

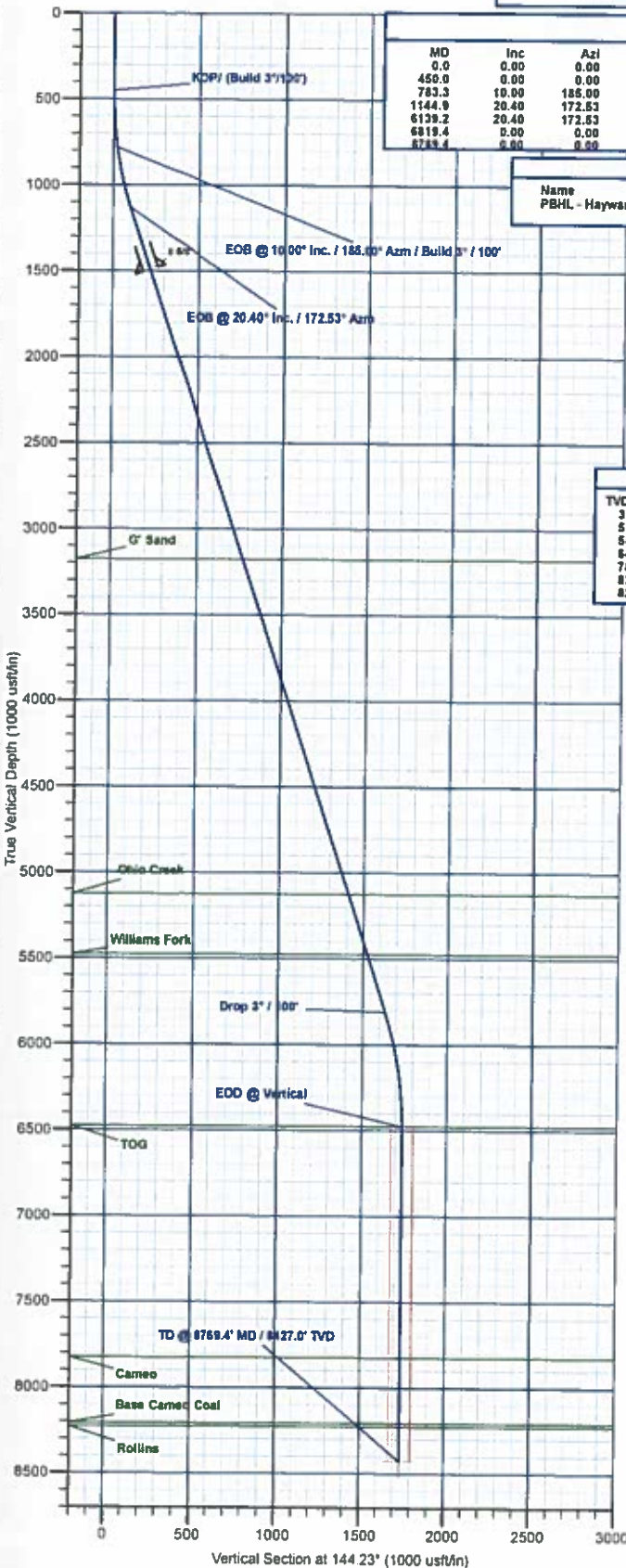


Project: Mesa County, CO
 Site: Hayward 0993 25-09 Pad
 Well: Hayward 0993-25-14E
 Wellbore: A-4
 Design: Design #2
 Latitude: 39.244810
 Longitude: -107.715841
 Ground Level: 8007.0
 RKB @ 8037.0usft (H&P #522)



PROJECT DETAILS: Mesa County, CO

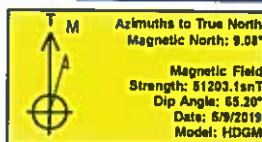
Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: Colorado Central Zone
 System Datum: Mean Sea Level



SECTION DETAILS									
MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	VSect	Annotation
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	KOP/ (Build 3"/100")
450.0	0.00	0.00	450.0	0.0	0.0	0.00	0.00	0.0	EOB @ 10.00" Inc. / 185.00" Azm / Build 3" / 100"
783.3	10.00	185.00	781.6	-28.9	-2.5	3.00	185.00	22.0	EOB @ 20.40" Inc. / 172.53" Azm
1144.9	20.40	172.53	1130.2	-123.0	2.9	3.00	-23.58	101.5	Drop 3" / 100"
1619.4	0.00	0.00	1611.1	-1849.4	228.4	0.00	0.00	1634.6	EOB @ Vertical
8768.4	0.00	0.00	8427.0	-1968.2	245.0	0.00	180.00	1740.1	TD @ 8768.4' MD / 8427.0' TVD

DESIGN TARGET DETAILS							
Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude
PBHL - Hayward 0993-25-14E	8427.0	-1968.2	245.0	1519735.78	2372718.22	39.238406	-107.714976

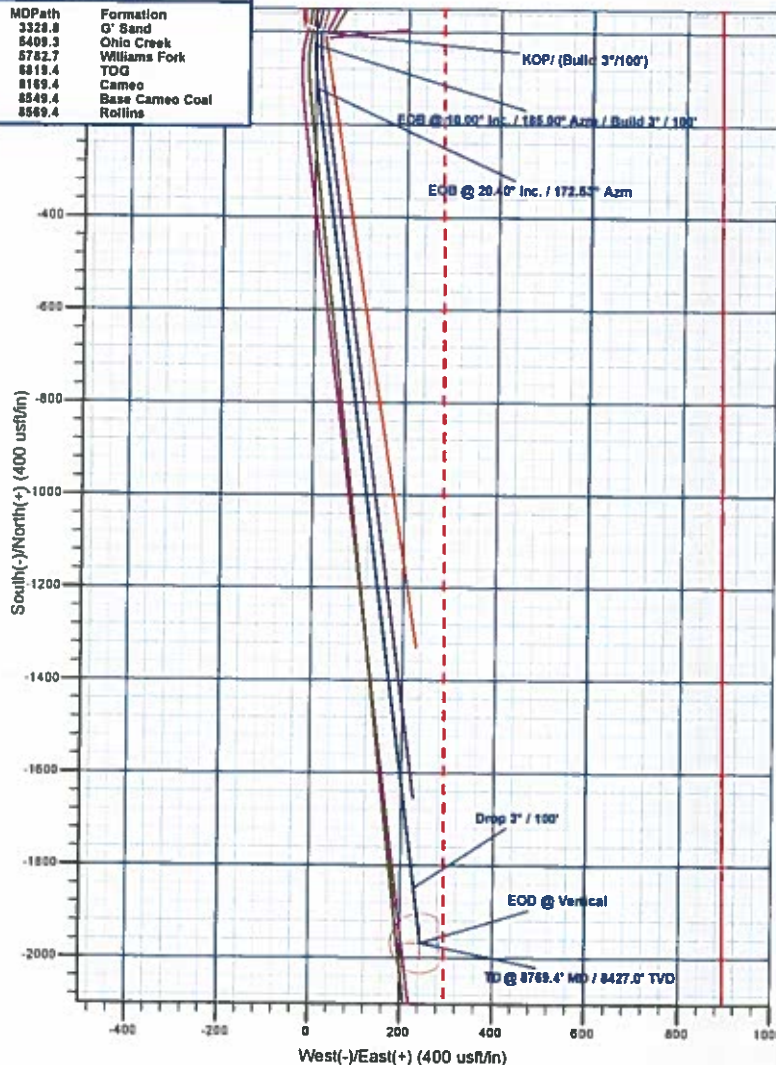
WELL DETAILS: Hayward 0993-25-14E						
+N-S	+E-W	Northing	Easting	Latitude	Longitude	
0.0	0.0	1521709.37	2372519.30	39.244810	-107.715841	



REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well Hayward 0993-25-14E, True North
 Vertical (TVD) Reference: RKB @ 8037.0usft (H&P #522)
 Section (VS) Reference: Slot - (0.0N, 0.0E)
 Measured Depth Reference: RKB @ 8037.0usft (H&P #522)
 Calculation Method: Minimum Curvature

FORMATION TOP DETAILS		
TVDPath	MDPath	Formation
3177.0	3328.8	G' Sand
5127.0	5409.3	Ohio Creek
5477.0	5782.7	Williams Fork
6477.0	6819.4	TOG
7827.0	8169.4	Cameo
8207.0	8549.4	Base Cameo Coal
8227.0	8569.4	Rollins



Plan: Design #2 (Hayward 0993-25-14E/A-4)

Created By: Will Jircik Date: 10:36, May 14 2019



Laramie Energy, LLC

**Mesa County, CO
Hayward 0993 25-09 Pad
Hayward 0993-25-14E**

A-4

Plan: Design #2

QES Well Planning Report

14 May, 2019





Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-14E
Company:	Laramie Energy, LLC	TVD Reference:	RKB @ 8037.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	RKB @ 8037.0usft (H&P #522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

Project	Mesa County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		Hayward 0993 25-09 Pad			
Site Position:		Northing:	1,519,030.59 usft	Latitude:	39.237495
From:	Lat/Long	Easting:	2,373,084.06 usft	Longitude:	-107.713617
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.40 "

Well	Hayward 0993-25-14E					
Well Position	+N/-S	2,664.2 usft	Northing:	1,521,709.38 usft	Latitude:	39.244810
	+E/-W	-629.9 usft	Easting:	2,372,519.30 usft	Longitude:	-107.715841
Position Uncertainty	0.0 usft		Wellhead Elevation:		Ground Level:	8,007.0 usft

Wellbore	A-4				
Magnetics	Model Name	Sample Date	Declination (")	Dip Angle (")	Field Strength (nT)
	HDGM	5/9/2019	9.08	65.20	51,203.10000000

Design	Design #2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	144.23

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
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
450.0	0.00	0.00	450.0	0.0	0.0	0.00	0.00	0.00	0.00	
783.3	10.00	185.00	781.6	-28.9	-2.5	3.00	3.00	0.00	185.00	
1,144.9	20.40	172.53	1,130.2	-123.0	2.9	3.00	2.88	-3.45	-23.58	
6,139.2	20.40	172.53	5,811.1	-1,849.4	229.4	0.00	0.00	0.00	0.00	
6,819.4	0.00	0.00	6,477.0	-1,968.2	245.0	3.00	-3.00	0.00	180.00	
8,769.4	0.00	0.00	8,427.0	-1,968.2	245.0	0.00	0.00	0.00	0.00	PBHL - Hayward 09



Well Planning Report



Database: EDM 5000.1 Single User Db
 Company: Laramie Energy, LLC
 Project: Mesa County, CO
 Site: Hayward 0993 25-09 Pad
 Well: Hayward 0993-25-14E
 Wellbore: A-4
 Design: Design #2

Local Co-ordinate Reference: Well Hayward 0993-25-14E
 TVD Reference: RKB @ 8037.0usft (H&P #522)
 MD Reference: RKB @ 8037.0usft (H&P #522)
 North Reference: True
 Survey Calculation Method: Minimum Curvature

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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP/ (Build 3°/100')									
450.0	0.00	0.00	450.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	1.50	185.00	500.0	-0.7	-0.1	0.5	3.00	3.00	0.00
600.0	4.50	185.00	599.8	-5.9	-0.5	4.5	3.00	3.00	0.00
700.0	7.50	185.00	699.3	-16.3	-1.4	12.4	3.00	3.00	0.00
EOB @ 10.00° Inc. / 185.00° Azm / Build 3° / 100'									
783.3	10.00	185.00	781.6	-28.9	-2.5	22.0	3.00	3.00	0.00
800.0	10.46	183.90	798.0	-31.9	-2.8	24.2	3.00	2.76	-6.61
900.0	13.28	178.90	895.9	-52.4	-3.2	40.7	3.00	2.82	-5.00
1,000.0	16.17	175.64	992.6	-77.8	-1.9	62.0	3.00	2.88	-3.26
1,100.0	19.08	173.35	1,087.9	-107.9	1.1	88.2	3.00	2.92	-2.29
EOB @ 20.40° Inc. / 172.53° Azm									
1,144.9	20.40	172.53	1,130.2	-123.0	2.9	101.5	3.00	2.94	-1.83
1,200.0	20.40	172.53	1,181.8	-142.0	5.4	118.4	0.00	0.00	0.00
1,300.0	20.40	172.53	1,275.5	-176.6	10.0	149.1	0.00	0.00	0.00
1,400.0	20.40	172.53	1,369.3	-211.1	14.5	179.8	0.00	0.00	0.00
1,500.0	20.40	172.53	1,463.0	-245.7	19.0	210.5	0.00	0.00	0.00
8 5/8"									
1,530.0	20.40	172.53	1,491.1	-256.1	20.4	219.7	0.00	0.00	0.00
1,600.0	20.40	172.53	1,556.7	-280.3	23.6	241.2	0.00	0.00	0.00
1,700.0	20.40	172.53	1,650.4	-314.8	28.1	271.9	0.00	0.00	0.00
1,800.0	20.40	172.53	1,744.2	-349.4	32.7	302.6	0.00	0.00	0.00
1,900.0	20.40	172.53	1,837.9	-384.0	37.2	333.3	0.00	0.00	0.00
2,000.0	20.40	172.53	1,931.6	-418.5	41.7	364.0	0.00	0.00	0.00
2,100.0	20.40	172.53	2,025.3	-453.1	46.3	394.7	0.00	0.00	0.00
2,200.0	20.40	172.53	2,119.1	-487.7	50.8	425.4	0.00	0.00	0.00
2,300.0	20.40	172.53	2,212.8	-522.2	55.3	456.1	0.00	0.00	0.00
2,400.0	20.40	172.53	2,306.5	-556.8	59.9	486.8	0.00	0.00	0.00
2,500.0	20.40	172.53	2,400.2	-591.4	64.4	517.5	0.00	0.00	0.00
2,600.0	20.40	172.53	2,494.0	-625.9	68.9	548.2	0.00	0.00	0.00
2,700.0	20.40	172.53	2,587.7	-660.5	73.5	578.9	0.00	0.00	0.00
2,800.0	20.40	172.53	2,681.4	-695.1	78.0	609.6	0.00	0.00	0.00
2,900.0	20.40	172.53	2,775.1	-729.7	82.5	640.2	0.00	0.00	0.00
3,000.0	20.40	172.53	2,868.9	-764.2	87.1	670.9	0.00	0.00	0.00
3,100.0	20.40	172.53	2,962.6	-798.8	91.6	701.6	0.00	0.00	0.00
3,200.0	20.40	172.53	3,056.3	-833.4	96.1	732.3	0.00	0.00	0.00
3,300.0	20.40	172.53	3,150.0	-867.9	100.7	763.0	0.00	0.00	0.00
G' Sand									
3,328.8	20.40	172.53	3,177.0	-877.9	102.0	771.9	0.00	0.00	0.00
3,400.0	20.40	172.53	3,243.8	-902.5	105.2	793.7	0.00	0.00	0.00
3,500.0	20.40	172.53	3,337.5	-937.1	109.7	824.4	0.00	0.00	0.00
3,600.0	20.40	172.53	3,431.2	-971.6	114.3	855.1	0.00	0.00	0.00
3,700.0	20.40	172.53	3,524.9	-1,006.2	118.8	885.8	0.00	0.00	0.00
3,800.0	20.40	172.53	3,618.7	-1,040.8	123.3	916.5	0.00	0.00	0.00
3,900.0	20.40	172.53	3,712.4	-1,075.3	127.9	947.2	0.00	0.00	0.00
4,000.0	20.40	172.53	3,806.1	-1,109.9	132.4	977.9	0.00	0.00	0.00
4,100.0	20.40	172.53	3,899.8	-1,144.5	136.9	1,008.6	0.00	0.00	0.00
4,200.0	20.40	172.53	3,993.6	-1,179.0	141.5	1,039.3	0.00	0.00	0.00
4,300.0	20.40	172.53	4,087.3	-1,213.6	146.0	1,070.0	0.00	0.00	0.00



Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-14E
Company:	Laramie Energy, LLC	TVD Reference:	RKB @ 8037.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	RKB @ 8037.0usft (H&P #522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

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)
4,400.0	20.40	172.53	4,181.0	-1,248.2	150.5	1,100.7	0.00	0.00	0.00
4,500.0	20.40	172.53	4,274.8	-1,282.7	155.1	1,131.4	0.00	0.00	0.00
4,600.0	20.40	172.53	4,368.5	-1,317.3	159.6	1,162.1	0.00	0.00	0.00
4,700.0	20.40	172.53	4,462.2	-1,351.9	164.1	1,192.8	0.00	0.00	0.00
4,800.0	20.40	172.53	4,555.9	-1,386.4	168.7	1,223.5	0.00	0.00	0.00
4,900.0	20.40	172.53	4,649.7	-1,421.0	173.2	1,254.2	0.00	0.00	0.00
5,000.0	20.40	172.53	4,743.4	-1,455.6	177.8	1,284.9	0.00	0.00	0.00
5,100.0	20.40	172.53	4,837.1	-1,490.1	182.3	1,315.6	0.00	0.00	0.00
5,200.0	20.40	172.53	4,930.8	-1,524.7	186.8	1,346.3	0.00	0.00	0.00
5,300.0	20.40	172.53	5,024.6	-1,559.3	191.4	1,377.0	0.00	0.00	0.00
5,400.0	20.40	172.53	5,118.3	-1,593.8	195.9	1,407.7	0.00	0.00	0.00
Ohio Creek									
5,409.3	20.40	172.53	5,127.0	-1,597.1	196.3	1,410.5	0.00	0.00	0.00
5,500.0	20.40	172.53	5,212.0	-1,628.4	200.4	1,438.4	0.00	0.00	0.00
5,600.0	20.40	172.53	5,305.7	-1,663.0	205.0	1,469.1	0.00	0.00	0.00
5,700.0	20.40	172.53	5,399.5	-1,697.6	209.5	1,499.8	0.00	0.00	0.00
Williams Fork									
5,782.7	20.40	172.53	5,477.0	-1,726.2	213.2	1,525.2	0.00	0.00	0.00
5,800.0	20.40	172.53	5,493.2	-1,732.1	214.0	1,530.5	0.00	0.00	0.00
5,900.0	20.40	172.53	5,586.9	-1,766.7	218.6	1,561.2	0.00	0.00	0.00
6,000.0	20.40	172.53	5,680.6	-1,801.3	223.1	1,591.9	0.00	0.00	0.00
6,100.0	20.40	172.53	5,774.4	-1,835.8	227.6	1,622.6	0.00	0.00	0.00
Drop 3° / 100'									
6,139.2	20.40	172.53	5,811.1	-1,849.4	229.4	1,634.6	0.00	0.00	0.00
6,200.0	18.58	172.53	5,868.4	-1,869.5	232.0	1,652.5	3.00	-3.00	0.00
6,300.0	15.58	172.53	5,964.0	-1,898.6	235.9	1,678.3	3.00	-3.00	0.00
6,400.0	12.58	172.53	6,061.0	-1,922.7	239.0	1,699.7	3.00	-3.00	0.00
6,500.0	9.58	172.53	6,159.1	-1,941.8	241.5	1,716.7	3.00	-3.00	0.00
6,600.0	6.58	172.53	6,258.1	-1,955.7	243.4	1,729.0	3.00	-3.00	0.00
6,700.0	3.58	172.53	6,357.7	-1,964.5	244.5	1,736.8	3.00	-3.00	0.00
6,800.0	0.58	172.53	6,457.6	-1,968.1	245.0	1,740.0	3.00	-3.00	0.00
EOD @ Vertical - TOG									
6,819.4	0.00	0.00	6,477.0	-1,968.2	245.0	1,740.1	3.00	-3.00	0.00
6,900.0	0.00	0.00	6,557.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,000.0	0.00	0.00	6,657.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,100.0	0.00	0.00	6,757.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,200.0	0.00	0.00	6,857.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,300.0	0.00	0.00	6,957.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,400.0	0.00	0.00	7,057.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,500.0	0.00	0.00	7,157.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,600.0	0.00	0.00	7,257.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,700.0	0.00	0.00	7,357.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,800.0	0.00	0.00	7,457.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,900.0	0.00	0.00	7,557.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,000.0	0.00	0.00	7,657.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,100.0	0.00	0.00	7,757.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
Cameo									
8,169.4	0.00	0.00	7,827.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,200.0	0.00	0.00	7,857.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,300.0	0.00	0.00	7,957.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,400.0	0.00	0.00	8,057.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,500.0	0.00	0.00	8,157.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
Base Cameo Coal									



Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-14E
Company:	Laramie Energy, LLC	TVD Reference:	RKB @ 8037.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	RKB @ 8037.0usft (H&P #522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

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)
8,549.4	0.00	0.00	8,207.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
Rollins									
8,569.4	0.00	0.00	8,227.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,600.0	0.00	0.00	8,257.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,700.0	0.00	0.00	8,357.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
TD @ 8769.4' MD / 8427.0' TVD									
8,769.4	0.00	0.00	8,427.0	-1,968.2	245.0	1,740.1	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									
PBHL - Hayward 0993	0.00	0.00	8,427.0	-1,968.2	245.0	1,519,735.78	2,372,716.22	39.239406	-107.714976
- plan hits target center									
- Circle (radius 65.0)									

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,530.0	1,491.1	8 5/8"	8-5/8	11

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
3,328.8	3,177.0	G' Sand			
5,409.3	5,127.0	Ohio Creek			
5,782.7	5,477.0	Williams Fork			
6,819.4	6,477.0	TOG			
8,169.4	7,827.0	Cameo			
8,549.4	8,207.0	Base Cameo Coal			
8,569.4	8,227.0	Rollins			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
450.0	450.0	0.0	0.0	KOP/ (Build 3°/100')
783.3	781.6	-28.9	-2.5	EOB @ 10.00° Inc. / 185.00° Azm / Build 3° / 100'
1,144.9	1,130.2	-123.0	2.9	EOB @ 20.40° Inc. / 172.53° Azm
6,139.2	5,811.1	-1,849.4	229.4	Drop 3° / 100'
6,819.4	6,477.0	-1,968.2	245.0	EOD @ Vertical
8,769.4	8,427.0	-1,968.2	245.0	TD @ 8769.4' MD / 8427.0' TVD