



COG OPERATING LLC

Lea County, NM (NAD27 NME)

JC Federal #51

JC Federal #51

OH - Job #32D0311223

HOBBS OCD

MAY 04 2011

RECEIVED

30-025-39481

Survey: MWD ST Survey

SDI Standard Survey Report

17 April, 2011

This survey is correct to the best of my knowledge and is supported by actual field data.

[Signature]

Notarized this date 17th of April, 2011.

[Signature]

Notary Signature
County of Midland
State of Texas





Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #51
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Site:	JC Federal #51	MD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Well:	JC Federal #51	North Reference:	Grid
Wellbore:	OH - Job #32D0311223	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	JC Federal #51				
Site Position:		Northing:	661,240.60 usft	Latitude:	32° 48' 59.421 N
From:	Map	Easting:	677,445.00 usft	Longitude:	103° 45' 20.691 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.31 °

Well	JC Federal #51					
Well Position	+N/-S	0.0 usft	Northing:	661,240.60 usft	Latitude:	32° 48' 59.421 N
	+E/-W	0.0 usft	Easting:	677,445.00 usft	Longitude:	103° 45' 20.691 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	3,999.0 usft

Wellbore	OH - Job #32D0311223				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	3/13/2011	7.73	60.73	49,009

Design	Actual				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:		Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
		0.0	0.0	0.0	35.81

Survey Program	Date 4/17/2011				
	From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
	100.0	2,078.0	Gyro Survey (OH - Job #32D0311223)	Keeper	Standard Wireline Keeper ver 1.0.2
	2,140.0	5,933.0	MWD ST Survey (OH - Job #32D0311223)	MWD	MWD - Standard

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0	
100.0	0.58	221.20	100.0	-0.4	-0.3	221.20	0.5	
200.0	0.48	223.20	200.0	-1.1	-1.0	221.79	1.4	
300.0	0.75	216.11	300.0	-1.9	-1.6	220.54	2.5	
400.0	1.04	224.65	400.0	-3.1	-2.6	220.74	4.1	
500.0	1.50	231.44	500.0	-4.5	-4.3	223.54	6.3	
600.0	1.84	235.12	599.9	-6.3	-6.7	226.69	9.1	
700.0	2.01	234.59	699.9	-8.2	-9.4	228.88	12.5	
800.0	2.46	233.24	799.8	-10.5	-12.5	230.06	16.4	
900.0	2.51	233.34	899.7	-13.1	-16.0	230.74	20.7	
1,000.0	2.12	234.97	999.6	-15.5	-19.3	231.28	24.7	



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Site:	JC Federal #51	MD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Well:	JC Federal #51	North Reference:	Grid
Wellbore:	OH - Job #32D0311223	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,100.0	1.86	240.16	1,099.5	-17.3	-22.2	232.03	28.2
1,200.0	1.92	241.16	1,199.5	-19.0	-25.1	232.94	31.4
1,300.0	1.51	242.16	1,299.4	-20.4	-27.7	233.69	34.4
1,400.0	1.35	249.80	1,399.4	-21.4	-30.0	234.50	36.8
1,500.0	1.12	252.86	1,499.4	-22.1	-32.0	235.41	38.9
1,600.0	0.74	242.57	1,599.4	-22.7	-33.5	235.94	40.5
1,700.0	0.28	287.74	1,699.4	-22.9	-34.3	236.31	41.3
1,800.0	0.40	279.83	1,799.4	-22.8	-34.9	236.90	41.7
1,900.0	0.16	81.53	1,899.4	-22.7	-35.1	237.15	41.8
2,000.0	0.45	50.47	1,999.4	-22.4	-34.7	237.13	41.3
2,078.0	0.73	53.05	2,077.4	-21.9	-34.1	237.23	40.5



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Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Site:	JC Federal #51	MD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Well:	JC Federal #51	North Reference:	Grid
Wellbore:	OH - Job #32D0311223	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	JC Federal #51				
Site Position:	Northing:	661,240.60 usft	Latitude:	32° 48' 59.421 N	
From:	Map	Easting:	677,445.00 usft	Longitude:	103° 45' 20.691 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.31 °

Well	JC Federal #51					
Well Position	+N/-S	0.0 usft	Northing:	661,240.60 usft	Latitude:	32° 48' 59.421 N
	+E/-W	0.0 usft	Easting:	677,445.00 usft	Longitude:	103° 45' 20.691 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	3,999.0 usft	

Wellbore	OH - Job #32D0311223				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	3/13/2011	7.73	60.73	49,009

Design	Actual				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	35.81	

Survey Program	Date	4/17/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	2,078.0	Gyro Survey (OH - Job #32D0311223)	Keeper	Standard Wireline Keeper ver 1.0.2	
2,140.0	5,933.0	MWD ST Survey (OH - Job #32D0311223)	MWD	MWD - Standard	

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,078.0	0.73	53.05	2,077.4	-21.9	-34.1	237.23	40.5
2,140.0	0.67	56.02	2,139.4	-21.5	-33.4	237.28	39.7
2,171.0	0.84	51.82	2,170.4	-21.2	-33.1	237.32	39.3
MWD ST Tie-in							
2,266.0	4.95	48.95	2,265.2	-18.1	-29.5	238.42	34.6
2,360.0	4.69	49.00	2,358.9	-12.9	-23.5	241.19	26.8
2,453.0	5.27	37.99	2,451.5	-7.1	-18.0	248.57	19.4
2,547.0	6.64	32.68	2,545.0	0.9	-12.4	274.17	12.5
2,642.0	7.46	35.60	2,639.3	10.5	-5.9	330.92	12.1
2,736.0	8.27	34.24	2,732.4	21.1	1.5	4.05	21.1
2,830.0	8.71	30.90	2,825.4	32.8	9.0	15.27	34.0



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Site:	JC Federal #51	MD Reference:	KB Elev (13') @ 4012.0usft (Cavaloz #1)
Well:	JC Federal #51	North Reference:	Grid
Wellbore:	OH - Job #32D0311223	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
2,923.0	8.00	28.88	2,917.4	44.5	15.7	19.43	47.2	
3,024.0	8.40	31.78	3,017.4	56.9	23.0	21.98	61.4	
3,118.0	8.58	35.92	3,110.3	68.4	30.7	24.16	75.0	
3,213.0	9.00	42.43	3,204.2	79.7	39.9	26.59	89.1	
3,307.0	8.53	41.71	3,297.1	90.3	49.5	28.72	103.0	
3,401.0	8.53	39.25	3,390.1	100.9	58.5	30.11	116.6	
3,494.0	9.15	39.16	3,482.0	112.0	67.6	31.10	130.8	
3,588.0	9.04	39.44	3,574.8	123.5	77.0	31.94	145.5	
3,682.0	8.88	38.89	3,667.7	134.8	86.2	32.60	160.0	
3,777.0	8.50	38.76	3,761.6	146.0	95.2	33.11	174.3	
3,872.0	8.51	40.19	3,855.5	156.8	104.1	33.58	188.3	
3,967.0	8.29	40.52	3,949.5	167.4	113.1	34.05	202.1	
4,062.0	7.90	40.88	4,043.6	177.6	121.9	34.46	215.4	
4,156.0	7.69	41.11	4,136.7	187.2	130.2	34.82	228.0	
4,250.0	9.09	38.23	4,229.7	197.8	138.9	35.09	241.7	
4,344.0	9.04	36.23	4,322.5	209.6	147.9	35.22	256.5	
4,437.0	9.24	37.39	4,414.3	221.4	156.8	35.30	271.3	
4,531.0	9.33	37.76	4,507.1	233.4	166.0	35.42	286.4	
4,625.0	9.14	37.03	4,599.9	245.4	175.2	35.52	301.5	
4,718.0	9.24	37.84	4,691.7	257.2	184.2	35.61	316.3	
4,813.0	8.85	37.30	4,785.5	269.0	193.3	35.70	331.3	
4,906.0	8.68	37.33	4,877.4	280.3	201.9	35.77	345.4	
5,001.0	8.62	37.05	4,971.3	291.7	210.5	35.82	359.7	
5,096.0	7.79	39.96	5,065.4	302.3	219.0	35.92	373.2	
5,191.0	6.80	39.58	5,159.6	311.6	226.7	36.04	385.3	
5,285.0	5.25	35.31	5,253.1	319.3	232.7	36.08	395.1	
5,378.0	4.11	34.29	5,345.8	325.6	237.0	36.06	402.7	
5,473.0	2.61	46.71	5,440.6	329.9	240.5	36.10	408.3	
5,567.0	0.79	67.61	5,534.5	331.6	242.7	36.20	410.9	
5,662.0	0.89	56.27	5,629.5	332.2	243.9	36.28	412.2	
5,756.0	0.89	56.50	5,723.5	333.1	245.1	36.35	413.5	
5,850.0	0.88	55.15	5,817.5	333.9	246.3	36.42	414.9	
5,876.0	0.79	54.89	5,843.5	334.1	246.6	36.44	415.3	
Last MWD Survey								
5,933.0	0.57	51.39	5,900.5	334.5	247.2	36.46	415.9	
Prjection to Bit								

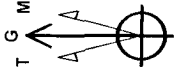
Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,171.0	2,170.4	-21.2	-33.1	MWD ST Tie-in
5,876.0	5,843.5	334.1	246.6	Last MWD Survey
5,933.0	5,900.5	334.5	247.2	Prjection to Bit



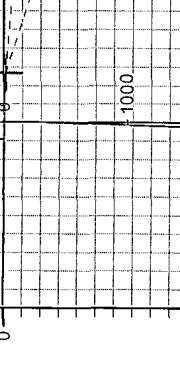
Project: Lea County, NM (NAD27 NME)
 Site: JC Federal #51
 Well: JC Federal #51
 Wellbore: OH - Job #32D0311223
 Design: Plan #5ST - 7-7/8" Hole



Azimuths to Grid North
 True North: -0.31°
 Magnetic North: 7.42°
 Strength: 49009.25nT
 Dip Angle: 60.73°
 Date: 3/13/2011
 Model: IGRF-200510



West HL-JCF-#5
 South HL-JCF-#5

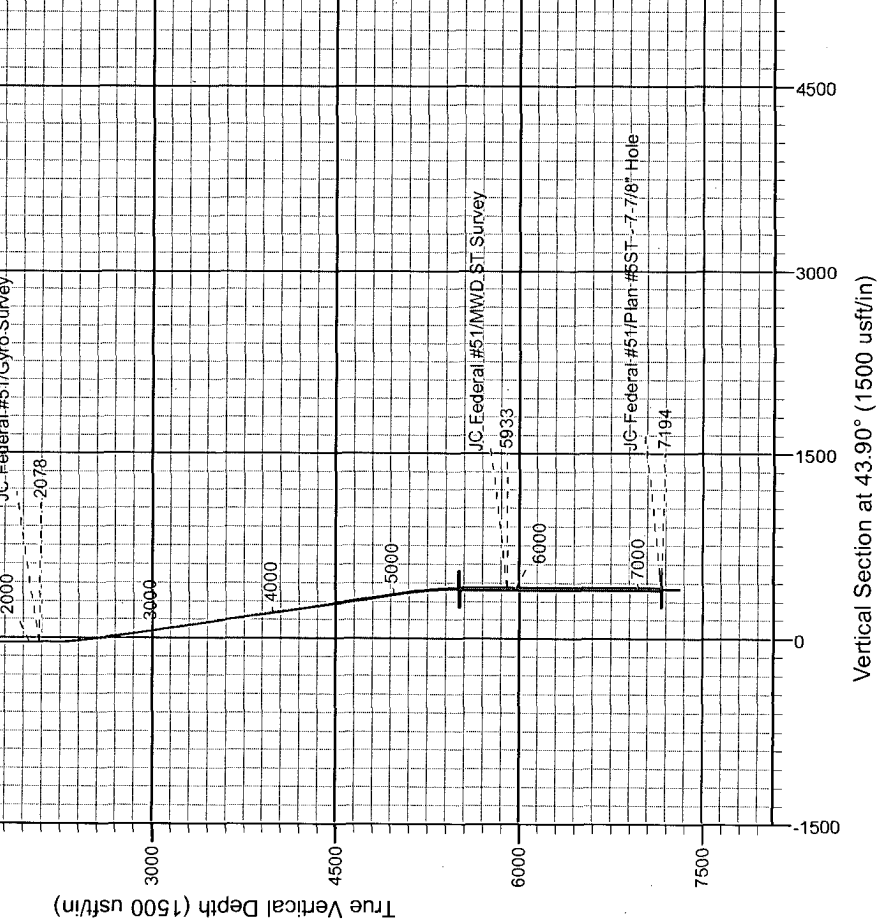
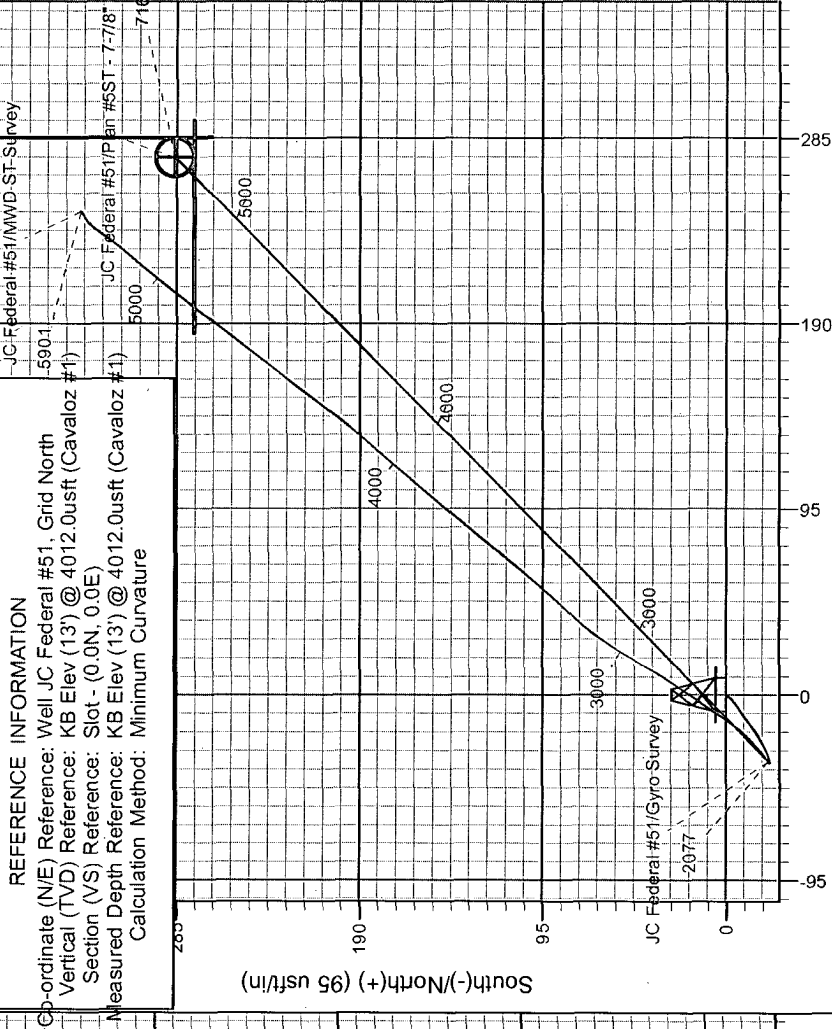


WELL DETAILS: JC Federal #51
 KB Elev (13') @ 4012.0usft (Cavaloz #1)
 Ground Level: 3999.0
 Easting: 677445.00
 Latitude: 32° 48' 59.421 N

Longitude: 103° 45' 20.691 W
 Slot

+N/-S: 0.0
 +E/-W: 0.0
 Northing: 661240.60

REFERENCE INFORMATION
 Coordinate (N/E) Reference: Well JC Federal #51, Grid North
 Vertical (TVD) Reference: KB Elev (13') @ 4012.0usft (Cavaloz #1)
 Section (VS) Reference: Slot - (0.0N, 0.0E)
 Measured Depth Reference: KB Elev (13') @ 4012.0usft (Cavaloz #1)
 Calculation Method: Minimum Curvature



COMPANY DETAILS: COG OPERATING LLC
 223032
 Calculation Method: Minimum Curvature
 Error System: ISCWSA
 Scan Method: Closest Approach 3D
 Error Surface: Elliptical Conic
 Warning Method: Error Ratio

PROJECT DETAILS: Lea County, NM (NAD27 NME)
 Geodetic System: State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico East 3001
 System Datum: Mean Sea Level

SITE DETAILS: JC Federal #51
 Site Centre Latitude: 32° 48' 59.421 N
 Longitude: 103° 45' 20.691 W
 Positional Uncertainty: 0.0
 Convergence: 0.31
 Local North: Grid