

Great Western

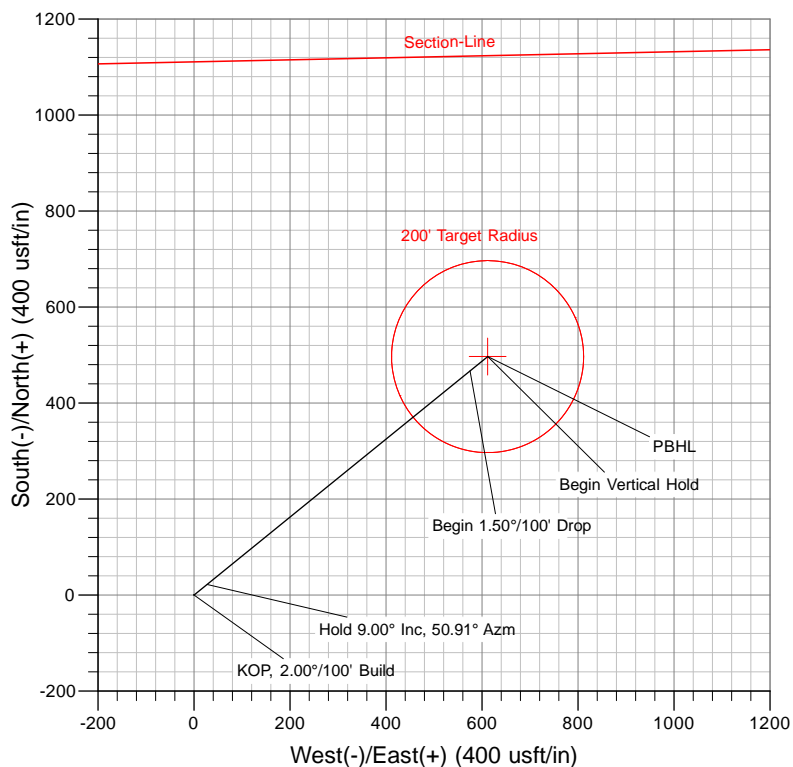
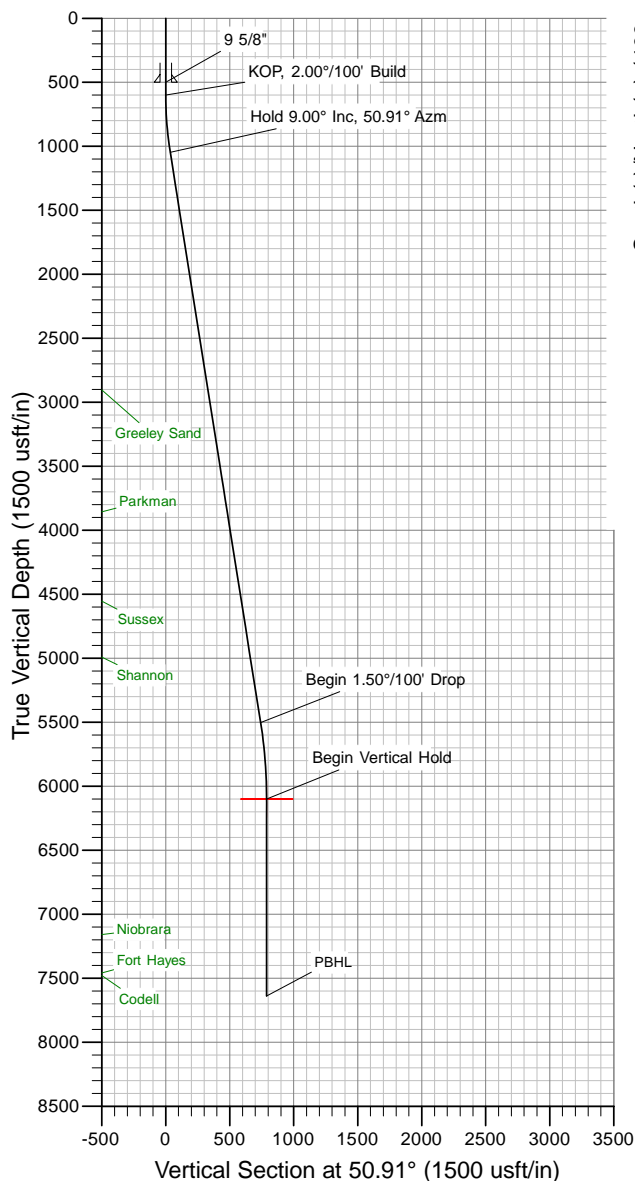
Company: Great Western
 Site: Larson
 Well: 20-21
 Project: Weld County, Colorado (NAD 83)
 Rig Name: Cade 22



Planning: 936.442.2510 Fax: 936.442.2515
 Operations: 936.442.2500 Fax: 936.442.2599

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	KOP, 2.00°/100' Build
1050.12	9.00	50.91	1048.27	22.25	27.39	35.29	35.29	Hold 9.00° Inc, 50.91° Azm
5559.71	9.00	50.91	5502.31	467.17	575.09	740.93	740.93	Begin 1.50°/100' Drop
6159.87	0.00	0.00	6100.00	496.83	611.61	787.98	787.98	Begin Vertical Hold
7697.87	0.00	0.00	7638.00	496.83	611.61	787.98	787.98	PBHL



Azimuths to Grid North
 True North: -0.45°
 Magnetic North: 8.39°

Magnetic Field
 Strength: 53171.9nT
 Dip Angle: 67.16°
 Date: 12/1/2011
 Model: WMM_2010

US State Plane 1983
 Colorado Northern Zone

Created By: Allen Slack
 Date: 15:57, December 01 2011
 Plan: Design #1

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.

Great Western

Weld County, Colorado (NAD 83)

Larson

20-21

Wellbore #1

Plan: Design #1

Standard Planning Report

01 December, 2011

Database:	Southern Region	Local Co-ordinate Reference:	Well 20-21
Company:	Great Western	TVD Reference:	WELL @ 5003.00usft (Cade 22)
Project:	Weld County, Colorado (NAD 83)	MD Reference:	WELL @ 5003.00usft (Cade 22)
Site:	Larson	North Reference:	Grid
Well:	20-21	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Project	Weld County, Colorado (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Well	20-21			
Well Position	+N/-S	1,449,252.45 usft	Northing:	1,449,252.45 usft
	+E/-W	3,192,383.12 usft	Easting:	3,192,383.12 usft
Position Uncertainty		0.00 usft	Wellhead Elevation:	
			Latitude:	40° 33' 52.3276 N
			Longitude:	104° 48' 27.198 W
			Ground Level:	4,989.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	WMM_2010	12/1/2011	8.83	67.16	53,172

Design	Design #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	50.91

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	
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,050.12	9.00	50.91	1,048.27	22.25	27.39	2.00	2.00	0.00	50.91	
5,559.71	9.00	50.91	5,502.31	467.17	575.09	0.00	0.00	0.00	0.00	
6,159.87	0.00	0.00	6,100.00	496.83	611.61	1.50	-1.50	0.00	180.00	Vert. v1 - Larson 2C
7,697.87	0.00	0.00	7,638.00	496.83	611.61	0.00	0.00	0.00	0.00	

Database:	Southern Region	Local Co-ordinate Reference:	Well 20-21
Company:	Great Western	TVD Reference:	WELL @ 5003.00usft (Cade 22)
Project:	Weld County, Colorado (NAD 83)	MD Reference:	WELL @ 5003.00usft (Cade 22)
Site:	Larson	North Reference:	Grid
Well:	20-21	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
100.00	0.00	0.00	100.00	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
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
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
9 5/8"									
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, 2.00°/100' Build									
700.00	2.00	50.91	699.98	1.10	1.35	1.75	2.00	2.00	0.00
800.00	4.00	50.91	799.84	4.40	5.42	6.98	2.00	2.00	0.00
900.00	6.00	50.91	899.45	9.90	12.18	15.69	2.00	2.00	0.00
1,000.00	8.00	50.91	998.70	17.58	21.64	27.88	2.00	2.00	0.00
1,050.12	9.00	50.91	1,048.27	22.25	27.39	35.29	2.00	2.00	0.00
Hold 9.00° Inc, 50.91° Azm									
1,100.00	9.00	50.91	1,097.54	27.17	33.45	43.09	0.00	0.00	0.00
1,200.00	9.00	50.91	1,196.30	37.04	45.59	58.74	0.00	0.00	0.00
1,300.00	9.00	50.91	1,295.07	46.90	57.74	74.39	0.00	0.00	0.00
1,400.00	9.00	50.91	1,393.84	56.77	69.88	90.04	0.00	0.00	0.00
1,500.00	9.00	50.91	1,492.61	66.64	82.03	105.68	0.00	0.00	0.00
1,600.00	9.00	50.91	1,591.38	76.50	94.18	121.33	0.00	0.00	0.00
1,700.00	9.00	50.91	1,690.14	86.37	106.32	136.98	0.00	0.00	0.00
1,800.00	9.00	50.91	1,788.91	96.23	118.47	152.63	0.00	0.00	0.00
1,900.00	9.00	50.91	1,887.68	106.10	130.61	168.27	0.00	0.00	0.00
2,000.00	9.00	50.91	1,986.45	115.97	142.76	183.92	0.00	0.00	0.00
2,100.00	9.00	50.91	2,085.22	125.83	154.90	199.57	0.00	0.00	0.00
2,200.00	9.00	50.91	2,183.99	135.70	167.05	215.22	0.00	0.00	0.00
2,300.00	9.00	50.91	2,282.75	145.56	179.19	230.86	0.00	0.00	0.00
2,400.00	9.00	50.91	2,381.52	155.43	191.34	246.51	0.00	0.00	0.00
2,500.00	9.00	50.91	2,480.29	165.30	203.48	262.16	0.00	0.00	0.00
2,600.00	9.00	50.91	2,579.06	175.16	215.63	277.81	0.00	0.00	0.00
2,700.00	9.00	50.91	2,677.83	185.03	227.77	293.46	0.00	0.00	0.00
2,800.00	9.00	50.91	2,776.59	194.89	239.92	309.10	0.00	0.00	0.00
2,900.00	9.00	50.91	2,875.36	204.76	252.06	324.75	0.00	0.00	0.00
2,927.98	9.00	50.91	2,903.00	207.52	255.46	329.13	0.00	0.00	0.00
Greeley Sand									
3,000.00	9.00	50.91	2,974.13	214.63	264.21	340.40	0.00	0.00	0.00
3,100.00	9.00	50.91	3,072.90	224.49	276.35	356.05	0.00	0.00	0.00
3,200.00	9.00	50.91	3,171.67	234.36	288.50	371.69	0.00	0.00	0.00
3,300.00	9.00	50.91	3,270.44	244.22	300.65	387.34	0.00	0.00	0.00
3,400.00	9.00	50.91	3,369.20	254.09	312.79	402.99	0.00	0.00	0.00
3,500.00	9.00	50.91	3,467.97	263.96	324.94	418.64	0.00	0.00	0.00
3,600.00	9.00	50.91	3,566.74	273.82	337.08	434.28	0.00	0.00	0.00
3,700.00	9.00	50.91	3,665.51	283.69	349.23	449.93	0.00	0.00	0.00
3,800.00	9.00	50.91	3,764.28	293.55	361.37	465.58	0.00	0.00	0.00
3,892.87	9.00	50.91	3,856.00	302.72	372.65	480.11	0.00	0.00	0.00
Parkman									
3,900.00	9.00	50.91	3,863.04	303.42	373.52	481.23	0.00	0.00	0.00
4,000.00	9.00	50.91	3,961.81	313.29	385.66	496.87	0.00	0.00	0.00
4,100.00	9.00	50.91	4,060.58	323.15	397.81	512.52	0.00	0.00	0.00
4,200.00	9.00	50.91	4,159.35	333.02	409.95	528.17	0.00	0.00	0.00
4,300.00	9.00	50.91	4,258.12	342.88	422.10	543.82	0.00	0.00	0.00
4,400.00	9.00	50.91	4,356.89	352.75	434.24	559.46	0.00	0.00	0.00
4,500.00	9.00	50.91	4,455.65	362.62	446.39	575.11	0.00	0.00	0.00

Database:	Southern Region	Local Co-ordinate Reference:	Well 20-21
Company:	Great Western	TVD Reference:	WELL @ 5003.00usft (Cade 22)
Project:	Weld County, Colorado (NAD 83)	MD Reference:	WELL @ 5003.00usft (Cade 22)
Site:	Larson	North Reference:	Grid
Well:	20-21	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)
4,598.56	9.00	50.91	4,553.00	372.34	458.36	590.53	0.00	0.00	0.00
Sussex									
4,600.00	9.00	50.91	4,554.42	372.48	458.53	590.76	0.00	0.00	0.00
4,700.00	9.00	50.91	4,653.19	382.35	470.68	606.41	0.00	0.00	0.00
4,800.00	9.00	50.91	4,751.96	392.21	482.83	622.05	0.00	0.00	0.00
4,900.00	9.00	50.91	4,850.73	402.08	494.97	637.70	0.00	0.00	0.00
5,000.00	9.00	50.91	4,949.50	411.95	507.12	653.35	0.00	0.00	0.00
5,042.02	9.00	50.91	4,991.00	416.09	512.22	659.92	0.00	0.00	0.00
Shannon									
5,100.00	9.00	50.91	5,048.26	421.81	519.26	669.00	0.00	0.00	0.00
5,200.00	9.00	50.91	5,147.03	431.68	531.41	684.64	0.00	0.00	0.00
5,300.00	9.00	50.91	5,245.80	441.54	543.55	700.29	0.00	0.00	0.00
5,400.00	9.00	50.91	5,344.57	451.41	555.70	715.94	0.00	0.00	0.00
5,500.00	9.00	50.91	5,443.34	461.27	567.84	731.59	0.00	0.00	0.00
5,559.71	9.00	50.91	5,502.31	467.17	575.09	740.93	0.00	0.00	0.00
Begin 1.50°/100' Drop									
5,600.00	8.40	50.91	5,542.14	471.01	579.82	747.02	1.50	-1.50	0.00
5,700.00	6.90	50.91	5,641.24	479.40	590.15	760.33	1.50	-1.50	0.00
5,800.00	5.40	50.91	5,740.67	486.15	598.47	771.04	1.50	-1.50	0.00
5,900.00	3.90	50.91	5,840.33	491.26	604.76	779.15	1.50	-1.50	0.00
6,000.00	2.40	50.91	5,940.18	494.72	609.02	784.64	1.50	-1.50	0.00
6,100.00	0.90	50.91	6,040.14	496.54	611.25	787.51	1.50	-1.50	0.00
6,159.87	0.00	0.00	6,100.00	496.83	611.61	787.98	1.50	-1.50	0.00
Begin Vertical Hold									
6,200.00	0.00	0.00	6,140.13	496.83	611.61	787.98	0.00	0.00	0.00
6,300.00	0.00	0.00	6,240.13	496.83	611.61	787.98	0.00	0.00	0.00
6,400.00	0.00	0.00	6,340.13	496.83	611.61	787.98	0.00	0.00	0.00
6,500.00	0.00	0.00	6,440.13	496.83	611.61	787.98	0.00	0.00	0.00
6,600.00	0.00	0.00	6,540.13	496.83	611.61	787.98	0.00	0.00	0.00
6,700.00	0.00	0.00	6,640.13	496.83	611.61	787.98	0.00	0.00	0.00
6,800.00	0.00	0.00	6,740.13	496.83	611.61	787.98	0.00	0.00	0.00
6,900.00	0.00	0.00	6,840.13	496.83	611.61	787.98	0.00	0.00	0.00
7,000.00	0.00	0.00	6,940.13	496.83	611.61	787.98	0.00	0.00	0.00
7,100.00	0.00	0.00	7,040.13	496.83	611.61	787.98	0.00	0.00	0.00
7,200.00	0.00	0.00	7,140.13	496.83	611.61	787.98	0.00	0.00	0.00
7,217.87	0.00	0.00	7,158.00	496.83	611.61	787.98	0.00	0.00	0.00
Niobrara									
7,300.00	0.00	0.00	7,240.13	496.83	611.61	787.98	0.00	0.00	0.00
7,400.00	0.00	0.00	7,340.13	496.83	611.61	787.98	0.00	0.00	0.00
7,500.00	0.00	0.00	7,440.13	496.83	611.61	787.98	0.00	0.00	0.00
7,517.87	0.00	0.00	7,458.00	496.83	611.61	787.98	0.00	0.00	0.00
Fort Hayes									
7,537.87	0.00	0.00	7,478.00	496.83	611.61	787.98	0.00	0.00	0.00
Codell									
7,600.00	0.00	0.00	7,540.13	496.83	611.61	787.98	0.00	0.00	0.00
7,697.87	0.00	0.00	7,638.00	496.83	611.61	787.98	0.00	0.00	0.00
PBHL									

Database:	Southern Region	Local Co-ordinate Reference:	Well 20-21
Company:	Great Western	TVD Reference:	WELL @ 5003.00usft (Cade 22)
Project:	Weld County, Colorado (NAD 83)	MD Reference:	WELL @ 5003.00usft (Cade 22)
Site:	Larson	North Reference:	Grid
Well:	20-21	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Design Targets

Target Name

- hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- Shape									
Vert. v1 - Larson 20-2	0.00	0.00	6,100.00	496.83	611.61	1,449,749.28	3,192,994.73	40° 33' 57.1897 N	104° 48' 19.222 W
- plan hits target center									
- Point									

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
500.00	500.00	9 5/8"	9-5/8	12-1/4

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
2,927.98	2,903.00	Greeley Sand		0.00	
3,892.87	3,856.00	Parkman		0.00	
4,598.56	4,553.00	Sussex		0.00	
5,042.02	4,991.00	Shannon		0.00	
7,217.87	7,158.00	Niobrara		0.00	
7,517.87	7,458.00	Fort Hayes		0.00	
7,537.87	7,478.00	Codell		0.00	

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
600.00	600.00	0.00	0.00	KOP, 2.00°/100' Build
1,050.12	1,048.27	22.25	27.39	Hold 9.00° Inc, 50.91° Azm
5,559.71	5,502.31	467.17	575.09	Begin 1.50°/100' Drop
6,159.87	6,100.00	496.83	611.61	Begin Vertical Hold
7,697.87	7,638.00	496.83	611.61	PBHL