



NM OIL CONSERVATION
ARTESIA DISTRICT

FEB 9 2017

RECEIVED

COG Operating LLC

Eddy County, NM (NAD-27 2015)

Shiner Bock 1 Federal Com #28H



API #: 30-015-43913

SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

PP: 352' FSL, 330' FWL, Sec 1, T17S, R31E, Unit M

BHL: 354' FSL, 351' FEL, Sec 1, T17S, R31E, Unit P

Design: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Standard Survey Report

25 November, 2016





TDS
Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD-27 2015)
Site: Shiner Bock 1 Federal Com #28H
Well: SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M
Wellbore: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P
Design: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Local Co-ordinate Reference: Well SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M
TVD Reference: KB @ 4008.00usft (Patriot 6)
MD Reference: KB @ 4008.00usft (Patriot 6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Project	Eddy County, NM (NAD-27 2015)		
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	Shiner Bock 1 Federal Com #28H		
Site Position:		Northing:	676,049.20 usft
From:	Map	Easting:	654,241.00 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in
		Latitude:	32° 51' 27.125 N
		Longitude:	103° 49' 51.762 W
		Grid Convergence:	0.27 °

Well	SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M		
Well Position	+N/-S	0.00 usft	Northing: 676,049.20 usft
	+E/-W	0.00 usft	Easting: 654,241.00 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 51' 27.125 N
		Longitude:	103° 49' 51.762 W
		Ground Level:	3,990.00 usft

Wellbore	BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	10/20/2016	7.19	60.61	48,350

Design	BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	90.72	

Survey Program	Date 11/25/2016				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,058.00	Scientific Gyro #1 (BHL: 350' FSL, 350' FE	Scientific Gyro	Scientific Drilling Intl	
2,058.00	10,672.00	TDS MWD #2 (BHL: 350' FSL, 350' FEL, S	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.46	188.30	100.00	-0.40	-0.06	-0.05	0.46	0.46	0.00	
200.00	0.57	188.56	199.99	-1.29	-0.19	-0.17	0.11	0.11	0.26	
300.00	0.51	195.83	299.99	-2.21	-0.39	-0.36	0.09	-0.06	7.27	
400.00	0.77	185.20	399.98	-3.30	-0.57	-0.53	0.28	0.26	-10.63	
500.00	0.66	180.79	499.98	-4.55	-0.64	-0.58	0.12	-0.11	-4.41	
600.00	0.70	180.40	599.97	-5.74	-0.65	-0.58	0.04	0.04	-0.39	



TDS
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Local Co-ordinate Reference: Well SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

Project: Eddy County, NM (NAD-27 2015)

TVD Reference: KB @ 4008.00usft (Patriot 6)

Site: Shiner Bock 1 Federal Com #28H

MD Reference: KB @ 4008.00usft (Patriot 6)

Well: SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

North Reference: Grid

Wellbore: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Survey Calculation Method: Minimum Curvature

Design: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Database: EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
700.00	0.76	176.93	699.96	-7.01	-0.62	-0.53	0.07	0.06	-3.47
800.00	0.82	180.33	799.95	-8.39	-0.59	-0.48	0.08	0.06	3.40
900.00	0.75	181.75	899.94	-9.76	-0.61	-0.49	0.07	-0.07	1.42
1,000.00	0.69	185.50	999.93	-11.01	-0.69	-0.55	0.08	-0.06	3.75
1,100.00	0.80	180.90	1,099.93	-12.31	-0.76	-0.60	0.13	0.11	-4.60
1,200.00	0.76	183.99	1,199.92	-13.67	-0.81	-0.64	0.06	-0.04	3.09
1,300.00	0.81	178.51	1,299.91	-15.03	-0.84	-0.65	0.09	0.05	-5.48
1,400.00	0.81	172.35	1,399.90	-16.44	-0.73	-0.52	0.09	0.00	-6.16
1,500.00	0.68	164.43	1,499.89	-17.71	-0.48	-0.25	0.17	-0.13	-7.92
1,600.00	0.78	162.25	1,599.88	-18.93	-0.11	0.13	0.10	0.10	-2.18
1,700.00	0.78	151.98	1,699.87	-20.18	0.42	0.67	0.14	0.00	-10.27
1,800.00	0.85	137.96	1,799.86	-21.33	1.23	1.50	0.21	0.07	-14.02
1,900.00	1.14	132.47	1,899.85	-22.56	2.47	2.75	0.30	0.29	-5.49
2,000.00	1.43	125.42	1,999.82	-23.95	4.22	4.52	0.33	0.29	-7.05
2,058.00	1.09	130.40	2,057.81	-24.73	5.23	5.54	0.62	-0.59	8.59
Tie-In to Scientific Gyro									
2,152.00	1.20	135.40	2,151.79	-26.01	6.60	6.92	0.16	0.12	5.32
First TDS MWD Survey									
2,246.00	1.10	139.60	2,245.77	-27.40	7.87	8.22	0.14	-0.11	4.47
2,341.00	0.70	146.00	2,340.76	-28.57	8.79	9.15	0.43	-0.42	6.74
2,435.00	0.70	185.50	2,434.75	-29.62	9.06	9.43	0.50	0.00	42.02
2,529.00	1.50	222.10	2,528.73	-31.11	8.18	8.57	1.09	0.85	38.94
2,624.00	1.50	234.40	2,623.70	-32.75	6.33	6.74	0.34	0.00	12.95
2,719.00	1.60	227.20	2,718.67	-34.38	4.35	4.78	0.23	0.11	-7.58
2,814.00	1.50	227.20	2,813.63	-36.12	2.46	2.92	0.11	-0.11	0.00
2,908.00	1.70	226.20	2,907.60	-37.92	0.55	1.03	0.21	0.21	-1.06
3,003.00	1.70	224.00	3,002.55	-39.91	-1.44	-0.94	0.07	0.00	-2.32
3,097.00	1.50	227.40	3,096.52	-41.75	-3.32	-2.79	0.24	-0.21	3.62
3,192.00	1.50	223.50	3,191.48	-43.49	-5.09	-4.54	0.11	0.00	-4.11
3,286.00	1.90	214.40	3,285.44	-45.67	-6.82	-6.24	0.51	0.43	-9.68
3,380.00	1.90	218.60	3,379.39	-48.17	-8.67	-8.06	0.15	0.00	4.47
3,475.00	1.80	222.70	3,474.34	-50.50	-10.66	-10.03	0.17	-0.11	4.32
3,569.00	2.00	225.80	3,568.29	-52.73	-12.84	-12.18	0.24	0.21	3.30
3,664.00	1.80	209.30	3,663.24	-55.19	-14.76	-14.06	0.61	-0.21	-17.37
3,758.00	1.60	179.70	3,757.20	-57.79	-15.47	-14.75	0.95	-0.21	-31.49
3,853.00	2.10	194.70	3,852.15	-60.80	-15.91	-15.14	0.73	0.53	15.79
3,947.00	2.10	195.00	3,946.09	-64.13	-16.79	-15.99	0.01	0.00	0.32
4,041.00	2.20	200.40	4,040.02	-67.48	-17.87	-17.02	0.24	0.11	5.74
4,136.00	2.30	200.40	4,134.95	-70.98	-19.17	-18.27	0.11	0.11	0.00
4,230.00	1.80	205.40	4,228.89	-74.08	-20.46	-19.53	0.56	-0.53	5.32
4,324.00	1.80	210.50	4,322.84	-76.68	-21.84	-20.87	0.17	0.00	5.43



TDS
Survey Report



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TVD Reference: KB @ 4008.00usft (Patriot 6)

Site: Shiner Bock 1 Federal Com #28H

MD Reference: KB @ 4008.00usft (Patriot 6)

Well: SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

North Reference: Grid

Wellbore: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Survey Calculation Method: Minimum Curvature

Design: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Database: EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,419.00	1.60	213.20	4,417.80	-79.08	-23.32	-22.33	0.23	-0.21	2.84
4,513.00	1.80	210.30	4,511.76	-81.45	-24.79	-23.76	0.23	0.21	-3.09
4,608.00	1.80	217.80	4,606.71	-83.92	-26.45	-25.40	0.25	0.00	7.89
4,702.00	1.60	215.40	4,700.67	-86.15	-28.12	-27.03	0.23	-0.21	-2.55
4,797.00	1.50	219.40	4,795.63	-88.20	-29.68	-28.57	0.16	-0.11	4.21
4,891.00	1.30	230.30	4,889.61	-89.83	-31.28	-30.15	0.35	-0.21	11.60
4,986.00	1.10	230.20	4,984.59	-91.10	-32.81	-31.66	0.21	-0.21	-0.11
5,080.00	1.20	228.80	5,078.57	-92.33	-34.24	-33.08	0.11	0.11	-1.49
5,174.00	1.10	225.80	5,172.55	-93.60	-35.63	-34.45	0.12	-0.11	-3.19
5,269.00	0.90	225.10	5,267.53	-94.77	-36.81	-35.62	0.21	-0.21	-0.74
5,364.00	0.70	119.20	5,362.53	-95.58	-36.83	-35.63	1.35	-0.21	-111.47
5,396.00	2.50	93.80	5,394.51	-95.72	-35.97	-34.76	5.91	5.63	-79.38
5,427.00	4.50	92.60	5,425.46	-95.82	-34.08	-32.87	6.46	6.45	-3.87
5,458.00	7.00	88.10	5,456.30	-95.81	-30.97	-29.77	8.19	8.06	-14.52
5,490.00	10.90	84.10	5,487.90	-95.43	-26.01	-24.81	12.33	12.19	-12.50
5,522.00	14.80	81.60	5,519.09	-94.53	-18.96	-17.77	12.31	12.19	-7.81
5,552.00	18.70	79.90	5,547.82	-93.12	-10.43	-9.26	13.10	13.00	-5.67
5,584.00	22.00	81.30	5,577.81	-91.32	0.55	1.70	10.42	10.31	4.38
5,615.00	25.40	84.70	5,606.20	-89.82	12.91	14.04	11.82	10.97	10.97
5,646.00	28.40	88.30	5,633.84	-88.99	26.91	28.02	11.01	9.68	11.61
5,678.00	31.60	90.30	5,661.55	-88.81	42.90	44.01	10.48	10.00	6.25
5,710.00	34.90	90.80	5,688.31	-88.98	60.44	61.56	10.35	10.31	1.56
5,741.00	38.10	90.90	5,713.23	-89.25	78.88	79.99	10.32	10.32	0.32
5,772.00	41.60	91.30	5,737.02	-89.64	98.74	99.85	11.32	11.29	1.29
5,804.00	44.60	91.30	5,760.38	-90.13	120.59	121.72	9.38	9.38	0.00
5,835.00	44.90	91.10	5,782.40	-90.59	142.41	143.54	1.07	0.97	-0.65
5,867.00	44.50	90.80	5,805.15	-90.96	164.92	166.05	1.41	-1.25	-0.94
5,899.00	44.00	90.50	5,828.07	-91.22	187.25	188.38	1.69	-1.56	-0.94
5,930.00	43.60	90.20	5,850.44	-91.35	208.70	209.83	1.45	-1.29	-0.97
5,961.00	43.40	90.00	5,872.93	-91.39	230.04	231.17	0.78	-0.65	-0.65
5,992.00	43.40	90.10	5,895.45	-91.40	251.34	252.47	0.22	0.00	0.32
6,024.00	45.90	90.30	5,918.22	-91.48	273.83	274.95	7.82	7.81	0.63
6,030.34	46.58	90.28	5,922.60	-91.51	278.41	279.53	10.67	10.67	-0.35
As-Drilled PP									
6,054.00	49.10	90.20	5,938.48	-91.58	295.94	297.07	10.67	10.67	-0.33
6,086.00	52.40	90.00	5,958.72	-91.62	320.72	321.84	10.32	10.31	-0.63
6,118.00	55.80	90.20	5,977.49	-91.67	346.64	347.76	10.64	10.63	0.63
6,149.00	59.00	90.30	5,994.18	-91.78	372.75	373.87	10.33	10.32	0.32
6,181.00	62.20	90.20	6,009.89	-91.90	400.62	401.75	10.00	10.00	-0.31
6,212.00	65.60	90.40	6,023.53	-92.05	428.46	429.58	10.98	10.97	0.65
6,244.00	68.00	89.40	6,036.13	-92.00	457.87	458.99	8.03	7.50	-3.13



TDS
Survey Report



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TVD Reference: KB @ 4008.00usft (Patriot 6)

Site: Shiner Bock 1 Federal Com #28H

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North Reference: Grid

Wellbore: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Survey Calculation Method: Minimum Curvature

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Database: EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,275.00	70.50	88.70	6,047.12	-91.51	486.85	487.96	8.34	8.06	-2.26
6,307.00	74.20	88.70	6,056.82	-90.82	517.33	518.43	11.56	11.56	0.00
6,339.00	78.80	89.30	6,064.28	-90.28	548.43	549.52	14.49	14.38	1.88
6,370.00	82.10	90.40	6,069.43	-90.20	579.00	580.09	11.21	10.65	3.55
6,402.00	84.70	91.40	6,073.11	-90.70	610.78	611.87	8.70	8.13	3.13
6,434.00	88.80	91.10	6,074.92	-91.40	642.71	643.81	12.85	12.81	-0.94
6,461.00	90.90	91.70	6,074.99	-92.06	669.70	670.81	8.09	7.78	2.22
6,525.00	91.10	91.60	6,073.87	-93.90	733.67	734.79	0.35	0.31	-0.16
6,620.00	91.30	89.90	6,071.88	-95.14	828.64	829.77	1.80	0.21	-1.79
6,714.00	91.60	89.10	6,069.50	-94.32	922.60	923.71	0.91	0.32	-0.85
6,809.00	91.40	89.40	6,067.02	-93.08	1,017.56	1,018.65	0.38	-0.21	0.32
6,903.00	91.10	89.60	6,064.97	-92.26	1,111.53	1,112.61	0.38	-0.32	0.21
6,997.00	90.90	88.50	6,063.33	-90.70	1,205.50	1,206.55	1.19	-0.21	-1.17
7,092.00	90.70	88.70	6,062.00	-88.38	1,300.47	1,301.48	0.30	-0.21	0.21
7,187.00	90.20	89.30	6,061.25	-86.72	1,395.45	1,396.43	0.82	-0.53	0.63
7,281.00	90.70	88.90	6,060.52	-85.25	1,489.43	1,490.39	0.68	0.53	-0.43
7,375.00	91.50	88.70	6,058.71	-83.28	1,583.40	1,584.32	0.88	0.85	-0.21
7,470.00	91.40	88.70	6,056.31	-81.13	1,678.34	1,679.23	0.11	-0.11	0.00
7,563.00	91.10	89.20	6,054.28	-79.42	1,771.30	1,772.16	0.63	-0.32	0.54
7,658.00	90.80	89.50	6,052.70	-78.34	1,866.28	1,867.12	0.45	-0.32	0.32
7,752.00	90.50	89.60	6,051.64	-77.61	1,960.27	1,961.09	0.34	-0.32	0.11
7,846.00	91.70	89.70	6,049.83	-77.03	2,054.25	2,055.06	1.28	1.28	0.11
7,941.00	91.50	90.10	6,047.18	-76.87	2,149.22	2,150.01	0.47	-0.21	0.42
8,036.00	91.10	90.30	6,045.02	-77.20	2,244.19	2,244.98	0.47	-0.42	0.21
8,130.00	91.00	90.70	6,043.30	-78.02	2,338.17	2,338.97	0.44	-0.11	0.43
8,225.00	91.30	89.30	6,041.40	-78.02	2,433.15	2,433.94	1.51	0.32	-1.47
8,319.00	91.40	89.30	6,039.18	-76.87	2,527.12	2,527.88	0.11	0.11	0.00
8,413.00	91.40	89.60	6,036.88	-75.97	2,621.08	2,621.83	0.32	0.00	0.32
8,508.00	91.20	90.00	6,034.73	-75.64	2,716.06	2,716.79	0.47	-0.21	0.42
8,603.00	91.00	90.20	6,032.90	-75.80	2,811.04	2,811.77	0.30	-0.21	0.21
8,697.00	90.60	90.20	6,031.59	-76.13	2,905.03	2,905.76	0.43	-0.43	0.00
8,792.00	90.90	89.00	6,030.35	-75.47	3,000.02	3,000.73	1.30	0.32	-1.26
8,886.00	90.90	89.20	6,028.87	-73.99	3,094.00	3,094.68	0.21	0.00	0.21
8,981.00	90.60	89.60	6,027.63	-73.00	3,188.98	3,189.65	0.53	-0.32	0.42
9,076.00	90.20	89.70	6,026.97	-72.42	3,283.98	3,284.63	0.43	-0.42	0.11
9,170.00	91.40	88.80	6,025.65	-71.19	3,377.96	3,378.59	1.60	1.28	-0.96
9,265.00	91.60	89.10	6,023.17	-69.44	3,472.91	3,473.51	0.38	0.21	0.32
9,360.00	91.30	89.40	6,020.76	-68.20	3,567.87	3,568.45	0.45	-0.32	0.32
9,455.00	91.00	89.80	6,018.86	-67.54	3,662.85	3,663.41	0.53	-0.32	0.42
9,550.00	90.70	90.20	6,017.45	-67.54	3,757.84	3,758.39	0.53	-0.32	0.42
9,645.00	91.10	88.90	6,015.95	-66.79	3,852.82	3,853.36	1.43	0.42	-1.37



TDS
Survey Report



Company: COG Operating LLC

Local Co-ordinate Reference:

Well SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

Project: Eddy County, NM (NAD-27 2015)

TVD Reference:

KB @ 4008.00usft (Patriot 6)

Site: Shiner Bock 1 Federal Com #28H

MD Reference:

KB @ 4008.00usft (Patriot 6)

Well: SHL: 445' FSL, 52' FWL, Sec 1, T17S, R31E, Unit M

North Reference:

Grid

Wellbore: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Survey Calculation Method:

Minimum Curvature

Design: BHL: 350' FSL, 350' FEL, Sec 1, T17S, R31E, Unit P

Database:

EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,740.00	91.10	89.20	6,014.13	-65.22	3,947.79	3,948.30	0.32	0.00	0.32
9,835.00	91.00	89.70	6,012.39	-64.31	4,042.77	4,043.26	0.54	-0.11	0.53
9,930.00	91.00	90.20	6,010.73	-64.22	4,137.75	4,138.23	0.53	0.00	0.53
10,025.00	90.80	90.70	6,009.24	-64.97	4,232.74	4,233.22	0.57	-0.21	0.53
10,119.00	90.50	90.90	6,008.17	-66.28	4,326.72	4,327.22	0.38	-0.32	0.21
10,214.00	91.00	89.50	6,006.93	-66.61	4,421.71	4,422.20	1.56	0.53	-1.47
10,307.00	91.10	88.70	6,005.23	-65.15	4,514.68	4,515.15	0.87	0.11	-0.86
10,402.00	90.50	88.90	6,003.90	-63.16	4,609.65	4,610.08	0.67	-0.63	0.21
10,496.00	89.90	88.90	6,003.57	-61.36	4,703.64	4,704.04	0.64	-0.64	0.00
10,591.00	89.40	88.70	6,004.15	-59.37	4,798.61	4,798.98	0.57	-0.53	-0.21
Last TDS MWD Survey									
10,672.00	89.40	88.70	6,005.00	-57.53	4,879.59	4,879.93	0.00	0.00	0.00
Projection to Bit/TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,058.00	2,057.81	-24.73	5.23	Tie-In to Scientific Gyro
2,152.00	2,151.79	-26.01	6.60	First TDS MWD Survey
6,030.34	5,922.60	-91.51	278.41	As-Drilled PP
10,591.00	6,004.15	-59.37	4,798.61	Last TDS MWD Survey
10,672.00	6,005.00	-57.53	4,879.59	Projection to Bit/TD

Checked By: _____ Approved By: _____ Date: _____