



McElvain Energy, Inc.

Lea County, NM (NAD83)

EK 29 BS2 Federal Com

4H

OH / Job 60207

Survey: Phoenix MWD Surveys

Standard Survey Report

21 September, 2016



PHOENIX
TECHNOLOGY SERVICES



Phoenix Technology Services LP

Survey Report



Company:	McElvain Energy, Inc.	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD83)	TVD Reference:	RKB @ 3929.00usft (H&P 497)
Site:	EK 29 BS2 Federal Com	MD Reference:	RKB @ 3929.00usft (H&P 497)
Well:	4H	North Reference:	Grid
Wellbore:	OH / Job 60207	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (H&P 497)	Database:	Compass 5000 GCR

Project	Lea County, NM (NAD83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	EK 29 BS2 Federal Com		
Site Position:		Northing:	623,533.90 usft
From:	Map	Easting:	769,543.90 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 42' 42.98578 N
		Longitude:	103° 35' 28.94512 W
		Grid Convergence:	0.40 °

Well	4H		
Well Position	+N/-S	0.00 usft	Northing: 623,533.90 usft
	+E/-W	0.00 usft	Easting: 769,543.90 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 42' 42.98578 N
		Longitude:	103° 35' 28.94512 W
		Ground Level:	3,904.00 usft

Wellbore	OH / Job 60207				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/2/2016	6.82	60.78	48,462

Design	Surveys (H&P 497)				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	1,818.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	358.28	

Survey Program	Date 9/21/2016				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
118.00	1,818.00	VES Gyro Surveys (OH / Job 60207 (Surfa	NS-GYRO-MS	North sensing gyrocompassing m/s	
1,818.00	14,664.00	Phoenix MWD Surveys (OH / Job 60207)	PHX+MWD+HDGM	PHX+OWSG MWD + HDGM	

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)	
1,818.00	0.11	209.02	1,817.99	-0.42	4.89	-0.57	0.00	0.00	0.00	
1,868.00	0.40	111.10	1,867.99	-0.52	5.03	-0.68	0.86	0.58	-195.84	
First Phoenix MWD Survey										
1,981.00	0.30	135.10	1,980.98	-0.88	5.61	-1.04	0.16	-0.09	21.24	
2,075.00	0.40	124.10	2,074.98	-1.23	6.06	-1.42	0.13	0.11	-11.70	
2,170.00	0.80	111.40	2,169.98	-1.66	6.95	-1.87	0.44	0.42	-13.37	
2,264.00	2.10	101.70	2,263.94	-2.25	9.25	-2.53	1.40	1.38	-10.32	
2,358.00	3.60	103.90	2,357.83	-3.31	13.80	-3.72	1.60	1.60	2.34	
2,452.00	4.70	107.80	2,451.58	-5.20	20.33	-5.80	1.21	1.17	4.15	
2,547.00	6.20	106.80	2,546.15	-7.87	28.95	-8.73	1.58	1.58	-1.05	



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Well:	4H	North Reference:	Grid
Wellbore:	OH / Job 60207	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (H&P 497)	Database:	Compass 5000 GCR

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)
2,641.00	6.80	105.50	2,639.54	-10.82	39.17	-11.99	0.66	0.64	-1.38
2,735.00	7.50	107.30	2,732.81	-14.13	50.39	-15.64	0.78	0.74	1.91
2,829.00	8.40	111.90	2,825.91	-18.52	62.62	-20.39	1.17	0.96	4.89
2,924.00	8.50	119.50	2,919.88	-24.57	75.17	-26.81	1.18	0.11	8.00
3,018.00	7.50	125.60	3,012.96	-31.56	86.20	-34.13	1.39	-1.06	6.49
3,112.00	6.10	128.60	3,106.30	-38.25	95.09	-41.08	1.54	-1.49	3.19
3,206.00	4.70	123.20	3,199.88	-43.47	102.22	-46.52	1.58	-1.49	-5.74
3,301.00	3.90	108.50	3,294.62	-46.63	108.54	-49.86	1.43	-0.84	-15.47
3,395.00	3.60	103.60	3,388.41	-48.33	114.44	-51.75	0.47	-0.32	-5.21
3,489.00	3.20	104.20	3,482.25	-49.67	119.85	-53.25	0.43	-0.43	0.64
3,584.00	3.10	94.70	3,577.11	-50.53	124.98	-54.26	0.56	-0.11	-10.00
3,678.00	3.20	87.60	3,670.96	-50.63	130.14	-54.51	0.43	0.11	-7.55
3,772.00	3.00	88.80	3,764.83	-50.47	135.22	-54.51	0.22	-0.21	1.28
3,866.00	2.90	86.80	3,858.70	-50.29	140.05	-54.47	0.15	-0.11	-2.13
3,960.00	2.90	83.90	3,952.58	-49.90	144.79	-54.22	0.16	0.00	-3.09
4,055.00	2.80	83.40	4,047.46	-49.38	149.48	-53.84	0.11	-0.11	-0.53
4,149.00	2.70	79.30	4,141.36	-48.70	153.94	-53.30	0.23	-0.11	-4.36
4,244.00	2.60	80.20	4,236.25	-47.92	158.26	-52.65	0.11	-0.11	0.95
4,338.00	3.20	81.10	4,330.13	-47.15	162.96	-52.02	0.64	0.64	0.96
4,432.00	3.90	79.20	4,423.95	-46.15	168.69	-51.19	0.76	0.74	-2.02
4,527.00	3.60	75.50	4,518.75	-44.80	174.75	-50.02	0.41	-0.32	-3.89
4,621.00	4.30	75.20	4,612.53	-43.16	181.01	-48.57	0.75	0.74	-0.32
4,716.00	5.00	86.80	4,707.21	-42.02	188.59	-47.66	1.23	0.74	12.21
4,810.00	5.10	92.60	4,800.85	-41.98	196.85	-47.87	0.55	0.11	6.17
4,862.00	4.90	92.10	4,852.65	-42.16	201.38	-48.19	0.39	-0.38	-0.96
4,934.00	4.90	90.30	4,924.39	-42.29	207.53	-48.50	0.21	0.00	-2.50
5,028.00	6.10	100.10	5,017.96	-43.19	216.46	-49.67	1.62	1.28	10.43
5,123.00	6.00	101.50	5,112.43	-45.06	226.30	-51.84	0.19	-0.11	1.47
5,217.00	5.90	101.40	5,205.92	-47.00	235.85	-54.06	0.11	-0.11	-0.11
5,311.00	5.70	101.70	5,299.44	-48.90	245.15	-56.24	0.22	-0.21	0.32
5,405.00	5.80	101.30	5,392.97	-50.78	254.38	-58.39	0.11	0.11	-0.43
5,500.00	5.70	101.10	5,487.49	-52.63	263.72	-60.52	0.11	-0.11	-0.21
5,594.00	5.60	101.50	5,581.03	-54.44	272.79	-62.60	0.11	-0.11	0.43
5,688.00	5.60	102.00	5,674.58	-56.31	281.77	-64.74	0.05	0.00	0.53
5,783.00	5.50	102.40	5,769.14	-58.25	290.75	-66.95	0.11	-0.11	0.42
5,877.00	5.50	101.30	5,862.71	-60.10	299.57	-69.06	0.11	0.00	-1.17
5,971.00	5.40	102.90	5,956.28	-61.97	308.30	-71.19	0.19	-0.11	1.70
6,066.00	5.20	103.80	6,050.87	-63.99	316.84	-73.47	0.23	-0.21	0.95
6,160.00	5.00	102.40	6,144.50	-65.89	324.98	-75.61	0.25	-0.21	-1.49
6,254.00	4.90	105.30	6,238.15	-67.83	332.85	-77.79	0.29	-0.11	3.09
6,349.00	5.50	101.80	6,332.76	-69.83	341.22	-80.04	0.71	0.63	-3.68
6,443.00	6.10	96.10	6,426.28	-71.28	350.60	-81.77	0.88	0.64	-6.06
6,537.00	6.50	93.90	6,519.71	-72.17	360.87	-82.97	0.50	0.43	-2.34



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6,632.00	6.40	93.80	6,614.11	-72.89	371.52	-84.01	0.11	-0.11	-0.11
6,726.00	6.40	93.10	6,707.53	-73.52	381.98	-84.95	0.08	0.00	-0.74
6,821.00	6.30	99.70	6,801.94	-74.69	392.40	-86.43	0.78	-0.11	6.95
6,915.00	5.80	101.90	6,895.42	-76.53	402.13	-88.57	0.59	-0.53	2.34
7,010.00	6.20	101.20	6,989.90	-78.52	411.86	-90.85	0.43	0.42	-0.74
7,104.00	6.20	102.00	7,083.35	-80.56	421.81	-93.19	0.09	0.00	0.85
7,198.00	6.10	102.00	7,176.81	-82.66	431.66	-95.57	0.11	-0.11	0.00
7,293.00	6.70	97.60	7,271.22	-84.44	442.09	-97.67	0.82	0.63	-4.63
7,387.00	6.50	97.40	7,364.59	-85.85	452.80	-99.40	0.21	-0.21	-0.21
7,482.00	7.00	96.50	7,458.93	-87.20	463.88	-101.08	0.54	0.53	-0.95
7,576.00	6.30	94.30	7,552.30	-88.23	474.72	-102.44	0.79	-0.74	-2.34
7,671.00	6.90	90.30	7,646.67	-88.65	485.62	-103.19	0.80	0.63	-4.21
7,766.00	7.80	94.00	7,740.89	-89.13	497.76	-104.03	1.07	0.95	3.89
7,860.00	8.00	102.10	7,834.00	-90.95	510.52	-106.23	1.20	0.21	8.62
7,954.00	7.20	104.90	7,927.18	-93.83	522.61	-109.48	0.94	-0.85	2.98
8,049.00	7.10	99.40	8,021.44	-96.32	534.15	-112.31	0.73	-0.11	-5.79
8,143.00	6.70	98.90	8,114.76	-98.12	545.30	-114.44	0.43	-0.43	-0.53
8,237.00	6.60	100.50	8,208.13	-99.95	556.03	-116.60	0.22	-0.11	1.70
8,332.00	7.70	95.10	8,302.39	-101.51	567.74	-118.51	1.36	1.16	-5.68
8,426.00	7.20	94.60	8,395.59	-102.55	579.88	-119.90	0.54	-0.53	-0.53
8,520.00	7.20	95.50	8,488.85	-103.58	591.62	-121.29	0.12	0.00	0.96
8,615.00	6.20	95.60	8,583.20	-104.65	602.65	-122.70	1.05	-1.05	0.11
8,709.00	6.30	96.00	8,676.64	-105.69	612.83	-124.04	0.12	0.11	0.43
8,802.00	7.20	97.40	8,769.00	-106.97	623.68	-125.64	0.98	0.97	1.51
8,896.00	9.10	99.50	8,862.04	-108.96	636.86	-128.02	2.05	2.02	2.23
8,991.00	10.20	102.90	8,955.70	-112.08	652.47	-131.61	1.30	1.16	3.58
9,085.00	10.10	106.00	9,048.23	-116.21	668.50	-136.22	0.59	-0.11	3.30
9,179.00	9.80	107.60	9,140.81	-120.90	684.05	-141.37	0.43	-0.32	1.70
9,273.00	9.40	104.40	9,233.50	-125.23	699.11	-146.15	0.71	-0.43	-3.40
9,357.00	8.70	105.50	9,316.45	-128.63	711.88	-149.94	0.86	-0.83	1.31
9,419.00	8.00	101.70	9,377.80	-130.76	720.62	-152.33	1.44	-1.13	-6.13
9,451.00	10.60	77.30	9,409.38	-130.56	725.68	-152.28	14.59	8.13	-76.25
9,482.00	14.30	62.10	9,439.66	-128.14	731.85	-150.05	15.85	11.94	-49.03
9,514.00	18.50	55.30	9,470.35	-123.40	739.52	-145.54	14.41	13.13	-21.25
9,545.00	21.50	49.30	9,499.48	-116.89	747.87	-139.29	11.71	9.68	-19.35
9,577.00	24.00	44.70	9,528.99	-108.44	756.90	-131.11	9.58	7.81	-14.38
9,608.00	26.60	40.60	9,557.02	-98.69	765.85	-121.63	10.11	8.39	-13.23
9,640.00	29.10	36.00	9,585.31	-86.95	775.09	-110.18	10.30	7.81	-14.38
9,672.00	30.70	31.30	9,613.06	-73.67	783.91	-97.17	8.86	5.00	-14.69
9,703.00	31.40	28.60	9,639.62	-59.82	791.88	-83.56	5.03	2.26	-8.71
9,735.00	32.20	24.50	9,666.82	-44.74	799.41	-68.71	7.20	2.50	-12.81
9,766.00	34.80	19.30	9,692.67	-28.87	805.76	-53.04	12.49	8.39	-16.77
9,798.00	36.10	13.50	9,718.74	-11.08	810.98	-35.42	11.27	4.06	-18.13



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9,829.00	38.80	9.30	9,743.36	7.39	814.69	-17.06	11.98	8.71	-13.55
9,860.00	42.40	7.40	9,766.89	27.35	817.60	2.80	12.28	11.61	-6.13
9,892.00	46.10	6.00	9,789.81	49.52	820.20	24.88	11.96	11.56	-4.38
9,924.00	50.50	5.00	9,811.09	73.30	822.48	48.58	13.95	13.75	-3.13
9,955.00	53.80	3.80	9,830.11	97.70	824.35	72.91	11.07	10.65	-3.87
9,987.00	57.30	2.50	9,848.21	124.04	825.80	99.20	11.44	10.94	-4.06
10,018.00	61.60	1.80	9,863.96	150.72	826.79	125.83	14.01	13.87	-2.26
10,049.00	65.60	1.10	9,877.75	178.47	827.49	153.55	13.06	12.90	-2.26
10,081.00	69.10	0.50	9,890.07	207.99	827.90	183.05	11.07	10.94	-1.88
10,112.00	71.50	0.00	9,900.52	237.18	828.03	212.22	7.89	7.74	-1.61
10,144.00	73.30	1.50	9,910.19	267.67	828.43	242.69	7.18	5.63	4.69
10,175.00	75.40	1.00	9,918.55	297.52	829.08	272.50	6.95	6.77	-1.61
10,207.00	79.00	1.00	9,925.64	328.71	829.63	303.66	11.25	11.25	0.00
10,236.00	82.00	0.00	9,930.43	357.31	829.87	332.24	10.89	10.34	-3.45
10,268.00	83.50	0.40	9,934.47	389.05	829.99	363.96	4.85	4.69	1.25
10,300.00	86.20	1.70	9,937.34	420.91	830.57	395.79	9.36	8.44	4.06
10,331.00	88.10	1.80	9,938.88	451.86	831.52	426.70	6.14	6.13	0.32
10,362.00	89.80	2.40	9,939.45	482.83	832.65	457.62	5.82	5.48	1.94
10,394.00	90.70	2.50	9,939.31	514.80	834.02	489.54	2.83	2.81	0.31
10,425.00	91.30	2.10	9,938.77	545.77	835.26	520.45	2.33	1.94	-1.29
10,457.00	90.50	1.90	9,938.26	577.75	836.38	552.38	2.58	-2.50	-0.63
10,488.00	90.40	2.10	9,938.02	608.73	837.46	583.32	0.72	-0.32	0.65
10,520.00	89.90	1.50	9,937.94	640.71	838.47	615.26	2.44	-1.56	-1.88
10,551.00	88.50	1.10	9,938.37	671.70	839.17	646.21	4.70	-4.52	-1.29
10,583.00	87.40	1.10	9,939.52	703.67	839.78	678.15	3.44	-3.44	0.00
10,614.00	87.70	1.10	9,940.84	734.64	840.38	709.08	0.97	0.97	0.00
10,646.00	88.00	0.60	9,942.04	766.61	840.85	741.03	1.82	0.94	-1.56
10,677.00	88.50	0.80	9,942.99	797.60	841.23	771.99	1.74	1.61	0.65
10,709.00	88.70	0.40	9,943.77	829.58	841.57	803.95	1.40	0.63	-1.25
10,740.00	89.40	0.30	9,944.28	860.58	841.76	834.93	2.28	2.26	-0.32
10,772.00	89.80	0.10	9,944.51	892.58	841.87	866.91	1.40	1.25	-0.63
10,803.00	90.30	0.10	9,944.48	923.58	841.92	897.89	1.61	1.61	0.00
10,834.00	90.90	359.70	9,944.15	954.58	841.87	928.88	2.33	1.94	-1.29
10,897.00	91.50	359.40	9,942.84	1,017.56	841.37	991.85	1.06	0.95	-0.48
10,929.00	91.80	359.40	9,941.91	1,049.54	841.04	1,023.83	0.94	0.94	0.00
11,023.00	92.10	357.60	9,938.72	1,143.45	838.58	1,117.77	1.94	0.32	-1.91
11,118.00	92.90	357.20	9,934.57	1,238.27	834.27	1,212.67	0.94	0.84	-0.42
11,212.00	91.60	358.00	9,930.88	1,332.11	830.34	1,306.58	1.62	-1.38	0.85
11,306.00	89.10	357.90	9,930.31	1,426.04	826.98	1,400.57	2.66	-2.66	-0.11
11,401.00	89.60	357.60	9,931.38	1,520.96	823.25	1,495.56	0.61	0.53	-0.32
11,495.00	90.80	356.60	9,931.06	1,614.83	818.49	1,589.54	1.66	1.28	-1.06
11,589.00	89.70	356.80	9,930.65	1,708.68	813.08	1,683.50	1.19	-1.17	0.21
11,683.00	90.50	356.80	9,930.48	1,802.53	807.84	1,777.47	0.85	0.85	0.00
11,778.00	91.90	356.00	9,928.49	1,897.32	801.87	1,872.39	1.70	1.47	-0.84



Phoenix Technology Services LP

Survey Report



Company:	McElvain Energy, Inc.	Local Co-ordinate Reference:	Well 4H
Project:	Lea County, NM (NAD83)	TVD Reference:	RKB @ 3929.00usft (H&P 497)
Site:	EK 29 BS2 Federal Com	MD Reference:	RKB @ 3929.00usft (H&P 497)
Well:	4H	North Reference:	Grid
Wellbore:	OH / Job 60207	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (H&P 497)	Database:	Compass 5000 GCR

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)
11,872.00	91.60	357.00	9,925.62	1,991.10	796.14	1,966.30	1.11	-0.32	1.06
11,967.00	89.80	357.80	9,924.46	2,085.99	791.83	2,061.28	2.07	-1.89	0.84
12,061.00	91.80	356.50	9,923.15	2,179.86	787.15	2,155.25	2.54	2.13	-1.38
12,156.00	91.30	357.90	9,920.58	2,274.70	782.52	2,250.19	1.56	-0.53	1.47
12,250.00	90.00	358.90	9,919.51	2,368.66	779.89	2,344.18	1.74	-1.38	1.06
12,344.00	90.80	359.00	9,918.86	2,462.64	778.17	2,438.17	0.86	0.85	0.11
12,439.00	90.00	358.20	9,918.19	2,557.61	775.85	2,533.17	1.19	-0.84	-0.84
12,533.00	91.10	358.20	9,917.29	2,651.56	772.90	2,627.16	1.17	1.17	0.00
12,628.00	90.60	358.10	9,915.88	2,746.50	769.83	2,722.15	0.54	-0.53	-0.11
12,723.00	89.40	358.90	9,915.88	2,841.46	767.34	2,817.15	1.52	-1.26	0.84
12,817.00	90.70	358.90	9,915.80	2,935.44	765.54	2,911.14	1.38	1.38	0.00
12,912.00	90.50	358.50	9,914.81	3,030.41	763.38	3,006.13	0.47	-0.21	-0.42
13,006.00	91.20	357.80	9,913.41	3,124.35	760.35	3,100.12	1.05	0.74	-0.74
13,101.00	90.20	358.20	9,912.25	3,219.28	757.03	3,195.11	1.13	-1.05	0.42
13,195.00	89.80	357.90	9,912.25	3,313.23	753.84	3,289.11	0.53	-0.43	-0.32
13,290.00	90.40	357.40	9,912.08	3,408.15	749.94	3,384.10	0.82	0.63	-0.53
13,384.00	92.90	357.40	9,909.38	3,502.01	745.68	3,478.05	2.66	2.66	0.00
13,479.00	93.90	358.00	9,903.74	3,596.76	741.87	3,572.87	1.23	1.05	0.63
13,573.00	93.10	357.90	9,898.01	3,690.52	738.52	3,666.69	0.86	-0.85	-0.11
13,668.00	92.00	358.90	9,893.78	3,785.39	735.87	3,761.60	1.56	-1.16	1.05
13,762.00	92.20	358.60	9,890.33	3,879.30	733.82	3,855.53	0.38	0.21	-0.32
13,856.00	92.00	357.10	9,886.89	3,973.17	730.29	3,949.46	1.61	-0.21	-1.60
13,950.00	91.40	357.50	9,884.10	4,067.03	725.87	4,043.41	0.77	-0.64	0.43
14,045.00	90.60	357.50	9,882.44	4,161.92	721.72	4,138.38	0.84	-0.84	0.00
14,139.00	89.20	357.70	9,882.61	4,255.84	717.79	4,232.37	1.50	-1.49	0.21
14,233.00	90.50	357.50	9,882.85	4,349.75	713.85	4,326.36	1.40	1.38	-0.21
14,327.00	89.70	356.80	9,882.69	4,443.63	709.18	4,420.34	1.13	-0.85	-0.74
14,422.00	88.40	357.60	9,884.26	4,538.50	704.54	4,515.31	1.61	-1.37	0.84
14,516.00	87.40	357.40	9,887.71	4,632.35	700.44	4,609.24	1.08	-1.06	-0.21
14,608.00	87.40	356.80	9,891.88	4,724.14	695.79	4,701.12	0.65	0.00	-0.65
Final Phoenix MWD Survey									
14,664.00	87.40	356.80	9,894.42	4,779.99	692.67	4,757.05	0.00	0.00	0.00
Projection to TD									

Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,868.00	1,867.99	-0.52	5.03	First Phoenix MWD Survey
14,608.00	9,891.88	4,680.25	698.13	Final Phoenix MWD Survey
14,664.00	9,894.42	4,724.14	695.79	Projection to TD