

LEAM Drilling Systems LLC

Survey Report

NM OIL CONSERVATION

ARTESIA DISTRICT

30-015-44091

DEC 27 2017

Company:	Rockcliff Energy	Local Coordinate Reference:	Well El Toro Invicta 14 #221H
Project:	Eddy County, NM	MD Reference:	RKB @ 2996.00usft
Site:	Toro Pad	MD Reference:	RKB @ 2996.00usft
Well:	El Toro Invicta 14 #221H	North Reference:	Grid
Wellbore:	OH	Survey/Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Multi User Db

Project:	Eddy County, NM		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site:		Toro Pad			
Site Position:		Northing:	472,609.00 usft	Latitude:	32° 17' 56.521 N
From:	Map	Easting:	582,897.00 usft	Longitude:	104° 3' 54.163 W
Position Uncertainty:	1.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.14 °

Well	El Toro Invicta 14 #221H					
Well Position	+N-S	0.00 usft	Northing:	472,609.00 usft	Latitude:	32° 17' 56.521 N
	+E-W	0.00 usft	Easting:	582,877.00 usft	Longitude:	104° 3' 54.396 W
Position Uncertainty	1.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	2,996.00 usft	

Wellbore:	OH
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Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	HDGM	12/23/2016	7.35	60.15	48,183

Design:	OH
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Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00

Vertical Section:	Depth From (TVD)	N-S	E-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.00	0.00	0.00	359.97

Survey Program		Date: 8/29/2017		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
224.00	7,668.00	Survey #1 (OH)	MWD-ISCWSA	MWD - Standard
7,750.00	12,836.00	Survey #2 (OH)	LEAM MWD+HDGM	MWD+HDGM
12,912.00	12,912.00	Survey #3 (OH)	Project	Projection

Survey	Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	N-S (usft)	E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	224.00	0.13	1.42	224.00	0.25	0.01	0.25	0.06	0.06	0.00
	274.00	0.09	345.65	274.00	0.35	0.00	0.35	0.10	-0.08	-31.54
	353.00	0.09	359.96	353.00	0.47	-0.02	0.47	0.03	0.00	18.11
	442.00	0.07	22.31	442.00	0.59	0.00	0.59	0.04	-0.02	25.11
	472.00	0.04	342.58	472.00	0.62	0.01	0.62	0.16	-0.10	-132.43
	589.00	0.20	145.50	589.00	0.49	0.11	0.49	0.20	0.14	139.25
	709.00	0.31	171.91	709.00	-0.01	0.27	-0.01	0.13	0.09	22.01
	830.00	0.51	193.53	830.00	-0.85	0.19	-0.85	0.21	0.17	17.87

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Project	Eddy County, NM	RKB @ 2996.00usft
Site	Toro Pad	RKB @ 2996.00usft
Well	El Toro Invicta 14 #221H	Grid
Wellbore	OH	Minimum Curvature
Design	OH	EDM 5000.1 Multi User Db

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True North (usft)	North (usft)	East (usft)	Depth (usft)	North (usft)	East (usft)	True North (usft)
957.00	0.66	195.74	956.99	-2.11	-0.14	-2.11	0.12	0.12	1.74
1,047.00	0.42	209.13	1,046.98	-2.89	-0.44	-2.89	0.30	-0.27	14.88
1,138.00	0.37	250.84	1,137.98	-3.28	-0.88	-3.28	0.31	-0.05	45.84
1,229.00	0.59	260.73	1,228.98	-3.45	-1.62	-3.45	0.26	0.24	10.87
1,320.00	0.81	249.45	1,319.97	-3.75	-2.68	-3.75	0.28	0.24	-12.40
1,410.00	0.94	243.09	1,409.96	-4.31	-3.94	-4.31	0.18	0.14	-7.07
1,501.00	1.14	239.79	1,500.95	-5.11	-5.38	-5.10	0.23	0.22	-3.63
1,592.00	1.32	238.45	1,591.93	-6.11	-7.06	-6.11	0.20	0.20	-1.47
1,683.00	1.12	237.32	1,682.91	-7.14	-8.70	-7.13	0.22	-0.22	-1.24
1,773.00	0.37	136.01	1,772.90	-7.82	-9.24	-7.82	1.39	-0.83	-112.57
1,864.00	1.49	112.17	1,863.89	-8.48	-7.94	-8.48	1.28	1.23	-26.20
1,955.00	2.37	118.31	1,954.83	-9.82	-5.19	-9.82	0.99	0.97	6.75
2,046.00	1.30	122.77	2,045.79	-11.27	-2.66	-11.27	1.19	-1.18	4.90
2,136.00	1.98	130.21	2,135.75	-12.83	-0.62	-12.83	0.79	0.76	8.27
2,227.00	1.71	134.05	2,226.70	-14.78	1.56	-14.79	0.33	-0.30	4.22
2,318.00	0.62	141.34	2,317.68	-16.11	2.84	-16.11	1.21	-1.20	8.01
2,409.00	0.57	118.69	2,408.68	-16.72	3.55	-16.72	0.26	-0.05	-24.89
2,500.00	0.55	123.39	2,499.67	-17.17	4.31	-17.18	0.06	-0.02	5.16
2,551.00	0.55	118.97	2,550.67	-17.43	4.73	-17.43	0.08	0.00	-8.67
2,767.00	0.62	145.43	2,766.66	-18.89	6.30	-18.89	0.13	0.03	12.25
2,949.00	0.51	144.58	2,948.65	-20.36	7.33	-20.37	0.06	-0.06	-0.47
3,130.00	0.35	147.29	3,129.64	-21.48	8.09	-21.49	0.09	-0.09	1.50
3,312.00	0.29	141.07	3,311.64	-22.31	8.68	-22.31	0.04	-0.03	-3.42
3,493.00	0.20	175.62	3,492.64	-22.98	8.99	-22.99	0.09	-0.05	19.09
3,675.00	0.31	168.31	3,674.64	-23.78	9.12	-23.78	0.06	0.06	-4.02
3,856.00	0.26	142.10	3,855.64	-24.58	9.47	-24.59	0.08	-0.03	-14.48
4,038.00	0.22	107.79	4,037.63	-25.02	10.06	-25.02	0.08	-0.02	-18.85
4,219.00	0.37	151.24	4,218.63	-25.63	10.67	-25.64	0.14	0.08	24.01
4,401.00	0.57	162.91	4,400.63	-27.01	11.22	-27.02	0.12	0.11	6.41
4,582.00	2.13	188.65	4,581.57	-31.20	10.97	-31.21	0.90	0.86	14.22
4,673.00	3.85	192.98	4,672.44	-35.85	10.03	-35.86	1.90	1.89	4.76
4,764.00	5.43	184.65	4,763.14	-43.12	9.00	-43.12	1.88	1.74	-9.15
4,855.00	7.36	186.08	4,853.57	-53.21	8.03	-53.21	2.13	2.12	1.57
4,945.00	6.59	186.55	4,942.91	-64.07	6.83	-64.07	0.86	-0.86	0.52
5,036.00	7.54	184.06	5,033.22	-75.21	5.81	-75.22	1.10	1.04	-2.74
5,127.00	6.94	185.69	5,123.49	-86.64	4.85	-86.64	0.70	-0.66	1.79
5,217.00	6.48	185.03	5,212.87	-97.11	3.86	-97.11	0.52	-0.51	-0.73
5,308.00	7.41	184.45	5,303.20	-108.08	2.96	-108.08	1.02	1.02	-0.64
5,399.00	6.86	183.62	5,393.50	-119.35	2.16	-119.35	0.61	-0.60	-0.91
5,490.00	6.18	182.44	5,483.91	-129.67	1.61	-129.67	0.76	-0.75	-1.30
5,580.00	7.67	176.82	5,573.25	-140.50	1.73	-140.51	1.82	1.66	-6.24
5,671.00	6.94	177.81	5,663.51	-152.06	2.28	-152.06	0.81	-0.80	1.09
5,762.00	6.24	176.08	5,753.91	-162.49	2.83	-162.49	0.80	-0.77	-1.90

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Company:	Rockcliff Energy	Local Coordinates/Reference:	Well El Toro Invicta 14 #221H
Project:	Eddy County, NM	True Reference:	RKB @ 2996.00usft
Site:	Toro Pad	Mag Reference:	RKB @ 2996.00usft
Well:	El Toro Invicta 14 #221H	North Reference:	Grid
Wellbore:	OH	Survey/Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (usft)	Collar Depth (ft)	Depth (ft)	Vertical Depth (usft)	INAR (usft)	ISAR (usft)	Vertical Angle (usft)	Dogleg Rate (/100usft)	Build Rate (/100usft)	Turn Rate (/100usft)	
5,852.00	5.65	174.87	5,843.43	-171.78	3.56	-171.78	0.67	-0.66	-1.34	
5,943.00	7.01	173.79	5,933.87	-181.76	4.56	-181.77	1.50	1.49	-1.19	
6,034.00	6.57	172.60	6,024.23	-192.45	5.83	-192.45	0.51	-0.48	-1.31	
6,125.00	6.02	178.46	6,114.68	-202.38	6.63	-202.38	0.93	-0.60	6.44	
6,216.00	6.22	179.92	6,205.16	-212.08	6.77	-212.08	0.28	0.22	1.60	
6,306.00	6.66	175.54	6,294.60	-222.16	7.18	-222.16	0.73	0.49	-4.87	
6,397.00	5.69	178.56	6,385.07	-231.93	7.70	-231.93	1.12	-1.07	3.32	
6,488.00	5.82	180.78	6,475.61	-241.05	7.75	-241.06	0.28	0.14	2.44	
6,579.00	6.81	185.98	6,566.06	-251.03	7.13	-251.04	1.26	1.09	5.71	
6,669.00	8.99	186.99	6,655.20	-263.32	5.72	-263.32	2.43	2.42	1.12	
6,760.00	8.72	187.09	6,745.11	-277.22	4.00	-277.23	0.30	-0.30	0.11	
6,850.00	7.87	181.40	6,834.17	-290.15	3.01	-290.16	1.31	-0.94	-6.32	
6,941.00	4.94	177.78	6,924.59	-300.30	3.01	-300.30	3.25	-3.22	-3.98	
7,032.00	6.75	164.18	7,015.12	-309.36	4.62	-309.36	2.49	1.99	-14.95	
7,123.00	8.00	167.38	7,105.37	-320.69	7.46	-320.69	1.45	1.37	3.52	
7,214.00	7.93	161.06	7,195.49	-332.80	10.88	-332.81	0.96	-0.08	-6.95	
7,305.00	6.99	164.22	7,285.72	-344.07	14.42	-344.08	1.13	-1.03	3.47	
7,396.00	5.80	169.46	7,376.15	-353.92	16.77	-353.93	1.46	-1.31	5.76	
7,486.00	5.47	167.03	7,465.72	-362.57	18.56	-362.58	0.45	-0.37	-2.70	
7,577.00	4.09	165.75	7,556.40	-369.94	20.34	-369.95	1.52	-1.52	-1.41	
7,668.00	3.10	158.26	7,647.22	-375.37	22.05	-375.39	1.20	-1.09	-8.23	
7,750.00	2.35	119.29	7,729.13	-378.26	24.33	-378.27	2.38	-0.91	-47.52	
7,795.00	6.90	31.87	7,774.01	-376.41	26.57	-376.42	15.97	10.11	-194.27	
7,841.00	12.59	15.19	7,819.34	-369.22	29.34	-369.23	13.68	12.37	-36.26	
7,886.00	18.20	11.48	7,862.71	-357.59	32.03	-357.60	12.65	12.47	-8.24	
7,932.00	24.66	9.76	7,905.50	-341.07	35.09	-341.09	14.11	14.04	-3.74	
7,934.73	25.04	9.81	7,907.98	-339.94	35.28	-339.96	14.08	14.06	1.71	
SL Crossing 0'FNL 365'FWL										
7,977.00	30.99	10.39	7,945.28	-320.40	38.77	-320.43	14.08	14.07	1.38	
8,023.00	36.94	9.31	7,983.41	-295.09	43.15	-295.12	13.00	12.93	-2.35	
8,068.00	41.53	4.72	8,018.27	-266.86	46.57	-266.89	12.06	10.20	-10.20	
8,112.00	43.25	2.71	8,050.77	-237.26	48.48	-237.29	4.98	3.91	-4.57	
8,159.00	45.09	2.22	8,084.48	-204.55	49.89	-204.57	3.98	3.91	-1.04	
8,205.00	44.10	1.41	8,117.23	-172.27	50.91	-172.29	2.48	-2.15	-1.76	
8,250.00	46.98	0.70	8,148.75	-140.16	51.50	-140.19	6.50	6.40	-1.58	
8,296.00	53.00	1.36	8,178.31	-104.95	52.14	-104.97	13.13	13.09	1.43	
8,341.00	59.73	2.28	8,203.22	-67.52	53.34	-67.55	15.05	14.96	2.04	
8,387.00	66.04	3.41	8,224.18	-26.65	55.38	-26.68	13.89	13.72	2.46	
8,405.30	68.66	3.69	8,231.22	-9.80	56.43	-9.83	14.40	14.33	1.51	
330' HL Crossing 330'FSL 387'FWL										
8,477.00	78.94	4.69	8,251.20	58.78	61.47	58.75	14.40	14.33	1.40	
8,568.00	90.78	4.10	8,259.34	148.99	68.40	148.95	13.03	13.01	-0.65	
8,659.00	92.21	4.14	8,256.96	239.72	74.93	239.68	1.57	1.57	0.04	
8,751.00	90.38	3.20	8,254.88	331.50	80.82	331.46	2.24	-1.99	-1.02	

LEAM Drilling Systems LLC

Survey Report

Company:	Rockcliff Energy	Well:	Well El Toro Invicta 14 #221H
Project:	Eddy County, NM	Grid:	RKB @ 2996.00usft
Site:	Toro Pad	Grid:	RKB @ 2996.00usft
Well:	El Toro Invicta 14 #221H	Minimum Curvature	
Wellbore:	OH	EDM 5000.1 Multi User Db	
Design:	OH		

Measured Depth (usft)	Inclination (°)	Assumed (ft)	Actual Depth (usft)	True Depth (usft)	True Depth (usft)	True Depth (usft)	Dogleg (1/1000ft)	Build (1/1000ft)	Turn (1/1000ft)
8,842.00	90.71	3.57	8,254.02	422.34	86.19	422.29	0.54	0.36	0.41
8,932.00	91.55	1.65	8,252.24	512.22	90.29	512.17	2.33	0.93	-2.13
9,023.00	90.05	0.10	8,250.97	603.20	91.68	603.15	2.37	-1.65	-1.70
9,114.00	90.10	0.30	8,250.85	694.20	92.00	694.15	0.23	0.05	0.22
9,205.00	90.43	359.58	8,250.43	785.19	91.90	785.15	0.87	0.36	-0.79
9,295.00	90.85	359.80	8,249.43	875.19	91.41	875.14	0.53	0.47	0.24
9,387.00	91.09	0.08	8,247.87	967.17	91.32	967.13	0.40	0.26	0.30
9,477.00	91.51	0.36	8,245.83	1,057.15	91.66	1,057.10	0.56	0.47	0.31
9,568.00	90.45	0.34	8,244.27	1,148.13	92.22	1,148.08	1.17	-1.16	-0.02
9,659.00	89.18	359.08	8,244.56	1,239.13	91.76	1,239.08	1.97	-1.40	-1.38
9,750.00	89.44	359.50	8,245.66	1,330.11	90.63	1,330.07	0.54	0.29	0.46
9,841.00	90.01	0.06	8,246.10	1,421.11	90.28	1,421.06	0.88	0.63	0.62
9,931.00	90.21	0.19	8,245.92	1,511.11	90.48	1,511.06	0.27	0.22	0.14
10,022.00	90.32	0.35	8,245.50	1,602.11	90.91	1,602.06	0.21	0.12	0.18
10,113.00	90.78	0.11	8,244.63	1,693.10	91.27	1,693.06	0.57	0.51	-0.26
10,204.00	89.18	359.60	8,244.66	1,784.10	91.04	1,784.05	1.85	-1.76	-0.56
10,295.00	89.15	359.73	8,245.99	1,875.09	90.51	1,875.04	0.15	-0.03	0.14
10,385.00	89.35	0.13	8,247.17	1,965.08	90.40	1,965.03	0.50	0.22	0.44
10,476.00	89.53	0.69	8,248.06	2,056.07	91.05	2,056.03	0.65	0.20	0.62
10,567.00	89.81	0.41	8,248.58	2,147.07	91.92	2,147.02	0.44	0.31	-0.31
10,658.00	90.36	0.34	8,248.44	2,238.07	92.52	2,238.02	0.61	0.60	-0.08
10,749.00	90.78	0.19	8,247.54	2,329.06	92.94	2,329.01	0.49	0.46	-0.16
10,840.00	90.87	359.93	8,246.23	2,420.05	93.03	2,420.00	0.30	0.10	-0.29
10,930.00	91.29	0.18	8,244.53	2,510.03	93.12	2,509.98	0.54	0.47	0.28
11,021.00	91.13	358.98	8,242.61	2,601.01	92.45	2,600.96	1.33	-0.18	-1.32
11,112.00	91.07	358.71	8,240.86	2,691.97	90.62	2,691.93	0.30	-0.07	-0.30
11,203.00	89.15	358.25	8,240.69	2,782.94	88.21	2,782.89	2.17	-2.11	-0.51
11,293.00	89.09	358.27	8,242.07	2,872.89	85.47	2,872.84	0.07	-0.07	0.02
11,385.00	89.48	358.99	8,243.22	2,964.85	83.27	2,964.81	0.89	0.42	0.78
11,475.00	89.92	359.27	8,243.69	3,054.84	81.91	3,054.80	0.58	0.49	0.31
11,566.00	90.74	359.65	8,243.17	3,145.83	81.05	3,145.79	0.99	0.90	0.42
11,657.00	91.51	0.24	8,241.38	3,236.81	80.96	3,236.77	1.07	0.85	0.65
11,747.00	90.01	0.55	8,240.19	3,326.80	81.58	3,326.76	1.70	-1.67	0.34
11,838.00	90.32	0.39	8,239.92	3,417.80	82.33	3,417.75	0.38	0.34	-0.18
11,929.00	91.55	1.04	8,238.44	3,508.78	83.47	3,508.73	1.53	1.35	0.71
12,020.00	89.59	1.27	8,237.53	3,599.75	85.30	3,599.70	2.17	-2.15	0.25
12,110.00	90.14	1.44	8,237.75	3,689.72	87.43	3,689.68	0.64	0.61	0.19
12,201.00	90.98	1.77	8,236.86	3,780.68	89.98	3,780.63	0.99	0.92	0.36
12,292.00	89.84	1.34	8,236.21	3,871.64	92.45	3,871.60	1.34	-1.25	-0.47
12,382.00	90.47	1.66	8,235.96	3,961.61	94.80	3,961.56	0.79	0.70	0.36
12,473.00	90.98	2.97	8,234.81	4,052.53	98.48	4,052.48	1.54	0.56	1.44
12,564.00	89.90	2.05	8,234.11	4,143.44	102.46	4,143.38	1.56	-1.19	-1.01
12,654.00	89.48	2.46	8,234.60	4,233.37	106.00	4,233.31	0.65	-0.47	0.46

LEAM Drilling Systems LLC

Survey Report

Company:	Rockcliff Energy	Local Coordinate Reference:	Well El Toro Invicta 14 #221H
Project:	Eddy County, NM	TVD Reference:	RKB @ 2996.00usft
Site:	Toro Pad	MD Reference:	RKB @ 2996.00usft
Well:	El Toro Invicta 14 #221H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Multi User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	N-S (usft)	E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
12,745.00	89.02	1.72	8,235.79	4,324.30	109.32	4,324.24	0.96	-0.51	-0.81	
12,836.00	89.62	1.56	8,236.87	4,415.25	111.93	4,415.19	0.68	0.66	-0.18	
12,912.00	89.62	1.56	8,237.37	4,491.22	113.99	4,491.16	0.00	0.00	0.00	
Projection										