

rec'd 2-22-2010

PathFinder Energy Services, Inc.

Survey Report

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Tie-in Date: 11/19/2009
Date Completed: 11/25/2009

MARBOB ENERGY
WHITE FED #1H
EDDY COUNTY, NM
Rig: PATRIOT 3
PathFinder Office Supervisor: FRANCISCO SINISTERRA
PathFinder Field Engineers: N. TVRDY
T. STACKHOUSE

Survey Horiz. Reference: WELLHEAD
Ref Coordinates: LAT: 32.7.16.6507 N LON: 103.58.53.7424 W
Reference: NAD27 new mexico east Transverse Mercator
Ref GRID Coord: X: 608893.5000 Y: 408026.2000
North Aligned To: GRID NORTH
Total Magnetic Correction: 7.76° EAST TO GRID
Vertical Section Plane: 180.83
Survey Vert. Reference: 22.00' Kelly Bushing To Ground
Altitude: 3042.00' Ground To MSL

Survey Calculations by RX5 V6.02A using Minimum Curvature

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
THE FOLLOWING ARE SCIENTIFIC GYRO SURVEYS.										
0.00	0.00	0.00	0.00	0.00	0.00	0.00 S	0.00 W	0.00@	258.39	0.00
100.00	0.23	267.20	100.00	100.00	0.01	0.01 S	0.20 W	0.21@	267.00	0.23
200.00	0.22	168.95	200.00	100.00	0.21	0.21 S	0.37 W	0.42@	240.45	0.34
300.00	1.51	103.14	299.99	100.00	0.68	0.70 S	0.95 E	1.18@	126.23	1.43
400.00	2.13	118.51	399.94	100.00	1.83	1.88 S	3.87 E	4.30@	115.97	0.78
500.00	2.80	128.48	499.85	100.00	4.18	4.29 S	7.41 E	8.56@	120.06	0.79
600.00	2.80	129.02	599.73	100.00	7.18	7.35 S	11.22 E	13.41@	123.22	0.03
700.00	1.31	164.93	699.66	100.00	9.79	9.99 S	13.42 E	16.73@	126.67	1.90
800.00	1.27	191.02	799.64	100.00	11.98	12.18 S	13.50 E	18.19@	132.06	0.58
900.00	1.51	202.63	899.61	100.00	14.30	14.49 S	12.78 E	19.32@	138.57	0.37
1000.00	1.36	202.90	999.58	100.00	16.62	16.79 S	11.82 E	20.53@	144.87	0.15
1100.00	1.47	193.49	1099.55	100.00	18.97	19.13 S	11.05 E	22.10@	149.99	0.26
1200.00	1.29	181.48	1199.52	100.00	21.35	21.51 S	10.73 E	24.03@	153.49	0.34
1300.00	1.23	159.96	1299.49	100.00	23.48	23.64 S	11.06 E	26.10@	154.92	0.47
1400.00	1.04	140.56	1399.48	100.00	25.17	25.35 S	12.01 E	28.05@	154.65	0.43
1500.00	1.30	121.64	1499.45	100.00	26.45	26.65 S	13.55 E	29.89@	153.04	0.46
1600.00	1.39	108.56	1599.43	100.00	27.40	27.63 S	15.67 E	31.76@	150.44	0.32
1700.00	1.30	105.14	1699.40	100.00	28.05	28.31 S	17.91 E	33.50@	147.68	0.12
1800.00	1.18	96.28	1799.38	100.00	28.43	28.72 S	20.03 E	35.01@	145.11	0.23
1900.00	1.42	93.81	1899.35	100.00	28.59	28.91 S	22.29 E	36.51@	142.37	0.25
2000.00	1.37	82.03	1999.32	100.00	28.47	28.83 S	24.71 E	37.97@	139.40	0.29
2100.00	1.01	56.64	2099.30	100.00	27.79	28.18 S	26.63 E	38.77@	136.62	0.63
2200.00	0.92	63.44	2199.29	100.00	26.93	27.34 S	28.08 E	39.19@	134.23	0.14
2300.00	1.00	76.61	2299.27	100.00	26.34	26.78 S	29.65 E	39.95@	132.08	0.23
2400.00	2.10	82.67	2399.23	100.00	25.87	26.34 S	32.32 E	41.69@	129.18	1.11
2500.00	2.32	83.31	2499.16	100.00	25.34	25.87 S	36.14 E	44.45@	125.59	0.22

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Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
2600.00	2.25	86.77	2599.08	100.00	24.94	25.52 S	40.11 E	47.55@	122.47	0.16
2700.00	2.41	88.69	2699.00	100.00	24.72	25.36 S	44.18 E	50.94@	119.86	0.18
2800.00	2.41	92.57	2798.91	100.00	24.71	25.41 S	48.38 E	54.65@	117.71	0.16
2900.00	2.50	92.27	2898.82	100.00	24.83	25.59 S	52.66 E	58.55@	115.92	0.09
3000.00	1.88	94.47	2998.74	100.00	24.98	25.81 S	56.47 E	62.09@	114.56	0.63
3100.00	1.28	100.57	3098.71	100.00	25.28	26.14 S	59.21 E	64.72@	113.82	0.62
3200.00	1.27	108.64	3198.68	100.00	25.81	26.70 S	61.35 E	66.91@	113.52	0.18
3300.00	1.17	105.02	3298.66	100.00	26.40	27.32 S	63.39 E	69.03@	113.31	0.13
3400.00	0.87	95.11	3398.64	100.00	26.70	27.65 S	65.13 E	70.76@	113.00	0.35
3500.00	0.88	98.58	3498.63	100.00	26.86	27.83 S	66.65 E	72.23@	112.66	0.05
3600.00	0.62	79.42	3598.62	100.00	26.86	27.85 S	67.94 E	73.42@	112.29	0.36
3700.00	0.54	79.80	3698.62	100.00	26.66	27.66 S	68.94 E	74.28@	111.87	0.08
3800.00	0.57	64.38	3798.61	100.00	26.35	27.36 S	69.85 E	75.02@	111.39	0.15
3900.00	0.49	76.50	3898.61	100.00	26.02	27.05 S	70.71 E	75.71@	110.93	0.14
4000.00	0.51	81.29	3998.60	100.00	25.84	26.88 S	71.57 E	76.45@	110.59	0.05
4100.00	0.53	68.22	4098.60	100.00	25.59	26.64 S	72.44 E	77.18@	110.19	0.12
4200.00	0.38	66.46	4198.60	100.00	25.28	26.34 S	73.17 E	77.77@	109.80	0.15
4300.00	0.41	55.85	4298.59	100.00	24.93	26.01 S	73.77 E	78.22@	109.42	0.08
4400.00	0.19	90.43	4398.59	100.00	24.73	25.81 S	74.23 E	78.59@	109.17	0.28
4500.00	0.24	104.98	4498.59	100.00	24.78	25.86 S	74.60 E	78.96@	109.12	0.07
4600.00	0.21	78.14	4598.59	100.00	24.79	25.88 S	74.98 E	79.32@	109.04	0.11
4700.00	0.05	27.62	4698.59	100.00	24.71	25.80 S	75.18 E	79.49@	108.94	0.18
4800.00	0.13	172.09	4798.59	100.00	24.78	25.88 S	75.22 E	79.54@	108.98	0.17
4900.00	0.18	147.24	4898.59	100.00	25.03	26.12 S	75.32 E	79.72@	109.13	0.08
5000.00	0.18	179.32	4998.59	100.00	25.31	26.41 S	75.41 E	79.90@	109.30	0.10
5100.00	0.30	159.01	5098.59	100.00	25.71	26.81 S	75.50 E	80.12@	109.55	0.14
5200.00	0.42	129.36	5198.59	100.00	26.19	27.29 S	75.88 E	80.64@	109.78	0.22
5300.00	0.36	137.06	5298.59	100.00	26.64	27.75 S	76.38 E	81.26@	109.97	0.08
5400.00	0.46	143.24	5398.58	100.00	27.19	28.30 S	76.83 E	81.88@	110.22	0.11

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5500.00	0.73	150.72	5498.58	100.00	28.06	29.18 S	77.38 E	82.70@	110.66	0.28
5600.00	0.82	148.96	5598.57	100.00	29.21	30.35 S	78.06 E	83.75@	111.24	0.09
5700.00	0.80	144.93	5698.56	100.00	30.39	31.53 S	78.83 E	84.90@	111.80	0.06
5800.00	0.74	137.54	5798.55	100.00	31.42	32.58 S	79.67 E	86.07@	112.24	0.12
5900.00	0.88	143.65	5898.54	100.00	32.50	33.67 S	80.56 E	87.32@	112.69	0.16
6000.00	0.91	130.87	5998.53	100.00	33.63	34.81 S	81.62 E	88.73@	113.10	0.20
6100.00	0.88	131.16	6098.51	100.00	34.63	35.84 S	82.79 E	90.22@	113.41	0.03
6200.00	1.06	124.84	6198.50	100.00	35.65	36.87 S	84.13 E	91.86@	113.67	0.21
6300.00	1.14	132.06	6298.48	100.00	36.82	38.07 S	85.63 E	93.71@	113.97	0.16
6400.00	1.18	133.05	6398.46	100.00	38.17	39.44 S	87.12 E	95.63@	114.35	0.05
6500.00	1.09	130.38	6498.44	100.00	39.47	40.76 S	88.60 E	97.52@	114.70	0.10
6600.00	1.15	136.52	6598.42	100.00	40.79	42.10 S	90.01 E	99.37@	115.07	0.13
6700.00	1.29	138.76	6698.40	100.00	42.34	43.67 S	91.45 E	101.34@	115.53	0.15
** TIE IN TO SCIENTIFIC GYRO SURVEY @ 6745' MD.										
6745.00	1.13	139.04	6743.39	45.00	43.05	44.39 S	92.07 E	102.21@	115.74	0.36
THE FOLLOWING ARE PATHFINDER MWD SURVEYS.										
6785.00	2.11	176.23	6783.37	40.00	44.08	45.42 S	92.38 E	102.94@	116.18	3.47
6817.00	5.54	189.84	6815.30	32.00	46.19	47.53 S	92.15 E	103.69@	117.29	11.01
6849.00	9.85	195.53	6847.00	32.00	50.37	51.69 S	91.15 E	104.79@	119.56	13.66
6881.00	14.16	199.23	6878.30	32.00	56.73	58.03 S	89.13 E	106.36@	123.07	13.67
6913.00	18.03	198.46	6909.04	32.00	65.17	66.43 S	86.27 E	108.88@	127.59	12.11
6944.00	21.37	194.80	6938.22	31.00	75.23	76.44 S	83.31 E	113.07@	132.54	11.48
6976.00	24.36	193.14	6967.70	32.00	87.33	88.51 S	80.32 E	119.52@	137.78	9.56
7008.00	28.31	194.68	6996.38	32.00	101.16	102.28 S	76.90 E	127.96@	143.06	12.53
7040.00	32.27	193.12	7024.00	32.00	116.88	117.95 S	73.03 E	138.73@	148.23	12.62
7071.00	35.26	191.40	7049.77	31.00	133.76	134.78 S	69.38 E	151.59@	152.76	10.13
7103.00	38.25	189.28	7075.41	32.00	152.65	153.62 S	65.96 E	167.18@	156.76	10.15
7135.00	41.24	186.58	7100.01	32.00	172.94	173.88 S	63.15 E	184.99@	160.04	10.79
7167.00	44.93	186.27	7123.38	32.00	194.69	195.59 S	60.71 E	204.80@	162.76	11.55
7198.00	48.28	188.06	7144.67	31.00	217.08	217.94 S	57.89 E	225.50@	165.12	11.59

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RIG: PATRIOT 3

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Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft)		Closure Dist Dir (ft) (deg)		DLS (dg/100ft)
7230.00	51.88	188.96	7165.21	32.00	241.39	242.20 S	54.25 E	248.21@	167.37	11.45
7262.00	54.61	189.29	7184.35	32.00	266.76	267.52 S	50.19 E	272.18@	169.37	8.57
7294.00	57.86	189.96	7202.14	32.00	293.05	293.74 S	45.74 E	297.28@	171.15	10.30
7326.00	61.03	190.38	7218.40	32.00	320.23	320.86 S	40.87 E	323.45@	172.74	9.97
7357.00	64.19	190.71	7232.66	31.00	347.36	347.92 S	35.83 E	349.76@	174.12	10.24
7389.00	67.44	190.01	7245.77	32.00	376.14	376.63 S	30.59 E	377.87@	175.36	10.35
7421.00	70.61	190.37	7257.22	32.00	405.62	406.03 S	25.30 E	406.82@	176.43	9.96
7453.00	73.07	190.36	7267.20	32.00	435.61	435.94 S	19.83 E	436.39@	177.40	7.69
7485.00	75.89	190.82	7275.76	32.00	465.99	466.24 S	14.16 E	466.46@	178.26	8.92
7516.00	78.70	190.43	7282.57	31.00	495.79	495.96 S	8.59 E	496.04@	179.01	9.15
7548.00	80.72	189.82	7288.29	32.00	526.86	526.96 S	3.05 E	526.97@	179.67	6.59
7580.00	83.01	190.16	7292.82	32.00	558.13	558.15 S	2.44 W	558.16@	180.25	7.23
7612.00	84.68	189.06	7296.25	32.00	589.57	589.52 S	7.75 W	589.57@	180.75	6.24
7643.00	87.32	187.79	7298.41	31.00	620.22	620.11 S	12.28 W	620.23@	181.13	9.45
7673.00	88.55	186.47	7299.49	30.00	650.02	649.86 S	16.00 W	650.05@	181.41	6.01
7707.00	88.81	186.05	7300.28	34.00	683.86	683.64 S	19.71 W	683.93@	181.65	1.45
7739.00	90.13	185.87	7300.57	32.00	715.73	715.47 S	23.03 W	715.84@	181.84	4.16
7803.00	90.04	185.51	7300.48	64.00	779.50	779.15 S	29.38 W	779.71@	182.16	0.58
7898.00	89.16	186.08	7301.14	95.00	874.14	873.66 S	38.97 W	874.53@	182.55	1.10
7993.00	89.60	185.95	7302.17	95.00	968.74	968.13 S	48.92 W	969.37@	182.89	0.48
8089.00	90.66	185.22	7301.95	96.00	1064.41	1063.68 S	58.26 W	1065.27@	183.14	1.34
8184.00	91.54	185.83	7300.13	95.00	1159.07	1158.22 S	67.41 W	1160.18@	183.33	1.13
8279.00	90.75	185.87	7298.23	95.00	1253.69	1252.70 S	77.09 W	1255.07@	183.52	0.83
8375.00	91.01	185.54	7296.75	96.00	1349.33	1348.21 S	86.63 W	1351.00@	183.68	0.44
8470.00	89.25	186.15	7296.54	95.00	1443.96	1442.72 S	96.31 W	1445.93@	183.82	1.96
8565.00	88.90	186.11	7298.07	95.00	1538.54	1537.16 S	106.45 W	1540.84@	183.96	0.37
8661.00	88.90	186.22	7299.91	96.00	1634.11	1632.59 S	116.76 W	1636.76@	184.09	0.12
8756.00	90.92	186.73	7300.06	95.00	1728.64	1726.98 S	127.47 W	1731.68@	184.22	2.19
8851.00	90.75	186.54	7298.68	95.00	1823.14	1821.33 S	138.45 W	1826.58@	184.35	0.27

+ Horiz →

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8947.00	89.60	184.69	7298.39	96.00	1918.80	1916.86 S	147.84 W	1922.56@	184.41	2.27
9042.00	89.60	182.89	7299.05	95.00	2013.67	2011.65 S	154.12 W	2017.54@	184.38	1.89
9169.00	90.22	181.07	7299.25	127.00	2140.64	2138.57 S	158.50 W	2144.43@	184.24	1.51
9264.00	89.96	179.58	7299.10	95.00	2235.63	2233.56 S	159.04 W	2239.22@	184.07	1.59
9360.00	90.22	179.19	7298.95	96.00	2331.60	2329.56 S	158.01 W	2334.91@	183.88	0.49
9455.00	88.64	177.21	7299.89	95.00	2426.49	2424.50 S	155.03 W	2429.45@	183.66	2.67
9550.00	87.67	176.60	7302.95	95.00	2521.22	2519.31 S	149.90 W	2523.77@	183.41	1.21
9646.00	88.55	177.05	7306.12	96.00	2616.93	2615.11 S	144.59 W	2619.10@	183.16	1.03
9741.00	89.69	176.10	7307.58	95.00	2711.65	2709.93 S	138.91 W	2713.48@	182.93	1.56
9836.00	90.31	175.37	7307.58	95.00	2806.28	2804.66 S	131.85 W	2807.76@	182.69	1.01
9931.00	90.48	175.79	7306.92	95.00	2900.88	2899.38 S	124.53 W	2902.05@	182.46	0.48
10027.00	90.75	175.74	7305.89	96.00	2996.49	2995.11 S	117.44 W	2997.41@	182.25	0.29
10122.00	90.92	175.55	7304.51	95.00	3091.10	3089.82 S	110.23 W	3091.79@	182.04	0.27
10217.00	90.57	177.03	7303.27	95.00	3185.79	3184.61 S	104.08 W	3186.31@	181.87	1.60
10313.00	90.22	177.15	7302.61	96.00	3281.58	3280.49 S	99.21 W	3281.99@	181.73	0.39
10408.00	90.13	177.36	7302.32	95.00	3376.39	3375.38 S	94.66 W	3376.70@	181.61	0.24
10503.00	90.04	177.10	7302.18	95.00	3471.21	3470.27 S	90.07 W	3471.44@	181.49	0.29
10598.00	89.25	176.83	7302.77	95.00	3565.99	3565.13 S	85.04 W	3566.14@	181.37	0.88
10693.00	89.52	177.49	7303.79	95.00	3660.79	3660.01 S	80.33 W	3660.89@	181.26	0.75
10788.00	89.52	177.96	7304.58	95.00	3755.64	3754.93 S	76.56 W	3755.71@	181.17	0.49
10884.00	90.13	177.57	7304.88	96.00	3851.51	3850.86 S	72.81 W	3851.54@	181.08	0.75
10979.00	90.57	177.63	7304.30	95.00	3946.35	3945.77 S	68.84 W	3946.37@	181.00	0.47
11075.00	90.66	178.02	7303.27	96.00	4042.22	4041.69 S	65.19 W	4042.22@	180.92	0.42
11170.00	91.28	178.70	7301.66	95.00	4137.11	4136.64 S	62.47 W	4137.11@	180.87	0.97
11265.00	91.28	179.06	7299.54	95.00	4232.03	4231.60 S	60.62 W	4232.03@	180.82	0.38
11360.00	90.40	178.93	7298.14	95.00	4326.97	4326.57 S	58.95 W	4326.98@	180.78	0.94
11455.00	90.22	179.22	7297.63	95.00	4421.93	4421.56 S	57.42 W	4421.93@	180.74	0.36
STRAIGHT LINE PROJECTION TO BIT @ 11500' MD.										
11500.00	90.22	179.22	7297.46	45.00	4466.91	4466.56 S	56.81 W	4466.92@	180.73	0.00

Surf: 480' FNL, 380' FEL
EOL: 333' FEL, 437' FEL