

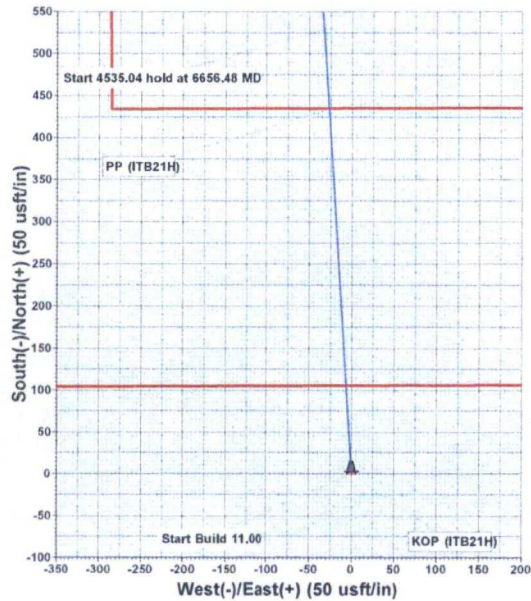
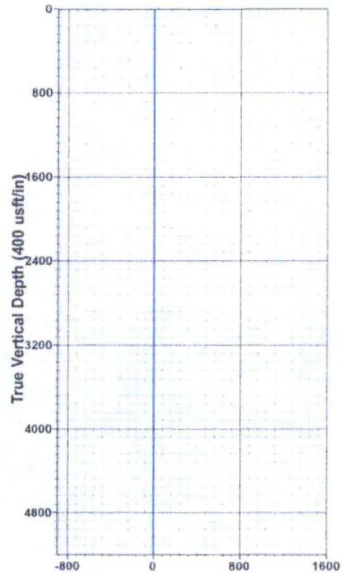


Section Details										
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	5829.21	0.00	0.00	5829.21	0.00	0.00	0.00	0.00	0.00	
3	6656.48	91.00	356.45	6350.00	528.94	-32.81	11.00	356.45	529.96	
4	11191.52	91.00	356.45	6270.85	5054.60	-313.50	0.00	0.00	5064.31	PBHL (ITB21H)

Ground Elevation:: 4014.00
RKB Elevation: RKB @ 4032.00usft (Silver Oak 3)

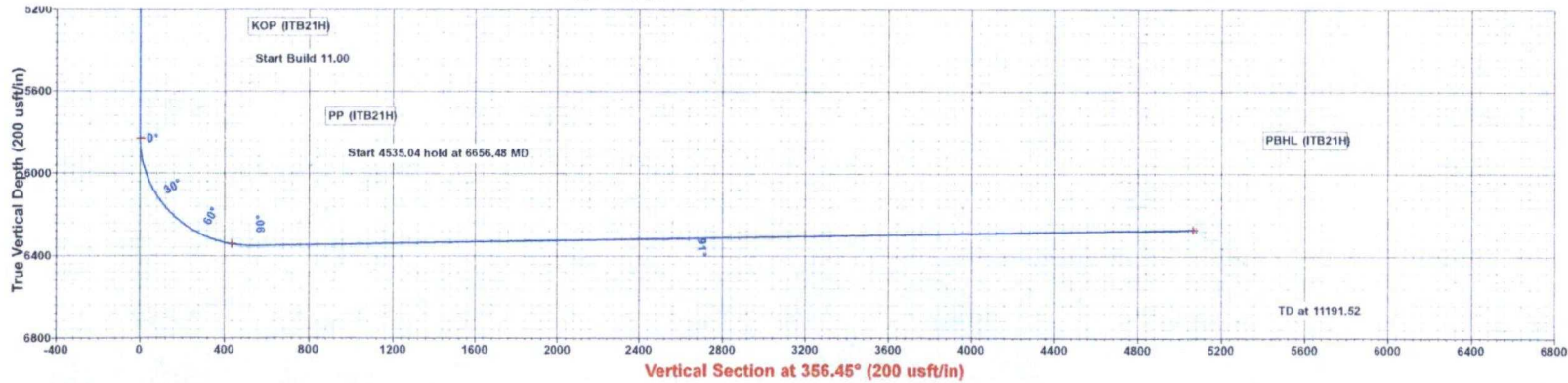
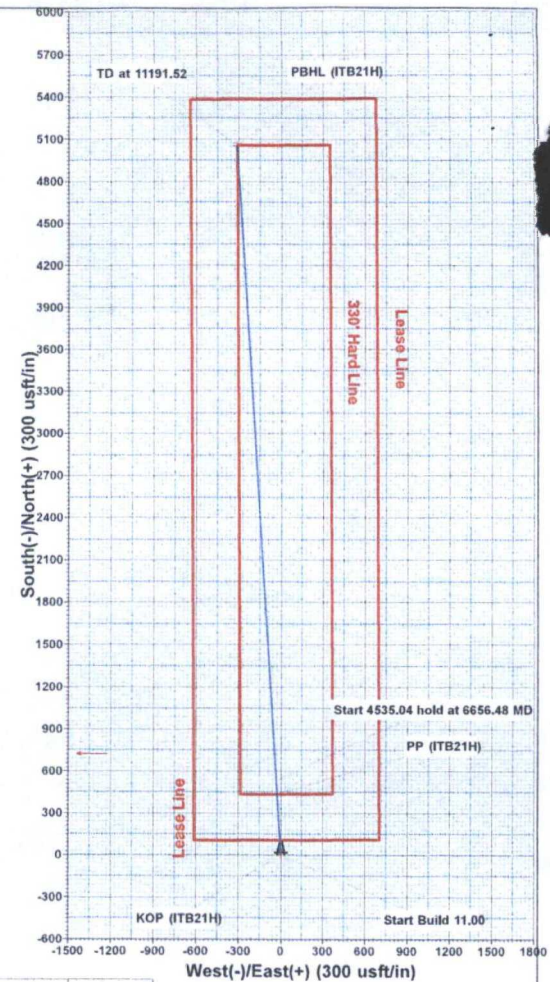
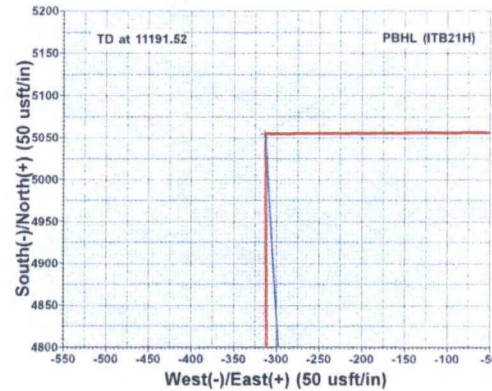
Northing 665032.80 Easting 676011.80 Latitude 32° 49' 37.022 N Longitude 103° 45' 37.244 W

COG Operating LLC
Project: Lea County, NM (NAD-27 2015)
Site: Ivar The Boneless Federal 21H
Well: SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D
Wellbore: BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D
Plan: Design #1 (SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D/BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D)



Azimuths to Grid North
True North: -0.31°
Magnetic North: 6.88°

Magnetic Field
Strength: 48369.5snT
Dip Angle: 60.60°
Date: 07/06/2016
Model: IGRF2015



Terra Directional Services LLC
3705 South County Road 1210, Midland, TX 79706
Phone: 432-618-1210

PROJECT DETAILS: Lea County, NM (NAD-27 2015)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid



COG Operating LLC

Lea County, NM (NAD-27 2015)

Ivar The Boneless Federal 21H

SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D

PP: 330' FSL, 586' FWL, Sec 22, T17S, R32E, Unit M

BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D

Plan: Design #1

Standard Planning Report

06 July, 2016



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Site Ivar The Boneless Federal 21H
Company:	COG Operating LLC	TVD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Project:	Lea County, NM (NAD-27 2015)	MD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Site:	Ivar The Boneless Federal 21H	North Reference:	Grid
Well:	SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Wellbore:	BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D		
Design:	Design #1		

Project	Lea County, NM (NAD-27 2015)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Ivar The Boneless Federal 21H		
Site Position:		Northing:	665,032.80 usft
From:	Map	Easting:	676,011.80 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in
		Latitude:	32° 49' 37.022 N
		Longitude:	103° 45' 37.244 W
		Grid Convergence:	0.31 °

Well	SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	4,032.00 usft
		Latitude:	32° 49' 37.022 N
		Longitude:	103° 45' 37.244 W
		Ground Level:	4,014.00 usft

Wellbore	BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2015	07/06/16	7.19
			Dip Angle (°)
			60.60
			Field Strength (nT)
			48,370

Design	Design #1		
Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth:
			0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			Direction (°)
			356.45

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	
5,829.21	0.00	0.00	5,829.21	0.00	0.00	0.00	0.00	0.00	0.00	
6,656.48	91.00	356.45	6,350.00	528.94	-32.81	11.00	11.00	0.00	356.45	
11,191.52	91.00	356.45	6,270.85	5,054.60	-313.50	0.00	0.00	0.00	0.00	PBHL (ITB21H)

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Site Ivar The Boneless Federal 21H
Company:	COG Operating LLC	TVD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Project:	Lea County, NM (NAD-27 2015)	MD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Site:	Ivar The Boneless Federal 21H	North Reference:	Grid
Well:	SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Wellbore:	BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D		
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
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
1,200.00	0.00	0.00	1,200.00	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
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,800.00	0.00	0.00	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,900.00	0.00	0.00	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	5,000.00	0.00	0.00	0.00	0.00	0.00	0.00
5,100.00	0.00	0.00	5,100.00	0.00	0.00	0.00	0.00	0.00	0.00

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Site Ivar The Boneless Federal 21H
Company:	COG Operating LLC	TVD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Project:	Lea County, NM (NAD-27 2015)	MD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Site:	Ivar The Boneless Federal 21H	North Reference:	Grid
Well:	SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Wellbore:	BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D		
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)
5,200.00	0.00	0.00	5,200.00	0.00	0.00	0.00	0.00	0.00	0.00
5,300.00	0.00	0.00	5,300.00	0.00	0.00	0.00	0.00	0.00	0.00
5,400.00	0.00	0.00	5,400.00	0.00	0.00	0.00	0.00	0.00	0.00
5,500.00	0.00	0.00	5,500.00	0.00	0.00	0.00	0.00	0.00	0.00
5,600.00	0.00	0.00	5,600.00	0.00	0.00	0.00	0.00	0.00	0.00
5,700.00	0.00	0.00	5,700.00	0.00	0.00	0.00	0.00	0.00	0.00
5,800.00	0.00	0.00	5,800.00	0.00	0.00	0.00	0.00	0.00	0.00
5,829.21	0.00	0.00	5,829.21	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 11.00									
5,850.00	2.29	356.45	5,849.99	0.41	-0.03	0.42	11.00	11.00	0.00
5,900.00	7.79	356.45	5,899.78	4.79	-0.30	4.80	11.00	11.00	0.00
5,950.00	13.29	356.45	5,948.92	13.92	-0.86	13.94	11.00	11.00	0.00
6,000.00	18.79	356.45	5,996.96	27.70	-1.72	27.75	11.00	11.00	0.00
6,050.00	24.29	356.45	6,043.45	46.01	-2.85	46.10	11.00	11.00	0.00
6,100.00	29.79	356.45	6,087.97	68.69	-4.26	68.82	11.00	11.00	0.00
6,150.00	35.29	356.45	6,130.10	95.52	-5.92	95.70	11.00	11.00	0.00
6,200.00	40.79	356.45	6,169.47	126.26	-7.83	126.50	11.00	11.00	0.00
6,250.00	46.29	356.45	6,205.70	160.62	-9.96	160.93	11.00	11.00	0.00
6,300.00	51.79	356.45	6,238.46	198.29	-12.30	198.67	11.00	11.00	0.00
6,350.00	57.29	356.45	6,267.46	238.92	-14.82	239.38	11.00	11.00	0.00
6,400.00	62.79	356.45	6,292.42	282.14	-17.50	282.68	11.00	11.00	0.00
6,450.00	68.29	356.45	6,313.12	327.54	-20.32	328.17	11.00	11.00	0.00
6,500.00	73.79	356.45	6,329.36	374.72	-23.24	375.44	11.00	11.00	0.00
6,550.00	79.29	356.45	6,341.00	423.24	-26.25	424.05	11.00	11.00	0.00
6,600.00	84.79	356.45	6,347.92	472.64	-29.31	473.55	11.00	11.00	0.00
6,650.00	90.29	356.45	6,350.07	522.48	-32.41	523.48	11.00	11.00	0.00
6,656.48	91.00	356.45	6,350.00	528.94	-32.81	529.96	11.00	11.00	0.00
Start 4535.04 hold at 6656.48 MD									
6,700.00	91.00	356.45	6,349.24	572.38	-35.50	573.48	0.00	0.00	0.00
6,800.00	91.00	356.45	6,347.49	672.17	-41.69	673.46	0.00	0.00	0.00
6,900.00	91.00	356.45	6,345.75	771.96	-47.88	773.45	0.00	0.00	0.00
7,000.00	91.00	356.45	6,344.00	871.76	-54.07	873.43	0.00	0.00	0.00
7,100.00	91.00	356.45	6,342.26	971.55	-60.26	973.41	0.00	0.00	0.00
7,200.00	91.00	356.45	6,340.51	1,071.34	-66.45	1,073.40	0.00	0.00	0.00
7,300.00	91.00	356.45	6,338.77	1,171.13	-72.64	1,173.38	0.00	0.00	0.00
7,400.00	91.00	356.45	6,337.02	1,270.93	-78.83	1,273.37	0.00	0.00	0.00
7,500.00	91.00	356.45	6,335.28	1,370.72	-85.02	1,373.35	0.00	0.00	0.00
7,600.00	91.00	356.45	6,333.53	1,470.51	-91.21	1,473.34	0.00	0.00	0.00
7,700.00	91.00	356.45	6,331.79	1,570.31	-97.39	1,573.32	0.00	0.00	0.00
7,800.00	91.00	356.45	6,330.04	1,670.10	-103.58	1,673.31	0.00	0.00	0.00
7,900.00	91.00	356.45	6,328.30	1,769.89	-109.77	1,773.29	0.00	0.00	0.00
8,000.00	91.00	356.45	6,326.55	1,869.69	-115.96	1,873.28	0.00	0.00	0.00
8,100.00	91.00	356.45	6,324.80	1,969.48	-122.15	1,973.26	0.00	0.00	0.00
8,200.00	91.00	356.45	6,323.06	2,069.27	-128.34	2,073.25	0.00	0.00	0.00
8,300.00	91.00	356.45	6,321.31	2,169.06	-134.53	2,173.23	0.00	0.00	0.00
8,400.00	91.00	356.45	6,319.57	2,268.86	-140.72	2,273.22	0.00	0.00	0.00
8,500.00	91.00	356.45	6,317.82	2,368.65	-146.91	2,373.20	0.00	0.00	0.00
8,600.00	91.00	356.45	6,316.08	2,468.44	-153.10	2,473.19	0.00	0.00	0.00
8,700.00	91.00	356.45	6,314.33	2,568.24	-159.29	2,573.17	0.00	0.00	0.00
8,800.00	91.00	356.45	6,312.59	2,668.03	-165.48	2,673.16	0.00	0.00	0.00
8,900.00	91.00	356.45	6,310.84	2,767.82	-171.67	2,773.14	0.00	0.00	0.00
9,000.00	91.00	356.45	6,309.10	2,867.62	-177.86	2,873.13	0.00	0.00	0.00

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Site Ivar The Boneless Federal 21H
Company:	COG Operating LLC	TVD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Project:	Lea County, NM (NAD-27 2015)	MD Reference:	RKB @ 4032.00usft (Silver Oak 3)
Site:	Ivar The Boneless Federal 21H	North Reference:	Grid
Well:	SHL: 105' FNL, 613 FWL, Sec 22, T17S, R32E, Unit D	Survey Calculation Method:	Minimum Curvature
Wellbore:	BHL: 330' FNL, 330 FWL, Sec 15, T17S, R32E, Unit D		
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)
9,100.00	91.00	356.45	6,307.35	2,967.41	-184.05	2,973.11	0.00	0.00	0.00
9,200.00	91.00	356.45	6,305.61	3,067.20	-190.24	3,073.10	0.00	0.00	0.00
9,300.00	91.00	356.45	6,303.86	3,166.99	-196.43	3,173.08	0.00	0.00	0.00
9,400.00	91.00	356.45	6,302.12	3,266.79	-202.62	3,273.06	0.00	0.00	0.00
9,500.00	91.00	356.45	6,300.37	3,366.58	-208.80	3,373.05	0.00	0.00	0.00
9,600.00	91.00	356.45	6,298.63	3,466.37	-214.99	3,473.03	0.00	0.00	0.00
9,700.00	91.00	356.45	6,296.88	3,566.17	-221.18	3,573.02	0.00	0.00	0.00
9,800.00	91.00	356.45	6,295.14	3,665.96	-227.37	3,673.00	0.00	0.00	0.00
9,900.00	91.00	356.45	6,293.39	3,765.75	-233.56	3,772.99	0.00	0.00	0.00
10,000.00	91.00	356.45	6,291.65	3,865.55	-239.75	3,872.97	0.00	0.00	0.00
10,100.00	91.00	356.45	6,289.90	3,965.34	-245.94	3,972.96	0.00	0.00	0.00
10,200.00	91.00	356.45	6,288.15	4,065.13	-252.13	4,072.94	0.00	0.00	0.00
10,300.00	91.00	356.45	6,286.41	4,164.92	-258.32	4,172.93	0.00	0.00	0.00
10,400.00	91.00	356.45	6,284.66	4,264.72	-264.51	4,272.91	0.00	0.00	0.00
10,500.00	91.00	356.45	6,282.92	4,364.51	-270.70	4,372.90	0.00	0.00	0.00
10,600.00	91.00	356.45	6,281.17	4,464.30	-276.89	4,472.88	0.00	0.00	0.00
10,700.00	91.00	356.45	6,279.43	4,564.10	-283.08	4,572.87	0.00	0.00	0.00
10,800.00	91.00	356.45	6,277.68	4,663.89	-289.27	4,672.85	0.00	0.00	0.00
10,900.00	91.00	356.45	6,275.94	4,763.68	-295.46	4,772.84	0.00	0.00	0.00
11,000.00	91.00	356.45	6,274.19	4,863.48	-301.65	4,872.82	0.00	0.00	0.00
11,100.00	91.00	356.45	6,272.45	4,963.27	-307.84	4,972.81	0.00	0.00	0.00
11,191.52	91.00	356.45	6,270.85	5,054.60	-313.50	5,064.31	0.00	0.00	0.00
TD at 11191.52									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
KOP (ITB21H) - plan hits target center - Point	0.00	0.00	5,829.21	0.00	0.00	665,032.80	676,011.80	32° 49' 37.022 N	103° 45' 37.244 W
PBHL (ITB21H) - plan hits target center - Point	0.00	0.00	6,270.85	5,054.60	-313.50	670,087.40	675,698.30	32° 50' 27.053 N	103° 45' 40.597 W
PP (ITB21H) - plan misses target center by 0.14usft at 6561.14usft MD (6342.95 TVD, 434.18 N, -26.93 E) - Point	0.00	0.00	6,343.09	434.17	-26.93	665,466.97	675,984.87	32° 49' 41.319 N	103° 45' 37.532 W

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
5,829.21	5,829.21	0.00	0.00	Start Build 11.00
6,656.48	6,350.00	528.94	-32.81	Start 4535.04 hold at 6656.48 MD
11,191.52	6,270.85	5,054.60	-313.50	TD at 11191.52