



Well Details: RWF 411-17

TVD Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318) Level: 6174.50					
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	1627389.60	2317147.70	39.5309838	-107.9212318

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well RWF 411-17 - Slot RWF 411-17 (B7), True North
Vertical (TVD) Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Section (VS) Reference: Slot - RWF 411-17 (B7)(0.00N, 0.00E)
Measured Depth Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
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

11:29, June 24 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.	RWF 411-17
County & State	Garfield County, CO
SDI Job No.	OP.019109
Rig	H&P 318

I, Mel Mireles Jr., having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 120 feet to a measured depth of 8,944 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

24-Jun-19

Date

Mel Mireles Jr.

Grand Junction Assistant Well Planner
Scientific Drilling - Colorado District

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 411-17 - Slot RWF 411-17 (B7)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 411-17	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		DOE 1-M-18 Pad			
Site Position:		Northing:	1,627,441.60 usft	Latitude:	39.5311260
From:	Map	Easting:	2,317,141.30 usft	Longitude:	-107.9212595
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	-1.53 °

Well	RWF 411-17 - Slot RWF 411-17 (B7)					
Well Position	+N/-S	0.00 usft	Northing:	1,627,389.60 usft	Latitude:	39.5309838
	+E/-W	0.00 usft	Easting:	2,317,147.70 usft	Longitude:	-107.9212319
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	6,174.50 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	6/5/2019	9.33	65.75	51,479

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	103.58	

Survey Program	Date	6/24/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
120.00	579.00	Survey #1 - Gyro MWD Survey (OH)	Gyro MWD 105	Gyro MWD Error Model Ver 1.0.5	
650.00	1,069.00	Survey #2 - Surface MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
1,179.00	8,944.00	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	
120.00	0.26	212.43	120.00	-0.23	-0.15	-0.09	0.22	0.22	0.00	
First SDI Gyro MWD Survey										
212.00	1.76	107.14	211.99	-0.82	1.09	1.25	2.01	1.63	-114.45	
304.00	4.05	115.84	303.86	-2.66	5.37	5.84	2.53	2.49	9.46	
395.00	6.33	109.78	394.48	-5.75	12.98	13.97	2.57	2.51	-6.66	
487.00	7.74	105.03	485.79	-9.08	23.74	25.20	1.66	1.53	-5.16	
579.00	9.06	99.23	576.80	-11.85	36.87	38.62	1.70	1.43	-6.30	

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 411-17 - Slot RWF 411-17 (B7)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 411-17	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)
Last SDI Gyro MWD Survey									
650.00	9.87	98.90	646.83	-13.68	48.40	50.26	1.14	1.14	-0.46
First SDI Surface MWD Survey									
744.00	11.26	96.90	739.24	-16.03	65.47	67.41	1.53	1.48	-2.13
839.00	12.92	94.85	832.13	-18.05	85.26	87.12	1.80	1.75	-2.16
933.00	12.38	97.54	923.85	-20.26	105.72	107.52	0.85	-0.57	2.86
1,028.00	11.17	104.25	1,016.85	-23.86	124.74	126.85	1.92	-1.27	7.06
1,069.00	11.17	107.15	1,057.07	-26.01	132.38	134.79	1.37	0.00	7.07
Last SDI Surface MWD Survey									
1,179.00	11.26	108.07	1,164.97	-32.48	152.77	156.13	0.18	0.08	0.84
First SDI Production MWD Survey									
1,273.00	10.15	106.15	1,257.34	-37.63	169.46	173.55	1.24	-1.18	-2.04
1,368.00	10.25	106.79	1,350.84	-42.40	185.59	190.36	0.16	0.11	0.67
1,462.00	8.10	110.78	1,443.63	-47.17	199.79	205.28	2.38	-2.29	4.24
1,556.00	7.03	99.07	1,536.81	-50.42	211.66	217.58	1.99	-1.14	-12.46
1,651.00	6.95	105.46	1,631.11	-52.87	222.94	229.12	0.82	-0.08	6.73
1,745.00	7.12	103.64	1,724.40	-55.76	234.08	240.63	0.30	0.18	-1.94
1,839.00	6.77	100.12	1,817.71	-58.11	245.20	251.99	0.59	-0.37	-3.74
1,934.00	7.12	101.79	1,912.02	-60.29	256.48	263.46	0.43	0.37	1.76
2,028.00	6.77	102.41	2,005.33	-62.68	267.59	274.83	0.38	-0.37	0.66
2,123.00	6.63	100.12	2,099.68	-64.84	278.46	285.90	0.32	-0.15	-2.41
2,217.00	6.58	103.32	2,193.05	-67.04	289.04	296.70	0.40	-0.05	3.40
2,312.00	6.60	100.74	2,287.43	-69.31	299.70	307.60	0.31	0.02	-2.72
2,406.00	6.77	103.81	2,380.79	-71.64	310.39	318.53	0.42	0.18	3.27
2,500.00	6.68	106.71	2,474.14	-74.53	321.01	329.53	0.37	-0.10	3.09
2,595.00	6.42	105.04	2,568.52	-77.50	331.43	340.36	0.34	-0.27	-1.76
2,690.00	6.77	105.66	2,662.89	-80.39	341.95	351.26	0.38	0.37	0.65
2,784.00	7.03	103.37	2,756.21	-83.21	352.88	362.55	0.40	0.28	-2.44
2,879.00	6.16	102.93	2,850.58	-85.70	363.50	373.46	0.92	-0.92	-0.46
2,973.00	5.89	108.47	2,944.06	-88.36	372.99	383.31	0.68	-0.29	5.89
3,068.00	6.33	104.95	3,038.52	-91.25	382.68	393.40	0.61	0.46	-3.71
3,162.00	6.16	104.87	3,131.97	-93.88	392.56	403.63	0.18	-0.18	-0.09
3,257.00	5.89	109.09	3,226.44	-96.78	402.09	413.57	0.55	-0.28	4.44
3,352.00	5.63	103.02	3,320.96	-99.43	411.24	423.09	0.70	-0.27	-6.39
3,446.00	5.98	103.20	3,414.48	-101.59	420.50	432.59	0.37	0.37	0.19
3,540.00	5.98	104.16	3,507.97	-103.90	430.01	442.39	0.11	0.00	1.02
3,635.00	5.72	103.29	3,602.47	-106.20	439.42	452.07	0.29	-0.27	-0.92
3,729.00	5.72	106.27	3,696.01	-108.59	448.47	461.43	0.32	0.00	3.17
3,824.00	5.54	103.99	3,790.55	-111.02	457.47	470.75	0.30	-0.19	-2.40
3,918.00	6.60	106.01	3,884.02	-113.61	467.06	480.68	1.15	1.13	2.15
4,013.00	5.98	107.59	3,978.45	-116.61	477.03	491.07	0.68	-0.65	1.66
4,107.00	6.16	105.19	4,071.92	-119.41	486.56	501.00	0.33	0.19	-2.55
4,202.00	6.33	103.64	4,166.36	-121.98	496.57	511.33	0.25	0.18	-1.63
4,296.00	6.07	103.64	4,259.81	-124.38	506.44	521.48	0.28	-0.28	0.00

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 411-17 - Slot RWF 411-17 (B7)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 411-17	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)
4,391.00	6.01	110.38	4,354.28	-127.29	515.98	531.44	0.75	-0.06	7.09
4,485.00	5.63	111.81	4,447.80	-130.72	524.87	540.89	0.43	-0.40	1.52
4,579.00	6.51	94.50	4,541.28	-132.85	534.47	550.72	2.15	0.94	-18.41
4,674.00	5.74	98.06	4,635.73	-133.94	544.54	560.77	0.90	-0.81	3.75
4,769.00	5.13	104.10	4,730.31	-135.64	553.36	569.74	0.88	-0.64	6.36
4,863.00	6.08	90.73	4,823.86	-136.73	562.42	578.80	1.71	1.01	-14.22
4,957.00	6.07	93.27	4,917.33	-137.08	572.36	588.54	0.29	-0.01	2.70
5,052.00	5.72	94.14	5,011.83	-137.71	582.09	598.15	0.38	-0.37	0.92
5,146.00	5.28	98.10	5,105.40	-138.65	591.05	607.08	0.62	-0.47	4.21
5,241.00	6.07	79.91	5,199.94	-138.39	600.32	616.03	2.06	0.83	-19.15
5,335.00	5.54	80.79	5,293.46	-136.79	609.69	624.77	0.57	-0.56	0.94
5,430.00	4.71	76.82	5,388.08	-135.17	618.02	632.48	0.95	-0.87	-4.18
5,524.00	4.22	84.21	5,481.79	-133.94	625.22	639.19	0.80	-0.52	7.86
5,619.00	3.52	80.26	5,576.57	-133.09	631.57	645.16	0.79	-0.74	-4.16
5,713.00	3.96	82.72	5,670.37	-132.19	637.63	650.85	0.50	0.47	2.62
5,807.00	3.87	81.14	5,764.15	-131.29	643.99	656.81	0.15	-0.10	-1.68
5,902.00	3.43	83.42	5,858.96	-130.47	649.98	662.44	0.49	-0.46	2.40
5,996.00	2.29	75.16	5,952.84	-129.67	654.59	666.73	1.29	-1.21	-8.79
6,090.00	3.08	92.30	6,046.74	-129.29	658.92	670.86	1.19	0.84	18.23
6,185.00	2.71	78.06	6,141.62	-128.93	663.67	675.39	0.85	-0.39	-14.99
6,279.00	2.90	119.00	6,235.52	-129.62	667.93	679.69	2.09	0.20	43.55
6,374.00	2.82	128.83	6,330.40	-132.25	671.85	684.12	0.52	-0.08	10.35
6,468.00	2.73	117.61	6,424.29	-134.74	675.63	688.38	0.58	-0.10	-11.94
6,501.12	2.60	117.42	6,457.37	-135.45	677.00	689.88	0.38	-0.38	-0.58
RWF 411-17 KMV									
6,563.00	2.37	117.00	6,519.20	-136.68	679.39	692.49	0.38	-0.38	-0.67
6,657.00	2.46	117.96	6,613.11	-138.51	682.90	696.33	0.10	0.10	1.02
6,751.00	1.93	136.95	6,707.04	-140.61	685.76	699.61	0.95	-0.56	20.20
6,846.00	2.11	155.05	6,801.99	-143.37	687.59	702.03	0.69	0.19	19.05
6,940.00	1.30	110.35	6,895.95	-145.31	689.32	704.17	1.59	-0.86	-47.55
7,035.00	1.66	121.02	6,990.92	-146.39	691.51	706.55	0.48	0.38	11.23
7,129.00	1.63	103.55	7,084.88	-147.40	693.98	709.19	0.53	-0.03	-18.59
7,224.00	1.49	96.25	7,179.84	-147.86	696.52	711.77	0.26	-0.15	-7.68
7,318.00	1.51	93.48	7,273.81	-148.06	698.97	714.20	0.08	0.02	-2.95
7,413.00	1.52	100.31	7,368.78	-148.37	701.46	716.69	0.19	0.01	7.19
7,508.00	1.58	144.42	7,463.75	-149.66	703.46	718.94	1.23	0.06	46.43
7,602.00	1.67	129.39	7,557.71	-151.58	705.28	721.15	0.46	0.10	-15.99
7,696.00	1.34	135.05	7,651.68	-153.23	707.11	723.32	0.38	-0.35	6.02
7,791.00	1.60	137.96	7,746.64	-155.00	708.78	725.36	0.28	0.27	3.06
7,885.00	1.76	119.61	7,840.61	-156.69	710.92	727.83	0.59	0.17	-19.52
7,980.00	1.85	143.30	7,935.56	-158.64	713.10	730.41	0.79	0.09	24.94
8,074.00	2.54	152.67	8,029.49	-161.70	714.97	732.95	0.83	0.73	9.97
8,169.00	1.76	155.44	8,124.42	-164.90	716.54	735.23	0.83	-0.82	2.92
8,263.00	2.01	156.57	8,218.37	-167.73	717.79	737.11	0.27	0.27	1.20

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Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 411-17	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)
8,358.00	2.38	161.46	8,313.30	-171.12	719.08	739.16	0.44	0.39	5.15
8,452.00	1.97	146.09	8,407.23	-174.32	720.61	741.39	0.75	-0.44	-16.35
8,547.00	1.82	172.74	8,502.18	-177.17	721.71	743.13	0.93	-0.16	28.05
8,641.00	1.55	155.38	8,596.14	-179.80	722.43	744.45	0.61	-0.29	-18.47
8,736.00	1.48	163.99	8,691.11	-182.15	723.30	745.85	0.25	-0.07	9.06
8,830.00	1.80	130.76	8,785.07	-184.28	724.75	747.76	1.05	0.34	-35.35
8,887.00	2.02	100.38	8,842.04	-185.05	726.42	749.56	1.79	0.39	-53.30
Last SDI Production MWD Survey									
8,944.00	2.02	100.38	8,899.01	-185.41	728.40	751.57	0.00	0.00	0.00
Projection to TD - RWF 411-17 PBHL									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
120.00	120.00	-0.23	-0.15	First SDI Gyro MWD Survey
579.00	576.80	-11.85	36.87	Last SDI Gyro MWD Survey
650.00	646.83	-13.68	48.40	First SDI Surface MWD Survey
1,069.00	1,057.07	-26.01	132.38	Last SDI Surface MWD Survey
1,179.00	1,164.97	-32.48	152.77	First SDI Production MWD Survey
8,887.00	8,842.04	-185.05	726.42	Last SDI Production MWD Survey
8,944.00	8,899.01	-185.41	728.40	Projection to TD

Checked By: _____	Approved By: _____	Date: _____
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