



DIRECTIONAL SERVICES, LLC.

NM OIL CONSERVATION
ARTESIA DISTRICT

JAN 22 2018

RECEIVED

Concho

Latshaw 44

Road Runner Federal Com 2H (171193)

2017-07-25 to 2017-08-17

Eddy, New Mexico (,)

30-015-44147

Please provide signature
page for directional survey

Job Type
Directional

COG OPERATING, LLC

Project: Eddy /Lea County, NM (NAD27) NMEZ
 Site: Road Runner Federal COM 2H
 Well: #2H
 Wellbore: Lateral 2 (ST)
 Design: Lateral 2 (ST)



3249+25 @ 3274.00ft (Latshaw44)
 NAD 1927 (NADCON CONUS)



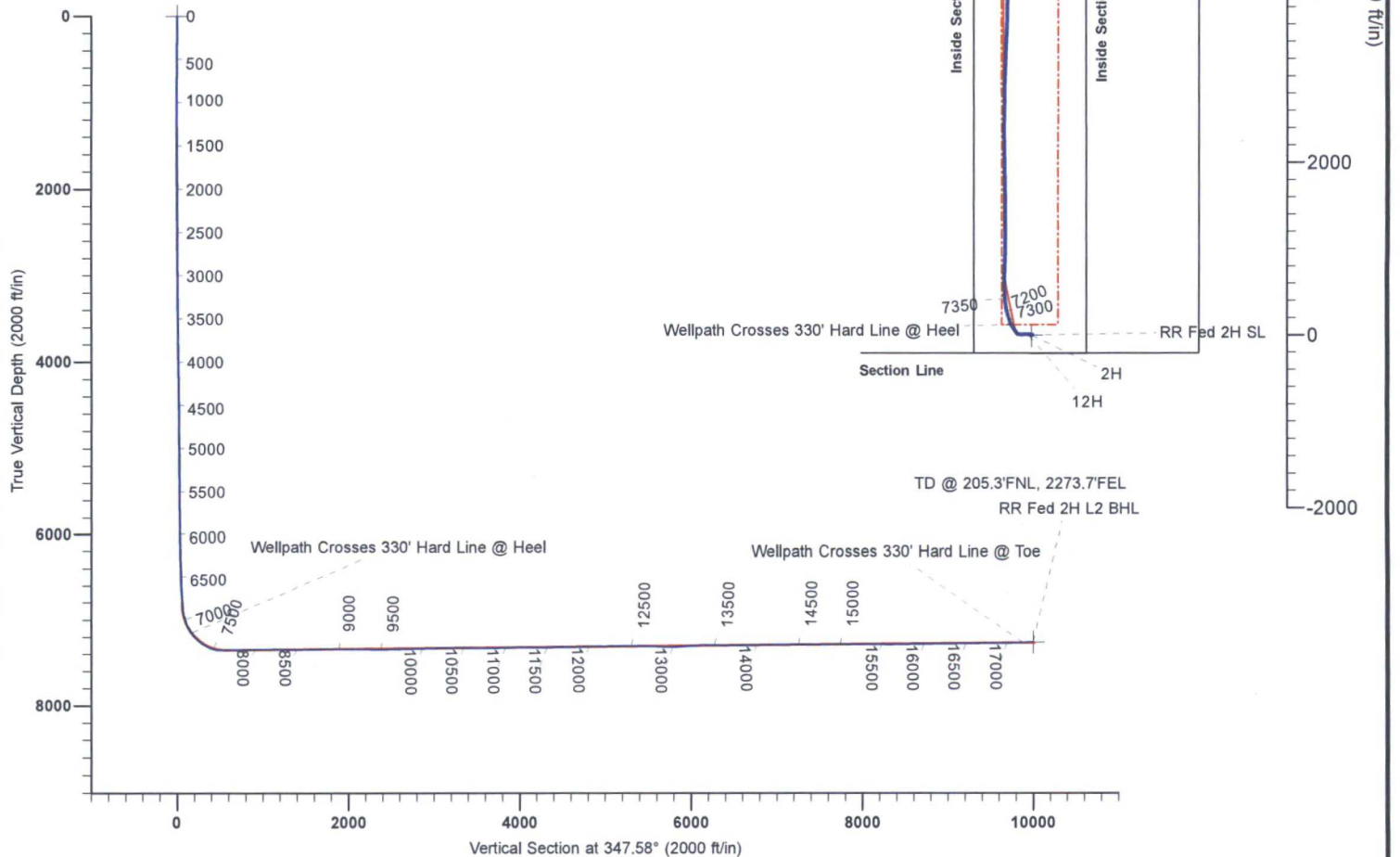
Azimuths to Grid North
 True North: -0.05°
 Magnetic North: 7.42°

Magnetic Field
 Strength: 47974.0snT
 Dip Angle: 59.91°
 Date: 07/25/2017
 Model: USER DEFINED (Surcon)

To convert a Magnetic Direction to a Grid Direction, Add 7.42°

ANNOTATIONS

MD	TVD	+N/-S	+E/-W	Annotation
7181.00	7151.91	121.33	-237.16	Wellpath Crosses 330' Hard Line @ Heel
17195.00	7258.44	10050.28	-317.29	Wellpath Crosses 330' Hard Line @ Toe
17320.00	7253.45	10174.99	-310.50	TD @ 205.3'FNL, 2273.7'FEL



TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
RR Fed 2H SL	0.00	0.00	0.00	397929.70	527721.50	Point
RR Fed 2H L2 BHL	7253.45	10174.99	-310.50	408104.69	527411.00	Point

Design: Lateral 2 (ST) (#2H/Lateral 2 (ST))
 Created By: Mekka Williams
 eSomina Well Design
 mekka@esominawell.com
 17:02, August 13 2017

VON DIRECTIONAL
 12074 FM 3083 Conroe, Texas 77301
 936-756-2400





NM OIL CONSERVATION ARTESIA DISTRICT JAN 22 2018

Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Project	Eddy /Lea County, NM (NAD27) NMEZ		
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	Road Runner Federal COM 2H		
Site Position:		Northing:	397,929.70 ft
From:	Map	Easting:	527,721.50 ft
Position Uncertainty:	0.00 ft	Slot Radius:	13.20 in
		Latitude:	32° 5' 38.367 N
		Longitude:	104° 14' 37.751 W
		Grid Convergence:	0.05 °

Well	#2H - Slot 2H		
Well Position	+N/-S	0.00 ft	Northing:
	+E/-W	0.00 ft	Easting:
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft
		Latitude:	32° 5' 38.367 N
		Longitude:	104° 14' 37.751 W
		Ground Level:	3,249.00 ft

Wellbore	Lateral 2 (ST)		
Magnetics	Model Name	Sample Date	Declination (°)
	User Defined	07/25/17	7.47
			Dip Angle (°)
			59.91
			Field Strength (nT)
			47,974

Design	Lateral 2 (ST)		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	6,742.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			Direction (°)
			347.58

Survey Program	Date 08/13/17		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name
100.00	6,742.00	Survey #1 (Lateral)	GYD_DP_MS
6,749.00	17,265.00	Survey #2 (Lateral 2 (ST))	MWD
17,320.00	17,320.00	Survey #3 (Lateral 2 (ST))	Projection
			Description
			Gyrodata gyro-compassing and drop
			MWD v3: standard declination
			Projection

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.79	278.78	100.00	0.11	-0.68	0.25	0.79	0.79	0.00
125.00	0.74	278.57	124.99	0.16	-1.01	0.37	0.20	-0.20	-0.84
150.00	0.81	276.94	149.99	0.20	-1.35	0.49	0.29	0.28	-6.52
175.00	0.69	269.37	174.99	0.22	-1.67	0.58	0.62	-0.48	-30.28
200.00	0.89	263.22	199.99	0.20	-2.02	0.63	0.87	0.80	-24.60
225.00	0.94	252.11	224.98	0.11	-2.40	0.62	0.74	0.20	-44.44
250.00	1.06	255.45	249.98	-0.01	-2.82	0.60	0.53	0.48	13.36
275.00	1.13	253.16	274.98	-0.14	-3.28	0.57	0.33	0.28	-9.16



Survey Report

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Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
300.00	1.08	251.46	299.97	-0.29	-3.74	0.52	0.24	-0.20	-6.80
325.00	0.96	249.49	324.97	-0.44	-4.16	0.47	0.50	-0.48	-7.88
350.00	1.02	256.53	349.96	-0.56	-4.57	0.44	0.54	0.24	28.16
375.00	1.18	247.78	374.96	-0.71	-5.03	0.39	0.93	0.64	-35.00
400.00	1.09	198.10	399.95	-1.03	-5.34	0.14	3.83	-0.36	-198.72
425.00	1.80	159.39	424.95	-1.63	-5.28	-0.45	4.67	2.84	-154.84
450.00	2.10	150.63	449.93	-2.39	-4.91	-1.28	1.69	1.20	-35.04
475.00	2.07	150.49	474.92	-3.19	-4.47	-2.15	0.12	-0.12	-0.56
500.00	1.80	141.55	499.90	-3.89	-4.00	-2.93	1.62	-1.08	-35.76
525.00	1.32	124.85	524.89	-4.36	-3.52	-3.50	2.63	-1.92	-66.80
550.00	1.15	99.38	549.89	-4.56	-3.04	-3.80	2.28	-0.68	-101.88
575.00	1.02	78.48	574.88	-4.56	-2.57	-3.90	1.66	-0.52	-83.60
600.00	1.01	73.41	599.88	-4.45	-2.14	-3.89	0.36	-0.04	-20.28
625.00	1.05	71.99	624.88	-4.32	-1.71	-3.85	0.19	0.16	-5.68
650.00	1.12	73.82	649.87	-4.18	-1.26	-3.81	0.31	0.28	7.32
675.00	0.99	72.23	674.87	-4.05	-0.82	-3.77	0.53	-0.52	-6.36
700.00	1.09	71.51	699.86	-3.90	-0.39	-3.73	0.40	0.40	-2.88
725.00	1.03	69.97	724.86	-3.75	0.05	-3.67	0.27	-0.24	-6.16
750.00	0.99	69.97	749.85	-3.60	0.46	-3.62	0.16	-0.16	0.00
775.00	1.13	69.92	774.85	-3.44	0.90	-3.55	0.56	0.56	-0.20
800.00	1.02	66.81	799.85	-3.27	1.33	-3.48	0.50	-0.44	-12.44
825.00	0.94	66.22	824.84	-3.10	1.73	-3.40	0.32	-0.32	-2.36
850.00	0.99	69.72	849.84	-2.94	2.12	-3.33	0.31	0.20	14.00
875.00	0.83	69.07	874.83	-2.80	2.49	-3.27	0.64	-0.64	-2.60
900.00	0.85	69.00	899.83	-2.67	2.83	-3.22	0.08	0.08	-0.28
925.00	0.86	68.73	924.83	-2.54	3.18	-3.16	0.04	0.04	-1.08
950.00	0.86	71.66	949.83	-2.41	3.53	-3.11	0.18	0.00	11.72
975.00	0.89	72.82	974.82	-2.29	3.89	-3.08	0.14	0.12	4.64
1,000.00	0.88	65.48	999.82	-2.16	4.25	-3.02	0.45	-0.04	-29.36
1,025.00	0.90	71.76	1,024.82	-2.02	4.62	-2.96	0.40	0.08	25.12
1,050.00	0.85	62.45	1,049.81	-1.87	4.97	-2.89	0.60	-0.20	-37.24
1,075.00	0.97	62.32	1,074.81	-1.68	5.32	-2.79	0.48	0.48	-0.52
1,100.00	0.89	65.07	1,099.81	-1.50	5.68	-2.69	0.37	-0.32	11.00
1,125.00	0.89	65.17	1,124.81	-1.34	6.03	-2.61	0.01	0.00	0.40
1,150.00	0.75	69.92	1,149.80	-1.20	6.36	-2.54	0.62	-0.56	19.00
1,175.00	0.86	71.53	1,174.80	-1.09	6.70	-2.50	0.45	0.44	6.44
1,200.00	0.82	75.84	1,199.80	-0.98	7.05	-2.48	0.30	-0.16	17.24
1,225.00	0.84	80.43	1,224.80	-0.91	7.40	-2.48	0.28	0.08	18.36
1,250.00	0.85	84.68	1,249.79	-0.86	7.77	-2.51	0.25	0.04	17.00
1,275.00	0.82	85.56	1,274.79	-0.83	8.13	-2.56	0.13	-0.12	3.52
1,300.00	0.84	89.30	1,299.79	-0.81	8.49	-2.62	0.23	0.08	14.96
1,325.00	0.86	87.59	1,324.78	-0.80	8.86	-2.69	0.13	0.08	-6.84
1,350.00	0.75	87.33	1,349.78	-0.79	9.21	-2.75	0.44	-0.44	-1.04

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Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,375.00	0.84	89.09	1,374.78	-0.78	9.56	-2.82	0.37	0.36	7.04
1,400.00	0.80	85.29	1,399.78	-0.76	9.92	-2.88	0.27	-0.16	-15.20
1,425.00	0.99	83.43	1,424.77	-0.72	10.30	-2.92	0.77	0.76	-7.44
1,450.00	1.01	83.41	1,449.77	-0.67	10.74	-2.97	0.08	0.08	-0.08
1,475.00	0.99	79.35	1,474.77	-0.61	11.17	-3.00	0.29	-0.08	-16.24
1,500.00	1.17	75.75	1,499.76	-0.50	11.63	-2.99	0.77	0.72	-14.40
1,525.00	1.14	72.08	1,524.76	-0.37	12.11	-2.96	0.32	-0.12	-14.68
1,550.00	1.12	76.02	1,549.75	-0.23	12.59	-2.93	0.32	-0.08	15.76
1,575.00	0.98	72.70	1,574.75	-0.11	13.03	-2.91	0.61	-0.56	-13.28
1,600.00	0.57	56.62	1,599.75	0.02	13.34	-2.84	1.84	-1.64	-64.32
1,625.00	0.46	30.57	1,624.74	0.18	13.49	-2.73	1.02	-0.44	-104.20
1,650.00	0.40	33.30	1,649.74	0.34	13.59	-2.59	0.25	-0.24	10.92
1,675.00	0.40	25.90	1,674.74	0.49	13.68	-2.46	0.21	0.00	-29.60
1,700.00	0.58	43.43	1,699.74	0.66	13.80	-2.32	0.93	0.72	70.12
1,725.00	0.59	37.72	1,724.74	0.85	13.97	-2.17	0.24	0.04	-22.84
1,750.00	0.79	52.15	1,749.74	1.06	14.18	-2.01	1.05	0.80	57.72
1,775.00	0.77	41.68	1,774.74	1.29	14.43	-1.84	0.57	-0.08	-41.88
1,800.00	0.78	41.93	1,799.73	1.55	14.65	-1.64	0.04	0.04	1.00
1,825.00	0.81	45.77	1,824.73	1.80	14.90	-1.45	0.24	0.12	15.36
1,850.00	0.56	22.80	1,849.73	2.03	15.07	-1.26	1.47	-1.00	-91.88
1,875.00	0.56	313.21	1,874.73	2.23	15.03	-1.06	2.56	0.00	-278.36
1,900.00	0.99	289.24	1,899.73	2.38	14.73	-0.84	2.12	1.72	-95.88
1,925.00	1.02	289.64	1,924.72	2.53	14.32	-0.61	0.12	0.12	1.60
1,950.00	1.12	287.59	1,949.72	2.68	13.88	-0.37	0.43	0.40	-8.20
1,975.00	1.08	288.11	1,974.71	2.82	13.42	-0.13	0.16	-0.16	2.08
2,000.00	1.11	288.27	1,999.71	2.97	12.97	0.11	0.12	0.12	0.64
2,025.00	1.02	291.83	2,024.71	3.13	12.53	0.36	0.45	-0.36	14.24
2,050.00	1.06	288.84	2,049.70	3.29	12.11	0.61	0.27	0.16	-11.96
2,075.00	0.95	293.86	2,074.70	3.45	11.70	0.85	0.56	-0.44	20.08
2,100.00	1.00	294.97	2,099.69	3.62	11.31	1.11	0.21	0.20	4.44
2,125.00	0.86	303.91	2,124.69	3.82	10.96	1.37	0.80	-0.56	35.76
2,150.00	0.93	295.90	2,149.69	4.01	10.62	1.64	0.57	0.28	-32.04
2,175.00	0.92	296.06	2,174.68	4.19	10.26	1.89	0.04	-0.04	0.64
2,200.00	0.95	296.09	2,199.68	4.37	9.89	2.14	0.12	0.12	0.12
2,225.00	0.99	296.05	2,224.68	4.56	9.51	2.40	0.16	0.16	-0.16
2,250.00	1.00	293.93	2,249.67	4.74	9.12	2.67	0.15	0.04	-8.48
2,275.00	0.99	293.37	2,274.67	4.91	8.72	2.92	0.06	-0.04	-2.24
2,300.00	0.93	292.76	2,299.67	5.08	8.33	3.17	0.24	-0.24	-2.44
2,325.00	1.02	291.38	2,324.66	5.24	7.94	3.41	0.37	0.36	-5.52
2,350.00	0.80	293.33	2,349.66	5.39	7.57	3.63	0.89	-0.88	7.80
2,375.00	0.71	286.36	2,374.66	5.50	7.26	3.81	0.51	-0.36	-27.88
2,400.00	0.73	280.50	2,399.66	5.57	6.96	3.95	0.31	0.08	-23.44
2,425.00	0.65	277.62	2,424.65	5.62	6.66	4.06	0.35	-0.32	-11.52



Survey Report

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
2,450.00	0.73	282.66	2,449.65	5.67	6.36	4.17	0.40	0.32	20.16	
2,475.00	0.69	285.10	2,474.65	5.75	6.06	4.31	0.20	-0.16	9.76	
2,500.00	0.71	285.13	2,499.65	5.83	5.77	4.45	0.08	0.08	0.12	
2,525.00	0.86	279.85	2,524.65	5.90	5.43	4.59	0.67	0.60	-21.12	
2,550.00	0.72	283.91	2,549.64	5.97	5.10	4.73	0.60	-0.56	16.24	
2,575.00	0.72	280.52	2,574.64	6.04	4.79	4.87	0.17	0.00	-13.56	
2,600.00	0.84	280.85	2,599.64	6.10	4.46	5.00	0.48	0.48	1.32	
2,625.00	0.78	282.15	2,624.64	6.17	4.11	5.14	0.25	-0.24	5.20	
2,650.00	0.80	277.55	2,649.63	6.23	3.77	5.27	0.27	0.08	-18.40	
2,675.00	0.89	277.78	2,674.63	6.28	3.40	5.40	0.36	0.36	0.92	
2,700.00	0.81	276.95	2,699.63	6.33	3.04	5.52	0.32	-0.32	-3.32	
2,725.00	0.84	280.57	2,724.63	6.38	2.68	5.65	0.24	0.12	14.48	
2,750.00	0.83	280.54	2,749.62	6.45	2.32	5.80	0.04	-0.04	-0.12	
2,775.00	0.81	278.48	2,774.62	6.51	1.97	5.93	0.14	-0.08	-8.24	
2,800.00	0.86	277.40	2,799.62	6.56	1.61	6.06	0.21	0.20	-4.32	
2,825.00	0.88	275.38	2,824.62	6.60	1.23	6.18	0.15	0.08	-8.08	
2,850.00	0.89	275.34	2,849.61	6.64	0.85	6.30	0.04	0.04	-0.16	
2,875.00	0.85	278.42	2,874.61	6.68	0.47	6.42	0.25	-0.16	12.32	
2,900.00	0.89	276.81	2,899.61	6.73	0.09	6.55	0.19	0.16	-6.44	
2,925.00	0.98	276.36	2,924.60	6.78	-0.31	6.69	0.36	0.36	-1.80	
2,950.00	0.93	277.93	2,949.60	6.83	-0.72	6.83	0.23	-0.20	6.28	
2,975.00	0.89	276.15	2,974.60	6.88	-1.12	6.96	0.20	-0.16	-7.12	
3,000.00	0.98	274.88	2,999.59	6.92	-1.52	7.08	0.37	0.36	-5.08	
3,025.00	0.94	280.86	3,024.59	6.97	-1.94	7.23	0.43	-0.16	23.92	
3,050.00	1.01	280.49	3,049.59	7.05	-2.36	7.39	0.28	0.28	-1.48	
3,075.00	1.18	278.57	3,074.58	7.13	-2.83	7.57	0.70	0.68	-7.68	
3,100.00	1.08	279.80	3,099.58	7.21	-3.31	7.75	0.41	-0.40	4.92	
3,125.00	1.12	280.89	3,124.57	7.30	-3.79	7.94	0.18	0.16	4.36	
3,150.00	1.11	280.67	3,149.57	7.39	-4.26	8.13	0.04	-0.04	-0.88	
3,175.00	1.10	280.24	3,174.56	7.47	-4.74	8.32	0.05	-0.04	-1.72	
3,200.00	1.14	280.78	3,199.56	7.56	-5.22	8.51	0.17	0.16	2.16	
3,225.00	1.14	280.22	3,224.55	7.65	-5.71	8.70	0.04	0.00	-2.24	
3,250.00	1.36	275.91	3,249.55	7.73	-6.25	8.89	0.96	0.88	-17.24	
3,275.00	1.68	275.38	3,274.54	7.79	-6.91	9.10	1.28	1.28	-2.12	
3,300.00	1.86	275.86	3,299.53	7.87	-7.68	9.34	0.72	0.72	1.92	
3,325.00	1.88	275.95	3,324.51	7.95	-8.49	9.59	0.08	0.08	0.36	
3,350.00	1.86	274.16	3,349.50	8.03	-9.30	9.84	0.25	-0.08	-7.16	
3,375.00	1.86	273.59	3,374.49	8.08	-10.11	10.07	0.07	0.00	-2.28	
3,400.00	1.88	271.47	3,399.47	8.12	-10.93	10.28	0.29	0.08	-8.48	
3,425.00	1.80	274.16	3,424.46	8.15	-11.73	10.49	0.47	-0.32	10.76	
3,450.00	1.77	273.60	3,449.45	8.21	-12.50	10.71	0.14	-0.12	-2.24	
3,475.00	1.81	273.89	3,474.44	8.26	-13.28	10.92	0.16	0.16	1.16	
3,500.00	1.86	272.47	3,499.42	8.30	-14.08	11.14	0.27	0.20	-5.68	
3,525.00	1.94	271.81	3,524.41	8.33	-14.91	11.35	0.33	0.32	-2.64	



Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,550.00	2.22	268.96	3,549.39	8.34	-15.82	11.55	1.19	1.12	-11.40
3,575.00	2.53	267.56	3,574.37	8.31	-16.85	11.74	1.26	1.24	-5.60
3,600.00	2.76	268.69	3,599.34	8.27	-18.01	11.95	0.94	0.92	4.52
3,625.00	2.72	267.70	3,624.32	8.23	-19.20	12.17	0.25	-0.16	-3.96
3,650.00	2.78	267.63	3,649.29	8.18	-20.40	12.38	0.24	0.24	-0.28
3,675.00	2.80	267.44	3,674.26	8.13	-21.61	12.59	0.09	0.08	-0.76
3,700.00	2.80	268.45	3,699.23	8.09	-22.83	12.81	0.20	0.00	4.04
3,725.00	2.78	269.34	3,724.20	8.06	-24.05	13.05	0.19	-0.08	3.56
3,750.00	2.81	267.88	3,749.17	8.03	-25.27	13.28	0.31	0.12	-5.84
3,775.00	2.63	267.29	3,774.14	7.98	-26.46	13.49	0.73	-0.72	-2.36
3,800.00	2.57	266.96	3,799.11	7.93	-27.59	13.68	0.25	-0.24	-1.32
3,825.00	2.54	268.42	3,824.09	7.88	-28.70	13.87	0.29	-0.12	5.84
3,850.00	2.35	270.90	3,849.07	7.87	-29.77	14.09	0.87	-0.76	9.92
3,875.00	2.13	272.67	3,874.05	7.90	-30.74	14.33	0.92	-0.88	7.08
3,900.00	2.14	271.30	3,899.03	7.94	-31.68	14.56	0.21	0.04	-5.48
3,925.00	1.91	268.25	3,924.01	7.93	-32.56	14.75	1.02	-0.92	-12.20
3,950.00	1.81	269.36	3,949.00	7.92	-33.37	14.91	0.43	-0.40	4.44
3,975.00	1.83	267.78	3,973.99	7.90	-34.16	15.06	0.22	0.08	-6.32
4,000.00	1.95	270.04	3,998.98	7.88	-34.99	15.22	0.56	0.48	9.04
4,025.00	2.23	275.00	4,023.96	7.92	-35.90	15.46	1.33	1.12	19.84
4,050.00	2.79	280.64	4,048.93	8.08	-36.98	15.85	2.45	2.24	22.56
4,075.00	2.81	281.60	4,073.90	8.31	-38.18	16.33	0.20	0.08	3.84
4,100.00	2.91	279.73	4,098.87	8.55	-39.40	16.82	0.55	0.40	-7.48
4,125.00	3.12	278.53	4,123.84	8.75	-40.70	17.30	0.88	0.84	-4.80
4,150.00	3.26	280.07	4,148.80	8.98	-42.07	17.82	0.66	0.56	6.16
4,175.00	3.13	276.31	4,173.76	9.18	-43.45	18.31	0.99	-0.52	-15.04
4,200.00	3.12	272.46	4,198.72	9.28	-44.81	18.70	0.84	-0.04	-15.40
4,225.00	3.14	265.27	4,223.69	9.25	-46.17	18.97	1.57	0.08	-28.76
4,250.00	3.06	259.93	4,248.65	9.08	-47.51	19.09	1.20	-0.32	-21.36
4,275.00	3.18	260.72	4,273.61	8.85	-48.85	19.16	0.51	0.48	3.16
4,300.00	2.89	259.75	4,298.58	8.63	-50.16	19.22	1.18	-1.16	-3.88
4,325.00	2.76	259.95	4,323.55	8.41	-51.37	19.27	0.52	-0.52	0.80
4,350.00	2.74	261.27	4,348.52	8.22	-52.55	19.33	0.27	-0.08	5.28
4,375.00	2.69	264.00	4,373.49	8.06	-53.73	19.43	0.55	-0.20	10.92
4,400.00	2.72	269.79	4,398.46	8.00	-54.91	19.62	1.10	0.12	23.16
4,425.00	2.78	278.67	4,423.43	8.09	-56.10	19.97	1.72	0.24	35.52
4,450.00	2.70	280.57	4,448.41	8.29	-57.28	20.42	0.48	-0.32	7.60
4,475.00	2.75	280.97	4,473.38	8.51	-58.44	20.88	0.21	0.20	1.60
4,500.00	2.63	280.18	4,498.35	8.73	-59.60	21.34	0.50	-0.48	-3.16
4,525.00	2.69	281.37	4,523.32	8.94	-60.74	21.80	0.33	0.24	4.76
4,550.00	2.79	280.07	4,548.29	9.17	-61.91	22.27	0.47	0.40	-5.20
4,575.00	2.81	280.15	4,573.27	9.38	-63.11	22.74	0.08	0.08	0.32
4,600.00	3.25	276.76	4,598.23	9.57	-64.42	23.21	1.90	1.76	-13.56

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,625.00	3.44	276.77	4,623.19	9.74	-65.87	23.69	0.76	0.76	0.04
4,650.00	3.46	275.34	4,648.14	9.90	-67.36	24.16	0.35	0.08	-5.72
4,675.00	3.56	273.44	4,673.10	10.02	-68.89	24.60	0.61	0.40	-7.60
4,700.00	3.63	269.62	4,698.05	10.06	-70.46	24.98	1.00	0.28	-15.28
4,725.00	3.73	268.13	4,722.99	10.03	-72.06	25.30	0.55	0.40	-5.96
4,750.00	3.72	267.11	4,747.94	9.96	-73.68	25.58	0.27	-0.04	-4.08
4,775.00	3.61	267.48	4,772.89	9.89	-75.28	25.85	0.45	-0.44	1.48
4,800.00	3.61	267.90	4,797.84	9.82	-76.85	26.12	0.11	0.00	1.68
4,825.00	3.47	266.11	4,822.79	9.74	-78.39	26.38	0.71	-0.56	-7.16
4,850.00	3.47	265.79	4,847.75	9.64	-79.90	26.60	0.08	0.00	-1.28
4,875.00	3.32	266.31	4,872.70	9.53	-81.38	26.82	0.61	-0.60	2.08
4,900.00	3.35	265.45	4,897.66	9.43	-82.83	27.03	0.23	0.12	-3.44
4,925.00	3.32	265.14	4,922.62	9.31	-84.28	27.22	0.14	-0.12	-1.24
4,950.00	3.32	264.41	4,947.58	9.18	-85.72	27.40	0.17	0.00	-2.92
4,975.00	3.29	263.36	4,972.54	9.02	-87.15	27.56	0.27	-0.12	-4.20
5,000.00	3.27	262.53	4,997.49	8.85	-88.57	27.70	0.21	-0.08	-3.32
5,025.00	3.23	263.28	5,022.45	8.67	-89.98	27.83	0.23	-0.16	3.00
5,050.00	3.23	263.99	5,047.41	8.52	-91.38	27.98	0.16	0.00	2.84
5,075.00	3.12	263.79	5,072.38	8.37	-92.76	28.13	0.44	-0.44	-0.80
5,100.00	3.14	262.73	5,097.34	8.21	-94.11	28.26	0.24	0.08	-4.24
5,125.00	3.12	263.55	5,122.30	8.05	-95.47	28.40	0.20	-0.08	3.28
5,150.00	3.05	263.83	5,147.27	7.90	-96.81	28.54	0.29	-0.28	1.12
5,175.00	2.98	263.90	5,172.23	7.76	-98.11	28.68	0.28	-0.28	0.28
5,200.00	2.92	263.79	5,197.20	7.62	-99.39	28.82	0.24	-0.24	-0.44
5,225.00	2.86	264.99	5,222.17	7.50	-100.65	28.97	0.34	-0.24	4.80
5,250.00	2.81	266.58	5,247.14	7.41	-101.88	29.15	0.37	-0.20	6.36
5,275.00	2.85	266.35	5,272.10	7.33	-103.11	29.34	0.17	0.16	-0.92
5,300.00	2.87	265.88	5,297.07	7.25	-104.36	29.52	0.12	0.08	-1.88
5,325.00	2.84	266.15	5,322.04	7.16	-105.60	29.71	0.13	-0.12	1.08
5,350.00	2.85	265.25	5,347.01	7.07	-106.84	29.88	0.18	0.04	-3.60
5,375.00	2.73	266.73	5,371.98	6.98	-108.05	30.06	0.56	-0.48	5.92
5,400.00	2.53	267.58	5,396.96	6.92	-109.20	30.25	0.82	-0.80	3.40
5,425.00	2.58	268.23	5,421.93	6.88	-110.31	30.45	0.23	0.20	2.60
5,450.00	2.67	268.63	5,446.90	6.85	-111.45	30.67	0.37	0.36	1.60
5,475.00	2.64	266.93	5,471.88	6.81	-112.61	30.87	0.34	-0.12	-6.80
5,500.00	2.46	268.89	5,496.85	6.76	-113.72	31.07	0.80	-0.72	7.84
5,525.00	2.37	271.98	5,521.83	6.77	-114.77	31.30	0.63	-0.36	12.36
5,550.00	1.93	272.52	5,546.81	6.81	-115.71	31.54	1.76	-1.76	2.16
5,575.00	2.04	272.56	5,571.80	6.85	-116.58	31.76	0.44	0.44	0.16
5,600.00	2.08	271.52	5,596.78	6.88	-117.48	31.99	0.22	0.16	-4.16
5,625.00	2.35	273.92	5,621.76	6.93	-118.44	32.24	1.14	1.08	9.60
5,650.00	2.61	274.31	5,646.74	7.00	-119.52	32.55	1.04	1.04	1.56
5,675.00	2.73	275.70	5,671.71	7.11	-120.68	32.90	0.55	0.48	5.56



Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,700.00	2.59	273.61	5,696.69	7.20	-121.84	33.24	0.68	-0.56	-8.36
5,725.00	2.27	273.09	5,721.66	7.26	-122.89	33.53	1.28	-1.28	-2.08
5,750.00	1.90	271.80	5,746.65	7.30	-123.80	33.76	1.49	-1.48	-5.16
5,775.00	1.74	271.77	5,771.63	7.33	-124.60	33.96	0.64	-0.64	-0.12
5,800.00	1.64	274.70	5,796.62	7.37	-125.33	34.16	0.53	-0.40	11.72
5,825.00	1.84	272.14	5,821.61	7.41	-126.09	34.36	0.86	0.80	-10.24
5,850.00	2.14	274.06	5,846.60	7.46	-126.96	34.60	1.23	1.20	7.68
5,875.00	2.09	280.39	5,871.58	7.58	-127.87	34.91	0.96	-0.20	25.32
5,900.00	2.25	285.83	5,896.56	7.79	-128.79	35.31	1.04	0.64	21.76
5,925.00	2.49	287.28	5,921.54	8.09	-129.78	35.82	0.99	0.96	5.80
5,950.00	2.70	290.12	5,946.51	8.45	-130.85	36.40	0.98	0.84	11.36
5,975.00	2.82	290.69	5,971.49	8.87	-131.98	37.05	0.49	0.48	2.28
6,000.00	2.88	289.42	5,996.45	9.30	-133.15	37.72	0.35	0.24	-5.08
6,025.00	3.13	282.14	6,021.42	9.65	-134.41	38.34	1.82	1.00	-29.12
6,050.00	3.20	275.14	6,046.38	9.86	-135.77	38.83	1.57	0.28	-28.00
6,075.00	3.12	270.22	6,071.34	9.92	-137.15	39.19	1.13	-0.32	-19.68
6,100.00	3.00	265.52	6,096.31	9.87	-138.48	39.43	1.11	-0.48	-18.80
6,125.00	2.98	258.40	6,121.27	9.69	-139.77	39.53	1.49	-0.08	-28.48
6,150.00	2.62	254.87	6,146.25	9.41	-140.95	39.51	1.60	-1.44	-14.12
6,175.00	2.22	255.44	6,171.22	9.14	-141.98	39.47	1.60	-1.60	2.28
6,200.00	2.01	259.01	6,196.21	8.93	-142.87	39.46	0.99	-0.84	14.28
6,225.00	1.79	260.38	6,221.19	8.79	-143.69	39.49	0.90	-0.88	5.48
6,250.00	1.62	265.35	6,246.18	8.69	-144.43	39.56	0.90	-0.68	19.88
6,275.00	1.92	267.26	6,271.17	8.64	-145.20	39.67	1.22	1.20	7.64
6,300.00	2.90	277.17	6,296.15	8.70	-146.24	39.96	4.25	3.92	39.64
6,325.00	3.97	280.43	6,321.10	8.94	-147.72	40.51	4.35	4.28	13.04
6,350.00	4.18	280.97	6,346.04	9.27	-149.47	41.20	0.85	0.84	2.16
6,375.00	3.81	282.43	6,370.98	9.62	-151.17	41.91	1.53	-1.48	5.84
6,400.00	3.09	283.58	6,395.93	9.96	-152.64	42.56	2.89	-2.88	4.60
6,425.00	2.65	291.36	6,420.90	10.33	-153.83	43.18	2.35	-1.76	31.12
6,450.00	2.46	295.96	6,445.88	10.77	-154.85	43.83	1.12	-0.76	18.40
6,475.00	2.75	294.81	6,470.85	11.26	-155.88	44.53	1.18	1.16	-4.60
6,500.00	3.26	290.92	6,495.82	11.76	-157.09	45.28	2.20	2.04	-15.56
6,525.00	3.78	292.85	6,520.77	12.34	-158.51	46.15	2.13	2.08	7.72
6,550.00	4.05	293.62	6,545.71	13.01	-160.08	47.14	1.10	1.08	3.08
6,575.00	4.01	297.36	6,570.65	13.77	-161.66	48.22	1.06	-0.16	14.96
6,600.00	3.87	301.70	6,595.59	14.61	-163.16	49.37	1.32	-0.56	17.36
6,625.00	3.92	304.37	6,620.53	15.54	-164.58	50.58	0.75	0.20	10.68
6,650.00	4.10	307.05	6,645.47	16.56	-166.00	51.88	1.04	0.72	10.72
6,675.00	4.35	307.39	6,670.40	17.67	-167.47	53.28	1.01	1.00	1.36
6,700.00	4.50	303.59	6,695.33	18.79	-169.04	54.71	1.32	0.60	-15.20
6,725.00	4.60	298.11	6,720.25	19.80	-170.74	56.07	1.78	0.40	-21.92
6,742.00	4.46	297.72	6,737.20	20.43	-171.93	56.94	0.84	-0.82	-2.29
6,749.00	5.30	310.30	6,744.17	20.77	-172.41	57.37	19.37	12.00	179.71



Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,780.00	5.39	309.60	6,775.04	22.62	-174.63	59.66	0.36	0.29	-2.26
6,812.00	2.55	331.22	6,806.96	24.21	-176.13	61.53	9.88	-8.88	67.56
6,844.00	2.69	358.04	6,838.93	25.58	-176.50	62.95	3.82	0.44	83.81
6,875.00	7.25	331.88	6,869.80	28.03	-177.44	65.55	16.06	14.71	-84.39
6,907.00	11.42	327.60	6,901.37	32.49	-180.09	70.47	13.20	13.03	-13.38
6,938.00	14.14	328.71	6,931.60	38.32	-183.71	76.94	8.81	8.77	3.58
6,970.00	15.37	329.81	6,962.55	45.33	-187.87	84.68	3.94	3.84	3.44
7,002.00	18.83	328.65	6,993.13	53.40	-192.69	93.60	10.86	10.81	-3.63
7,033.00	21.85	328.15	7,022.19	62.58	-198.34	103.78	9.76	9.74	-1.61
7,065.00	24.54	323.33	7,051.60	72.97	-205.45	115.46	10.28	8.41	-15.06
7,097.00	27.71	322.75	7,080.33	84.23	-213.92	128.27	9.94	9.91	-1.81
7,128.00	30.60	325.51	7,107.40	96.47	-222.76	142.13	10.28	9.32	8.90
7,160.00	33.36	330.62	7,134.55	110.85	-231.69	158.10	12.07	8.63	15.97
7,192.00	36.12	335.83	7,160.85	127.13	-239.87	175.76	12.66	8.63	16.28
7,223.00	39.64	339.08	7,185.31	144.71	-247.15	194.49	13.05	11.35	10.48
7,255.00	43.96	339.92	7,209.16	164.69	-254.61	215.60	13.61	13.50	2.63
7,287.00	47.95	339.15	7,231.41	186.23	-262.65	238.37	12.59	12.47	-2.41
7,318.00	51.38	341.65	7,251.47	208.49	-270.56	261.81	12.66	11.06	8.06
7,350.00	55.72	344.40	7,270.48	233.10	-278.06	287.46	15.22	13.56	8.59
7,382.00	58.18	345.95	7,287.93	259.03	-284.92	314.26	8.69	7.69	4.84
7,413.00	60.80	348.88	7,303.67	285.09	-290.73	340.96	11.73	8.45	9.45
7,445.00	65.00	351.96	7,318.25	313.17	-295.45	369.40	15.67	13.13	9.63
7,477.00	69.56	353.78	7,330.61	342.45	-299.11	398.78	15.18	14.25	5.69
7,508.00	74.64	354.02	7,340.13	371.78	-302.24	428.09	16.40	16.39	0.77
7,540.00	80.05	354.06	7,347.14	402.82	-305.48	459.10	16.91	16.91	0.13
7,572.00	85.93	354.19	7,351.04	434.40	-308.73	490.64	18.38	18.38	0.41
7,603.00	89.98	354.84	7,352.15	465.23	-311.69	521.39	13.23	13.06	2.10
7,635.00	91.82	356.83	7,351.65	497.14	-314.01	553.05	8.47	5.75	6.22
7,725.00	92.00	2.12	7,348.64	587.05	-314.84	641.04	5.88	0.20	5.88
7,819.00	89.36	1.20	7,347.53	681.00	-312.11	732.20	2.97	-2.81	-0.98
7,914.00	90.85	0.24	7,347.35	775.99	-310.92	824.70	1.87	1.57	-1.01
8,007.00	90.05	0.44	7,346.62	868.98	-310.37	915.40	0.89	-0.86	0.22
8,103.00	91.34	0.32	7,345.46	964.97	-309.73	1,009.01	1.35	1.34	-0.13
8,198.00	88.16	0.36	7,345.87	1,059.96	-309.17	1,101.65	3.35	-3.35	0.04
8,293.00	89.23	0.25	7,348.04	1,154.93	-308.66	1,194.29	1.13	1.13	-0.12
8,387.00	90.51	0.22	7,348.25	1,248.93	-308.28	1,286.00	1.36	1.36	-0.03
8,482.00	91.32	0.58	7,346.73	1,343.91	-307.61	1,378.62	0.93	0.85	0.38
8,577.00	89.67	359.93	7,345.91	1,438.90	-307.19	1,471.30	1.87	-1.74	-0.68
8,672.00	90.33	359.31	7,345.91	1,533.90	-307.82	1,564.20	0.95	0.69	-0.65
8,766.00	90.90	359.51	7,344.90	1,627.89	-308.79	1,656.20	0.64	0.61	0.21
8,861.00	91.91	358.91	7,342.57	1,722.85	-310.10	1,749.22	1.24	1.06	-0.63
8,956.00	90.84	358.99	7,340.29	1,817.80	-311.84	1,842.33	1.13	-1.13	0.08
9,051.00	89.02	359.34	7,340.41	1,912.79	-313.22	1,935.39	1.95	-1.92	0.37

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
9,146.00	89.51	359.09	7,341.63	2,007.77	-314.52	2,028.43	0.58	0.52	-0.26	
9,241.00	90.46	358.05	7,341.65	2,102.74	-316.90	2,121.68	1.48	1.00	-1.09	
9,336.00	89.75	359.70	7,341.48	2,197.72	-318.76	2,214.84	1.89	-0.75	1.74	
9,430.00	89.24	0.22	7,342.31	2,291.71	-318.83	2,306.65	0.77	-0.54	0.55	
9,525.00	90.02	0.57	7,342.92	2,386.71	-318.17	2,399.28	0.90	0.82	0.37	
9,620.00	91.00	0.48	7,342.08	2,481.70	-317.30	2,491.86	1.04	1.03	-0.09	
9,715.00	91.89	359.91	7,339.68	2,576.67	-316.98	2,584.53	1.11	0.94	-0.60	
9,810.00	90.88	0.76	7,337.38	2,671.64	-316.42	2,677.16	1.39	-1.06	0.89	
9,905.00	91.57	0.96	7,335.35	2,766.60	-315.00	2,769.59	0.76	0.73	0.21	
10,000.00	91.24	0.93	7,333.02	2,861.56	-313.43	2,861.99	0.35	-0.35	-0.03	
10,095.00	92.43	1.62	7,329.98	2,956.49	-311.32	2,954.24	1.45	1.25	0.73	
10,190.00	90.76	2.20	7,327.34	3,051.39	-308.15	3,046.24	1.86	-1.76	0.61	
10,285.00	89.67	2.84	7,326.98	3,146.30	-303.98	3,138.03	1.33	-1.15	0.67	
10,380.00	90.26	2.68	7,327.04	3,241.19	-299.40	3,229.71	0.64	0.62	-0.17	
10,475.00	91.02	1.42	7,325.98	3,336.12	-296.00	3,321.69	1.55	0.80	-1.33	
10,570.00	89.47	3.26	7,325.57	3,431.03	-292.12	3,413.55	2.53	-1.63	1.94	
10,664.00	89.86	3.48	7,326.12	3,524.87	-286.60	3,504.00	0.48	0.41	0.23	
10,759.00	89.89	1.92	7,326.33	3,619.76	-282.12	3,595.70	1.64	0.03	-1.64	
10,854.00	90.53	0.88	7,325.98	3,714.73	-279.80	3,687.95	1.29	0.67	-1.09	
10,949.00	91.57	0.61	7,324.24	3,809.70	-278.57	3,780.44	1.13	1.09	-0.28	
11,043.00	90.41	0.05	7,322.62	3,903.69	-278.03	3,872.10	1.37	-1.23	-0.60	
11,138.00	90.80	0.10	7,321.61	3,998.68	-277.90	3,964.85	0.41	0.41	0.05	
11,233.00	89.37	359.77	7,321.47	4,093.68	-278.01	4,057.64	1.54	-1.51	-0.35	
11,328.00	89.96	0.19	7,322.03	4,188.67	-278.04	4,150.42	0.76	0.62	0.44	
11,423.00	89.84	358.57	7,322.19	4,283.67	-279.07	4,243.41	1.71	-0.13	-1.71	
11,518.00	90.89	359.08	7,321.59	4,378.64	-281.02	4,336.58	1.23	1.11	0.54	
11,612.00	92.20	358.08	7,319.05	4,472.58	-283.35	4,428.82	1.75	1.39	-1.06	
11,707.00	90.58	356.66	7,316.75	4,567.44	-287.71	4,522.40	2.27	-1.71	-1.49	
11,802.00	90.94	356.75	7,315.49	4,662.28	-293.17	4,616.19	0.39	0.38	0.09	
11,897.00	91.70	357.05	7,313.30	4,757.11	-298.30	4,709.91	0.86	0.80	0.32	
11,992.00	92.32	355.58	7,309.97	4,851.85	-304.40	4,803.75	1.68	0.65	-1.55	
12,087.00	91.35	355.75	7,306.93	4,946.53	-311.58	4,897.75	1.04	-1.02	0.18	
12,181.00	91.79	355.47	7,304.35	5,040.22	-318.77	4,990.80	0.55	0.47	-0.30	
12,276.00	90.31	355.61	7,302.61	5,134.91	-326.16	5,084.86	1.56	-1.56	0.15	
12,370.00	90.53	356.06	7,301.92	5,228.66	-332.99	5,177.88	0.53	0.23	0.48	
12,465.00	89.29	359.72	7,302.07	5,323.58	-336.48	5,271.33	4.07	-1.31	3.85	
12,560.00	88.75	1.23	7,303.70	5,418.56	-335.70	5,363.92	1.69	-0.57	1.59	
12,655.00	88.83	2.15	7,305.70	5,513.50	-332.89	5,456.03	0.97	0.08	0.97	
12,749.00	88.68	1.45	7,307.74	5,607.43	-329.94	5,547.13	0.76	-0.16	-0.74	
12,845.00	88.72	0.97	7,309.92	5,703.38	-327.92	5,640.40	0.50	0.04	-0.50	
12,940.00	89.82	1.86	7,311.13	5,798.34	-325.57	5,732.63	1.49	1.16	0.94	
13,035.00	91.12	2.11	7,310.35	5,893.28	-322.28	5,824.64	1.39	1.37	0.26	
13,130.00	92.81	1.59	7,307.10	5,988.17	-319.21	5,916.65	1.86	1.78	-0.55	



Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
13,225.00	93.77	2.66	7,301.64	6,082.95	-315.70	6,008.45	1.51	1.01	1.13
13,320.00	94.46	3.12	7,294.83	6,177.58	-310.92	6,099.84	0.87	0.73	0.48
13,411.00	91.07	3.65	7,290.44	6,268.30	-305.55	6,187.28	3.77	-3.73	0.58
13,506.00	87.38	0.81	7,291.72	6,363.20	-301.86	6,279.16	4.90	-3.88	-2.99
13,601.00	88.45	359.85	7,295.18	6,458.13	-301.31	6,371.75	1.51	1.13	-1.01
13,696.00	89.35	359.53	7,297.00	6,553.11	-301.83	6,464.62	1.01	0.95	-0.34
13,791.00	90.15	358.69	7,297.42	6,648.10	-303.30	6,557.70	1.22	0.84	-0.88
13,885.00	91.25	358.38	7,296.27	6,742.06	-305.70	6,649.98	1.22	1.17	-0.33
13,974.00	93.33	358.93	7,292.71	6,830.96	-307.79	6,737.24	2.42	2.34	0.62
14,069.00	90.45	0.98	7,289.58	6,925.89	-307.87	6,829.97	3.72	-3.03	2.16
14,164.00	91.86	1.22	7,287.66	7,020.85	-306.04	6,922.31	1.51	1.48	0.25
14,258.00	90.89	0.22	7,285.41	7,114.81	-304.86	7,013.82	1.48	-1.03	-1.06
14,353.00	90.01	0.23	7,284.66	7,209.81	-304.49	7,106.52	0.93	-0.93	0.01
14,448.00	89.53	358.33	7,285.04	7,304.79	-305.68	7,199.54	2.06	-0.51	-2.00
14,543.00	88.31	358.80	7,286.83	7,399.75	-308.06	7,292.78	1.38	-1.28	0.49
14,638.00	89.77	359.01	7,288.43	7,494.71	-309.88	7,385.91	1.55	1.54	0.22
14,733.00	90.43	358.65	7,288.26	7,589.69	-311.82	7,479.08	0.79	0.69	-0.38
14,827.00	91.82	358.04	7,286.41	7,683.63	-314.53	7,571.41	1.61	1.48	-0.65
14,922.00	91.20	359.47	7,283.91	7,778.57	-316.59	7,664.57	1.64	-0.65	1.51
15,017.00	89.54	0.05	7,283.30	7,873.57	-316.99	7,757.42	1.85	-1.75	0.61
15,112.00	90.23	0.72	7,283.49	7,968.56	-316.35	7,850.06	1.01	0.73	0.71
15,207.00	89.17	0.37	7,283.99	8,063.56	-315.45	7,942.63	1.18	-1.12	-0.37
15,301.00	89.67	1.31	7,284.94	8,157.54	-314.07	8,034.12	1.13	0.53	1.00
15,396.00	90.77	1.76	7,284.57	8,252.50	-311.53	8,126.31	1.25	1.16	0.47
15,491.00	90.03	1.25	7,283.91	8,347.47	-309.03	8,218.52	0.95	-0.78	-0.54
15,586.00	89.77	359.66	7,284.08	8,442.46	-308.28	8,311.13	1.70	-0.27	-1.67
15,681.00	90.98	359.61	7,283.45	8,537.46	-308.88	8,404.03	1.27	1.27	-0.05
15,775.00	89.69	358.22	7,282.90	8,631.43	-310.66	8,496.19	2.02	-1.37	-1.48
15,870.00	90.71	357.47	7,282.57	8,726.36	-314.23	8,589.66	1.33	1.07	-0.79
15,965.00	92.17	357.11	7,280.18	8,821.22	-318.72	8,683.27	1.58	1.54	-0.38
16,060.00	90.50	357.51	7,277.97	8,916.09	-323.18	8,776.87	1.81	-1.76	0.42
16,155.00	91.82	358.24	7,276.05	9,011.00	-326.70	8,870.32	1.59	1.39	0.77
16,249.00	89.69	358.35	7,274.81	9,104.95	-329.50	8,962.67	2.27	-2.27	0.12
16,344.00	90.92	358.49	7,274.30	9,199.91	-332.12	9,055.97	1.30	1.29	0.15
16,438.00	89.77	359.71	7,273.74	9,293.89	-333.59	9,148.07	1.78	-1.22	1.30
16,533.00	90.83	359.67	7,273.24	9,388.89	-334.11	9,240.95	1.12	1.12	-0.04
16,627.00	92.72	359.77	7,270.33	9,482.84	-334.57	9,332.80	2.01	2.01	0.11
16,722.00	91.03	0.71	7,267.22	9,577.78	-334.17	9,425.44	2.04	-1.78	0.99
16,816.00	89.52	1.84	7,266.77	9,671.75	-332.08	9,516.76	2.01	-1.61	1.20
16,911.00	89.88	1.78	7,267.27	9,766.70	-329.08	9,608.84	0.38	0.38	-0.06
17,006.00	91.44	2.00	7,266.17	9,861.64	-325.94	9,700.88	1.66	1.64	0.23
17,101.00	92.97	2.66	7,262.52	9,956.49	-322.09	9,792.68	1.75	1.61	0.69
17,196.00	91.99	3.20	7,258.41	10,051.28	-317.23	9,884.20	1.18	-1.03	0.57
17,265.00	92.41	3.08	7,255.76	10,120.12	-313.46	9,950.62	0.63	0.61	-0.17



Survey Report

Company:	COG OPERATING, LLC	Local Co-ordinate Reference:	Well #2H - Slot 2H
Project:	Eddy /Lea County, NM (NAD27) NMEZ	TVD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Site:	Road Runner Federal COM 2H	MD Reference:	3249+25 @ 3274.00ft (Latshaw44)
Well:	#2H	North Reference:	Grid
Wellbore:	Lateral 2 (ST)	Survey Calculation Method:	Minimum Curvature
Design:	Lateral 2 (ST)	Database:	VON_EDM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
17,320.00	92.41	3.08	7,253.45	10,174.99	-310.50	10,003.58	0.00	0.00	0.00

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
RR Fed 2H SL	0.00	0.00	0.00	0.00	0.00	397,929.70	527,721.50	32° 5' 38.367 N	104° 14' 37.751 W
- actual wellpath hits target center									
- Point									
RR Fed 2H L2 BHL	0.00	0.00	7,253.45	10,174.99	-310.50	408,104.69	527,411.00	32° 7' 19.067 N	104° 14' 41.263 W
- actual wellpath misses target center by 0.01ft at 17320.00ft MD (7253.45 TVD, 10174.99 N, -310.51 E)									
- Point									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
7,181.00	7,151.91	121.33	-237.16	Wellpath Crosses 330' Hard Line @ Heel
17,195.00	7,258.44	10,050.28	-317.29	Wellpath Crosses 330' Hard Line @ Toe
17,320.00	7,253.45	10,174.99	-310.50	TD @ 205.3'FNL, 2273.7'FEL

Checked By: _____ Approved By: _____ Date: _____