

NM OIL CONSERVATION  
ARTESIA DISTRICT

JUN 01 2018

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## Survey Certification Form

30.015-44097

State of New Mexico  
Eddy County

I, Randy W. Rakowitz, certify that; I am employed by LEAM Drilling Services, that I did on the day(s) of 08/09/2017 through 08/28/2017, conduct or supervise the taking of MWD Survey from a depth of 285' MD to 21,664' MD; that the data is true, correct, complete and within the limitations of the tools as set forth by LEAM Drilling Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of Devon Energy Production Company, LP for the Emerald PWU 20-22 12H (OH) in Eddy County, New Mexico; and that I reviewed this report and find that it conforms to the principals and procedures as set forth by LEAM Drilling Services.

A handwritten signature in black ink, appearing to read 'Randy W. Rakowitz', is written over a solid horizontal line.

Randy W. Rakowitz  
MWD Operations Coordinator



August 30, 2017

Devon Energy Production Company, LP  
Well: Emerald PWU 20-22 12H (OH)  
County/Parish: Eddy County, NM

LEAM MWD: (OH) from 285' MD - 21,578' MD  
Projection; 21,664' MD

This Borehole Survey taken between 08/09/2017/2017 and 08/28/ 2017 had been conducted and calculated according to the highest professional standards and complies with all known State and Federal requirements.

Reviewed and Approved:

Date: August 30, 2017

**LEAM Drilling Systems LLC**  
Survey Report

<b>Company:</b> Devon Energy	<b>Local Co-ordinate Reference:</b> Well 12H
<b>Project:</b> Eddy County, NM (NAD-83)	<b>TVD Reference:</b> 3313.8' GE + 23.5' KB @ 3337.30usft
<b>Site:</b> Emerald PWU 20-22	<b>MD Reference:</b> 3313.8' GE + 23.5' KB @ 3337.30usft
<b>Well:</b> 12H	<b>North Reference:</b> Grid
<b>Wellbore:</b> OH	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> OH	<b>Database:</b> EDM 5000.1 MULTI User DB

<b>Project</b>	Eddy County, NM (NAD-83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	New Mexico Eastern Zone		

<b>Site</b>	Emerald PWU 20-22				
<b>Site Position:</b>		<b>Northing:</b>	596,335.26 usft	<b>Latitude:</b>	32° 38' 20.9983 N
<b>From:</b>	Map	<b>Easting:</b>	611,703.17 usft	<b>Longitude:</b>	104° 6' 17.0598 W
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.12 °

<b>Well</b>	12H					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	596,335.26 usft	<b>Latitude:</b>	32° 38' 20.9983 N
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	611,703.17 usft	<b>Longitude:</b>	104° 6' 17.0598 W
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	0.00 usft	<b>Ground Level:</b>	3,313.80 usft

<b>Wellbore</b>	OH				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	HDGM	8/8/2017	7.43	60.50	48,186

<b>Design</b>	OH				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	90.00	

<b>Survey Program</b>	<b>Date</b>	11/2/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
50.00	150.00	Survey #1 (OH)	VES GyroFlex V2		
285.00	9,449.00	Survey #2 (OH)	LEAM MWD+HDGM	MWD+HDGM	
9,544.00	21,578.00	Survey #3 (OH)	MWD+IFR1+MS	MWD + IFR1 + Multi-Station Correction	
21,664.00	21,664.00	Survey #4 (OH)	Project	Projection	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	0.09	354.90	50.00	0.04	0.00	0.00	0.18	0.18	0.00	0.00
100.00	0.29	335.65	100.00	0.19	-0.06	-0.06	0.41	0.40	-38.50	-38.50
150.00	0.57	324.69	150.00	0.51	-0.26	-0.26	0.58	0.56	-21.92	-21.92
285.00	1.50	247.30	284.98	0.38	-2.27	-2.27	1.10	0.69	-57.33	-57.33
338.00	1.50	253.60	337.96	-0.09	-3.58	-3.58	0.31	0.00	11.89	11.89
438.00	1.80	251.50	437.92	-0.95	-6.32	-6.32	0.31	0.30	-2.10	-2.10
529.00	1.90	260.30	528.87	-1.66	-9.17	-9.17	0.33	0.11	9.67	9.67

# LEAM Drilling Systems LLC

## Survey Report

**Company:** Devon Energy  
**Project:** Eddy County, NM (NAD-83)  
**Site:** Emerald PWU 20-22  
**Well:** 12H  
**Wellbore:** OH  
**Design:** OH

**Local Co-ordinate Reference:** Well 12H  
**TVD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**MD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**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)	Buid Rate (°/100usft)	Turn Rate (°/100usft)
620.00	1.90	257.60	619.82	-2.24	-12.13	-12.13	0.10	0.00	-2.97
711.00	1.80	254.60	710.77	-2.94	-14.98	-14.98	0.15	-0.11	-3.30
803.00	1.80	254.60	802.73	-3.71	-17.76	-17.76	0.00	0.00	0.00
894.00	1.70	267.10	893.69	-4.16	-20.49	-20.49	0.43	-0.11	13.74
985.00	1.50	262.90	984.65	-4.37	-23.02	-23.02	0.25	-0.22	-4.62
1,077.00	1.40	260.80	1,076.62	-4.70	-25.32	-25.32	0.12	-0.11	-2.28
1,169.00	1.40	253.10	1,168.60	-5.21	-27.51	-27.51	0.20	0.00	-8.37
1,261.00	1.50	257.80	1,260.57	-5.79	-29.76	-29.76	0.17	0.11	5.11
1,353.00	0.80	280.10	1,352.55	-5.93	-31.57	-31.57	0.89	-0.76	24.24
1,449.00	0.50	270.50	1,448.54	-5.81	-32.65	-32.65	0.33	-0.31	-10.00
1,544.00	0.90	277.10	1,543.53	-5.71	-33.80	-33.80	0.43	0.42	6.95
1,640.00	0.70	269.00	1,639.52	-5.63	-35.14	-35.14	0.24	-0.21	-8.44
1,736.00	0.90	276.60	1,735.51	-5.56	-36.47	-36.47	0.24	0.21	7.92
1,831.00	0.70	294.20	1,830.51	-5.23	-37.74	-37.74	0.33	-0.21	18.53
1,927.00	1.10	282.80	1,926.49	-4.79	-39.18	-39.18	0.45	0.42	-11.88
2,022.00	0.70	308.20	2,021.48	-4.23	-40.52	-40.52	0.58	-0.42	26.74
2,118.00	0.40	293.50	2,117.48	-3.73	-41.29	-41.29	0.34	-0.31	-15.31
2,214.00	0.40	295.90	2,213.48	-3.45	-41.90	-41.90	0.02	0.00	2.50
2,310.00	0.60	324.20	2,309.47	-2.90	-42.50	-42.50	0.33	0.21	29.48
2,405.00	0.70	289.40	2,404.47	-2.30	-43.33	-43.33	0.42	0.11	-36.63
2,501.00	1.10	317.20	2,500.45	-1.43	-44.51	-44.51	0.61	0.42	28.96
2,596.00	1.50	318.10	2,595.43	0.17	-45.96	-45.96	0.42	0.42	0.95
2,724.00	3.00	318.10	2,723.33	3.91	-49.32	-49.32	1.17	1.17	0.00
2,788.00	3.30	322.10	2,787.23	6.61	-51.57	-51.57	0.58	0.47	6.25
2,883.00	3.80	319.30	2,882.05	11.15	-55.30	-55.30	0.56	0.53	-2.95
2,979.00	4.60	321.30	2,977.79	16.57	-59.78	-59.78	0.85	0.83	2.08
3,074.00	5.10	319.80	3,072.45	22.76	-64.89	-64.89	0.54	0.53	-1.58
3,170.00	5.70	322.80	3,168.02	29.82	-70.53	-70.53	0.69	0.63	3.13
3,265.00	6.10	320.70	3,262.52	37.49	-76.58	-76.58	0.48	0.42	-2.21
3,361.00	6.20	320.40	3,357.97	45.43	-83.11	-83.11	0.11	0.10	-0.31
3,406.00	6.10	320.20	3,402.71	49.14	-86.19	-86.19	0.23	-0.22	-0.44
3,543.00	6.10	319.00	3,538.93	60.22	-95.63	-95.63	0.09	0.00	-0.88
3,639.00	5.40	325.60	3,634.45	67.80	-101.52	-101.52	1.00	-0.73	6.88
3,734.00	5.30	337.10	3,729.04	75.53	-105.76	-105.76	1.13	-0.11	12.11
3,830.00	5.20	335.80	3,824.64	83.58	-109.27	-109.27	0.16	-0.10	-1.35
3,925.00	4.80	342.70	3,919.28	91.30	-112.21	-112.21	0.76	-0.42	7.26
4,021.00	4.50	343.20	4,014.96	98.74	-114.49	-114.49	0.32	-0.31	0.52
4,116.00	4.60	345.70	4,109.66	106.00	-116.51	-116.51	0.23	0.11	2.63
4,212.00	5.20	348.30	4,205.31	113.99	-118.35	-118.35	0.67	0.63	2.71
4,307.00	6.20	345.00	4,299.84	123.16	-120.55	-120.55	1.11	1.05	-3.47
4,403.00	5.80	351.00	4,395.31	132.96	-122.65	-122.65	0.77	-0.42	6.25
4,498.00	5.80	339.50	4,489.83	142.20	-125.08	-125.08	1.22	0.00	-12.11
4,594.00	5.30	338.80	4,585.38	150.88	-128.38	-128.38	0.53	-0.52	-0.73

# LEAM Drilling Systems LLC

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4,689.00	5.10	339.50	4,679.99	158.92	-131.45	-131.45	0.22	-0.21	0.74
4,785.00	5.40	339.70	4,775.59	167.16	-134.51	-134.51	0.31	0.31	0.21
4,881.00	4.90	339.00	4,871.20	175.22	-137.55	-137.55	0.52	-0.52	-0.73
4,976.00	4.70	342.50	4,965.86	182.72	-140.17	-140.17	0.37	-0.21	3.68
5,072.00	4.50	346.20	5,061.56	190.13	-142.25	-142.25	0.37	-0.21	3.85
5,168.00	4.80	338.80	5,157.24	197.53	-144.60	-144.60	0.70	0.31	-7.71
5,263.00	5.50	343.10	5,251.86	205.59	-147.36	-147.36	0.84	0.74	4.53
5,359.00	5.30	344.50	5,347.43	214.27	-149.88	-149.88	0.25	-0.21	1.46
5,454.00	4.80	353.20	5,442.06	222.44	-151.53	-151.53	0.96	-0.53	9.16
5,550.00	5.50	348.10	5,537.68	230.93	-152.95	-152.95	0.87	0.73	-5.31
5,645.00	5.80	340.20	5,632.22	239.90	-155.52	-155.52	0.88	0.32	-8.32
5,741.00	5.30	339.50	5,727.76	248.62	-158.71	-158.71	0.53	-0.52	-0.73
5,836.00	4.70	342.90	5,822.40	256.45	-161.39	-161.39	0.70	-0.63	3.58
5,932.00	4.60	342.00	5,918.09	263.87	-163.74	-163.74	0.13	-0.10	-0.94
6,027.00	5.50	336.50	6,012.72	271.67	-166.73	-166.73	1.07	0.95	-5.79
6,123.00	5.00	336.20	6,108.31	279.72	-170.26	-170.26	0.52	-0.52	-0.31
6,218.00	4.90	339.20	6,202.96	287.30	-173.37	-173.37	0.29	-0.11	3.16
6,314.00	6.00	339.70	6,298.53	295.84	-176.56	-176.56	1.15	1.15	0.52
6,410.00	5.50	340.90	6,394.04	304.89	-179.81	-179.81	0.54	-0.52	1.25
6,505.00	4.50	338.50	6,488.68	312.66	-182.67	-182.67	1.08	-1.05	-2.53
6,523.32	4.54	338.18	6,506.94	314.00	-183.20	-183.20	0.25	0.21	-1.73
<b>HL Crossing - 6523.32' MD</b>									
6,601.00	4.70	336.90	6,584.37	319.78	-185.59	-185.59	0.25	0.21	-1.65
6,696.00	5.70	340.80	6,678.98	327.82	-188.67	-188.67	1.12	1.05	4.11
6,792.00	6.10	342.30	6,774.47	337.18	-191.79	-191.79	0.45	0.42	1.56
6,887.00	5.30	339.40	6,869.00	346.09	-194.86	-194.86	0.89	-0.84	-3.05
6,983.00	4.90	336.40	6,964.62	354.00	-198.07	-198.07	0.50	-0.42	-3.13
7,079.00	5.50	337.10	7,060.22	362.00	-201.50	-201.50	0.63	0.63	0.73
7,174.00	6.10	336.40	7,154.74	370.81	-205.29	-205.29	0.64	0.63	-0.74
7,269.00	5.50	332.50	7,249.25	379.48	-209.41	-209.41	0.76	-0.63	-4.11
7,365.00	4.70	336.00	7,344.87	387.15	-213.14	-213.14	0.89	-0.83	3.65
7,461.00	3.70	326.40	7,440.61	393.33	-216.45	-216.45	1.27	-1.04	-10.00
7,556.00	3.30	341.60	7,535.44	398.47	-219.01	-219.01	1.06	-0.42	16.00
7,651.00	3.70	344.60	7,630.26	404.02	-220.69	-220.69	0.46	0.42	3.16
7,746.00	2.50	337.40	7,725.12	408.89	-222.30	-222.30	1.33	-1.26	-7.58
7,842.00	3.10	347.80	7,821.00	413.36	-223.65	-223.65	0.82	0.63	10.83
7,938.00	2.60	354.30	7,916.89	418.07	-224.42	-224.42	0.62	-0.52	6.77
8,033.00	2.20	356.40	8,011.80	422.03	-224.74	-224.74	0.43	-0.42	2.21
8,128.00	1.50	356.40	8,106.75	425.09	-224.94	-224.94	0.74	-0.74	0.00
8,224.00	0.80	5.90	8,202.73	427.01	-224.95	-224.95	0.75	-0.73	9.90
8,312.00	0.50	356.20	8,290.73	428.01	-224.91	-224.91	0.36	-0.34	-11.02
8,363.00	0.70	45.60	8,341.72	428.45	-224.70	-224.70	1.05	0.39	96.86
8,411.00	8.10	91.20	8,389.55	428.58	-221.11	-221.11	15.89	15.42	95.00
8,458.00	14.00	93.50	8,435.66	428.16	-212.11	-212.11	12.59	12.55	4.89

# LEAM Drilling Systems LLC

## Survey Report

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8,506.00	21.10	93.20	8,481.40	427.33	-197.67	-197.67	14.79	14.79	-0.63
8,553.00	25.80	91.20	8,524.51	426.64	-178.99	-178.99	10.14	10.00	-4.26
8,601.00	28.80	88.30	8,567.16	426.76	-156.98	-156.98	6.84	6.25	-6.04
8,649.00	32.70	88.30	8,608.40	427.49	-132.46	-132.46	8.13	8.13	0.00
8,697.00	37.70	90.30	8,647.61	427.80	-104.80	-104.80	10.69	10.42	4.17
8,743.00	42.10	91.43	8,682.89	427.34	-75.31	-75.31	9.69	9.57	2.46
8,791.00	44.30	91.64	8,717.88	426.46	-42.46	-42.46	4.59	4.58	0.44
8,839.00	47.06	92.74	8,751.41	425.14	-8.15	-8.15	5.98	5.75	2.29
8,887.00	51.23	93.03	8,782.81	423.31	28.10	28.10	8.70	8.69	0.60
8,935.00	55.86	93.77	8,811.32	421.01	66.63	66.63	9.73	9.65	1.54
8,983.00	59.10	93.19	8,837.12	418.56	107.02	107.02	6.83	6.75	-1.21
9,031.00	62.94	93.13	8,860.37	416.25	148.94	148.94	8.00	8.00	-0.13
9,078.00	65.28	92.37	8,880.89	414.22	191.17	191.17	5.19	4.98	-1.62
9,126.00	68.83	89.99	8,899.61	413.32	235.35	235.35	8.69	7.40	-4.96
9,174.00	71.19	88.26	8,916.02	414.02	280.45	280.45	5.97	4.92	-3.60
9,222.00	74.61	86.79	8,930.13	416.00	326.28	326.28	7.70	7.13	-3.06
9,270.00	78.61	85.53	8,941.24	419.13	372.86	372.86	8.72	8.33	-2.63
9,333.00	83.68	85.66	8,950.94	423.91	434.90	434.90	8.05	8.05	0.21
9,400.00	86.50	85.70	8,956.67	428.94	501.46	501.46	4.21	4.21	0.06
9,449.00	87.55	85.30	8,959.21	432.78	550.24	550.24	2.29	2.14	-0.82
9,544.00	88.12	84.99	8,962.80	440.81	644.83	644.83	0.68	0.60	-0.33
9,640.00	88.96	84.76	8,965.25	449.39	740.42	740.42	0.91	0.88	-0.24
9,736.00	90.13	86.93	8,966.01	456.34	836.16	836.16	2.57	1.22	2.26
9,831.00	89.97	88.57	8,965.93	460.07	931.08	931.08	1.73	-0.17	1.73
9,927.00	89.46	89.25	8,966.41	461.90	1,027.06	1,027.06	0.89	-0.53	0.71
10,022.00	89.68	92.11	8,967.12	460.77	1,122.04	1,122.04	3.02	0.23	3.01
10,118.00	89.68	92.32	8,967.65	457.06	1,217.97	1,217.97	0.22	0.00	0.22
10,214.00	90.07	91.62	8,967.86	453.76	1,313.91	1,313.91	0.83	0.41	-0.73
10,309.00	89.55	91.70	8,968.18	451.01	1,408.87	1,408.87	0.55	-0.55	0.08
10,405.00	89.82	90.80	8,968.71	448.91	1,504.84	1,504.84	0.98	0.28	-0.94
10,501.00	89.89	90.86	8,968.95	447.52	1,600.83	1,600.83	0.10	0.07	0.06
10,596.00	90.77	91.33	8,968.40	445.71	1,695.81	1,695.81	1.05	0.93	0.49
10,692.00	90.25	91.43	8,967.55	443.40	1,791.78	1,791.78	0.55	-0.54	0.10
10,788.00	89.85	90.46	8,967.46	441.81	1,887.77	1,887.77	1.09	-0.42	-1.01
10,883.00	89.58	90.37	8,967.94	441.12	1,982.76	1,982.76	0.30	-0.28	-0.09
10,979.00	89.32	90.78	8,968.86	440.16	2,078.75	2,078.75	0.51	-0.27	0.43
11,075.00	89.75	90.59	8,969.64	439.01	2,174.74	2,174.74	0.49	0.45	-0.20
11,170.00	89.72	90.46	8,970.08	438.14	2,269.74	2,269.74	0.14	-0.03	-0.14
11,266.00	89.95	89.20	8,970.35	438.43	2,365.73	2,365.73	1.33	0.24	-1.31
11,362.00	90.22	88.93	8,970.21	439.99	2,461.72	2,461.72	0.40	0.28	-0.28
11,457.00	90.32	89.03	8,969.76	441.68	2,556.71	2,556.71	0.15	0.11	0.11
11,553.00	90.99	87.61	8,968.67	444.50	2,652.66	2,652.66	1.64	0.70	-1.48
11,649.00	91.36	88.41	8,966.70	447.83	2,748.58	2,748.58	0.92	0.39	0.83

# LEAM Drilling Systems LLC

## Survey Report

**Company:** Devon Energy  
**Project:** Eddy County, NM (NAD-83)  
**Site:** Emerald PWU 20-22  
**Well:** 12H  
**Wellbore:** OH  
**Design:** OH

**Local Co-ordinate Reference:** Well 12H  
**TVD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**MD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**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)
11,744.00	92.30	87.14	8,963.66	451.52	2,843.45	2,843.45	1.66	0.99	-1.34
11,833.00	92.82	87.12	8,959.69	455.97	2,932.25	2,932.25	0.58	0.58	-0.02
11,929.00	90.61	86.17	8,956.82	461.59	3,028.04	3,028.04	2.51	-2.30	-0.99
12,025.00	89.66	86.62	8,956.59	467.62	3,123.85	3,123.85	1.09	-0.99	0.47
12,120.00	90.46	89.27	8,956.49	471.03	3,218.78	3,218.78	2.91	0.84	2.79
12,216.00	89.26	90.94	8,956.72	470.85	3,314.77	3,314.77	2.14	-1.25	1.74
12,312.00	89.33	91.96	8,957.91	468.42	3,410.73	3,410.73	1.06	0.07	1.06
12,407.00	88.93	93.07	8,959.35	464.25	3,505.63	3,505.63	1.24	-0.42	1.17
12,503.00	90.67	92.79	8,959.68	459.35	3,601.50	3,601.50	1.84	1.81	-0.29
12,598.00	90.67	92.61	8,958.57	454.87	3,696.39	3,696.39	0.19	0.00	-0.19
12,694.00	89.06	92.16	8,958.80	450.88	3,792.30	3,792.30	1.74	-1.68	-0.47
12,789.00	90.08	92.94	8,959.51	446.65	3,887.20	3,887.20	1.35	1.07	0.82
12,885.00	90.55	92.55	8,958.98	442.05	3,983.09	3,983.09	0.64	0.49	-0.41
12,980.00	89.61	92.43	8,958.85	437.93	4,078.00	4,078.00	1.00	-0.99	-0.13
13,076.00	88.03	92.62	8,960.83	433.70	4,173.88	4,173.88	1.66	-1.65	0.20
13,171.00	90.01	92.49	8,962.45	429.46	4,268.77	4,268.77	2.09	2.08	-0.14
13,267.00	89.88	92.37	8,962.54	425.39	4,364.68	4,364.68	0.18	-0.14	-0.13
13,362.00	89.14	91.08	8,963.36	422.53	4,459.63	4,459.63	1.57	-0.78	-1.36
13,458.00	88.94	89.94	8,964.97	421.68	4,555.61	4,555.61	1.21	-0.21	-1.19
13,554.00	89.26	89.16	8,966.47	422.43	4,651.60	4,651.60	0.88	0.33	-0.81
13,649.00	89.60	89.40	8,967.42	423.63	4,746.58	4,746.58	0.44	0.36	0.25
13,745.00	90.18	88.89	8,967.60	425.06	4,842.57	4,842.57	0.80	0.60	-0.53
13,840.00	88.57	88.97	8,968.64	426.83	4,937.55	4,937.55	1.70	-1.69	0.08
13,930.57	86.29	88.53	8,972.70	428.81	5,028.00	5,028.00	2.57	-2.52	-0.49
<b>SL Crossing - 13930.57' MD</b>									
13,936.00	86.15	88.50	8,973.06	428.95	5,033.41	5,033.41	2.57	-2.52	-0.49
14,031.00	86.15	88.26	8,979.44	431.63	5,128.16	5,128.16	0.25	0.00	-0.25
14,127.00	86.62	88.29	8,985.49	434.51	5,223.93	5,223.93	0.49	0.49	0.03
14,223.00	86.35	89.98	8,991.38	435.96	5,319.73	5,319.73	1.78	-0.28	1.76
14,318.00	86.69	90.94	8,997.15	435.20	5,414.55	5,414.55	1.07	0.36	1.01
14,414.00	86.22	91.25	9,003.08	433.37	5,510.35	5,510.35	0.59	-0.49	0.32
14,509.00	86.96	90.81	9,008.73	431.66	5,605.17	5,605.17	0.91	0.78	-0.46
14,605.00	88.20	90.38	9,012.79	430.67	5,701.07	5,701.07	1.37	1.29	-0.45
14,700.00	88.60	90.15	9,015.44	430.23	5,796.04	5,796.04	0.49	0.42	-0.24
14,796.00	89.28	89.84	9,017.21	430.24	5,892.02	5,892.02	0.78	0.71	-0.32
14,891.00	90.22	89.74	9,017.63	430.59	5,987.02	5,987.02	1.00	0.99	-0.11
14,987.00	91.73	90.36	9,015.99	430.50	6,083.00	6,083.00	1.70	1.57	0.65
15,082.00	91.69	90.91	9,013.16	429.45	6,177.95	6,177.95	0.58	-0.04	0.58
15,178.00	91.76	90.92	9,010.27	427.92	6,273.89	6,273.89	0.07	0.07	0.01
15,273.00	91.66	90.80	9,007.44	426.49	6,368.84	6,368.84	0.16	-0.11	-0.13
15,322.00	91.69	88.95	9,006.00	426.60	6,417.82	6,417.82	3.77	0.06	-3.78
15,418.00	88.84	90.03	9,005.56	427.45	6,513.80	6,513.80	3.17	-2.97	1.13
15,513.00	87.89	91.21	9,008.27	426.43	6,608.76	6,608.76	1.59	-1.00	1.24
15,609.00	87.81	91.41	9,011.87	424.23	6,704.66	6,704.66	0.22	-0.08	0.21

# LEAM Drilling Systems LLC

## Survey Report

**Company:** Devon Energy  
**Project:** Eddy County, NM (NAD-83)  
**Site:** Emerald PWU 20-22  
**Well:** 12H  
**Wellbore:** OH  
**Design:** OH

**Local Co-ordinate Reference:** Well 12H  
**TVD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**MD Reference:** 3313.8' GE + 23.5' KB @ 3337.30usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**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)
15,704.00	87.87	93.40	9,015.45	420.25	6,799.51	6,799.51	2.09	0.06	2.09
15,800.00	87.76	93.64	9,019.11	414.36	6,895.26	6,895.26	0.27	-0.11	0.25
15,895.00	88.51	93.03	9,022.20	408.84	6,990.04	6,990.04	1.02	0.79	-0.64
15,991.00	89.63	91.44	9,023.76	405.09	7,085.95	7,085.95	2.03	1.17	-1.66
16,087.00	89.06	90.00	9,024.86	403.89	7,181.94	7,181.94	1.61	-0.59	-1.50
16,182.00	89.11	89.37	9,026.38	404.41	7,276.92	7,276.92	0.67	0.05	-0.66
16,277.00	88.96	88.96	9,027.98	405.79	7,371.90	7,371.90	0.46	-0.16	-0.43
16,373.00	88.83	88.69	9,029.83	407.76	7,467.86	7,467.86	0.31	-0.14	-0.28
16,469.00	88.56	88.73	9,032.01	409.92	7,563.81	7,563.81	0.28	-0.28	0.04
16,564.00	88.13	88.51	9,034.76	412.21	7,658.74	7,658.74	0.51	-0.45	-0.23
16,660.00	88.14	89.24	9,037.88	414.09	7,754.67	7,754.67	0.76	0.01	0.76
16,755.00	89.05	90.26	9,040.21	414.51	7,849.64	7,849.64	1.44	0.96	1.07
16,851.00	89.54	90.56	9,041.39	413.82	7,945.63	7,945.63	0.60	0.51	0.31
16,947.00	89.62	90.68	9,042.10	412.78	8,041.62	8,041.62	0.15	0.08	0.13
17,042.00	89.56	91.05	9,042.78	411.35	8,136.61	8,136.61	0.39	-0.06	0.39
17,138.00	89.56	91.30	9,043.51	409.38	8,232.59	8,232.59	0.26	0.00	0.26
17,233.00	89.97	91.37	9,043.90	407.17	8,327.56	8,327.56	0.44	0.43	0.07
17,329.00	88.68	90.34	9,045.03	405.73	8,423.54	8,423.54	1.72	-1.34	-1.07
17,424.00	88.33	89.86	9,047.51	405.57	8,518.51	8,518.51	0.63	-0.37	-0.51
17,520.00	88.25	89.84	9,050.38	405.82	8,614.46	8,614.46	0.09	-0.08	-0.02
17,616.00	88.19	89.87	9,053.36	406.06	8,710.42	8,710.42	0.07	-0.06	0.03
17,711.00	87.89	89.85	9,056.61	406.29	8,805.36	8,805.36	0.32	-0.32	-0.02
17,807.00	88.08	89.38	9,059.98	406.94	8,901.30	8,901.30	0.53	0.20	-0.49
17,902.00	88.17	89.46	9,063.09	407.90	8,996.24	8,996.24	0.13	0.09	0.08
17,998.00	88.19	89.59	9,066.14	408.69	9,092.19	9,092.19	0.14	0.02	0.14
18,094.00	89.00	89.60	9,068.50	409.37	9,188.16	9,188.16	0.84	0.84	0.01
18,189.00	89.53	89.50	9,069.71	410.12	9,283.15	9,283.15	0.57	0.56	-0.11
18,285.00	89.52	89.65	9,070.51	410.83	9,379.14	9,379.14	0.16	-0.01	0.16
18,380.00	90.30	89.49	9,070.66	411.54	9,474.14	9,474.14	0.84	0.82	-0.17
18,475.00	90.69	89.35	9,069.84	412.51	9,569.13	9,569.13	0.44	0.41	-0.15
18,571.00	91.07	88.73	9,068.36	414.11	9,665.11	9,665.11	0.76	0.40	-0.65
18,667.00	91.47	88.27	9,066.24	416.63	9,761.05	9,761.05	0.63	0.42	-0.48
18,762.00	91.48	87.97	9,063.79	419.74	9,855.97	9,855.97	0.32	0.01	-0.32
18,856.00	91.62	87.83	9,061.25	423.19	9,949.87	9,949.87	0.21	0.15	-0.15
18,950.00	91.64	88.91	9,058.57	425.86	10,043.79	10,043.79	1.15	0.02	1.15
19,046.00	91.04	89.51	9,056.33	427.18	10,139.75	10,139.75	0.88	-0.63	0.63
19,141.00	90.34	89.57	9,055.19	427.94	10,234.74	10,234.74	0.74	-0.74	0.06
19,214.26	88.46	90.13	9,055.95	428.13	10,308.00	10,308.00	2.68	-2.57	0.77
<b>SL Crossing - 19214.26' MD</b>									
19,236.00	87.90	90.30	9,056.64	428.05	10,329.72	10,329.72	2.68	-2.57	0.77
19,331.00	87.02	90.37	9,060.85	427.50	10,424.63	10,424.63	0.93	-0.93	0.07
19,425.00	87.41	90.35	9,065.42	426.91	10,518.52	10,518.52	0.42	0.41	-0.02
19,520.00	88.02	89.84	9,069.21	426.75	10,613.44	10,613.44	0.84	0.64	-0.54



# LEAM Drilling Systems LLC

## Survey Report

<b>Company:</b> Devon Energy	<b>Local Co-ordinate Reference:</b> Well 12H
<b>Project:</b> Eddy County, NM (NAD-83)	<b>TVD Reference:</b> 3313.8' GE + 23.5' KB @ 3337.30usft
<b>Site:</b> Emerald PWU 20-22	<b>MD Reference:</b> 3313.8' GE + 23.5' KB @ 3337.30usft
<b>Well:</b> 12H	<b>North Reference:</b> Grid
<b>Wellbore:</b> OH	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> OH	<b>Database:</b> 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)
19,615.00	91.50	90.25	9,069.61	426.67	10,708.42	10,708.42	3.69	3.66	0.43
19,709.00	91.09	90.43	9,067.48	426.12	10,802.40	10,802.40	0.48	-0.44	0.19
19,804.00	91.50	90.99	9,065.34	424.94	10,897.37	10,897.37	0.73	0.43	0.59
19,898.00	91.82	91.27	9,062.61	423.09	10,991.31	10,991.31	0.45	0.34	0.30
19,993.00	90.86	90.78	9,060.39	421.39	11,086.27	11,086.27	1.13	-1.01	-0.52
20,088.00	91.04	91.34	9,058.82	419.63	11,181.24	11,181.24	0.62	0.19	0.59
20,182.00	91.58	90.94	9,056.67	417.76	11,275.19	11,275.19	0.71	0.57	-0.43
20,277.00	90.05	90.11	9,055.32	416.89	11,370.17	11,370.17	1.83	-1.61	-0.87
20,371.00	90.33	90.16	9,055.00	416.67	11,464.17	11,464.17	0.30	0.30	0.05
20,467.00	91.20	90.19	9,053.72	416.38	11,560.16	11,560.16	0.91	0.91	0.03
20,561.00	90.51	89.52	9,052.32	416.61	11,654.15	11,654.15	1.02	-0.73	-0.71
20,657.00	90.53	89.50	9,051.45	417.44	11,750.14	11,750.14	0.03	0.02	-0.02
20,751.00	91.00	89.30	9,050.19	418.42	11,844.13	11,844.13	0.54	0.50	-0.21
20,846.00	90.01	89.19	9,049.36	419.67	11,939.12	11,939.12	1.05	-1.04	-0.12
20,941.00	89.17	89.03	9,050.04	421.15	12,034.10	12,034.10	0.90	-0.88	-0.17
21,036.00	89.24	89.52	9,051.35	422.35	12,129.09	12,129.09	0.52	0.07	0.52
21,131.00	89.08	89.55	9,052.75	423.12	12,224.07	12,224.07	0.17	-0.17	0.03
21,226.00	89.21	89.60	9,054.16	423.82	12,319.06	12,319.06	0.15	0.14	0.05
21,320.00	89.45	89.86	9,055.26	424.27	12,413.05	12,413.05	0.38	0.26	0.28
21,416.00	89.44	89.95	9,056.19	424.43	12,509.05	12,509.05	0.09	-0.01	0.09
21,511.00	89.54	89.90	9,057.04	424.55	12,604.04	12,604.04	0.12	0.11	-0.05
21,578.00	89.58	90.12	9,057.55	424.54	12,671.04	12,671.04	0.33	0.06	0.33
21,664.00	89.58	90.12	9,058.18	424.36	12,757.04	12,757.04	0.00	0.00	0.00
<b>Projection</b>									