

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 1F-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4871.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4871.0ft (Original Well Elev)
Well:	Herren 1F-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 1F-33H-H367					
Well Position	+N/-S	0.0 ft	Northing:	1,310,178.63 ft	Latitude:	40.183205
	+E/-W	0.0 ft	Easting:	3,171,231.12 ft	Longitude:	-104.887167
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,848.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM_FILE	12/19/2018	8.40	66.57	52,129.30000000

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	284.65	

Survey Program	Date	1/2/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
177.0	1,929.0	Survey #1 (Wellbore #1)	GYRO-MWD	OWSG Gyro MWD	
2,010.0	12,098.0	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	
177.0	0.62	99.67	177.0	-0.2	0.9	-1.0	0.35	0.35	
272.0	0.79	118.83	272.0	-0.6	2.0	-2.1	0.30	0.18	
367.0	0.88	122.78	367.0	-1.3	3.2	-3.4	0.11	0.09	
461.0	1.32	38.94	461.0	-0.8	4.5	-4.6	1.60	0.47	
556.0	2.99	14.94	555.9	2.4	5.8	-5.0	1.96	1.76	
650.0	5.37	12.66	649.6	9.1	7.4	-4.9	2.54	2.53	
745.0	6.42	9.32	744.1	18.7	9.3	-4.2	1.16	1.11	
819.0	7.79	14.60	817.6	27.6	11.2	-3.8	2.05	1.85	
913.0	9.58	26.02	910.5	40.8	16.2	-5.4	2.64	1.90	
1,008.0	10.66	33.54	1,004.0	55.2	24.6	-9.8	1.79	1.14	
1,102.0	12.44	36.43	1,096.1	70.6	35.4	-16.4	1.99	1.89	

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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
1,197.0	13.18	41.26	1,188.8	87.0	48.6	-25.0	1.37	0.78	
1,291.0	13.60	38.11	1,280.2	103.7	62.5	-34.2	0.90	0.45	
1,386.0	13.30	32.77	1,372.6	121.7	75.3	-42.1	1.34	-0.32	
1,480.0	12.21	31.49	1,464.3	139.3	86.3	-48.3	1.20	-1.16	
1,575.0	9.95	34.05	1,557.5	154.7	96.2	-53.9	2.43	-2.38	
1,669.0	8.78	41.99	1,650.2	166.7	105.5	-59.9	1.85	-1.24	
1,764.0	6.93	34.23	1,744.4	176.9	113.6	-65.2	2.24	-1.95	
1,859.0	7.07	39.24	1,838.6	186.1	120.5	-69.5	0.66	0.15	
1,929.0	8.33	39.32	1,908.0	193.4	126.5	-73.4	1.80	1.80	
2,010.0	9.32	40.84	1,988.1	202.9	134.5	-78.8	1.26	1.22	
2,073.0	9.62	39.44	2,050.2	210.8	141.1	-83.2	0.60	0.48	
2,168.0	11.07	36.89	2,143.7	224.2	151.7	-90.0	1.60	1.53	
2,261.0	13.05	34.34	2,234.6	240.0	162.9	-96.9	2.20	2.13	
2,356.0	10.90	31.17	2,327.5	256.6	173.6	-103.1	2.37	-2.26	
2,450.0	12.61	33.11	2,419.6	272.8	183.9	-108.9	1.87	1.82	
2,545.0	11.16	28.63	2,512.5	289.5	193.9	-114.4	1.81	-1.53	
2,639.0	13.84	35.22	2,604.3	306.7	204.8	-120.5	3.23	2.85	
2,733.0	12.88	31.26	2,695.7	324.9	216.7	-127.5	1.41	-1.02	
2,827.0	12.35	39.08	2,787.5	341.6	228.5	-134.6	1.90	-0.56	
2,922.0	10.50	33.64	2,880.6	356.7	239.7	-141.7	2.25	-1.95	
3,016.0	10.72	43.30	2,973.0	370.2	250.4	-148.6	1.90	0.23	
3,111.0	8.97	39.79	3,066.6	382.3	261.2	-156.0	1.95	-1.84	
3,206.0	10.42	36.27	3,160.2	394.9	271.0	-162.3	1.65	1.53	
3,300.0	8.48	32.14	3,253.0	407.7	279.7	-167.5	2.18	-2.06	
3,394.0	10.33	35.39	3,345.7	420.4	288.3	-172.6	2.05	1.97	
3,489.0	10.64	32.67	3,439.1	434.7	298.0	-178.3	0.61	0.33	
3,583.0	9.01	37.94	3,531.7	447.8	307.2	-183.9	1.98	-1.73	
3,677.0	10.90	28.54	3,624.3	461.5	316.0	-189.0	2.65	2.01	
3,796.0	11.65	26.09	3,741.0	482.1	326.6	-194.1	0.75	0.63	
3,891.0	11.12	28.54	3,834.1	498.8	335.2	-198.2	0.76	-0.56	
3,985.0	13.76	33.11	3,925.9	516.1	345.7	-203.9	3.00	2.81	
4,080.0	13.67	36.45	4,018.2	534.6	358.5	-211.6	0.84	-0.09	
4,174.0	11.03	33.11	4,110.0	551.1	370.0	-218.6	2.91	-2.81	
4,269.0	10.90	44.71	4,203.3	565.1	381.3	-226.0	2.32	-0.14	
4,363.0	12.17	42.86	4,295.4	578.7	394.3	-235.1	1.41	1.35	
4,458.0	13.23	39.08	4,388.1	594.5	408.0	-244.4	1.42	1.12	
4,552.0	12.57	35.66	4,479.7	611.1	420.7	-252.5	1.07	-0.70	
4,647.0	11.34	32.49	4,572.7	627.4	431.7	-259.0	1.47	-1.29	
4,741.0	9.19	26.08	4,665.2	641.9	440.0	-263.4	2.59	-2.29	
4,836.0	11.03	32.40	4,758.7	656.4	448.2	-267.6	2.26	1.94	
4,930.0	14.06	35.66	4,850.4	673.3	459.7	-274.5	3.31	3.22	
5,025.0	12.92	31.88	4,942.8	691.7	472.0	-281.7	1.52	-1.20	
5,119.0	10.99	29.94	5,034.8	708.4	482.1	-287.2	2.10	-2.05	
5,213.0	9.19	28.71	5,127.3	722.7	490.1	-291.4	1.93	-1.91	
5,308.0	9.67	37.94	5,221.0	735.7	498.7	-296.4	1.67	0.51	
5,403.0	8.17	34.51	5,314.9	747.5	507.4	-301.9	1.67	-1.58	
5,498.0	9.10	38.91	5,408.8	758.9	516.0	-307.2	1.20	0.98	
5,592.0	11.21	40.49	5,501.3	771.7	526.6	-314.3	2.26	2.24	
5,687.0	12.57	40.93	5,594.3	786.5	539.3	-322.9	1.43	1.43	
5,781.0	13.27	32.67	5,685.9	803.3	551.9	-330.7	2.10	0.74	
5,875.0	10.68	29.86	5,777.9	820.0	562.0	-336.4	2.82	-2.76	
5,969.0	11.03	26.52	5,870.2	835.6	570.4	-340.5	0.77	0.37	
6,064.0	12.35	28.45	5,963.2	852.6	579.3	-344.8	1.45	1.39	

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6,158.0	12.26	38.82	6,055.1	869.2	590.3	-351.3	2.35	-0.10	
6,253.0	9.58	35.13	6,148.3	883.6	601.2	-358.2	2.91	-2.82	
6,348.0	11.03	43.48	6,241.8	896.6	612.0	-365.3	2.19	1.53	
6,442.0	9.05	34.69	6,334.4	909.2	622.4	-372.2	2.66	-2.11	
6,537.0	10.50	31.00	6,428.0	922.8	631.1	-377.2	1.66	1.53	
6,631.0	9.67	8.94	6,520.6	937.9	636.7	-378.8	4.18	-0.88	
6,678.0	12.22	338.97	6,566.7	946.5	635.6	-375.5	13.07	5.43	
6,725.0	16.17	320.42	6,612.3	956.2	629.6	-367.3	12.72	8.40	
6,772.0	17.67	300.65	6,657.3	964.9	619.3	-355.1	12.59	3.19	
6,820.0	18.77	281.57	6,703.0	970.1	605.4	-340.4	12.58	2.29	
6,867.0	19.86	278.67	6,747.3	972.9	590.1	-324.9	3.09	2.32	
6,915.0	21.05	279.20	6,792.3	975.5	573.6	-308.2	2.51	2.48	
6,962.0	21.75	278.94	6,836.0	978.2	556.6	-291.2	1.50	1.49	
7,010.0	24.52	284.04	6,880.2	982.0	538.2	-272.3	7.12	5.77	
7,057.0	28.83	287.99	6,922.2	987.8	517.9	-251.3	9.91	9.17	
7,104.0	31.47	293.09	6,962.8	996.2	495.9	-227.8	7.82	5.62	
7,151.0	34.23	296.87	7,002.3	1,006.9	472.8	-202.7	7.31	5.87	
7,199.0	38.72	297.57	7,040.9	1,020.0	447.4	-174.9	9.39	9.35	
7,246.0	42.85	294.93	7,076.5	1,033.5	419.9	-144.8	9.52	8.79	
7,293.0	45.62	292.47	7,110.1	1,046.7	389.9	-112.5	6.93	5.89	
7,340.0	47.11	288.34	7,142.6	1,058.5	358.0	-78.6	7.10	3.17	
7,388.0	48.74	283.42	7,174.8	1,068.3	323.7	-43.0	8.33	3.40	
7,435.0	50.76	281.22	7,205.1	1,075.9	288.7	-7.2	5.59	4.30	
7,482.0	56.29	278.67	7,233.1	1,082.4	251.5	30.5	12.55	11.77	
7,529.0	61.08	277.44	7,257.5	1,088.0	211.7	70.3	10.43	10.19	
7,577.0	65.52	273.14	7,279.1	1,091.9	169.1	112.6	12.23	9.25	
7,624.0	69.96	270.32	7,296.9	1,093.2	125.6	155.0	10.96	9.45	
7,671.0	73.52	268.39	7,311.6	1,092.7	81.0	198.0	8.52	7.57	
7,718.0	77.65	266.11	7,323.3	1,090.5	35.5	241.4	9.96	8.79	
7,766.0	79.41	265.14	7,332.8	1,086.9	-11.4	285.9	4.17	3.67	
7,813.0	84.68	265.23	7,339.3	1,083.0	-57.7	329.8	11.21	11.21	
7,823.7	86.16	265.59	7,340.2	1,082.2	-68.4	339.8	14.25	13.85	TPZ - 7823.7' MD (1203 FNL, 460 FEL)
7,860.0	91.19	266.81	7,341.0	1,079.8	-104.6	374.3	14.25	13.85	
7,955.0	91.67	268.65	7,338.7	1,076.0	-199.5	465.1	2.00	0.51	
8,049.0	91.27	268.48	7,336.2	1,073.7	-293.4	555.4	0.46	-0.43	
8,144.0	90.09	268.48	7,335.1	1,071.1	-388.4	646.7	1.24	-1.24	
8,238.0	89.74	271.20	7,335.3	1,070.9	-482.4	737.5	2.92	-0.37	
8,333.0	92.59	271.82	7,333.3	1,073.4	-577.3	830.0	3.07	3.00	
8,428.0	92.90	271.73	7,328.8	1,076.3	-672.1	922.5	0.34	0.33	
8,522.0	90.97	272.61	7,325.6	1,079.9	-766.0	1,014.2	2.26	-2.05	
8,616.0	90.48	272.17	7,324.4	1,083.8	-859.9	1,106.1	0.70	-0.52	
8,710.0	89.30	271.56	7,324.6	1,086.9	-953.9	1,197.7	1.41	-1.26	
8,805.0	88.81	270.68	7,326.2	1,088.7	-1,048.8	1,290.1	1.06	-0.52	
8,899.0	89.12	270.94	7,327.9	1,090.0	-1,142.8	1,381.4	0.43	0.33	
8,993.0	91.06	271.29	7,327.7	1,091.9	-1,236.8	1,472.7	2.10	2.06	
9,088.0	91.06	271.12	7,325.9	1,093.9	-1,331.8	1,565.1	0.18	0.00	
9,183.0	90.44	270.06	7,324.7	1,094.9	-1,426.7	1,657.3	1.29	-0.65	
9,277.0	90.26	270.24	7,324.1	1,095.1	-1,520.7	1,748.3	0.27	-0.19	
9,372.0	89.96	270.15	7,323.9	1,095.4	-1,615.7	1,840.3	0.33	-0.32	
9,466.0	89.74	270.24	7,324.2	1,095.7	-1,709.7	1,931.3	0.25	-0.23	
9,561.0	90.00	269.97	7,324.4	1,095.9	-1,804.7	2,023.2	0.39	0.27	
9,655.0	90.44	270.41	7,324.0	1,096.2	-1,898.7	2,114.3	0.66	0.47	
9,749.0	90.53	270.24	7,323.3	1,096.8	-1,992.7	2,205.3	0.20	0.10	

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9,844.0	91.01	271.73	7,322.0	1,098.4	-2,087.7	2,297.6	1.65	0.51	
9,938.0	90.62	271.29	7,320.6	1,100.9	-2,181.7	2,389.2	0.63	-0.41	
10,032.0	90.62	270.76	7,319.6	1,102.6	-2,275.6	2,480.5	0.56	0.00	
10,127.0	89.82	269.80	7,319.3	1,103.0	-2,370.6	2,572.5	1.32	-0.84	
10,221.0	90.75	271.91	7,318.8	1,104.4	-2,464.6	2,663.8	2.45	0.99	
10,316.0	89.56	272.87	7,318.5	1,108.4	-2,559.5	2,756.6	1.61	-1.25	
10,410.0	88.99	272.43	7,319.7	1,112.7	-2,653.4	2,848.6	0.77	-0.61	
10,504.0	88.68	272.35	7,321.6	1,116.6	-2,747.3	2,940.4	0.34	-0.33	
10,599.0	88.86	272.17	7,323.7	1,120.4	-2,842.2	3,033.2	0.27	0.19	
10,694.0	89.03	272.43	7,325.4	1,124.2	-2,937.1	3,126.0	0.33	0.18	
10,788.0	88.95	272.43	7,327.1	1,128.2	-3,031.0	3,217.8	0.09	-0.09	
10,883.0	88.99	270.76	7,328.8	1,130.8	-3,126.0	3,310.4	1.76	0.04	
10,977.0	89.69	272.26	7,329.9	1,133.3	-3,219.9	3,401.9	1.76	0.74	
11,072.0	88.90	269.62	7,331.0	1,134.9	-3,314.9	3,494.2	2.90	-0.83	
11,166.0	88.29	269.89	7,333.3	1,134.5	-3,408.9	3,585.0	0.71	-0.65	
11,261.0	88.02	270.41	7,336.4	1,134.7	-3,503.8	3,676.9	0.62	-0.28	
11,356.0	87.89	269.97	7,339.8	1,135.0	-3,598.8	3,768.8	0.48	-0.14	
11,451.0	88.11	269.89	7,343.1	1,134.9	-3,693.7	3,860.7	0.25	0.23	
11,545.0	88.77	269.53	7,345.7	1,134.4	-3,787.7	3,951.5	0.80	0.70	
11,639.0	89.82	270.41	7,346.8	1,134.4	-3,881.7	4,042.4	1.46	1.12	
11,734.0	90.09	270.32	7,346.9	1,135.0	-3,976.7	4,134.4	0.30	0.28	
11,828.0	90.22	269.62	7,346.6	1,134.9	-4,070.7	4,225.4	0.76	0.14	
11,923.0	90.70	269.09	7,345.9	1,133.9	-4,165.7	4,317.0	0.75	0.51	
12,017.0	91.32	269.01	7,344.2	1,132.3	-4,259.6	4,407.5	0.67	0.66	
12,030.0	91.27	268.92	7,343.9	1,132.1	-4,272.6	4,420.0	0.79	-0.38	LAST SURVEY - 12030.0' MD
12,098.0	91.27	268.92	7,342.4	1,130.8	-4,340.6	4,485.5	0.00	0.00	PTB - 12098.0' MD (1208 FNL, 465 FWL)

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Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 1F-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4871.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4871.0ft (Original Well Elev)
Well:	Herren 1F-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 1F-33H-H367 BH - actual wellpath misses target center by 8.5ft at 12098.0ft MD (7342.4 TVD, 1130.8 N, -4340.6 E) - Point	0.00	0.00	7,347.0	1,135.7	-4,345.9	1,311,284.24	3,166,877.50	40.186322	-104.902722
Herren 1F 1941' TGT - actual wellpath misses target center by 10.9ft at 9697.3ft MD (7323.7 TVD, 1096.5 N, -1941.0 E) - Point	0.00	0.00	7,330.0	1,105.4	-1,941.0	1,311,270.56	3,169,282.53	40.186239	-104.894114
Herren 1F 68' TGT - actual wellpath misses target center by 5.2ft at 7823.0ft MD (7340.1 TVD, 1082.2 N, -67.6 E) - Point	0.00	0.00	7,335.0	1,081.8	-68.0	1,311,259.91	3,171,155.65	40.186175	-104.887410
Herren 1F-33H-H367 TF - actual wellpath misses target center by 50.0ft at 7819.7ft MD (7339.9 TVD, 1082.5 N, -64.4 E) - Point	0.00	0.00	7,290.0	1,081.8	-68.4	1,311,259.91	3,171,155.29	40.186175	-104.887412
Herren 1F 2926' TGT - actual wellpath misses target center by 11.8ft at 10682.4ft MD (7325.2 TVD, 1123.7 N, -2925.6 E) - Point	0.00	0.00	7,315.0	1,117.8	-2,926.0	1,311,276.17	3,168,297.47	40.186273	-104.897640

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,823.7	7,340.2	1,082.2	-68.4	TPZ - 7823.7' MD (1203 FNL, 460 FEL)	
12,030.0	7,343.9	1,132.1	-4,272.6	LAST SURVEY - 12030.0' MD	
12,098.0	7,342.4	1,130.8	-4,340.6	PTB - 12098.0' MD (1208 FNL, 465 FWL)	

Checked By: _____	Approved By: _____	Date: _____
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