



CONCHO

NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 11 2017

RECEIVED

COG Operating LLC

Eddy County, NM (NAD-27 2015)

Burch Keely Unit #966H

API #: 30-015-44067

SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L

PP: 2265' FSL, 330' FWL, Sec 19, T17S, R30E, Unit L

BHL: 2283' FSL, 249' FEL, Sec 19, T17S, R30E, Unit I

Design: BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I

Standard Survey Report

02 April, 2017

**Please provide signature
page for directional survey**





TDS
Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD-27 2015)
Site: Burch Keely Unit #966H
Well: SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L
Wellbore: BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I
Design: BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I

Local Co-ordinate Reference: Well SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L
TVD Reference: KB @ 3640.00usft (Silver Oak 3)
MD Reference: KB @ 3640.00usft (Silver Oak 3)
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		Burch Keely Unit #966H			
Site Position:		Northing:	661,461.00 usft	Latitude:	32° 49' 4.970 N
From:	Map	Easting:	596,813.30 usft	Longitude:	104° 1' 5.512 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.17 °

Well	SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L					
Well Position	+N/-S	0.00 usft	Northing:	661,461.00 usft	Latitude:	32° 49' 4.970 N
	+E/-W	0.00 usft	Easting:	596,813.30 usft	Longitude:	104° 1' 5.512 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,622.00 usft

Wellbore	BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	3/8/2017	7.24	60.54	48,270

Design	BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I				
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	85.77	

Survey Program	Date 4/2/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
25.00	1,058.00	VES Gyro #1 (BHL: 2290' FSL, 220' FEL,	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
1,058.00	9,571.00	TDS MWD #2 (BHL: 2290' FSL, 220' FEL,	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	
25.00	0.16	74.25	25.00	0.01	0.03	0.03	0.64	0.64	0.00	
50.00	0.07	185.39	50.00	0.00	0.07	0.07	0.79	-0.36	444.56	
75.00	0.16	237.37	75.00	-0.03	0.03	0.03	0.52	0.36	207.92	
100.00	0.08	46.77	100.00	-0.04	0.02	0.02	0.96	-0.32	677.60	
125.00	0.21	32.24	125.00	0.01	0.06	0.06	0.54	0.52	-58.12	
150.00	0.16	64.30	150.00	0.07	0.11	0.12	0.45	-0.20	128.24	



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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)
175.00	0.23	45.63	175.00	0.12	0.18	0.19	0.37	0.28	-74.68
200.00	0.17	44.08	200.00	0.18	0.24	0.25	0.24	-0.24	-6.20
225.00	0.38	353.81	225.00	0.29	0.26	0.28	1.20	0.84	-201.08
250.00	0.79	338.63	250.00	0.53	0.19	0.22	1.74	1.64	-60.72
275.00	1.32	334.26	274.99	0.95	0.00	0.07	2.14	2.12	-17.48
300.00	1.38	322.79	299.99	1.45	-0.31	-0.20	1.11	0.24	-45.88
325.00	1.54	326.50	324.98	1.97	-0.68	-0.53	0.74	0.64	14.84
350.00	1.42	324.93	349.97	2.50	-1.04	-0.85	0.51	-0.48	-6.28
375.00	1.37	320.98	374.96	2.99	-1.41	-1.18	0.43	-0.20	-15.80
400.00	1.30	324.63	399.96	3.45	-1.76	-1.50	0.44	-0.28	14.60
425.00	1.29	326.33	424.95	3.92	-2.08	-1.78	0.16	-0.04	6.80
450.00	1.31	325.41	449.94	4.39	-2.40	-2.07	0.12	0.08	-3.68
475.00	1.32	329.99	474.94	4.87	-2.70	-2.34	0.42	0.04	18.32
500.00	1.37	331.82	499.93	5.39	-2.99	-2.58	0.26	0.20	7.32
525.00	1.34	330.26	524.92	5.90	-3.27	-2.83	0.19	-0.12	-6.24
550.00	1.33	335.41	549.92	6.42	-3.54	-3.06	0.48	-0.04	20.60
575.00	1.21	341.16	574.91	6.93	-3.75	-3.22	0.70	-0.48	23.00
600.00	1.28	343.29	599.90	7.45	-3.91	-3.35	0.34	0.28	8.52
625.00	1.27	348.22	624.90	7.99	-4.05	-3.45	0.44	-0.04	19.72
650.00	1.34	346.87	649.89	8.55	-4.17	-3.53	0.31	0.28	-5.40
675.00	1.38	355.01	674.88	9.13	-4.26	-3.58	0.79	0.16	32.56
700.00	1.43	349.84	699.88	9.74	-4.35	-3.62	0.54	0.20	-20.68
725.00	1.43	352.14	724.87	10.35	-4.44	-3.67	0.23	0.00	9.20
750.00	1.31	356.37	749.86	10.95	-4.50	-3.68	0.63	-0.48	16.92
775.00	1.29	1.78	774.86	11.51	-4.51	-3.65	0.50	-0.08	21.64
800.00	1.33	6.27	799.85	12.08	-4.47	-3.57	0.44	0.16	17.96
825.00	1.28	6.55	824.84	12.65	-4.41	-3.46	0.20	-0.20	1.12
850.00	1.29	15.91	849.84	13.20	-4.30	-3.32	0.84	0.04	37.44
875.00	1.30	17.46	874.83	13.74	-4.14	-3.11	0.15	0.04	6.20
900.00	1.28	24.08	899.82	14.26	-3.94	-2.88	0.60	-0.08	26.48
925.00	1.26	29.39	924.82	14.76	-3.69	-2.59	0.48	-0.08	21.24
950.00	1.24	28.21	949.81	15.24	-3.43	-2.29	0.13	-0.08	-4.72
975.00	1.24	26.16	974.81	15.72	-3.18	-2.01	0.18	0.00	-8.20
1,000.00	1.08	26.93	999.80	16.17	-2.95	-1.75	0.64	-0.64	3.08
1,025.00	0.99	28.21	1,024.80	16.57	-2.75	-1.52	0.37	-0.36	5.12
1,050.00	0.97	28.66	1,049.79	16.95	-2.54	-1.29	0.09	-0.08	1.80
1,058.00	0.96	25.05	1,057.79	17.07	-2.48	-1.22	0.77	-0.13	-45.13
Tie-In to VES Gyro									
1,103.00	0.90	12.60	1,102.79	17.75	-2.24	-0.93	0.47	-0.13	-27.67
First TDS MWD Survey									
1,135.00	0.80	18.30	1,134.78	18.21	-2.12	-0.77	0.41	-0.31	17.81



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1,230.00	2.60	317.50	1,229.74	20.43	-3.37	-1.85	2.44	1.89	-64.00
1,325.00	4.80	316.70	1,324.54	24.91	-7.55	-5.69	2.32	2.32	-0.84
1,419.00	7.50	320.60	1,417.99	32.52	-14.14	-11.71	2.90	2.87	4.15
1,514.00	8.20	321.60	1,512.10	42.62	-22.29	-19.08	0.75	0.74	1.05
1,609.00	8.00	321.60	1,606.15	53.11	-30.60	-26.60	0.21	-0.21	0.00
1,704.00	7.80	323.20	1,700.25	63.45	-38.57	-33.78	0.31	-0.21	1.68
1,799.00	8.70	314.60	1,794.27	73.66	-47.55	-41.98	1.61	0.95	-9.05
1,893.00	9.30	314.00	1,887.11	83.92	-58.07	-51.72	0.65	0.64	-0.64
1,988.00	9.10	315.50	1,980.89	94.61	-68.86	-61.69	0.33	-0.21	1.58
2,083.00	9.10	318.00	2,074.69	105.56	-79.15	-71.15	0.42	0.00	2.63
2,178.00	9.00	319.20	2,168.51	116.76	-89.03	-80.18	0.22	-0.11	1.26
2,273.00	9.10	321.50	2,262.33	128.27	-98.57	-88.84	0.40	0.11	2.42
2,368.00	8.40	315.70	2,356.22	139.11	-108.09	-97.53	1.18	-0.74	-6.11
2,463.00	8.60	316.70	2,450.18	149.25	-117.81	-106.48	0.26	0.21	1.05
2,558.00	8.70	317.60	2,544.10	159.72	-127.52	-115.39	0.18	0.11	0.95
2,653.00	7.70	311.10	2,638.13	169.21	-137.16	-124.31	1.43	-1.05	-6.84
2,747.00	8.10	311.80	2,731.24	177.77	-146.85	-133.33	0.44	0.43	0.74
2,842.00	8.00	314.10	2,825.30	186.83	-156.58	-142.38	0.35	-0.11	2.42
2,937.00	8.20	315.80	2,919.35	196.29	-166.05	-151.12	0.33	0.21	1.79
3,032.00	8.40	317.20	3,013.36	206.24	-175.49	-159.80	0.30	0.21	1.47
3,127.00	8.50	319.20	3,107.33	216.64	-184.79	-168.31	0.33	0.11	2.11
3,221.00	7.30	315.20	3,200.43	226.14	-193.54	-176.33	1.40	-1.28	-4.26
3,316.00	7.50	314.90	3,294.64	234.80	-202.19	-184.32	0.21	0.21	-0.32
3,411.00	7.40	319.40	3,388.84	243.82	-210.56	-192.00	0.62	-0.11	4.74
3,506.00	7.60	320.70	3,483.03	253.33	-218.52	-199.24	0.28	0.21	1.37
3,601.00	7.80	324.60	3,577.17	263.44	-226.23	-206.18	0.59	0.21	4.11
3,695.00	8.10	310.60	3,670.28	272.95	-234.96	-214.18	2.08	0.32	-14.89
3,790.00	8.80	309.50	3,764.25	281.93	-245.65	-224.18	0.76	0.74	-1.16
3,885.00	7.20	309.80	3,858.32	290.36	-255.83	-233.71	1.68	-1.68	0.32
3,980.00	4.20	310.50	3,952.84	296.44	-263.05	-240.47	3.16	-3.16	0.74
4,075.00	1.60	269.10	4,047.72	298.67	-267.02	-244.26	3.35	-2.74	-43.58
4,170.00	0.70	175.40	4,142.70	298.07	-268.30	-245.58	1.88	-0.95	-98.63
4,233.00	0.70	180.50	4,205.70	297.31	-268.27	-245.61	0.10	0.00	8.10
4,264.00	0.80	173.30	4,236.69	296.90	-268.25	-245.62	0.44	0.32	-23.23
4,296.00	1.50	119.70	4,268.69	296.47	-267.86	-245.26	3.78	2.19	-167.50
4,327.00	4.20	96.70	4,299.65	296.14	-266.38	-243.81	9.29	8.71	-74.19
4,359.00	8.00	86.50	4,331.46	296.14	-262.99	-240.43	12.30	11.88	-31.88
4,391.00	12.60	80.20	4,362.94	296.87	-257.33	-234.73	14.78	14.38	-19.69
4,422.00	17.50	78.10	4,392.87	298.41	-249.43	-226.74	15.90	15.81	-6.77
4,454.00	21.20	79.70	4,423.05	300.43	-239.02	-216.21	11.68	11.56	5.00
4,486.00	23.90	81.30	4,452.61	302.45	-226.92	-203.99	8.65	8.44	5.00



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4,517.00	26.20	82.60	4,480.69	304.28	-213.93	-190.90	7.63	7.42	4.19
4,548.00	29.10	83.40	4,508.14	306.03	-199.65	-176.53	9.43	9.35	2.58
4,580.00	32.30	84.70	4,535.66	307.71	-183.40	-160.20	10.21	10.00	4.06
4,612.00	34.90	86.80	4,562.31	309.01	-165.74	-142.50	8.90	8.13	6.56
4,643.00	37.40	88.70	4,587.34	309.72	-147.47	-124.23	8.84	8.06	6.13
4,675.00	40.10	89.80	4,612.29	309.98	-127.45	-104.24	8.71	8.44	3.44
4,706.00	43.10	90.60	4,635.47	309.90	-106.87	-83.72	9.83	9.68	2.58
4,738.00	44.70	90.70	4,658.53	309.65	-84.68	-61.61	5.00	5.00	0.31
4,770.00	45.30	90.90	4,681.16	309.34	-62.06	-39.07	1.93	1.88	0.63
4,801.00	45.80	90.80	4,702.87	309.01	-39.93	-17.03	1.63	1.61	-0.32
4,833.00	46.40	90.90	4,725.05	308.67	-16.88	5.94	1.89	1.88	0.31
4,864.00	47.10	90.70	4,746.30	308.35	5.70	28.43	2.31	2.26	-0.65
4,896.00	47.60	90.60	4,767.98	308.08	29.24	51.88	1.58	1.56	-0.31
4,909.01	47.77	90.56	4,776.73	307.99	38.86	61.47	1.31	1.29	-0.32
As-Drilled PP									
4,927.00	48.00	90.50	4,788.80	307.86	52.20	74.77	1.31	1.29	-0.32
4,959.00	49.20	90.40	4,809.96	307.67	76.20	98.69	3.76	3.75	-0.31
4,991.00	51.80	90.60	4,830.31	307.46	100.89	123.29	8.14	8.13	0.63
5,022.00	54.70	90.50	4,848.86	307.22	125.73	148.04	9.36	9.35	-0.32
5,054.00	58.90	90.00	4,866.38	307.11	152.50	174.73	13.19	13.13	-1.56
5,085.00	62.60	89.90	4,881.52	307.13	179.54	201.70	11.94	11.94	-0.32
5,117.00	65.20	89.90	4,895.60	307.18	208.27	230.36	8.13	8.13	0.00
5,149.00	67.50	89.70	4,908.44	307.28	237.58	259.60	7.21	7.19	-0.63
5,180.00	70.60	89.90	4,919.52	307.38	266.53	288.48	10.02	10.00	0.65
5,212.00	73.90	90.20	4,929.27	307.36	297.00	318.86	10.35	10.31	0.94
5,244.00	78.00	90.40	4,937.04	307.19	328.04	349.80	12.83	12.81	0.63
5,275.00	82.40	90.30	4,942.31	307.01	358.58	380.25	14.20	14.19	-0.32
5,307.00	86.50	89.60	4,945.41	307.04	390.42	412.00	13.00	12.81	-2.19
5,339.00	89.20	89.00	4,946.61	307.43	422.39	443.92	8.64	8.44	-1.88
5,402.00	91.30	89.10	4,946.33	308.47	485.38	506.81	3.34	3.33	0.16
5,502.00	92.40	88.60	4,943.11	310.48	585.31	606.61	1.21	1.10	-0.50
5,597.00	90.20	89.20	4,940.95	312.30	680.26	701.44	2.40	-2.32	0.63
5,692.00	89.90	89.70	4,940.87	313.21	775.25	796.24	0.61	-0.32	0.53
5,787.00	90.00	89.70	4,940.95	313.71	870.25	891.02	0.11	0.11	0.00
5,882.00	90.00	89.90	4,940.95	314.04	965.25	985.79	0.21	0.00	0.21
5,977.00	89.60	90.40	4,941.28	313.79	1,060.25	1,080.51	0.67	-0.42	0.53
6,071.00	89.70	90.90	4,941.86	312.73	1,154.24	1,174.16	0.54	0.11	0.53
6,166.00	90.20	90.00	4,941.94	311.98	1,249.24	1,268.85	1.08	0.53	-0.95
6,261.00	91.50	90.00	4,940.53	311.98	1,344.22	1,363.57	1.37	1.37	0.00
6,356.00	92.00	90.60	4,937.63	311.48	1,439.18	1,458.23	0.82	0.53	0.63
6,451.00	91.60	89.50	4,934.64	311.40	1,534.13	1,552.92	1.23	-0.42	-1.16



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Company: COG Operating LLC

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

Site: Burch Keely Unit #966H

Well: SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L

Wellbore: BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I

Design: BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I

Local Co-ordinate Reference:

Well SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L

TVD Reference:

KB @ 3640.00usft (Silver Oak 3)

MD Reference:

KB @ 3640.00usft (Silver Oak 3)

North Reference:

Grid

Survey Calculation Method:

Minimum Curvature

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)
6,546.00	92.00	89.50	4,931.66	312.23	1,629.08	1,647.67	0.42	0.42	0.00
6,641.00	92.30	89.80	4,928.10	312.81	1,724.01	1,742.39	0.45	0.32	0.32
6,736.00	90.50	89.20	4,925.78	313.64	1,818.97	1,837.15	2.00	-1.89	-0.63
6,831.00	90.50	89.80	4,924.95	314.47	1,913.97	1,931.95	0.63	0.00	0.63
6,926.00	90.40	89.30	4,924.20	315.21	2,008.96	2,026.74	0.54	-0.11	-0.53
7,021.00	90.30	89.70	4,923.62	316.04	2,103.95	2,121.53	0.43	-0.11	0.42
7,116.00	90.10	90.50	4,923.29	315.88	2,198.95	2,216.26	0.87	-0.21	0.84
7,211.00	90.50	90.00	4,922.79	315.46	2,293.95	2,310.97	0.67	0.42	-0.53
7,306.00	91.70	89.00	4,920.97	316.29	2,388.93	2,405.75	1.64	1.26	-1.05
7,401.00	92.30	89.10	4,917.65	317.86	2,483.85	2,500.53	0.64	0.63	0.11
7,496.00	91.30	88.20	4,914.67	320.10	2,578.78	2,595.37	1.42	-1.05	-0.95
7,591.00	91.50	88.60	4,912.35	322.75	2,673.71	2,690.24	0.47	0.21	0.42
7,685.00	91.80	88.80	4,909.64	324.88	2,767.65	2,784.07	0.38	0.32	0.21
7,780.00	91.80	89.10	4,906.66	326.62	2,862.59	2,878.88	0.32	0.00	0.32
7,875.00	91.90	89.80	4,903.59	327.54	2,957.53	2,973.64	0.74	0.11	0.74
7,970.00	92.00	90.00	4,900.36	327.70	3,052.48	3,068.33	0.24	0.11	0.21
8,065.00	91.30	89.10	4,897.62	328.45	3,147.43	3,163.09	1.20	-0.74	-0.95
8,160.00	91.00	89.20	4,895.71	329.86	3,242.40	3,257.90	0.33	-0.32	0.11
8,254.00	91.10	89.80	4,893.99	330.68	3,336.38	3,351.69	0.65	0.11	0.64
8,349.00	90.50	90.10	4,892.67	330.76	3,431.37	3,446.42	0.71	-0.63	0.32
8,444.00	90.30	90.30	4,892.00	330.43	3,526.37	3,541.14	0.30	-0.21	0.21
8,539.00	90.00	89.80	4,891.75	330.34	3,621.37	3,635.87	0.61	-0.32	-0.53
8,634.00	89.50	89.50	4,892.17	330.93	3,716.37	3,730.65	0.61	-0.53	-0.32
8,729.00	90.30	89.10	4,892.33	332.09	3,811.36	3,825.47	0.94	0.84	-0.42
8,824.00	91.40	89.00	4,890.93	333.66	3,906.33	3,920.30	1.16	1.16	-0.11
8,919.00	90.80	89.10	4,889.10	335.24	4,001.30	4,015.13	0.64	-0.63	0.11
9,014.00	90.00	89.70	4,888.44	336.23	4,096.29	4,109.94	1.05	-0.84	0.63
9,109.00	89.70	89.30	4,888.69	337.06	4,191.29	4,204.73	0.53	-0.32	-0.42
9,204.00	91.10	89.40	4,888.02	338.14	4,286.28	4,299.54	1.48	1.47	0.11
9,299.00	89.80	89.90	4,887.28	338.72	4,381.27	4,394.32	1.47	-1.37	0.53
9,358.00	89.30	89.90	4,887.74	338.82	4,440.27	4,453.17	0.85	-0.85	0.00
9,453.00	89.60	89.90	4,888.65	338.99	4,535.27	4,547.92	0.32	0.32	0.00
9,485.00	89.50	89.90	4,888.90	339.04	4,567.26	4,579.83	0.31	-0.31	0.00
Last TDS MWD Survey									
9,571.00	89.50	89.90	4,889.65	339.19	4,653.26	4,665.60	0.00	0.00	0.00
Projection to Bit/TD									



TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1957' FSL, 290' FWL, Sec 19, T17S, R30E, Unit L
Project:	Eddy County, NM (NAD-27 2015)	TVD Reference:	KB @ 3640.00usft (Silver Oak 3)
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Wellbore:	BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 2290' FSL, 220' FEL, Sec 19, T17S, R30E, Unit I	Database:	EDM 5000.1 Single User Db

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,058.00	1,057.79	17.07	-2.48	Tie-In to VES Gyro
1,103.00	1,102.79	17.75	-2.24	First TDS MWD Survey
4,909.01	4,776.73	307.99	38.86	As-Drilled PP
9,485.00	4,888.90	339.04	4,567.26	Last TDS MWD Survey
9,571.00	4,889.65	339.19	4,653.26	Projection to Bit/TD

Checked By: _____	Approved By: _____	Date: _____
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