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Logos Operating LLC

Rio Arriba, NM NAD83

Federal 2307-7P

Federal 2307-7P COM 1H - Slot 7P 1H

OH

Design: OH

Standard Survey Report

08 November, 2018

NMCCD

DEC 13 2018

DISTRICT III

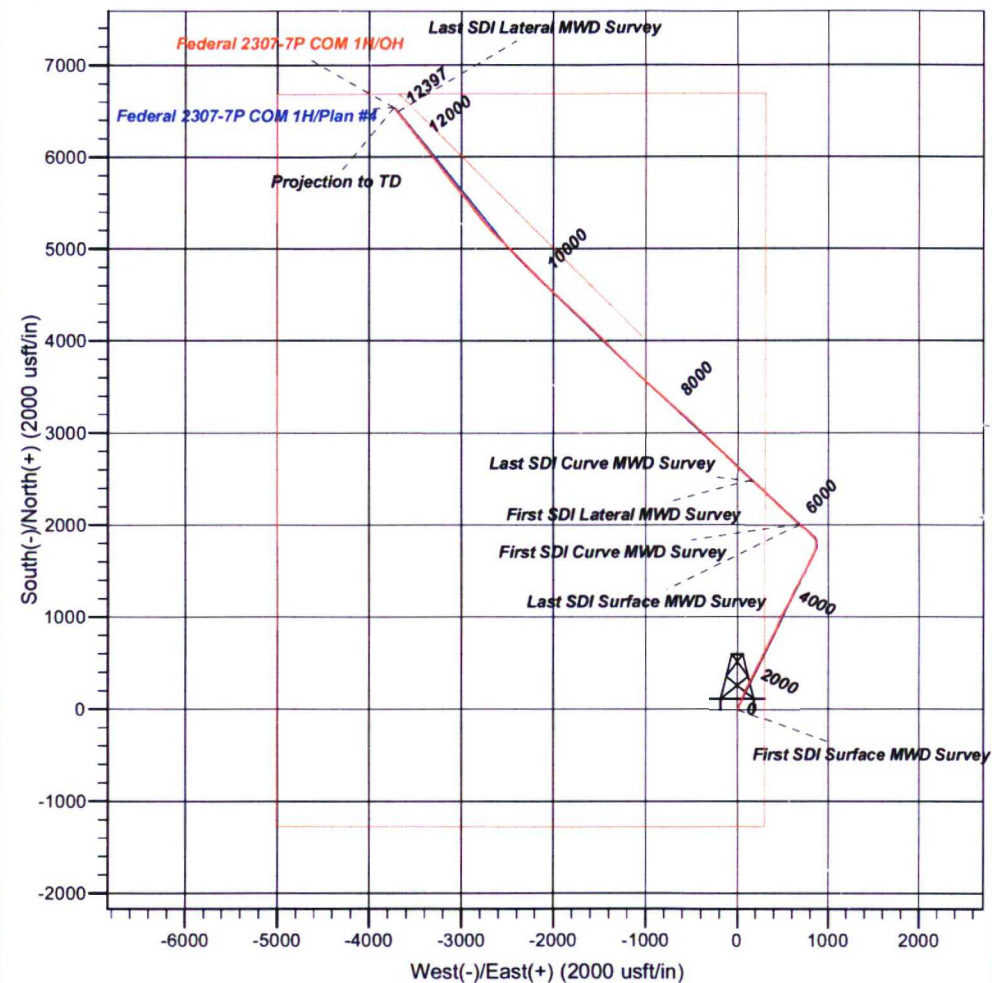
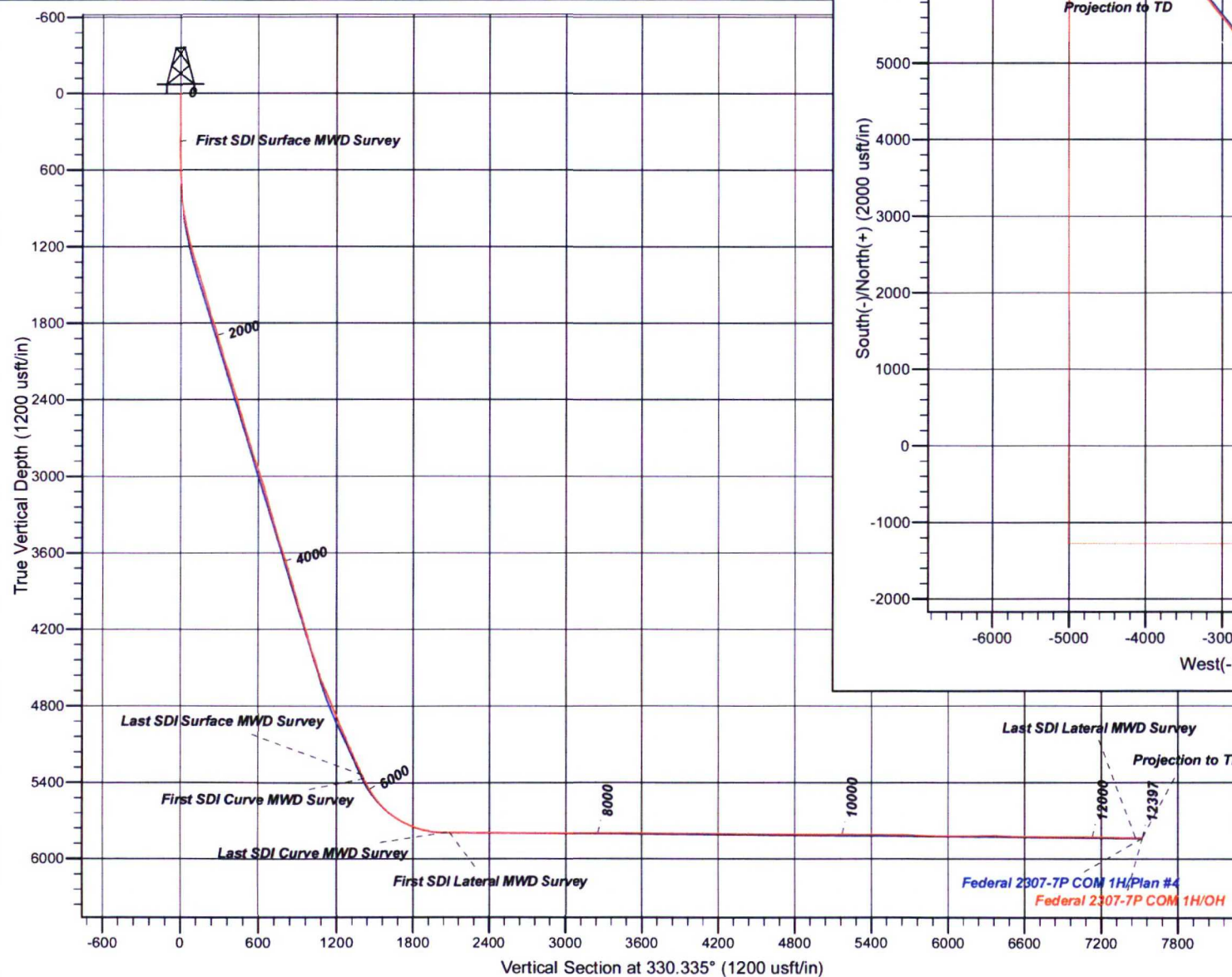


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WELL DETAILS: Federal 2307-7P COM 1H

GL 7272' & RKB 14' @ 7286.00usft (Aztec 920) 7272.00						
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
0.00	0.00	1905969.03	2789753.16	36.2378930	-107.6072830	7P 1H



Design: OH (Federal 2307-7P COM 1H/OH)

Created By: Janie Collins Date: 12:02, November 08 2018

PROJECT DETAILS: Rio Arriba, NM NAD83

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: New Mexico Western Zone

System Datum: Mean Sea Level
Local North: True



Scientific Drilling, Intl
Survey Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2307-7P
Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

Project	Rio Arriba, NM NAD83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site	Federal 2307-7P				
Site Position:		Northing:	1,905,969.03 usft	Latitude:	36.2378930
From:	Lat/Long	Easting:	2,789,753.17 usft	Longitude:	-107.6072830
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.13 °

Well	Federal 2307-7P COM 1H - Slot 7P 1H				
Well Position	+N/-S	0.00 usft	Northing:	1,905,969.03 usft	Latitude: 36.2378930
	+E/-W	0.00 usft	Easting:	2,789,753.17 usft	Longitude: -107.6072830
Position Uncertainty	0.00 usft		Wellhead Elevation:	0.00 usft	Ground Level: 7,272.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	10/15/2018	8.80	62.83	49,486

Design	OH				
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	330.335	

Survey Program	Date	11/8/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
375.00	5,874.00	Survey #1 - Surface MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
5,905.00	6,754.00	Survey #2 - Curve MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
6,777.00	12,397.00	Survey #3 - Lateral MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	

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	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375.00	1.07	100.360	374.98	-0.63	3.44	-2.25	0.29	0.29	0.00
First SDI Surface MWD Survey									
437.00	0.53	100.910	436.97	-0.79	4.30	-2.81	0.87	-0.87	0.89
499.00	1.56	41.830	498.96	-0.21	5.14	-2.73	2.20	1.66	-95.29
562.00	3.29	29.480	561.90	2.00	6.60	-1.53	2.85	2.75	-19.60
623.00	4.98	27.980	622.74	5.86	8.71	0.78	2.78	2.77	-2.46
686.00	6.50	26.430	685.42	11.47	11.58	4.24	2.42	2.41	-2.46
748.00	8.18	23.530	746.91	18.66	14.90	8.84	2.77	2.71	-4.68



Scientific Drilling, Intl Survey Report



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Site: Federal 2307-7P
Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

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)
810.00	9.85	21.740	808.15	27.63	18.62	14.79	2.73	2.69	-2.89
872.00	12.23	20.630	869.00	38.70	22.90	22.29	3.85	3.84	-1.79
934.00	13.89	19.830	929.39	51.85	27.74	31.32	2.69	2.68	-1.29
995.00	15.50	20.610	988.39	66.37	33.09	41.29	2.66	2.64	1.28
1,057.00	17.48	20.610	1,047.84	82.84	39.29	52.54	3.19	3.19	0.00
1,118.00	19.28	21.350	1,105.73	100.79	46.18	64.73	2.98	2.95	1.21
1,180.00	21.29	21.630	1,163.88	120.79	54.06	78.21	3.25	3.24	0.45
1,241.00	23.08	22.280	1,220.36	142.15	62.67	92.50	2.96	2.93	1.07
1,303.00	24.87	22.550	1,277.01	165.44	72.28	107.98	2.89	2.89	0.44
1,364.00	27.02	22.940	1,331.86	190.05	82.60	124.26	3.54	3.52	0.64
1,426.00	27.80	24.080	1,386.90	216.22	93.99	141.36	1.52	1.26	1.84
1,498.00	27.99	27.090	1,450.53	246.59	108.54	160.55	1.97	0.26	4.18
1,561.00	27.99	29.340	1,506.17	272.64	122.51	176.27	1.68	0.00	3.57
1,624.00	28.02	28.710	1,561.79	298.51	136.86	191.65	0.47	0.05	-1.00
1,687.00	27.81	28.280	1,617.46	324.43	150.94	207.20	0.46	-0.33	-0.68
1,750.00	28.03	27.330	1,673.13	350.52	164.69	223.07	0.79	0.35	-1.51
1,814.00	27.75	26.450	1,729.69	377.22	178.24	239.57	0.78	-0.44	-1.38
1,877.00	27.85	25.250	1,785.42	403.66	191.05	256.20	0.90	0.16	-1.90
1,940.00	27.77	24.550	1,841.14	430.32	203.42	273.24	0.53	-0.13	-1.11
2,003.00	27.93	26.200	1,896.85	456.91	216.03	290.10	1.25	0.25	2.62
2,066.00	27.89	27.870	1,952.52	483.17	229.44	306.29	1.24	-0.06	2.65
2,129.00	27.68	27.910	2,008.26	509.13	243.17	322.05	0.33	-0.33	0.06
2,192.00	27.44	26.980	2,064.11	535.00	256.61	337.88	0.78	-0.38	-1.48
2,255.00	27.47	25.850	2,120.01	561.01	269.53	354.08	0.83	0.05	-1.79
2,318.00	28.06	24.980	2,175.76	587.52	282.12	370.88	1.14	0.94	-1.38
2,381.00	27.84	24.350	2,231.41	614.35	294.45	388.10	0.58	-0.35	-1.00
2,444.00	27.87	24.370	2,287.11	641.17	306.59	405.39	0.05	0.05	0.03
2,508.00	27.92	26.360	2,343.68	668.22	319.41	422.55	1.46	0.08	3.11
2,571.00	27.82	27.610	2,399.37	694.46	332.77	438.74	0.94	-0.16	1.98
2,634.00	27.81	28.440	2,455.09	720.41	346.59	454.46	0.61	-0.02	1.32
2,697.00	27.70	29.200	2,510.84	746.12	360.73	469.79	0.59	-0.17	1.21
2,760.00	27.98	27.830	2,566.55	771.97	374.77	485.30	1.11	0.44	-2.17
2,824.00	28.17	27.190	2,623.02	798.68	388.68	501.63	0.56	0.30	-1.00
2,887.00	27.99	26.400	2,678.61	825.15	402.05	518.02	0.66	-0.29	-1.25
2,950.00	28.03	25.490	2,734.23	851.76	415.00	534.73	0.68	0.06	-1.44
3,013.00	27.87	24.160	2,789.88	878.55	427.39	551.88	1.02	-0.25	-2.11
3,076.00	28.00	23.060	2,845.54	905.60	439.21	569.52	0.84	0.21	-1.75
3,139.00	28.32	22.940	2,901.08	932.96	450.83	587.56	0.52	0.51	-0.19
3,202.00	28.01	24.020	2,956.62	960.24	462.68	605.39	0.95	-0.49	1.71
3,265.00	28.11	25.050	3,012.22	987.20	474.98	622.73	0.79	0.16	1.63
3,328.00	28.09	26.650	3,067.79	1,013.90	487.92	639.53	1.20	-0.03	2.54
3,392.00	28.36	28.840	3,124.18	1,040.68	502.01	655.82	1.67	0.42	3.42
3,455.00	27.99	30.530	3,179.72	1,066.52	516.74	670.99	1.40	-0.59	2.68



Scientific Drilling, Intl Survey Report



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Project: Rio Arriba, NM NAD83
Site: Federal 2307-7P
Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

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)
3,518.00	27.82	31.160	3,235.39	1,091.84	531.85	685.50	0.54	-0.27	1.00
3,581.00	27.55	29.780	3,291.18	1,117.06	546.70	700.08	1.10	-0.43	-2.19
3,644.00	27.64	28.340	3,347.02	1,142.57	560.87	715.23	1.07	0.14	-2.29
3,708.00	27.64	27.110	3,403.71	1,168.85	574.68	731.23	0.89	0.00	-1.92
3,771.00	27.87	26.290	3,459.46	1,195.06	587.86	747.48	0.71	0.37	-1.30
3,834.00	27.52	23.890	3,515.25	1,221.57	600.28	764.37	1.86	-0.56	-3.81
3,897.00	27.87	23.150	3,571.03	1,248.42	611.96	781.91	0.78	0.56	-1.17
3,960.00	28.32	24.430	3,626.61	1,275.56	623.93	799.58	1.19	0.71	2.03
4,023.00	28.25	25.870	3,682.09	1,302.59	636.62	816.78	1.09	-0.11	2.29
4,086.00	28.05	26.960	3,737.63	1,329.20	649.84	833.37	0.88	-0.32	1.73
4,149.00	27.96	28.380	3,793.26	1,355.40	663.58	849.33	1.07	-0.14	2.25
4,212.00	27.99	29.100	3,848.90	1,381.31	677.79	864.81	0.54	0.05	1.14
4,276.00	27.78	29.460	3,905.47	1,407.42	692.43	880.25	0.42	-0.33	0.56
4,339.00	28.04	29.090	3,961.14	1,433.14	706.85	895.47	0.50	0.41	-0.59
4,402.00	27.85	27.900	4,016.79	1,459.09	720.93	911.04	0.94	-0.30	-1.89
4,465.00	27.93	27.150	4,072.48	1,485.22	734.55	927.01	0.57	0.13	-1.19
4,528.00	27.83	26.490	4,128.16	1,511.51	747.84	943.28	0.51	-0.16	-1.05
4,591.00	27.41	25.990	4,183.98	1,537.71	760.76	959.65	0.76	-0.67	-0.79
4,654.00	27.93	26.240	4,239.78	1,563.98	773.63	976.10	0.85	0.83	0.40
4,717.00	27.84	27.290	4,295.46	1,590.29	786.90	992.39	0.79	-0.14	1.67
4,780.00	27.78	26.460	4,351.19	1,616.50	800.19	1,008.60	0.62	-0.10	-1.32
4,844.00	27.79	25.730	4,407.81	1,643.30	813.31	1,025.38	0.53	0.02	-1.14
4,895.00	27.78	24.470	4,452.93	1,664.82	823.40	1,039.10	1.15	-0.02	-2.47
4,958.00	27.42	23.730	4,508.76	1,691.47	835.31	1,056.35	0.79	-0.57	-1.17
4,990.00	27.41	24.760	4,537.17	1,704.90	841.36	1,065.03	1.48	-0.03	3.22
5,021.00	28.25	21.510	4,564.58	1,718.21	847.04	1,073.78	5.59	2.71	-10.48
5,053.00	29.45	15.940	4,592.61	1,732.82	851.98	1,084.04	9.19	3.75	-17.41
5,084.00	29.24	10.680	4,619.64	1,747.59	855.48	1,095.14	8.34	-0.68	-16.97
5,116.00	28.66	7.310	4,647.64	1,762.88	857.90	1,107.23	5.41	-1.81	-10.53
5,148.00	26.81	2.920	4,675.97	1,777.70	859.25	1,119.44	8.61	-5.78	-13.72
5,179.00	24.40	357.280	4,703.93	1,791.08	859.30	1,131.04	11.05	-7.77	-18.19
5,211.00	22.62	350.700	4,733.28	1,803.76	857.99	1,142.71	9.90	-5.56	-20.56
5,242.00	22.70	343.830	4,761.89	1,815.39	855.36	1,154.11	8.54	0.26	-22.16
5,274.00	22.94	337.820	4,791.39	1,827.10	851.29	1,166.30	7.32	0.75	-18.78
5,306.00	22.50	332.010	4,820.91	1,838.28	846.06	1,178.61	7.14	-1.38	-18.16
5,337.00	22.01	326.770	4,849.60	1,848.38	840.09	1,190.34	6.59	-1.58	-16.90
5,368.00	21.75	322.250	4,878.37	1,857.78	833.39	1,201.82	5.50	-0.84	-14.58
5,400.00	22.04	317.910	4,908.06	1,866.93	825.74	1,213.56	5.14	0.91	-13.56
5,432.00	22.80	313.070	4,937.65	1,875.62	817.18	1,225.34	6.24	2.38	-15.13
5,463.00	23.82	312.140	4,966.12	1,883.92	808.15	1,237.02	3.50	3.29	-3.00
5,495.00	24.41	312.700	4,995.32	1,892.74	798.50	1,249.46	1.98	1.84	1.75
5,526.00	23.56	313.510	5,023.65	1,901.35	789.30	1,261.50	2.94	-2.74	2.61
5,589.00	24.06	313.210	5,081.28	1,918.81	770.81	1,285.82	0.82	0.79	-0.48
5,653.00	25.64	311.390	5,139.36	1,936.90	750.91	1,311.39	2.74	2.47	-2.84



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5,716.00	25.90	311.320	5,196.09	1,955.00	730.35	1,337.29	0.42	0.41	-0.11
5,779.00	26.28	311.820	5,252.67	1,973.38	709.62	1,363.53	0.70	0.60	0.79
5,842.00	25.89	311.070	5,309.26	1,991.72	688.86	1,389.74	0.81	-0.62	-1.19
5,874.00	25.59	310.620	5,338.08	2,000.81	678.35	1,402.84	1.12	-0.94	-1.41
Last SDI Surface MWD Survey									
5,905.00	26.20	310.840	5,365.97	2,009.64	668.09	1,415.59	1.99	1.97	0.71
First SDI Curve MWD Survey									
5,937.00	28.19	310.670	5,394.43	2,019.19	657.01	1,429.37	6.22	6.22	-0.53
5,968.00	30.30	311.090	5,421.48	2,029.10	645.56	1,443.65	6.84	6.81	1.35
6,000.00	32.33	312.040	5,448.81	2,040.14	633.12	1,459.39	6.53	6.34	2.97
6,031.00	34.00	312.500	5,474.76	2,051.54	620.57	1,475.52	5.45	5.39	1.48
6,063.00	36.33	312.230	5,500.92	2,063.96	606.95	1,493.05	7.30	7.28	-0.84
6,095.00	38.47	313.630	5,526.34	2,077.20	592.73	1,511.59	7.20	6.69	4.38
6,126.00	41.32	312.640	5,550.12	2,090.79	578.22	1,530.58	9.42	9.19	-3.19
6,158.00	43.99	312.390	5,573.66	2,105.44	562.24	1,551.22	8.36	8.34	-0.78
6,189.00	46.84	312.130	5,595.41	2,120.29	545.90	1,572.21	9.21	9.19	-0.84
6,221.00	49.35	312.310	5,616.78	2,136.29	528.26	1,594.84	7.85	7.84	0.56
6,252.00	51.67	313.060	5,636.50	2,152.51	510.68	1,617.64	7.71	7.48	2.42
6,284.00	53.87	312.820	5,655.86	2,169.86	492.03	1,641.95	6.90	6.88	-0.75
6,315.00	56.89	312.580	5,673.47	2,187.16	473.28	1,666.26	9.76	9.74	-0.77
6,347.00	60.81	312.040	5,690.02	2,205.59	453.03	1,692.30	12.33	12.25	-1.69
6,378.00	63.02	311.780	5,704.61	2,223.86	432.68	1,718.24	7.17	7.13	-0.84
6,410.00	65.41	312.280	5,718.53	2,243.15	411.28	1,745.60	7.60	7.47	1.56
6,441.00	66.98	313.880	5,731.04	2,262.52	390.56	1,772.68	6.92	5.06	5.16
6,473.00	69.10	314.550	5,743.01	2,283.22	369.30	1,801.19	6.90	6.63	2.09
6,505.00	71.83	313.900	5,753.71	2,304.25	347.68	1,830.16	8.74	8.53	-2.03
6,536.00	74.25	313.830	5,762.75	2,324.79	326.31	1,858.59	7.81	7.81	-0.23
6,568.00	76.67	313.490	5,770.78	2,346.18	303.90	1,888.26	7.63	7.56	-1.06
6,599.00	79.39	313.600	5,777.21	2,367.07	281.92	1,917.29	8.78	8.77	0.35
6,630.00	82.15	313.290	5,782.18	2,388.11	259.71	1,946.57	8.96	8.90	-1.00
6,662.00	85.06	312.920	5,785.75	2,409.83	236.49	1,976.94	9.17	9.09	-1.16
6,694.00	87.21	312.000	5,787.90	2,431.39	212.94	2,007.32	7.31	6.72	-2.88
6,725.00	88.16	311.630	5,789.16	2,452.04	189.85	2,036.69	3.29	3.06	-1.19
6,754.00	88.59	311.690	5,789.98	2,471.31	168.20	2,064.16	1.50	1.48	0.21
Last SDI Curve MWD Survey									
6,777.00	88.79	311.140	5,790.50	2,486.52	150.95	2,085.91	2.54	0.87	-2.39
First SDI Lateral MWD Survey									
6,840.00	89.26	311.190	5,791.58	2,527.98	103.53	2,145.41	0.75	0.75	0.08
6,902.00	88.86	312.340	5,792.59	2,569.27	57.29	2,204.17	1.96	-0.65	1.85
6,964.00	88.45	313.520	5,794.05	2,611.49	11.91	2,263.31	2.01	-0.66	1.90
7,026.00	88.99	313.480	5,795.43	2,654.15	-33.05	2,322.64	0.87	0.87	-0.06
7,089.00	90.27	314.520	5,795.84	2,697.91	-78.36	2,383.09	2.62	2.03	1.65
7,151.00	90.64	314.600	5,795.35	2,741.42	-122.54	2,442.76	0.61	0.60	0.13
7,213.00	90.50	316.190	5,794.73	2,785.55	-166.07	2,502.66	2.57	-0.23	2.56



Scientific Drilling, Intl Survey Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2307-7P
Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

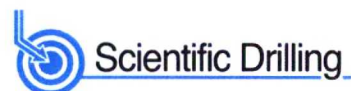
Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

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)
7,274.00	89.70	315.080	5,794.63	2,829.16	-208.73	2,561.66	2.24	-1.31	-1.82
7,336.00	89.83	314.890	5,794.88	2,872.99	-252.58	2,621.45	0.37	0.21	-0.31
7,397.00	89.53	313.890	5,795.22	2,915.66	-296.17	2,680.10	1.71	-0.49	-1.64
7,459.00	89.63	313.820	5,795.67	2,958.62	-340.87	2,739.55	0.20	0.16	-0.11
7,521.00	89.46	313.360	5,796.17	3,001.36	-385.78	2,798.92	0.79	-0.27	-0.74
7,582.00	89.46	313.380	5,796.74	3,043.25	-430.12	2,857.26	0.03	0.00	0.03
7,644.00	90.30	313.780	5,796.87	3,085.99	-475.03	2,916.63	1.50	1.35	0.65
7,705.00	90.64	312.220	5,796.37	3,127.59	-519.64	2,974.85	2.62	0.56	-2.56
7,767.00	90.94	312.460	5,795.52	3,169.34	-565.46	3,033.81	0.62	0.48	0.39
7,830.00	89.78	311.670	5,795.12	3,211.55	-612.23	3,093.64	2.23	-1.84	-1.25
7,893.00	89.43	311.810	5,795.56	3,253.49	-659.24	3,153.35	0.60	-0.56	0.22
7,956.00	89.06	311.860	5,796.39	3,295.51	-706.18	3,213.08	0.59	-0.59	0.08
8,019.00	89.97	312.100	5,796.92	3,337.64	-753.01	3,272.88	1.49	1.44	0.38
8,082.00	90.37	312.610	5,796.73	3,380.09	-799.56	3,332.80	1.03	0.63	0.81
8,145.00	90.40	312.060	5,796.31	3,422.52	-846.13	3,392.71	0.87	0.05	-0.87
8,208.00	90.50	311.920	5,795.81	3,464.66	-892.96	3,452.51	0.27	0.16	-0.22
8,271.00	89.29	310.870	5,795.93	3,506.32	-940.21	3,512.10	2.54	-1.92	-1.67
8,335.00	89.23	312.470	5,796.76	3,548.86	-988.02	3,572.72	2.50	-0.09	2.50
8,398.00	89.50	313.090	5,797.45	3,591.65	-1,034.25	3,632.79	1.07	0.43	0.98
8,461.00	89.03	312.820	5,798.26	3,634.58	-1,080.36	3,692.91	0.86	-0.75	-0.43
8,524.00	89.87	314.360	5,798.87	3,678.01	-1,125.98	3,753.23	2.78	1.33	2.44
8,587.00	90.87	314.510	5,798.46	3,722.11	-1,170.97	3,813.82	1.61	1.59	0.24
8,650.00	90.10	314.960	5,797.93	3,766.45	-1,215.72	3,874.49	1.42	-1.22	0.71
8,713.00	89.53	315.460	5,798.13	3,811.16	-1,260.10	3,935.31	1.20	-0.90	0.79
8,777.00	89.19	315.600	5,798.84	3,856.83	-1,304.93	3,997.18	0.57	-0.53	0.22
8,839.00	89.16	315.110	5,799.74	3,900.94	-1,348.50	4,057.07	0.79	-0.05	-0.79
8,902.00	89.33	314.340	5,800.57	3,945.27	-1,393.25	4,117.74	1.25	0.27	-1.22
8,966.00	90.34	314.970	5,800.75	3,990.25	-1,438.78	4,179.36	1.86	1.58	0.98
9,029.00	90.20	315.220	5,800.46	4,034.87	-1,483.25	4,240.14	0.45	-0.22	0.40
9,092.00	90.03	314.200	5,800.33	4,079.19	-1,528.02	4,300.81	1.64	-0.27	-1.62
9,155.00	89.43	314.370	5,800.63	4,123.18	-1,573.12	4,361.35	0.99	-0.95	0.27
9,218.00	88.66	314.270	5,801.68	4,167.19	-1,618.19	4,421.90	1.23	-1.22	-0.16
9,281.00	89.23	314.280	5,802.84	4,211.16	-1,663.29	4,482.43	0.90	0.90	0.02
9,344.00	89.46	313.590	5,803.56	4,254.87	-1,708.66	4,542.86	1.15	0.37	-1.10
9,408.00	89.26	313.600	5,804.27	4,299.00	-1,755.00	4,604.15	0.31	-0.31	0.02
9,471.00	89.66	313.480	5,804.86	4,342.39	-1,800.67	4,664.46	0.66	0.63	-0.19
9,534.00	89.80	313.300	5,805.16	4,385.67	-1,846.45	4,724.72	0.36	0.22	-0.29
9,597.00	89.36	312.650	5,805.62	4,428.62	-1,892.54	4,784.85	1.25	-0.70	-1.03
9,660.00	90.27	313.740	5,805.83	4,471.74	-1,938.47	4,845.05	2.25	1.44	1.73
9,724.00	89.90	313.150	5,805.73	4,515.75	-1,984.94	4,906.29	1.09	-0.58	-0.92
9,786.00	90.47	314.030	5,805.53	4,558.50	-2,029.84	4,965.66	1.69	0.92	1.42
9,849.00	90.47	314.230	5,805.01	4,602.36	-2,075.06	5,026.15	0.32	0.00	0.32
9,913.00	90.24	314.680	5,804.62	4,647.18	-2,120.74	5,087.71	0.79	-0.36	0.70



Scientific Drilling, Intl
Survey Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
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Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

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)
9,976.00	89.56	314.510	5,804.73	4,691.41	-2,165.60	5,148.35	1.11	-1.08	-0.27
10,039.00	89.46	314.930	5,805.27	4,735.74	-2,210.37	5,209.02	0.69	-0.16	0.67
10,102.00	89.33	315.790	5,805.93	4,780.56	-2,254.63	5,269.87	1.38	-0.21	1.37
10,165.00	89.46	315.630	5,806.60	4,825.66	-2,298.62	5,330.83	0.33	0.21	-0.25
10,228.00	90.07	315.030	5,806.86	4,870.46	-2,342.91	5,391.68	1.36	0.97	-0.95
10,292.00	89.83	315.120	5,806.91	4,915.78	-2,388.10	5,453.42	0.40	-0.38	0.14
10,355.00	89.19	315.470	5,807.45	4,960.55	-2,432.42	5,514.26	1.16	-1.02	0.56
10,418.00	89.33	315.290	5,808.26	5,005.39	-2,476.67	5,575.12	0.36	0.22	-0.29
10,481.00	90.34	313.530	5,808.45	5,049.47	-2,521.67	5,635.70	3.22	1.60	-2.79
10,544.00	87.72	312.450	5,809.51	5,092.42	-2,567.74	5,695.82	4.50	-4.16	-1.71
10,608.00	87.58	314.390	5,812.14	5,136.37	-2,614.19	5,757.00	3.04	-0.22	3.03
10,671.00	87.95	317.340	5,814.59	5,181.55	-2,658.02	5,817.95	4.72	0.59	4.68
10,733.00	88.32	318.740	5,816.61	5,227.62	-2,699.45	5,878.49	2.33	0.60	2.26
10,797.00	88.42	319.130	5,818.43	5,275.86	-2,741.47	5,941.20	0.63	0.16	0.61
10,860.00	89.60	321.410	5,819.52	5,324.30	-2,781.73	6,003.22	4.07	1.87	3.62
10,923.00	90.40	321.830	5,819.52	5,373.68	-2,820.85	6,065.49	1.43	1.27	0.67
10,986.00	90.03	322.270	5,819.28	5,423.36	-2,859.59	6,127.83	0.91	-0.59	0.70
11,049.00	91.14	323.240	5,818.64	5,473.51	-2,897.72	6,190.28	2.34	1.76	1.54
11,113.00	91.07	322.180	5,817.41	5,524.42	-2,936.48	6,253.70	1.66	-0.11	-1.66
11,176.00	90.34	320.730	5,816.63	5,573.68	-2,975.73	6,315.94	2.58	-1.16	-2.30
11,239.00	88.25	319.690	5,817.41	5,622.09	-3,016.05	6,377.95	3.71	-3.32	-1.65
11,302.00	87.25	320.470	5,819.88	5,670.37	-3,056.44	6,439.89	2.01	-1.59	1.24
11,365.00	88.22	321.300	5,822.37	5,719.21	-3,096.16	6,501.99	2.03	1.54	1.32
11,428.00	89.23	322.480	5,823.77	5,768.76	-3,135.03	6,564.29	2.47	1.60	1.87
11,491.00	89.83	322.500	5,824.29	5,818.74	-3,173.39	6,626.70	0.95	0.95	0.03
11,554.00	89.50	322.990	5,824.66	5,868.88	-3,211.52	6,689.14	0.94	-0.52	0.78
11,583.00	89.50	322.920	5,824.91	5,892.03	-3,228.99	6,717.90	0.24	0.00	-0.24
11,645.00	90.27	322.120	5,825.03	5,941.23	-3,266.72	6,779.32	1.79	1.24	-1.29
11,709.00	90.07	322.710	5,824.84	5,991.94	-3,305.76	6,842.71	0.97	-0.31	0.92
11,772.00	89.53	322.860	5,825.06	6,042.11	-3,343.86	6,905.17	0.89	-0.86	0.24
11,835.00	90.23	322.800	5,825.20	6,092.31	-3,381.92	6,967.63	1.12	1.11	-0.10
11,898.00	89.66	322.260	5,825.26	6,142.32	-3,420.25	7,030.04	1.25	-0.90	-0.86
11,961.00	88.66	321.810	5,826.18	6,191.98	-3,459.00	7,092.37	1.74	-1.59	-0.71
12,025.00	89.09	321.720	5,827.44	6,242.24	-3,498.60	7,155.65	0.69	0.67	-0.14
12,088.00	88.82	321.810	5,828.59	6,291.72	-3,537.58	7,217.93	0.45	-0.43	0.14
12,151.00	89.66	322.100	5,829.42	6,341.32	-3,576.40	7,280.26	1.41	1.33	0.46
12,214.00	89.66	322.130	5,829.80	6,391.05	-3,615.09	7,342.61	0.05	0.00	0.05
12,277.00	89.40	321.720	5,830.31	6,440.64	-3,653.94	7,404.93	0.77	-0.41	-0.65
12,340.00	88.93	322.030	5,831.23	6,490.19	-3,692.83	7,467.23	0.89	-0.75	0.49
Last SDI Lateral MWD Survey									
12,397.00	88.93	322.030	5,832.29	6,535.12	-3,727.89	7,523.63	0.00	0.00	0.00
Projection to TD									



Scientific Drilling, Intl
Survey Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2307-7P
Well: Federal 2307-7P COM 1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well Federal 2307-7P COM 1H - Slot 7P 1H
TVD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
MD Reference: GL 7272' & RKB 14' @ 7286.00usft (Aztec 920)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: Grand Junction District

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
375.00	374.98	-0.63	3.44	First SDI Surface MWD Survey
5,874.00	5,338.08	2,000.81	678.35	Last SDI Surface MWD Survey
5,905.00	5,365.97	2,009.64	668.09	First SDI Curve MWD Survey
6,754.00	5,789.98	2,471.31	168.20	Last SDI Curve MWD Survey
6,777.00	5,790.50	2,486.52	150.95	First SDI Lateral MWD Survey
12,340.00	5,831.23	6,490.19	-3,692.83	Last SDI Lateral MWD Survey
12,397.00	5,832.29	6,535.12	-3,727.89	Projection to TD

Checked By: _____ Approved By: _____ Date: _____