



COG OPERATING, LLC

Eddy /Lea County, NM (NAD27) NMEZ

Nelson Federal COM 23H

23H - Slot 23H - SL 2188'FSL, 1895'FWL Sec 15

PP - 2930'FSL, 1700'FWL, Sec 15

Lateral

PLANNED BHL 220'FNL, 1700'FWL Sec10

Platted BHL 330'FNL, 1650'FWL Sec10

ACTUAL BHL 221'FNL, 1676'FWL Sec10





Survey Report



Company: COG OPERATING, LLC
Project: Eddy / Lea County, NM (NAD27) NMEZ
Site: Nelson Federal COM 23H
Well: 23H
Wellbore: Lateral
Design: Lateral PLANNED BHL 352'FWL, 220'FNL

Local Co-ordinate Reference: Well 23H - Slot 23H
TVD Reference: 4044+18 @ 4065.00ft (Patriot 6)
MD Reference: 4044+18 @ 4065.00ft (Patriot 6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: VON_EDM

Project	Eddy / Lea County, NM (NAD27) NMEZ		
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	Nelson Federal COM 23H, 2188 FSL, 1895'FWL Sec15		
Site Position:	Northings:	667,330.20 ft	Latitude: 32° 49' 59.673 N
From: Map	Eastings:	677,279.30 ft	Longitude: 103° 45' 22.259 W
Position Uncertainty:	Slot Radius:	13.20 in	Grid Convergence: 0.31 °

Well	23H - Slot 23H		
Well Position	+N-S	0.00 ft	Northings: 667,330.20 ft
	+E-W	0.00 ft	Eastings: 677,279.30 ft
Position Uncertainty	Wellhead Elevation:	0.00 ft	Ground Level: 4,044.00 ft

Wellbore	Lateral		
Magnetics	Model Name	Sample Date	Declination
	IGRF2015	05/19/17	7.09
			Dip Angle
			60.59
			Field Strength
			48,283

Design	Lateral PLANNED BHL 352'FWL, 220'FNL		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
Vertical Section:	Depth From (TVD)	+N-S	+E-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			Direction
			(°)
			358.10

Survey Program	Date 06/13/17		
From	To	Survey (Wellbore)	Tool Name
(ft)	(ft)		
100.00	2,250.00	Survey #1 (Lateral)	GYD_DP_MS
2,387.00	14,090.00	Survey #2 (Lateral)	MWD
14,145.00	14,145.00	Survey #3 (Lateral)	Projection
			Description
			Gyrodata gyro-compassing and drop
			MWD v3: standard declination
			Projection

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)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Nelson FedCom 23H SL									
	100.00	0.55	128.58	100.00	-0.29	0.39	-0.30	0.55	0.55	0.00
	200.00	0.49	90.78	199.99	-0.58	1.20	-0.62	0.32	-0.06	-35.80
	300.00	0.25	90.08	299.99	-0.58	1.84	-0.84	0.24	-0.24	-0.70
	400.00	0.31	104.63	399.99	-0.65	2.32	-0.73	0.09	0.06	14.55
	500.00	0.24	83.60	499.99	-0.70	2.79	-0.79	0.12	-0.07	-21.03
	600.00	0.32	69.69	599.99	-0.58	3.26	-0.89	0.10	0.08	-13.91
	700.00	0.28	56.08	699.99	-0.35	3.71	-0.48	0.09	-0.06	-13.61



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 TVD Reference: 4044+18 @ 4085.00ft (Patriot 6)
 MD Reference: 4044+18 @ 4085.00ft (Patriot 6)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: VON_EDM

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)
800.00	0.11	95.05	799.99	-0.24	4.00	-0.37	0.19	-0.15	38.97
900.00	0.33	181.96	899.99	-0.53	4.08	-0.67	0.34	0.22	86.91
1,000.00	0.40	188.17	999.98	-1.17	4.02	-1.30	0.08	0.07	6.21
1,100.00	0.54	203.25	1,099.98	-1.94	3.79	-2.07	0.19	0.14	15.08
1,200.00	0.49	218.36	1,199.98	-2.71	3.34	-2.82	0.14	-0.05	15.11
1,300.00	0.47	225.28	1,299.97	-3.34	2.78	-3.43	0.06	-0.02	6.92
1,400.00	0.34	226.13	1,399.97	-3.83	2.28	-3.90	0.13	-0.13	0.85
1,500.00	0.13	85.49	1,499.97	-3.99	2.18	-4.08	0.46	-0.21	-180.64
1,600.00	0.33	117.73	1,599.97	-4.08	2.52	-4.16	0.27	0.20	52.24
1,700.00	0.87	54.58	1,699.96	-3.77	3.40	-3.88	0.78	0.54	-63.15
1,800.00	1.12	72.26	1,799.95	-3.03	4.95	-3.19	0.39	0.25	17.68
1,900.00	1.19	60.20	1,899.93	-2.22	6.78	-2.44	0.25	0.07	-12.08
2,000.00	1.35	66.46	1,999.91	-1.23	8.76	-1.52	0.21	0.16	6.26
2,100.00	1.32	64.89	2,099.88	-0.27	10.88	-0.63	0.05	-0.03	-1.57
2,200.00	1.34	77.62	2,199.85	0.47	13.07	0.03	0.30	0.02	12.73
2,250.00	1.28	78.45	2,249.84	0.70	14.18	0.23	0.13	-0.12	1.66
2,387.00	1.51	89.60	2,386.80	1.02	17.49	0.44	0.26	0.17	8.14
2,481.00	0.88	67.84	2,480.78	1.30	19.40	0.66	0.81	-0.67	-23.15
2,575.00	2.24	326.22	2,574.75	3.10	19.04	2.47	2.73	1.45	-108.11
2,669.00	2.03	319.87	2,668.69	5.90	16.95	5.34	0.34	-0.22	-8.76
2,764.00	2.88	301.06	2,763.60	8.42	13.62	7.86	1.22	0.89	-19.80
2,859.00	4.20	289.39	2,858.42	10.81	8.48	10.52	1.58	1.39	-12.28
2,953.00	3.69	291.52	2,952.19	13.08	2.43	12.97	0.56	-0.54	2.27
3,047.00	4.23	287.58	3,045.97	15.22	-3.89	15.33	0.64	0.57	-4.19
3,141.00	4.81	287.04	3,139.88	17.42	-10.76	17.77	0.62	0.62	-0.57
3,236.00	3.89	285.02	3,234.40	19.42	-17.68	20.00	0.98	-0.97	-2.13
3,330.00	4.53	290.22	3,328.15	21.53	-24.24	22.32	0.79	0.68	5.53
3,424.00	4.96	278.62	3,421.83	23.44	-31.76	24.48	1.11	0.48	-12.13
3,518.00	5.89	287.71	3,516.40	25.55	-40.48	26.88	1.30	0.96	9.36
3,613.00	5.00	288.36	3,609.98	28.18	-49.00	29.78	0.96	-0.95	-1.44
3,707.00	6.10	293.46	3,703.53	31.32	-57.51	33.21	1.38	1.17	7.55
3,802.00	5.79	291.89	3,798.02	35.11	-68.59	37.30	0.37	-0.33	-1.65
3,896.00	5.73	293.27	3,891.55	38.74	-75.30	41.21	0.16	-0.06	1.47
3,991.00	5.34	289.55	3,986.11	42.09	-83.82	44.84	0.56	-0.41	-3.92
4,086.00	5.32	291.19	4,080.70	45.16	-92.10	48.19	0.16	-0.02	1.73
4,180.00	4.93	291.79	4,174.32	48.23	-99.91	51.52	0.42	-0.41	0.64
4,276.00	5.07	292.31	4,269.95	51.38	-107.66	54.92	0.15	0.15	0.54
4,370.00	4.83	293.50	4,363.60	54.53	-115.14	58.32	0.28	-0.28	1.27
4,465.00	4.88	295.97	4,458.26	57.89	-122.44	61.92	0.23	0.05	2.60
4,560.00	4.69	294.72	4,552.93	61.28	-129.60	65.55	0.23	-0.20	-1.32
4,654.00	4.51	294.11	4,648.63	64.40	-136.46	68.89	0.20	-0.19	-0.65
4,749.00	4.79	296.93	4,741.32	67.73	-143.41	72.44	0.38	0.29	2.97
4,841.00	4.14	286.83	4,833.04	70.43	-150.01	75.36	1.11	-0.71	-10.98

	Survey Report	Local Co-ordinate Reference: TVD Reference: MD Reference: North Reference: Survey Calculation Method:	Company: Project: Site: Well: Wellbore: Design:
W&A DIRECTIONAL SERVICES, LLC	Well 23H - Slot 23H 4044+18 @ 4065.00ft (Patriot 6) Grid Minimum Curvature VON_EDM	COG OPERATING, LLC Eddy /Lesa County, NM (NAD27) NMEZ Nelson Federal COM 23H Lateral Lateral PLANNED BHL 352FWL, 2207FNL	Database:



Survey Report



Company: COG OPERATING, LLC
Project: Eddy /Lea County, NM (NAD27) NMEZ
Site: Nelson Federal COM 23H
Well: 23H
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Design: Lateral PLANNED BHL 352'FWL, 220'FNL

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North Reference: Grid
Survey Calculation Method: Minimum Curvature
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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)
6,704.00	88.43	0.08	6,375.51	709.28	-193.99	715.33	6.53	6.53	0.03
6,736.95	89.05	359.21	6,376.24	742.22	-194.19	748.25	3.23	1.87	-2.63
Nelson FedCom 23H LP p3									
6,742.00	89.14	359.08	6,376.32	747.27	-194.27	753.30	3.23	1.87	-2.63
6,777.58	89.32	359.08	6,376.80	782.85	-194.84	788.88	0.49	0.49	0.01
Nelson FedCom 23H LP p1									
6,837.00	89.61	359.09	6,377.35	842.26	-195.78	848.28	0.49	0.49	0.01
6,932.00	89.29	359.74	6,378.27	937.25	-196.75	943.25	0.78	-0.34	0.68
7,027.00	88.83	0.05	6,379.82	1,032.23	-196.93	1,038.19	0.58	-0.48	0.33
7,122.00	89.94	359.70	6,380.84	1,127.23	-197.13	1,133.14	1.23	1.17	-0.37
7,218.00	91.05	359.37	6,380.01	1,223.22	-197.91	1,229.11	1.21	1.18	-0.34
7,312.00	91.00	358.38	6,378.33	1,317.18	-199.76	1,323.08	1.05	-0.05	-1.05
7,408.00	91.09	359.05	6,378.58	1,413.14	-201.91	1,419.06	0.70	0.09	0.70
7,502.00	90.99	359.96	6,374.88	1,507.12	-202.72	1,513.01	0.97	-0.11	0.97
7,597.00	91.24	359.23	6,373.03	1,602.10	-203.39	1,607.96	0.81	0.26	-0.77
7,692.00	91.59	358.74	6,370.68	1,697.06	-205.08	1,702.92	0.63	0.37	-0.52
7,787.00	90.62	358.57	6,368.85	1,792.01	-207.31	1,797.90	1.04	-1.02	-0.18
7,882.00	89.11	0.20	6,369.07	1,887.00	-208.33	1,892.87	2.34	-1.59	1.72
7,977.00	89.76	0.68	6,370.01	1,981.99	-207.60	1,987.79	0.85	0.68	0.51
8,073.00	88.98	359.00	6,371.07	2,077.98	-207.86	2,083.73	1.93	-0.81	-1.75
8,167.00	89.19	359.96	6,372.57	2,171.96	-208.72	2,177.69	1.05	0.22	1.02
8,263.00	89.97	359.53	6,373.27	2,267.96	-209.14	2,273.65	0.93	0.81	-0.45
8,358.00	90.19	0.16	6,373.14	2,362.96	-209.40	2,368.60	0.70	0.23	0.66
8,453.00	89.87	359.85	6,373.09	2,457.96	-209.39	2,463.55	0.47	-0.34	-0.33
8,548.00	89.20	359.64	6,373.86	2,552.95	-209.82	2,558.51	0.74	-0.71	-0.22
8,643.00	89.49	358.85	6,374.94	2,647.94	-211.23	2,653.48	1.09	0.31	-1.04
8,738.00	89.51	358.23	6,375.77	2,742.90	-213.82	2,748.48	0.44	0.02	-0.44
8,833.00	89.99	358.51	6,376.19	2,837.88	-216.52	2,843.48	0.58	0.51	0.29
8,928.00	90.19	359.64	6,376.04	2,932.84	-218.06	2,938.46	1.21	0.21	1.19
9,024.00	90.46	359.77	6,375.49	3,028.84	-218.55	3,034.42	0.31	0.28	0.14
9,119.00	90.82	359.38	6,374.43	3,123.83	-219.27	3,129.38	0.57	0.38	-0.43
9,214.00	90.92	0.45	6,372.99	3,218.82	-219.43	3,224.32	1.15	0.11	1.15
9,309.00	90.40	359.56	6,371.80	3,313.81	-219.42	3,319.26	1.08	-0.55	-0.94
9,408.00	90.90	359.42	6,370.77	3,412.80	-220.30	3,418.23	0.52	0.51	-0.14
9,502.00	89.77	359.29	6,370.22	3,506.79	-221.36	3,512.20	1.21	-1.20	-0.14
9,597.00	89.39	1.04	6,370.92	3,601.78	-221.09	3,607.13	1.88	-0.40	1.84
9,691.00	88.50	359.54	6,372.65	3,695.78	-220.61	3,701.05	1.88	-0.95	-1.60
9,786.00	88.37	358.98	6,375.25	3,790.72	-221.85	3,795.99	0.63	-0.14	-0.61
9,814.00	88.90	359.17	6,375.91	3,818.71	-222.31	3,823.98	2.04	1.89	0.75
9,908.00	90.15	359.19	6,376.69	3,912.69	-223.86	3,917.96	1.33	1.33	0.02
10,001.00	90.48	357.80	6,376.18	4,005.66	-226.10	4,010.95	1.54	0.35	-1.49
10,095.00	90.88	357.47	6,374.98	4,099.57	-229.98	4,104.94	0.84	0.53	-0.35
10,190.00	90.33	359.91	6,373.90	4,194.53	-232.15	4,199.92	2.66	-0.88	2.57
10,283.00	91.03	0.36	6,372.79	4,287.52	-231.93	4,292.86	0.89	0.75	0.48



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10,378.00	90.58	1.33	8,371.48	4,382.50	-230.53	4,387.74	1.13	-0.47	1.02
10,472.00	89.06	357.76	8,371.75	4,476.48	-231.27	4,481.89	4.13	-1.82	-3.80
10,587.00	89.80	358.36	8,372.86	4,571.42	-234.49	4,578.88	0.85	0.57	0.63
10,660.00	90.06	358.64	8,373.14	4,664.39	-236.92	4,669.68	0.58	0.49	0.30
10,755.00	90.47	358.29	8,372.70	4,759.37	-238.84	4,764.66	0.81	0.43	0.68
10,850.00	90.78	359.72	8,371.68	4,854.36	-239.46	4,859.63	0.55	0.31	0.45
10,944.00	89.03	359.59	8,371.85	4,948.35	-240.03	4,953.59	1.85	-1.84	-0.14
11,039.00	89.54	0.13	8,373.04	5,043.35	-240.26	5,048.54	0.78	0.54	0.57
11,133.00	89.75	359.98	8,373.62	5,137.34	-240.17	5,142.48	0.27	0.22	-0.16
11,227.00	90.27	0.44	8,373.61	5,231.34	-239.82	5,236.42	0.74	0.55	0.49
11,322.00	90.41	0.77	8,373.04	5,326.34	-238.82	5,331.33	0.38	0.15	0.35
11,417.00	89.95	359.73	8,372.74	5,421.33	-238.41	5,426.28	1.20	-0.48	-1.09
11,512.00	88.92	358.32	8,373.68	5,516.31	-240.02	5,521.24	1.84	-1.08	-1.48
11,607.00	88.88	358.48	8,375.50	5,611.28	-242.89	5,616.22	0.15	-0.03	0.15
11,702.00	89.05	358.41	8,377.20	5,706.21	-245.29	5,711.20	0.18	0.17	-0.05
11,797.00	89.32	358.16	8,378.55	5,801.15	-248.13	5,806.19	0.39	0.28	-0.26
11,890.00	89.87	358.61	8,379.37	5,894.11	-250.75	5,899.18	0.61	0.38	0.48
11,984.00	89.68	358.59	8,379.91	5,988.08	-253.05	5,993.18	0.02	0.01	-0.02
12,078.00	90.03	358.75	8,380.15	6,082.06	-255.23	6,087.17	0.41	0.37	0.17
12,173.00	90.99	359.45	8,379.30	6,177.04	-258.72	6,182.15	1.25	1.01	0.74
12,268.00	91.22	359.97	8,377.47	6,272.02	-257.20	6,277.10	0.60	0.24	0.55
12,362.00	90.27	0.33	8,376.25	6,366.01	-256.95	6,371.03	1.08	-1.01	0.38
12,456.00	90.86	359.91	8,375.32	6,460.01	-258.78	6,464.97	0.77	0.63	-0.45
12,549.00	91.08	0.14	8,373.74	6,552.99	-258.72	6,557.90	0.34	0.24	0.25
12,643.00	89.51	359.30	8,373.28	6,646.99	-257.18	6,651.86	1.89	-1.67	-0.89
12,737.00	89.83	0.11	8,373.97	6,740.98	-257.88	6,745.82	0.87	0.13	0.88
12,831.00	89.55	359.23	8,374.64	6,834.98	-258.20	6,839.78	0.94	-0.09	-0.94
12,924.00	89.62	359.18	8,375.31	6,927.98	-259.51	6,932.78	0.11	0.08	-0.08
13,019.00	89.92	359.41	8,375.69	7,022.96	-260.89	7,027.74	0.41	0.32	0.26
13,113.00	89.92	359.51	8,375.82	7,116.95	-261.58	7,121.71	0.11	0.00	0.11
13,208.00	90.07	359.52	8,375.83	7,211.95	-262.38	7,216.88	0.16	0.16	0.01
13,301.00	90.07	359.72	8,375.72	7,304.95	-263.00	7,309.85	0.22	0.00	0.22
13,395.00	90.05	359.63	8,375.62	7,398.94	-263.53	7,403.81	0.10	-0.02	-0.10
13,489.00	90.54	359.90	8,375.14	7,492.94	-263.92	7,497.57	0.60	0.52	0.29
13,584.00	90.80	0.23	8,373.94	7,587.93	-263.81	7,592.51	0.51	0.38	0.35
13,678.00	89.58	359.48	8,373.56	7,679.93	-264.08	7,684.48	1.66	-1.43	-0.84
13,770.00	89.74	359.63	8,374.12	7,773.93	-264.81	7,778.43	0.25	0.17	0.18
13,864.00	89.98	359.54	8,374.34	7,867.92	-265.49	7,872.40	0.28	0.27	-0.10
13,953.00	90.38	0.18	8,374.05	7,956.92	-265.71	7,961.36	0.84	0.44	0.72
13,985.00	90.38	0.36	8,373.84	7,988.92	-265.55	7,993.33	0.56	0.00	0.56
14,038.00	91.18	0.63	8,373.14	8,039.91	-265.11	8,044.28	1.66	1.57	0.53
Wellpath Crosses 330°HL @ Toe									
14,079.00	91.86	0.86	8,372.00	8,082.89	-264.55	8,087.22	1.66	1.57	0.53



Survey Report



Company: COG OPERATING, LLC
Project: Eddy / Lea County, NM (NAD27) NMEZ
Site: Nelson Federal COM 23H
Well: 23H
Wellbore: Lateral
Design: Lateral PLANNED BHL 352'FWL, 220'FNL

Local Co-ordinate Reference: Well 23H - Slot 23H
TVD Reference: 4044+18 @ 4065.00ft (Patriot 6)
MD Reference: 4044+18 @ 4065.00ft (Patriot 6)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: VON_EDM

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)
14,090.00	92.17	0.84	6,371.61	8,093.89	-264.39	8,098.20	2.82	2.82	-0.18
14,145.00	92.17	0.84	6,369.53	8,148.84	-263.59	8,153.10	0.00	0.00	0.00

TD @ 221'FNL, 1676'FWL - Nelson FedCom 23H BHL - Nelson FedCom 23H PBHL

Design Targets

Target Name

- hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Nelson FedCom 23H SL - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	667,330.20	677,279.30	32° 49' 59.673 N	103° 45' 22.259 W
Nelson FedCom 23H BT - actual wellpath hits target center - Point	0.00	0.00	6,369.53	8,148.84	-263.59	675,479.04	677,015.71	32° 51' 20.319 N	103° 45' 24.827 W

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
14,036.00	6,373.14	8,039.91	-265.11	Wellpath Crosses 330'HL @ Toe
14,145.00	6,369.53	8,148.84	-263.59	TD @ 221'FNL, 1676'FWL

Checked By: _____ Approved By: _____ Date: _____

COG OPERATING, LLC

Project: Eddy /Lea County, NM (NAD27) NMEZ
 Site: Nelson Federal COM 23H
 Well: 23H
 Wellbore: Lateral
 Design: Lateral PLANNED BHL 352'FWL, 220'FNL

4044+18 @ 4065.00ft (Patriot 6)
 NAD 1927 (NADCON CONUS)

West(-)/East(+) (2000 ft/in)

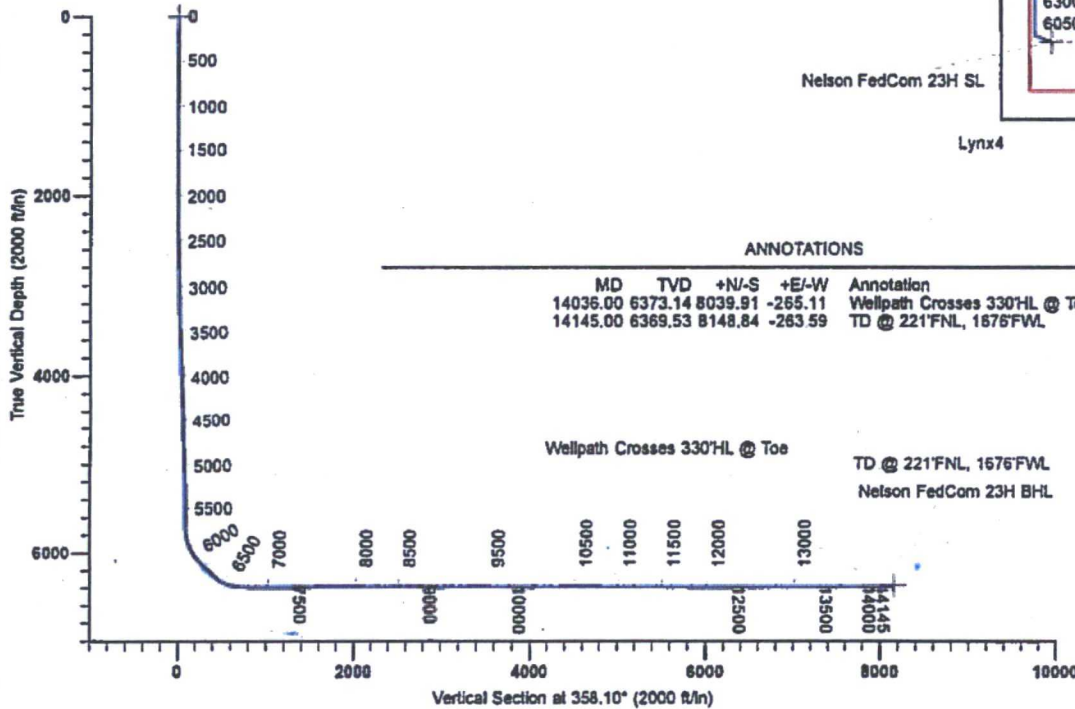
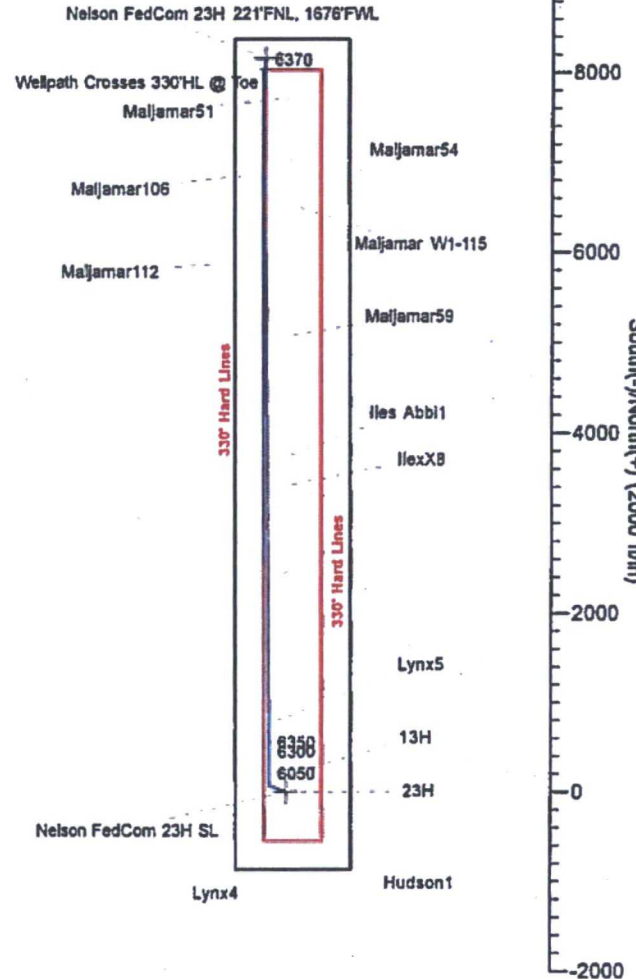
-2000 0 2000



Azimuths to Grid North
 True North: -0.31°
 Magnetic North: 6.78°

Magnetic Field
 Strength: 48283.4nT
 Dip Angle: 60.59°
 Date: 05/19/2017
 Model: IGRF2015

To convert a Magnetic Direction to a Grid Direction Add 6.78°



ANNOTATIONS

MD	TVD	+N/-S	+E/-W	Annotation
14036.00	6373.14	8039.81	-265.11	Wellpath Crosses 330°HL @ Toe
14145.00	6369.53	8148.84	-263.59	TD @ 221'FNL, 1676'FWL

Wellpath Crosses 330°HL @ Toe

TD @ 221'FNL, 1676'FWL
 Nelson FedCom 23H BHL

TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
Nelson FedCom 23H SL	0.00	0.00	0.00	667330.20	677279.30	Point
Nelson FedCom 23H BHL	6369.53	8148.84	-263.59	675479.04	677015.71	Point

Design: Lateral PLANNED BHL 352'FWL, 220'FNL (23H/Lateral)
 Created By: Mekka Williams
 eSomina Well Design
 mekka@esominawell.com
 7-02, June 13 2017

VON DIRECTIONAL
 12074 FM 3083 Conroe, Texas 77301
 936-756-2400





May 31, 2017

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: Nelson Federal Com No. 023H

Please find enclosed a copy of the survey from 0' to 2250' ran on the above referenced well.

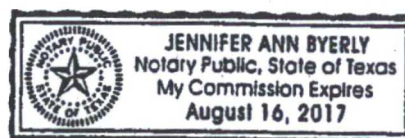
Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 31st day of May,
A.D., 2017, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas



VES Survey International
P.O. Box 261021, Corpus Christi, Texas 78426
T (361) 767-0602 F (361) 767-0612
www.vessurvey.com



Company: COG OPERATING
Lease/Well: NELSON FEDERAL COM No./023H

Rig Name: PATRIOT 6
State/County: NEW MEXICO/LEA
VS-Azi: 359.45 Degrees
Latitude: 32.83337, Longitude: -103.75668
Grid North = True North -0.31 degs (NAD 27)
Grid Correction Applied = -0.31 degs



Depth Reference : RKB=18 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: e-line gyro-de_01.ut
Minimum Curvature Method
Report Date/Time: 5/31/2017 / 16:10

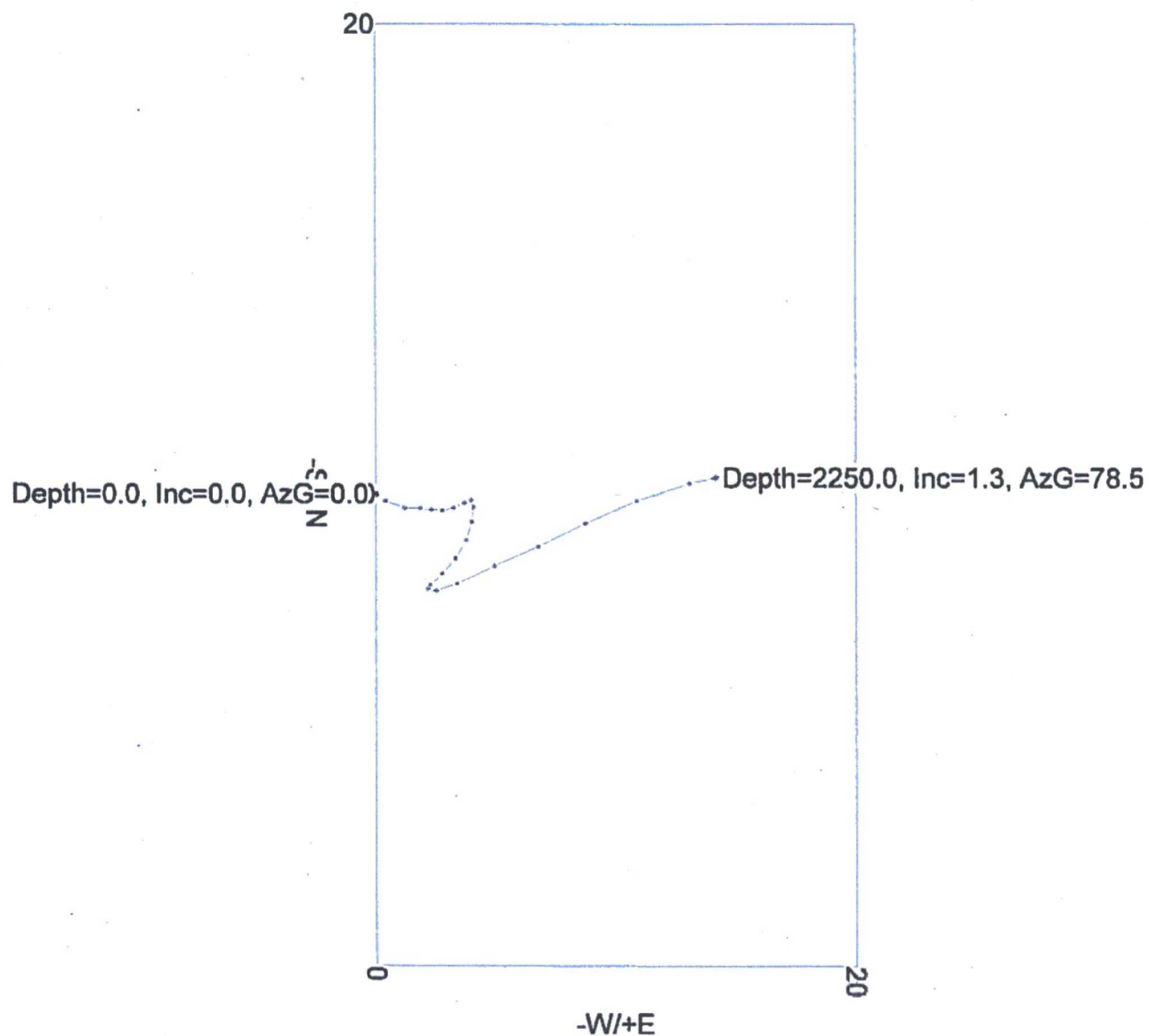
VES Survey International
Midland, Texas
432-563-5444
Surveyor: Michael Cook
Nelson Federal Com No. 023H / API 30-025-43706

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----
100.00	0.55	126.58	100.00	-0.29	0.39	-0.29	0.48	126.58	0.55
200.00	0.49	90.78	199.99	-0.58	1.20	-0.59	1.33	115.84	0.33
300.00	0.25	90.08	299.99	-0.59	1.84	-0.60	1.93	107.69	0.24
400.00	0.31	104.63	399.99	-0.65	2.31	-0.68	2.41	105.79	0.09
500.00	0.24	83.60	499.99	-0.70	2.78	-0.73	2.87	104.12	0.12
600.00	0.32	69.69	599.99	-0.58	3.24	-0.61	3.30	100.13	0.10
700.00	0.26	56.08	699.99	-0.36	3.69	-0.39	3.71	95.54	0.09
800.00	0.11	95.05	799.99	-0.24	3.98	-0.28	3.98	93.46	0.18
900.00	0.33	181.96	899.99	-0.54	4.07	-0.58	4.10	97.55	0.34
1000.00	0.40	188.17	999.98	-1.17	4.01	-1.21	4.17	106.32	0.08
1100.00	0.54	203.25	1099.98	-1.95	3.77	-1.99	4.25	117.41	0.19
1200.00	0.49	218.36	1199.98	-2.73	3.32	-2.76	4.29	129.44	0.15
1300.00	0.47	225.28	1299.97	-3.35	2.76	-3.38	4.34	140.50	0.06
1400.00	0.34	226.13	1399.97	-3.84	2.26	-3.86	4.46	149.54	0.13
1500.00	0.13	65.49	1499.97	-4.00	2.15	-4.02	4.54	151.72	0.47
1600.00	0.33	117.73	1599.97	-4.08	2.51	-4.11	4.79	148.41	0.27

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1700.00	0.87	54.58	1699.96	-3.77	3.38	-3.81	5.07	138.11	0.78
1800.00	1.12	72.28	1799.95	-3.03	4.93	-3.08	5.79	121.59	0.39
1900.00	1.19	60.20	1899.93	-2.22	6.76	-2.29	7.12	108.18	0.25
2000.00	1.35	66.46	1999.91	-1.23	8.75	-1.32	8.84	98.01	0.21
2100.00	1.32	64.89	2099.88	-0.27	10.88	-0.37	10.88	91.42	0.05
2200.00	1.34	77.62	2199.85	0.47	13.07	0.35	13.07	87.94	0.30
2250.00	1.28	78.45	2249.84	0.71	14.18	0.57	14.20	87.14	0.13



VES Survey International
Midland, Texas
432-563-5444
Surveyor: Michael Cook
Nelson Federal Com No. 023H / API 30-025-43706



V.E.S. Survey Date: 5/25/2017



I Michael Cook certify that I am employed by VES Survey International. That I did on the day(s) of 05/25/17 through 05/25/17 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,250.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating for the Nelson Federal Com Well # 023H API # 30-025-43706 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.



Michael Cook
Service Technician
VES Survey International



I Michael Cook certify that I am employed by VES Survey International. That I did on the day(s) of 05/25/17 through 05/25/17 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,250.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating for the Nelson Federal Com Well # 023H API # 30-025-43706 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.

A handwritten signature in blue ink, appearing to read "M. Cook", is written over a horizontal line.

Michael Cook
Service Technician
VES Survey International