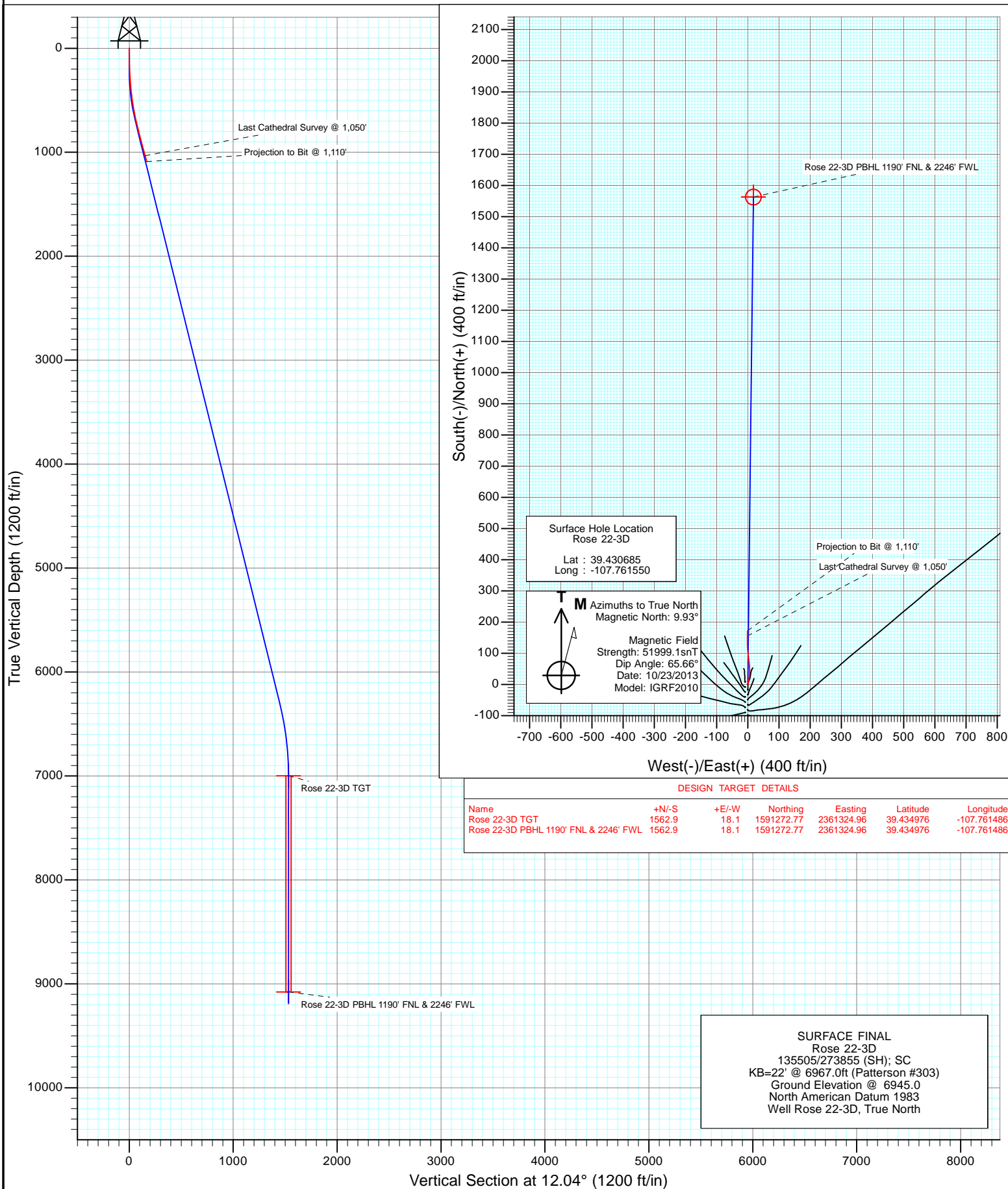




Project: Mamm Creek
Site: K22W Pad
Well: Rose 22-3D
Wellbore: OH
Design: SURFACE FINAL



Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well Rose 22-3D
Project:	Mamm Creek	TVD Reference:	KB=22' @ 6967.0ft (Patterson #303)
Site:	K22W Pad	MD Reference:	KB=22' @ 6967.0ft (Patterson #303)
Well:	Rose 22-3D	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	SURFACE FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Mamm Creek		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		K22W Pad			
Site Position:		Northing:	1,589,615.65 ft	Latitude:	39.430424
From:	Lat/Long	Easting:	2,361,269.29 ft	Longitude:	-107.761537
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-1.43 °

Well	Rose 22-3D					
Well Position	+N/-S	0.0 ft	Northing:	1,589,710.75 ft	Latitude:	39.430685
	+E/-W	0.0 ft	Easting:	2,361,267.99 ft	Longitude:	-107.761550
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	6,945.0 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/23/2013	9.93	65.66	51,999

Design	SURFACE FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	12.04	

Survey Program	Date	12/16/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
121.0	1,110.0	Survey #1 (OH)	Geolink MWD	Geolink MWD	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
121.0	0.80	32.80	121.0	0.7	0.5	0.8	0.66	0.66		
152.0	1.00	32.30	152.0	1.1	0.7	1.2	0.65	0.65		
212.0	2.30	8.40	212.0	2.8	1.2	2.9	2.41	2.17		
242.0	2.90	8.50	241.9	4.1	1.4	4.3	2.00	2.00		
303.0	4.20	8.90	302.8	7.8	1.9	8.1	2.13	2.13		
334.0	4.60	13.50	333.7	10.2	2.4	10.4	1.72	1.29		
364.0	5.20	6.00	363.6	12.7	2.8	13.0	2.92	2.00		
455.0	7.10	15.70	454.1	22.2	4.8	22.7	2.37	2.09		
486.0	7.70	7.20	484.8	26.1	5.6	26.7	4.02	1.94		
547.0	9.20	359.90	545.2	35.0	6.1	35.5	3.02	2.46		
577.0	9.70	0.70	574.8	40.0	6.1	40.4	1.72	1.67		
668.0	12.30	355.00	664.1	57.3	5.3	57.1	3.09	2.86		

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Well:	Rose 22-3D	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	SURFACE FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
759.0	14.50	354.50	752.6	78.3	3.4	77.3	2.42	2.42	
851.0	15.60	354.30	841.4	102.1	1.1	100.0	1.20	1.20	
941.0	15.80	356.60	928.1	126.3	-0.8	123.4	0.73	0.22	
1,050.0	15.80	2.20	1,033.0	156.0	-1.2	152.3	1.40	0.00	Last Cathedral Survey @ 1,050'
1,110.0	15.80	2.20	1,090.7	172.3	-0.5	168.4	0.00	0.00	Projection to Bit @ 1,110'

Targets									
Target Name	- hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude Longitude
Rose 22-3D PBHL 1190'		0.00	0.00	9,077.0	1,562.9	18.1	1,591,272.77	2,361,324.96	39.434976 -107.761486
	- actual wellpath misses target center by 8106.5ft at 1110.0ft MD (1090.7 TVD, 172.3 N, -0.5 E)								
	- Circle (radius 25.0)								
Rose 22-3D TGT		0.00	0.00	6,999.0	1,562.9	18.1	1,591,272.77	2,361,324.96	39.434976 -107.761486
	- actual wellpath misses target center by 6069.8ft at 1110.0ft MD (1090.7 TVD, 172.3 N, -0.5 E)								
	- Point								

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
1,050.0	1,033.0	156.0	-1.2	Last Cathedral Survey @ 1,050'	
1,110.0	1,090.7	172.3	-0.5	Projection to Bit @ 1,110'	

Checked By: _____ Approved By: _____ Date: _____