



Well Details: GM 311-8

TVD Reference: GL 6175' & RKB 24' @ 6199.00usft
 +N/-S +E/-W Northing Easting Latitude Longitude Slot
 0.00 0.00 1601173.41 2257371.67 39.4544741 -108.1303789 GM 311-8 (B10)

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well GM 311-8 - Slot GM 311-8 (B10), True North
 Vertical (TVD) Reference: GL 6175' & RKB 24' @ 6199.00usft
 Section (VS) Reference: Slot - GM 311-8 (B10)(0.00N, 0.00E)
 Measured Depth Reference: GL 6175' & RKB 24' @ 6199.00usft
 Calculation Method: Minimum Curvature

PROJECT DETAILS: Garfield County, CO NAD83

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

System Datum: Mean Sea Level

Plan: OH

12:27, January 02 2019
 Created By: Mel Mireles Jr.



Directional Survey Certification

2948 I-70 Business Loop
Grand Junction, CO 81504
(970)-245-9447 Fax (970)-245-9454

Operator	TEP Rocky Mountain, LLC.
Well Name & No.	GM 311-8
County & State	Garfield County, CO
SDI Job No.	OP.014916
Rig	H&P 271

I, Mel Mireles Jr., having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 129 feet to a measured depth of 7,319 feet is true and correct as determined from all available records.

A handwritten signature in black ink, appearing to read 'Mel Mireles Jr.', written over a horizontal line.

Signature

02-Jan-19

Date

Mel Mireles Jr.

Grand Junction Assistant Well Planner
Scientific Drilling - Colorado District

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well GM 311-8 - Slot GM 311-8 (B10)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Site:	MV 60-8D Pad	MD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Well:	GM 311-8	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

Project	Garfield County, CO NAD83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		MV 60-8D Pad			
Site Position:		Northing:	1,601,172.03 usft	Latitude:	39.4544712
From:	Map	Easting:	2,257,381.57 usft	Longitude:	-108.1303437
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	-1.66 °

Well	GM 311-8 - Slot GM 311-8 (B10)					
Well Position	+N/-S	0.00 usft	Northing:	1,601,173.41 usft	Latitude:	39.4544742
	+E/-W	0.00 usft	Easting:	2,257,371.67 usft	Longitude:	-108.1303789
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	6,175.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/22/2018	9.48	65.67	51,619

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	298.45	

Survey Program	Date	1/2/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
129.00	492.00	Survey #1 - Gyro MWD Survey (OH)	Gyro MWD 105	Gyro MWD Error Model Ver 1.0.5	
566.00	964.00	Survey #2 - Surface MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
1,078.00	7,319.00	Survey #3 - Production MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	

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	
129.00	1.06	324.32	128.99	0.97	-0.70	1.07	0.82	0.82	0.00	
First SDI Gyro MWD Survey										
217.00	3.26	315.00	216.92	3.40	-2.94	4.20	2.52	2.50	-10.59	
309.00	6.16	307.53	308.61	8.26	-8.71	11.59	3.22	3.15	-8.12	
401.00	9.85	304.80	399.69	15.76	-19.09	24.29	4.03	4.01	-2.97	
492.00	13.20	301.29	488.85	25.60	-34.36	42.41	3.76	3.68	-3.86	
Last SDI Gyro MWD Survey										

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well GM 311-8 - Slot GM 311-8 (B10)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Site:	MV 60-8D Pad	MD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Well:	GM 311-8	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

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)	
566.00	15.14	297.51	560.59	34.45	-50.15	60.51	2.90	2.62	-5.11	
First SDI Surface MWD Survey										
657.00	18.91	299.64	647.59	47.24	-73.52	87.14	4.20	4.14	2.34	
749.00	21.72	297.00	733.86	62.34	-101.65	119.07	3.21	3.05	-2.87	
840.00	25.80	297.26	817.13	79.07	-134.27	155.72	4.48	4.48	0.29	
933.00	29.85	297.69	899.36	99.10	-172.77	199.11	4.36	4.35	0.46	
964.00	31.22	297.94	926.06	106.45	-186.70	214.86	4.44	4.42	0.81	
Last SDI Surface MWD Survey										
1,078.00	32.90	298.54	1,022.67	135.09	-240.00	275.37	1.50	1.47	0.53	
First SDI Production MWD Survey										
1,173.00	34.27	297.71	1,101.81	159.85	-286.35	327.92	1.52	1.44	-0.87	
1,267.00	35.47	298.67	1,178.93	185.24	-333.71	381.66	1.40	1.28	1.02	
1,361.00	35.85	298.18	1,255.31	211.33	-381.91	436.46	0.51	0.40	-0.52	
1,455.00	35.69	296.75	1,331.58	236.67	-430.65	491.39	0.91	-0.17	-1.52	
1,550.00	35.55	297.26	1,408.80	261.79	-479.95	546.70	0.35	-0.15	0.54	
1,644.00	35.72	295.93	1,485.20	286.31	-528.92	601.44	0.84	0.18	-1.41	
1,738.00	35.95	294.54	1,561.41	309.76	-578.70	656.38	0.90	0.24	-1.48	
1,832.00	34.80	297.59	1,638.06	333.65	-627.58	710.74	2.24	-1.22	3.24	
1,927.00	35.17	298.97	1,715.90	359.46	-675.54	765.20	0.92	0.39	1.45	
2,021.00	36.54	299.79	1,792.08	386.47	-723.51	820.25	1.54	1.46	0.87	
2,116.00	34.73	298.65	1,869.29	413.50	-771.81	875.59	2.03	-1.91	-1.20	
2,210.00	36.06	299.56	1,945.92	439.99	-819.38	930.03	1.52	1.41	0.97	
2,304.00	36.12	299.68	2,021.88	467.36	-867.51	985.39	0.10	0.06	0.13	
2,398.00	35.70	300.00	2,098.01	494.79	-915.33	1,040.51	0.49	-0.45	0.34	
2,493.00	35.74	299.76	2,175.14	522.42	-963.42	1,095.95	0.15	0.04	-0.25	
2,587.00	34.81	300.00	2,251.88	549.46	-1,010.49	1,150.22	1.00	-0.99	0.26	
2,682.00	35.78	301.04	2,329.42	577.34	-1,057.77	1,205.07	1.20	1.02	1.09	
2,776.00	35.80	300.75	2,405.67	605.57	-1,104.95	1,259.99	0.18	0.02	-0.31	
2,870.00	34.94	300.44	2,482.32	633.26	-1,151.78	1,314.37	0.93	-0.91	-0.33	
2,964.00	34.31	299.47	2,559.67	659.93	-1,198.05	1,367.76	0.89	-0.67	-1.03	
3,059.00	32.54	296.54	2,638.96	684.53	-1,244.23	1,420.07	2.52	-1.86	-3.08	
3,153.00	32.98	298.06	2,718.01	707.86	-1,289.42	1,470.92	0.99	0.47	1.62	
3,247.00	34.44	300.52	2,796.20	733.39	-1,334.90	1,523.07	2.13	1.55	2.62	
3,341.00	35.21	301.69	2,873.37	761.13	-1,380.86	1,576.69	1.08	0.82	1.24	
3,436.00	35.08	300.58	2,951.05	789.40	-1,427.67	1,631.32	0.69	-0.14	-1.17	
3,530.00	36.44	299.70	3,027.33	816.98	-1,475.17	1,686.23	1.55	1.45	-0.94	
3,624.00	36.07	299.81	3,103.13	844.57	-1,523.44	1,741.80	0.40	-0.39	0.12	
3,718.00	36.59	300.04	3,178.86	872.35	-1,571.70	1,797.47	0.57	0.55	0.24	
3,813.00	36.56	301.57	3,255.15	901.34	-1,620.32	1,854.03	0.96	-0.03	1.61	
3,907.00	36.01	299.50	3,330.92	929.60	-1,668.22	1,909.61	1.43	-0.59	-2.20	
4,001.00	33.65	298.58	3,408.08	955.67	-1,715.15	1,963.29	2.57	-2.51	-0.98	
4,096.00	31.99	299.21	3,487.91	980.55	-1,760.23	2,014.78	1.78	-1.75	0.66	
4,190.00	30.15	298.93	3,568.42	1,004.12	-1,802.63	2,063.28	1.96	-1.96	-0.30	
4,285.00	29.52	299.10	3,650.83	1,027.04	-1,843.96	2,110.54	0.67	-0.66	0.18	

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well GM 311-8 - Slot GM 311-8 (B10)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Site:	MV 60-8D Pad	MD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Well:	GM 311-8	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

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)
4,379.00	28.59	299.06	3,733.00	1,049.23	-1,883.86	2,156.19	0.99	-0.99	-0.04
4,473.00	26.42	298.49	3,816.37	1,070.13	-1,921.90	2,199.60	2.33	-2.31	-0.61
4,568.00	25.84	298.54	3,901.66	1,090.11	-1,958.66	2,241.44	0.61	-0.61	0.05
4,662.00	23.30	295.81	3,987.15	1,107.99	-1,993.40	2,280.50	2.96	-2.70	-2.90
4,756.00	21.99	295.82	4,073.90	1,123.75	-2,025.98	2,316.66	1.39	-1.39	0.01
4,850.00	19.38	296.77	4,161.83	1,138.44	-2,055.75	2,349.83	2.80	-2.78	1.01
4,945.00	16.51	294.22	4,252.20	1,151.08	-2,082.14	2,379.06	3.13	-3.02	-2.68
5,039.00	16.15	299.51	4,342.42	1,163.00	-2,105.70	2,405.45	1.63	-0.38	5.63
5,133.00	14.76	296.22	4,433.02	1,174.73	-2,127.82	2,430.49	1.75	-1.48	-3.50
5,228.00	13.61	295.79	4,525.12	1,184.94	-2,148.74	2,453.74	1.22	-1.21	-0.45
5,322.00	13.14	296.52	4,616.57	1,194.53	-2,168.26	2,475.47	0.53	-0.50	0.78
5,416.00	12.22	295.48	4,708.27	1,203.58	-2,186.80	2,496.08	1.01	-0.98	-1.11
5,511.00	10.49	304.72	4,801.42	1,212.83	-2,202.99	2,514.72	2.64	-1.82	9.73
5,569.13	9.23	305.59	4,858.69	1,218.56	-2,211.13	2,524.61	2.19	-2.17	1.49
GM 311-8 BTW									
5,604.00	8.47	306.23	4,893.14	1,221.70	-2,215.48	2,529.93	2.19	-2.17	1.84
5,698.00	6.85	308.91	4,986.30	1,229.31	-2,225.42	2,542.30	1.76	-1.72	2.85
5,793.00	4.77	307.05	5,080.81	1,235.25	-2,232.98	2,551.78	2.20	-2.19	-1.96
5,887.00	2.66	298.49	5,174.61	1,238.65	-2,238.02	2,557.82	2.31	-2.24	-9.11
5,982.00	1.30	272.95	5,269.55	1,239.76	-2,241.03	2,561.00	1.67	-1.43	-26.88
6,076.00	0.84	121.68	5,363.54	1,239.45	-2,241.51	2,561.28	2.21	-0.49	-160.93
6,171.00	0.91	189.55	5,458.53	1,238.34	-2,241.05	2,560.34	1.03	0.07	71.44
6,265.00	0.59	215.55	5,552.53	1,237.21	-2,241.45	2,560.15	0.49	-0.34	27.66
6,359.00	0.78	188.29	5,646.52	1,236.18	-2,241.82	2,559.99	0.40	0.20	-29.00
6,453.00	1.75	218.82	5,740.50	1,234.43	-2,242.82	2,560.03	1.22	1.03	32.48
6,547.00	2.13	201.81	5,834.44	1,231.69	-2,244.37	2,560.09	0.73	0.40	-18.10
6,642.00	2.03	200.94	5,929.38	1,228.48	-2,245.62	2,559.66	0.11	-0.11	-0.92
6,736.00	2.72	215.37	6,023.30	1,225.11	-2,247.51	2,559.71	0.97	0.73	15.35
6,830.00	2.55	201.82	6,117.20	1,221.35	-2,249.58	2,559.74	0.69	-0.18	-14.41
6,925.00	2.41	211.96	6,212.11	1,217.69	-2,251.42	2,559.62	0.48	-0.15	10.67
7,019.00	3.41	217.52	6,305.99	1,213.79	-2,254.17	2,560.18	1.10	1.06	5.91
7,113.00	3.06	216.72	6,399.84	1,209.57	-2,257.37	2,560.98	0.38	-0.37	-0.85
7,259.00	3.43	209.17	6,545.61	1,202.63	-2,261.83	2,561.60	0.39	0.25	-5.17
Last SDI Production MWD Survey									
7,319.00	3.43	209.17	6,605.50	1,199.49	-2,263.58	2,561.64	0.00	0.00	0.00
Projection to TD - GM 311-8 PBHL									



Scientific Drilling, Intl
Survey Report

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well GM 311-8 - Slot GM 311-8 (B10)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Site:	MV 60-8D Pad	MD Reference:	GL 6175' & RKB 24' @ 6199.00usft
Well:	GM 311-8	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
129.00	128.99	0.97	-0.70	First SDI Gyro MWD Survey
492.00	488.85	25.60	-34.36	Last SDI Gyro MWD Survey
566.00	560.59	34.45	-50.15	First SDI Surface MWD Survey
964.00	926.06	106.45	-186.70	Last SDI Surface MWD Survey
1,078.00	1,022.67	135.09	-240.00	First SDI Production MWD Survey
7,259.00	6,545.61	1,202.63	-2,261.83	Last SDI Production MWD Survey
7,319.00	6,605.50	1,199.49	-2,263.58	Projection to TD

Checked By: _____	Approved By: _____	Date: _____
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