

Results of Directional Survey

API number:	30-025-39616		
OGRID:		Operator:	COG OPERATING LLC
		Property:	JC FEDERAL # 45

surface	ULSTR:	F	22	T	17S	R	32E
				1680	FNL	1410	FWL

BH Loc	ULSTR:	F	22	T	17S	R	32E
7124	MD	7116.1	TVD	1655	FNL	1657	FWL

Top Perf/OH	ULSTR:	F	22	T	17S	R	32E
5460	MD	5452.1	TVD	1665	FNL	1663	FWL

Bot Perf/OH	ULSTR:	F	22	T	17S	R	32E
6850	MD	6842.1	TVD	1658	FNL	1656	FWL

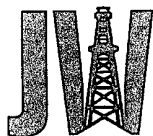
	MD	N/S	E/W	VD
	5367	15.10	251.50	5359.2
TOP PERFS/OH	5460	14.51	253.08	5452.10
	5461	14.50	253.10	5453.10
	6769	21.30	246.10	6761.10
BOT PERFS/OH	6850	22.25	246.21	6842.10
	6846	22.20	246.20	6838.10

NEXT TO LAST	6769	21.30	246.10	6761.10
LAST READING	6846	22.20	246.20	6838.10
TD	7124	25.45	246.56	7116.10

Surface Location	1680	FN	1410	FW
Projected BHL	1655	FN	1657	FW
Location of				
Top Perfs/OH	1665	FN	1663	FW
Bottom Perfs/OH	1658	FN	1656	FW

SUMMARY of Subsurface Locations

Surface Location	F-22-17S-32E	1680	FN	1410	FW	Vert. Depth
Top Perfs/OH	F-22-17S-32E	1665	FN	1663	FW	5452.10
Bottom Perfs/OH	F-22-17S-32E	1658	FN	1656	FW	6842.10
Projected TD	F-22-17S-32E	1655	FN	1657	FW	7116.10



DRILLING INC. Oil Well Drilling Contractor

Post Office Box 160 Artesia, New Mexico 88211-0160 Office (575) 748-8704 Fax (575) 748-8719

December 9, 2010

COG Operating, LLC
550 W. Texas Suite 1300
Midland, Texas 79710

Re: JC Federal # 45
Sec. 22, T-17-S, R-32-E
Lea County, New Mexico

RECEIVED

FEB 07 2011

140850CD

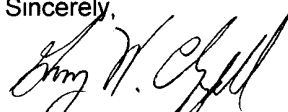
Attn: John Coffman

The following is a Deviation Survey on the referenced well in Lea County, New Mexico:

279' - 0.25°
609' - 1.25°
874' - 1.5°
1373' - 1.75°
1840' - 3°

SUR @ F-22-17s-32e, 1680/N & 1410/W
BHL @ F-22-17s-32e, 1655/N & 1657/W
API # 30-025-39616

Sincerely,


Gary W. Chappell
Contracts Manager

PETROLEUM ENGINEER



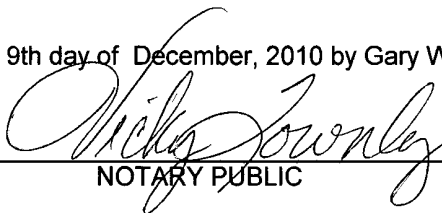
STATE OF NEW MEXICO)
COUNTY OF EDDY)

FEB 16 2011

The foregoing was acknowledged before me this 9th day of December, 2010 by Gary W. Chappell.

MY COMMISSION EXPIRES

5/18/2014


NOTARY PUBLIC

RECEIVED

FEB 07 2011

HOBBS

COG OPERATING LLC

Lea County, NM (NAD27 NME)

JC Federal #45

JC Federal #45

DH - Job #32D1110925

SUR @ F-22-17s-32e, 1680/N & 1410/W
BHL @ F-22-17s-32e, 1655/N & 1657/W
API # 30-025-39616

SDI Standard Survey Report

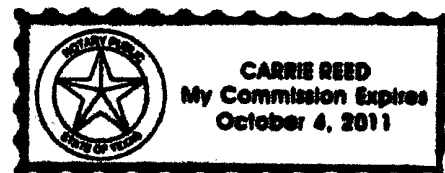
This survey is correct to the best of my knowledge and is supported by actual field data.

Richard

Notarized this date 10th of January, 2011.

Carrie Reed

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 #45
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Site:	JC Federal #45	MD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Well:	JC Federal #45	North Reference:	Grid
Wellbore:	OH	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 #45		
Site Position:		Northing:	663,461.30 usft
From:	Map	Easting:	676,818.20 usft
Position Uncertainty:	0.0 usft	Slot Radius:	0"
		Latitude:	32° 49' 21.428 N
		Longitude:	103° 45' 27.894 W
		Grid Convergence:	0.31 °

Well	JC Federal #45		
Well Position	+N/-S	0.0 usft	Northing: 663,461.30 usft
	+E/-W	0.0 usft	Easting: 676,818.20 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 49' 21.428 N
		Longitude:	103° 45' 27.894 W
		Ground Level:	4,006.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/1/2010	7.78	60.72	49,007

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	85.22

Survey Program	Date	1/8/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	2,080.0	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2	
2,186.0	6,846.0	MWD Survey (OH)	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	0.13	117.82	100.0	-0.1	0.1	117.82	0.1	
200.0	0.44	111.91	200.0	-0.2	0.6	114.10	0.6	
300.0	0.70	107.67	300.0	-0.6	1.5	111.13	1.6	
400.0	0.81	88.88	400.0	-0.7	2.8	105.07	2.9	
500.0	1.13	78.47	500.0	-0.5	4.5	96.89	4.5	
600.0	1.27	79.28	599.9	-0.1	6.5	91.19	6.5	
700.0	1.73	66.82	699.9	0.7	9.0	85.77	9.0	
800.0	2.25	55.44	799.9	2.4	12.0	78.81	12.2	
900.0	2.72	49.57	899.8	5.0	15.4	71.95	16.2	
1,000.0	2.57	46.62	999.7	8.1	18.9	66.74	20.5	

Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #45
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Site:	JC Federal #45	MD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Well:	JC Federal #45	North Reference:	Grid
Wellbore:	OH	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	2.54	47.69	1,099.6	11.1	22.1	63.28	24.8
1,200.0	2.39	45.43	1,199.5	14.1	25.2	60.83	28.9
1,300.0	2.06	46.88	1,299.4	16.8	28.0	59.10	32.7
1,400.0	2.40	50.30	1,399.3	19.3	31.0	58.00	36.5
1,500.0	2.70	53.36	1,499.2	22.1	34.5	57.34	40.9
1,600.0	3.09	55.97	1,599.1	25.0	38.6	57.06	46.0
1,700.0	3.10	59.98	1,698.9	27.9	43.2	57.15	51.4
1,800.0	3.22	61.01	1,798.8	30.6	48.0	57.48	56.9
1,900.0	3.11	58.26	1,898.6	33.4	52.7	57.67	62.4
2,000.0	2.95	56.86	1,998.5	36.2	57.2	57.66	67.7
2,080.0	2.80	54.90	2,078.4	38.5	60.5	57.57	71.7

Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #45
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Site:	JC Federal #45	MD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Well:	JC Federal #45	North Reference:	Grid
Wellbore:	DH - Job #32D1110925	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 #45				
Site Position:		Northing:	663,461.30 usft	Latitude:	32° 49' 21.428 N	
From:	Map	Easting:	676,818.20 usft	Longitude:	103° 45' 27.894 W	
Position Uncertainty:		0.0 usft	Slot Radius:	0"	Grid Convergence:	0.31 °

Well	JC Federal #45					
Well Position	+N/-S	0.0 usft	Northing:	663,461.30 usft	Latitude:	32° 49' 21.428 N
	+E/-W	0.0 usft	Easting:	676,818.20 usft	Longitude:	103° 45' 27.894 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,006.0 usft

Wellbore	DH - Job #32D1110925				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/1/2010	7.78	60.72	49,007

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	85.22

Survey Program	Date	1/8/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	2,080.0	Gyro Survey (DH - Job #32D1110925)	Keeper	Standard Wireline Keeper ver 1.0.2	
2,186.0	6,846.0	MWD Survey (DH - Job #32D1110925)	MWD	MWD - Standard	

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,080.0	2.80	54.90	2,078.4	38.5	60.5	57.57	71.7
2,186.0	2.69	49.79	2,184.3	41.5	64.5	57.22	76.7
2,280.0	3.52	73.57	2,278.1	43.8	69.0	57.59	81.7
2,373.0	2.99	73.05	2,371.0	45.3	74.0	58.54	86.8
2,467.0	3.08	73.75	2,464.9	46.7	78.8	59.34	91.6
2,561.0	3.62	99.77	2,558.7	46.9	84.2	60.86	96.4
2,655.0	3.47	95.02	2,652.5	46.2	89.9	62.82	101.1
2,749.0	3.30	90.47	2,746.4	45.9	95.5	64.32	105.9
2,842.0	3.23	90.64	2,839.2	45.8	100.7	65.53	110.7
2,935.0	3.69	105.83	2,932.0	45.0	106.2	67.04	115.4
3,028.0	3.34	111.94	3,024.9	43.2	111.6	68.86	119.7

Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #45
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Site:	JC Federal #45	MD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Well:	JC Federal #45	North Reference:	Grid
Wellbore:	DH - Job #32D1110925	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)
3,121.0	2.99	118.05	3,117.7	41.0	116.3	70.57	123.3
3,215.0	2.81	114.10	3,211.6	38.9	120.6	72.10	126.7
3,310.0	3.96	97.30	3,306.4	37.6	125.9	73.39	131.4
3,404.0	3.67	98.94	3,400.2	36.7	132.1	74.48	137.1
3,498.0	3.40	93.79	3,494.0	36.0	137.9	75.36	142.5
3,591.0	4.97	105.91	3,586.8	34.7	144.5	76.48	148.6
3,684.0	4.66	108.58	3,679.5	32.4	152.0	77.95	155.4
3,778.0	4.91	106.60	3,773.1	30.1	159.4	79.32	162.3
3,871.0	4.66	107.41	3,865.8	27.8	166.9	80.54	169.2
3,965.0	4.04	98.62	3,959.5	26.2	173.8	81.44	175.7
4,059.0	3.87	101.35	4,053.3	25.0	180.2	82.09	181.9
4,152.0	3.76	96.42	4,146.1	24.1	186.3	82.63	187.8
4,245.0	3.95	97.50	4,238.9	23.3	192.5	83.09	193.9
4,339.0	4.04	95.63	4,332.7	22.6	199.0	83.53	200.3
4,432.0	3.78	97.74	4,425.5	21.8	205.3	83.93	206.4
4,526.0	4.09	96.45	4,519.2	21.0	211.7	84.32	212.7
4,620.0	4.03	92.49	4,613.0	20.5	218.3	84.63	219.3
4,713.0	4.22	95.57	4,705.8	20.1	225.0	84.91	225.9
4,807.0	2.62	99.85	4,799.6	19.4	230.5	85.20	231.4
4,901.0	2.71	96.24	4,893.5	18.7	234.9	85.44	235.6
4,994.0	2.72	99.63	4,986.4	18.1	239.2	85.67	239.9
5,087.0	2.39	103.30	5,079.3	17.3	243.3	85.93	243.9
5,181.0	1.69	102.75	5,173.2	16.6	246.5	86.16	247.1
5,275.0	1.57	112.06	5,267.2	15.8	249.1	86.38	249.6
5,367.0	1.58	98.01	5,359.2	15.1	251.5	86.56	252.0
5,461.0	0.62	146.35	5,453.1	14.5	253.1	86.72	253.5
5,554.0	0.48	104.26	5,546.1	14.0	253.7	86.84	254.1
5,648.0	0.53	97.22	5,640.1	13.9	254.6	86.89	254.9
5,741.0	0.40	289.37	5,733.1	13.9	254.7	86.87	255.1
5,821.0	0.94	287.50	5,813.1	14.2	253.8	86.80	254.2
5,928.0	0.97	279.15	5,920.1	14.6	252.1	86.68	252.5
6,020.0	0.47	280.60	6,012.1	14.8	250.9	86.63	251.3
6,114.0	0.60	294.11	6,106.1	15.1	250.1	86.55	250.5
6,207.0	0.85	299.42	6,199.1	15.6	249.0	86.41	249.5
6,301.0	0.70	315.35	6,293.1	16.4	248.0	86.23	248.6
6,395.0	1.07	344.30	6,387.1	17.6	247.4	85.93	248.0
6,488.0	0.56	331.20	6,480.1	18.8	246.9	85.64	247.7
6,582.0	0.55	347.80	6,574.1	19.7	246.6	85.44	247.4
6,675.0	0.47	318.06	6,667.1	20.4	246.3	85.26	247.1
6,769.0	0.69	6.27	6,761.1	21.3	246.1	85.06	247.0
6,846.0	0.69	6.27	6,838.1	22.2	246.2	84.85	247.2

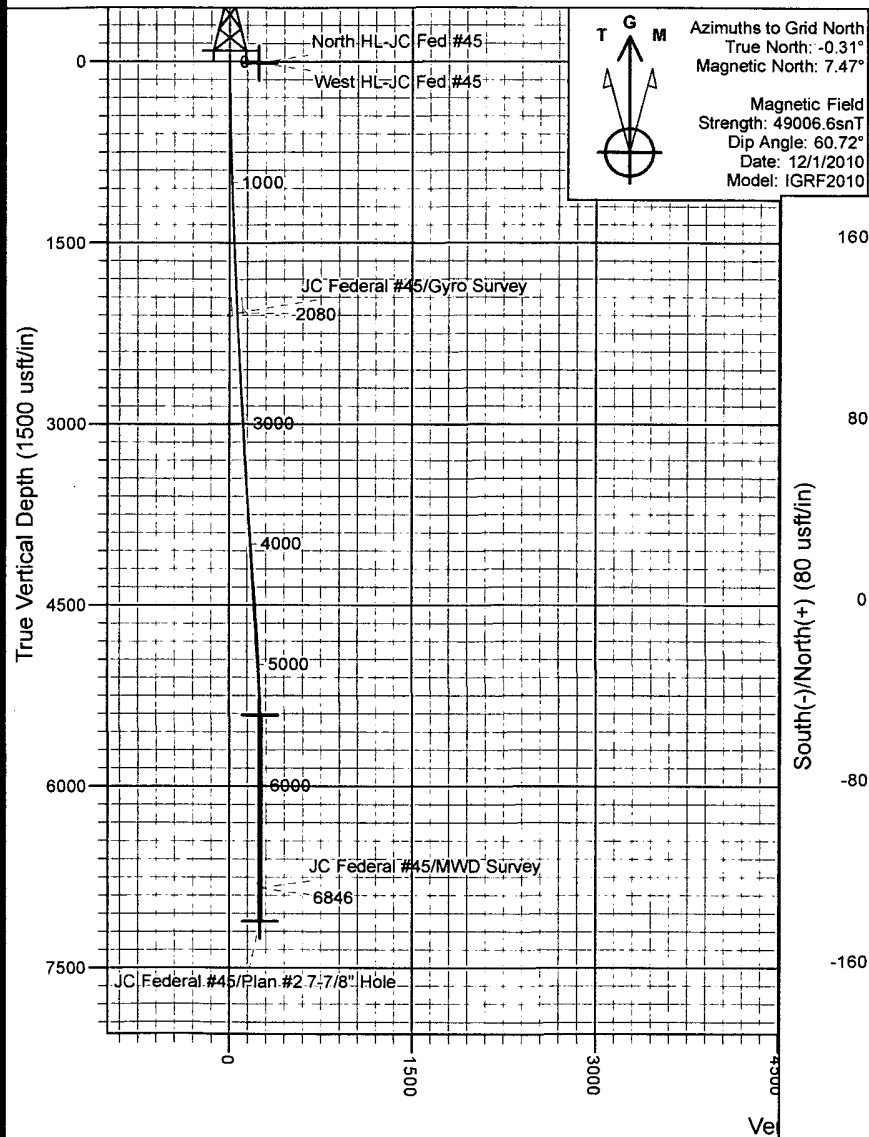
Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #45
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Site:	JC Federal #45	MD Reference:	KB Elev (13') @ 4019.0usft (JW #4)
Well:	JC Federal #45	North Reference:	Grid
Wellbore:	DH - Job #32D1110925	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,080.0	2,078.4	38.5	60.5	Gyro Tie-in
6,769.0	6,761.1	21.3	246.1	Last MWD Survey
6,846.0	6,838.1	22.2	246.2	Projection to Bit



Project: Lea County, NM (NAD27 NME)
 Site: JC Federal #45
 Well: JC Federal #45
 Wellbore: DH - Job #32D1110925
 Design: Plan #2 7-7/8" Hole



Azimuths to Grid North
 True North: -0.31°
 Magnetic North: 7.47°
 Magnetic Field
 Strength: 49006.6snT
 Dip Angle: 60.72°
 Date: 12/1/2010
 Model: IGRF2010

+N/-S
 0.0

+E/-W
 0.0

Northing
 663461.30

WELL DETAILS: JC Federal #45
 KB Elev (13') @ 4019.0usft (JW #4)
 Ground Level: 4006.0
 Easting
 676818.20

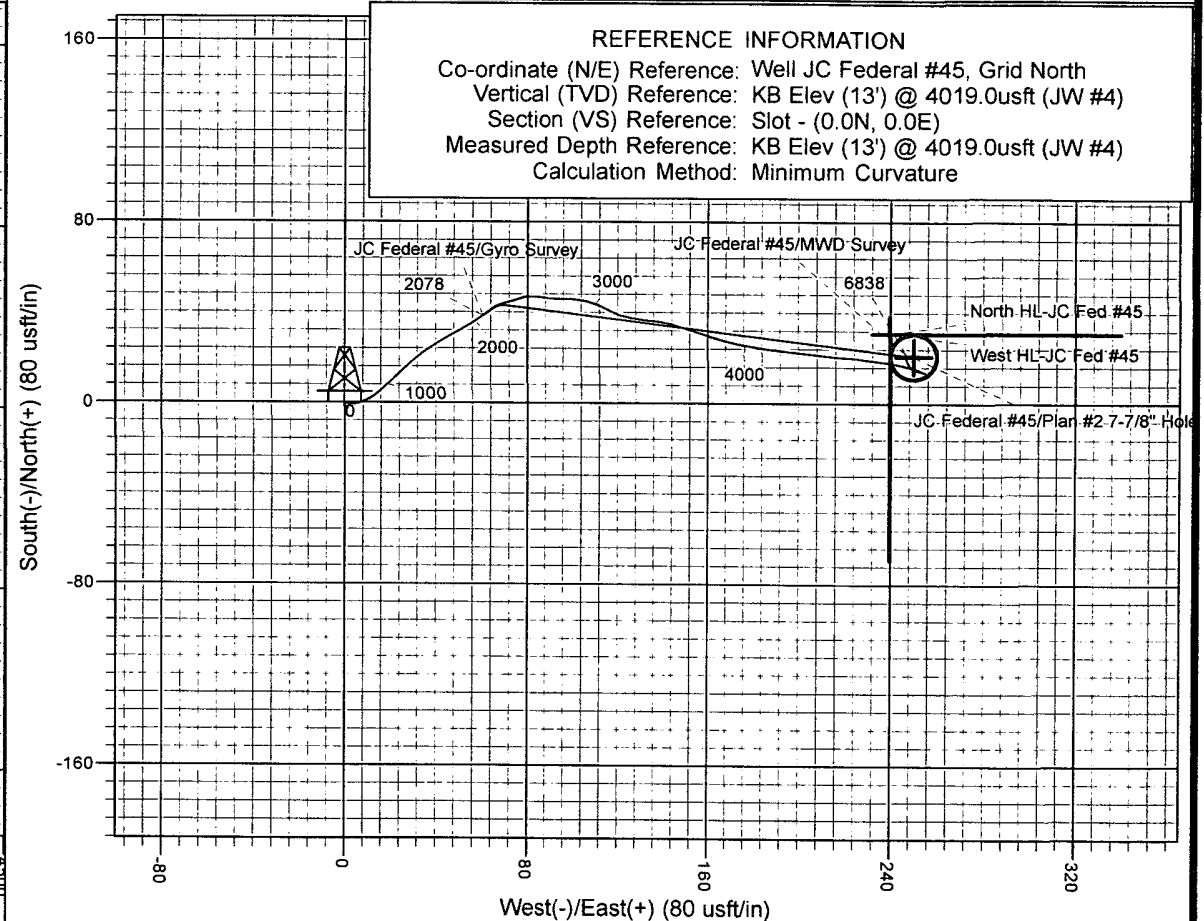
Latitude
 32° 49' 21.428 N

Longitude
 103° 45' 27.894 W

Slot

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well JC Federal #45, Grid North
 Vertical (TVD) Reference: KB Elev (13') @ 4019.0usft (JW #4)
 Section (VS) Reference: Slot - (0.0N, 0.0E)
 Measured Depth Reference: KB Elev (13') @ 4019.0usft (JW #4)
 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: US 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 #45
 Site Centre Latitude: 32° 49' 21.428 N
 Longitude: 103° 45' 27.894 W
 Positional Uncertainty: 0.0
 Convergence: 0.31
 Local North: Grid