



CRESTONE PEAK
RESOURCES

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	
3	789.02	9.78	195.68	786.65	-40.09	-11.26	2.00	195.68	-40.18	
4	6350.46	9.78	195.68	6267.25	-949.65	-266.65	0.00	0.00	-951.80	
5	7593.39	90.00	0.47	7100.00	-242.85	-298.47	8.00	164.58	-245.29	RUEGGE 3I-4H-N165 TPZ
6	9091.68	90.00	0.47	7100.00	1255.39	-286.09	0.00	0.00	1253.00	RUEGGE 3I 1253' VS
7	9136.23	89.11	0.47	7100.35	1299.94	-285.72	2.00	-180.00	1297.55	
8	10184.92	89.11	0.47	7116.65	2348.47	-277.06	0.00	0.00	2346.11	
9	10227.81	89.97	0.47	7117.00	2391.35	-276.71	2.00	0.00	2389.00	RUEGGE 3I 2389' VS
10	11954.58	89.97	0.47	7118.00	4118.07	-262.44	0.00	0.00	4115.78	RUEGGE 3I-4H-N165 BHL

FINAL
RUEGGE 3I-4H-N165
360337 185097 361937 185188
23 KB @ 4939.00usft
Ground Level @ 4916.00
North American Datum 1983
Well RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H-N165 SHL True North

Name	Type	User	Target	No Target (Freehand)	Azimuth	Origin	Type	N/S	E/W	From	TVD	Longitude
RUEGGE 3I 1253' VS					7100.00	1255.39	-286.09	40.078695	-104.671867			
RUEGGE 3I-4H-N165 TPZ					7100.00	-242.85	-298.47	40.074862	-104.671911			
RUEGGE 3I 2389' VS					7117.00	2391.35	-276.71	40.081814	-104.671833			
RUEGGE 3I-4H-N165 BHL					7118.00	4118.07	-262.44	40.086554	-104.671782			

Project: DJ BASIN
Site: S4-T1N-R65W (RUEGGE)
Well: RUEGGE 3I-4H-N165
Wellbore: OH
Design: FINAL

True Vertical Depth (200 usft/in)

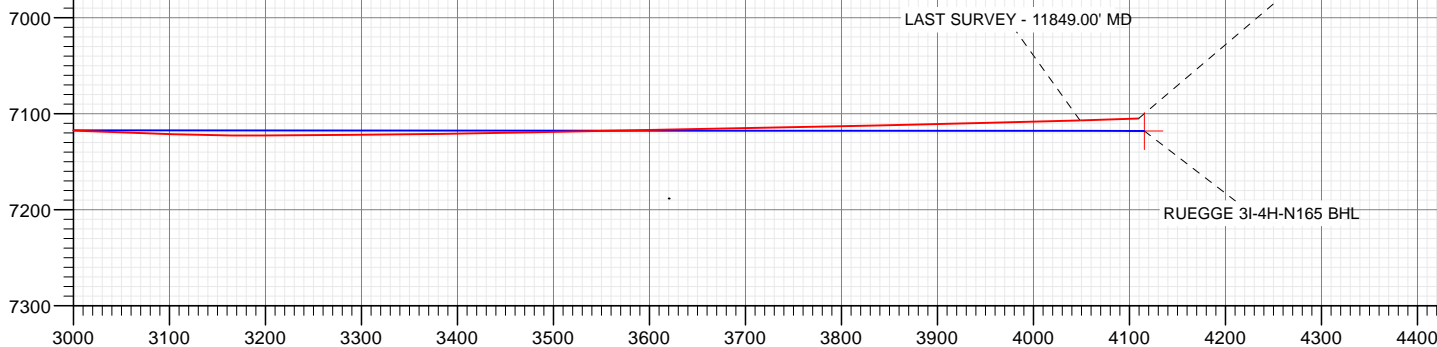
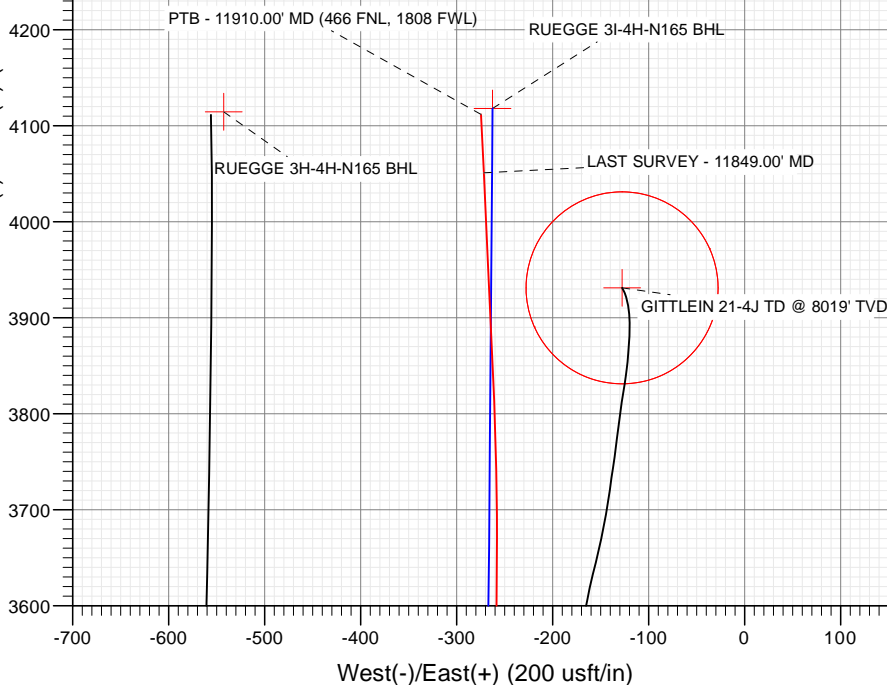
South(-)/North(+) (200 usft/in)

West(-)/East(+) (200 usft/in)



Azimuths to True North
Magnetic North: 8.17°

Magnetic Field
Strength: 52111.9nT
Dip Angle: 66.47°
Date: 6/20/2018
Model: HDGM_FILE



Vertical Section at 0.47° (200 usft/in)

WELL DETAILS: RUEGGE 3I-4H-N165

+N/-S	+E/-W	Northing	Easting	4916.00	Latitude	Longitude	Slot
0.00	0.00	1271343.05	3232031.22		40.075249	-104.670844	

CATHEDRAL



Cathedral Energy Services

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H
Project:	DJ BASIN	TVD Reference:	23' KB @ 4939.00usft
Site:	S4-T1N-R65W (RUEGGE)	MD Reference:	23' KB @ 4939.00usft
Well:	RUEGGE 3I-4H-N165	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	DJ BASIN		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		S4-T1N-R65W (RUEGGE)			
Site Position:		Northing:	1,271,333.68 usft	Latitude:	40.075225
From:	Map	Easting:	3,231,971.96 usft	Longitude:	-104.671056
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.54 °

Well	RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H-N165 SHL					
Well Position	+N/-S	0.00 usft	Northing:	1,271,343.05 usft	Latitude:	40.075249
	+E/-W	0.00 usft	Easting:	3,232,031.22 usft	Longitude:	-104.670844
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	4,916.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM_FILE	6/20/2018	8.17	66.47	52,111.90000000

Design	FINAL				
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	0.47	

Survey Program	Date	6/24/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
109.00	2,407.00	Survey #1 (OH)	VESSI_GYROFLEX	VESSI Gyroflex Gyro	
2,563.00	11,910.00	Survey #2 (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 (°/100usf)	Build Rate (°/100u)	Formations / Comments
10.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	
109.00	0.70	312.34	109.00	0.41	-0.45	0.40	0.71	0.71	
140.00	0.81	298.53	139.99	0.64	-0.78	0.63	0.68	0.35	
232.00	0.56	318.85	231.99	1.29	-1.65	1.28	0.37	-0.27	
323.00	0.78	192.84	322.99	1.02	-2.08	1.00	1.32	0.24	
414.00	2.15	199.87	413.95	-1.19	-2.79	-1.21	1.52	1.51	
476.00	3.36	189.41	475.88	-4.08	-3.49	-4.10	2.11	1.95	
558.00	4.59	193.10	557.68	-9.64	-4.62	-9.68	1.53	1.50	
643.00	5.86	196.62	642.33	-17.11	-6.64	-17.17	1.54	1.49	
725.00	6.39	200.49	723.86	-25.40	-9.43	-25.48	0.82	0.65	
809.00	8.41	195.74	807.16	-35.69	-12.73	-35.79	2.51	2.40	
868.00	8.93	196.18	865.48	-44.24	-15.18	-44.36	0.89	0.88	

Cathedral Energy Services

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H
Project:	DJ BASIN	TVD Reference:	23' KB @ 4939.00usft
Site:	S4-T1N-R65W (RUEGGE)	MD Reference:	23' KB @ 4939.00usft
Well:	RUEGGE 3I-4H-N165	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
950.00	10.62	194.56	946.29	-57.67	-18.85	-57.82	2.09	2.06	
1,032.00	9.95	194.02	1,026.97	-71.86	-22.47	-72.04	0.83	-0.82	
1,115.00	8.71	192.86	1,108.87	-84.94	-25.61	-85.15	1.51	-1.49	
1,198.00	9.39	194.70	1,190.84	-97.62	-28.72	-97.85	0.89	0.82	
1,281.00	9.78	194.36	1,272.68	-110.99	-32.19	-111.26	0.47	0.47	
1,363.00	10.76	195.13	1,353.36	-125.13	-35.91	-125.42	1.21	1.20	
1,446.00	11.01	195.53	1,434.87	-140.25	-40.06	-140.57	0.31	0.30	
1,529.00	11.15	194.81	1,516.32	-155.64	-44.23	-156.00	0.24	0.17	
1,612.00	11.61	192.86	1,597.69	-171.54	-48.14	-171.93	0.72	0.55	
1,696.00	11.78	195.96	1,679.95	-188.03	-52.38	-188.45	0.77	0.20	
1,781.00	11.53	200.41	1,763.20	-204.33	-57.73	-204.80	1.10	-0.29	
1,862.00	9.93	200.27	1,842.78	-218.47	-62.97	-218.98	1.98	-1.98	
1,943.00	9.75	200.42	1,922.59	-231.45	-67.78	-232.00	0.22	-0.22	
2,024.00	9.62	198.23	2,002.43	-244.31	-72.29	-244.89	0.48	-0.16	
2,108.00	9.79	197.35	2,085.23	-257.79	-76.62	-258.41	0.27	0.20	
2,192.00	9.59	198.19	2,168.03	-271.25	-80.93	-271.91	0.29	-0.24	
2,276.00	9.06	200.10	2,250.92	-284.11	-85.39	-284.80	0.73	-0.63	
2,365.00	8.47	194.95	2,338.88	-297.03	-89.49	-297.75	1.10	-0.66	
2,407.00	8.24	192.37	2,380.44	-302.95	-90.93	-303.69	1.05	-0.55	
2,563.00	9.27	185.62	2,534.62	-326.38	-94.56	-327.14	0.93	0.66	
2,658.00	9.67	188.43	2,628.33	-341.89	-96.48	-342.67	0.64	0.42	
2,752.00	10.94	203.29	2,720.83	-357.89	-101.16	-358.71	3.12	1.35	
2,846.00	13.18	200.04	2,812.75	-376.16	-108.36	-377.03	2.49	2.38	
2,941.00	11.82	196.43	2,905.49	-395.66	-114.83	-396.59	1.65	-1.43	
3,036.00	10.81	196.34	2,998.65	-413.55	-120.09	-414.52	1.06	-1.06	
3,130.00	9.10	195.38	3,091.23	-429.17	-124.54	-430.18	1.83	-1.82	
3,225.00	8.92	215.42	3,185.08	-442.42	-130.80	-443.48	3.29	-0.19	
3,320.00	11.12	216.56	3,278.62	-455.78	-140.53	-456.92	2.33	2.32	
3,414.00	12.79	206.10	3,370.59	-472.41	-150.51	-473.63	2.90	1.78	
3,509.00	10.77	204.78	3,463.59	-489.92	-158.85	-491.20	2.15	-2.13	
3,604.00	10.50	193.18	3,556.97	-506.40	-164.55	-507.74	2.27	-0.28	
3,698.00	9.10	194.76	3,649.59	-521.93	-168.39	-523.30	1.52	-1.49	
3,793.00	10.02	184.74	3,743.28	-537.44	-170.99	-538.82	2.00	0.97	
3,888.00	7.87	183.07	3,837.12	-552.17	-172.02	-553.56	2.28	-2.26	
3,982.00	8.83	194.76	3,930.13	-565.57	-174.21	-566.98	2.07	1.02	
4,077.00	12.35	193.44	4,023.50	-582.51	-178.43	-583.95	3.71	3.71	
4,171.00	12.52	192.65	4,115.29	-602.23	-182.99	-603.71	0.26	0.18	
4,266.00	11.65	192.57	4,208.18	-621.64	-187.34	-623.15	0.92	-0.92	
4,360.00	8.88	190.90	4,300.67	-638.03	-190.77	-639.57	2.96	-2.95	
4,466.00	9.45	190.46	4,405.32	-654.62	-193.90	-656.19	0.54	0.54	
4,561.00	8.66	190.28	4,499.13	-669.33	-196.59	-670.92	0.83	-0.83	
4,656.00	8.79	198.01	4,593.04	-683.27	-200.11	-684.89	1.24	0.14	
4,750.00	6.50	195.55	4,686.19	-695.22	-203.76	-696.87	2.46	-2.44	
4,845.00	9.71	211.73	4,780.25	-707.22	-209.42	-708.92	4.11	3.38	
4,940.00	12.57	221.04	4,873.45	-721.84	-220.42	-723.62	3.55	3.01	
5,034.00	10.06	201.79	4,965.65	-737.19	-230.19	-739.05	4.79	-2.67	
5,129.00	10.24	182.19	5,059.19	-753.33	-233.60	-755.22	3.62	0.19	
5,224.00	7.87	170.33	5,153.01	-768.19	-232.83	-770.07	3.16	-2.49	
5,318.00	10.11	185.09	5,245.86	-782.75	-232.48	-784.63	3.40	2.38	
5,413.00	11.82	193.97	5,339.13	-800.50	-235.57	-802.41	2.53	1.80	
5,507.00	9.32	190.37	5,431.53	-817.33	-239.26	-819.27	2.75	-2.66	
5,601.00	9.32	206.72	5,524.30	-831.62	-244.05	-833.60	2.81	0.00	
5,696.00	10.68	195.64	5,617.87	-846.97	-249.89	-848.99	2.47	1.43	

Cathedral Energy Services

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H
Project:	DJ BASIN	TVD Reference:	23' KB @ 4939.00usft
Site:	S4-T1N-R65W (RUEGGE)	MD Reference:	23' KB @ 4939.00usft
Well:	RUEGGE 3I-4H-N165	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
5,791.00	8.22	191.25	5,711.57	-862.11	-253.58	-864.16	2.70	-2.59	
5,885.00	8.75	198.54	5,804.55	-875.48	-257.17	-877.56	1.27	0.56	
5,980.00	11.12	189.23	5,898.12	-891.38	-260.94	-893.49	3.01	2.49	
6,075.00	9.01	181.49	5,991.66	-907.86	-262.60	-909.98	2.63	-2.22	
6,169.00	6.81	177.80	6,084.76	-920.79	-262.58	-922.91	2.40	-2.34	
6,263.00	4.66	171.38	6,178.28	-930.13	-261.79	-932.25	2.38	-2.29	
6,358.00	1.49	191.33	6,273.14	-935.16	-261.46	-937.28	3.47	-3.34	
6,453.00	1.93	345.14	6,368.12	-934.83	-262.11	-936.95	3.51	0.46	
6,547.00	12.17	359.47	6,461.29	-923.36	-262.61	-925.48	10.97	10.89	
6,642.00	18.63	7.29	6,552.84	-898.26	-260.77	-900.37	7.13	6.80	
6,737.00	23.51	7.82	6,641.46	-864.42	-256.27	-866.49	5.14	5.14	
6,832.00	26.76	8.43	6,727.45	-824.48	-250.55	-826.51	3.43	3.42	
6,926.00	35.38	16.96	6,807.93	-777.41	-239.48	-779.35	10.28	9.17	
7,020.00	43.90	11.60	6,880.27	-719.33	-224.96	-721.15	9.76	9.06	
7,115.00	54.49	5.09	6,942.30	-648.31	-214.87	-650.05	12.28	11.15	
7,209.00	63.94	0.44	6,990.38	-567.76	-211.15	-569.48	10.91	10.05	
7,304.00	69.87	357.45	7,027.63	-480.45	-212.80	-482.17	6.88	6.24	
7,399.00	74.44	356.83	7,056.74	-390.15	-217.32	-391.92	4.85	4.81	
7,493.00	78.44	355.87	7,078.77	-298.98	-223.14	-300.80	4.37	4.26	
7,550.27	80.51	355.07	7,089.24	-242.85	-227.59	-244.71	3.86	3.61	TPZ - 7550.27 (460 FSL, 1890 FWL)
7,588.00	81.87	354.55	7,095.02	-205.72	-230.96	-207.61	3.86	3.61	
7,683.00	89.52	355.25	7,102.14	-111.44	-239.38	-113.39	8.09	8.05	
7,777.00	91.76	355.87	7,101.09	-17.73	-246.65	-19.75	2.47	2.38	
7,872.00	91.71	356.36	7,098.22	77.01	-253.09	74.93	0.52	-0.05	
7,967.00	89.08	356.92	7,097.56	171.83	-258.65	169.71	2.83	-2.77	
8,061.00	88.95	356.39	7,099.18	265.66	-264.14	263.48	0.58	-0.14	
8,156.00	88.33	355.55	7,101.43	360.40	-270.81	358.16	1.10	-0.65	
8,251.00	88.42	358.85	7,104.13	455.23	-275.45	452.96	3.47	0.09	
8,346.00	89.52	357.18	7,105.83	550.16	-278.74	547.85	2.10	1.16	
8,440.00	90.44	356.48	7,105.87	644.01	-283.94	641.66	1.23	0.98	
8,535.00	90.75	356.22	7,104.88	738.81	-289.98	736.41	0.43	0.33	
8,630.00	89.52	359.65	7,104.66	833.73	-293.41	831.30	3.84	-1.29	
8,725.00	89.17	358.85	7,105.74	928.72	-294.65	926.27	0.92	-0.37	
8,819.00	90.00	1.40	7,106.42	1,022.71	-294.45	1,020.26	2.85	0.88	
8,914.00	90.84	1.23	7,105.73	1,117.68	-292.27	1,115.24	0.90	0.88	
9,008.00	90.66	1.05	7,104.50	1,211.65	-290.40	1,209.23	0.27	-0.19	
9,103.00	90.48	0.35	7,103.55	1,306.64	-289.24	1,304.22	0.76	-0.19	
9,197.00	89.52	359.21	7,103.55	1,400.64	-289.60	1,398.21	1.59	-1.02	
9,292.00	89.08	358.94	7,104.71	1,495.62	-291.13	1,493.18	0.54	-0.46	
9,386.00	89.69	2.98	7,105.72	1,589.58	-289.55	1,587.15	4.35	0.65	
9,481.00	89.08	2.19	7,106.74	1,684.47	-285.27	1,682.08	1.05	-0.64	
9,576.00	88.59	1.75	7,108.67	1,779.40	-282.01	1,777.03	0.69	-0.52	
9,671.00	88.29	1.40	7,111.26	1,874.33	-279.40	1,871.97	0.49	-0.32	
9,766.00	88.55	1.49	7,113.88	1,969.26	-277.00	1,966.92	0.29	0.27	
9,860.00	89.30	1.40	7,115.64	2,063.21	-274.63	2,060.89	0.80	0.80	
9,955.00	88.20	0.96	7,117.71	2,158.17	-272.67	2,155.86	1.25	-1.16	
10,049.00	88.20	0.17	7,120.67	2,252.12	-271.75	2,249.81	0.84	0.00	
10,144.00	88.02	359.91	7,123.80	2,347.07	-271.68	2,344.76	0.33	-0.19	
10,239.00	91.58	1.32	7,124.13	2,442.04	-270.66	2,439.74	4.03	3.75	
10,333.00	91.76	0.88	7,121.39	2,535.98	-268.86	2,533.69	0.51	0.19	
10,428.00	92.11	1.32	7,118.18	2,630.91	-267.04	2,628.63	0.59	0.37	
10,523.00	92.81	1.23	7,114.11	2,725.80	-264.92	2,723.54	0.74	0.74	
10,618.00	88.86	1.40	7,112.72	2,820.75	-262.74	2,818.50	4.16	-4.16	

Cathedral Energy Services

Survey Report

Company:	Crestone Peak Resources	Local Co-ordinate Reference:	Well RUEGGE 3I-4H-N165 - Slot RUEGGE 3I-4H
Project:	DJ BASIN	TVD Reference:	23' KB @ 4939.00usft
Site:	S4-T1N-R65W (RUEGGE)	MD Reference:	23' KB @ 4939.00usft
Well:	RUEGGE 3I-4H-N165	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
10,712.00	88.37	1.23	7,115.00	2,914.69	-260.59	2,912.46	0.55	-0.52	
10,807.00	88.02	0.79	7,117.99	3,009.63	-258.91	3,007.41	0.59	-0.37	
10,902.00	87.98	0.17	7,121.30	3,104.57	-258.12	3,102.35	0.65	-0.04	
10,996.00	90.35	359.38	7,122.67	3,198.55	-258.49	3,196.32	2.66	2.52	
11,090.00	90.44	359.29	7,122.02	3,292.54	-259.58	3,290.30	0.14	0.10	
11,185.00	90.75	0.00	7,121.04	3,387.54	-260.17	3,385.29	0.82	0.33	
11,279.00	91.41	0.88	7,119.27	3,481.51	-259.45	3,479.27	1.17	0.70	
11,374.00	90.97	0.44	7,117.29	3,576.49	-258.35	3,574.25	0.65	-0.46	
11,469.00	90.92	0.17	7,115.73	3,671.47	-257.85	3,669.23	0.29	-0.05	
11,563.00	91.27	358.15	7,113.93	3,765.44	-259.22	3,763.19	2.18	0.37	
11,657.00	91.36	357.36	7,111.77	3,859.34	-262.90	3,857.06	0.85	0.10	
11,752.00	91.27	357.54	7,109.59	3,954.22	-267.13	3,951.90	0.21	-0.09	
11,849.00	91.76	357.27	7,107.03	4,051.09	-271.52	4,048.73	0.58	0.51	LAST SURVEY - 11849.00' MD
11,910.00	91.76	357.27	7,105.15	4,111.99	-274.42	4,109.60	0.00	0.00	PTB - 11910.00' MD (466 FNL, 1808 FWL)

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
RUEGGE 3I-4H-N165 B - hit/miss target - Shape	0.00	0.00	7,118.00	4,118.07	-262.44	1,275,458.49	3,231,730.29	40.086554	-104.671782
- actual wellpath misses target center by 18.59usft at 11910.00usft MD (7105.15 TVD, 4111.99 N, -274.42 E)									
- Point									
RUEGGE 3I 1253' VS - actual wellpath misses target center by 5.42usft at 9051.83usft MD (7104.02 TVD, 1255.47 N, -289.72 E)	0.00	0.00	7,100.00	1,255.39	-286.09	1,272,595.71	3,231,733.41	40.078695	-104.671867
- Point									
RUEGGE 3I 2389' VS - actual wellpath misses target center by 9.29usft at 10188.22usft MD (7124.69 TVD, 2391.27 N, -271.50 E)	0.00	0.00	7,117.00	2,391.35	-276.71	1,273,731.72	3,231,732.17	40.081814	-104.671833
- Point									
RUEGGE 3I-4H-N165 T - actual wellpath misses target center by 71.27usft at 7558.26usft MD (7090.53 TVD, -235.00 N, -228.28 E)	0.00	0.00	7,100.00	-242.85	-298.47	1,271,097.43	3,231,735.03	40.074582	-104.671911
- Point									

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
7,550.27	7,089.24	-242.85	-227.59	TPZ - 7550.27 (460 FSL, 1890 FWL)	
11,849.00	7,107.03	4,051.09	-271.52	LAST SURVEY - 11849.00' MD	
11,910.00	7,105.15	4,111.99	-274.42	PTB - 11910.00' MD (466 FNL, 1808 FWL)	

Checked By: _____ Approved By: _____ Date: _____