

# **Elm Ridge Exploration Company.**

**La Plata County, Co (Nad 83)**

**Sec 15, T33N, R9W**

**IGW 152**

**DD**

**UWI:**

**WL:**

**Survey: Final**

## **Standard Survey Report**

**07 July, 2014**



Elm Ridge Exploration Company.

Project: La Plata County, Co (Nad 83)  
Site: Sec 15, T33N, R9W  
Well: IGW 152  
Wellbore: DD  
Plan: Final

Reference Details - WELL CENTRE

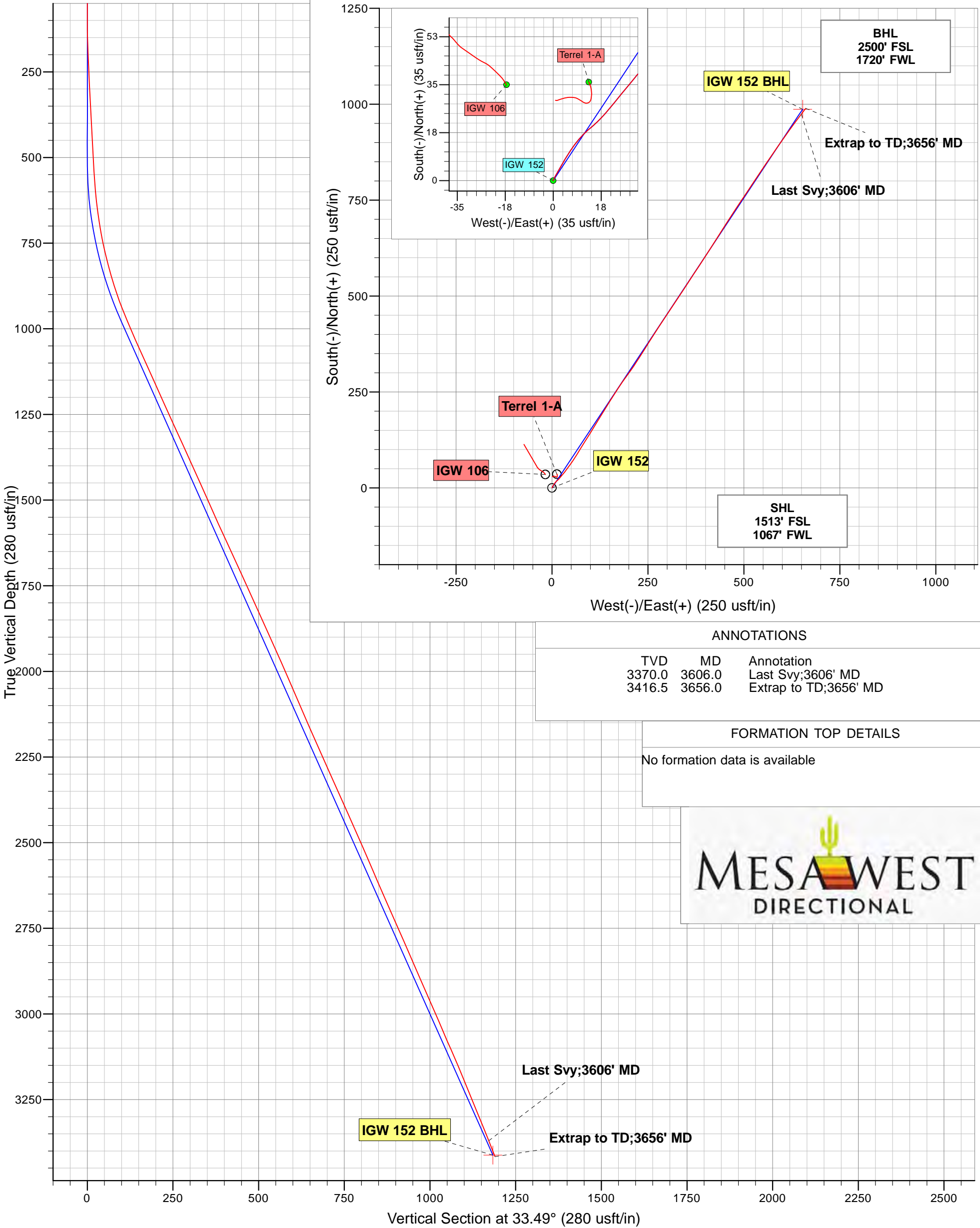
Geodetic System: US State Plane 1983  
Ellipsoid: GRS 1980  
Zone: Colorado Southern Zone  
Northing: 1166481.94  
Easting: 2323796.32  
Latitude: 37° 6' 2.988 N  
Longitude: 107° 49' 7.500 W  
Grid Convergence: 1.42° East  
Ground Elevation: 6871.0  
KB Elevation: RKB @ 6883.0usft (Bear Cat #1)



Azimuths to True North  
Magnetic North: 9.64°  
  
Magnetic Field  
Strength: 50667.8snT  
Dip Angle: 63.70°  
Date: 2/5/2014  
Model: IGRF2010

PLAN DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	12.0	0.00	0.00	12.0	0.0	0.0	0.00	0.00	0.0	
2	512.0	0.00	0.00	512.0	0.0	0.0	0.00	0.00	0.0	
3	992.3	24.01	33.49	978.4	82.7	54.7	5.00	33.49	99.2	
4	3656.6	24.01	33.49	3412.0	987.0	653.0	0.00	0.00	1183.5	IGW 152 BHL



## Mesa West Directional

## Survey Report



<b>Company:</b>	Elm Ridge Exploration Company.	<b>Local Co-ordinate Reference:</b>	Well IGW 152
<b>Project:</b>	La Plata County, Co (Nad 83)	<b>TVD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Site:</b>	Sec 15, T33N, R9W	<b>MD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Well:</b>	IGW 152	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	La Plata County, Co (Nad 83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Southern Zone		

Site	Sec 15, T33N, R9W				
Site Position:		Northing:	1,166,481.94 usft	Latitude:	37° 6' 2.988 N
From:	Lat/Long	Easting:	2,323,796.32 usft	Longitude:	107° 49' 7.500 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.42 °

Well	IGW 152					
Well Position	+N/-S	0.0 usft	Northing:	1,166,481.94 usft	Latitude:	37° 6' 2.988 N
	+E/-W	0.0 usft	Easting:	2,323,796.32 usft	Longitude:	107° 49' 7.500 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	6,871.0 usft

<b>Wellbore</b>	DD				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	2/5/2014	9.64	63.70	50,668

<b>Design</b>	Final				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	33.49	

<b>Survey Program</b>	<b>Date</b>	7/7/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
105.0	3,656.0	Final (DD)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>Subsea (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>
0.0	0.00	0.00	0.0	-6,883.0	0.0	0.0	0.0	0.00	0.00	0.00
105.0	0.00	0.00	105.0	-6,778.0	0.0	0.0	0.0	0.00	0.00	0.00
113.0	0.30	23.10	113.0	-6,770.0	0.0	0.0	0.0	3.75	3.75	0.00
143.0	1.40	22.30	143.0	-6,740.0	0.4	0.2	0.5	3.67	3.67	-2.67
174.0	2.00	27.90	174.0	-6,709.0	1.3	0.6	1.4	2.01	1.94	18.06
205.0	2.30	27.90	205.0	-6,678.0	2.3	1.1	2.5	0.97	0.97	0.00
235.0	2.70	29.30	234.9	-6,648.1	3.4	1.7	3.8	1.35	1.33	4.67
296.0	2.70	31.60	295.9	-6,587.1	5.9	3.2	6.7	0.18	0.00	3.77
357.0	2.90	31.50	356.8	-6,526.2	8.5	4.8	9.7	0.33	0.33	-0.16
419.0	3.00	32.00	418.7	-6,464.3	11.2	6.4	12.9	0.17	0.16	0.81

## Mesa West Directional

## Survey Report



<b>Company:</b>	Elm Ridge Exploration Company.	<b>Local Co-ordinate Reference:</b>	Well IGW 152
<b>Project:</b>	La Plata County, Co (Nad 83)	<b>TVD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Site:</b>	Sec 15, T33N, R9W	<b>MD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Well:</b>	IGW 152	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final	<b>Database:</b>	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
498.0	3.30	40.00	497.6	-6,385.4	14.7	9.0	17.2	0.67	0.38	10.13
538.0	3.40	43.92	537.5	-6,345.5	16.4	10.6	19.5	0.62	0.25	9.80
568.0	3.90	46.40	567.5	-6,315.5	17.7	11.9	21.4	1.75	1.67	8.27
599.0	5.20	49.90	598.4	-6,284.6	19.4	13.8	23.7	4.29	4.19	11.29
630.0	6.60	46.50	629.2	-6,253.8	21.5	16.1	26.8	4.65	4.52	-10.97
660.0	7.80	42.30	659.0	-6,224.0	24.2	18.7	30.5	4.37	4.00	-14.00
691.0	9.00	38.40	689.6	-6,193.4	27.7	21.7	35.0	4.28	3.87	-12.58
722.0	10.40	39.90	720.2	-6,162.8	31.7	25.0	40.2	4.59	4.52	4.84
753.0	11.70	39.50	750.6	-6,132.4	36.3	28.8	46.1	4.20	4.19	-1.29
785.0	13.40	37.50	781.8	-6,101.2	41.7	33.1	53.0	5.48	5.31	-6.25
817.0	14.90	37.30	812.9	-6,070.1	47.9	37.8	60.8	4.69	4.69	-0.63
848.0	16.00	36.90	842.7	-6,040.3	54.5	42.8	69.1	3.56	3.55	-1.29
880.0	17.40	34.80	873.4	-6,009.6	62.0	48.2	78.3	4.76	4.38	-6.56
912.0	19.10	34.40	903.8	-5,979.2	70.2	53.9	88.3	5.33	5.31	-1.25
943.0	20.80	33.20	932.9	-5,950.1	79.0	59.8	98.9	5.64	5.48	-3.87
975.0	22.30	31.90	962.7	-5,920.3	88.9	66.1	110.6	4.92	4.69	-4.06
1,007.0	23.40	31.20	992.2	-5,890.8	99.5	72.6	123.0	3.54	3.44	-2.19
1,070.0	24.10	32.00	1,049.8	-5,833.2	121.1	85.9	148.4	1.22	1.11	1.27
1,133.0	23.90	32.50	1,107.4	-5,775.6	142.8	99.5	174.0	0.45	-0.32	0.79
1,197.0	24.50	31.50	1,165.8	-5,717.2	165.0	113.4	200.2	1.14	0.94	-1.56
1,260.0	24.30	30.30	1,223.1	-5,659.9	187.4	126.8	226.2	0.85	-0.32	-1.90
1,324.0	24.60	32.70	1,281.4	-5,601.6	210.0	140.7	252.7	1.62	0.47	3.75
1,387.0	24.60	32.80	1,338.7	-5,544.3	232.0	154.8	278.9	0.07	0.00	0.16
1,450.0	24.50	31.40	1,396.0	-5,487.0	254.2	168.8	305.1	0.94	-0.16	-2.22
1,514.0	24.20	35.80	1,454.3	-5,428.7	276.2	183.3	331.5	2.87	-0.47	6.88
1,578.0	23.80	36.50	1,512.8	-5,370.2	297.2	198.7	357.5	0.77	-0.63	1.09
1,641.0	24.00	33.60	1,570.4	-5,312.6	318.1	213.3	383.0	1.89	0.32	-4.60
1,704.0	25.10	32.60	1,627.7	-5,255.3	340.0	227.6	409.2	1.87	1.75	-1.59
1,768.0	24.70	32.00	1,685.7	-5,197.3	362.8	242.0	436.1	0.74	-0.63	-0.94
1,831.0	24.40	32.80	1,743.0	-5,140.0	384.9	256.1	462.3	0.71	-0.48	1.27
1,895.0	24.50	32.00	1,801.3	-5,081.7	407.2	270.3	488.7	0.54	0.16	-1.25
1,958.0	23.80	33.50	1,858.8	-5,024.2	428.9	284.2	514.5	1.48	-1.11	2.38
2,021.0	24.50	33.80	1,916.3	-4,966.7	450.4	298.5	540.3	1.13	1.11	0.48
2,085.0	24.00	34.10	1,974.6	-4,908.4	472.2	313.2	566.6	0.80	-0.78	0.47
2,148.0	23.30	33.50	2,032.3	-4,850.7	493.2	327.2	591.9	1.17	-1.11	-0.95
2,212.0	23.60	33.10	2,091.0	-4,792.0	514.5	341.2	617.3	0.53	0.47	-0.63
2,275.0	23.10	32.80	2,148.9	-4,734.1	535.4	354.8	642.3	0.82	-0.79	-0.48
2,339.0	23.70	33.40	2,207.6	-4,675.4	556.7	368.7	667.7	1.01	0.94	0.94
2,402.0	24.40	33.90	2,265.1	-4,617.9	578.1	382.9	693.4	1.16	1.11	0.79
2,465.0	24.30	33.10	2,322.5	-4,560.5	599.7	397.2	719.4	0.55	-0.16	-1.27
2,529.0	24.10	32.00	2,380.9	-4,502.1	621.8	411.3	745.6	0.77	-0.31	-1.72
2,592.0	23.90	32.90	2,438.5	-4,444.5	643.5	425.1	771.2	0.66	-0.32	1.43
2,655.0	23.50	32.80	2,496.2	-4,386.8	664.7	438.8	796.5	0.64	-0.63	-0.16
2,718.0	23.30	31.30	2,554.0	-4,329.0	685.9	452.1	821.5	1.00	-0.32	-2.38

# Mesa West Directional

## Survey Report



<b>Company:</b>	Elm Ridge Exploration Company.	<b>Local Co-ordinate Reference:</b>	Well IGW 152
<b>Project:</b>	La Plata County, Co (Nad 83)	<b>TVD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Site:</b>	Sec 15, T33N, R9W	<b>MD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Well:</b>	IGW 152	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final	<b>Database:</b>	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,782.0	23.50	33.20	2,612.7	-4,270.3	707.4	465.7	846.9	1.22	0.31	2.97
2,845.0	23.60	34.30	2,670.5	-4,212.5	728.4	479.6	872.1	0.72	0.16	1.75
2,909.0	23.60	33.60	2,729.1	-4,153.9	749.6	494.0	897.7	0.44	0.00	-1.09
2,940.0	24.00	33.50	2,757.5	-4,125.5	760.0	500.9	910.2	1.30	1.29	-0.32
2,972.0	24.00	33.40	2,786.7	-4,096.3	770.9	508.0	923.3	0.13	0.00	-0.31
3,003.0	23.60	33.40	2,815.1	-4,067.9	781.4	514.9	935.8	1.29	-1.29	0.00
3,035.0	23.50	33.90	2,844.4	-4,038.6	792.0	522.0	948.6	0.70	-0.31	1.56
3,067.0	23.10	33.20	2,873.8	-4,009.2	802.5	529.0	961.2	1.52	-1.25	-2.19
3,098.0	23.50	34.30	2,902.3	-3,980.7	812.7	535.8	973.5	1.91	1.29	3.55
3,130.0	23.80	34.80	2,931.6	-3,951.4	823.3	543.1	986.3	1.13	0.94	1.56
3,162.0	24.10	33.40	2,960.8	-3,922.2	834.1	550.4	999.3	2.01	0.94	-4.38
3,193.0	23.80	33.30	2,989.2	-3,893.8	844.6	557.3	1,011.9	0.98	-0.97	-0.32
3,225.0	23.10	33.20	3,018.5	-3,864.5	855.2	564.3	1,024.6	2.19	-2.19	-0.31
3,257.0	22.80	34.40	3,048.0	-3,835.0	865.6	571.2	1,037.1	1.74	-0.94	3.75
3,289.0	23.10	35.60	3,077.4	-3,805.6	875.8	578.4	1,049.6	1.74	0.94	3.75
3,320.0	24.00	36.00	3,105.9	-3,777.1	885.9	585.6	1,061.9	2.95	2.90	1.29
3,352.0	23.90	35.70	3,135.1	-3,747.9	896.4	593.2	1,074.9	0.49	-0.31	-0.94
3,384.0	22.80	34.50	3,164.5	-3,718.5	906.8	600.5	1,087.6	3.74	-3.44	-3.75
3,415.0	21.50	33.90	3,193.2	-3,689.8	916.4	607.1	1,099.3	4.26	-4.19	-1.94
3,447.0	22.30	35.70	3,222.9	-3,660.1	926.2	613.9	1,111.2	3.26	2.50	5.63
3,479.0	22.40	36.50	3,252.5	-3,630.5	936.1	621.1	1,123.4	1.00	0.31	2.50
3,511.0	22.50	36.50	3,282.1	-3,600.9	945.9	628.4	1,135.6	0.31	0.31	0.00
3,542.0	22.50	36.90	3,310.7	-3,572.3	955.4	635.4	1,147.4	0.49	0.00	1.29
3,574.0	22.30	37.00	3,340.3	-3,542.7	965.1	642.8	1,159.6	0.64	-0.63	0.31
Last Svy;3606' MD										
3,606.0	21.50	37.10	3,370.0	-3,513.0	974.7	650.0	1,171.5	2.50	-2.50	0.31
Extrap to TD;3656' MD										
3,656.0	21.50	37.10	3,416.5	-3,466.5	989.3	661.0	1,189.8	0.00	0.00	0.00

Design Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting		
- Shape	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	Latitude	Longitude
IGW 152 BHL	0.00	0.00	3,412.0	987.0	653.0	1,167,452.43	2,324,473.62	37° 6' 12.746 N	107° 48' 59.439 W
- survey misses target center by 6.8usft at 3649.4usft MD (3410.3 TVD, 987.3 N, 659.6 E)									
- Point									

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
3,606.0	3,370.0	974.7	650.0	Last Svy;3606' MD	
3,656.0	3,416.5	989.3	661.0	Extrap to TD;3656' MD	

## Mesa West Directional

### Survey Report



<b>Company:</b>	Elm Ridge Exploration Company.	<b>Local Co-ordinate Reference:</b>	Well IGW 152
<b>Project:</b>	La Plata County, Co (Nad 83)	<b>TVD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Site:</b>	Sec 15, T33N, R9W	<b>MD Reference:</b>	RKB @ 6883.0usft (Bear Cat #1)
<b>Well:</b>	IGW 152	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final	<b>Database:</b>	EDM 5000.1 Single User Db

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_