

Results of Directional Survey

API number:	30-025-41390		
OGRID:		Operator:	COG OPERATING LLC
		Property:	CRAZY HORSE FEDERAL COM # 2H

surface	ULSTR:	E	18	T	19S	R	32E
				1750	FNL	420	FWL

5313

BH Loc	ULSTR:	H	18	T	19S	R	32E
13515	MD	9185.3	TVD	1853	FNL	343	FEL
						4970	FWL

Top Perf/OH	ULSTR:	E	18	T	19S	R	32E
9437	MD	9200.6	TVD	1698	FNL	899	FWL

Bot Perf/OH	ULSTR:	H	18	T	19S	R	32E
13460	MD	9188.2	TVD	1851	FNL	398	FEL
						4915	FWL

	MD	N/S	E/W	VD
	9405	58.01	448.78	9192
TOP PERFS/OH	9437	52.09	479.13	9200.58
	9437	52.09	479.13	9200.58
	13337	-94.73	4372.23	9194.71
BOT PERFS/OH	13460	-100.78	4494.91	9188.21
	13515	-103.48	4549.76	9185.30

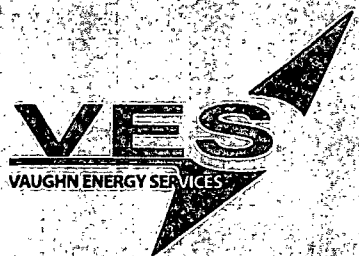
NEXT TO LAST	13337	-94.73	4372.23	9194.71
LAST READING	13515	-103.48	4549.76	9185.30
TD	13515	-103.48	4549.76	9185.30

Surface Location	1750	FN	420	FW
Projected BHL	1853	FN	4970	FW
Location of				
Top Perfs/OH	1698	FN	899	FW
Bottom Perfs/OH	1851	FN	4915	FW

SUMMARY of Subsurface Locations

Surface Location	E-18-19S-32E	1750	FN	420	FW	Vert. Depth
Top Perfs/OH	E-18-19S-32E	1698	FN	899	FW	9200.58
Bottom Perfs/OH	H-18-19S-32E	1851	FN	4915	FW	9188.21
Projected TD	H-18-19S-32E	1853	FN	4970	FW	9185.30

APR 21 2014



A GYRO TECHNOLOGIES INC. COMPANY

P.O. Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

January 7, 2014

HOBBS OCD

MAR 17 2014

RECEIVED

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, TX 79701

Attn: Kanicia Castillo

Re: **Crazy Horse Federal Com No 002H**

Please find enclosed a copy of the survey from 0' to 8,600' ran on the above referenced well.

If I can be of any further service, please do not hesitate to call me at 800-606-4976.

Sincerely,

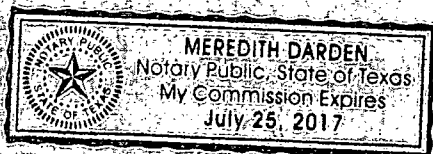
Keith Havelka
Operations

STATE OF TEXAS §

COUNTY OF NUECES §

This instrument was acknowledged before me on the 7th day of January
A.D., 2014, by Keith Havelka.

Meredith Darden
Notary Public, State of Texas





Company: COG Operating LLC-Concho
Lease/Well: Crazy Horse Federal Com/No 002H
Location: S18 T19s R32e
Rig Name: Patriot #6
State/County: New Mexico/Lea
Latitude: 32.66, Longitude: -103.81
GRID North is 0.28 Degrees East of True North
VS-Azi: 0.00 Degrees



HOBBS OCB

RKB : 18 Feet

MAR 17 2014

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: ...e federal #2h gyro survey.ut

Minimum Curvature Method

Report Date/Time: 1/7/2014 / 09:59

RECEIVED

Vaughn Energy Services

(432) 563-5444

Gardendale, TX 79758

Surveyor: Dustin Wedel

Crazy Horse Federal Com No 002H / API 30-025-41390

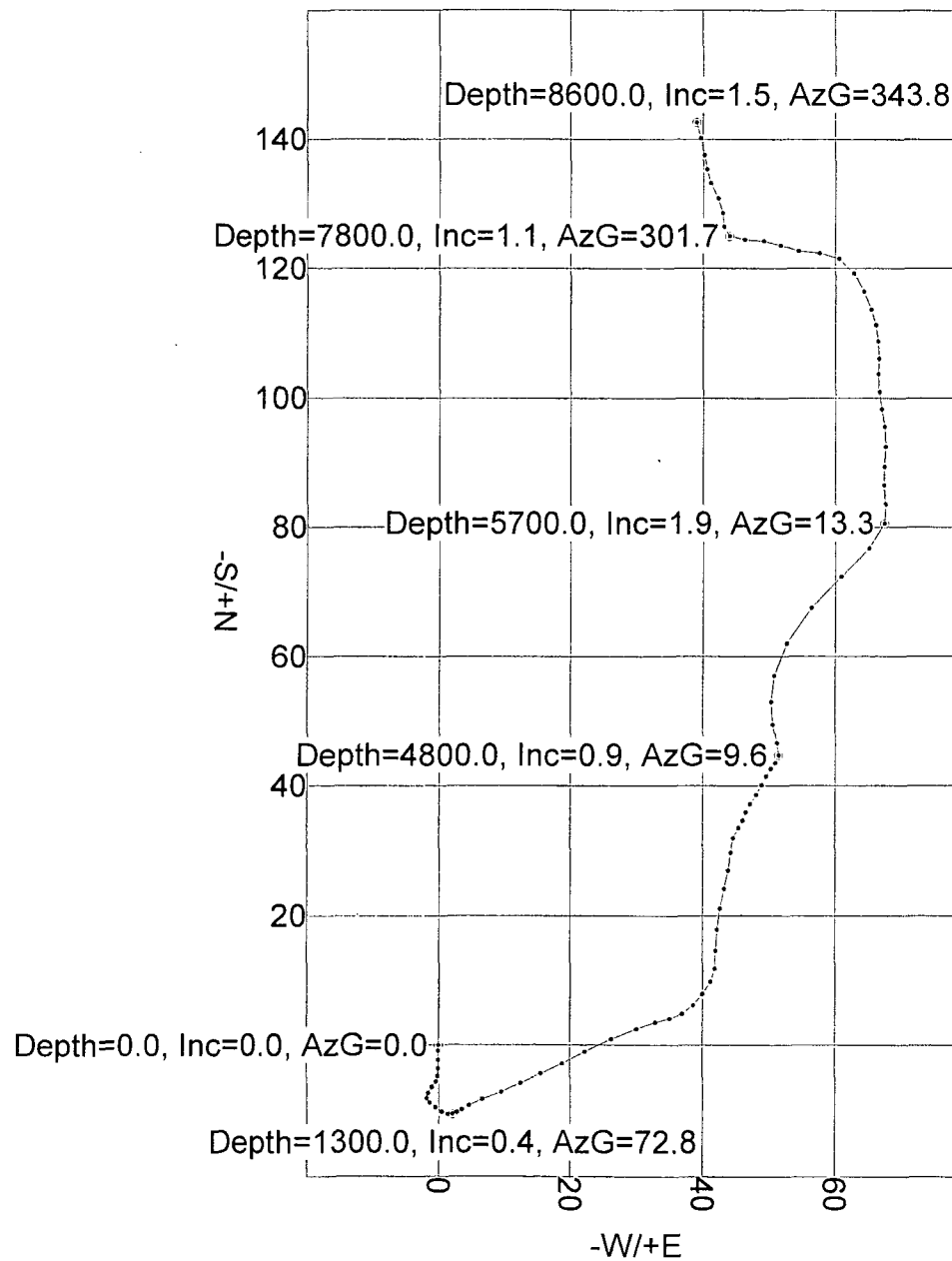
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	1.01	182.87	99.99	-0.88	-0.04	0.88	182.87	1.01
200.00	0.64	172.60	199.98	-2.32	-0.02	2.32	180.40	0.40
300.00	0.79	187.66	299.98	-3.56	-0.04	3.56	180.58	0.24
400.00	0.57	184.35	399.97	-4.74	-0.17	4.74	182.00	0.23
500.00	0.46	215.10	499.97	-5.56	-0.44	5.58	184.47	0.29
600.00	0.69	217.91	599.96	-6.37	-1.04	6.46	189.26	0.23
700.00	0.54	205.39	699.95	-7.27	-1.61	7.45	192.50	0.20
800.00	0.36	172.46	799.95	-8.01	-1.77	8.20	192.49	0.31
900.00	0.60	134.19	899.95	-8.68	-1.36	8.79	188.89	0.39
1000.00	0.70	125.70	999.94	-9.40	-0.49	9.41	182.98	0.14
1100.00	0.63	120.26	1099.94	-10.03	0.48	10.05	177.26	0.09
1200.00	0.46	104.68	1199.93	-10.41	1.35	10.50	172.63	0.22
1300.00	0.40	72.83	1299.93	-10.41	2.07	10.62	168.76	0.24
1400.00	0.46	60.74	1399.93	-10.11	2.75	10.48	164.78	0.11
1500.00	0.49	67.42	1499.92	-9.76	3.50	10.36	160.29	0.06
1600.00	0.90	56.67	1599.91	-9.16	4.54	10.23	153.62	0.43
1700.00	1.69	68.63	1699.89	-8.19	6.57	10.50	141.26	0.83
1800.00	1.79	69.69	1799.84	-7.11	9.42	11.80	127.06	0.11

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	1.89	63.94	1899.79	-5.84	12.37	13.68	115.29	0.21
2000.00	2.12	66.46	1999.73	-4.38	15.55	16.15	105.72	0.25
2100.00	2.03	63.83	2099.66	-2.85	18.84	19.06	98.62	0.13
2200.00	2.40	60.30	2199.59	-1.04	22.25	22.28	92.66	0.39
2300.00	2.66	66.54	2299.49	0.92	26.20	26.21	87.98	0.38
2400.00	2.06	68.39	2399.41	2.51	29.99	30.10	85.22	0.60
2500.00	1.43	73.09	2499.36	3.53	32.85	33.04	83.86	0.65
2600.00	1.14	77.74	2599.33	4.11	35.02	35.26	83.31	0.30
2700.00	1.24	60.26	2699.31	4.85	36.93	37.25	82.51	0.37
2800.00	1.21	41.65	2799.29	6.18	38.57	39.06	80.90	0.40
2900.00	1.36	37.82	2899.26	7.90	40.00	40.77	78.83	0.18
3000.00	1.22	26.38	2999.24	9.79	41.20	42.35	76.63	0.29
3100.00	1.26	8.73	3099.22	11.83	41.84	43.48	74.21	0.38
3200.00	1.93	0.64	3199.18	14.60	42.02	44.49	70.84	0.71
3300.00	1.82	5.77	3299.12	17.87	42.20	45.83	67.06	0.20
3400.00	1.96	9.78	3399.07	21.14	42.65	47.60	63.64	0.19
3500.00	1.57	13.65	3499.02	24.15	43.27	49.55	60.83	0.41
3600.00	1.69	9.75	3598.98	26.94	43.84	51.45	58.43	0.17
3700.00	1.53	6.00	3698.94	29.72	44.23	53.29	56.10	0.20
3800.00	1.12	18.14	3798.92	31.97	44.67	54.93	54.41	0.49
3900.00	0.92	36.41	3898.90	33.54	45.45	56.49	53.57	0.38
4000.00	0.59	18.52	3998.89	34.67	46.09	57.68	53.05	0.40
4100.00	0.92	21.04	4098.88	35.91	46.54	58.78	52.35	0.33
4200.00	0.75	34.23	4198.87	37.20	47.20	60.09	51.76	0.25
4300.00	1.18	30.32	4298.86	38.62	48.08	61.67	51.23	0.43
4400.00	0.76	28.26	4398.84	40.09	48.91	63.24	50.66	0.42
4500.00	0.99	24.64	4498.83	41.46	49.59	64.63	50.10	0.23
4600.00	0.59	38.69	4598.82	42.64	50.26	65.91	49.69	0.44
4700.00	0.68	35.91	4698.82	43.52	50.93	66.99	49.49	0.09
4800.00	0.88	9.58	4798.81	44.75	51.41	68.15	48.96	0.40
4900.00	1.37	341.51	4898.79	46.64	51.15	69.22	47.64	0.73
5000.00	1.92	353.20	4998.75	49.44	50.57	70.72	45.65	0.64
5100.00	2.19	359.47	5098.68	53.01	50.36	73.12	43.53	0.36
5200.00	2.48	11.75	5198.60	57.04	50.78	76.37	41.68	0.58
5300.00	3.68	26.82	5298.45	62.03	52.67	81.37	40.34	1.44
5400.00	4.00	40.07	5398.23	67.56	56.37	87.99	39.84	0.94
5500.00	3.55	47.67	5498.02	72.32	60.90	94.54	40.10	0.68
5600.00	3.47	40.61	5597.83	76.70	65.16	100.64	40.35	0.44
5700.00	1.85	13.33	5697.72	80.57	67.50	105.11	39.96	2.01

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5800.00	1.65	354.27	5797.67	83.58	67.73	107.58	39.02	0.61
5900.00	1.68	357.81	5897.63	86.48	67.53	109.72	37.99	0.11
6000.00	1.65	3.36	5997.59	89.38	67.56	112.04	37.08	0.16
6100.00	1.88	2.70	6097.54	92.46	67.72	114.61	36.22	0.23
6200.00	1.74	350.46	6197.49	95.59	67.55	117.05	35.25	0.41
6300.00	1.39	350.70	6297.46	98.28	67.10	119.00	34.32	0.35
6400.00	1.75	354.28	6397.42	100.99	66.75	121.06	33.46	0.38
6500.00	1.43	3.56	6497.38	103.76	66.68	123.33	32.73	0.42
6600.00	1.29	359.07	6597.35	106.13	66.74	125.37	32.16	0.17
6700.00	1.76	354.87	6697.32	108.79	66.58	127.54	31.47	0.48
6800.00	1.13	347.31	6797.28	111.28	66.23	129.49	30.76	0.66
6900.00	1.74	340.65	6897.25	113.67	65.51	131.19	29.96	0.63
7000.00	1.70	334.71	6997.21	116.44	64.37	133.05	28.93	0.18
7100.00	1.94	329.28	7097.16	119.24	62.87	134.80	27.80	0.30
7200.00	1.87	300.67	7197.10	121.53	60.60	135.80	26.50	0.95
7300.00	1.82	270.28	7297.05	122.37	57.61	135.26	25.21	0.97
7400.00	1.88	282.33	7397.00	122.73	54.42	134.26	23.91	0.39
7500.00	1.42	295.26	7496.96	123.61	51.70	133.99	22.70	0.59
7600.00	1.61	274.80	7596.93	124.25	49.19	133.64	21.60	0.57
7700.00	1.71	273.96	7696.89	124.47	46.31	132.81	20.41	0.10
7800.00	1.07	301.74	7796.86	125.06	44.04	132.59	19.40	0.91
7900.00	1.08	356.35	7896.84	126.49	43.19	133.66	18.85	0.99
8000.00	1.34	354.25	7996.82	128.60	43.01	135.60	18.49	0.26
8100.00	1.44	331.16	8096.79	130.86	42.29	137.52	17.91	0.56
8200.00	1.58	337.65	8196.76	133.23	41.16	139.45	17.17	0.22
8300.00	0.95	356.37	8296.73	135.34	40.58	141.29	16.69	0.74
8400.00	1.62	348.35	8396.71	137.55	40.24	143.32	16.31	0.68
8500.00	1.44	347.26	8496.67	140.16	39.68	145.67	15.81	0.18
8600.00	1.45	343.77	8596.64	142.60	39.05	147.85	15.31	0.09



Vaughn Energy Services
(432) 563-5444
Gardendale, TX 79758
Surveyor: Dustin Wedel
Crazy Horse Federal Com No 002H / API 30-025-41390



VES Survey Date: 12/16/2013

PathFinder – a Schlumberger company

BHL Report

Page 01/01
Tie-in Date: 12/16/2013
Date Completed: 12/22/2013

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY, NEW MEXICO
API#: 30-025-41390 Rig: PATRIOT 6
PathFinder Office Supervisor: JOSEPH HOGAN
PathFinder Field Engineers: F.LICERO
 B.FULTON

Survey Horiz. Reference: WELLHEAD
Ref Coordinates: LAT: 32.39.46.2387 N LON: 103.48.44.5664 W
GRID Reference: NAD27 new mexico east Transverse Mercator
Ref GRID Coord: X: 660321.3000 Y: 605247.2000
North Aligned To: GRID NORTH
Total Magnetic Correction: 7.14° EAST TO GRID
Vertical Section Plane: 91.51
Survey Vert. Reference: 18.00' Kelly Bushing To Ground
Altitude: 3600.70' Ground To MSL

Measured Depth	13515.00	(feet)
Inclination	93.03	(deg)
Azimuth	92.82	(deg)
True Vertical Depth	9185.30	(feet)
Vertical Section	4550.91	(feet)
Survey X cord	664871.06	(feet)
Survey Y cord	605143.72	(feet)
Survey Lat	32.66249743 N	(deg)
Survey Lon	103.79759764 W	(deg)
Rectangular Corr. N/S	103.48 S	(feet)
Rectangular Corr. E/W	4549.76 E	(feet)
Closure Distance	4550.94	(feet)
Direction of Closure	91.30	(deg)
Dogleg Severity	0.00	(deg/100ft)

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY COUNTY, NEW MEXICO
API#: 30-025-41390 RIG: PATRIOT 6
PathFinder Office Supervisor: JOSEPH HOGAN
PathFinder Field Engineers: F.LICERO
B.FULTON

HOBBS OGD

MAR 17 2014

RECEIVED

Survey Horiz. Reference: WELLHEAD
Ref Coordinates: LAT: 32.39.46.2387 N LON: 103.48.44.5664 W
GRID Reference: NAD27 new mexico east Transverse Mercator
Ref GRID Coord: X: 660321.3000 Y: 605247.2000
North Aligned To: GRID NORTH
Total Magnetic Correction: 7.14° EAST TO GRID
Vertical Section Plane: 91.51
Survey Vert. Reference: 18.00' Kelly Bushing To Ground
Altitude: 3600.70' Ground To MSL

Survey Calculations by RX5 V6.05 using Minimum Curvature

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
THE FOLLOWING ARE VAUGHN ENERGY SERVICES GYRO SURVEY.										
100.00	1.01	182.87	100.00	0.00	-0.02	0.88 S	0.05 W	0.88@	183.12	0.00
200.00	0.64	172.60	199.99	100.00	0.04	2.31 S	0.02 W	2.31@	180.50	0.40
300.00	0.79	187.66	299.98	100.00	0.05	3.55 S	0.04 W	3.55@	180.65	0.24
400.00	0.57	184.35	399.97	100.00	-0.04	4.73 S	0.17 W	4.73@	182.05	0.22
500.00	0.46	215.10	499.97	100.00	-0.29	5.55 S	0.44 W	5.57@	184.51	0.29
600.00	0.69	217.91	599.96	100.00	-0.87	6.36 S	1.04 W	6.44@	189.28	0.23
700.00	0.54	205.39	699.96	100.00	-1.42	7.26 S	1.61 W	7.43@	192.52	0.20
800.00	0.36	172.46	799.95	100.00	-1.56	7.99 S	1.77 W	8.19@	192.50	0.31
900.00	0.60	134.19	899.95	100.00	-1.13	8.67 S	1.36 W	8.77@	188.88	0.39
1000.00	0.70	125.70	999.94	100.00	-0.24	9.39 S	0.48 W	9.40@	182.95	0.14
1100.00	0.63	120.26	1099.94	100.00	0.75	10.02 S	0.49 E	10.04@	177.22	0.09
1200.00	0.46	104.68	1199.93	100.00	1.62	10.40 S	1.35 E	10.49@	172.60	0.22
1300.00	0.40	72.83	1299.93	100.00	2.35	10.40 S	2.07 E	10.61@	168.73	0.24
1400.00	0.46	60.74	1399.93	100.00	3.02	10.10 S	2.76 E	10.47@	164.74	0.11
1500.00	0.49	67.42	1499.92	100.00	3.76	9.74 S	3.50 E	10.35@	160.23	0.06
1600.00	0.90	56.67	1599.92	100.00	4.79	9.15 S	4.55 E	10.22@	153.54	0.43
1700.00	1.69	68.63	1699.89	100.00	6.79	8.18 S	6.58 E	10.50@	141.17	0.83
1800.00	1.79	69.69	1799.84	100.00	9.60	7.10 S	9.42 E	11.79@	127.00	0.10
1900.00	1.89	63.94	1899.79	100.00	12.51	5.83 S	12.37 E	13.67@	115.25	0.21
2000.00	2.12	66.46	1999.73	100.00	15.65	4.37 S	15.54 E	16.14@	105.70	0.25
2100.00	2.03	63.83	2099.67	100.00	18.90	2.85 S	18.83 E	19.04@	98.60	0.13
2200.00	2.40	60.30	2199.59	100.00	22.26	1.03 S	22.24 E	22.26@	92.65	0.39
2300.00	2.66	66.54	2299.49	100.00	26.15	0.93 N	26.18 E	26.20@	87.96	0.38
2400.00	2.06	68.39	2399.41	100.00	29.91	2.52 N	29.98 E	30.09@	85.20	0.60
2500.00	1.43	73.09	2499.36	100.00	32.74	3.54 N	32.85 E	33.04@	83.85	0.65

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY COUNTY, NEW MEXICO
API#: 30-025-41390 Rig: PATRIOT 6

Page 02/06

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
2600.00	1.14	77.74	2599.34	100.00	34.89	4.12 N	35.01 E	35.26@	83.30	0.31
2700.00	1.24	60.26	2699.32	100.00	36.78	4.86 N	36.93 E	37.24@	82.50	0.38
2800.00	1.21	41.65	2799.29	100.00	38.39	6.19 N	38.57 E	39.06@	80.88	0.40
2900.00	1.36	37.82	2899.27	100.00	39.77	7.92 N	40.00 E	40.77@	78.81	0.17
3000.00	1.22	26.38	2999.24	100.00	40.92	9.81 N	41.20 E	42.35@	76.61	0.29
3100.00	1.26	8.73	3099.22	100.00	41.51	11.85 N	41.84 E	43.48@	74.19	0.38
3200.00	1.93	0.64	3199.18	100.00	41.62	14.62 N	42.02 E	44.49@	70.82	0.71
3300.00	1.82	5.77	3299.13	100.00	41.71	17.88 N	42.20 E	45.83@	67.04	0.20
3400.00	1.96	9.78	3399.07	100.00	42.08	21.15 N	42.65 E	47.61@	63.63	0.19
3500.00	1.57	13.65	3499.02	100.00	42.61	24.16 N	43.26 E	49.56@	60.82	0.41
3600.00	1.69	9.75	3598.98	100.00	43.11	26.95 N	43.84 E	51.46@	58.42	0.16
3700.00	1.53	6.00	3698.94	100.00	43.43	29.73 N	44.23 E	53.29@	56.09	0.19
3800.00	1.12	18.14	3798.92	100.00	43.81	31.99 N	44.67 E	54.94@	54.40	0.49
3900.00	0.92	36.41	3898.90	100.00	44.55	33.56 N	45.45 E	56.50@	53.56	0.38
4000.00	0.59	18.52	3998.89	100.00	45.16	34.69 N	46.09 E	57.69@	53.03	0.40
4100.00	0.92	21.04	4098.88	100.00	45.58	35.93 N	46.54 E	58.80@	52.33	0.33
4200.00	0.75	34.23	4198.87	100.00	46.20	37.22 N	47.20 E	60.11@	51.74	0.25
4300.00	1.18	30.32	4298.86	100.00	47.05	38.65 N	48.09 E	61.70@	51.21	0.43
4400.00	0.76	28.26	4398.85	100.00	47.85	40.13 N	48.92 E	63.27@	50.64	0.42
4500.00	0.99	24.64	4498.83	100.00	48.49	41.49 N	49.60 E	64.67@	50.08	0.24
4600.00	0.59	38.69	4598.82	100.00	49.14	42.68 N	50.28 E	65.95@	49.67	0.44
4700.00	0.68	35.91	4698.82	100.00	49.78	43.56 N	50.95 E	67.03@	49.47	0.09
4800.00	0.88	9.58	4798.81	100.00	50.23	44.80 N	51.42 E	68.20@	48.94	0.41
4900.00	1.37	341.51	4898.79	100.00	49.92	46.69 N	51.17 E	69.27@	47.62	0.72
5000.00	1.92	353.20	4998.75	100.00	49.27	49.49 N	50.59 E	70.78@	45.63	0.64
5100.00	2.19	359.47	5098.68	100.00	48.96	53.06 N	50.38 E	73.17@	43.51	0.35
5200.00	2.48	11.75	5198.60	100.00	49.28	57.09 N	50.80 E	76.42@	41.66	0.58
5300.00	3.68	26.82	5298.46	100.00	51.04	62.08 N	52.69 E	81.42@	40.32	1.44

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY COUNTY, NEW MEXICO
API#: 30-025-41390 Rig: PATRIOT 6

Page 03/06

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
5400.00	4.00	40.07	5398.23	100.00	54.58	67.61 N	56.38 E	88.03@	39.83	0.94
5500.00	3.55	47.67	5498.02	100.00	58.99	72.36 N	60.92 E	94.59@	40.09	0.67
5600.00	3.47	40.61	5597.83	100.00	63.13	76.74 N	65.18 E	100.69@	40.34	0.44
5700.00	1.85	13.33	5697.72	100.00	65.37	80.61 N	67.52 E	105.15@	39.95	2.01
5800.00	1.65	354.27	5797.68	100.00	65.52	83.62 N	67.75 E	107.62@	39.01	0.61
5900.00	1.68	357.81	5897.64	100.00	65.24	86.51 N	67.55 E	109.76@	37.98	0.11
6000.00	1.65	3.36	5997.59	100.00	65.20	89.42 N	67.58 E	112.08@	37.08	0.16
6100.00	1.88	2.70	6097.55	100.00	65.28	92.49 N	67.74 E	114.64@	36.22	0.23
6200.00	1.74	350.46	6197.50	100.00	65.02	95.63 N	67.56 E	117.09@	35.24	0.41
6300.00	1.39	350.70	6297.46	100.00	64.50	98.32 N	67.12 E	119.04@	34.32	0.35
6400.00	1.75	354.28	6397.42	100.00	64.08	101.04 N	66.77 E	121.11@	33.46	0.37
6500.00	1.43	3.56	6497.38	100.00	63.93	103.80 N	66.69 E	123.38@	32.72	0.41
6600.00	1.29	359.07	6597.35	100.00	63.93	106.17 N	66.75 E	125.41@	32.16	0.18
6700.00	1.76	354.87	6697.32	100.00	63.70	108.83 N	66.60 E	127.59@	31.46	0.48
6800.00	1.13	347.31	6797.29	100.00	63.29	111.32 N	66.24 E	129.54@	30.76	0.66
6900.00	1.74	340.65	6897.25	100.00	62.50	113.71 N	65.52 E	131.24@	29.95	0.63
7000.00	1.70	334.71	6997.21	100.00	61.29	116.49 N	64.39 E	133.10@	28.93	0.18
7100.00	1.94	329.28	7097.16	100.00	59.72	119.28 N	62.89 E	134.85@	27.80	0.30
7200.00	1.87	300.67	7197.11	100.00	57.39	121.57 N	60.62 E	135.85@	26.50	0.94
7300.00	1.82	270.28	7297.06	100.00	54.38	122.41 N	57.63 E	135.30@	25.21	0.97
7400.00	1.88	282.33	7397.01	100.00	51.18	122.77 N	54.44 E	134.30@	23.91	0.39
7500.00	1.42	295.26	7496.96	100.00	48.44	123.65 N	51.71 E	134.03@	22.70	0.59
7600.00	1.61	274.80	7596.93	100.00	45.90	124.30 N	49.19 E	133.68@	21.59	0.57
7700.00	1.71	273.96	7696.89	100.00	43.01	124.52 N	46.31 E	132.85@	20.40	0.10
7800.00	1.07	301.74	7796.86	100.00	40.71	125.11 N	44.02 E	132.63@	19.39	0.91
7900.00	1.08	356.35	7896.84	100.00	39.82	126.54 N	43.17 E	133.70@	18.84	0.99
8000.00	1.34	354.25	7996.82	100.00	39.59	128.65 N	42.99 E	135.64@	18.48	0.26
8100.00	1.44	331.16	8096.79	100.00	38.80	130.91 N	42.27 E	137.56@	17.89	0.56

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY COUNTY, NEW MEXICO
API#: 30-025-41390 Rig: PATRIOT 6

Page 04/06

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
8200.00	1.58	337.65	8196.76	100.00	37.61	133.29 N	41.14 E	139.49@	17.15	0.22
8300.00	0.95	356.37	8296.73	100.00	36.98	135.39 N	40.56 E	141.33@	16.68	0.75
8400.00	1.62	348.35	8396.71	100.00	36.58	137.60 N	40.22 E	143.36@	16.29	0.69
8500.00	1.44	347.26	8496.67	100.00	35.95	140.21 N	39.66 E	145.71@	15.79	0.18
** TIED INTO VAUGHN ENERGY SERVICES GYRO SURVEY.										
8600.00	1.45	343.77	8596.64	100.00	35.26	142.65 N	39.03 E	147.89@	15.30	0.09
THE FOLLOWING ARE PATHFINDER MWD SURVEY										
8686.00	1.93	358.88	8682.60	86.00	34.86	145.14 N	38.70 E	150.21@	14.93	0.76
8718.00	2.11	359.05	8714.58	32.00	34.81	146.27 N	38.68 E	151.30@	14.81	0.56
8749.00	2.37	35.62	8745.56	31.00	35.14	147.36 N	39.04 E	152.45@	14.84	4.60
8781.00	5.19	71.39	8777.49	32.00	36.87	148.36 N	40.80 E	153.87@	15.38	11.09
8812.00	10.20	83.52	8808.20	31.00	40.91	149.12 N	44.86 E	155.72@	16.74	16.90
8844.00	15.83	87.82	8839.37	32.00	48.08	149.61 N	52.04 E	158.40@	19.18	17.84
8876.00	21.54	89.93	8869.67	32.00	58.32	149.78 N	62.28 E	162.21@	22.58	17.96
8907.00	27.17	92.57	8897.90	31.00	71.09	149.47 N	75.06 E	167.26@	26.66	18.49
8939.00	31.74	94.33	8925.76	32.00	86.81	148.51 N	90.76 E	174.04@	31.43	14.53
8971.00	35.88	96.09	8952.34	32.00	104.58	146.87 N	108.48 E	182.59@	36.45	13.29
9002.00	39.57	98.72	8976.86	31.00	123.43	144.41 N	127.28 E	192.50@	41.39	12.98
9034.00	42.82	100.83	9000.94	32.00	144.28	140.82 N	148.05 E	204.32@	46.43	11.04
9066.00	45.20	104.35	9023.95	32.00	166.09	135.96 N	169.73 E	217.48@	51.30	10.66
9097.00	47.40	108.39	9045.37	31.00	187.74	129.64 N	191.22 E	231.02@	55.87	11.79
9120.00	49.59	110.50	9060.62	23.00	204.12	123.90 N	207.46 E	241.64@	59.15	11.74
9152.00	53.64	110.85	9080.48	32.00	227.81	115.04 N	230.92 E	257.99@	63.52	12.69
9184.00	56.63	109.27	9098.77	32.00	252.70	106.04 N	255.58 E	276.71@	67.47	10.18
9215.00	58.83	107.34	9115.32	31.00	277.79	97.82 N	280.47 E	297.04@	70.77	8.83
9247.00	60.67	105.05	9131.45	32.00	304.53	90.11 N	307.01 E	319.96@	73.64	8.44
9279.00	62.96	103.56	9146.56	32.00	332.03	83.15 N	334.34 E	344.52@	76.03	8.25
9310.00	65.77	102.59	9159.97	31.00	359.41	76.83 N	361.56 E	369.63@	78.00	9.49

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
 CRAZY HORSE FEDERAL 2H
 LEA COUNTY COUNTY, NEW MEXICO
 API#: 30-025-41390 Rig: PATRIOT 6

Page 05/06

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
9342.00	68.68	102.41	9172.36	32.00	388.37	70.44 N	390.36 E	396.67@	79.77	9.11
9374.00	71.84	102.06	9183.16	32.00	417.96	64.06 N	419.80 E	424.66@	81.32	9.93
9405.00	73.78	101.53	9192.33	31.00	447.10	58.01 N	448.78 E	452.52@	82.63	6.47
9437.00	76.33	100.57	9200.58	32.00	477.59	52.09 N	479.13 E	481.95@	83.80	8.48
9469.00	78.17	98.46	9207.64	32.00	508.49	46.93 N	509.90 E	512.06@	84.74	8.63
9500.00	81.07	97.49	9213.23	31.00	538.79	42.70 N	540.10 E	541.78@	85.48	9.85
9532.00	84.15	96.70	9217.34	32.00	570.37	38.78 N	571.59 E	572.90@	86.12	9.93
9627.00	90.04	93.10	9222.16	95.00	665.02	30.69 N	666.06 E	666.77@	87.36	7.26
9722.00	91.28	93.10	9221.06	95.00	759.98	25.55 N	760.91 E	761.34@	88.08	1.30
9817.00	92.24	93.01	9218.14	95.00	854.90	20.49 N	855.73 E	855.98@	88.63	1.01
9943.00	90.66	93.89	9214.95	126.00	980.78	12.91 N	981.46 E	981.54@	89.25	1.44
10038.00	91.19	94.59	9213.42	95.00	1075.66	5.89 N	1076.19 E	1076.20@	89.69	0.92
10133.00	90.57	93.18	9211.96	95.00	1170.56	0.54 S	1170.95 E	1170.95@	90.03	1.62
10228.00	91.01	94.06	9210.65	95.00	1265.49	6.54 S	1265.75 E	1265.77@	90.30	1.04
10323.00	89.96	93.71	9209.85	95.00	1360.40	12.98 S	1360.53 E	1360.59@	90.55	1.16
10418.00	90.13	92.22	9209.77	95.00	1455.37	17.89 S	1455.40 E	1455.51@	90.70	1.58
10513.00	91.54	92.83	9208.39	95.00	1550.34	22.08 S	1550.30 E	1550.45@	90.82	1.62
10614.00	91.63	93.31	9205.59	101.00	1651.26	27.48 S	1651.11 E	1651.34@	90.95	0.48
10709.00	90.22	93.59	9204.06	95.00	1746.19	33.20 S	1745.92 E	1746.24@	91.09	1.51
10804.00	90.22	94.04	9203.70	95.00	1841.11	39.52 S	1840.71 E	1841.14@	91.23	0.47
10899.00	90.66	94.30	9202.97	95.00	1936.01	46.43 S	1935.46 E	1936.02@	91.37	0.54
10994.00	90.22	92.91	9202.24	95.00	2030.94	52.40 S	2030.27 E	2030.94@	91.48	1.54
11090.00	89.16	91.50	9202.76	96.00	2126.93	56.09 S	2126.19 E	2126.93@	91.51	1.84
11185.00	88.55	90.34	9204.66	95.00	2221.90	57.62 S	2221.16 E	2221.90@	91.49	1.38
11280.00	88.02	89.86	9207.50	95.00	2316.83	57.79 S	2316.11 E	2316.83@	91.43	0.75
11375.00	90.13	90.64	9209.03	95.00	2411.79	58.20 S	2411.09 E	2411.79@	91.38	2.37
11469.00	90.31	90.21	9208.67	94.00	2505.77	58.90 S	2505.09 E	2505.78@	91.35	0.50
11564.00	90.48	89.69	9208.02	95.00	2600.73	58.81 S	2600.09 E	2600.75@	91.30	0.58

PathFinder – a Schlumberger company

Survey Report

COG OPERATING LLC.
CRAZY HORSE FEDERAL 2H
LEA COUNTY COUNTY, NEW MEXICO
API#: 30-025-41390 Rig: PATRIOT 6

Page 06/06

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
11659.00	91.45	89.51	9206.42	95.00	2695.67	58.15 S	2695.07 E	2695.70@	91.24	1.04
11785.00	91.71	92.26	9202.94	126.00	2821.60	60.10 S	2820.99 E	2821.63@	91.22	2.19
11880.00	89.78	91.92	9201.71	95.00	2916.58	63.56 S	2915.92 E	2916.61@	91.25	2.06
11975.00	89.08	92.05	9202.65	95.00	3011.57	66.85 S	3010.86 E	3011.60@	91.27	0.75
12070.00	89.08	91.35	9204.18	95.00	3106.56	69.67 S	3105.80 E	3106.58@	91.29	0.74
12165.00	89.87	90.89	9205.05	95.00	3201.55	71.53 S	3200.78 E	3201.58@	91.28	0.96
12260.00	90.13	90.37	9205.05	95.00	3296.54	72.57 S	3295.77 E	3296.57@	91.26	0.61
12355.00	89.78	90.75	9205.12	95.00	3391.53	73.50 S	3390.77 E	3391.56@	91.24	0.54
12450.00	89.52	91.61	9205.70	95.00	3486.52	75.45 S	3485.74 E	3486.56@	91.24	0.95
12545.00	89.16	91.86	9206.80	95.00	3581.52	78.33 S	3580.69 E	3581.55@	91.25	0.46
12640.00	89.16	91.15	9208.19	95.00	3676.50	80.83 S	3675.65 E	3676.54@	91.26	0.75
12735.00	90.84	90.86	9208.19	95.00	3771.50	82.49 S	3770.63 E	3771.53@	91.25	1.80
12830.00	90.75	89.54	9206.87	95.00	3866.46	82.82 S	3865.62 E	3866.51@	91.23	1.39
12925.00	91.01	90.45	9205.41	95.00	3961.42	82.82 S	3960.61 E	3961.47@	91.20	1.00
13020.00	91.36	91.01	9203.45	95.00	4056.39	84.03 S	4055.58 E	4056.45@	91.19	0.70
13115.00	90.66	91.00	9201.77	95.00	4151.37	85.69 S	4150.55 E	4151.43@	91.18	0.74
13210.00	91.63	92.63	9199.87	95.00	4246.34	88.70 S	4245.48 E	4246.41@	91.20	2.00
13337.00	93.03	92.82	9194.71	127.00	4373.21	94.73 S	4372.23 E	4373.25@	91.24	1.11
STRAIGHT LINE PROJECTION TO BIT AT 13515'MD										
13515.00	93.03	92.82	9185.30	178.00	4550.91	103.48 S	4549.76 E	4550.94@	91.30	0.00

** The survey data at tie-in point was furnished by a recognized survey company and entered as submitted. Survey stations above the tie-in point represent recalculated data by PathFinder – a Schlumberger company and may reflect minor changes due to rounding differences between survey programs. Only survey stations taken by qualified PathFinder personnel are subject to certification.