

Legacy Reserves Operating

Lea County, NM

Sec 11-T20S-R34E

Lea Unit #56H

Wellbore #1

Survey: MWD Surveys

Standard Survey Report

06 November, 2017

Survey Report

Company: Legacy Reserves Operating
Project: Lea County, NM
Site: Sec 11-T20S-R34E
Well: Lea Unit #56H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Lea Unit #56H
TVD Reference: KB=18 @ 3680.00ft (McVay 4)
MD Reference: KB=18 @ 3680.00ft (McVay 4)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Project	Lea County, NM
Map System:	US State Plane 1983
Geo Datum:	North American Datum 1983
Map Zone:	New Mexico Eastern Zone
System Datum:	Mean Sea Level

Site		Sec 11-T20S-R34E			
Site Position:		Northing:	581,113.4047 usft	Latitude:	32.594916
From:	Lat/Long	Easting:	791,122.5525 usft	Longitude:	-103.522275
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.44 °

Well	Lea Unit #56H					
Well Position	+N/-S	0.00 ft	Northing:	580,919.3000 usf	Latitude:	32.594417
	+E/-W	0.00 ft	Easting:	789,467.4000 usf	Longitude:	-103.527654
Position Uncertainty		0.00 ft	Wellhead Elevation:	0.00 ft	Ground Level:	3,662.00 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/22/2017	6.70	60.57	48,287

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	183.95	

Survey Program		Date	11/6/2017		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
187.00	16,740.00	MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	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
187.00	0.13	57.42	187.00	0.11	0.18	-0.13	0.07	0.07	0.00
First MWD Survey @ 187'MD									
279.00	0.44	304.83	279.00	0.37	-0.02	-0.37	0.55	0.34	-122.38
370.00	0.66	252.01	370.00	0.41	-0.81	-0.35	0.58	0.24	-58.04
461.00	0.26	135.12	460.99	0.10	-1.16	-0.02	0.89	-0.44	-128.45
641.00	0.13	78.43	640.99	-0.15	-0.67	0.19	0.12	-0.07	-31.49
831.00	0.40	231.80	830.99	-0.51	-0.98	0.58	0.27	0.14	80.72
1,005.00	0.48	224.33	1,004.99	-1.41	-1.97	1.54	0.06	0.05	-4.29
1,186.00	0.53	240.85	1,185.98	-2.36	-3.23	2.58	0.08	0.03	9.13
1,369.00	0.31	215.10	1,368.97	-3.18	-4.25	3.46	0.16	-0.12	-14.07

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,558.00	0.04	101.28	1,557.97	-3.61	-4.48	3.91	0.17	-0.14	-60.22
1,647.00	0.04	346.85	1,646.97	-3.59	-4.46	3.88	0.08	0.00	-128.57
1,776.00	0.31	77.29	1,775.97	-3.46	-4.13	3.74	0.24	0.21	70.11
1,964.00	0.31	69.02	1,963.97	-3.17	-3.16	3.38	0.02	0.00	-4.40
2,153.00	0.26	80.10	2,152.97	-2.91	-2.26	3.06	0.04	-0.03	5.86
2,341.00	0.26	67.09	2,340.97	-2.67	-1.45	2.77	0.03	0.00	-6.92
2,529.00	0.13	341.13	2,528.96	-2.31	-1.12	2.38	0.15	-0.07	-45.72
2,718.00	0.13	48.81	2,717.96	-1.96	-1.03	2.03	0.08	0.00	35.81
2,906.00	0.44	58.39	2,905.96	-1.44	-0.26	1.46	0.17	0.16	5.10
3,095.00	0.26	358.80	3,094.96	-0.63	0.35	0.61	0.20	-0.10	-31.53
3,283.00	0.35	5.65	3,282.96	0.36	0.40	-0.39	0.05	0.05	3.64
3,471.00	0.31	231.97	3,470.95	0.62	0.06	-0.62	0.32	-0.02	-71.11
3,660.00	0.53	225.91	3,659.95	-0.30	-0.97	0.37	0.12	0.12	-3.21
3,754.00	0.75	226.08	3,753.94	-1.03	-1.73	1.15	0.23	0.23	0.18
3,942.00	0.39	238.94	3,941.93	-2.21	-3.16	2.43	0.20	-0.19	6.84
4,318.00	1.03	241.88	4,317.90	-4.47	-7.24	4.96	0.17	0.17	0.78
4,412.00	1.11	241.85	4,411.89	-5.30	-8.79	5.89	0.09	0.09	-0.03
4,601.00	0.97	244.72	4,600.86	-6.84	-11.85	7.64	0.08	-0.07	1.52
4,789.00	1.71	244.81	4,788.80	-8.72	-15.83	9.78	0.39	0.39	0.05
4,947.00	2.02	247.71	4,946.72	-10.78	-20.54	12.16	0.21	0.20	1.84
5,136.00	2.59	259.92	5,135.57	-12.79	-27.82	14.67	0.40	0.30	6.46
5,230.00	2.55	260.71	5,229.47	-13.50	-31.98	15.66	0.06	-0.04	0.84
5,324.00	2.51	260.45	5,323.38	-14.17	-36.07	16.62	0.04	-0.04	-0.28
5,464.00	2.35	261.34	5,463.25	-15.12	-41.93	17.96	0.12	-0.11	0.64
5,558.00	1.59	341.10	5,557.21	-14.17	-44.26	17.18	2.76	-0.81	84.85
5,652.00	1.59	353.23	5,651.18	-11.64	-44.83	14.70	0.36	0.00	12.90
5,747.00	1.73	350.12	5,746.14	-8.92	-45.24	12.01	0.18	0.15	-3.27
5,840.00	1.75	347.92	5,839.09	-6.15	-45.77	9.28	0.07	0.02	-2.37
5,934.00	1.81	347.97	5,933.05	-3.29	-46.38	6.48	0.06	0.06	0.05
6,122.00	1.75	19.99	6,120.96	2.31	-46.02	0.86	0.52	-0.03	17.03
6,311.00	1.76	14.97	6,309.87	7.82	-44.29	-4.76	0.08	0.01	-2.66
6,499.00	1.46	11.84	6,497.80	12.96	-43.05	-9.96	0.17	-0.16	-1.66
6,593.00	1.38	15.29	6,591.77	15.22	-42.50	-12.26	0.12	-0.09	3.67
6,687.00	1.27	18.22	6,685.75	17.30	-41.88	-14.38	0.14	-0.12	3.12
6,876.00	0.95	25.47	6,874.71	20.71	-40.55	-17.87	0.18	-0.17	3.84
6,970.00	0.87	12.45	6,968.70	22.11	-40.06	-19.30	0.24	-0.09	-13.85
7,158.00	0.69	18.36	7,156.68	24.57	-39.40	-21.80	0.10	-0.10	3.14
7,253.00	0.78	8.88	7,251.67	25.76	-39.12	-23.00	0.16	0.09	-9.98
7,347.00	0.55	30.19	7,345.67	26.78	-38.79	-24.05	0.36	-0.24	22.67
7,441.00	0.39	8.65	7,439.66	27.48	-38.52	-24.77	0.25	-0.17	-22.91
7,536.00	0.28	30.21	7,534.66	28.00	-38.35	-25.30	0.17	-0.12	22.69
7,630.00	0.16	329.79	7,628.66	28.32	-38.30	-25.61	0.26	-0.13	-64.28
7,724.00	0.14	242.38	7,722.66	28.38	-38.47	-25.66	0.22	-0.02	-92.99

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7,913.00	0.10	281.88	7,911.66	28.30	-38.84	-25.56	0.05	-0.02	20.90
8,008.00	0.17	65.68	8,006.66	28.38	-38.79	-25.64	0.27	0.07	151.37
8,102.00	0.14	60.72	8,100.66	28.49	-38.56	-25.77	0.03	-0.03	-5.28
8,196.00	0.13	39.58	8,194.66	28.63	-38.39	-25.92	0.05	-0.01	-22.49
8,291.00	0.53	31.67	8,289.66	29.09	-38.09	-26.40	0.42	0.42	-8.33
8,385.00	0.92	38.17	8,383.65	30.05	-37.40	-27.41	0.42	0.41	6.91
8,479.00	1.05	38.35	8,477.64	31.32	-36.40	-28.74	0.14	0.14	0.19
8,574.00	1.23	43.98	8,572.62	32.74	-35.15	-30.24	0.22	0.19	5.93
8,668.00	1.27	32.20	8,666.60	34.34	-33.89	-31.93	0.28	0.04	-12.53
8,762.00	1.85	22.44	8,760.56	36.63	-32.76	-34.29	0.68	0.62	-10.38
8,856.00	1.58	26.05	8,854.52	39.19	-31.61	-36.93	0.31	-0.29	3.84
8,898.00	1.63	42.74	8,896.50	40.15	-30.95	-37.93	1.12	0.12	39.74
8,944.00	3.65	159.55	8,942.47	39.26	-30.00	-37.10	10.04	4.39	253.94
8,991.00	9.10	173.97	8,989.17	34.16	-29.08	-32.08	12.00	11.60	30.68
9,037.00	14.02	174.93	9,034.22	24.99	-28.21	-22.99	10.70	10.70	2.09
9,084.00	18.64	178.89	9,079.31	11.80	-27.56	-9.87	10.11	9.83	8.43
9,132.00	22.55	180.73	9,124.24	-5.08	-27.53	6.96	8.26	8.15	3.83
9,179.00	26.73	183.11	9,166.95	-24.66	-28.22	26.54	9.14	8.89	5.06
9,226.00	30.55	182.49	9,208.19	-47.15	-29.31	49.06	8.15	8.13	-1.32
9,273.00	32.18	182.23	9,248.32	-71.59	-30.31	73.51	3.48	3.47	-0.55
9,321.00	34.73	184.34	9,288.37	-98.01	-31.85	99.96	5.84	5.31	4.40
9,368.00	40.88	185.74	9,325.48	-126.69	-34.40	128.75	13.21	13.09	2.98
9,415.00	46.15	184.78	9,359.56	-158.90	-37.35	161.09	11.30	11.21	-2.04
9,416.50	46.23	184.73	9,360.59	-159.98	-37.44	162.18	5.58	5.04	-3.31
330' Hardline Crossing @ 9416.5' MD									
9,462.00	48.53	183.28	9,391.40	-193.37	-39.77	195.65	5.58	5.06	-3.19
9,509.00	53.19	181.17	9,421.07	-229.79	-41.17	232.08	10.51	9.91	-4.49
9,556.00	58.02	181.00	9,447.61	-268.55	-41.90	270.80	10.28	10.28	-0.36
9,604.00	61.36	181.08	9,471.83	-309.98	-42.65	312.18	6.96	6.96	0.17
9,651.00	65.63	184.16	9,492.80	-351.98	-44.59	354.21	10.81	9.09	6.55
9,698.00	71.47	185.83	9,509.98	-395.53	-48.41	397.93	12.86	12.43	3.55
9,745.00	76.13	185.83	9,523.09	-440.42	-53.00	443.02	9.91	9.91	0.00
9,792.00	81.10	184.60	9,532.37	-486.29	-57.18	489.07	10.88	10.57	-2.62
9,865.00	86.77	183.98	9,540.08	-558.65	-62.61	561.63	7.81	7.77	-0.85
9,912.00	86.95	183.63	9,542.65	-605.47	-65.72	608.56	0.84	0.38	-0.74
10,007.00	87.30	185.30	9,547.42	-700.06	-73.11	703.43	1.79	0.37	1.76
10,101.00	86.51	185.92	9,552.49	-793.48	-82.28	797.26	1.07	-0.84	0.66
10,195.00	87.69	185.48	9,557.25	-886.89	-91.60	891.09	1.34	1.26	-0.47
10,290.00	88.79	185.04	9,560.17	-981.44	-100.31	986.02	1.25	1.16	-0.46
10,384.00	90.42	184.16	9,560.81	-1,075.13	-107.85	1,080.01	1.97	1.73	-0.94
10,479.00	90.20	184.86	9,560.30	-1,169.84	-115.32	1,175.00	0.77	-0.23	0.74
10,573.00	90.64	183.37	9,559.61	-1,263.59	-122.06	1,268.99	1.65	0.47	-1.59
10,667.00	90.51	183.11	9,558.67	-1,357.43	-127.38	1,362.98	0.31	-0.14	-0.28

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10,762.00	90.46	183.90	9,557.86	-1,452.25	-133.18	1,457.98	0.83	-0.05	0.83
10,856.00	89.27	183.98	9,558.08	-1,546.03	-139.64	1,551.97	1.27	-1.27	0.09
10,950.00	89.58	185.39	9,559.03	-1,639.71	-147.32	1,645.96	1.54	0.33	1.50
11,045.00	90.07	184.16	9,559.32	-1,734.38	-155.23	1,740.95	1.39	0.52	-1.29
11,139.00	90.33	182.05	9,558.99	-1,828.23	-160.32	1,834.93	2.26	0.28	-2.24
11,234.00	89.80	182.14	9,558.88	-1,923.17	-163.79	1,929.88	0.57	-0.56	0.09
11,328.00	89.67	181.88	9,559.32	-2,017.11	-167.09	2,023.83	0.31	-0.14	-0.28
11,422.00	90.51	183.98	9,559.17	-2,110.98	-171.89	2,117.80	2.41	0.89	2.23
11,517.00	91.34	183.98	9,557.64	-2,205.74	-178.49	2,212.79	0.87	0.87	0.00
11,611.00	90.99	183.81	9,555.72	-2,299.50	-184.87	2,306.77	0.41	-0.37	-0.18
11,706.00	89.67	182.40	9,555.18	-2,394.36	-190.01	2,401.75	2.03	-1.39	-1.48
11,800.00	90.46	182.84	9,555.07	-2,488.26	-194.31	2,495.73	0.96	0.84	0.47
11,894.00	89.76	183.11	9,554.89	-2,582.13	-199.19	2,589.71	0.80	-0.74	0.29
11,989.00	87.91	179.07	9,556.82	-2,677.07	-201.00	2,684.55	4.68	-1.95	-4.25
12,083.00	87.43	179.24	9,560.64	-2,770.98	-199.61	2,778.15	0.54	-0.51	0.18
12,178.00	87.25	183.19	9,565.06	-2,865.84	-201.62	2,872.92	4.16	-0.19	4.16
12,272.00	87.08	183.11	9,569.70	-2,959.58	-206.78	2,966.79	0.20	-0.18	-0.09
12,367.00	86.46	183.11	9,575.06	-3,054.29	-211.93	3,061.63	0.65	-0.65	0.00
12,461.00	85.89	184.16	9,581.33	-3,147.89	-217.87	3,155.42	1.27	-0.61	1.12
12,556.00	87.34	183.81	9,586.94	-3,242.49	-224.46	3,250.25	1.57	1.53	-0.37
12,650.00	89.41	184.42	9,589.60	-3,336.21	-231.21	3,344.21	2.30	2.20	0.65
12,744.00	90.29	185.22	9,589.85	-3,429.87	-239.11	3,438.19	1.27	0.94	0.85
12,839.00	89.85	185.13	9,589.73	-3,524.48	-247.67	3,533.17	0.47	-0.46	-0.09
12,933.00	88.53	184.42	9,591.06	-3,618.15	-255.50	3,627.15	1.59	-1.40	-0.76
13,028.00	88.62	185.48	9,593.42	-3,712.76	-263.69	3,722.11	1.12	0.09	1.12
13,121.00	88.70	185.74	9,595.60	-3,805.29	-272.78	3,815.04	0.29	0.09	0.28
13,210.00	90.24	185.57	9,596.42	-3,893.85	-281.55	3,903.99	1.74	1.73	-0.19
13,305.00	91.34	185.57	9,595.11	-3,988.39	-290.77	3,998.95	1.16	1.16	0.00
13,399.00	91.25	185.48	9,592.99	-4,081.93	-299.82	4,092.89	0.14	-0.10	-0.10
13,493.00	91.69	185.92	9,590.58	-4,175.43	-309.15	4,186.81	0.66	0.47	0.47
13,588.00	91.16	186.09	9,588.21	-4,269.88	-319.09	4,281.72	0.59	-0.56	0.18
13,682.00	90.77	185.92	9,586.63	-4,363.35	-328.92	4,375.65	0.45	-0.41	-0.18
13,777.00	91.03	186.97	9,585.14	-4,457.74	-339.58	4,470.54	1.14	0.27	1.11
13,871.00	91.78	187.24	9,582.83	-4,550.99	-351.20	4,564.37	0.85	0.80	0.29
13,965.00	91.69	187.59	9,579.99	-4,644.16	-363.33	4,658.15	0.38	-0.10	0.37
14,060.00	90.51	187.50	9,578.16	-4,738.32	-375.80	4,752.95	1.25	-1.24	-0.09
14,154.00	89.80	186.53	9,577.91	-4,831.61	-387.28	4,846.81	1.28	-0.76	-1.03
14,248.00	88.18	183.90	9,579.57	-4,925.20	-395.82	4,940.76	3.29	-1.72	-2.80
14,342.00	89.01	182.84	9,581.87	-5,019.01	-401.35	5,034.73	1.43	0.88	-1.13
14,434.37	89.87	183.27	9,582.78	-5,111.24	-406.27	5,127.08	1.04	0.93	0.46
Sec 11/14 Crossing @ 14434.37'MD									
14,437.00	89.89	183.28	9,582.78	-5,113.87	-406.42	5,129.71	1.04	0.93	0.46
14,531.00	91.03	184.07	9,582.03	-5,207.67	-412.44	5,223.70	1.48	1.21	0.84
14,625.00	89.36	182.58	9,581.71	-5,301.50	-417.89	5,317.69	2.38	-1.78	-1.59

Survey Report

Company: Legacy Reserves Operating
Project: Lea County, NM
Site: Sec 11-T20S-R34E
Well: Lea Unit #56H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Lea Unit #56H
TVD Reference: KB=18 @ 3680.00ft (McVay 4)
MD Reference: KB=18 @ 3680.00ft (McVay 4)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,719.00	89.05	182.23	9,583.01	-5,395.41	-421.84	5,411.65	0.50	-0.33	-0.37
14,814.00	88.75	182.14	9,584.84	-5,490.32	-425.46	5,506.59	0.33	-0.32	-0.09
14,908.00	88.66	182.14	9,586.96	-5,584.23	-428.97	5,600.52	0.10	-0.10	0.00
15,003.00	89.71	181.08	9,588.31	-5,679.18	-431.64	5,695.42	1.57	1.11	-1.12
15,097.00	90.02	181.52	9,588.53	-5,773.16	-433.77	5,789.32	0.57	0.33	0.47
15,192.00	89.14	181.26	9,589.23	-5,868.13	-436.07	5,884.22	0.97	-0.93	-0.27
15,286.00	89.80	182.40	9,590.10	-5,962.07	-439.08	5,978.15	1.40	0.70	1.21
15,380.00	90.86	183.28	9,589.56	-6,055.95	-443.73	6,072.13	1.47	1.13	0.94
15,475.00	90.99	183.46	9,588.02	-6,150.78	-449.32	6,167.12	0.23	0.14	0.19
15,568.00	91.03	184.25	9,586.39	-6,243.55	-455.57	6,260.10	0.85	0.04	0.85
15,661.00	91.38	183.28	9,584.43	-6,336.33	-461.67	6,353.08	1.11	0.38	-1.04
15,755.00	91.12	182.75	9,582.38	-6,430.18	-466.62	6,447.04	0.63	-0.28	-0.56
15,850.00	91.12	183.46	9,580.52	-6,525.02	-471.76	6,542.01	0.75	0.00	0.75
15,943.00	91.21	183.72	9,578.63	-6,617.82	-477.58	6,634.99	0.30	0.10	0.28
16,036.00	91.21	184.34	9,576.67	-6,710.57	-484.12	6,727.97	0.67	0.00	0.67
16,130.00	89.71	183.37	9,575.91	-6,804.35	-490.44	6,821.97	1.90	-1.60	-1.03
16,223.00	88.53	181.88	9,577.34	-6,897.23	-494.70	6,914.93	2.04	-1.27	-1.60
16,316.00	88.48	182.49	9,579.77	-6,990.13	-498.24	7,007.85	0.66	-0.05	0.66
16,410.00	89.23	183.55	9,581.65	-7,083.98	-503.19	7,101.82	1.38	0.80	1.13
16,503.00	89.32	183.90	9,582.82	-7,176.78	-509.23	7,194.81	0.39	0.10	0.38
16,596.00	88.97	184.25	9,584.21	-7,269.53	-515.84	7,287.80	0.53	-0.38	0.38
16,680.00	88.92	184.42	9,585.76	-7,353.28	-522.19	7,371.78	0.21	-0.06	0.20
Final MWD Survey @ 16680'MD									
16,740.00	88.92	184.42	9,586.89	-7,413.09	-526.81	7,431.77	0.00	0.00	0.00
Projection to TD @ 16740'MD									

Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
187.00	187.00	0.11	0.18	First MWD Survey @ 187'MD
9,416.50	9,360.59	-159.98	-37.44	330' Hardline Crossing @ 9416.5'MD
14,434.37	9,582.78	-5,111.24	-406.27	Sec 11/14 Crossing @ 14434.37'MD
16,680.00	9,585.76	-7,353.28	-522.19	Final MWD Survey @ 16680'MD
16,740.00	9,586.89	-7,413.09	-526.81	Projection to TD @ 16740'MD

Checked By: _____ Approved By: _____ Date: _____