



Job Number: SVGJ-160277
Company: PDC
Lease/Well: Ehrlich 13-32
Location: Weld County, CO
Rig Name: MS Slickline 2788
RKB: 0'
G.L. or M.S.L.: GL

State/Country: Colorado/USA
Declination: 8.31°
Grid: East To True North
File name: W:\2016\PDC\GJ\EHRLICH\1332.SVY
Date/Time: 08-Nov-16 / 16:13
Curve Name: Surface - 6890' M.D. (Rate Gyro)
Lat: 40.441181 Long: -104.581475

MS Energy

WINSERVE SURVEY CALCULATIONS
Minimum Curvature Method
Vertical Section Plane .00
Vertical Section Referenced to Wellhead
Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
100.00	.72	51.12	100.00	.39	.49	.39	.63	51.12	.72
200.00	.81	41.73	199.99	1.32	1.45	1.32	1.96	47.74	.15
300.00	.83	38.36	299.98	2.41	2.37	2.41	3.38	44.48	.05
400.00	.90	42.22	399.97	3.56	3.35	3.56	4.89	43.21	.09
500.00	.92	45.04	499.95	4.71	4.44	4.71	6.47	43.32	.05
600.00	1.00	55.17	599.94	5.78	5.73	5.78	8.13	44.75	.19
700.00	1.15	56.53	699.92	6.83	7.28	6.83	9.98	46.83	.15
800.00	1.32	52.11	799.90	8.09	9.03	8.09	12.12	48.13	.19
900.00	1.37	47.52	899.87	9.60	10.82	9.60	14.46	48.40	.12
1000.00	1.17	46.70	999.85	11.11	12.44	11.11	16.68	48.23	.20
1100.00	1.23	56.49	1099.83	12.40	14.08	12.40	18.76	48.62	.21
1200.00	1.36	56.28	1199.80	13.65	15.96	13.65	21.00	49.45	.13
1300.00	1.45	50.24	1299.77	15.12	17.92	15.12	23.45	49.84	.17
1400.00	1.26	38.46	1399.74	16.79	19.58	16.79	25.79	49.38	.34

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
1500.00	1.06	26.03	1499.72	18.48	20.67	18.48	27.73	48.19	.32
1600.00	.82	15.01	1599.71	20.01	21.26	20.01	29.19	46.74	.30
1700.00	.67	357.37	1699.70	21.28	21.42	21.28	30.19	45.18	.27
1800.00	.91	356.23	1799.69	22.66	21.34	22.66	31.12	43.28	.24
1900.00	.92	349.67	1899.68	24.24	21.14	24.24	32.16	41.09	.11
2000.00	.67	353.76	1999.67	25.61	20.93	25.61	33.08	39.26	.26
2100.00	.34	41.55	2099.66	26.42	21.07	26.42	33.79	38.57	.51
2200.00	.38	134.41	2199.66	26.41	21.50	26.41	34.05	39.15	.52
2300.00	.28	145.12	2299.66	25.97	21.88	25.97	33.96	40.11	.12
2400.00	.57	166.04	2399.66	25.29	22.14	25.29	33.61	41.20	.32
2500.00	.85	156.21	2499.65	24.13	22.56	24.13	33.03	43.07	.30
2600.00	.84	142.27	2599.64	22.87	23.30	22.87	32.65	45.54	.21
2700.00	.81	147.58	2699.63	21.69	24.13	21.69	32.45	48.05	.08
2800.00	.96	175.02	2799.62	20.26	24.58	20.26	31.86	50.50	.44
2900.00	1.21	187.56	2899.60	18.38	24.52	18.38	30.64	53.14	.34
3000.00	1.18	188.84	2999.58	16.32	24.22	16.32	29.20	56.03	.04
3100.00	.85	184.44	3099.56	14.56	24.00	14.56	28.07	58.76	.34
3200.00	.55	120.38	3199.56	13.58	24.36	13.58	27.89	60.87	.78
3300.00	.65	197.99	3299.55	12.80	24.60	12.80	27.73	62.52	.76
3400.00	1.19	208.87	3399.54	11.35	23.92	11.35	26.48	64.63	.57
3500.00	1.44	206.82	3499.51	9.32	22.85	9.32	24.68	67.82	.25
3600.00	1.50	206.19	3599.48	7.02	21.71	7.02	22.82	72.08	.06
3700.00	1.56	208.24	3699.44	4.65	20.49	4.65	21.01	77.22	.08
3800.00	1.58	214.71	3799.41	2.31	19.06	2.31	19.20	83.08	.18
3900.00	1.60	222.43	3899.37	.15	17.33	.15	17.33	89.50	.21
4000.00	1.24	229.81	3999.34	-1.58	15.56	-1.58	15.64	95.79	.40
4100.00	1.03	235.45	4099.32	-2.79	14.00	-2.79	14.27	101.26	.24
4200.00	.61	240.32	4199.31	-3.56	12.79	-3.56	13.28	105.55	.43
4300.00	.40	248.60	4299.30	-3.95	12.01	-3.95	12.64	108.21	.22
4400.00	.52	270.43	4399.30	-4.07	11.23	-4.07	11.94	109.95	.21
4500.00	.85	247.69	4499.29	-4.35	10.09	-4.35	10.99	113.34	.42
4600.00	1.37	222.08	4599.27	-5.52	8.60	-5.52	10.22	122.70	.71
4700.00	1.40	215.23	4699.25	-7.41	7.09	-7.41	10.26	136.23	.17
4800.00	1.48	204.92	4799.21	-9.58	5.85	-9.58	11.22	148.60	.27
4900.00	1.54	201.95	4899.18	-11.99	4.80	-11.99	12.92	158.19	.10

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
5000.00	1.38	200.51	4999.15	-14.37	3.88	-14.37	14.88	164.90	.16
5100.00	1.50	210.02	5099.12	-16.63	2.80	-16.63	16.86	170.45	.27
5200.00	1.52	207.17	5199.08	-18.94	1.54	-18.94	19.00	175.36	.08
5300.00	1.78	198.37	5299.04	-21.60	.44	-21.60	21.60	178.82	.36
5400.00	1.50	199.28	5399.00	-24.31	-.48	-24.31	24.31	181.13	.28
5500.00	1.66	206.75	5498.96	-26.83	-1.56	-26.83	26.88	183.33	.26
5600.00	2.01	208.08	5598.91	-29.67	-3.04	-29.67	29.83	185.85	.35
5700.00	1.42	187.88	5698.86	-32.45	-4.04	-32.45	32.70	187.09	.84
5800.00	1.49	174.43	5798.83	-34.97	-4.08	-34.97	35.21	186.65	.35
5900.00	1.71	170.08	5898.79	-37.73	-3.70	-37.73	37.92	185.59	.25
6000.00	1.77	172.86	5998.75	-40.74	-3.25	-40.74	40.87	184.56	.10
6100.00	2.06	173.41	6098.69	-44.05	-2.85	-44.05	44.15	183.70	.29
6200.00	2.15	166.85	6198.62	-47.67	-2.22	-47.67	47.72	182.66	.26
6300.00	2.39	137.79	6298.55	-51.04	-.39	-51.04	51.04	180.44	1.16
6400.00	2.91	126.34	6398.44	-54.09	3.06	-54.09	54.17	176.76	.74
6500.00	3.82	139.90	6498.27	-58.14	7.25	-58.14	58.59	172.89	1.20
6600.00	4.72	149.99	6597.99	-64.25	11.45	-64.25	65.26	169.89	1.17
6700.00	5.37	158.56	6697.61	-72.17	15.22	-72.17	73.76	168.09	.99
6800.00	4.58	155.87	6797.23	-80.17	18.56	-80.17	82.29	166.96	.82
Last Survey Depth Recorded									
6890.00	3.71	152.48	6886.99	-86.03	21.38	-86.03	88.65	166.05	1.00