

Cheyenne Gas Storage LLC

Logan Co., CO

Sec.6-T11N-R52W

ECGS 6-21 WPD004-2

Wellbore #1

Plan: Design #1

Standard Planning Report

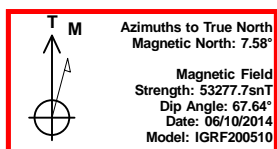
11 June, 2014

Archer

Company Name: Cheyenne Gas Storage LLC

Project: Logan Co., CO
Site: Sec.6-T11N-R52W
Well: ECGS 6-21 WPD004-2
Wellbore: Wellbore #1
Design: Design #1
Latitude: 40° 57' 11.232 N
Longitude: 103° 13' 14.304 W
Ground Level: 4557.00
WELL @ 4567.00usft (Original Well Elev)

Archer



PROJECT DETAILS: Logan Co., CO

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: Colorado Northern Zone
System Datum: Mean Sea Level

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Site Sec.6-T11N-R52W, True North
Vertical (TVD) Reference: WELL @ 4567.00usft (Original Well Elev)
Section (VS) Reference: Slot - (0.00N, 0.00E)
Measured Depth Reference: WELL @ 4567.00usft (Original Well Elev)
Calculation Method: Minimum Curvature

WELL DETAILS: ECGS 6-21 WPD004-2

+N/-S	+E/-W	Northing	Ground Level: Easting	Latitude	Longitude	Slot
0.00	0.00	1598167.601	3629576.142	40° 57' 11.232 N	103° 13' 14.304 W	

WELLBORE TARGET DETAILS (MAP CO-ORDINATES AND LAT/LONG)

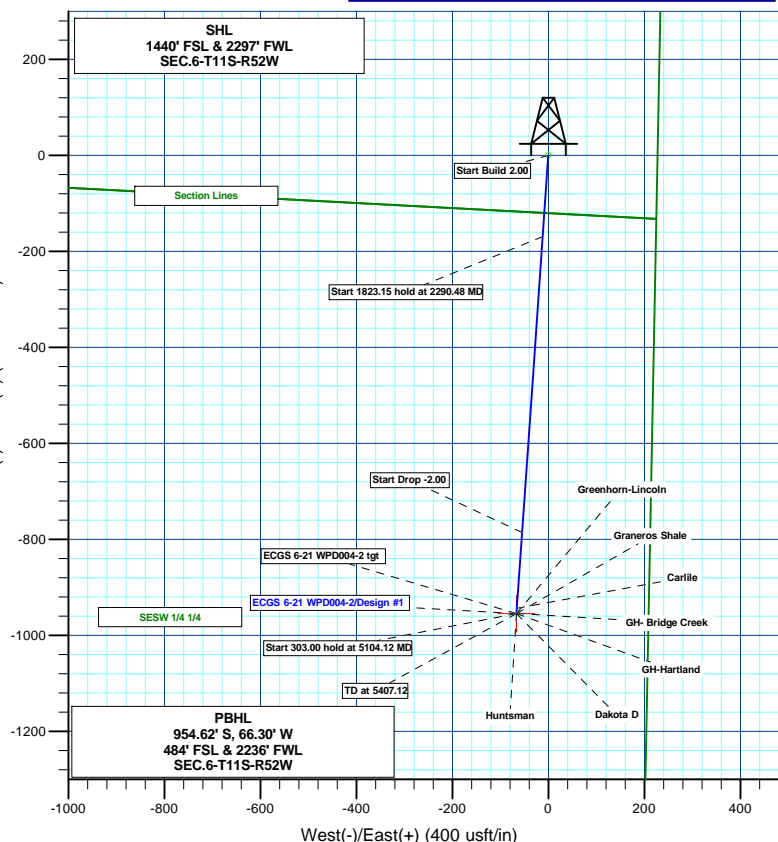
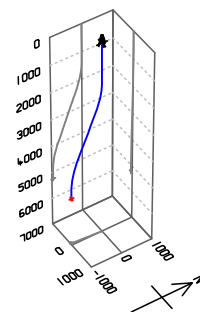
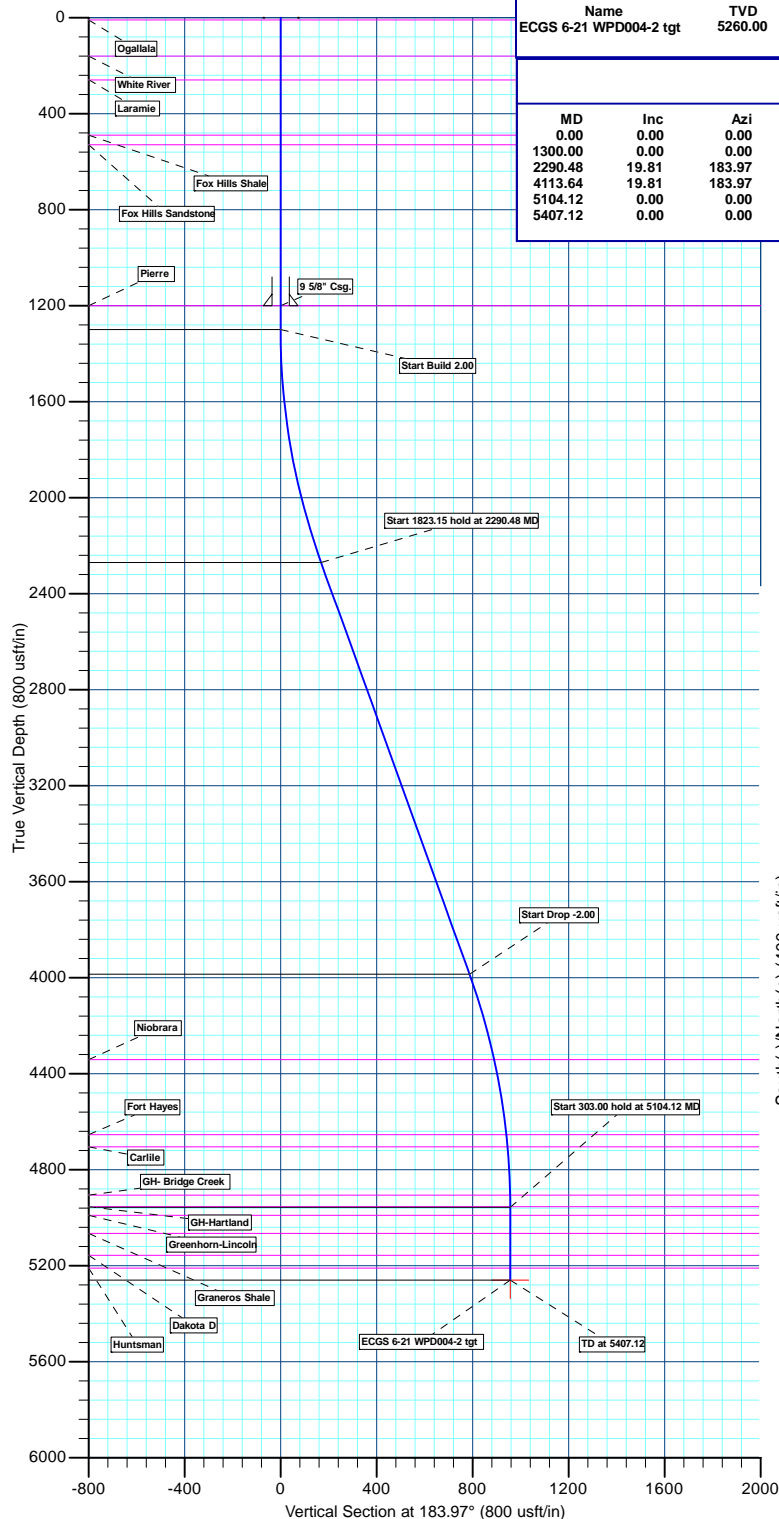
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
ECGS 6-21 WPD004-2 tgt	5260.00	-954.62	-66.30	1597211.594	3629534.399	40° 57' 1.800 N	103° 13' 15.168 W	Point

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1300.00	0.00	0.00	1300.00	0.00	0.00	0.00	0.00	0.00	Start Build 2.00
2290.48	19.81	183.97	2270.87	-169.12	-11.75	2.00	183.97	169.53	Start 1823.15 hold at 2290.48 MD
4113.64	19.81	183.97	3986.13	-785.50	-54.55	0.00	0.00	787.39	Start Drop -2.00
5104.12	0.00	0.00	4957.00	-954.62	-66.30	2.00	180.00	956.92	Start 303.00 hold at 5104.12 MD
5407.12	0.00	0.00	5260.00	-954.62	-66.30	0.00	0.00	956.92	TD at 5407.12

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
10.00	10.00	Ogallala
160.00	160.00	White River
260.00	260.00	Laramie
490.00	490.00	Fox Hills Shale
530.00	530.00	Fox Hills Sandstone
1200.00	1200.00	Pierre
4342.00	4484.30	Niobrara
4655.00	4801.56	Fort Hayes
4705.00	4851.79	Carlile
4907.00	5054.12	GH- Bridge Creek
4955.00	5102.12	GH-Hartland
4991.00	5138.12	Greenhorn-Lincoln
5066.00	5213.12	Graneros Shale
5157.00	5304.12	Dakota D
5211.00	5358.12	Huntsman



Plan: Design #1 (ECGS 6-21 WPD004-2/Wellbore #1)

Created By: Ricky Osburn Date: 8:41, June 11 2014

Database:	EDMDBBW	Local Co-ordinate Reference:	Site Sec.6-T11N-R52W
Company:	Cheyenne Gas Storage LLC	TVD Reference:	WELL @ 4567.00usft (Original Well Elev)
Project:	Logan Co., CO	MD Reference:	WELL @ 4567.00usft (Original Well Elev)
Site:	Sec.6-T11N-R52W	North Reference:	True
Well:	ECGS 6-21 WPD004-2	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Project	Logan Co., CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		Sec.6-T11N-R52W			
Site Position:		Northing:	1,598,167.601 usft	Latitude:	40° 57' 11.232 N
From:	Lat/Long	Easting:	3,629,576.142 usft	Longitude:	103° 13' 14.304 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.47 °

Well		ECGS 6-21 WPD004-2				
Well Position	+N/-S	0.00 usft	Northing:	1,598,167.601 usft	Latitude:	40° 57' 11.232 N
	+E/-W	0.00 usft	Easting:	3,629,576.142 usft	Longitude:	103° 13' 14.304 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	4,557.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	2014/06/10	7.58	67.64	53,278

Design	Design #1			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	183.97

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,290.48	19.81	183.97	2,270.87	-169.12	-11.75	2.00	2.00	0.00	183.97	
4,113.64	19.81	183.97	3,986.13	-785.50	-54.55	0.00	0.00	0.00	0.00	
5,104.12	0.00	0.00	4,957.00	-954.62	-66.30	2.00	-2.00	0.00	180.00	
5,407.12	0.00	0.00	5,260.00	-954.62	-66.30	0.00	0.00	0.00	0.00	ECGS 6-21 WPD004-

Database:	EDMDBBW	Local Co-ordinate Reference:	Site Sec.6-T11N-R52W
Company:	Cheyenne Gas Storage LLC	TVD Reference:	WELL @ 4567.00usft (Original Well Elev)
Project:	Logan Co., CO	MD Reference:	WELL @ 4567.00usft (Original Well Elev)
Site:	Sec.6-T11N-R52W	North Reference:	True
Well:	ECGS 6-21 WPD004-2	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Planned 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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ogallala									
10.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
White River									
160.00	0.00	0.00	160.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
Laramie									
260.00	0.00	0.00	260.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
Fox Hills Shale									
490.00	0.00	0.00	490.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
Fox Hills Sandstone									
530.00	0.00	0.00	530.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
Pierre - 9 5/8" Csg.									
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	2.00	183.97	1,399.98	-1.74	-0.12	1.75	2.00	2.00	0.00
1,500.00	4.00	183.97	1,499.84	-6.96	-0.48	6.98	2.00	2.00	0.00
1,600.00	6.00	183.97	1,599.45	-15.66	-1.09	15.69	2.00	2.00	0.00
1,700.00	8.00	183.97	1,698.70	-27.81	-1.93	27.88	2.00	2.00	0.00
1,800.00	10.00	183.97	1,797.47	-43.42	-3.02	43.52	2.00	2.00	0.00
1,900.00	12.00	183.97	1,895.62	-62.45	-4.34	62.60	2.00	2.00	0.00
2,000.00	14.00	183.97	1,993.06	-84.89	-5.90	85.10	2.00	2.00	0.00
2,100.00	16.00	183.97	2,089.64	-110.71	-7.69	110.98	2.00	2.00	0.00
2,200.00	18.00	183.97	2,185.27	-139.88	-9.71	140.21	2.00	2.00	0.00
Start 1823.15 hold at 2290.48 MD									
2,290.48	19.81	183.97	2,270.87	-169.12	-11.75	169.53	2.00	2.00	0.00
2,300.00	19.81	183.97	2,279.82	-172.34	-11.97	172.75	0.00	0.00	0.00
2,400.00	19.81	183.97	2,373.90	-206.15	-14.32	206.64	0.00	0.00	0.00
2,500.00	19.81	183.97	2,467.99	-239.95	-16.67	240.53	0.00	0.00	0.00
2,600.00	19.81	183.97	2,562.07	-273.76	-19.01	274.42	0.00	0.00	0.00
2,700.00	19.81	183.97	2,656.15	-307.57	-21.36	308.31	0.00	0.00	0.00
2,800.00	19.81	183.97	2,750.23	-341.38	-23.71	342.20	0.00	0.00	0.00
2,900.00	19.81	183.97	2,844.31	-375.19	-26.06	376.09	0.00	0.00	0.00
3,000.00	19.81	183.97	2,938.40	-409.00	-28.41	409.98	0.00	0.00	0.00
3,100.00	19.81	183.97	3,032.48	-442.80	-30.75	443.87	0.00	0.00	0.00
3,200.00	19.81	183.97	3,126.56	-476.61	-33.10	477.76	0.00	0.00	0.00
3,300.00	19.81	183.97	3,220.64	-510.42	-35.45	511.65	0.00	0.00	0.00
3,400.00	19.81	183.97	3,314.73	-544.23	-37.80	545.54	0.00	0.00	0.00
3,500.00	19.81	183.97	3,408.81	-578.04	-40.15	579.43	0.00	0.00	0.00
3,600.00	19.81	183.97	3,502.89	-611.85	-42.49	613.32	0.00	0.00	0.00
3,700.00	19.81	183.97	3,596.97	-645.65	-44.84	647.21	0.00	0.00	0.00
3,800.00	19.81	183.97	3,691.06	-679.46	-47.19	681.10	0.00	0.00	0.00

Database:	EDMDBBW	Local Co-ordinate Reference:	Site Sec.6-T11N-R52W
Company:	Cheyenne Gas Storage LLC	TVD Reference:	WELL @ 4567.00usft (Original Well Elev)
Project:	Logan Co., CO	MD Reference:	WELL @ 4567.00usft (Original Well Elev)
Site:	Sec.6-T11N-R52W	North Reference:	True
Well:	ECGS 6-21 WPD004-2	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Planned 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)
3,900.00	19.81	183.97	3,785.14	-713.27	-49.54	714.99	0.00	0.00	0.00
4,000.00	19.81	183.97	3,879.22	-747.08	-51.89	748.88	0.00	0.00	0.00
4,100.00	19.81	183.97	3,973.30	-780.89	-54.23	782.77	0.00	0.00	0.00
Start Drop -2.00									
4,113.64	19.81	183.97	3,986.13	-785.50	-54.55	787.39	0.00	0.00	0.00
4,200.00	18.08	183.97	4,067.81	-813.47	-56.50	815.43	2.00	-2.00	0.00
4,300.00	16.08	183.97	4,163.40	-842.77	-58.53	844.80	2.00	-2.00	0.00
4,400.00	14.08	183.97	4,259.95	-868.73	-60.33	870.82	2.00	-2.00	0.00
Niobrara									
4,484.30	12.40	183.97	4,342.00	-887.99	-61.67	890.13	2.00	-2.00	0.00
4,500.00	12.08	183.97	4,357.35	-891.31	-61.90	893.46	2.00	-2.00	0.00
4,600.00	10.08	183.97	4,455.48	-910.48	-63.23	912.68	2.00	-2.00	0.00
4,700.00	8.08	183.97	4,554.22	-926.23	-64.33	928.46	2.00	-2.00	0.00
4,800.00	6.08	183.97	4,653.45	-938.53	-65.18	940.79	2.00	-2.00	0.00
Fort Hayes									
4,801.56	6.05	183.97	4,655.00	-938.69	-65.19	940.95	2.00	-2.00	0.00
Carlile									
4,851.79	5.05	183.97	4,705.00	-943.54	-65.53	945.81	2.00	-2.00	0.00
4,900.00	4.08	183.97	4,753.05	-947.37	-65.80	949.65	2.00	-2.00	0.00
5,000.00	2.08	183.97	4,852.90	-952.73	-66.17	955.03	2.00	-2.00	0.00
GH- Bridge Creek									
5,054.12	1.00	183.97	4,907.00	-954.18	-66.27	956.48	2.00	-2.00	0.00
GH-Hartland									
5,102.12	0.04	183.97	4,955.00	-954.62	-66.30	956.92	2.00	-2.00	0.00
Start 303.00 hold at 5104.12 MD									
5,104.12	0.00	0.00	4,957.00	-954.62	-66.30	956.92	2.00	-2.00	8,801.36
Greenhorn-Lincoln									
5,138.12	0.00	0.00	4,991.00	-954.62	-66.30	956.92	0.00	0.00	0.00
5,200.00	0.00	0.00	5,052.88	-954.62	-66.30	956.92	0.00	0.00	0.00
Graneros Shale									
5,213.12	0.00	0.00	5,066.00	-954.62	-66.30	956.92	0.00	0.00	0.00
5,300.00	0.00	0.00	5,152.88	-954.62	-66.30	956.92	0.00	0.00	0.00
Dakota D									
5,304.12	0.00	0.00	5,157.00	-954.62	-66.30	956.92	0.00	0.00	0.00
Huntsman									
5,358.12	0.00	0.00	5,211.00	-954.62	-66.30	956.92	0.00	0.00	0.00
TD at 5407.12									
5,407.12	0.00	0.00	5,260.00	-954.62	-66.30	956.92	0.00	0.00	0.00

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
ECGS 6-21 WPD004-2 t	0.00	0.00	5,260.00	-954.62	-66.30	1,597,211.594	3,629,534.399	40° 57' 1.800 N	103° 13' 15.168 W
- plan hits target center									
- Point									

Database:	EDMDBBW	Local Co-ordinate Reference:	Site Sec.6-T11N-R52W
Company:	Cheyenne Gas Storage LLC	TVD Reference:	WELL @ 4567.00usft (Original Well Elev)
Project:	Logan Co., CO	MD Reference:	WELL @ 4567.00usft (Original Well Elev)
Site:	Sec.6-T11N-R52W	North Reference:	True
Well:	ECGS 6-21 WPD004-2	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
1,200.00	1,200.00	9 5/8" Csg.	9-5/8	12-1/4	

Formations					
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
10.00	10.00	Ogallala		0.00	183.97
160.00	160.00	White River		0.00	183.97
260.00	260.00	Laramie		0.00	183.97
490.00	490.00	Fox Hills Shale		0.00	183.97
530.00	530.00	Fox Hills Sandstone		0.00	183.97
1,200.00	1,200.00	Pierre		0.00	183.97
4,484.30	4,342.00	Niobrara		0.00	183.97
4,801.56	4,655.00	Fort Hayes		0.00	183.97
4,851.79	4,705.00	Carlile		0.00	183.97
5,054.12	4,907.00	GH- Bridge Creek		0.00	183.97
5,102.12	4,955.00	GH-Hartland		0.00	183.97
5,138.12	4,991.00	Greenhorn-Lincoln		0.00	183.97
5,213.12	5,066.00	Graneros Shale		0.00	183.97
5,304.12	5,157.00	Dakota D		0.00	183.97
5,358.12	5,211.00	Huntsman		0.00	183.97

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,300.00	1,300.00	0.00	0.00	Start Build 2.00	
2,290.48	2,270.87	-169.12	-11.75	Start 1823.15 hold at 2290.48 MD	
4,113.64	3,986.13	-785.50	-54.55	Start Drop -2.00	
5,104.12	4,957.00	-954.62	-66.30	Start 303.00 hold at 5104.12 MD	
5,407.12	5,260.00	-954.62	-66.30	TD at 5407.12	