

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 1C-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4870.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4870.0ft (Original Well Elev)
Well:	Herren 1C-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 1C-33H-H367					
Well Position	+N/-S	0.0 ft	Northing:	1,310,199.85 ft	Latitude:	40.183263
	+E/-W	0.0 ft	Easting:	3,171,252.33 ft	Longitude:	-104.887091
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,847.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM_FILE	12/6/2018	8.42	66.57	52,133.60000000

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	294.70	

Survey Program	Date	12/11/2018			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
81.0	1,952.0	Survey #1 (Wellbore #1)	GYRO-MWD	OWSG Gyro MWD	
2,072.0	12,301.0	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		
81.0	0.62	26.37	81.0	0.4	0.2	0.0	0.77	0.77		
272.0	1.85	3.87	272.0	4.4	0.9	1.1	0.68	0.64		
366.0	2.73	346.03	365.9	8.1	0.4	3.0	1.19	0.94		
461.0	2.99	352.35	460.8	12.7	-0.5	5.7	0.43	0.27		
555.0	4.84	345.85	554.5	19.0	-1.7	9.5	2.02	1.97		
650.0	5.89	353.94	649.1	27.7	-3.2	14.5	1.36	1.11		
724.0	7.54	351.69	722.6	36.3	-4.3	19.1	2.26	2.23		
818.0	9.19	359.74	815.6	49.9	-5.3	25.7	2.15	1.76		
913.0	10.17	8.08	909.3	65.8	-4.1	31.3	1.80	1.03		
1,007.0	11.59	16.51	1,001.6	83.1	-0.3	35.0	2.27	1.51		
1,101.0	13.31	24.71	1,093.4	102.0	6.9	36.3	2.62	1.83		

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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
1,196.0	15.99	27.23	1,185.3	123.6	17.5	35.7	2.90	2.82	
1,290.0	19.90	28.74	1,274.7	149.1	31.1	34.0	4.19	4.16	
1,385.0	21.23	26.04	1,363.6	178.7	46.4	32.5	1.72	1.40	
1,479.0	18.92	19.53	1,451.9	208.4	59.0	33.5	3.42	-2.46	
1,573.0	18.50	18.09	1,541.0	236.9	68.7	36.6	0.66	-0.45	
1,668.0	20.23	21.80	1,630.6	266.5	79.5	39.1	2.23	1.82	
1,763.0	18.03	21.89	1,720.3	295.4	91.1	40.7	2.32	-2.32	
1,857.0	17.73	24.55	1,809.8	321.9	102.5	41.4	0.93	-0.32	
1,952.0	18.20	26.43	1,900.2	348.4	115.1	41.0	0.79	0.49	
2,072.0	16.08	26.08	2,014.8	380.1	130.7	40.1	1.77	-1.77	
2,167.0	16.96	22.74	2,105.9	404.7	141.9	40.2	1.36	0.93	
2,261.0	17.05	23.18	2,195.8	430.0	152.6	41.0	0.17	0.10	
2,355.0	17.36	20.89	2,285.6	455.8	163.0	42.3	0.79	0.33	
2,449.0	19.91	20.63	2,374.7	483.9	173.7	44.4	2.71	2.71	
2,543.0	18.06	18.25	2,463.5	512.7	183.9	47.2	2.13	-1.97	
2,638.0	20.13	18.34	2,553.3	542.2	193.6	50.7	2.18	2.18	
2,733.0	18.98	16.41	2,642.8	572.5	203.1	54.7	1.39	-1.21	
2,827.0	20.26	18.08	2,731.4	602.7	212.5	58.8	1.49	1.36	
2,921.0	19.29	14.65	2,819.8	633.1	221.5	63.4	1.61	-1.03	
3,015.0	19.25	17.46	2,908.6	663.0	230.1	68.0	0.99	-0.04	
3,110.0	19.29	23.97	2,998.3	692.2	241.1	70.2	2.26	0.04	
3,204.0	17.36	21.86	3,087.5	719.4	252.7	71.1	2.17	-2.05	
3,299.0	14.33	19.75	3,178.9	743.7	261.9	72.8	3.25	-3.19	
3,393.0	15.03	22.39	3,269.8	765.9	270.5	74.3	1.03	0.74	
3,488.0	13.89	22.65	3,361.8	787.8	279.6	75.2	1.20	-1.20	
3,582.0	14.06	16.32	3,453.0	809.2	287.1	77.3	1.64	0.18	
3,677.0	15.56	14.56	3,544.9	832.6	293.6	81.2	1.65	1.58	
3,797.0	19.82	25.99	3,659.2	866.5	306.5	83.6	4.56	3.55	
3,891.0	19.69	21.77	3,747.7	895.5	319.4	84.0	1.52	-0.14	
3,985.0	19.86	21.24	3,836.1	925.1	331.1	85.8	0.26	0.18	
4,080.0	21.27	17.81	3,925.1	956.5	342.2	88.8	1.95	1.48	
4,175.0	19.29	16.41	4,014.2	988.0	351.9	93.2	2.15	-2.08	
4,269.0	15.47	13.60	4,103.9	1,015.1	359.2	97.8	4.16	-4.06	
4,364.0	15.43	13.07	4,195.4	1,039.7	365.1	102.8	0.15	-0.04	
4,459.0	17.05	18.69	4,286.6	1,065.2	372.4	106.8	2.37	1.71	
4,553.0	18.68	17.90	4,376.1	1,092.6	381.4	110.0	1.75	1.73	
4,647.0	16.44	21.77	4,465.7	1,119.3	391.0	112.5	2.69	-2.38	
4,742.0	17.10	22.91	4,556.7	1,144.6	401.4	113.6	0.78	0.69	
4,836.0	17.84	18.96	4,646.4	1,171.0	411.5	115.5	1.49	0.79	
4,931.0	16.44	15.18	4,737.1	1,197.7	419.7	119.2	1.88	-1.47	
5,025.0	19.78	17.55	4,826.5	1,225.7	428.0	123.4	3.64	3.55	
5,120.0	19.60	25.64	4,915.9	1,255.4	439.7	125.1	2.87	-0.19	
5,214.0	17.40	24.67	5,005.1	1,282.4	452.4	124.8	2.36	-2.34	
5,309.0	15.65	22.82	5,096.1	1,307.1	463.3	125.3	1.92	-1.84	
5,404.0	16.13	24.67	5,187.5	1,330.9	473.8	125.7	0.73	0.51	
5,499.0	17.14	17.20	5,278.5	1,356.3	483.5	127.5	2.49	1.06	
5,593.0	14.11	18.61	5,369.1	1,380.4	491.2	130.6	3.25	-3.22	
5,687.0	15.69	16.94	5,459.9	1,403.4	498.6	133.5	1.74	1.68	
5,782.0	16.30	18.96	5,551.2	1,428.3	506.6	136.6	0.87	0.64	
5,876.0	16.83	17.99	5,641.3	1,453.7	515.1	139.5	0.64	0.56	
5,970.0	17.62	23.18	5,731.1	1,479.8	524.9	141.4	1.84	0.84	
6,065.0	19.29	18.17	5,821.2	1,507.9	535.5	143.6	2.42	1.76	
6,159.0	20.52	20.89	5,909.6	1,538.0	546.2	146.5	1.64	1.31	

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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
6,253.0	17.71	20.01	5,998.4	1,566.9	557.0	148.7	3.00	-2.99	
6,348.0	18.72	18.96	6,088.7	1,594.9	566.9	151.4	1.12	1.06	
6,443.0	16.79	16.23	6,179.1	1,622.5	575.7	155.0	2.21	-2.03	
6,537.0	17.45	16.50	6,269.0	1,649.0	583.5	159.0	0.71	0.70	
6,632.0	16.88	28.27	6,359.8	1,674.8	594.0	160.2	3.70	-0.60	
6,726.0	13.80	29.42	6,450.4	1,696.6	606.0	158.4	3.29	-3.28	
6,821.0	10.28	27.66	6,543.3	1,714.0	615.5	157.0	3.72	-3.71	
6,868.0	12.52	5.95	6,589.4	1,722.8	618.0	158.4	10.21	4.77	
6,916.0	15.65	349.69	6,636.0	1,734.3	617.4	163.8	10.45	6.52	
6,963.0	17.75	336.95	6,681.0	1,747.2	613.4	172.8	8.95	4.47	
7,010.0	19.64	321.48	6,725.5	1,760.0	605.7	185.1	11.25	4.02	
7,057.0	23.12	312.07	6,769.3	1,772.3	593.9	201.0	10.38	7.40	
7,105.0	26.46	303.64	6,812.9	1,784.6	578.0	220.6	10.12	6.96	
7,152.0	27.95	308.29	6,854.7	1,797.2	560.7	241.6	5.52	3.17	
7,200.0	28.61	302.49	6,897.0	1,810.3	542.1	264.0	5.89	1.37	
7,247.0	29.53	293.88	6,938.1	1,821.1	522.0	286.7	9.11	1.96	
7,294.0	32.26	289.22	6,978.4	1,829.9	499.6	310.8	7.72	5.81	
7,341.0	35.73	287.29	7,017.4	1,838.1	474.6	336.9	7.73	7.38	
7,388.0	37.40	283.07	7,055.1	1,845.4	447.6	364.5	6.42	3.55	
7,435.0	40.91	278.41	7,091.6	1,850.9	418.5	393.2	9.74	7.47	
7,483.0	44.34	276.56	7,126.9	1,855.1	386.3	424.3	7.61	7.15	
7,530.0	48.82	277.44	7,159.2	1,859.3	352.4	456.8	9.63	9.53	
7,578.0	53.61	277.62	7,189.2	1,864.2	315.3	492.5	9.98	9.98	
7,625.0	55.81	279.64	7,216.4	1,870.0	277.4	529.4	5.85	4.68	
7,672.0	60.73	281.05	7,241.1	1,877.1	238.1	568.1	10.77	10.47	
7,719.0	65.39	281.22	7,262.4	1,885.2	197.0	608.8	9.92	9.91	
7,767.0	66.40	282.89	7,282.0	1,894.4	154.1	651.6	3.81	2.10	
7,814.0	70.36	282.63	7,299.3	1,904.0	111.5	694.3	8.44	8.43	
7,861.0	76.64	283.07	7,312.6	1,914.1	67.6	738.4	13.39	13.36	
7,908.0	82.79	284.30	7,321.0	1,925.0	22.7	783.8	13.34	13.09	
7,956.0	89.03	282.10	7,324.5	1,935.9	-23.9	830.7	13.78	13.00	
8,027.6	89.74	279.09	7,325.2	1,949.1	-94.2	900.1	4.32	0.99	TPZ - 8027.6' MD (315 FNL, 460 FEL)
8,050.0	89.96	278.15	7,325.3	1,952.4	-116.4	921.6	4.32	0.99	
8,145.0	91.80	276.65	7,323.8	1,964.7	-210.6	1,012.3	2.50	1.94	
8,239.0	90.75	271.47	7,321.7	1,971.3	-304.3	1,100.2	5.62	-1.12	
8,334.0	90.26	268.04	7,320.9	1,970.9	-399.3	1,186.3	3.65	-0.52	
8,429.0	91.98	269.53	7,319.0	1,968.9	-494.2	1,271.8	2.40	1.81	
8,523.0	91.76	267.95	7,316.0	1,966.8	-588.2	1,356.2	1.70	-0.23	
8,617.0	90.75	270.15	7,313.9	1,965.3	-682.1	1,440.9	2.57	-1.07	
8,711.0	89.78	271.56	7,313.5	1,966.7	-776.1	1,526.9	1.82	-1.03	
8,806.0	89.65	270.76	7,314.0	1,968.6	-871.1	1,614.0	0.85	-0.14	
8,900.0	89.25	270.50	7,314.9	1,969.6	-965.1	1,699.8	0.51	-0.43	
8,995.0	88.81	269.62	7,316.5	1,969.7	-1,060.1	1,786.2	1.04	-0.46	
9,089.0	90.26	272.08	7,317.2	1,971.1	-1,154.0	1,872.1	3.04	1.54	
9,184.0	90.13	271.12	7,316.9	1,973.8	-1,249.0	1,959.5	1.02	-0.14	
9,278.0	90.18	271.12	7,316.6	1,975.6	-1,343.0	2,045.7	0.05	0.05	
9,373.0	89.82	270.68	7,316.6	1,977.1	-1,438.0	2,132.6	0.60	-0.38	
9,467.0	89.34	268.92	7,317.3	1,976.8	-1,532.0	2,217.8	1.94	-0.51	
9,562.0	90.66	270.24	7,317.3	1,976.1	-1,627.0	2,303.8	1.96	1.39	
9,656.0	90.88	270.32	7,316.1	1,976.5	-1,720.9	2,389.4	0.25	0.23	
9,750.0	90.66	272.35	7,314.8	1,978.7	-1,814.9	2,475.7	2.17	-0.23	
9,845.0	90.35	271.82	7,314.0	1,982.2	-1,909.8	2,563.4	0.65	-0.33	
9,939.0	90.00	271.29	7,313.7	1,984.7	-2,003.8	2,649.8	0.68	-0.37	

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10,033.0	89.78	270.24	7,313.9	1,986.0	-2,097.8	2,735.7	1.14	-0.23	
10,128.0	90.57	269.80	7,313.6	1,986.0	-2,192.8	2,822.1	0.95	0.83	
10,222.0	90.57	268.48	7,312.6	1,984.6	-2,286.8	2,906.9	1.40	0.00	
10,317.0	89.47	269.89	7,312.6	1,983.3	-2,381.8	2,992.6	1.88	-1.16	
10,411.0	88.68	269.89	7,314.1	1,983.1	-2,475.7	3,077.9	0.84	-0.84	
10,505.0	88.90	270.85	7,316.1	1,983.7	-2,569.7	3,163.5	1.05	0.23	
10,600.0	90.62	272.35	7,316.5	1,986.3	-2,664.7	3,250.9	2.40	1.81	
10,695.0	90.44	272.35	7,315.6	1,990.2	-2,759.6	3,338.8	0.19	-0.19	
10,789.0	90.66	272.08	7,314.7	1,993.9	-2,853.5	3,425.6	0.37	0.23	
10,884.0	90.97	271.64	7,313.4	1,997.0	-2,948.5	3,513.2	0.57	0.33	
10,979.0	89.74	270.59	7,312.8	1,998.8	-3,043.4	3,600.2	1.70	-1.29	
11,073.0	90.40	270.94	7,312.7	2,000.1	-3,137.4	3,686.1	0.79	0.70	
11,168.0	90.31	270.15	7,312.1	2,001.0	-3,232.4	3,772.8	0.84	-0.09	
11,262.0	90.88	268.92	7,311.1	2,000.2	-3,326.4	3,857.9	1.44	0.61	
11,357.0	86.66	266.90	7,313.1	1,996.7	-3,421.3	3,942.7	4.92	-4.44	
11,452.0	87.36	267.86	7,318.1	1,992.4	-3,516.1	4,026.9	1.25	0.74	
11,546.0	87.98	269.89	7,321.9	1,990.6	-3,610.0	4,111.5	2.26	0.66	
11,640.0	88.68	271.12	7,324.7	1,991.4	-3,703.9	4,197.2	1.51	0.74	
11,735.0	89.43	272.08	7,326.2	1,994.0	-3,798.9	4,284.6	1.28	0.79	
11,829.0	89.25	273.40	7,327.3	1,998.5	-3,892.8	4,371.7	1.42	-0.19	
11,924.0	89.47	272.43	7,328.4	2,003.4	-3,987.6	4,459.9	1.05	0.23	
12,019.0	89.39	271.56	7,329.3	2,006.7	-4,082.6	4,547.6	0.92	-0.08	
12,113.0	88.99	270.59	7,330.6	2,008.4	-4,176.5	4,633.7	1.12	-0.43	
12,207.0	89.34	270.59	7,332.0	2,009.4	-4,270.5	4,719.5	0.37	0.37	
12,231.0	89.43	270.85	7,332.3	2,009.7	-4,294.5	4,741.4	1.15	0.37	LAST SURVEY - 12231.0' MD
12,301.0	89.43	270.85	7,333.0	2,010.7	-4,364.5	4,805.4	0.00	0.00	PTB - 12301.0' MD (307 FNL, 465 FWL)

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well Herren 1C-33H-H367
Project:	Sec 33 T3N-R67W	TVD Reference:	WELL @ 4870.0ft (Original Well Elev)
Site:	Herren Pad	MD Reference:	WELL @ 4870.0ft (Original Well Elev)
Well:	Herren 1C-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 1C 1882' TGT - actual wellpath misses target center by 8.1ft at 9817.2ft MD (7314.2 TVD, 1981.3 N, -1882.0 E) - Point	0.00	0.00	7,322.0	1,983.1	-1,882.0	1,312,169.92	3,169,356.67	40.188707	-104.893827
Herren 1C 94' TGT - actual wellpath misses target center by 11.5ft at 8029.1ft MD (7325.2 TVD, 1949.3 N, -95.7 E) - Point	0.00	0.00	7,324.0	1,960.6	-94.0	1,312,159.75	3,171,144.78	40.188645	-104.887427
Herren 1C-33H-H367 TF - actual wellpath misses target center by 37.0ft at 8029.2ft MD (7325.2 TVD, 1949.3 N, -95.8 E) - Point	0.00	0.00	7,290.0	1,960.6	-94.2	1,312,159.75	3,171,144.58	40.188645	-104.887428
Herren 1C-33H-H367 Bt - actual wellpath misses target center by 7.4ft at 12301.0ft MD (7333.0 TVD, 2010.7 N, -4364.5 E) - Point	0.00	0.00	7,336.0	2,014.5	-4,370.2	1,312,184.06	3,166,868.34	40.188792	-104.902733
Herren 1C 2916' TGT - actual wellpath misses target center by 0.2ft at 10851.5ft MD (7313.9 TVD, 1996.0 N, -2916.0 E) - Point	0.00	0.00	7,314.0	1,996.1	-2,916.0	1,312,175.80	3,168,322.61	40.188742	-104.897528

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
8,027.6	7,325.2	1,949.1	-94.2	TPZ - 8027.6' MD (315 FNL, 460 FEL)	
12,231.0	7,332.3	2,009.7	-4,294.5	LAST SURVEY - 12231.0' MD	
12,301.0	7,333.0	2,010.7	-4,364.5	PTB - 12301.0' MD (307 FNL, 465 FWL)	

Checked By: _____	Approved By: _____	Date: _____
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