

30-015-41580

RKI Exploration & Production

Eddy County (NM83E)

Sec 22-T26S-R30E

RDU #44H

Ross Draw Unit

Wellbore #1

Survey: MWD Surveys

Standard Survey Report

18 October, 2013

Wolverine Directional, LLC

Survey Report

Company:	RKI Exploration & Production	Local Co-ordinate Reference:	Well RDU #44H
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0ft (Original Well Elev)
Site:	Sec 22-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDU #44H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Design:	Wellbore #1			
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	182.09

Survey Program	Date: 10/18/13			
From	To	Survey (Wellbore)	Tool Name	Description
(ft)	(ft)			
100.0	12,187.0	MWD Surveys (Wellbore #1)	MWD	MWD - Standard

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(ft)	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(°/100ft)	(°/100ft)	(°/100ft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.32	256.64	100.0	-0.1	-0.3	0.1	0.32	0.32	0.00
First GYRO Survey									
200.0	0.45	222.76	200.0	-0.4	-0.8	0.4	0.26	0.13	-33.88
300.0	0.73	213.57	300.0	-1.2	-1.4	1.3	0.29	0.28	-9.19
400.0	0.79	220.83	400.0	-2.3	-2.2	2.4	0.11	0.06	7.26
500.0	1.52	254.34	500.0	-3.2	-4.0	3.3	0.97	0.73	33.51
600.0	1.65	250.52	599.9	-4.0	-6.6	4.2	0.17	0.13	-3.82
700.0	1.77	250.17	699.9	-5.0	-9.4	5.4	0.12	0.12	-0.35
800.0	1.92	232.74	799.8	-6.5	-12.2	7.0	0.58	0.15	-17.43
900.0	2.08	231.99	899.8	-8.7	-15.0	9.2	0.16	0.16	-0.75
1,000.0	2.13	232.24	999.7	-10.9	-17.9	11.6	0.05	0.05	0.25
1,100.0	2.26	234.09	1,099.6	-13.2	-20.9	14.0	0.15	0.13	1.85
1,200.0	2.25	234.28	1,199.6	-15.5	-24.1	16.4	0.01	-0.01	0.19
1,300.0	1.74	229.91	1,299.5	-17.7	-26.9	18.6	0.53	-0.51	-4.37
1,400.0	1.23	230.90	1,399.5	-19.3	-28.9	20.4	0.51	-0.51	0.99
1,500.0	0.74	237.14	1,499.4	-20.3	-30.2	21.4	0.50	-0.49	6.24
1,600.0	0.54	228.13	1,599.4	-21.0	-31.1	22.1	0.22	-0.20	-9.01
1,700.0	0.57	231.62	1,699.4	-21.6	-31.9	22.8	0.05	0.03	3.49
1,800.0	0.95	207.20	1,799.4	-22.7	-32.6	23.8	0.49	0.38	-24.42
1,900.0	1.18	200.63	1,899.4	-24.4	-33.4	25.6	0.26	0.23	-6.57
2,000.0	1.38	199.45	1,999.4	-26.5	-34.1	27.7	0.20	0.20	-1.18
2,100.0	1.56	200.27	2,099.3	-28.9	-35.0	30.1	0.18	0.18	0.82
2,200.0	1.78	220.68	2,199.3	-31.3	-36.5	32.7	0.63	0.22	20.41
2,300.0	2.20	225.53	2,299.2	-33.9	-38.9	35.3	0.45	0.42	4.85
2,400.0	2.10	222.48	2,399.2	-36.6	-41.5	38.0	0.15	-0.10	-3.05
2,500.0	1.82	216.18	2,499.1	-39.2	-43.7	40.8	0.35	-0.28	-6.30
2,600.0	1.67	210.33	2,599.1	-41.7	-45.3	43.4	0.23	-0.15	-5.85
2,700.0	1.12	203.09	2,699.0	-43.9	-46.5	45.6	0.58	-0.55	-7.24
2,800.0	0.73	171.23	2,799.0	-45.4	-46.7	47.1	0.63	-0.39	-31.86
2,900.0	1.46	132.20	2,899.0	-46.9	-45.7	48.5	1.00	0.73	-39.03
3,000.0	1.69	131.28	2,999.0	-48.7	-43.6	50.3	0.23	0.23	-0.92
3,100.0	2.33	118.55	3,098.9	-50.7	-40.8	52.1	0.78	0.64	-12.73
3,200.0	3.72	116.58	3,198.8	-53.1	-36.1	54.4	1.39	1.39	-1.97
3,300.0	4.25	116.82	3,298.5	-56.2	-29.9	57.3	0.53	0.53	0.24
3,400.0	3.78	112.24	3,398.3	-59.1	-23.5	60.0	0.57	-0.47	-4.58
3,500.0	3.06	119.06	3,498.1	-61.7	-18.1	62.3	0.83	-0.72	6.82
3,600.0	2.89	119.14	3,598.0	-64.2	-13.6	64.7	0.17	-0.17	0.08
3,700.0	2.81	117.35	3,697.8	-66.6	-9.2	66.9	0.12	-0.08	-1.79

Wolverine Directional, LLC

Survey Report

Company:	RKI Exploration & Production	Local Co-ordinate Reference:	Well RDU #44H
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0ft (Original Well Elev)
Site:	Sec 22-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDU #44H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,800.0	2.70	117.68	3,797.7	-68.8	-4.9	68.9	0.11	-0.11	0.33
3,900.0	2.65	119.44	3,897.6	-71.0	-0.8	71.0	0.10	-0.05	1.76
4,000.0	2.55	117.92	3,997.5	-73.2	3.1	73.0	0.12	-0.10	-1.52
4,100.0	2.41	116.89	4,097.4	-75.2	7.0	74.9	0.15	-0.14	-1.03
4,200.0	2.12	115.71	4,197.3	-76.9	10.5	76.5	0.29	-0.29	-1.18
4,300.0	2.04	112.89	4,297.3	-78.4	13.8	77.9	0.13	-0.08	-2.82
4,400.0	1.76	116.31	4,397.2	-79.8	16.8	79.1	0.30	-0.28	3.42
4,500.0	1.59	115.98	4,497.2	-81.1	19.5	80.3	0.17	-0.17	-0.33
4,600.0	1.56	115.08	4,597.1	-82.3	21.9	81.4	0.04	-0.03	-0.90
4,700.0	1.33	112.12	4,697.1	-83.3	24.3	82.4	0.24	-0.23	-2.96
4,800.0	1.15	106.64	4,797.1	-84.0	26.3	83.0	0.22	-0.18	-5.48
4,900.0	1.03	103.79	4,897.1	-84.5	28.1	83.4	0.13	-0.12	-2.85
5,000.0	1.02	93.42	4,997.1	-84.8	29.9	83.6	0.19	-0.01	-10.37
5,100.0	1.15	88.57	5,097.0	-84.8	31.8	83.6	0.16	0.13	-4.85
5,200.0	1.11	104.75	5,197.0	-85.0	33.7	83.7	0.32	-0.04	16.18
5,300.0	0.98	125.16	5,297.0	-85.8	35.4	84.4	0.39	-0.13	20.41
5,400.0	0.92	131.11	5,397.0	-86.8	36.7	85.4	0.12	-0.06	5.95
5,500.0	0.94	120.55	5,497.0	-87.7	38.0	86.3	0.17	0.02	-10.56
5,600.0	0.90	142.28	5,597.0	-88.8	39.2	87.3	0.35	-0.04	21.73
5,700.0	1.03	151.76	5,696.9	-90.2	40.1	88.7	0.21	0.13	9.48
5,800.0	1.22	153.77	5,796.9	-91.9	41.0	90.4	0.19	0.19	2.01
5,900.0	1.24	162.42	5,896.9	-93.9	41.8	92.3	0.19	0.02	8.65
6,000.0	1.27	159.72	5,996.9	-96.0	42.5	94.4	0.07	0.03	-2.70
6,100.0	1.30	165.82	6,096.9	-98.1	43.1	96.5	0.14	0.03	6.10
6,200.0	1.22	170.22	6,196.8	-100.3	43.6	98.6	0.13	-0.08	4.40
6,300.0	1.16	170.31	6,296.8	-102.3	43.9	100.7	0.06	-0.06	0.09
6,400.0	0.99	154.69	6,396.8	-104.1	44.5	102.4	0.34	-0.17	-15.62
6,500.0	1.00	145.17	6,496.8	-105.6	45.3	103.9	0.17	0.01	-9.52
6,600.0	1.01	137.70	6,596.8	-107.0	46.4	105.2	0.13	0.01	-7.47
6,700.0	1.12	141.11	6,696.7	-108.4	47.6	106.6	0.13	0.11	3.41
6,800.0	1.23	142.08	6,796.7	-110.0	48.9	108.1	0.11	0.11	0.97
6,900.0	1.21	150.59	6,896.7	-111.8	50.1	109.9	0.18	-0.02	8.51
7,000.0	1.26	157.33	6,996.7	-113.7	51.0	111.8	0.15	0.05	6.74
7,100.0	1.58	162.37	7,096.6	-116.0	51.9	114.1	0.34	0.32	5.04
7,188.0	1.64	163.20	7,184.6	-118.4	52.6	116.4	0.07	0.07	0.94
Last GYRO Survey									
7,209.0	1.80	173.70	7,205.6	-119.0	52.7	117.0	1.68	0.76	50.00
First MWD Survey									
7,240.0	3.30	167.00	7,236.6	-120.4	53.0	118.3	4.93	4.84	-21.61
7,272.0	6.30	166.30	7,268.5	-123.0	53.6	120.9	9.38	9.38	-2.19
7,304.0	9.60	168.50	7,300.1	-127.3	54.6	125.2	10.35	10.31	6.88
7,335.0	12.80	172.50	7,330.5	-133.2	55.5	131.1	10.62	10.32	12.90
7,367.0	15.90	177.20	7,361.5	-141.1	56.2	139.0	10.34	9.69	14.69
7,399.0	19.00	180.20	7,392.1	-150.7	56.4	148.5	10.08	9.69	9.38
7,430.0	22.20	181.60	7,421.1	-161.6	56.2	159.4	10.44	10.32	4.52
7,462.0	25.20	184.80	7,450.4	-174.4	55.5	172.3	10.20	9.38	10.00
7,494.0	28.10	186.60	7,479.0	-188.7	54.0	186.6	9.41	9.06	5.63
7,526.0	31.60	186.00	7,506.7	-204.5	52.3	202.5	10.98	10.94	-1.88
7,557.0	35.10	183.60	7,532.6	-221.5	50.9	219.5	12.06	11.29	-7.74
7,589.0	38.10	181.10	7,558.3	-240.6	50.1	238.6	10.47	9.38	-7.81
7,621.0	41.20	180.40	7,582.9	-261.0	49.9	259.0	9.79	9.69	-2.19
7,653.0	43.70	181.60	7,606.6	-282.6	49.5	280.6	8.21	7.81	3.75
7,685.0	46.50	181.50	7,629.1	-305.2	48.9	303.3	8.75	8.75	-0.31
7,716.0	49.10	181.60	7,650.0	-328.2	48.2	326.2	8.39	8.39	0.32

Wolverine Directional, LLC

Survey Report

Company:	RKI Exploration & Production	Local Co-ordinate Reference:	Well RDU #44H
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0ft (Original Well Elev)
Site:	Sec 22-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDU #44H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
7,748.0	52.00	182.50	7,670.3	-352.9	47.4	350.9	9.32	9.06	2.81
7,780.0	55.40	183.20	7,689.2	-378.6	46.1	376.7	10.77	10.63	2.19
7,812.0	59.20	183.60	7,706.5	-405.5	44.5	403.6	11.92	11.88	1.25
7,843.0	62.80	182.90	7,721.6	-432.6	42.9	430.7	11.78	11.61	-2.26
7,875.0	65.90	181.50	7,735.4	-461.4	41.8	459.6	10.46	9.69	-4.38
7,907.0	67.70	179.40	7,748.0	-490.8	41.6	489.0	8.25	5.63	-6.56
7,939.0	71.20	179.70	7,759.2	-520.8	41.8	518.9	10.97	10.94	0.94
7,971.0	74.20	181.80	7,768.8	-551.3	41.4	549.4	11.28	9.38	6.56
8,002.0	78.00	183.60	7,776.2	-581.4	40.0	579.5	13.49	12.26	5.81
8,034.0	81.30	183.90	7,782.0	-612.8	38.0	611.0	10.35	10.31	0.94
8,066.0	84.30	184.50	7,786.0	-644.4	35.6	642.7	9.56	9.38	1.88
8,097.0	88.30	184.60	7,788.0	-675.3	33.2	673.6	12.91	12.90	0.32
8,123.0	90.70	184.60	7,788.2	-701.2	31.1	699.6	9.23	9.23	0.00
8,155.0	91.90	184.30	7,787.5	-733.1	28.6	731.5	3.87	3.75	-0.94
8,187.0	92.40	184.50	7,786.3	-765.0	26.2	763.5	1.68	1.56	0.63
8,218.0	92.70	184.50	7,784.9	-795.8	23.7	794.4	0.97	0.97	0.00
8,250.0	93.00	184.10	7,783.3	-827.7	21.3	826.4	1.56	0.94	-1.25
8,346.0	91.80	183.40	7,779.3	-923.4	15.1	922.2	1.45	-1.25	-0.73
8,441.0	90.90	183.40	7,777.0	-1,018.2	9.4	1,017.2	0.95	-0.95	0.00
8,536.0	91.10	184.10	7,775.4	-1,113.0	3.2	1,112.1	0.77	0.21	0.74
8,631.0	90.40	184.10	7,774.1	-1,207.7	-3.6	1,207.1	0.74	-0.74	0.00
8,727.0	90.90	182.90	7,773.0	-1,303.6	-9.4	1,303.0	1.35	0.52	-1.25
8,822.0	90.20	182.20	7,772.1	-1,398.5	-13.7	1,398.0	1.04	-0.74	-0.74
8,917.0	91.50	182.20	7,770.7	-1,493.4	-17.3	1,493.0	1.37	1.37	0.00
9,012.0	92.10	181.30	7,767.7	-1,588.3	-20.2	1,588.0	1.14	0.63	-0.95
9,108.0	90.60	182.30	7,765.5	-1,684.2	-23.2	1,683.9	1.88	-1.56	1.04
9,203.0	88.70	182.70	7,766.1	-1,779.1	-27.4	1,778.9	2.04	-2.00	0.42
9,297.0	90.20	182.90	7,767.0	-1,873.0	-32.0	1,872.9	1.61	1.60	0.21
9,391.0	90.00	181.30	7,766.8	-1,966.9	-35.4	1,966.9	1.72	-0.21	-1.70
9,485.0	90.80	179.70	7,766.1	-2,060.9	-36.2	2,060.9	1.90	0.85	-1.70
9,579.0	92.30	179.50	7,763.6	-2,154.9	-35.6	2,154.7	1.61	1.60	-0.21
9,673.0	92.90	182.20	7,759.3	-2,248.8	-37.0	2,248.6	2.94	0.64	2.87
9,767.0	91.50	183.40	7,755.7	-2,342.6	-41.6	2,342.5	1.96	-1.49	1.28
9,862.0	90.70	183.70	7,753.9	-2,437.4	-47.4	2,437.5	0.90	-0.84	0.32
9,957.0	89.70	184.30	7,753.6	-2,532.1	-54.1	2,532.4	1.23	-1.05	0.63
10,051.0	89.70	182.90	7,754.1	-2,626.0	-60.0	2,626.4	1.49	0.00	-1.49
10,145.0	89.30	181.50	7,754.9	-2,719.9	-63.6	2,720.4	1.55	-0.43	-1.49
10,239.0	92.90	183.40	7,753.1	-2,813.8	-67.6	2,814.3	4.33	3.83	2.02
10,333.0	91.90	184.30	7,749.1	-2,907.5	-73.9	2,908.2	1.43	-1.06	0.96
10,426.0	91.90	184.60	7,746.1	-3,000.1	-81.1	3,001.1	0.32	0.00	0.32
10,521.0	93.50	184.80	7,741.6	-3,094.7	-88.9	3,095.9	1.70	1.68	0.21
10,617.0	93.10	184.60	7,736.1	-3,190.2	-96.7	3,191.6	0.47	-0.42	-0.21
10,711.0	89.30	184.50	7,734.1	-3,283.9	-104.2	3,285.5	4.04	-4.04	-0.11
10,805.0	90.60	184.50	7,734.2	-3,377.6	-111.6	3,379.4	1.38	1.38	0.00
10,899.0	90.50	182.30	7,733.3	-3,471.4	-117.1	3,473.4	2.34	-0.11	-2.34
10,992.0	91.50	182.70	7,731.6	-3,564.3	-121.2	3,566.4	1.16	1.08	0.43
11,086.0	91.90	182.30	7,728.9	-3,658.2	-125.3	3,660.3	0.60	0.43	-0.43
11,180.0	89.10	182.20	7,728.0	-3,752.1	-129.0	3,754.3	2.98	-2.98	-0.11
11,273.0	90.60	182.00	7,728.3	-3,845.0	-132.4	3,847.3	1.63	1.61	-0.22
11,367.0	91.20	182.30	7,726.8	-3,938.9	-135.9	3,941.3	0.71	0.64	0.32
11,463.0	92.60	181.60	7,723.6	-4,034.8	-139.2	4,037.2	1.63	1.46	-0.73
11,556.0	92.20	182.90	7,719.7	-4,127.7	-142.8	4,130.1	1.46	-0.43	1.40
11,651.0	89.70	182.70	7,718.1	-4,222.5	-147.5	4,225.1	2.64	-2.63	-0.21
11,745.0	91.60	182.30	7,717.1	-4,316.4	-151.6	4,319.1	2.07	2.02	-0.43

Wolverine Directional, LLC

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Well:	RDU #44H	North Reference:	True
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Design:	Wellbore #1	Database:	EDM 2003.21 Single User 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)	Turn Rate (°/100ft)
11,838.0	90.20	182.70	7,715.6	-4,409.3	-155.6	4,412.1	1.57	-1.51	0.43
11,931.0	89.50	182.20	7,715.9	-4,502.3	-159.6	4,505.1	0.92	-0.75	-0.54
12,025.0	91.80	181.80	7,714.8	-4,596.2	-162.9	4,599.1	2.48	2.45	-0.43
12,119.0	93.70	181.60	7,710.3	-4,690.0	-165.7	4,693.0	2.03	2.02	-0.21
12,140.0	94.00	181.50	7,708.9	-4,711.0	-166.2	4,713.9	1.51	1.43	-0.48
Last MWD Survey:									
12,187.0	94.00	181.50	7,705.6	-4,757.9	-167.5	4,760.8	0.00	0.00	0.00
Proj to TD -RDU #44H PBHL									

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
100.0	100.0	-0.1	-0.3	First GYRO Survey
7,188.0	7,184.6	-118.4	52.6	Last GYRO Survey
7,209.0	7,205.6	-119.0	52.7	First MWD Survey
12,140.0	7,708.9	-4,711.0	-166.2	Last MWD Survey
12,187.0	7,705.6	-4,757.9	-167.5	Proj to TD

Checked By: _____	Approved By: _____	Date: _____
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