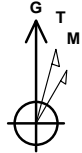


ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
2140.41	0.00	0.00	2140.41	0.00	0.00	0.00	0.00	KOP, 7.00°/100' Build
2997.56	60.00	209.05	2849.27	-357.76	-198.74	409.26	409.26	Begin 60.00° Tangent
3197.56	60.00	209.05	2949.27	-509.17	-282.86	582.46	582.46	Begin 10.00°/100' Build
3503.19	90.56	209.05	3026.00	-764.52	-424.71	874.57	874.57	Begin 90.56° Lateral
5640.40	90.56	209.05	3005.00	-2632.71	-1462.55	3011.68	3011.68	PBHL

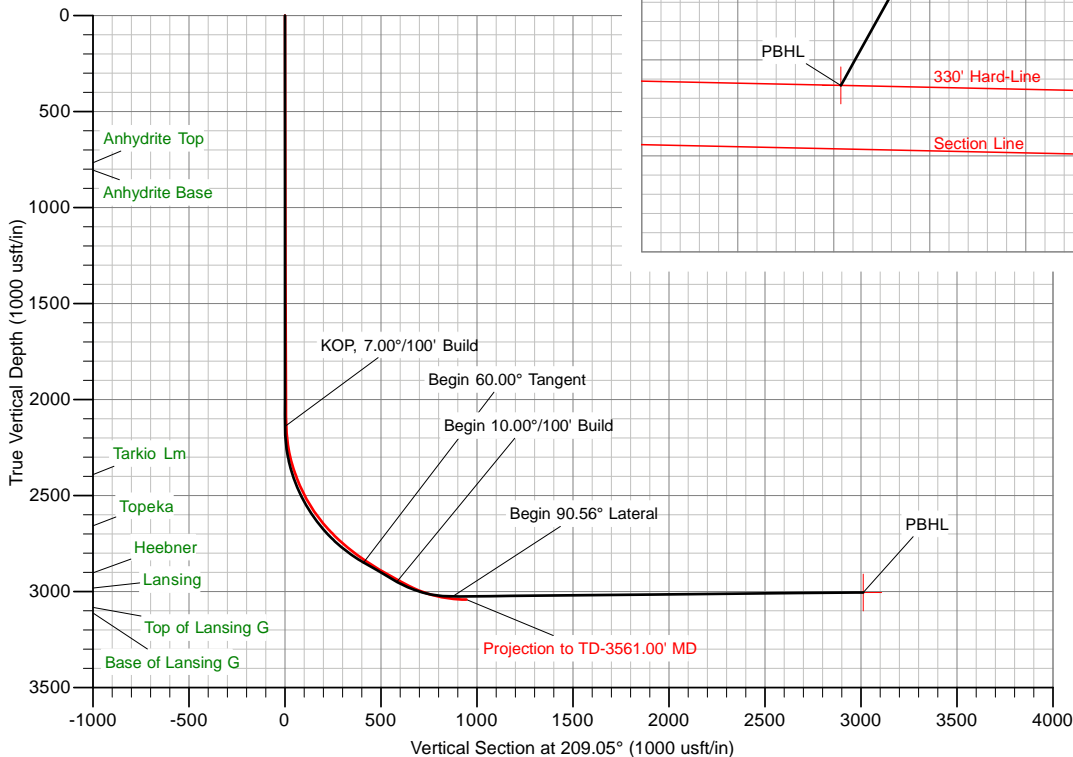
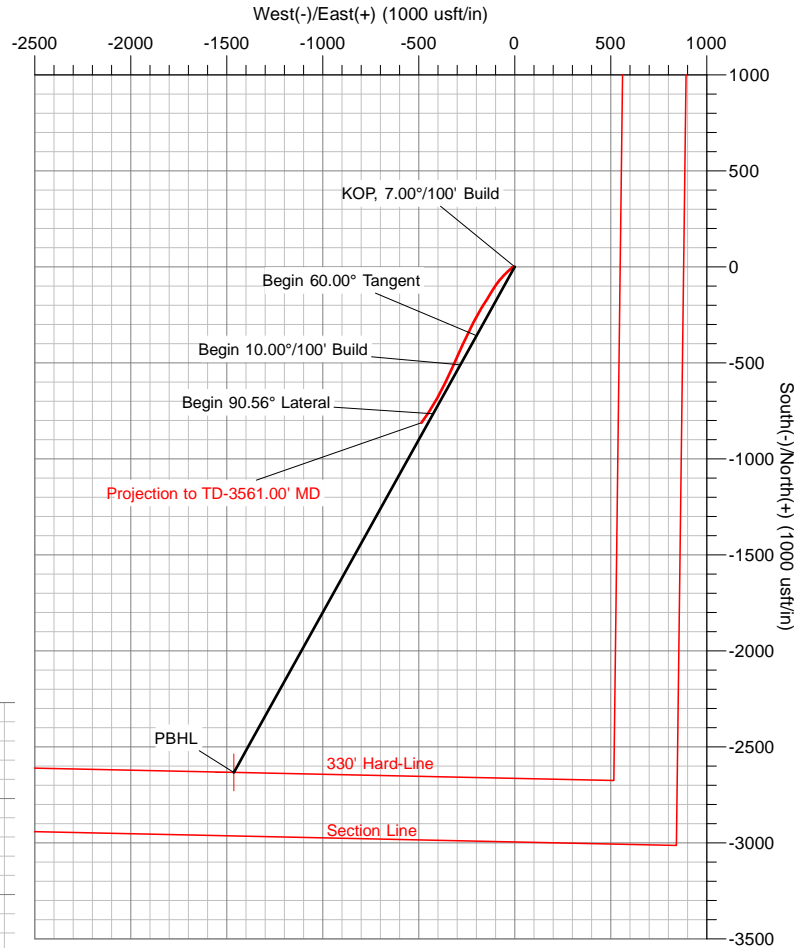


Azimuths to Grid North  
 True North: 0.42°  
 Magnetic North: 5.35°

Magnetic Field  
 Strength: 52680.3snT  
 Dip Angle: 66.59°  
 Date: 03/01/2013  
 Model: WMM\_2010

US State Plane 1927 (Exact solution)  
 Kansas North 1501

Created By: BDJ  
 Date: 11:08, March 22 2013  
 Plan: Design #3



The customer should only rely on this document after independently verifying all paths, targets, coordinates, lease and hard lines represented. Any decisions made or wells drilled utilizing this or any other information supplied by MS Energy are at the sole risk and responsibility of the customer. MS Energy is not responsible for the accuracy of this schematic or the information contained herein.

# Cardinal River Energy

Russell County, Kansas (NAD27)

CRECO Kronos

1-8H

Wellbore #1

Survey: MS MWD

## Standard Survey Report

22 March, 2013

<b>Company:</b>	Cardinal River Energy	<b>Local Co-ordinate Reference:</b>	Well 1-8H
<b>Project:</b>	Russell County, Kansas (NAD27)	<b>TVD Reference:</b>	WELL @ 1830.00usft (Val 2)
<b>Site:</b>	CRECO Kronos	<b>MD Reference:</b>	WELL @ 1830.00usft (Val 2)
<b>Well:</b>	1-8H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys	<b>Database:</b>	Well Planning Conroe

<b>Project</b>	Russell County, Kansas (NAD27)		
<b>Map System:</b>	US State Plane 1927 (Exact solution)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b>	Kansas North 1501		

<b>Well</b>	1-8H				
<b>Well Position</b>	<b>+N-S</b>	0.00 usft	<b>Northing:</b>	188,926.37 usft	<b>Latitude:</b> 38° 51' 0.4572 N
	<b>+E-W</b>	0.00 usft	<b>Easting:</b>	1,808,598.56 usft	<b>Longitude:</b> 98° 40' 19.361 W
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b> 1,819.00 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	WMM_2010	2013/03/01	4.92	66.59	52,680

<b>Design</b>	Surveys				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	209.05	

<b>Survey Program</b>	<b>Date</b>	2013/03/22			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
1,334.00	3,561.00	MS MWD (Wellbore #1)	MWD	MWD - Standard	

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
1,334.00	0.40	272.40	1,333.99	0.19	-4.65	2.09	0.03	0.03	0.00
2,015.00	0.40	237.10	2,014.97	-1.00	-9.02	5.25	0.04	0.00	-5.18
2,046.00	0.40	228.50	2,045.97	-1.13	-9.20	5.45	0.19	0.00	-27.74
2,077.00	0.60	225.90	2,076.97	-1.31	-9.39	5.71	0.65	0.65	-8.39
2,108.00	1.10	228.30	2,107.97	-1.62	-9.73	6.14	1.62	1.61	7.74
2,139.00	2.00	235.70	2,138.96	-2.13	-10.40	6.91	2.97	2.90	23.87
2,171.00	4.00	237.10	2,170.91	-3.05	-11.80	8.39	6.25	6.25	4.38
2,202.00	6.30	233.30	2,201.78	-4.65	-14.07	10.90	7.50	7.42	-12.26
2,233.00	8.90	230.60	2,232.51	-7.19	-17.29	14.68	8.46	8.39	-8.71
2,264.00	11.20	229.50	2,263.03	-10.67	-21.43	19.73	7.44	7.42	-3.55
2,296.00	13.50	228.20	2,294.29	-15.18	-26.58	26.17	7.24	7.19	-4.06
2,326.00	15.70	226.70	2,323.32	-20.29	-32.14	33.35	7.44	7.33	-5.00
2,388.00	20.50	225.70	2,382.23	-33.64	-46.03	51.76	7.76	7.74	-1.61
2,420.00	22.30	224.60	2,412.03	-41.87	-54.30	62.97	5.76	5.63	-3.44

<b>Company:</b>	Cardinal River Energy	<b>Local Co-ordinate Reference:</b>	Well 1-8H
<b>Project:</b>	Russell County, Kansas (NAD27)	<b>TVD Reference:</b>	WELL @ 1830.00usft (Val 2)
<b>Site:</b>	CRECO Kronos	<b>MD Reference:</b>	WELL @ 1830.00usft (Val 2)
<b>Well:</b>	1-8H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys	<b>Database:</b>	Well Planning Conroe

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)
2,451.00	23.70	223.00	2,440.56	-50.62	-62.68	74.69	4.95	4.52	-5.16
2,482.00	25.40	221.90	2,468.76	-60.13	-71.37	87.22	5.68	5.48	-3.55
2,513.00	27.00	218.20	2,496.57	-70.60	-80.16	100.65	7.37	5.16	-11.94
2,545.00	29.00	216.30	2,524.83	-82.57	-89.25	115.52	6.84	6.25	-5.94
2,576.00	31.80	215.00	2,551.56	-95.32	-98.38	131.10	9.28	9.03	-4.19
2,607.00	34.40	213.60	2,577.53	-109.30	-107.92	147.95	8.74	8.39	-4.52
2,639.00	36.40	211.80	2,603.61	-124.90	-117.92	166.45	7.05	6.25	-5.63
2,670.00	38.30	210.80	2,628.26	-140.97	-127.69	185.24	6.43	6.13	-3.23
2,701.00	40.40	210.00	2,652.23	-157.93	-137.63	204.89	6.97	6.77	-2.58
2,732.00	42.50	211.00	2,675.46	-175.61	-148.05	225.40	7.10	6.77	3.23
2,763.00	44.40	212.00	2,697.97	-193.78	-159.19	246.70	6.52	6.13	3.23
2,795.00	46.30	212.50	2,720.45	-213.03	-171.34	269.43	6.04	5.94	1.56
2,826.00	48.00	211.50	2,741.54	-232.31	-183.38	292.13	5.97	5.48	-3.23
2,857.00	49.50	210.10	2,761.98	-252.33	-195.31	315.42	5.91	4.84	-4.52
2,889.00	51.40	208.70	2,782.35	-273.82	-207.42	340.09	6.83	5.94	-4.38
2,920.00	52.60	206.90	2,801.44	-295.43	-218.81	364.51	5.99	3.87	-5.81
2,950.00	54.20	206.20	2,819.32	-316.98	-229.57	388.57	5.65	5.33	-2.33
2,981.00	55.50	205.50	2,837.17	-339.79	-240.62	413.88	4.58	4.19	-2.26
3,012.00	57.20	204.60	2,854.35	-363.16	-251.55	439.62	5.99	5.48	-2.90
3,044.00	59.00	204.20	2,871.26	-387.90	-262.77	466.70	5.72	5.63	-1.25
3,075.00	59.90	204.30	2,887.01	-412.24	-273.73	493.30	2.92	2.90	0.32
3,106.00	60.30	204.20	2,902.47	-436.75	-284.77	520.08	1.32	1.29	-0.32
3,138.00	60.50	204.40	2,918.27	-462.11	-296.22	547.81	0.83	0.63	0.63
3,169.00	61.00	204.00	2,933.42	-486.78	-307.31	574.76	1.97	1.61	-1.29
3,199.00	61.50	204.60	2,947.85	-510.75	-318.13	600.97	2.42	1.67	2.00
3,231.00	62.40	205.20	2,962.90	-536.36	-330.02	629.14	3.26	2.81	1.88
3,262.00	64.40	205.90	2,976.78	-561.37	-341.98	656.80	6.76	6.45	2.26
3,293.00	66.50	206.40	2,989.66	-586.68	-354.41	684.96	6.93	6.77	1.61
3,325.00	69.10	207.10	3,001.75	-613.13	-367.74	714.56	8.37	8.13	2.19
3,356.00	72.60	208.00	3,011.92	-639.09	-381.29	743.83	11.62	11.29	2.90
3,419.00	78.50	207.60	3,027.63	-693.03	-409.72	804.80	9.39	9.37	-0.63
3,471.00	82.20	213.10	3,036.35	-737.24	-435.62	856.02	12.62	7.12	10.58
3,502.00	84.70	214.30	3,039.89	-762.86	-452.71	886.71	8.93	8.06	3.87
3,561.00	89.50	213.10	3,042.87	-811.87	-485.39	945.42	8.39	8.14	-2.03

Projection to TD-3561.00' MD

Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
3,561.00	3,042.87	-811.87	-485.39	Projection to TD-3561.00' MD