



PATRIOT DRILLING, LLC

OPERATOR: COG Operating, LLC
WELL/LEASE: Smalls Federal # 7 H
COUNTY: Lea County, New Mexico
Sec. 28, T22S, R34E

**STATE OF NEW MEXICO
DEVIATION REPORT**

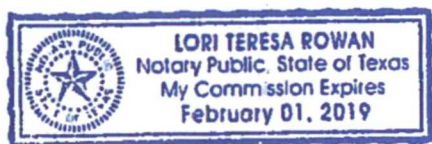
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
277	1/4	2,451	1 3/4
547	1/2	3,395	1 1/2
1,091	1 1/2	3,684	1 1/4
1,280	1 1/4	4,388	1 1/2
1,941	3	4,987	1/2
2,147	3	5,270	1 1/4

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-
President

The foregoing instrument was acknowledged before me on this 30th day of
November, 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling,

My Commission Expires: 02/01/2019



Lori T. Rowan
Notary Public for Ector Co., Texas



November 22, 2016

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: Smalls Federal No. 007H

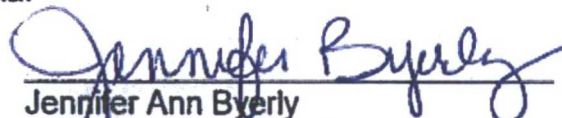
Please find enclosed a copy of the survey from 0' to 5126' ran on the above referenced well.

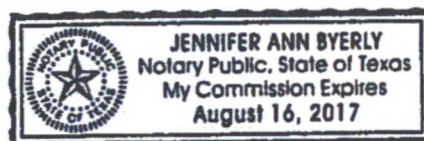
Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 22nd day of November, A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas





Company: COG OPERATING
Lease/Well: SMALLS FEDERAL NO./007H

Rig Name: PATRIOT 2
State/County: NEW MEXICO/LEA
VS-Azi: 351.65 Degrees
Latitude: 32.35582, Longitude: -103.47661
Grid North = True North -0.46 degs (NAD 27)
Grid Correction Applied = -0.46 degs



Depth Reference : RKB=20 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: e-line gyro-de_01.ut
Minimum Curvature Method
Report Date/Time: 11/22/2016 / 16:43

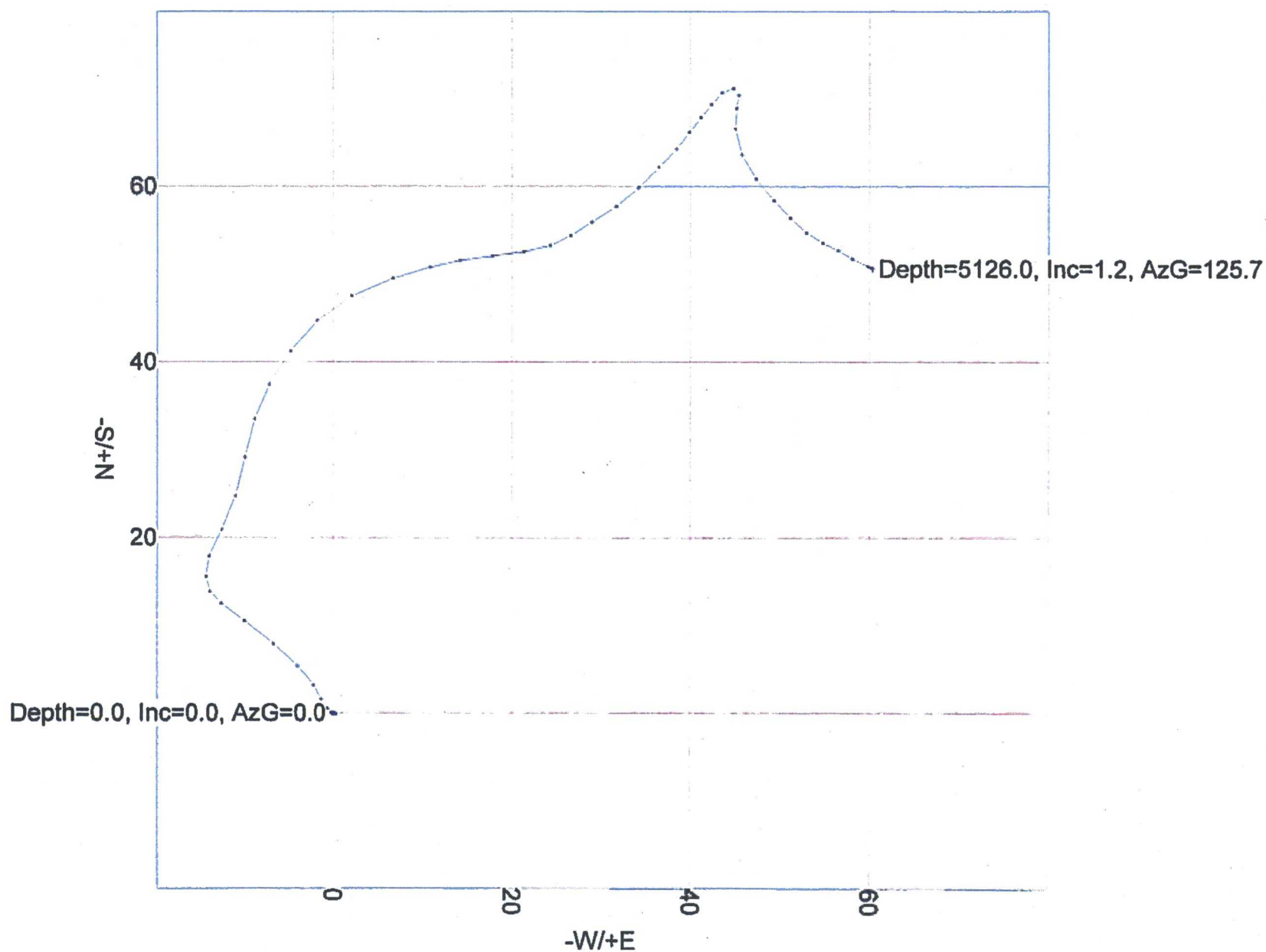
VES Survey International
Midland, Texas
432-563-5444
Surveyor: Michael Cook
Smalls Federal No. 007H / API 30-025-43068

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section 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	0.00	----
100.00	0.18	96.86	100.00	-0.02	0.16	-0.04	0.16	96.86	0.18
200.00	0.05	185.43	200.00	-0.08	0.31	-0.13	0.32	105.36	0.19
300.00	0.17	260.67	300.00	-0.15	0.16	-0.18	0.22	133.90	0.16
400.00	0.27	310.60	400.00	-0.02	-0.16	0.00	0.16	261.91	0.21
500.00	0.53	326.07	500.00	0.52	-0.60	0.60	0.80	310.68	0.28
600.00	0.89	330.03	599.99	1.58	-1.25	1.75	2.02	321.59	0.36
700.00	1.30	328.05	699.97	3.22	-2.24	3.51	3.92	325.12	0.41
800.00	2.01	315.79	799.93	5.44	-4.07	5.97	6.79	323.21	0.79
900.00	2.24	309.87	899.86	7.95	-6.79	8.85	10.45	319.49	0.31
1000.00	2.55	306.89	999.77	10.53	-10.07	11.89	14.57	316.30	0.34
1100.00	1.25	307.11	1099.71	12.53	-12.72	14.24	17.85	314.57	1.31
1200.00	0.91	328.98	1199.70	13.86	-13.99	15.75	19.70	314.74	0.52
1300.00	1.21	358.00	1299.68	15.60	-14.44	17.53	21.26	317.22	0.61
1400.00	1.51	17.17	1399.65	17.92	-14.09	19.78	22.79	321.83	0.54
1500.00	2.31	30.55	1499.60	20.91	-12.67	22.53	24.46	328.78	0.91
1600.00	2.51	15.39	1599.51	24.76	-11.07	26.11	27.12	335.91	0.67

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1700.00	2.62	11.37	1699.41	29.12	-10.04	30.27	30.80	340.98	0.21
1800.00	2.54	17.70	1799.31	33.47	-8.91	34.41	34.84	345.09	0.30
1900.00	2.39	27.36	1899.22	37.43	-7.28	38.09	38.13	348.99	0.44
2000.00	2.78	36.69	1999.11	41.23	-4.87	41.50	41.52	353.26	0.57
2100.00	2.61	46.71	2099.00	44.73	-1.77	44.52	44.77	357.74	0.50
2200.00	2.89	60.90	2198.89	47.52	2.09	46.71	47.57	2.52	0.73
2300.00	2.88	71.91	2298.76	49.53	6.68	48.03	49.98	7.68	0.55
2400.00	2.08	74.41	2398.67	50.80	10.82	48.69	51.94	12.03	0.80
2500.00	1.93	79.92	2498.61	51.58	14.23	48.97	53.51	15.42	0.25
2600.00	2.19	84.51	2598.54	52.06	17.79	48.92	55.01	18.87	0.30
2700.00	1.96	80.23	2698.48	52.53	21.37	48.87	56.71	22.14	0.28
2800.00	1.51	71.02	2798.43	53.25	24.29	49.15	58.53	24.53	0.53
2900.00	1.44	57.06	2898.40	54.36	26.60	49.92	60.52	26.07	0.36
3000.00	1.79	56.99	2998.36	55.90	28.96	51.10	62.95	27.39	0.34
3100.00	1.92	55.45	3098.31	57.70	31.65	52.49	65.81	28.75	0.14
3200.00	1.87	43.73	3198.25	59.83	34.16	54.23	68.89	29.73	0.39
3300.00	1.88	45.04	3298.20	62.17	36.45	56.21	72.06	30.39	0.05
3400.00	1.48	38.11	3398.16	64.34	38.41	58.08	74.94	30.84	0.45
3500.00	1.26	37.15	3498.13	66.24	39.88	59.75	77.32	31.05	0.22
3600.00	1.16	38.57	3598.11	67.91	41.17	61.21	79.42	31.23	0.11
3700.00	1.01	37.34	3698.09	69.40	42.34	62.52	81.30	31.38	0.15
3800.00	1.02	45.99	3798.07	70.72	43.51	63.65	83.03	31.60	0.15
3900.00	0.74	103.74	3898.06	71.18	44.78	63.93	84.10	32.17	0.88
4000.00	0.68	183.62	3998.06	70.44	45.37	63.10	83.78	32.79	0.92
4100.00	1.02	193.67	4098.04	68.97	45.12	61.69	82.42	33.19	0.37
4200.00	1.72	176.38	4198.02	66.81	45.01	59.37	80.39	34.04	0.80
4300.00	1.80	158.13	4297.97	63.66	45.68	56.35	78.35	35.67	0.56
4400.00	1.99	143.84	4397.92	60.80	47.29	53.29	77.03	37.88	0.51
4500.00	1.66	137.25	4497.86	58.33	49.30	50.56	76.38	40.20	0.39
4600.00	1.43	136.11	4597.83	56.37	51.15	48.35	76.12	42.22	0.24
4700.00	1.35	130.51	4697.80	54.71	52.91	46.45	76.11	44.04	0.16
4800.00	1.19	112.38	4797.77	53.55	54.77	45.03	76.59	45.64	0.43
4900.00	1.02	123.48	4897.76	52.66	56.47	43.90	77.21	47.00	0.28
5000.00	1.10	116.37	4997.74	51.75	58.07	42.76	77.78	48.30	0.16
5100.00	1.12	116.53	5097.72	50.88	59.81	41.66	78.52	49.61	0.02
5126.00	1.20	125.74	5123.72	50.61	60.25	41.32	78.69	49.97	0.78



VES Survey International
Midland, Texas
432-563-5444
Surveyor: Michael Cook
Smalls Federal No. 007H / API 30-025-43068



V.E.S. Survey Date: 11/18/2016



I Michael Cook certify that I am employed by VES Survey International. That I did on the day(s) of 11/18/16 through 11/18/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 5,126.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating for the Smalls Federal Well # 7H API # 30-025-43068 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.

A handwritten signature in blue ink, appearing to read "M. Cook", is written over a horizontal line.

Michael Cook
Service Technician
VES Survey International



COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 28, T 22 S. , R 34 E.

Smalls Federal 7H

Wellbore #1

Design: Wellbore #1

Standard Survey Report

28 November, 2016





Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Smalls Federal 7H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Site:	Sec. 28, T 22 S. , R 34 E.	MD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Well:	Smalls Federal 7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Project	Lea County, NM (NAD27 NME)		
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	Sec. 28, T 22 S. , R 34 E.		
Site Position:		Northing:	494,207.1000 usft
From:	Map	Easting:	762,956.0000 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 21' 20.937 N
		Longitude:	103° 28' 54.416 W
		Grid Convergence:	0.46 "

Well	Smalls Federal 7H		
Well Position	+N/-S	0.00 ft	Northing: 494,219.9000 usft
	+E/-W	0.00 ft	Easting: 764,553.4000 usft
Position Uncertainty	0.00 ft	Wellhead Elevation:	0.00 ft
		Latitude:	32° 21' 20.938 N
		Longitude:	103° 28' 35.794 W
		Ground Level:	3,411.00 ft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2015	10/24/2016	6.99
			Dip Angle (°)
			60.21
			Field Strength (nT)
			48,093

Design	Wellbore #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			Direction (°)
			351.65

Survey Program	Date 11/28/2016		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name
100.00	5,126.00	VES Gyros (Wellbore #1)	VESSI_GYROFLEX
5,270.00	14,780.00	IDS MWD Surveys (Wellbore #1)	MWD
			Description
			VESSI Gyroflex Gyro
			MWD - Standard

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Buid 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	0.18	96.86	100.00	-0.02	0.16	-0.04	0.18	0.18	0.00
200.00	0.05	185.43	200.00	-0.08	0.31	-0.12	0.19	-0.13	88.57
300.00	0.17	260.67	300.00	-0.15	0.16	-0.17	0.16	0.12	75.24
400.00	0.27	310.60	400.00	-0.02	-0.17	0.01	0.21	0.10	49.93
500.00	0.53	326.07	500.00	0.52	-0.61	0.60	0.28	0.26	15.47
600.00	0.89	330.03	599.99	1.57	-1.25	1.74	0.36	0.36	3.96
700.00	1.30	328.05	699.97	3.21	-2.24	3.50	0.41	0.41	-1.98
800.00	2.01	315.79	799.93	5.43	-4.06	5.96	0.79	0.71	-12.26
900.00	2.24	309.87	899.86	7.94	-6.79	8.84	0.32	0.23	-5.92



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Smalls Federal 7H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Site:	Sec. 28, T 22 S. , R 34 E.	MD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Well:	Smalls Federal 7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/S (ft)	+E/W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	2.55	306.89	999.77	10.53	-10.06	11.88	0.33	0.31	-2.98
1,100.00	1.25	307.11	1,099.71	12.52	-12.71	14.23	1.30	-1.30	0.22
1,200.00	0.91	328.98	1,199.70	13.86	-13.99	15.74	0.53	-0.34	21.87
1,300.00	1.21	358.00	1,299.68	15.60	-14.44	17.53	0.61	0.30	29.02
1,400.00	1.51	17.17	1,399.65	17.91	-14.09	19.77	0.54	0.30	19.17
1,500.00	2.31	30.55	1,499.60	20.90	-12.67	22.52	0.91	0.80	13.38
1,600.00	2.51	15.39	1,599.51	24.75	-11.07	26.10	0.67	0.20	-15.16
1,700.00	2.62	11.37	1,699.41	29.10	-10.04	30.25	0.21	0.11	-4.02
1,800.00	2.54	17.70	1,799.31	33.45	-8.91	34.39	0.30	-0.08	6.33
1,900.00	2.39	27.36	1,899.22	37.42	-7.28	38.08	0.44	-0.15	9.66
2,000.00	2.78	36.69	1,999.11	41.21	-4.87	41.48	0.57	0.39	9.33
2,100.00	2.61	46.71	2,099.00	44.72	-1.77	44.50	0.50	-0.17	10.02
2,200.00	2.89	60.90	2,198.89	47.51	2.09	46.70	0.73	0.28	14.19
2,300.00	2.88	71.91	2,298.76	49.51	6.68	48.02	0.55	-0.01	11.01
2,400.00	2.08	74.41	2,398.67	50.78	10.82	48.67	0.81	-0.80	2.50
2,500.00	1.93	79.92	2,498.61	51.56	14.23	48.95	0.24	-0.15	5.51
2,600.00	2.19	84.51	2,598.54	52.04	17.79	48.91	0.31	0.26	4.59
2,700.00	1.96	80.23	2,698.48	52.51	21.37	48.85	0.28	-0.23	-4.28
2,800.00	1.51	71.02	2,798.43	53.23	24.30	49.14	0.53	-0.45	-9.21
2,900.00	1.44	57.06	2,898.40	54.34	26.61	49.90	0.37	-0.07	-13.96
3,000.00	1.79	56.99	2,998.36	55.88	28.97	51.08	0.35	0.35	-0.07
3,100.00	1.92	55.45	3,098.31	57.68	31.66	52.47	0.14	0.13	-1.54
3,200.00	1.87	43.73	3,198.25	59.81	34.17	54.21	0.39	-0.05	-11.72
3,300.00	1.88	45.04	3,298.20	62.15	36.46	56.19	0.04	0.01	1.31
3,400.00	1.48	38.11	3,398.16	64.32	38.41	58.06	0.45	-0.40	-6.93
3,500.00	1.26	37.15	3,498.13	66.21	39.87	59.72	0.22	-0.22	-0.96
3,600.00	1.16	38.57	3,598.11	67.88	41.17	61.18	0.10	-0.10	1.42
3,700.00	1.01	37.34	3,698.09	69.37	42.33	62.49	0.15	-0.15	-1.23
3,800.00	1.02	45.99	3,798.07	70.69	43.51	63.62	0.15	0.01	8.65
3,900.00	0.74	103.74	3,898.06	71.16	44.78	63.90	0.88	-0.28	57.75
4,000.00	0.68	183.62	3,998.06	70.41	45.37	63.08	0.91	-0.06	79.88
4,100.00	1.02	193.67	4,098.05	68.95	45.12	61.67	0.37	0.34	10.05
4,200.00	1.72	176.38	4,198.02	66.59	45.00	59.35	0.81	0.70	-17.29
4,300.00	1.80	158.13	4,297.97	63.64	45.68	56.33	0.56	0.08	-18.25
4,400.00	1.99	143.84	4,397.92	60.78	47.29	53.27	0.51	0.19	-14.29
4,500.00	1.66	137.25	4,497.87	58.31	49.30	50.53	0.39	-0.33	-6.59
4,600.00	1.43	136.11	4,597.83	56.35	51.15	48.32	0.23	-0.23	-1.14
4,700.00	1.35	130.51	4,697.80	54.68	52.91	46.42	0.16	-0.08	-5.60
4,800.00	1.19	112.38	4,797.78	53.52	54.76	45.00	0.43	-0.16	-18.13
4,900.00	1.02	123.48	4,897.76	52.64	56.47	43.88	0.27	-0.17	11.10
5,000.00	1.10	116.37	4,997.74	51.72	58.07	42.74	0.15	0.08	-7.11
5,100.00	1.12	116.53	5,097.72	50.86	59.80	41.63	0.02	0.02	0.16
5,126.00	1.20	125.74	5,123.72	50.59	60.25	41.30	0.78	0.31	35.42



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Smalls Federal 7H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Site:	Sec. 28, T 22 S., R 34 E.	MD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Well:	Smalls Federal 7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,270.00	1.20	142.80	5,267.68	48.50	62.39	38.93	0.25	0.00	11.85
First IDS MWD Survey									
5,365.00	1.80	200.70	5,362.66	46.32	62.46	36.75	1.63	0.63	60.95
5,459.00	4.60	250.40	5,456.51	43.67	58.39	34.73	3.94	2.98	52.87
5,554.00	6.20	263.00	5,551.09	41.77	49.71	34.10	2.09	1.68	13.26
5,649.00	6.00	269.00	5,645.56	41.05	39.65	34.86	0.70	-0.21	6.32
5,743.00	7.00	264.30	5,738.95	40.40	29.04	35.75	1.20	1.06	-5.00
5,837.00	8.80	266.20	5,832.06	39.35	16.16	36.59	1.93	1.91	2.02
5,931.00	8.70	266.30	5,924.96	38.42	1.89	37.74	0.11	-0.11	0.11
6,026.00	10.20	263.40	6,018.67	36.99	-13.63	38.58	1.66	1.58	-3.05
6,120.00	10.20	262.60	6,111.18	34.96	-30.15	38.97	0.15	0.00	-0.85
6,215.00	10.50	263.20	6,204.64	32.85	-47.09	39.34	0.34	0.32	0.63
6,309.00	10.20	261.60	6,297.11	30.62	-63.83	39.57	0.44	-0.32	-1.70
6,403.00	10.20	262.60	6,389.62	28.33	-80.32	39.70	0.19	0.00	1.06
6,498.00	9.80	261.80	6,483.18	26.10	-96.66	39.86	0.45	-0.42	-0.84
6,592.00	9.40	261.30	6,575.86	23.79	-112.17	39.83	0.43	-0.43	-0.53
6,687.00	9.10	259.30	6,669.63	21.23	-127.22	39.48	0.46	-0.32	-2.11
6,781.00	9.10	258.30	6,762.45	18.34	-141.80	38.74	0.17	0.00	-1.06
6,875.00	8.90	256.80	6,855.29	15.17	-156.16	37.69	0.33	-0.21	-1.60
6,970.00	9.50	263.00	6,949.07	12.54	-171.10	37.25	1.22	0.63	6.53
7,064.00	9.50	261.10	7,041.78	10.39	-186.46	37.36	0.33	0.00	-2.02
7,158.00	9.90	267.40	7,134.44	8.82	-202.20	38.09	1.21	0.43	6.70
7,253.00	9.80	268.60	7,228.04	8.26	-218.44	39.89	0.24	-0.11	1.26
7,347.00	9.70	275.90	7,320.68	8.88	-234.31	42.81	1.32	-0.11	7.77
7,442.00	9.20	274.10	7,414.39	10.24	-249.85	46.42	0.61	-0.53	-1.89
7,536.00	8.50	272.70	7,507.27	11.11	-264.28	49.37	0.78	-0.74	-1.49
7,630.00	8.70	267.70	7,600.22	11.15	-278.32	51.45	0.82	0.21	-5.32
7,725.00	7.60	266.90	7,694.26	10.52	-291.78	52.78	1.16	-1.16	-0.84
7,819.00	8.00	266.20	7,787.39	9.75	-304.51	53.87	0.44	0.43	-0.74
7,914.00	8.60	267.30	7,881.39	8.98	-318.20	55.09	0.65	0.63	1.16
8,008.00	7.50	268.30	7,974.47	8.46	-331.36	56.49	1.18	-1.17	1.06
8,103.00	7.80	272.20	8,068.62	8.53	-343.99	58.39	0.63	0.32	4.11
8,197.00	8.90	266.00	8,161.62	8.27	-357.62	60.11	1.51	1.17	-6.60
8,291.00	8.40	267.00	8,254.55	7.40	-371.73	61.30	0.56	-0.53	1.06
8,386.00	8.70	269.90	8,348.50	7.02	-385.85	62.98	0.55	0.32	3.05
8,480.00	9.40	264.00	8,441.33	6.21	-400.59	64.32	1.24	0.74	-6.28
8,574.00	7.70	260.60	8,534.28	4.38	-414.44	64.52	1.89	-1.81	-3.62
8,669.00	7.10	265.60	8,628.49	2.89	-426.57	64.80	0.93	-0.63	5.26
8,764.00	8.90	265.00	8,722.56	1.80	-439.75	65.64	1.90	1.89	-0.63
8,858.00	9.10	267.40	8,815.41	0.83	-454.42	66.81	0.45	0.21	2.55
8,952.00	10.30	270.00	8,908.06	0.49	-470.25	68.77	1.36	1.28	2.77
9,046.00	8.50	268.60	9,000.80	0.32	-485.60	70.83	1.93	-1.91	-1.49
9,140.00	9.40	272.30	9,093.65	0.46	-500.21	73.09	1.14	0.96	3.94



Integrity Directional Services, LLC
Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Smalls Federal 7H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Site:	Sec. 28, T 22 S., R 34 E.	MD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Well:	Smalls Federal 7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,234.00	8.20	273.30	9,186.54	1.15	-514.58	75.86	1.29	-1.28	1.06
9,329.00	9.40	275.60	9,280.42	2.30	-529.06	79.10	1.32	1.26	2.42
9,423.00	8.70	277.00	9,373.25	3.91	-543.76	82.84	0.78	-0.74	1.49
9,517.00	9.00	267.00	9,466.14	4.39	-558.16	85.40	1.67	0.32	-10.64
9,675.00	6.90	289.60	9,622.65	6.93	-579.45	91.01	2.36	-1.33	14.30
9,707.00	8.00	319.20	9,654.39	9.26	-582.71	93.79	12.32	3.44	92.50
9,738.00	10.20	338.10	9,685.01	13.45	-585.15	98.28	11.88	7.10	60.97
9,770.00	13.40	346.90	9,716.33	19.69	-587.05	104.73	11.45	10.00	27.50
9,801.00	16.50	350.80	9,746.28	27.53	-588.56	112.71	10.51	10.00	12.58
9,833.00	19.20	353.70	9,776.73	37.25	-589.87	122.52	8.88	8.44	9.06
9,864.00	22.00	356.20	9,805.75	48.11	-590.81	133.40	9.47	9.03	8.06
9,896.00	24.90	353.70	9,835.10	60.79	-591.95	146.11	9.58	9.06	-7.81
9,927.00	27.60	352.60	9,862.90	74.40	-593.59	159.82	8.85	8.71	-3.55
9,959.00	30.20	353.30	9,890.92	89.75	-595.49	175.28	8.19	8.13	2.19
9,990.00	33.00	354.20	9,917.32	105.90	-597.25	191.51	9.16	9.03	2.90
10,022.00	36.20	354.10	9,943.65	123.97	-599.10	209.66	10.00	10.00	-0.31
10,053.00	40.30	353.80	9,967.99	143.05	-601.13	228.83	13.24	13.23	-0.97
10,084.00	44.90	353.30	9,990.81	163.90	-603.49	249.80	14.88	14.84	-1.61
10,115.00	50.20	353.20	10,011.72	186.60	-606.17	272.65	17.10	17.10	-0.32
10,147.00	55.60	352.60	10,031.02	211.92	-609.33	298.16	16.94	16.88	-1.88
10,178.00	60.40	353.00	10,047.44	237.99	-612.62	324.44	15.52	15.48	1.29
10,209.00	63.80	353.50	10,061.94	265.20	-615.84	351.82	11.06	10.97	1.61
10,241.00	66.70	354.10	10,075.34	294.08	-618.98	380.86	9.22	9.06	1.88
10,273.00	69.10	354.10	10,087.38	323.57	-622.03	410.47	7.50	7.50	0.00
10,304.00	71.90	353.40	10,097.73	352.62	-625.21	439.67	9.28	9.03	-2.26
10,336.00	75.70	353.10	10,106.65	383.13	-628.82	470.39	11.91	11.88	-0.94
10,367.00	80.50	353.50	10,113.04	413.25	-632.36	500.70	15.54	15.48	1.29
10,399.00	85.70	354.50	10,116.89	444.83	-635.68	532.43	16.54	16.25	3.13
10,429.00	89.60	354.80	10,118.12	474.67	-638.47	562.36	13.04	13.00	1.00
10,460.00	89.20	354.10	10,118.44	505.52	-641.47	593.32	2.60	-1.29	-2.26
10,491.00	88.70	354.00	10,119.01	536.35	-644.68	624.28	1.64	-1.61	-0.32
10,586.00	88.40	352.60	10,121.41	630.67	-655.76	719.21	1.51	-0.32	-1.47
10,681.00	88.00	354.80	10,124.40	725.04	-666.18	814.10	2.35	-0.42	2.32
10,775.00	91.20	358.20	10,125.05	818.84	-671.92	907.73	4.97	3.40	3.62
10,870.00	88.70	358.60	10,125.14	913.79	-674.57	1,002.07	2.67	-2.63	0.42
10,964.00	91.20	1.10	10,125.22	1,007.78	-674.81	1,095.09	3.76	2.66	2.66
11,058.00	91.70	359.90	10,122.84	1,101.74	-673.99	1,187.94	1.38	0.53	-1.28
11,153.00	92.60	359.70	10,119.28	1,196.67	-674.33	1,281.91	0.97	0.95	-0.21
11,248.00	92.20	359.90	10,115.30	1,291.59	-674.66	1,375.87	0.47	-0.42	0.21
11,342.00	93.50	0.20	10,110.62	1,385.47	-674.57	1,468.75	1.42	1.38	0.32
11,437.00	92.30	358.50	10,105.82	1,480.34	-675.65	1,562.76	2.19	-1.26	-1.79
11,531.00	90.60	358.00	10,103.44	1,574.26	-678.52	1,656.11	1.89	-1.81	-0.53
11,626.00	88.70	359.90	10,104.02	1,669.23	-680.26	1,750.33	2.83	-2.00	2.00
11,720.00	87.90	0.00	10,106.81	1,763.19	-680.34	1,843.30	0.86	-0.85	0.11



Integrity Directional Services, LLC
Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 28, T 22 S., R 34 E.
Well: Smalls Federal 7H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Smalls Federal 7H
TVD Reference: KB=20' @ 3431.00ft (Patriot 2)
MD Reference: KB=20' @ 3431.00ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
11,815.00	89.20	0.10	10,109.21	1,858.16	-680.26	1,937.25	1.37	1.37	0.11
11,909.00	87.90	0.10	10,111.59	1,952.13	-680.10	2,030.20	1.38	-1.38	0.00
12,004.00	90.80	0.70	10,112.67	2,047.11	-679.43	2,124.08	3.12	3.05	0.63
12,098.00	91.90	1.10	10,110.45	2,141.07	-677.96	2,216.83	1.25	1.17	0.43
12,192.00	92.20	2.30	10,107.09	2,234.97	-675.17	2,309.32	1.32	0.32	1.28
12,286.00	91.00	1.90	10,104.47	2,328.86	-671.73	2,401.73	1.35	-1.28	-0.43
12,381.00	91.70	2.10	10,102.23	2,423.78	-668.41	2,495.15	0.77	0.74	0.21
12,475.00	90.10	0.20	10,100.75	2,517.74	-666.53	2,587.85	2.64	-1.70	-2.02
12,569.00	88.60	359.70	10,101.82	2,611.73	-666.61	2,680.85	1.68	-1.60	-0.53
12,664.00	87.90	359.90	10,104.72	2,706.69	-666.94	2,774.85	0.77	-0.74	0.21
12,758.00	88.50	0.60	10,107.67	2,800.64	-666.53	2,867.74	0.98	0.64	0.74
12,853.00	88.30	0.60	10,110.32	2,895.60	-665.54	2,961.55	0.21	-0.21	0.00
12,947.00	87.50	0.80	10,113.77	2,989.53	-664.39	3,054.32	0.88	-0.85	0.21
13,041.00	88.80	0.70	10,116.80	3,083.47	-663.16	3,147.08	1.39	1.38	-0.11
13,135.00	91.60	0.30	10,116.47	3,177.45	-662.34	3,239.95	3.01	2.98	-0.43
13,230.00	90.60	359.70	10,114.65	3,272.43	-662.34	3,333.93	1.23	-1.05	-0.63
13,324.00	89.30	358.70	10,114.73	3,366.42	-663.65	3,427.11	1.74	-1.38	-1.06
13,419.00	89.00	358.00	10,116.14	3,461.37	-666.39	3,521.45	0.80	-0.32	-0.74
13,513.00	88.70	357.40	10,118.03	3,555.28	-670.16	3,614.91	0.71	-0.32	-0.64
13,608.00	89.30	357.60	10,119.69	3,650.17	-674.30	3,709.40	0.67	0.63	0.21
13,702.00	89.50	357.90	10,120.67	3,744.09	-677.99	3,802.86	0.38	0.21	0.32
13,796.00	90.10	357.70	10,121.00	3,838.02	-681.60	3,896.32	0.67	0.64	-0.21
13,890.00	90.80	357.20	10,120.26	3,931.93	-685.78	3,989.83	0.92	0.74	-0.53
13,985.00	91.00	357.10	10,118.77	4,026.80	-690.51	4,084.38	0.24	0.21	-0.11
14,079.00	92.00	357.10	10,116.31	4,120.64	-695.26	4,177.93	1.06	1.06	0.00
14,174.00	91.10	357.70	10,113.74	4,215.51	-699.57	4,272.41	1.14	-0.95	0.63
14,268.00	90.10	358.30	10,112.75	4,309.44	-702.85	4,365.83	1.24	-1.06	0.64
14,363.00	90.40	358.00	10,112.34	4,404.39	-705.91	4,460.22	0.45	0.32	-0.32
14,457.00	89.30	359.60	10,112.59	4,498.37	-707.88	4,553.48	2.07	-1.17	1.70
14,550.00	90.40	359.10	10,112.83	4,591.36	-708.94	4,645.64	1.30	1.18	-0.54
14,645.00	91.60	359.00	10,111.17	4,686.33	-710.51	4,739.83	1.27	1.26	-0.11
14,732.00	92.20	358.40	10,108.29	4,773.26	-712.49	4,826.13	0.98	0.69	-0.69
Final IDS MWD Survey									
14,780.00	92.20	358.40	10,106.44	4,821.21	-713.82	4,873.76	0.00	0.00	0.00
Projection to TD									



Integrity Directional Services, LLC
Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Smalls Federal 7H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Site:	Sec. 28, T 22 S. , R 34 E.	MD Reference:	KB=20' @ 3431.00ft (Patriot 2)
Well:	Smalls Federal 7H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N-S (ft)	+E-W (ft)	
5,270.00	5,267.68	48.50	62.39	First IDS MWD Survey
14,732.00	10,108.29	4,773.26	-712.49	Final IDS MWD Survey
14,780.00	10,106.44	4,821.21	-713.82	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

SMALLS FEDERAL #7H (30-025-43068)

<u>Perfs</u>	<u>7 1/2% Acid (Gal)</u>	<u>Sand (#)</u>	<u>Fluid (Gal)</u>
1	1470	313481	424788
2	3024	313240	442260
3	3024	311662	455448
4	3024	311339	436968
5	2982	311087	434784
6	3024	312003	434364
7	3024	312172	439194
8	3024	312968	439992
9	3024	312289	380688
10	2982	312465	378966
11	3024	312240	379554
12	3024	312273	382872
13	2982	313515	366534
14	3024	312264	362880
15	2982	312150	361410
16	3024	312043	356538
17	2982	312293	358134
18	4536	312557	374514
19	3024	310398	361998
20	3024	312435	385224
21	3024	310259	365610
22	3024	395389	559692
23	3024	312220	324870
24	3024	312899	362628
25	3024	311137	359436
26	3024	311672	353934
27	3024	309007	356832
Totals	81,396	8,507,457	10,640,112

From Bottom to Top	Stage 1	Distance Between Perfs	Shots	Stage 2	Distance Between Perfs	Shots	Stage 3	Distance Between Perfs	Shots	Stage 4	Distance Between Perfs	Shots	Stage 5	Distance Between Perfs	Shots
	14,705	41	14	14,542	41	14	14,378	41	14	14,215	41	14	14,053	44	14
	14,684	41	12	14,501	41	12	14,338	41	12	14,174	41	12	14,011	41	12
	14,623	40	10	14,460	41	10	14,297	41	10	14,133	36	10	13,970	41	10
	14,583		8	14,419		8	14,256		8	14,097		8	13,929		8
	Plug to Plug	179	44	Plug to Plug	155	44	Plug to Plug	159	44	Plug to Plug	166	44	Plug to Plug	171	44
	Frac Plug	14,731	Total Shots	Frac Plug	14,552	Total Shots	Frac Plug	14,397	Total Shots	Frac Plug	14,238	Total Shots	Frac Plug	14,072	Total Shots

From Bottom to Top	Stage 6	Distance Between Perfs	Shots	Stage 7	Distance Between Perfs	Shots	Stage 8	Distance Between Perfs	Shots	Stage 9	Distance Between Perfs	Shots	Stage 10	Distance Between Perfs	Shots
	13,888	41	14	13,725	41	14	13,562	41	14	13,398	41	14	13,240	35	14
	13,848	41	12	13,681	36	12	13,521	41	12	13,358	41	12	13,194	41	12
	13,807	41	10	13,645	42	10	13,480	41	10	13,317	42	10	13,153	40	10
	13,766		8	13,603		8	13,439		8	13,275		8	13,113		8
	Plug to Plug	156	44	Plug to Plug	163	44	Plug to Plug	157	44	Plug to Plug	170	44	Plug to Plug	166	44
	Frac Plug	13,901	Total Shots	Frac Plug	13,745	Total Shots	Frac Plug	13,582	Total Shots	Frac Plug	13,425	Total Shots	Frac Plug	13,255	Total Shots

From Bottom to Top	Stage 11	Distance Between Perfs	Shots	Stage 12	Distance Between Perfs	Shots	Stage 13	Distance Between Perfs	Shots	Stage 14	Distance Between Perfs	Shots	Stage 15	Distance Between Perfs	Shots
	13,072	41	14	12,908	41	14	12,745	44	14	12,582	41	14	12,418	43	14
	13,031	41	12	12,868	36	12	12,704	41	12	12,541	41	12	12,381	44	12
	12,990	41	10	12,832	43	10	12,663	40	10	12,500	41	10	12,337	41	10
	12,949		8	12,789		8	12,623		8	12,459		8	12,296		8
	Plug to Plug	160	44	Plug to Plug	164	44	Plug to Plug	173	44	Plug to Plug	153	44	Plug to Plug	164	44
	Frac Plug	13,069	Total Shots	Frac Plug	12,929	Total Shots	Frac Plug	12,785	Total Shots	Frac Plug	12,592	Total Shots	Frac Plug	12,439	Total Shots

From Bottom to Top	Stage 16	Distance Between Perfs	Shots	Stage 17	Distance Between Perfs	Shots	Stage 18	Distance Between Perfs	Shots	Stage 19	Distance Between Perfs	Shots	Stage 20	Distance Between Perfs	Shots
	12,255	41	14	12,092	41	14	11,930	45	14	11,765	41	14	11,602	41	14
	12,214	41	12	12,051	41	12	11,888	41	12	11,724	41	12	11,559	35	12
	12,173	40	10	12,010	35	10	11,847	41	10	11,683	40	10	11,524	45	10
	12,133		8	11,975		8	11,806		8	11,643		8	11,479		8
	Plug to Plug	159	44	Plug to Plug	167	44	Plug to Plug	169	44	Plug to Plug	158	44	Plug to Plug	163	44
	Frac Plug	12,275	Total Shots	Frac Plug	12,118	Total Shots	Frac Plug	11,949	Total Shots	Frac Plug	11,780	Total Shots	Frac Plug	11,622	Total Shots

From Bottom to Top	Stage 21	Distance Between Perfs	Shots	Stage 22	Distance Between Perfs	Shots	Stage 23	Distance Between Perfs	Shots	Stage 24	Distance Between Perfs	Shots	Stage 25	Distance Between Perfs	Shots
	11,438	41	14	11,275	41	14	11,108	45	14	10,948	41	14	10,785	41	14
	11,396	41	12	11,234	41	12	11,072	42	12	10,908	41	12	10,744	43	12
	11,357	41	10	11,193	40	10	11,030	41	10	10,867	41	10	10,701	35	10
	11,316		8	11,153		8	10,989		8	10,826		8	10,666		8
	Plug to Plug	155	44	Plug to Plug	172	44	Plug to Plug	165	44	Plug to Plug	161	44	Plug to Plug	164	44
	Frac Plug	11,459	Total Shots	Frac Plug	11,304	Total Shots	Frac Plug	11,132	Total Shots	Frac Plug	10,967	Total Shots	Frac Plug	10,806	Total Shots

From Bottom to Top	Stage 26	Distance Between Perfs	Shots	Stage 27	Distance Between Perfs	Shots	Stage 28	Distance Between Perfs	Shots	Stage 29	Distance Between Perfs	Shots	Stage 30	Distance Between Perfs	Shots
	10,622	44	14	10,458	41	14	10,336			0			0		
	10,581	41	12	10,418	41	12									
	10,540	41	10	10,377	41	10									
	10,499		8	10,336		8									
	Plug to Plug	173	44	Plug to Plug	133	44	Plug to Plug	0	0	Plug to Plug	0	0	Plug to Plug	0	0
	Frac Plug	10,642	Total Shots	Frac Plug	10,489	Total Shots	Frac Plug		Total Shots	Frac Plug		Total Shots	Frac Plug		Total Shots