

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 11-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4872.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4872.0ft (Original Well Elev)
Well:	Herren 11-33H-H367	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Sec 33 T3N-R67W, Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		Herren Pad			
Site Position:		Northing:	1,310,206.92 ft	Latitude:	40.183282
From:	Map	Easting:	3,171,259.40 ft	Longitude:	-104.887065
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.40 °

Well	Herren 11-33H-H367					
Well Position	+N/-S	0.0 ft	Northing:	1,310,157.42 ft	Latitude:	40.183147
	+E/-W	0.0 ft	Easting:	3,171,209.90 ft	Longitude:	-104.887243
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,849.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM_FILE	12/31/2018	8.40	66.57	52,125.40000000

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	272.79	

Survey Program	Date	1/10/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
168.0	1,941.0	Survey #1 (Wellbore #1)	GYRO-MWD	OWSG Gyro MWD	
2,009.0	11,830.0	Survey #2 (Wellbore #1)	MWD+HDGM	OWSG MWD + HDGM	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
168.0	0.62	213.75	168.0	-0.8	-0.5	0.5	0.37	0.37		
265.0	0.79	231.59	265.0	-1.6	-1.3	1.2	0.28	0.18		
359.0	1.58	101.95	359.0	-2.3	-0.6	0.4	2.31	0.84		
454.0	3.52	88.15	453.9	-2.5	3.6	-3.8	2.13	2.04		
549.0	5.89	83.67	548.6	-1.8	11.4	-11.5	2.52	2.49		
643.0	8.36	81.30	641.8	-0.3	22.9	-22.9	2.65	2.63		
738.0	8.45	76.11	735.8	2.5	36.5	-36.4	0.80	0.09		
833.0	8.18	71.98	829.8	6.2	49.8	-49.4	0.69	-0.28		
927.0	7.92	68.12	922.9	10.7	62.1	-61.5	0.64	-0.28		
1,002.0	7.60	65.42	997.2	14.7	71.4	-70.6	0.65	-0.43		
1,096.0	7.76	61.09	1,090.4	20.4	82.6	-81.5	0.64	0.17		

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 11-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4872.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4872.0ft (Original Well Elev)
Well:	Herren 11-33H-H367	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
1,191.0	8.14	76.94	1,184.5	25.0	94.8	-93.5	2.33	0.40	
1,285.0	8.22	78.34	1,277.5	27.8	107.9	-106.4	0.23	0.09	
1,380.0	8.16	77.77	1,371.5	30.6	121.1	-119.5	0.11	-0.06	
1,474.0	7.60	72.73	1,464.6	33.9	133.6	-131.8	0.95	-0.60	
1,569.0	7.09	69.46	1,558.9	37.8	145.1	-143.0	0.69	-0.54	
1,663.0	6.13	80.25	1,652.2	40.7	155.4	-153.3	1.67	-1.02	
1,758.0	5.24	77.11	1,746.8	42.5	164.7	-162.4	0.99	-0.94	
1,852.0	4.85	71.98	1,840.4	44.7	172.6	-170.2	0.63	-0.41	
1,941.0	5.32	85.49	1,929.1	46.2	180.3	-177.9	1.44	0.53	
2,009.0	5.00	92.98	1,996.8	46.3	186.4	-183.9	1.10	-0.47	
2,072.0	4.88	93.61	2,059.5	46.0	191.8	-189.4	0.21	-0.19	
2,166.0	7.38	97.79	2,153.0	44.9	201.8	-199.4	2.70	2.66	
2,260.0	6.38	96.44	2,246.3	43.5	213.0	-210.6	1.08	-1.06	
2,354.0	7.51	98.24	2,339.6	42.0	224.2	-221.9	1.22	1.20	
2,448.0	7.25	81.97	2,432.9	42.0	236.2	-233.9	2.23	-0.28	
2,543.0	8.66	84.13	2,527.0	43.6	249.3	-246.8	1.52	1.48	
2,638.0	7.95	82.90	2,621.0	45.1	262.9	-260.4	0.77	-0.75	
2,669.0	7.71	82.09	2,651.7	45.7	267.1	-264.5	0.85	-0.77	
2,701.0	7.64	81.50	2,683.4	46.3	271.3	-268.7	0.33	-0.22	
2,732.0	7.40	81.62	2,714.1	46.9	275.3	-272.7	0.78	-0.77	
2,826.0	6.25	81.24	2,807.4	48.5	286.4	-283.7	1.22	-1.22	
2,920.0	6.53	90.57	2,900.9	49.3	296.8	-294.0	1.14	0.30	
3,015.0	7.31	93.41	2,995.2	48.8	308.2	-305.5	0.90	0.82	
3,109.0	7.36	89.31	3,088.4	48.6	320.2	-317.4	0.56	0.05	
3,204.0	7.19	76.82	3,182.6	50.0	332.1	-329.2	1.67	-0.18	
3,298.0	7.09	63.29	3,275.9	53.9	343.0	-339.9	1.79	-0.11	
3,393.0	6.16	61.46	3,370.3	59.0	352.7	-349.4	1.00	-0.98	
3,487.0	6.10	72.41	3,463.8	62.9	361.9	-358.4	1.24	-0.06	
3,582.0	5.06	68.26	3,558.3	66.0	370.6	-366.9	1.17	-1.09	
3,676.0	4.07	75.01	3,652.0	68.4	377.7	-373.9	1.20	-1.05	
3,794.0	5.01	92.50	3,769.6	69.3	386.8	-383.0	1.41	0.80	
3,888.0	7.85	103.31	3,863.0	67.6	397.2	-393.4	3.27	3.02	
3,983.0	8.67	89.94	3,957.1	66.1	410.7	-407.0	2.19	0.86	
4,078.0	8.52	74.13	4,051.0	68.0	424.6	-420.8	2.48	-0.16	
4,172.0	8.20	60.92	4,144.0	73.2	437.2	-433.1	2.07	-0.34	
4,267.0	6.51	59.93	4,238.2	79.2	447.7	-443.4	1.78	-1.78	
4,362.0	7.61	65.42	4,332.5	84.5	458.1	-453.5	1.36	1.16	
4,456.0	6.98	62.57	4,425.8	89.7	468.9	-463.9	0.77	-0.67	
4,550.0	6.20	60.63	4,519.1	94.9	478.4	-473.2	0.86	-0.83	
4,645.0	5.35	58.01	4,613.7	99.7	486.6	-481.1	0.94	-0.89	
4,740.0	6.72	74.38	4,708.1	103.6	495.7	-490.1	2.30	1.44	
4,834.0	5.43	76.96	4,801.6	106.0	505.3	-499.6	1.40	-1.37	
4,928.0	4.84	72.86	4,895.2	108.2	513.4	-507.6	0.74	-0.63	
5,023.0	6.62	76.78	4,989.7	110.7	522.6	-516.6	1.92	1.87	
5,117.0	5.13	74.01	5,083.2	113.0	531.9	-525.8	1.61	-1.59	
5,212.0	6.19	84.17	5,177.8	114.7	541.1	-534.9	1.53	1.12	
5,307.0	8.36	85.84	5,272.0	115.8	553.1	-546.8	2.29	2.28	
5,402.0	8.37	68.96	5,366.0	118.7	566.4	-560.0	2.58	0.01	
5,496.0	6.43	65.02	5,459.2	123.4	577.6	-570.9	2.13	-2.06	
5,590.0	4.84	55.35	5,552.8	127.9	585.6	-578.7	1.96	-1.69	
5,685.0	5.91	63.92	5,647.4	132.3	593.3	-586.2	1.41	1.13	
5,779.0	4.79	92.66	5,741.0	134.3	601.6	-594.3	3.05	-1.19	
5,873.0	6.98	97.19	5,834.5	133.4	611.2	-603.9	2.38	2.33	

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 11-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4872.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4872.0ft (Original Well Elev)
Well:	Herren 11-33H-H367	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
5,968.0	7.00	89.85	5,928.8	132.7	622.7	-615.5	0.94	0.02	
6,062.0	9.37	86.44	6,021.8	133.2	636.0	-628.8	2.57	2.52	
6,156.0	9.75	59.48	6,114.5	137.7	650.5	-643.1	4.74	0.40	
6,251.0	8.80	53.92	6,208.3	146.0	663.4	-655.5	1.37	-1.00	
6,346.0	4.88	30.72	6,302.6	153.8	671.3	-663.0	4.97	-4.13	
6,393.0	4.11	306.92	6,349.5	156.5	671.0	-662.6	12.82	-1.64	
6,440.0	5.70	269.70	6,396.4	157.5	667.3	-658.8	7.39	3.38	
6,487.0	9.47	276.86	6,442.9	158.0	661.1	-652.6	8.25	8.02	
6,535.0	12.35	280.61	6,490.1	159.4	652.1	-643.6	6.18	6.00	
6,582.0	15.90	292.22	6,535.6	162.8	641.2	-632.6	9.63	7.55	
6,629.0	19.64	294.37	6,580.4	168.5	628.1	-619.1	8.08	7.96	
6,676.0	23.20	297.47	6,624.1	176.0	612.7	-603.4	7.95	7.57	
6,724.0	25.53	298.83	6,667.9	185.3	595.2	-585.5	4.99	4.85	
6,771.0	28.45	295.34	6,709.7	195.0	576.2	-566.0	7.07	6.21	
6,819.0	32.34	292.91	6,751.1	204.9	554.0	-543.4	8.50	8.10	
6,866.0	33.92	286.28	6,790.5	213.5	529.9	-518.8	8.41	3.36	
6,913.0	35.77	280.26	6,829.1	219.6	503.8	-492.5	8.31	3.94	
6,960.0	38.56	273.74	6,866.6	223.0	475.6	-464.2	10.26	5.94	
7,008.0	43.05	273.54	6,902.9	225.0	444.3	-432.8	9.36	9.35	
7,055.0	48.50	273.26	6,935.7	227.0	410.7	-399.2	11.60	11.60	
7,103.0	53.16	271.36	6,966.0	228.5	373.5	-362.0	10.18	9.71	
7,150.0	57.24	270.46	6,992.8	229.1	334.9	-323.4	8.82	8.68	
7,197.0	61.29	271.08	7,016.8	229.6	294.6	-283.0	8.69	8.62	
7,244.0	64.62	270.00	7,038.2	230.0	252.7	-241.2	7.37	7.09	
7,291.0	66.75	269.99	7,057.5	230.0	209.9	-198.4	4.53	4.53	
7,338.0	69.85	267.67	7,074.9	229.1	166.2	-154.9	8.03	6.60	
7,386.0	73.73	267.07	7,089.9	227.0	120.7	-109.5	8.17	8.08	
7,433.0	76.45	268.06	7,102.0	225.1	75.3	-64.3	6.13	5.79	
7,481.0	78.25	266.41	7,112.5	222.8	28.5	-17.7	5.03	3.75	
7,528.0	81.56	265.34	7,120.7	219.5	-17.6	28.3	7.39	7.04	
7,553.0	84.13	264.09	7,123.9	217.2	-42.3	52.8	11.41	10.27	TPZ - 7553.0' MD (2089 FNL, 460 FEL)
7,575.0	86.39	263.00	7,125.7	214.8	-64.1	74.5	11.41	10.28	
7,669.0	93.29	263.98	7,125.9	204.1	-157.4	167.2	7.41	7.34	
7,764.0	92.09	265.59	7,121.5	195.5	-251.9	261.1	2.11	-1.26	
7,859.0	89.67	268.17	7,120.0	190.3	-346.8	355.6	3.72	-2.55	
7,953.0	89.16	268.79	7,121.0	187.8	-440.7	449.3	0.85	-0.54	
8,047.0	88.80	268.23	7,122.6	185.4	-534.7	543.1	0.71	-0.38	
8,142.0	89.26	269.99	7,124.3	183.9	-629.6	637.8	1.91	0.48	
8,237.0	88.96	269.25	7,125.7	183.3	-724.6	732.7	0.84	-0.32	
8,331.0	88.52	271.64	7,127.8	184.0	-818.6	826.6	2.58	-0.47	
8,426.0	88.61	271.63	7,130.2	186.7	-913.5	921.5	0.10	0.09	
8,520.0	88.39	271.44	7,132.6	189.2	-1,007.5	1,015.5	0.31	-0.23	
8,614.0	87.91	271.22	7,135.7	191.4	-1,101.4	1,109.4	0.56	-0.51	
8,709.0	89.32	272.28	7,138.0	194.3	-1,196.3	1,204.3	1.86	1.48	
8,803.0	89.07	272.35	7,139.3	198.1	-1,290.2	1,298.3	0.28	-0.27	
8,897.0	90.45	271.50	7,139.7	201.3	-1,384.2	1,392.3	1.72	1.47	
8,992.0	90.62	271.70	7,138.8	203.9	-1,479.1	1,487.3	0.28	0.18	
9,088.0	90.05	269.50	7,138.2	204.9	-1,575.1	1,583.2	2.37	-0.59	
9,183.0	89.76	268.92	7,138.4	203.6	-1,670.1	1,678.0	0.68	-0.31	
9,277.0	88.86	268.72	7,139.5	201.7	-1,764.1	1,771.8	0.98	-0.96	
9,371.0	88.08	268.37	7,142.0	199.3	-1,858.0	1,865.5	0.91	-0.83	
9,466.0	89.32	269.05	7,144.2	197.1	-1,953.0	1,960.2	1.49	1.31	
9,560.0	91.01	269.99	7,143.9	196.4	-2,047.0	2,054.1	2.06	1.80	

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 11-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4872.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4872.0ft (Original Well Elev)
Well:	Herren 11-33H-H367	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
9,655.0	90.91	270.55	7,142.3	196.8	-2,141.9	2,149.0	0.60	-0.11	
9,749.0	90.31	270.19	7,141.3	197.4	-2,235.9	2,242.9	0.74	-0.64	
9,843.0	89.56	269.79	7,141.4	197.4	-2,329.9	2,336.8	0.90	-0.80	
9,938.0	90.37	271.95	7,141.5	198.8	-2,424.9	2,431.7	2.43	0.85	
10,032.0	89.83	271.70	7,141.3	201.8	-2,518.9	2,525.7	0.63	-0.57	
10,127.0	91.05	271.80	7,140.6	204.7	-2,613.8	2,620.7	1.29	1.28	
10,221.0	90.56	271.52	7,139.3	207.5	-2,707.8	2,714.7	0.60	-0.52	
10,315.0	89.84	270.97	7,138.9	209.5	-2,801.7	2,808.6	0.96	-0.77	
10,410.0	89.23	270.11	7,139.7	210.4	-2,896.7	2,903.5	1.11	-0.64	
10,504.0	88.44	269.72	7,141.6	210.3	-2,990.7	2,997.4	0.94	-0.84	
10,599.0	87.73	269.68	7,144.8	209.8	-3,085.7	3,092.2	0.75	-0.75	
10,693.0	89.61	269.66	7,147.0	209.2	-3,179.6	3,186.0	2.00	2.00	
10,788.0	91.14	269.55	7,146.4	208.6	-3,274.6	3,280.9	1.61	1.61	
10,883.0	90.77	269.28	7,144.8	207.6	-3,369.6	3,375.7	0.48	-0.39	
10,977.0	90.83	268.95	7,143.5	206.1	-3,463.6	3,469.5	0.36	0.06	
11,072.0	90.28	268.99	7,142.5	204.4	-3,558.6	3,564.3	0.58	-0.58	
11,167.0	89.10	268.80	7,143.1	202.6	-3,653.5	3,659.1	1.26	-1.24	
11,261.0	88.05	269.00	7,145.4	200.8	-3,747.5	3,752.8	1.14	-1.12	
11,356.0	88.19	270.33	7,148.5	200.2	-3,842.4	3,847.6	1.41	0.15	
11,450.0	89.00	271.56	7,150.8	201.8	-3,936.4	3,941.6	1.57	0.86	
11,545.0	88.34	271.42	7,153.0	204.3	-4,031.3	4,036.5	0.71	-0.69	
11,639.0	89.05	271.45	7,155.2	206.6	-4,125.3	4,130.5	0.76	0.76	
11,734.0	87.69	271.30	7,157.9	208.9	-4,220.2	4,225.4	1.44	-1.43	
11,760.0	87.25	271.36	7,159.0	209.5	-4,246.2	4,251.3	1.71	-1.69	LAST SURVEY - 11760.0' MD
11,830.0	87.25	271.36	7,162.4	211.2	-4,316.1	4,321.2	0.00	0.00	PTB - 11830.0' MD (2149 FNL, 465 FWL)

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 11-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4872.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4872.0ft (Original Well Elev)
Well:	Herren 11-33H-H367	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
HERREN 11 2905' TGT - actual wellpath misses target center by 7.0ft at 10418.2ft MD (7139.8 TVD, 210.4 N, -2905.0 E) - Point	0.00	0.00	7,137.0	204.0	-2,905.0	1,310,341.39	3,168,303.56	40.183707	-104.897641
HERREN 11-33H-H367 F - actual wellpath misses target center by 6.9ft at 11830.0ft MD (7162.4 TVD, 211.2 N, -4316.1 E) - Point	0.00	0.00	7,158.0	210.9	-4,321.4	1,310,338.44	3,166,887.13	40.183725	-104.902710
Herren 11-33H-H367 TPZ - actual wellpath misses target center by 69.1ft at 7556.9ft MD (7124.2 TVD, 216.8 N, -46.2 E) - Point	0.00	0.00	7,090.0	157.0	-42.3	1,310,314.09	3,171,166.55	40.183578	-104.887395
HERREN 11 42' TGT - actual wellpath misses target center by 27.2ft at 7556.3ft MD (7124.2 TVD, 216.9 N, -45.5 E) - Point	0.00	0.00	7,127.0	190.0	-42.3	1,310,347.12	3,171,166.32	40.183669	-104.887395
HERREN 11 1711' TGT - actual wellpath misses target center by 4.8ft at 9224.0ft MD (7138.7 TVD, 202.8 N, -1711.1 E) - Point	0.00	0.00	7,137.0	198.3	-1,711.0	1,310,343.88	3,169,497.57	40.183691	-104.893367

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,553.0	7,123.9	217.2	-42.3	TPZ - 7553.0' MD (2089 FNL, 460 FEL)	
11,760.0	7,159.0	209.5	-4,246.2	LAST SURVEY - 11760.0' MD	
11,830.0	7,162.4	211.2	-4,316.1	PTB - 11830.0' MD (2149 FNL, 465 FWL)	

Checked By: _____ Approved By: _____ Date: _____