

RECEIVED
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HOBBSOCD

COG OPERATING

Lusk

Lea County, NM

Magnum Pronto State Com #4H

VH - Job #32K0111020

SUR: P-32-19s-32e, 330/S & 330/E
BHL: A-32-19s-32e, 4948/S & 511/E
API #30-025-39951

Survey: Actual

SDI Standard Survey Report

16 January, 2011

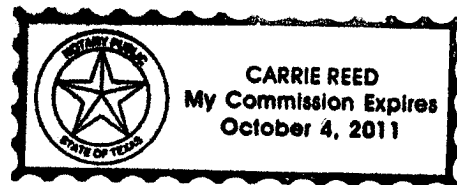
This survey is correct to the best of my knowledge and is supported by actual field data.

Richardson

Notarized this date 16th of January, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING	Local Co-ordinate Reference:	Well Magnum Pronto State Com #4H
Project:	Lusk	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Magnum Pronto State Com #4H	North Reference:	Grid
Wellbore:	VH - Job #32K0111020	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0111020	Database:	EDM-Regulatory

Project	Lusk		
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	Lea County, NM				
Site Position:		Northing:	608,010.37 usft	Latitude:	32° 40' 13.174 N
From:	Lat/Long	Easting:	668,500.03 usft	Longitude:	103° 47' 8.729 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.30 °

Well	Magnum Pronto State Com #4H, Directional (Pathfinder)					
Well Position	+N/-S	0.0 usft	Northing:	586,071.31 usft	Latitude:	32° 36' 36.000 N
	+E/-W	0.0 usft	Easting:	670,078.30 usft	Longitude:	103° 46' 51.600 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	0.0 usft

Wellbore	VH - Job #32K0111020				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2010	1/9/2011	7.82	60.53	48,932

Design	VH - Job #32K0111020			
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	358.70

Survey Program		Date	1/16/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	8,773.0	Actual (VH - Job #32K0111020)	Keeper	Keeper Gyro	

Survey								
Measured Depth	Inclination	Azimuth	True Vertical	North/South	East/West	Closure Azimuth	Closure Distance	
(usft)	(°)	(°)	Depth	(usft)	(usft)	(°)	(usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0	
100.0	0.19	14.50	100.0	0.2	0.0	14.50	0.2	
200.0	0.14	56.04	200.0	0.4	0.2	25.34	0.4	
300.0	0.21	26.89	300.0	0.6	0.4	30.69	0.7	
400.0	0.10	44.07	400.0	0.8	0.5	31.16	1.0	
500.0	0.07	79.50	500.0	0.9	0.6	34.50	1.1	
600.0	0.24	231.03	600.0	0.8	0.5	33.52	1.0	
700.0	0.51	216.21	700.0	0.3	0.1	18.64	0.3	
800.0	1.00	231.69	800.0	-0.6	-0.8	235.00	1.0	
900.0	1.03	228.41	900.0	-1.7	-2.2	231.85	2.8	
1,000.0	1.06	232.11	1,000.0	-2.9	-3.6	231.24	4.6	
1,100.0	0.49	127.25	1,099.9	-3.7	-4.0	227.02	5.5	

Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING	Local Co-ordinate Reference:	Well Magnum Pronto State Corn #4H
Project:	Lusk	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Magnum Pronto State Corn #4H	North Reference:	Grid
Wellbore:	VH - Job #32K0111020	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0111020	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,200.0	0.38	111.61	1,199.9	-4.1	-3.3	219.19	5.3
1,300.0	0.48	110.13	1,299.9	-4.4	-2.6	211.17	5.1
1,400.0	0.42	91.90	1,399.9	-4.5	-1.9	202.59	4.9
1,500.0	0.39	106.83	1,499.9	-4.6	-1.2	194.40	4.8
1,600.0	0.39	93.47	1,599.9	-4.8	-0.5	186.30	4.8
1,700.0	0.40	103.36	1,699.9	-4.9	0.2	178.17	4.9
1,800.0	0.47	88.96	1,799.9	-4.9	0.9	169.60	5.0
1,900.0	0.74	73.09	1,899.9	-4.7	1.9	157.79	5.1
2,000.0	1.50	63.34	1,999.9	-4.0	3.7	136.77	5.4
2,100.0	1.90	70.45	2,099.9	-2.8	6.5	113.57	7.0
2,200.0	1.86	68.78	2,199.8	-1.7	9.5	99.96	9.7
2,300.0	1.97	77.28	2,299.8	-0.7	12.7	93.18	12.7
2,400.0	1.86	77.18	2,399.7	0.0	16.0	89.89	16.0
2,500.0	0.99	81.25	2,499.7	0.5	18.4	88.37	18.4
2,600.0	0.83	73.57	2,599.7	0.9	20.0	87.54	20.0
2,700.0	0.26	99.23	2,699.6	1.0	20.9	87.18	20.9
2,800.0	0.10	76.18	2,799.6	1.0	21.2	87.26	21.2
2,900.0	0.22	254.27	2,899.6	1.0	21.1	87.34	21.1
3,000.0	0.25	234.92	2,999.6	0.8	20.7	87.78	20.7
3,100.0	0.47	256.31	3,099.6	0.6	20.1	88.35	20.2
3,200.0	0.74	275.13	3,199.6	0.5	19.1	88.38	19.1
3,300.0	0.87	308.85	3,299.6	1.1	17.9	86.56	17.9
3,400.0	1.23	280.99	3,399.6	1.8	16.2	83.82	16.3
3,500.0	1.65	283.10	3,499.6	2.3	13.8	80.57	14.0
3,600.0	1.82	289.44	3,599.5	3.1	10.9	73.88	11.3
3,700.0	2.04	295.92	3,699.5	4.4	7.8	60.21	9.0
3,800.0	2.04	300.98	3,799.4	6.1	4.6	37.10	7.7
3,900.0	2.05	303.06	3,899.3	8.0	1.6	11.40	8.2
4,000.0	1.85	299.21	3,999.3	9.8	-1.3	352.52	9.9
4,100.0	1.47	294.33	4,099.2	11.1	-3.9	340.83	11.8
4,200.0	1.18	294.53	4,199.2	12.1	-6.0	333.68	13.5
4,300.0	1.26	299.20	4,299.2	13.0	-7.9	328.89	15.2
4,400.0	1.47	307.85	4,399.2	14.4	-9.8	325.58	17.4
4,500.0	1.50	316.17	4,499.1	16.1	-11.8	323.84	19.9
4,600.0	1.37	320.87	4,599.1	18.0	-13.4	323.23	22.4
4,700.0	1.08	321.04	4,699.1	19.6	-14.8	323.03	24.6
4,800.0	0.76	319.04	4,799.1	20.9	-15.8	322.86	26.2
4,900.0	0.46	321.89	4,899.1	21.7	-16.5	322.75	27.2
5,000.0	0.47	319.52	4,999.1	22.3	-17.0	322.69	28.0
5,100.0	0.09	338.40	5,099.1	22.7	-17.3	322.69	28.5
5,200.0	0.33	121.02	5,199.1	22.6	-17.1	322.95	28.3
5,300.0	0.64	99.52	5,299.1	22.4	-16.3	323.97	27.7
5,400.0	0.64	103.14	5,399.1	22.1	-15.2	325.58	26.8
5,500.0	0.69	105.10	5,499.0	21.9	-14.1	327.28	26.0

Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING	Local Co-ordinate Reference:	Well Magnum Pronto State Com #4H
Project:	Lusk	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Magnum Pronto State Com #4H	North Reference:	Grid
Wellbore:	VH - Job #32K0111020	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0111020	Database:	EDM-Regulatory

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
5,600.0	0.78	98.87	5,599.0	21.6	-12.8	329.36	25.1
5,700.0	1.02	89.64	5,699.0	21.5	-11.2	332.42	24.3
5,800.0	0.98	89.16	5,799.0	21.5	-9.5	336.21	23.5
5,900.0	1.07	90.44	5,899.0	21.5	-7.7	340.32	22.9
6,000.0	1.07	82.93	5,999.0	21.6	-5.8	344.89	22.4
6,100.0	1.08	76.82	6,099.0	22.0	-4.0	349.69	22.3
6,200.0	1.01	78.30	6,198.9	22.4	-2.2	354.34	22.5
6,300.0	1.01	78.07	6,298.9	22.7	-0.5	358.77	22.7
6,400.0	1.00	77.26	6,398.9	23.1	1.2	3.03	23.1
6,500.0	1.02	73.17	6,498.9	23.5	2.9	7.09	23.7
6,600.0	0.93	73.37	6,598.9	24.0	4.6	10.74	24.5
6,700.0	0.81	80.50	6,698.9	24.4	6.0	13.89	25.1
6,800.0	0.72	77.55	6,798.9	24.6	7.3	16.60	25.7
6,900.0	0.68	79.48	6,898.9	24.9	8.5	18.94	26.3
7,000.0	0.48	72.15	6,998.8	25.1	9.5	20.76	26.9
7,100.0	0.21	55.94	7,098.8	25.3	10.1	21.67	27.3
7,200.0	0.67	309.16	7,198.8	25.8	9.8	20.73	27.6
7,300.0	1.09	309.16	7,298.8	26.8	8.6	17.76	28.1
7,400.0	1.23	325.27	7,398.8	28.3	7.2	14.35	29.2
7,500.0	1.06	346.56	7,498.8	30.1	6.4	12.03	30.7
7,600.0	0.83	340.97	7,598.8	31.6	6.0	10.66	32.2
7,700.0	0.77	44.87	7,698.8	32.8	6.2	10.69	33.4
7,800.0	0.31	63.10	7,798.8	33.4	6.9	11.68	34.1
7,900.0	0.44	220.27	7,898.8	33.2	6.9	11.73	33.9
8,000.0	0.53	231.02	7,998.8	32.6	6.3	10.91	33.2
8,100.0	0.70	240.06	8,098.8	32.0	5.4	9.57	32.5
8,200.0	0.45	228.83	8,198.7	31.5	4.6	8.27	31.8
8,300.0	0.15	268.28	8,298.7	31.2	4.2	7.57	31.5
8,400.0	0.20	36.37	8,398.7	31.4	4.1	7.49	31.6
8,500.0	0.34	4.67	8,498.7	31.8	4.3	7.62	32.1
8,600.0	0.45	1.21	8,598.7	32.5	4.3	7.51	32.8
8,700.0	0.71	352.99	8,698.7	33.5	4.2	7.18	33.8
8,773.0	0.77	322.79	8,771.7	34.3	3.9	6.42	34.5



Scientific Drilling
Directional Drilling Operations

Project: Lusk
Lea County, NM
Well: Magnum Pronto State Com #4H
Wellbore: VH - Job #32K0111020
Design: VH - Job #32K0111020

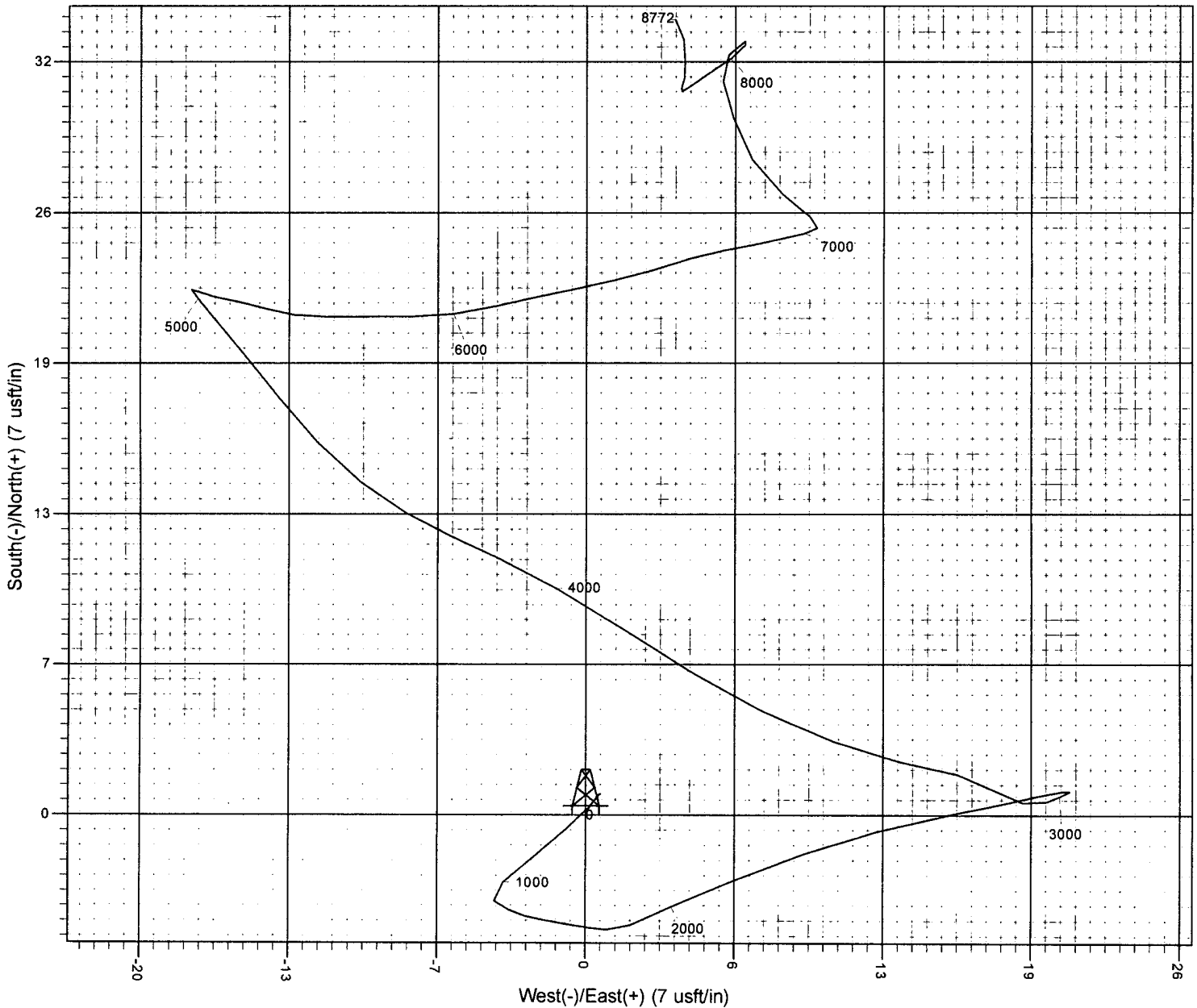


Azimuths to Grid North
True North: -0.30°
Magnetic North: 7.52°

Magnetic Field
Strength: 48931.8snT
Dip Angle: 60.53°
Date: 1/9/2011
Model: BGGM2010

WELL DETAILS: Magnum Pronto State Com #4H
WELL @ 0.0usft (Original Well Elev)
Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	586071.31	670078.30	32° 36' 36.000 N	103° 46' 51.600 W	



PROJECT DETAILS: Lusk
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: Lea County, NM
Site Centre Latitude: 32° 40' 13.174 N
Longitude: 103° 47' 8.729 W
Positional Uncertainty: 0.0
Convergence: 0.30
Local North: Grid

Job Number: 70001278

Company: COG

Lease/Well: Magnum Pronto State Com #4

Location: ☐

Rig Name: Patriot #6

RKB: ☐

G.L. or M.S.L.: ☐

State/Country: N.M.

Declination: 7.47

Grid: ☐

File name: E:\1278.SVY

Date/Time: 21-Jan-11 / 18:48

Curve Name: 1278WT-WT

SUR: P-32-19s-32e, 330/S & 330/E
BHL: A-32-19s-32e, 4948/S & 511/E
API #30-025-39951

Scientific Drilling

WINSERVE SURVEY CALCULATIONS

Minimum Curvature Method

Vertical Section Plane 358.70

Vertical Section Referenced to Wellhead

Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE Distance FT	Direction Deg	Dogleg Severity Deg/100
8773.00	.77	322.79	8771.73	34.39	3.88	34.29	34.61	6.44	.00
8872.00	3.96	351.12	8870.63	38.30	2.95	38.22	38.41	4.40	3.34
8903.00	7.65	352.18	8901.47	41.40	2.50	41.33	41.48	3.46	11.91
8935.00	11.43	354.02	8933.02	46.67	1.88	46.61	46.70	2.31	11.85
8967.00	15.04	355.45	8964.17	53.96	1.22	53.92	53.98	1.30	11.33
8999.00	18.29	356.44	8994.82	63.11	.58	63.08	63.12	.53	10.19
9031.00	21.54	355.82	9024.90	73.99	-.16	73.97	73.99	359.88	10.18
9062.00	24.36	357.20	9053.45	86.05	-.89	86.05	86.06	359.41	9.26
9094.00	26.20	358.42	9082.38	99.71	-1.40	99.71	99.72	359.19	5.98
9125.00	28.67	357.64	9109.89	113.98	-1.90	113.99	113.99	359.05	8.05
9157.00	32.10	357.29	9137.49	130.15	-2.62	130.17	130.17	358.85	10.73
9189.00	36.14	357.21	9163.98	148.07	-3.48	148.11	148.11	358.65	12.63
9221.00	39.92	357.42	9189.18	167.76	-4.40	167.82	167.82	358.50	11.82

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
9253.00	43.53	357.54	9213.06	189.03	-5.33	189.11	189.11	358.38	11.28
9285.00	47.84	357.53	9235.41	211.90	-6.32	211.99	212.00	358.29	13.47
9317.00	51.62	357.12	9256.09	236.29	-7.46	236.40	236.41	358.19	11.85
9349.00	54.52	356.85	9275.31	261.83	-8.81	261.96	261.98	358.07	9.09
9380.00	59.00	356.58	9292.30	287.71	-10.29	287.87	287.89	357.95	14.47
9412.00	62.96	356.35	9307.82	315.63	-12.02	315.82	315.86	357.82	12.39
9443.00	66.83	356.17	9320.97	343.64	-13.85	343.86	343.92	357.69	12.49
9475.00	70.26	356.60	9332.68	373.36	-15.73	373.62	373.69	357.59	10.79
9507.00	72.46	356.81	9342.90	403.63	-17.47	403.92	404.01	357.52	6.90
9538.00	75.01	356.55	9351.58	433.33	-19.19	433.66	433.76	357.46	8.27
9570.00	79.14	356.09	9358.74	464.45	-21.20	464.81	464.94	357.39	12.98
9602.00	83.71	355.58	9363.51	496.00	-23.50	496.41	496.56	357.29	14.37
9630.00	87.32	355.55	9365.70	523.83	-25.65	524.28	524.46	357.20	12.89
9662.00	87.41	355.20	9367.17	555.69	-28.23	556.19	556.41	357.09	1.13
9725.00	89.52	355.77	9368.86	618.47	-33.19	619.06	619.36	356.93	3.47
9789.00	89.78	355.63	9369.25	682.29	-37.99	682.97	683.34	356.81	.46
9853.00	90.40	355.13	9369.15	746.08	-43.14	746.87	747.32	356.69	1.24
9948.00	91.28	354.49	9367.76	840.68	-51.73	841.63	842.27	356.48	1.15
10042.00	89.78	353.94	9366.89	934.19	-61.21	935.34	936.19	356.25	1.70
10138.00	90.57	354.44	9366.59	1029.70	-70.93	1031.04	1032.14	356.06	.97
10233.00	91.19	355.65	9365.13	1124.33	-79.13	1125.83	1127.11	355.97	1.43
10328.00	92.15	356.94	9362.37	1219.09	-85.27	1220.71	1222.07	356.00	1.69
10423.00	90.40	357.18	9360.25	1313.93	-90.14	1315.64	1317.02	356.08	1.86
10517.00	90.04	357.58	9359.89	1407.84	-94.43	1409.62	1411.00	356.16	.57
10613.00	90.84	357.14	9359.15	1503.73	-98.86	1505.59	1506.98	356.24	.95
10708.00	90.31	358.52	9358.20	1598.65	-102.45	1600.57	1601.93	356.33	1.56
10803.00	89.78	359.39	9358.13	1693.64	-104.19	1695.56	1696.84	356.48	1.07
10899.00	90.04	359.50	9358.28	1789.63	-105.12	1791.56	1792.72	356.64	.29
10994.00	90.84	359.34	9357.55	1884.62	-106.08	1886.55	1887.61	356.78	.86
11089.00	89.96	.49	9356.88	1979.62	-106.22	1981.52	1982.47	356.93	1.52
11185.00	90.92	359.90	9356.15	2075.61	-105.89	2077.48	2078.31	357.08	1.17
11280.00	89.08	.05	9356.15	2170.61	-105.93	2172.45	2173.19	357.21	1.94
11376.00	89.69	359.84	9357.18	2266.60	-106.02	2268.43	2269.08	357.32	.67
11471.00	90.57	359.48	9356.96	2361.60	-106.59	2363.41	2364.00	357.42	1.00

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE Distance FT	Direction Deg	Dogleg Severity Deg/100
11540.00	91.10	359.89	9355.96	2430.59	-106.97	2432.39	2432.94	357.48	.97
11635.00	90.57	.32	9354.57	2525.58	-106.79	2527.35	2527.84	357.58	.72
11730.00	89.78	.44	9354.28	2620.58	-106.16	2622.31	2622.73	357.68	.84
11826.00	89.43	.32	9354.94	2716.57	-105.53	2718.27	2718.62	357.78	.39
11921.00	89.96	.14	9355.45	2811.57	-105.15	2813.23	2813.54	357.86	.59
12017.00	90.40	359.45	9355.15	2907.57	-105.49	2909.21	2909.48	357.92	.85
12112.00	88.99	.24	9355.65	3002.56	-105.75	3004.19	3004.43	357.98	1.70
12208.00	89.52	.07	9356.90	3098.56	-105.49	3100.15	3100.35	358.05	.58
12303.00	90.22	359.18	9357.12	3193.55	-106.11	3195.14	3195.31	358.10	1.19
12398.00	90.75	358.84	9356.31	3288.53	-107.75	3290.13	3290.30	358.12	.66
12494.00	88.90	358.92	9356.61	3384.51	-109.63	3386.13	3386.29	358.14	1.93
12589.00	89.34	358.46	9358.07	3479.47	-111.80	3481.11	3481.27	358.16	.67
12685.00	89.69	357.93	9358.88	3575.42	-114.82	3577.11	3577.27	358.16	.66
12780.00	90.40	358.04	9358.80	3670.36	-118.16	3672.10	3672.26	358.16	.76
12875.00	91.01	357.25	9357.63	3765.27	-122.06	3767.07	3767.25	358.14	1.05
12971.00	90.40	357.49	9356.45	3861.17	-126.47	3863.04	3863.24	358.12	.68
13066.00	90.13	357.27	9356.01	3956.06	-130.81	3958.01	3958.23	358.11	.37
13162.00	90.92	356.60	9355.13	4051.92	-135.94	4053.96	4054.20	358.08	1.08
13257.00	89.78	356.40	9354.55	4146.74	-141.74	4148.89	4149.16	358.04	1.22
13352.00	89.87	355.98	9354.84	4241.53	-148.06	4243.80	4244.11	358.00	.45
13422.00	90.31	355.84	9354.73	4311.35	-153.05	4313.71	4314.07	357.97	.66
13511.00	91.28	355.40	9353.50	4400.08	-159.85	4402.58	4402.99	357.92	1.20
13638.00	92.07	354.59	9349.79	4526.54	-170.92	4529.25	4529.77	357.84	.89
13692.00	92.68	353.98	9347.55	4580.23	-176.29	4583.05	4583.62	357.80	1.60
projection to bit									
13740.00	92.68	353.98	9345.30	4627.91	-181.32	4630.83	4631.46	357.76	.00