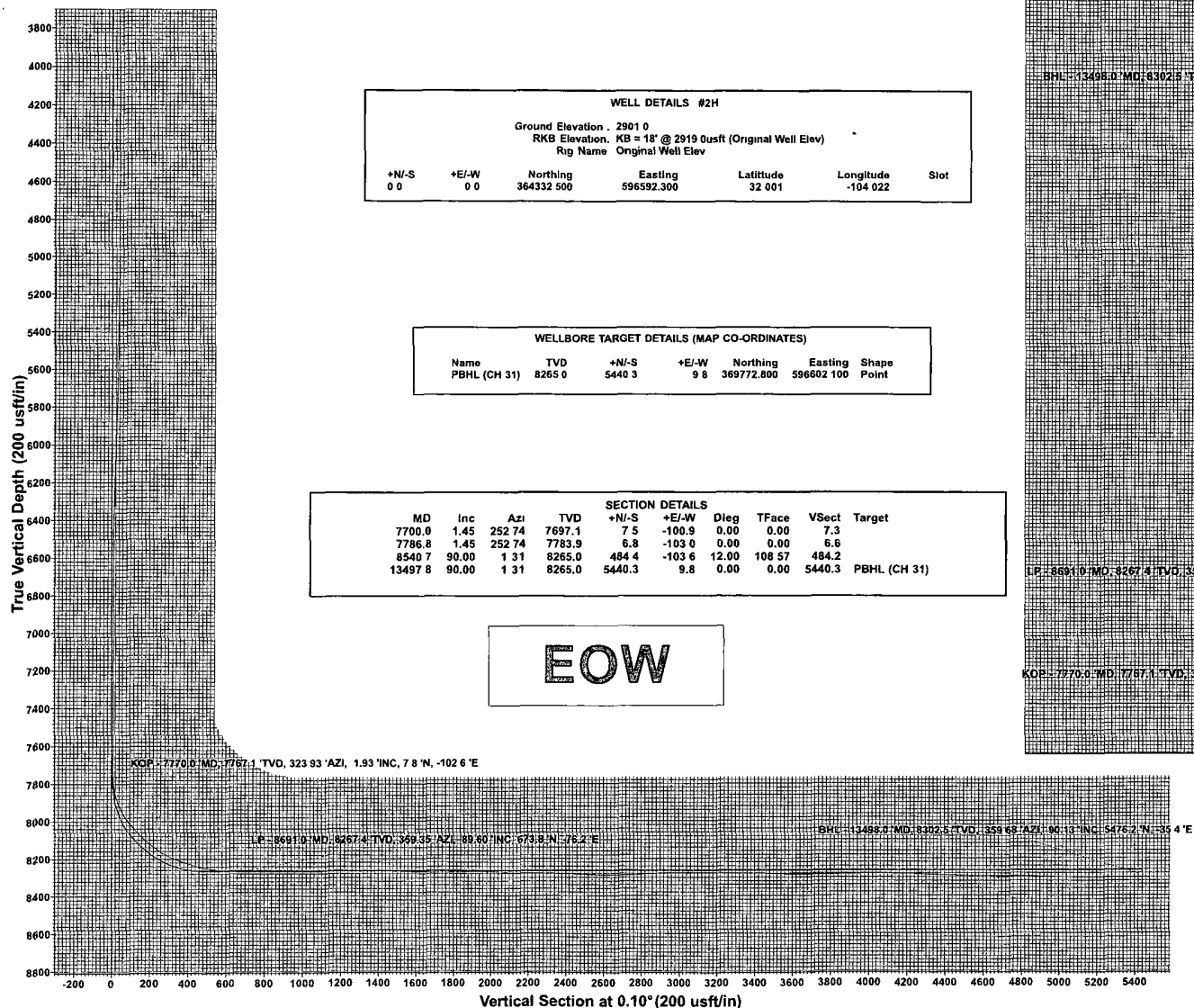


Azimuths to Grid North
True North: -0.17°
Magnetic North: 7.53°

Magnetic Field
Strength: 48366.1snT
Dip Angle: 59.88°
Date: 2/23/2012
Model: IGRF2010



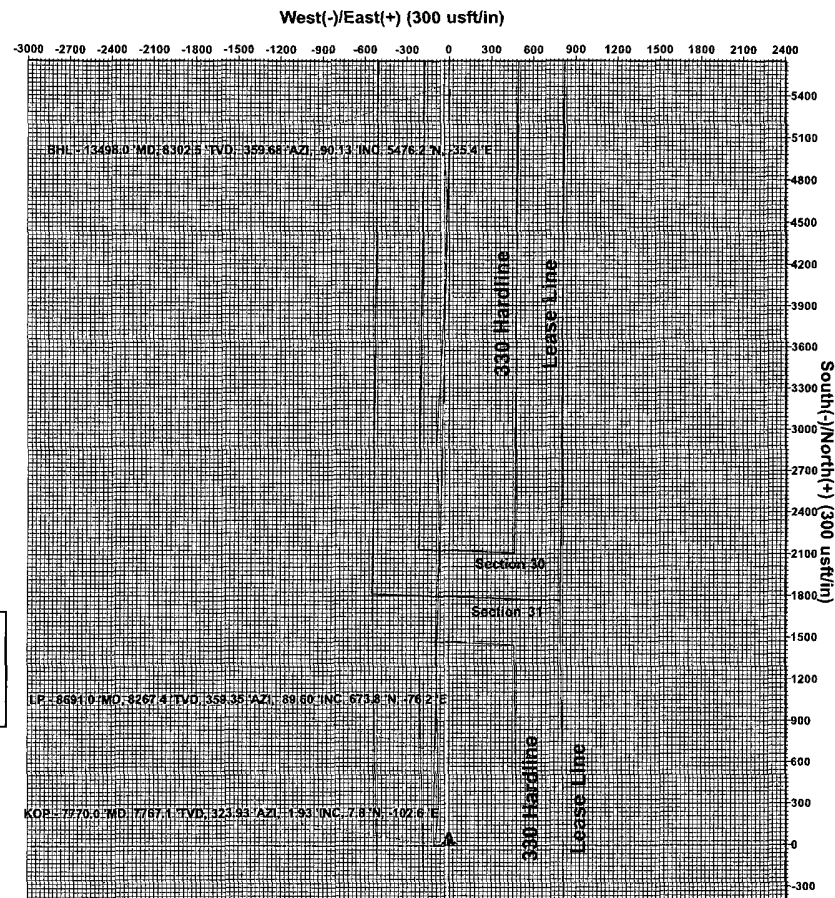
A Schlumberger Company



WELL DETAILS #2H						
Ground Elevation: 2901.0						
RKB Elevation: KB = 18' @ 2919.0usft (Original Well Elev)						
Rig Name: Original Well Elev						
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0.0	0.0	364332.500	596592.300	32.001	-104.022	

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)						
Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL (CH 31)	8265.0	5440.3	9.8	369772.800	596602.100	Point

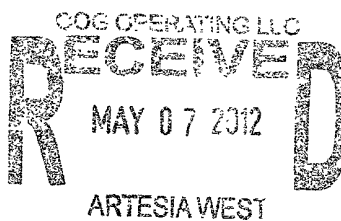
SECTION DETAILS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSeet	Target
7700.0	1.45	252.74	7697.1	7.5	-100.9	0.00	0.00	7.3	
7786.8	1.45	252.74	7783.9	6.8	-103.0	0.00	0.00	6.6	
8540.7	90.00	1.31	8265.0	484.4	-103.6	12.00	108.57	484.2	
13497.8	90.00	1.31	8265.0	5440.3	9.8	0.00	0.00	5440.3	PBHL (CH 31)



PROJECT DETAILS: Eddy County(NAD27)
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

Plan Post Gyro Plan #3 (#2H/OH)			
Created By	Michael Trout	Date	16-18, April 09 2012
Checked		Date	

COD Operating LLC
Eddy County(NAD27)
Copperhead 31 Fed Cam
#2H
Original Well Elev
OH
Post Gyro Plan #3



ROTARY SIDEWALL CORE ANALYSIS REPORT
FOR
COG OPERATING, LLC.
COPPERHEAD 31 FED COM # 2H
EDDY COUNTY, NEW MEXICO

COG OPERATING, LLC.
COPPERHEAD 31 FED COM # 2H
EDDY COUNTY, NEW MEXICO
U.S.A.
File: MD-56951



March 28, 2012

COG OPERATING, LLC.
550 W. Texas Street, Suite 100
Midland, TX. 79701

Attn: ANDREW McCARTHY

RE: COPPERHEAD 31 FED COM # 2H
Rotary Sidewall Core Analysis

Mr. McCARTHY:

The core analysis data from the above referenced well is enclosed in the following pages.

All quality control data is enclosed in a separate section of the report. The data, results, and digital images will be maintained in our files for your future reference. If you have any questions regarding our results or procedures, please do not hesitate to contact us. We appreciate the opportunity to analyze the core from the above referenced well and look forward to working with you again in the future.

DISTRIBUTION

COG OPERATING, LLC.
Attn: ANDREW McCARTHY
550 W. Texas Street, Suite 100
Midland, TX. 79701
4 Copies of the Report 1 with Photographs and 1 USB Drive

OXY PERMIAN, LTD.
Attn: SALLY DEHN
5 Greenway Plaza, Suite 110
Houston, TX. 77046-0521
1 Copy of the Report

COG OPERATING, LLC.
Attn: CONCHO WEST FIELD OFFICE
2208 West Main Street
Artesia, NM. 88210
1 Copy of the Report

Sincerely,

A handwritten signature in black ink, appearing to read "Wayne Helms", is written over a faint, larger version of the same signature.

Wayne Helms, General Manager
Weatherford Laboratories

COG OPERATING, LLC.
COPPERHEAD 31 FED COM # 2H
EDDY COUNTY, NEW MEXICO
U.S.A.
File:MD-56951



CORE ANALYSIS PROCEDURES

FOR

COG OPERATING, LLC.

COPPERHEAD 31 FED COM # 2H

EDDY COUNTY, NEW MEXICO

The Rotary Sidewalls were picked up by Weatherford Laboratories.

Gases from the Sidewalls were measured by Hot Wire Chromatography and reported in Gas Units.

A brief Lithological Description of the Sidewalls was recorded.

A description of the Fluorescence of the Sidewalls was recorded.

Ultraviolet Light Photographs were taken of the Sidewalls for a permanent record.

Natural Light Photographs were taken of the Sidewalls for a permanent record.

Composite Photographs of the Sidewall End Trims were taken under Natural and Ultraviolet Light.

The Sidewalls were extracted utilizing the Dean Stark method.

The fluids were measured by the Dean Stark method.

Porosities were measured in a Boyle's Law Porosimeter utilizing Helium.

Permeabilities were measured in a Hassler Sleeve Permeameter utilizing Nitrogen at 300 psi confining pressure.

Test samples of a known permeability were measured before and after the Sidewall permeabilities were measured.

COG OPERATING, LLC.
COPPERHEAD 31 FED COM # 2H
EDDY COUNTY, NEW MEXICO
U.S.A.
File:MD-56951



Weatherford

LABORATORIES

ROTARY SIDEWALL CORE ANALYSIS

COG PRODUCTION, LLC
COPPERHEAD 31 FED COM NO. 2H
EDDY COUNTY, NEW MEXICO

A.P.I. NUMBER : 30-015-39791
FIELD : Hay Hollow (Bone Spring)
LOCATION: 480' FSL, 2140' FEL,
Section 31, T-26-S, R-29-E

FILE NO. : MD-56951
DATE : April 11, 2012
ANALYSTS : WH, SB, JR

DEAN STARK EXTRACTION

SAMPLE NO.	DEPTH ft	GRAIN	POR %	PERM mD	SATURATIONS		GAS UNITS	FLUORESCENCE		LITHOLOGY
		DENSITY			Sw	So		%		
1	6900.0						937	0		Sh dk gy-blk slty sc sml ls incl
2	7000.5						919	0		Sh dk gy-blk slty calc fd frac
3	7050.5						60	0	Mf	Ls gy-dk gy dns sslty sshy
4	7210.0	2.56	3.0	tbfa	65.0	0.0	946	0	Mf	Sh dk gy-blk slty ls x-bd
5	7252.0	2.50	6.7	tbfa	55.6	0.0	478	0		Sh dk gy-blk slty sc pyr
6	7305.0	2.70	4.7	<.001	50.3	8.0	585	60	Yl-dl gld	Ss opaq-gy-tn vf-fgr sbrnd-sbang sslty scalc abd shy lam
7	7375.0	2.64	1.3	<.001	88.0	0.0	51	0		Sh dk gy-blk slty sdy sc sml ls incl sc pyr
8	7417.0	2.61	1.8	<.001	98.1	0.0	156	0		Sh dk gy-blk slty sc slty lam tr pyr
9	7453.5	2.68	3.1	<.001	76.8	0.0	301	0		Sh gy-dk gy-blk slty sdy
10	7515.0	2.56	2.5	<.001	47.4	0.0	230	0		Sh dk gy-blk slty tr pyr
11	7690.0	2.69	1.0	tbfa	87.5	0.0	45	0	Mf	Ls brn-dk gy dns sslty sshy sc pyr
12	7861.0	2.67	0.7	<.001	79.3	0.0	79	0	Mf	Ls brn-dk gy dns sslty sshy sc pyr
13	7962.0	2.69	6.0	<.001	67.2	0.0	57	0	Mf	Ss opaq-tn-gy vf-fgr sbrnd-sbang sslty scalc sc shy intrbd
14	8000.0	2.68	0.7	<.001	87.5	0.0	186	0		Ls brn-dk gy dns sslty sshy lrg shy x-bd sc pyr
15	8032.8	2.68	0.4	<.001	95.1	0.0	21	0		Ls brn-dk gy dns sslty sshy tr pyr
16	8055.0	2.66	2.8	<.001	80.0	0.0	98	0		Sh dk gy-blk slty sc sml ls incl
17	8080.0	2.69	3.5	<.001	78.5	0.0	349	0		Ss opaq-gy-tn vf-fgr sbrnd-sbang sslty mod calc abd shy lam
18	8137.5	2.65	1.5	<.001	88.1	0.0	43	0	Mf	Ls brn-gy sslty abd shy lam
19	8162.0	2.69	7.5	<.001	63.9	7.0	125	60	DI yl-blu	Ss opaq-gy-tn vf-fgr sbrnd-sbang sslty mod calc abd slty lam



Weatherford[®]

LABORATORIES

COG PRODUCTION, LLC
COPPERHEAD 31 FED COM NO. 2H
EDDY COUNTY, NEW MEXICO

A.P.I. NUMBER : 30-015-39791
FIELD : Hay Hollow (Bone Spring)
LOCATION: 480' FSL, 2140' FEL,
Section 31, T-26-S, R-29-E

FILE NO. : MD-56951
DATE : April 11, 2012
ANALYSTS : WH, SB, JR

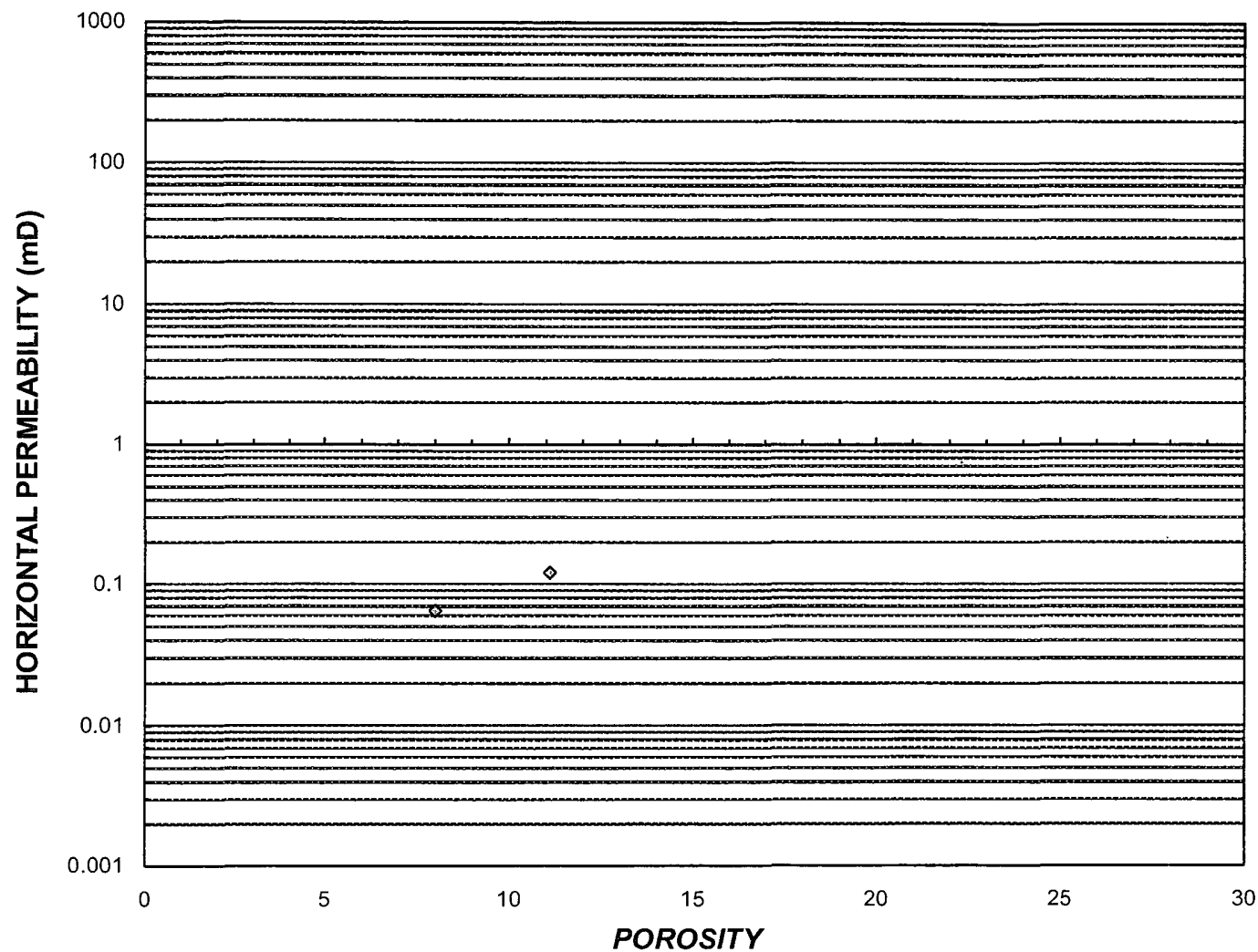
DEAN STARK EXTRACTION

SAMPLE NO.	DEPTH ft	GRAIN DENSITY	POR %	PERM mD	SATURATIONS		GAS UNITS	FLUORESCENCE		LITHOLOGY
					Sw	So		%		
20	8218.0	2.67	5.3	<.001	82.0	0.0	320	0		Sh dk gy-blk slty
21	8230.0	2.70	8.9	<.001	69.8	0.0	130	0	Mf	Ss opaq-tn-gy vf-fgr sbrnd-sbang sslty scalc sc slty intrbd
22	8260.0	2.68	11.1	0.120	37.0	17.0	725	80	Wht-blu	Ss opaq-tn-gy vf-fgr sbrnd-sbang sslty scalc
23	8270.0	2.72	8.0	0.064	42.7	16.8	533	80	Wht-blu	Ss opaq-tn-gy vf-fgr sbrnd-sbang sslty scalc
24	8278.0	2.69	8.3	<.001	71.2	0.0	236	0	Mf	Ss opaq-gy-tn vf-fgr sbrnd-sbang sslty scalc abd shy lam
25	8295.0	2.59	5.2	<.001	69.6	0.0	142	0		Sh dk gy-blk slty tr pyr
26	8325.0	2.68	6.5	<.001	67.5	0.0	488	0	Mf	Sh gy-dk gy-blk slty sdy sc slty intrbd
27	8340.0	2.62	4.9	<.001	74.5	0.0	928	0		Sh dk gy-blk slty tr pyr
28	8375.0	2.68	1.0	<.001	40.8	0.0	285	0		Ls gy-dk gy dns sslty sshy abd slty intrbd sc pyr



Weatherford
LABORATORIES

COG OPERATING, LLC
COPPERHEAD 31 FED COM # 2 H





Weatherford
LABORATORIES

COG PRODUCTION,LLC

COPPERHEAD 31 FED COM NO. 2H

4/25/2012

QUALITY CONTROL RERUN DATA

Sample No.	GRAIN DENSITY		POROSITY		<i>kstandard</i> Test Sample	PERMEABILITY	
	original	reruns	original	reruns		original	reruns
6	2.700	2.700	4.68	4.67	2.615	<.001	<.001
9	2.681	2.682	3.14	3.17		<.001	<.001
14	2.681	2.679	0.65	0.59		<.001	<.001
19	2.687	2.688	7.49	7.53		<.001	<.001
22	2.679	2.680	11.10	11.12		0.120	0.123
27	2.625	2.624	4.94	4.92	2.622	<.001	<.001

LITHOLOGICAL ABBREVIATIONS

Anhydrite (-ic)	anhy, anhyd	Filled	fd	Poor	pr
Anhydrite inclusion	A/I	Fine (-ly)	f, fnly	Pyrite	pyr
Bentonite (-ic)	bent	Fluorescence	flu	Quartz (-itic)	qtz
Black (-ish)	blk, blksh	Fossil (-iferous)	foss	Red	rd
Bleeding Oil	B/O	Fracture	frac	Round	rnd
Brecciated	brec	Fragments	frag	Residual Oil	So
Bright	brt	Friable	fri	Residual Water	Sw
Brittle	brit	Fusulinid	fus	Sample	Spl
Broken	brkn	Gilsonite	gil	Sandstone	Ss
Brown	brn	Gold	gld	Sandy	sdv
Buff	bf	Good	gd	Scattered	sc
Calcite (-ic)	calc, calctc	Grain (-s)	gr	Shaley	shy
Calcareous	calc	Granular	gran	Shale	sh
Carbonaceous	carb	Gray	gy	Shale parting	s/p
Cement	cmt	Gypsum	gyp	Silt (-y)	slt, slty
Chalk (-y)	chk, chky	Hair line(frac)	hl	Slight (-ly)	sli, s
Chert	cht	Halite	hal	Small	sml
Clay	cl	Inclusion	incl	Spotted (-y)	sp
Coal	c	Laminations (ated)	lam	Stringer	strgr
Coarse	crs	Large	lrg	Stylolite (-itic)	sty, styl
Conglomerate	cgl	Light	lt	Subround	sbrnd
Consolidated	consol	Limestone	ls	Subangular	sbang
Contaminated	contam	Limey	lmy	Sucrosic	suc
Crinoid (-al)	crin, crinal	Lithology	lith	Sulphur	su
Cross-bedded	x-bd	Medium	m	Tan	tn
Crystal (-line)	Xl, xln	Mineral Fluorescence	mf	Too broken (for Analysis)	tbfa
Dark	dk	Moderate	mod	Thin	thn
Dense	dns	Mudcake	m/c	Trace	Tr
Diameter	dia	No Show	N/S	Tripolitic	trip
Dolomite (ic)	dol, dolm	Oolite (-itic)	ool	Very	v
Dull	dl	Pale	pl	Vertical	vert, vt
Faint	fnt	Permeability	Perm, K	Vug (-gy)	vug
Fair	fr	Pin-Point Porosity	ppp		