



PRO DIRECTIONAL

TAP ROCK

Cosmo K 24S35E3328 No. 213H
Lea County, NM

October 18, 2018

Job No. LNM5178818
API No. 30-025-44656

Survey Completion Report



PRODIRECTIONAL

Survey Certification Letter

October 18, 2018



Operator Name: Tap Rock Operating
Well Name: Cosmo K 24S35E3328 No. 213H
County/Parish: Lea County,
State: NM
Rig Name: H&P 422
Job Number: LNM5178818

This is to certify the surveys performed on the referenced well by Professional Directional Ent., Inc. are true and correct MWD Surveys, data provided as follows:

<u>Surveyor</u>	<u>Surveyed Depths</u>	<u>Projection to Bit</u>	<u>Dates Performed</u>	<u>Type of Survey</u>
ProDirectional	11,744' MD – 18,778' MD	18,823' MD	09/09/18 – 09/23/18	MWD

Sincerely,

Mike Coats
Regulatory Specialist
Professional Directional

850 Conroe Park West Drive | Conroe, TX 77303 | Phone: 936.441.7266

prodirectional.com

The Standard of Excellence in Directional Supervision



Tap Rock Operating, LLC

Lea County, New Mexico

Cosmo K 24S35E3328

No. 213H

OH

Survey: ProDirectional

Survey Report

18 October, 2018





ProDirectional
Survey Report



Company: Tap Rock Operating, LLC
Project: Lea County, New Mexico (NAD 83)
Site: Cosmo K 24S35E3328
Well: 213H
Wellbore: OH
Design: OH 101'-18778 PTB 18823'

Local Co-ordinate Reference: Well 213H
TVD Reference: Well @ 3314.50usft (GL: 3288' + KB:26.5' (H&P 422))
MD Reference: Well @ 3314.50usft (GL: 3288' + KB:26.5' (H&P 422))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Project	Lea County, New Mexico (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Cosmo K 24S35E3328		
Site Position:		Northing:	428,699.00 usft
From:	Map	Eastng:	839,378.00 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 10' 29.65 N
		Longitude:	103° 22' 12.22 W
		Grid Convergence:	0.51 °

Well		213H				
Well Position	+N/-S	0.00 usft	Northing:	428,698.00 usft	Latitude:	32° 10' 29.65 N
	+E/-W	0.00 usft	Easting:	839,328.00 usft	Longitude:	103° 22' 12.81 W
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,288.00 usft	

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/5/2018	6.68	59.85	47,940.30

Design		OH 101'-18778 PTB 18823'		
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	359.42



ProDirectional
Survey Report



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Site:	Cosmo K 24S35E3328	MD Reference:	Well @ 3314.50usft (GL: 3288' + KB:26.5' (H&P 422))
Well:	213H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH 101'-18778 PTB 18823'	Database:	WellPlanner1

Survey Program		Date 10/18/2018									
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description							
101.76	11,683.94	VES Gyro (OH)	VESSI_GYRO_DROP	VESSI Gyroflex GS2 Drop							
11,744.00	18,823.00	Pro MWD (OH)	MWD+HDGM	OWSG MWD + HRGM							

Survey											
MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (")	Northing (usft)	Easting (usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	428,698.00	839,328.00	
101.76	1.14	343.80	101.75	0.97	0.97	-0.28	1.01	343.80	428,698.97	839,327.72	
196.18	0.92	331.93	196.16	2.55	2.54	-0.90	2.70	340.49	428,700.54	839,327.10	
290.60	1.24	325.35	290.56	4.07	4.05	-1.84	4.45	335.59	428,702.05	839,326.16	
385.02	1.29	325.40	384.96	5.80	5.77	-3.02	6.51	332.34	428,703.77	839,324.98	
479.44	1.11	344.92	479.36	7.56	7.53	-3.86	8.46	332.82	428,705.53	839,324.14	
573.86	1.28	344.67	573.76	9.47	9.43	-4.38	10.39	335.07	428,707.43	839,323.62	
668.28	1.59	355.77	668.15	11.80	11.75	-4.76	12.68	337.96	428,709.75	839,323.24	
762.70	1.90	0.74	762.52	14.67	14.62	-4.83	15.40	341.71	428,712.62	839,323.17	
857.12	1.81	9.36	856.89	17.70	17.66	-4.57	18.24	345.49	428,715.66	839,323.43	
951.54	2.27	18.42	951.25	20.94	20.90	-3.74	21.23	349.86	428,718.90	839,324.26	
1,045.96	2.31	18.93	1,045.60	24.50	24.48	-2.53	24.61	354.10	428,722.48	839,325.47	
1,140.38	0.82	1.44	1,139.98	26.97	26.95	-1.89	27.02	355.98	428,724.95	839,326.11	
1,234.80	1.15	234.49	1,234.40	27.10	27.08	-2.65	27.21	354.41	428,725.08	839,325.35	
1,392.16	2.46	224.33	1,391.67	23.81	23.74	-6.29	24.56	345.15	428,721.74	839,321.71	
1,486.58	2.83	220.69	1,485.99	20.62	20.53	-9.23	22.51	335.79	428,718.53	839,318.77	
1,581.00	2.59	217.19	1,580.31	17.18	17.06	-12.04	20.88	324.79	428,715.06	839,315.96	
1,675.42	2.40	215.33	1,674.64	13.89	13.75	-14.47	19.96	313.53	428,711.75	839,313.53	
1,769.84	2.12	217.73	1,768.98	10.92	10.75	-16.68	19.85	302.80	428,708.75	839,311.32	
1,864.26	1.87	216.29	1,863.35	8.32	8.13	-18.66	20.36	293.54	428,706.13	839,309.34	
1,958.68	2.18	214.40	1,957.71	5.62	5.41	-20.59	21.29	284.71	428,703.41	839,307.41	



ProDirectional Survey Report



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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
2,053.10	3.47	218.91	2,052.01	1.94	1.70	-23.40	23.46	274.16	428,699.70	839,304.60
2,147.52	4.97	216.31	2,146.17	-3.54	-3.82	-27.62	27.88	262.13	428,694.18	839,300.38
2,241.94	5.47	216.90	2,240.20	-10.38	-10.71	-32.74	34.45	251.88	428,687.29	839,295.26
2,336.36	4.83	219.61	2,334.24	-16.99	-17.37	-37.98	41.76	245.42	428,680.63	839,290.02
2,430.78	4.58	219.87	2,428.34	-22.89	-23.33	-42.93	48.86	241.48	428,674.67	839,285.07
2,525.20	4.11	217.41	2,522.49	-28.43	-28.91	-47.40	55.52	238.62	428,669.09	839,280.60
2,619.62	3.71	220.63	2,616.69	-33.39	-33.92	-51.45	61.62	236.60	428,664.08	839,276.55
2,714.04	3.19	222.24	2,710.94	-37.62	-38.18	-55.20	67.12	235.33	428,659.82	839,272.80
2,808.46	4.48	217.27	2,805.15	-42.46	-43.06	-59.20	73.20	233.97	428,654.94	839,268.80
2,902.88	5.04	220.27	2,899.24	-48.51	-49.16	-64.11	80.79	232.52	428,648.84	839,263.89
2,997.30	4.51	223.64	2,993.33	-54.30	-55.01	-69.36	88.52	231.58	428,642.99	839,258.64
3,091.72	4.21	225.41	3,087.48	-59.37	-60.13	-74.39	95.65	231.05	428,637.87	839,253.61
3,186.14	4.83	227.44	3,181.60	-64.44	-65.25	-79.78	103.07	230.72	428,632.75	839,248.22
3,280.56	5.41	230.89	3,275.65	-69.87	-70.75	-86.17	111.49	230.61	428,627.25	839,241.83
3,374.98	5.10	230.91	3,369.67	-75.26	-76.20	-92.88	120.14	230.63	428,621.80	839,235.12
3,469.40	4.81	231.23	3,463.74	-80.32	-81.33	-99.22	128.29	230.66	428,616.67	839,228.78
3,563.82	4.71	232.38	3,557.83	-85.10	-86.17	-105.38	136.12	230.73	428,611.83	839,222.62
3,658.24	4.42	223.04	3,651.95	-90.07	-91.20	-110.93	143.61	230.58	428,606.80	839,217.07
3,752.66	4.31	211.45	3,746.10	-95.71	-96.88	-115.27	150.57	229.95	428,601.12	839,212.73
3,847.08	4.78	202.27	3,840.23	-102.34	-103.55	-118.61	157.45	228.88	428,594.45	839,209.39
3,941.50	4.75	202.33	3,934.32	-109.57	-110.81	-121.58	164.50	227.65	428,587.19	839,206.42
4,035.92	3.91	193.71	4,028.47	-116.29	-117.55	-123.83	170.74	226.49	428,580.45	839,204.17
4,130.34	3.29	210.45	4,122.71	-121.73	-123.01	-125.97	176.07	225.68	428,574.99	839,202.03
4,224.76	3.30	227.18	4,216.97	-125.88	-127.20	-129.33	181.40	225.48	428,570.80	839,198.67
4,319.18	4.21	239.33	4,311.19	-129.45	-130.81	-134.31	187.49	225.76	428,567.19	839,193.69
4,413.60	4.77	247.40	4,405.32	-132.66	-134.09	-140.91	194.52	226.42	428,563.91	839,187.09
4,508.02	5.22	263.64	4,499.39	-134.56	-136.07	-148.81	201.64	227.56	428,561.93	839,179.19



ProDirectional
Survey Report



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4,602.44	4.97	272.13	4,593.43	-134.80	-136.40	-157.16	208.10	229.05	428,561.60	839,170.84
4,696.86	4.45	257.34	4,687.54	-135.37	-137.05	-164.83	214.36	230.26	428,560.95	839,163.17
4,791.28	3.84	233.56	4,781.72	-137.99	-139.73	-170.94	220.78	230.74	428,558.27	839,157.06
4,885.70	3.67	213.23	4,875.94	-142.36	-144.14	-175.14	226.83	230.55	428,553.86	839,152.86
4,980.12	3.53	227.78	4,970.18	-146.80	-148.62	-178.95	232.62	230.29	428,549.38	839,149.05
5,074.54	3.26	228.78	5,064.43	-150.48	-152.34	-183.12	238.20	230.24	428,545.66	839,144.88
5,168.96	3.16	227.92	5,158.70	-153.95	-155.85	-187.07	243.49	230.20	428,542.15	839,140.93
5,263.38	3.88	224.64	5,252.94	-157.93	-159.87	-191.25	249.27	230.11	428,538.13	839,136.75
5,357.80	4.10	219.00	5,347.13	-162.78	-164.77	-195.62	255.76	229.89	428,533.23	839,132.38
5,452.22	4.22	223.98	5,441.31	-167.85	-169.89	-200.16	262.54	229.68	428,528.11	839,127.84
5,546.64	4.47	221.90	5,535.45	-173.04	-175.13	-205.03	269.64	229.50	428,522.87	839,122.97
5,641.06	4.57	223.23	5,629.58	-178.47	-180.61	-210.06	277.03	229.31	428,517.39	839,117.94
5,735.48	4.63	214.85	5,723.70	-184.29	-186.47	-214.81	284.46	229.04	428,511.53	839,113.19
5,829.90	4.55	213.77	5,817.81	-190.49	-192.72	-219.07	291.77	228.66	428,505.28	839,108.93
5,924.32	4.80	219.89	5,911.92	-196.59	-198.86	-223.69	299.30	228.36	428,499.14	839,104.31
6,018.74	5.00	224.55	6,006.00	-202.49	-204.82	-229.11	307.32	228.20	428,493.18	839,098.89
6,113.16	4.71	226.77	6,100.08	-208.02	-210.41	-234.82	315.30	228.14	428,487.59	839,093.18
6,207.58	4.83	229.69	6,194.17	-213.19	-215.64	-240.68	323.15	228.14	428,482.36	839,087.32
6,302.00	4.79	229.45	6,288.26	-218.26	-220.77	-246.70	331.06	228.17	428,477.23	839,081.30
6,396.42	4.60	233.76	6,382.36	-223.00	-225.57	-252.75	338.77	228.25	428,472.43	839,075.25
6,490.84	4.52	242.56	6,476.48	-226.89	-229.53	-259.11	346.15	228.46	428,468.47	839,068.89
6,585.26	4.65	244.99	6,570.60	-230.15	-232.86	-265.88	353.43	228.79	428,465.14	839,062.12
6,679.68	4.71	245.06	6,664.71	-233.34	-236.11	-272.86	360.83	229.13	428,461.89	839,055.14
6,774.10	4.75	241.58	6,758.81	-236.76	-239.61	-279.81	368.38	229.43	428,458.39	839,048.19
6,868.52	4.60	243.42	6,852.91	-240.25	-243.16	-286.64	375.88	229.69	428,454.84	839,041.36
6,962.94	4.61	240.52	6,947.03	-243.74	-246.72	-293.33	383.29	229.93	428,451.28	839,034.67
7,057.36	4.29	239.79	7,041.16	-247.32	-250.37	-299.68	390.50	230.12	428,447.63	839,028.32



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7,151.78	4.00	234.78	7,135.34	-250.94	-254.04	-305.42	397.27	230.25	428,443.96	839,022.58
7,246.20	3.71	231.50	7,229.54	-254.69	-257.84	-310.51	403.61	230.29	428,440.16	839,017.49
7,340.62	3.31	231.28	7,323.78	-258.25	-261.45	-315.02	409.38	230.31	428,436.55	839,012.98
7,435.04	3.15	231.58	7,418.05	-261.52	-264.77	-319.18	414.70	230.32	428,433.23	839,008.82
7,529.46	3.25	228.59	7,512.33	-264.86	-268.15	-323.22	419.97	230.32	428,429.85	839,004.78
7,623.88	2.93	223.89	7,606.61	-268.34	-271.66	-326.90	425.05	230.27	428,426.34	839,001.10
7,718.30	2.92	218.38	7,700.91	-271.93	-275.28	-330.07	429.80	230.17	428,422.72	838,997.93
7,812.72	2.56	206.60	7,795.22	-275.67	-279.05	-332.51	434.09	230.00	428,418.95	838,995.49
7,907.14	2.58	198.94	7,889.55	-279.55	-282.95	-334.14	437.85	229.74	428,415.05	838,993.86
8,001.56	2.23	190.61	7,983.88	-283.36	-286.77	-335.17	441.10	229.45	428,411.23	838,992.83
8,095.98	1.87	176.32	8,078.24	-286.70	-290.11	-335.41	443.46	229.14	428,407.89	838,992.59
8,190.40	1.36	169.00	8,172.62	-289.34	-292.75	-335.09	444.96	228.86	428,405.25	838,992.91
8,284.82	1.04	160.97	8,267.02	-291.25	-294.66	-334.60	445.85	228.63	428,403.34	838,993.40
8,379.24	0.58	139.56	8,361.43	-292.43	-295.83	-334.01	446.18	228.47	428,402.17	838,993.99
8,473.66	0.52	100.36	8,455.85	-292.88	-296.27	-333.28	445.93	228.36	428,401.73	838,994.72
8,568.08	0.49	70.51	8,550.27	-292.83	-296.21	-332.48	445.29	228.30	428,401.79	838,995.52
8,662.50	0.50	74.83	8,644.68	-292.60	-295.97	-331.70	444.55	228.26	428,402.03	838,996.30
8,756.92	0.59	87.68	8,739.10	-292.48	-295.84	-330.82	443.81	228.19	428,402.16	838,997.18
8,851.34	0.57	92.47	8,833.51	-292.49	-295.84	-329.86	443.09	228.11	428,402.16	838,998.14
8,945.76	0.54	100.45	8,927.93	-292.60	-295.94	-328.96	442.49	228.02	428,402.06	838,999.04
9,040.18	0.69	118.09	9,022.34	-292.96	-296.29	-328.02	442.02	227.91	428,401.71	838,999.98
9,134.60	0.76	110.04	9,116.76	-293.45	-296.78	-326.93	441.54	227.77	428,401.22	839,001.07
9,229.02	0.92	112.78	9,211.17	-293.97	-297.28	-325.64	440.93	227.61	428,400.72	839,002.36
9,323.44	0.68	118.43	9,305.58	-294.54	-297.84	-324.45	440.43	227.45	428,400.16	839,003.55
9,417.86	0.83	119.25	9,399.99	-295.16	-298.44	-323.36	440.03	227.29	428,399.56	839,004.64
9,512.28	1.09	134.64	9,494.40	-296.13	-299.41	-322.12	439.78	227.09	428,398.59	839,005.88
9,606.70	1.38	142.53	9,588.79	-297.68	-300.94	-320.79	439.86	226.83	428,397.06	839,007.21



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Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
9,701.12	1.63	157.83	9,683.18	-299.84	-303.09	-319.59	440.46	226.52	428,394.91	839,008.41
9,795.54	1.89	172.98	9,777.56	-302.63	-305.88	-318.90	441.88	226.19	428,392.12	839,009.10
9,889.96	2.30	192.95	9,871.92	-306.02	-309.27	-319.13	444.40	225.90	428,388.73	839,008.87
9,984.38	2.32	182.23	9,966.26	-309.77	-313.03	-319.63	447.38	225.60	428,384.97	839,008.37
10,078.80	2.52	166.25	10,060.60	-313.70	-316.95	-319.21	449.84	225.20	428,381.05	839,008.79
10,173.22	2.60	161.24	10,154.92	-317.76	-321.00	-318.03	451.86	224.73	428,377.00	839,009.97
10,267.64	1.30	188.79	10,249.29	-320.85	-324.08	-317.50	453.69	224.41	428,373.92	839,010.50
10,362.06	0.75	254.30	10,343.69	-322.07	-325.31	-318.26	455.10	224.37	428,372.69	839,009.74
10,456.48	1.92	323.11	10,438.09	-320.96	-324.21	-319.81	455.40	224.61	428,373.79	839,008.19
10,550.90	1.80	316.78	10,532.46	-318.59	-321.86	-321.77	455.12	224.99	428,376.14	839,006.23
10,645.32	1.06	299.29	10,626.85	-317.06	-320.36	-323.55	455.32	225.28	428,377.64	839,004.45
10,739.74	1.74	317.84	10,721.24	-315.56	-318.87	-325.27	455.50	225.57	428,379.13	839,002.73
10,834.16	1.54	326.24	10,815.63	-313.42	-316.75	-326.94	455.21	225.91	428,381.25	839,001.06
10,928.58	2.05	305.64	10,910.00	-311.36	-314.71	-329.02	455.30	226.27	428,383.29	838,998.98
11,023.00	2.30	282.91	11,004.35	-309.92	-313.30	-332.24	456.66	226.68	428,384.70	838,995.76
11,117.42	2.50	298.51	11,098.69	-308.48	-311.90	-335.89	458.37	227.12	428,386.10	838,992.11
11,211.84	1.39	275.50	11,193.06	-307.36	-310.80	-338.84	459.80	227.47	428,387.20	838,989.16
11,306.26	1.41	242.80	11,287.45	-307.76	-311.23	-341.02	461.68	227.62	428,386.77	838,986.98
11,400.68	1.77	239.62	11,381.83	-309.00	-312.49	-343.31	464.23	227.69	428,385.51	838,984.69
11,495.10	1.83	222.08	11,476.21	-310.84	-314.35	-345.58	467.16	227.71	428,383.65	838,982.42
11,590.00	1.01	240.57	11,571.08	-312.35	-315.89	-347.32	469.48	227.71	428,382.11	838,980.68
11,683.94	0.32	240.06	11,665.01	-312.88	-316.42	-348.27	470.55	227.74	428,381.58	838,979.73
Latest VES Gyro Survey, 11683.94' MD, 11665.01' TVD										
11,744.00	0.50	214.50	11,725.07	-313.18	-316.72	-348.56	470.97	227.74	428,381.28	838,979.44
First Pro MWD Survey, 11744.00' MD, 11725.07' TVD										
11,858.00	0.40	189.10	11,839.07	-313.98	-317.53	-348.91	471.76	227.70	428,380.47	838,979.09
11,952.00	3.80	7.20	11,933.00	-311.21	-314.76	-348.57	469.65	227.92	428,383.24	838,979.43



ProDirectional Survey Report



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Project: Lea County, New Mexico (NAD 83)
Site: Cosmo K 24S35E3328
Well: 213H
Wellbore: OH
Design: OH 101'-18778 PTB 18823'

Local Co-ordinate Reference: Well 213H
TVD Reference: Well @ 3314.50usft (GL: 3288' + KB:26.5' (H&P 422))
MD Reference: Well @ 3314.50usft (GL: 3288' + KB:26.5' (H&P 422))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
11,999.00	10.90	11.30	11,979.59	-305.31	-308.85	-347.50	464.91	228.37	428,389.15	838,980.50
12,046.00	18.50	9.10	12,025.02	-293.60	-297.11	-345.45	455.64	229.30	428,400.89	838,982.55
12,093.00	25.20	10.20	12,068.62	-276.40	-279.88	-342.49	442.31	230.74	428,418.12	838,985.51
12,141.00	30.20	10.60	12,111.10	-254.50	-257.94	-338.46	425.55	232.69	428,440.06	838,989.54
12,188.00	35.70	10.60	12,150.53	-229.43	-232.82	-333.76	406.94	235.10	428,465.18	838,994.24
12,236.00	40.10	11.40	12,188.39	-200.56	-203.89	-328.12	386.31	238.14	428,494.11	838,999.88
12,283.00	42.40	10.30	12,223.73	-170.19	-173.46	-322.30	366.01	241.71	428,524.54	839,005.70
12,330.00	44.00	8.60	12,257.99	-138.51	-141.72	-317.02	347.26	245.91	428,556.28	839,010.98
12,377.00	48.60	6.00	12,290.45	-104.86	-108.03	-312.74	330.87	250.94	428,589.97	839,015.26
12,425.00	56.80	2.00	12,319.52	-66.84	-69.98	-310.15	317.95	257.29	428,628.02	839,017.85
12,472.00	59.80	0.50	12,344.22	-26.88	-30.01	-309.29	310.74	264.46	428,667.99	839,018.71
12,519.00	60.00	359.90	12,367.79	13.78	10.65	-309.14	309.33	271.97	428,708.65	839,018.86
12,566.00	57.80	358.60	12,392.07	54.02	50.89	-309.67	313.82	279.33	428,748.89	839,018.33
12,614.00	57.40	358.60	12,417.79	94.55	91.41	-310.66	323.82	286.40	428,789.41	839,017.34
12,709.00	59.10	359.30	12,467.78	175.32	172.17	-312.13	356.47	298.88	428,870.17	839,015.87
12,756.00	66.40	0.60	12,489.28	217.08	213.93	-312.15	378.42	304.42	428,911.93	839,015.85
12,803.00	71.30	358.70	12,506.24	260.89	257.74	-312.43	405.03	309.52	428,955.74	839,015.57
12,850.00	76.30	357.80	12,519.35	306.00	302.84	-313.81	436.11	313.98	429,000.84	839,014.19
12,897.00	85.00	358.00	12,526.97	352.32	349.14	-315.51	470.58	317.90	429,047.14	839,012.49
12,944.00	89.40	357.70	12,529.27	399.23	396.04	-317.27	507.45	321.30	429,094.04	839,010.73
12,992.00	92.40	358.50	12,528.52	447.21	444.00	-318.86	546.64	324.32	429,142.00	839,009.14
13,087.00	88.80	358.00	12,527.52	542.17	538.94	-321.76	627.68	329.16	429,236.94	839,006.24
13,208.00	89.80	356.20	12,529.00	663.05	659.77	-327.88	736.75	333.57	429,357.77	839,000.12
13,302.00	91.30	354.40	12,528.10	756.80	753.44	-335.59	824.80	335.99	429,451.44	838,992.41
13,396.00	93.10	357.20	12,524.49	850.53	847.11	-342.47	913.71	337.99	429,545.11	838,985.53
13,490.00	93.10	359.50	12,519.40	944.37	940.92	-345.17	1,002.24	339.85	429,638.92	838,982.83
13,585.00	90.80	2.30	12,516.17	1,039.27	1,035.84	-343.68	1,091.37	341.64	429,733.84	838,984.32



ProDirectional
Survey Report



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Wellbore: OH
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
13,678.00	90.90	0.50	12,514.79	1,132.20	1,128.80	-341.40	1,179.30	343.17	429,826.80	838,986.60
13,773.00	88.90	358.50	12,514.96	1,227.19	1,223.78	-342.23	1,270.74	344.38	429,921.78	838,985.77
13,868.00	91.40	357.90	12,514.71	1,322.16	1,318.73	-345.22	1,363.17	345.33	430,016.73	838,982.78
13,962.00	89.10	354.20	12,514.30	1,415.97	1,412.48	-351.69	1,455.61	346.02	430,110.48	838,976.31
14,056.00	93.10	355.20	12,512.49	1,509.61	1,506.04	-360.37	1,548.56	346.54	430,204.04	838,967.63
14,151.00	95.90	356.30	12,505.04	1,604.12	1,600.48	-367.39	1,642.11	347.07	430,298.48	838,960.61
14,245.00	96.50	359.10	12,494.89	1,697.51	1,693.84	-371.14	1,734.03	347.64	430,391.84	838,956.86
14,339.00	96.10	5.60	12,484.56	1,790.77	1,787.15	-367.31	1,824.50	348.39	430,485.15	838,960.69
14,433.00	90.60	10.90	12,479.07	1,883.43	1,879.94	-353.84	1,912.95	349.34	430,577.94	838,974.16
14,528.00	89.50	11.20	12,478.98	1,976.48	1,973.18	-335.63	2,001.52	350.35	430,671.18	838,992.37
14,622.00	84.10	9.90	12,484.23	2,068.53	2,065.41	-318.45	2,089.82	351.23	430,763.41	839,009.55
14,717.00	79.00	2.80	12,498.20	2,161.71	2,158.71	-308.03	2,180.57	351.88	430,856.71	839,019.97
14,812.00	83.90	356.70	12,512.33	2,255.58	2,252.57	-308.48	2,273.60	352.20	430,950.57	839,019.52
14,906.00	87.60	354.90	12,519.30	2,349.12	2,346.04	-315.34	2,367.14	352.34	431,044.04	839,012.66
15,000.00	86.90	353.50	12,523.81	2,442.62	2,439.45	-324.83	2,460.98	352.42	431,137.45	839,003.17
15,094.00	92.50	353.50	12,524.30	2,536.08	2,532.81	-335.47	2,554.93	352.46	431,230.81	838,992.53
15,189.00	92.80	356.40	12,519.91	2,630.67	2,627.33	-343.82	2,649.73	352.54	431,325.33	838,984.18
15,272.00	94.00	357.30	12,514.99	2,713.44	2,710.06	-348.37	2,732.36	352.67	431,408.06	838,979.63
15,377.00	91.90	357.50	12,509.58	2,818.23	2,814.80	-353.13	2,836.87	352.85	431,512.80	838,974.87
15,471.00	91.90	357.20	12,506.47	2,912.12	2,908.65	-357.47	2,930.53	352.99	431,606.65	838,970.53
15,565.00	92.10	359.70	12,503.18	3,006.04	3,002.55	-360.01	3,024.06	353.16	431,700.55	838,967.99
15,659.00	91.70	2.20	12,500.07	3,099.95	3,096.48	-358.46	3,117.16	353.40	431,794.48	838,969.54
15,754.00	89.70	2.30	12,498.91	3,194.82	3,191.39	-354.73	3,211.05	353.66	431,889.39	838,973.27
15,848.00	89.40	2.90	12,499.65	3,288.67	3,285.29	-350.46	3,303.93	353.91	431,983.29	838,977.54
15,937.00	90.30	4.40	12,499.88	3,377.43	3,374.11	-344.80	3,391.68	354.17	432,072.11	838,983.20
16,031.00	90.60	4.20	12,499.14	3,471.08	3,467.84	-337.75	3,484.25	354.44	432,165.84	838,990.25
16,125.00	90.70	3.90	12,498.07	3,564.77	3,561.60	-331.11	3,576.96	354.69	432,259.60	838,996.89



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Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
16,219.00	89.50	3.90	12,497.91	3,658.48	3,655.38	-324.72	3,669.78	354.92	432,353.38	839,003.28
16,313.00	89.50	2.20	12,498.73	3,752.29	3,749.24	-319.72	3,762.85	355.13	432,447.24	839,008.28
16,408.00	89.80	0.40	12,499.31	3,847.23	3,844.21	-317.56	3,857.30	355.28	432,542.21	839,010.44
16,502.00	89.70	359.50	12,499.72	3,941.22	3,938.21	-317.64	3,951.00	355.39	432,636.21	839,010.36
16,579.00	92.80	0.60	12,498.04	4,018.19	4,015.18	-317.58	4,027.72	355.48	432,713.18	839,010.42
16,690.00	93.00	0.60	12,492.43	4,129.02	4,126.03	-316.42	4,138.15	355.61	432,824.03	839,011.58
16,784.00	92.50	0.20	12,487.92	4,222.90	4,219.92	-315.76	4,231.72	355.72	432,917.92	839,012.24
16,879.00	91.00	358.60	12,485.01	4,317.85	4,314.87	-316.76	4,326.48	355.80	433,012.87	839,011.24
16,973.00	90.60	358.70	12,483.70	4,411.83	4,408.83	-318.97	4,420.35	355.86	433,106.83	839,009.03
17,068.00	90.20	358.50	12,483.04	4,506.82	4,503.80	-321.29	4,515.24	355.92	433,201.80	839,006.71
17,163.00	91.90	359.70	12,481.30	4,601.80	4,598.77	-322.78	4,610.08	355.99	433,296.77	839,005.22
17,257.00	89.80	358.70	12,479.90	4,695.78	4,692.74	-324.10	4,703.92	356.05	433,390.74	839,003.90
17,351.00	94.10	0.70	12,476.71	4,789.70	4,786.66	-324.59	4,797.65	356.12	433,484.66	839,003.41
17,445.00	92.40	0.10	12,471.38	4,883.53	4,880.50	-323.93	4,891.24	356.20	433,578.50	839,004.07
17,540.00	90.50	359.70	12,468.97	4,978.49	4,975.47	-324.10	4,986.01	356.27	433,673.47	839,003.90
17,634.00	90.30	1.40	12,468.32	5,072.47	5,069.45	-323.20	5,079.75	356.35	433,767.45	839,004.80
17,729.00	91.80	0.60	12,466.58	5,167.41	5,164.42	-321.54	5,174.42	356.44	433,862.42	839,006.46
17,823.00	91.50	358.30	12,463.87	5,261.37	5,258.37	-322.44	5,268.25	356.49	433,956.37	839,005.56
17,917.00	91.70	356.90	12,461.24	5,355.28	5,352.25	-326.38	5,362.19	356.51	434,050.25	839,001.62
18,012.00	92.00	355.50	12,458.18	5,450.08	5,446.99	-332.67	5,457.14	356.51	434,144.99	838,995.33
18,106.00	90.40	354.20	12,456.21	5,543.75	5,540.58	-341.11	5,551.07	356.48	434,238.58	838,986.89
18,201.00	91.10	353.00	12,454.96	5,638.25	5,634.98	-351.69	5,645.95	356.43	434,332.98	838,976.31
18,295.00	88.20	351.00	12,455.54	5,731.45	5,728.05	-364.77	5,739.65	356.36	434,426.05	838,963.23
18,390.00	89.80	350.40	12,457.20	5,825.33	5,821.78	-380.12	5,834.18	356.26	434,519.78	838,947.88
18,484.00	88.20	349.60	12,458.84	5,918.05	5,914.34	-396.44	5,927.61	356.17	434,612.34	838,931.56
18,578.00	87.80	349.00	12,462.12	6,010.53	6,006.65	-413.88	6,020.89	356.06	434,704.65	838,914.12
18,673.00	89.90	350.10	12,464.02	6,104.10	6,100.05	-431.11	6,115.26	355.96	434,798.05	838,896.89



ProDirectional Survey Report



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Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
18,767.00	90.90	350.40	12,463.37	6,196.89	6,192.68	-447.03	6,208.80	355.87	434,890.68	838,880.97
18,778.00	90.20	349.90	12,463.26	6,207.75	6,203.52	-448.91	6,219.74	355.86	434,901.52	838,879.09
Final Pro MWD Survey, 18778.00' MD, 12463.26' TVD										
18,823.00	90.20	349.90	12,463.11	6,252.13	6,247.82	-456.80	6,264.50	355.82	434,945.82	838,871.20
Projected TD, 18823 MD, 12463 TVD										

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
11,683.94	11,665.01	-316.42	-348.27	Latest VES Gyro Survey, 11683.94' MD, 11665.01' TVD
11,744.00	11,725.07	-316.72	-348.56	First Pro MWD Survey, 11744.00' MD, 11725.07' TVD
18,778.00	12,463.26	6,203.52	-448.91	Final Pro MWD Survey, 18778.00' MD, 12463.26' TVD
18,823.00	12,463.11	6,247.82	-456.80	Projected TD, 18823 MD, 12463 TVD