

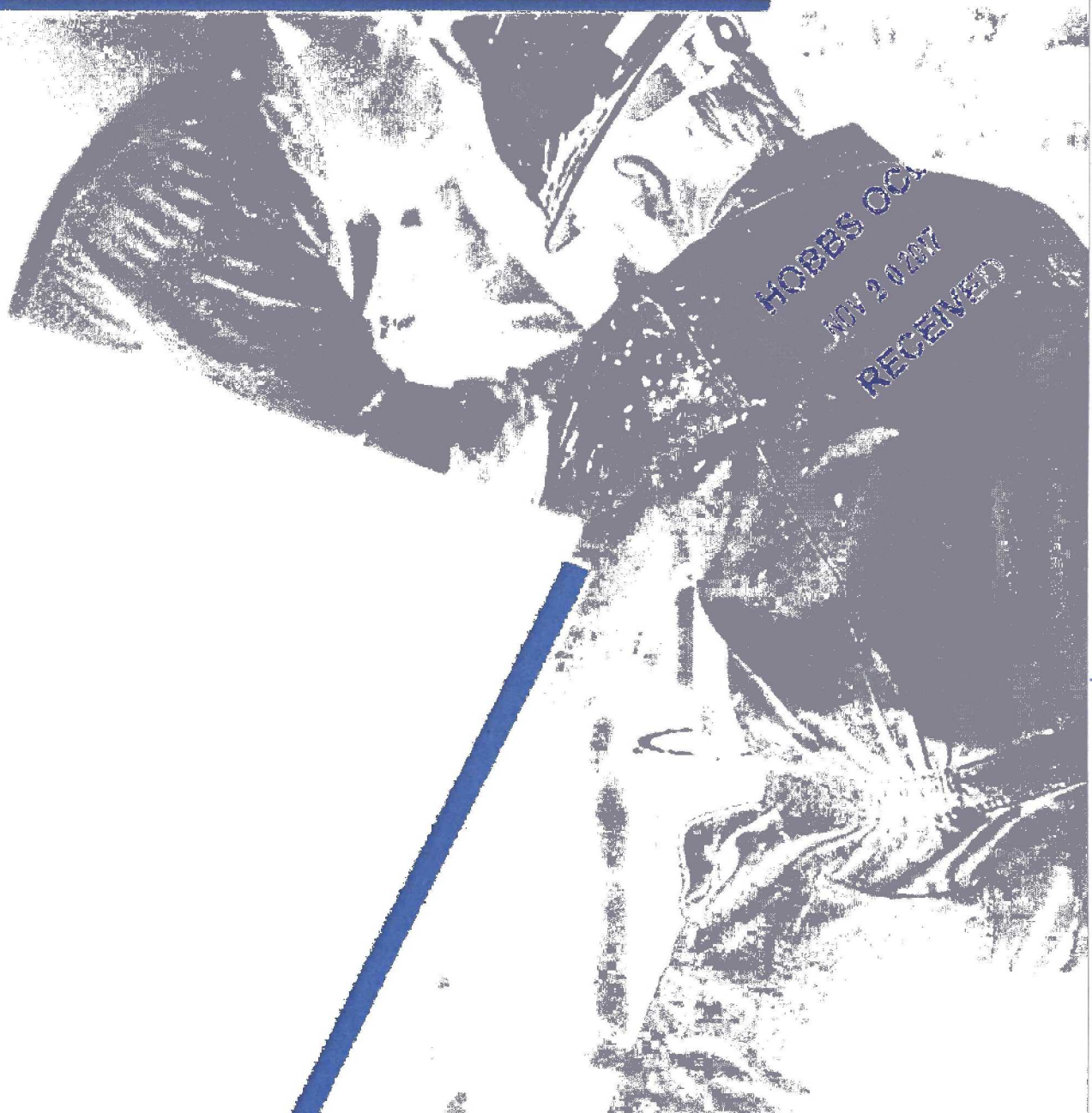
COG

SURVEY REPORT

VAST STATE #22H

ENSIGN 156

4/25/2017



Scientific Drilling

The **Ultimate Partner** In Wellbore Placement

SURVEY REPORT

VAST STATE #22H

COMPUTED KEEPER GYRO SURVEY

CUSTOMER
PROJECT
FIELD

COG
Vast State #22H
Vast State # 022H

SDI JOB NO.
SDI DISTRICT
SDI KIT/UNIT

Midland

SITE INFORMATION

Site Name
Lat/Long
Northing
Easting

Vast State # 022H
32.0368472° N, 103.5895444° W
377,937.1 ft
771,814.1 ft

Section
Township
Range

MAP INFORMATION

North Reference
Grid Correction
System
Datum
Map Zone

Grid North
-0.40 deg
US State Plane 1983
North American Datum 1983 (GRS 1980)
New Mexico East: 3001



WELL INFORMATION

Lat/Long
Northing
Easting
UWI

32.0368472° N, 103.5895444° W
377,937.1 ft
771,814.1 ft

DEPTH AND ELEVATION REFERENCE

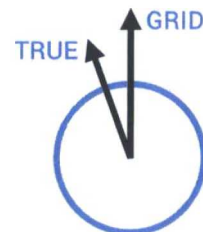
Ground Level
Level
Reference Datum
Reference Height
Reference Elevation

3260.5 ft above Mean Sea
Level
RKB
23.5 ft above G.L.
3284 ft

VERTICAL SECTION REFERENCE

+N/-S
+E/-W
Proposal Direction
Calculation Method

0 ft
0 ft
115.39°
Minimum Curvature



LOCAL GRAVITY REFERENCE INFORMATION

Local Gravity
True to Grid

998.499 mG [computed]
subtract 0.4°

WELL NOTES

Keeper Gyro Wireline Survey in 4 1/2 DP to 11812'

OPERATORS

Nathan Yerby

SDI Operator Name (Printed)

SIGNATURE

DATE

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
0.00	0.00	0.00	0.00	0.00	0.00	0.00	Invalid	0.00	0.00
100.00	0.39	70.38	100.00	0.24	0.11	0.32	0.39	0.34	70.38
125.00	0.45	69.67	125.00	0.37	0.18	0.49	0.26	0.52	70.24
150.00	0.64	71.74	150.00	0.54	0.26	0.72	0.75	0.76	70.44
175.00	0.50	65.00	175.00	0.71	0.35	0.95	0.62	1.01	70.04
200.00	0.42	65.33	200.00	0.84	0.43	1.13	0.33	1.21	69.23
225.00	0.38	76.37	224.99	0.96	0.49	1.30	0.33	1.38	69.41
250.00	0.41	84.95	249.99	1.10	0.51	1.47	0.25	1.55	70.66
275.00	0.56	84.34	274.99	1.28	0.53	1.68	0.61	1.76	72.31
300.00	0.58	82.83	299.99	1.50	0.56	1.92	0.10	2.00	73.70
325.00	0.55	76.04	324.99	1.70	0.61	2.17	0.29	2.25	74.34
350.00	0.57	73.76	349.99	1.88	0.67	2.40	0.13	2.49	74.39
375.00	0.49	71.29	374.99	2.05	0.74	2.62	0.36	2.73	74.24
400.00	0.45	73.88	399.99	2.20	0.80	2.82	0.16	2.93	74.12
425.00	0.39	78.28	424.99	2.34	0.85	3.00	0.29	3.11	74.23
450.00	0.34	87.87	449.99	2.48	0.87	3.15	0.31	3.27	74.64
475.00	0.38	92.16	474.99	2.62	0.87	3.31	0.19	3.42	75.33
500.00	0.37	85.35	499.99	2.76	0.87	3.47	0.18	3.58	75.94
525.00	0.29	80.41	524.99	2.88	0.89	3.61	0.34	3.72	76.21
550.00	0.19	82.28	549.98	2.97	0.90	3.71	0.39	3.82	76.35
575.00	0.06	135.45	574.98	3.01	0.90	3.76	0.64	3.87	76.57
600.00	0.13	182.41	599.98	3.04	0.86	3.77	0.40	3.87	77.15
625.00	0.21	187.20	624.98	3.06	0.79	3.76	0.31	3.85	78.19
650.00	0.23	168.82	649.98	3.11	0.69	3.77	0.29	3.83	79.58
675.00	0.27	165.62	674.98	3.17	0.59	3.79	0.17	3.84	81.21
700.00	0.27	171.33	699.98	3.24	0.47	3.82	0.11	3.84	82.95
725.00	0.18	159.58	724.98	3.31	0.38	3.84	0.38	3.86	84.39
750.00	0.18	183.10	749.98	3.35	0.30	3.85	0.29	3.86	85.53
775.00	0.22	208.82	774.98	3.36	0.22	3.83	0.38	3.83	86.70
800.00	0.25	217.65	799.98	3.35	0.14	3.77	0.21	3.77	87.94
825.00	0.34	194.89	824.98	3.35	0.02	3.72	0.56	3.72	89.68
850.00	0.35	179.32	849.98	3.39	-0.13	3.70	0.38	3.70	91.96

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
875.00	0.28	177.22	874.98	3.46	-0.26	3.70	0.29	3.71	94.08
900.00	0.25	195.35	899.98	3.50	-0.38	3.69	0.35	3.71	95.85
925.00	0.35	207.25	924.98	3.50	-0.50	3.64	0.47	3.67	97.83
950.00	0.39	207.57	949.98	3.50	-0.65	3.57	0.16	3.62	100.26
975.00	0.48	208.55	974.98	3.49	-0.81	3.48	0.35	3.57	103.17
1000.00	0.53	204.71	999.98	3.48	-1.01	3.38	0.24	3.52	106.65
1025.00	0.55	204.94	1024.98	3.49	-1.22	3.28	0.08	3.50	110.46
1050.00	0.51	194.64	1049.98	3.51	-1.44	3.20	0.41	3.51	114.21
1075.00	0.51	199.36	1074.98	3.54	-1.65	3.14	0.17	3.54	117.78
1100.00	0.50	196.88	1099.98	3.57	-1.86	3.07	0.10	3.59	121.27
1125.00	0.39	192.99	1124.97	3.60	-2.05	3.02	0.45	3.65	124.20
1150.00	0.38	198.29	1149.97	3.63	-2.21	2.97	0.15	3.70	126.66
1175.00	0.40	207.06	1174.97	3.64	-2.37	2.90	0.25	3.75	129.18
1200.00	0.44	203.66	1199.97	3.64	-2.53	2.83	0.19	3.80	131.87
1225.00	0.48	201.77	1224.97	3.65	-2.72	2.75	0.14	3.87	134.67
1250.00	0.44	198.87	1249.97	3.67	-2.91	2.68	0.16	3.95	137.32
1275.00	0.44	187.43	1274.97	3.71	-3.09	2.64	0.35	4.06	139.56
1300.00	0.42	185.74	1299.97	3.77	-3.28	2.61	0.10	4.19	141.44
1325.00	0.27	167.42	1324.97	3.83	-3.43	2.62	0.74	4.31	142.63
1350.00	0.09	153.12	1349.97	3.89	-3.50	2.64	0.73	4.39	143.00
1375.00	0.09	62.51	1374.97	3.91	-3.51	2.67	0.51	4.41	142.79
1400.00	0.41	23.94	1399.97	3.92	-3.42	2.72	1.39	4.37	141.50
1425.00	0.62	14.70	1424.97	3.90	-3.21	2.79	0.88	4.25	138.96
1450.00	0.81	12.61	1449.97	3.83	-2.90	2.86	0.76	4.08	135.40
1475.00	0.92	15.38	1474.96	3.76	-2.54	2.96	0.50	3.90	130.66
1500.00	0.96	12.06	1499.96	3.67	-2.14	3.05	0.27	3.73	125.02
1525.00	1.08	7.88	1524.96	3.56	-1.70	3.13	0.56	3.56	118.52
1550.00	1.08	6.32	1549.95	3.41	-1.23	3.19	0.12	3.42	111.14
1575.00	1.08	0.77	1574.95	3.23	-0.76	3.22	0.42	3.31	103.34
1600.00	1.02	355.26	1599.94	3.02	-0.31	3.20	0.47	3.22	95.46
1625.00	1.03	352.99	1624.94	2.79	0.14	3.16	0.17	3.16	87.49
1650.00	1.17	349.87	1649.93	2.52	0.61	3.08	0.61	3.14	78.77

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
1675.00	1.22	347.43	1674.93	2.21	1.12	2.98	0.28	3.18	69.36
1700.00	1.22	345.52	1699.92	1.88	1.64	2.86	0.17	3.29	60.12
1725.00	1.28	340.59	1724.92	1.51	2.16	2.70	0.48	3.46	51.28
1750.00	1.26	336.64	1749.91	1.11	2.68	2.49	0.36	3.66	42.97
1775.00	1.26	336.23	1774.90	0.69	3.18	2.27	0.04	3.91	35.55
1800.00	1.31	334.16	1799.90	0.26	3.69	2.04	0.28	4.22	28.89
1825.00	1.35	330.26	1824.89	-0.21	4.21	1.77	0.39	4.56	22.79
1850.00	1.34	327.84	1849.88	-0.70	4.71	1.47	0.23	4.93	17.29
1875.00	1.35	330.83	1874.88	-1.18	5.21	1.17	0.28	5.34	12.62
1900.00	1.36	330.25	1899.87	-1.66	5.73	0.88	0.07	5.79	8.71
1925.00	1.35	326.49	1924.86	-2.16	6.23	0.57	0.36	6.25	5.21
1950.00	1.27	323.92	1949.86	-2.65	6.70	0.24	0.40	6.70	2.07
1975.00	1.29	328.09	1974.85	-3.13	7.16	-0.07	0.38	7.16	359.45
2000.00	1.35	328.94	1999.84	-3.61	7.65	-0.37	0.28	7.66	357.23
2025.00	1.39	325.86	2024.84	-4.12	8.15	-0.69	0.32	8.18	355.15
2050.00	1.44	323.87	2049.83	-4.66	8.66	-1.05	0.28	8.72	353.10
2075.00	1.50	320.36	2074.82	-5.23	9.16	-1.44	0.44	9.28	351.06
2100.00	1.51	319.47	2099.81	-5.83	9.67	-1.86	0.09	9.84	349.09
2125.00	1.57	318.87	2124.80	-6.44	10.17	-2.30	0.28	10.43	347.25
2150.00	1.57	315.28	2149.79	-7.08	10.68	-2.77	0.39	11.03	345.46
2175.00	1.57	312.00	2174.79	-7.73	11.15	-3.26	0.36	11.62	343.68
2200.00	1.52	313.35	2199.78	-8.37	11.60	-3.76	0.25	12.20	342.05
2225.00	1.36	307.47	2224.77	-8.98	12.01	-4.24	0.85	12.74	340.58
2250.00	1.11	288.69	2249.76	-9.51	12.27	-4.70	1.90	13.14	339.03
2275.00	0.95	249.29	2274.76	-9.89	12.27	-5.12	2.84	13.30	337.34
2300.00	1.07	227.61	2299.75	-10.12	12.04	-5.49	1.60	13.24	335.49
2325.00	1.21	219.45	2324.75	-10.28	11.68	-5.83	0.83	13.06	333.48
2350.00	1.17	219.65	2349.74	-10.40	11.28	-6.16	0.13	12.86	331.36
2375.00	1.15	219.51	2374.74	-10.53	10.89	-6.48	0.10	12.68	329.24
2400.00	1.16	220.13	2399.73	-10.65	10.51	-6.81	0.06	12.52	327.07
2425.00	1.21	220.99	2424.73	-10.79	10.11	-7.14	0.23	12.38	324.78
2450.00	1.26	220.05	2449.72	-10.93	9.70	-7.49	0.23	12.26	322.33

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
2475.00	1.25	219.15	2474.72	-11.06	9.28	-7.84	0.09	12.15	319.80
2500.00	1.26	219.85	2499.71	-11.20	8.86	-8.19	0.06	12.06	317.25
2525.00	1.29	218.75	2524.71	-11.33	8.43	-8.54	0.16	12.00	314.62
2550.00	1.27	218.30	2549.70	-11.46	7.99	-8.89	0.09	11.95	311.97
2575.00	1.28	217.91	2574.69	-11.58	7.56	-9.23	0.06	11.93	309.31
2600.00	1.32	216.60	2599.69	-11.70	7.11	-9.57	0.21	11.92	306.59
2625.00	1.32	217.70	2624.68	-11.81	6.65	-9.92	0.10	11.94	303.82
2650.00	1.29	220.28	2649.67	-11.95	6.20	-10.28	0.28	12.01	301.11
2675.00	1.30	219.94	2674.67	-12.09	5.77	-10.64	0.05	12.11	298.48
2700.00	1.27	217.46	2699.66	-12.22	5.34	-10.99	0.24	12.22	295.89
2725.00	1.23	215.17	2724.65	-12.32	4.90	-11.32	0.26	12.33	293.39
2750.00	1.24	217.49	2749.65	-12.43	4.46	-11.64	0.20	12.46	290.98
2775.00	1.28	218.06	2774.64	-12.54	4.03	-11.97	0.16	12.63	288.60
2800.00	1.24	217.24	2799.64	-12.66	3.59	-12.31	0.15	12.82	286.28
2825.00	1.27	220.71	2824.63	-12.79	3.17	-12.65	0.32	13.04	284.06
2850.00	1.33	218.20	2849.62	-12.93	2.73	-13.01	0.33	13.29	281.86
2875.00	1.40	219.65	2874.62	-13.06	2.27	-13.38	0.32	13.58	279.62
2900.00	1.43	219.33	2899.61	-13.21	1.79	-13.78	0.14	13.89	277.42
2925.00	1.46	216.73	2924.60	-13.35	1.30	-14.17	0.29	14.23	275.23
2950.00	1.51	214.94	2949.59	-13.47	0.77	-14.54	0.25	14.57	273.03
2975.00	1.63	212.04	2974.58	-13.57	0.20	-14.92	0.59	14.92	270.77
3000.00	1.69	210.33	2999.57	-13.64	-0.42	-15.30	0.30	15.30	268.43
3025.00	1.68	210.03	3024.56	-13.70	-1.05	-15.67	0.06	15.70	266.15
3050.00	1.67	210.06	3049.55	-13.76	-1.69	-16.03	0.04	16.12	264.00
3075.00	1.70	210.22	3074.54	-13.82	-2.32	-16.40	0.13	16.56	261.94
3100.00	1.73	211.16	3099.53	-13.89	-2.96	-16.78	0.15	17.04	259.99
3125.00	1.59	208.51	3124.52	-13.95	-3.59	-17.14	0.62	17.51	258.17
3150.00	1.46	204.52	3149.51	-13.96	-4.18	-17.44	0.67	17.93	256.51
3175.00	1.25	202.12	3174.50	-13.94	-4.73	-17.67	0.88	18.29	255.03
3200.00	1.19	200.98	3199.50	-13.90	-5.22	-17.87	0.26	18.61	253.72
3225.00	1.18	198.82	3224.49	-13.85	-5.70	-18.04	0.18	18.92	252.45
3250.00	1.08	195.40	3249.49	-13.78	-6.18	-18.19	0.51	19.21	251.25

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
3275.00	1.04	175.65	3274.48	-13.63	-6.63	-18.23	1.46	19.40	250.02
3300.00	1.38	138.35	3299.48	-13.24	-7.08	-18.02	3.36	19.36	248.54
3325.00	1.58	129.37	3324.47	-12.63	-7.53	-17.55	1.23	19.10	246.79
3350.00	1.69	124.45	3349.46	-11.93	-7.95	-16.98	0.70	18.75	244.90
3375.00	1.80	121.96	3374.45	-11.17	-8.37	-16.34	0.54	18.36	242.88
3400.00	1.86	119.12	3399.44	-10.38	-8.77	-15.66	0.42	17.95	240.73
3425.00	1.91	116.92	3424.42	-9.56	-9.16	-14.93	0.37	17.52	238.47
3450.00	2.06	117.22	3449.41	-8.69	-9.55	-14.16	0.57	17.08	235.99
3475.00	2.35	115.18	3474.39	-7.73	-9.98	-13.30	1.21	16.62	233.12
3500.00	2.61	111.36	3499.37	-6.65	-10.40	-12.30	1.23	16.11	229.79
3525.00	2.89	108.74	3524.34	-5.46	-10.81	-11.18	1.25	15.55	225.95
3550.00	3.07	106.45	3549.30	-4.17	-11.20	-9.94	0.85	14.98	221.58
3575.00	3.32	104.80	3574.26	-2.80	-11.58	-8.60	1.08	14.42	216.60
3600.00	3.61	103.37	3599.22	-1.32	-11.95	-7.13	1.21	13.91	210.84
3625.00	3.75	100.58	3624.17	0.24	-12.28	-5.56	0.89	13.48	204.37
3650.00	3.60	94.15	3649.12	1.76	-12.48	-3.98	1.75	13.10	197.66
3675.00	3.30	78.81	3674.07	3.07	-12.40	-2.49	3.87	12.65	191.34
3700.00	3.32	69.74	3699.03	4.15	-12.01	-1.10	2.09	12.06	185.24
3725.00	3.46	66.79	3723.99	5.16	-11.46	0.27	0.90	11.47	178.65
3750.00	3.60	65.14	3748.94	6.16	-10.83	1.68	0.68	10.96	171.20
3775.00	3.76	64.72	3773.89	7.18	-10.15	3.13	0.65	10.63	162.86
3800.00	3.73	64.67	3798.83	8.22	-9.46	4.61	0.11	10.52	154.02
3825.00	3.73	63.84	3823.78	9.24	-8.75	6.07	0.21	10.65	145.24
3850.00	3.26	59.78	3848.73	10.15	-8.03	7.42	2.12	10.93	137.28
3875.00	2.43	49.25	3873.70	10.76	-7.33	8.43	3.92	11.17	131.00
3900.00	1.83	40.50	3898.69	11.08	-6.68	9.09	2.72	11.28	126.31
3925.00	1.59	35.92	3923.67	11.25	-6.10	9.56	1.10	11.33	122.54
3950.00	1.55	36.26	3948.66	11.37	-5.54	9.96	0.16	11.40	119.10
3975.00	1.60	39.12	3973.65	11.52	-5.00	10.38	0.38	11.52	115.71
4000.00	1.65	42.40	3998.64	11.71	-4.46	10.84	0.42	11.73	112.36
4025.00	1.58	42.75	4023.63	11.92	-3.94	11.32	0.31	11.99	109.20
4050.00	1.44	42.15	4048.63	12.11	-3.46	11.77	0.53	12.26	106.37

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
4075.00	1.35	43.24	4073.62	12.29	-3.01	12.18	0.41	12.54	103.88
4100.00	1.35	46.30	4098.61	12.49	-2.59	12.59	0.29	12.86	101.63
4125.00	1.41	45.58	4123.60	12.70	-2.17	13.02	0.25	13.20	99.47
4150.00	1.40	42.54	4148.60	12.89	-1.73	13.45	0.30	13.56	97.34
4175.00	1.43	45.86	4173.59	13.09	-1.29	13.88	0.34	13.94	95.31
4200.00	1.47	55.63	4198.58	13.36	-0.89	14.37	1.01	14.40	93.55
4225.00	1.58	64.58	4223.57	13.74	-0.56	14.95	1.04	14.96	92.15
4250.00	1.80	73.36	4248.56	14.25	-0.30	15.63	1.36	15.64	91.11
4275.00	2.02	77.84	4273.55	14.89	-0.10	16.44	1.06	16.44	90.34
4300.00	1.88	78.86	4298.53	15.57	0.08	17.27	0.57	17.27	89.75
4325.00	1.42	81.56	4323.52	16.16	0.20	17.98	1.85	17.98	89.36
4350.00	0.82	93.58	4348.52	16.59	0.23	18.47	2.56	18.47	89.27
4375.00	0.46	100.14	4373.52	16.85	0.21	18.75	1.50	18.75	89.37
4400.00	0.20	63.49	4398.52	16.97	0.21	18.88	1.28	18.89	89.37
4425.00	0.31	341.40	4423.52	16.95	0.29	18.90	1.39	18.90	89.12
4450.00	0.42	340.10	4448.52	16.84	0.44	18.85	0.43	18.85	88.65
4475.00	0.44	341.31	4473.51	16.71	0.62	18.79	0.07	18.80	88.11
4500.00	0.46	341.40	4498.51	16.57	0.80	18.72	0.08	18.74	87.54
4525.00	0.27	342.94	4523.51	16.46	0.95	18.67	0.74	18.70	87.07
4550.00	0.10	102.12	4548.51	16.44	1.01	18.68	1.31	18.70	86.92
4575.00	0.47	125.28	4573.51	16.56	0.94	18.78	1.52	18.80	87.12
4600.00	0.73	127.88	4598.51	16.82	0.79	18.99	1.05	19.01	87.63
4625.00	0.84	131.78	4623.51	17.15	0.57	19.25	0.50	19.26	88.31
4650.00	0.92	131.26	4648.51	17.52	0.31	19.54	0.32	19.54	89.09
4675.00	0.81	127.63	4673.50	17.89	0.07	19.83	0.50	19.83	89.79
4700.00	0.28	97.81	4698.50	18.12	-0.05	20.03	2.33	20.03	90.13
4725.00	0.65	330.33	4723.50	18.06	0.07	20.02	3.39	20.02	89.80
4750.00	1.10	324.86	4748.50	17.74	0.39	19.82	1.83	19.82	88.88
4775.00	1.20	325.36	4773.49	17.30	0.80	19.53	0.42	19.55	87.66
4800.00	1.22	327.37	4798.49	16.85	1.24	19.24	0.18	19.28	86.32
4825.00	1.19	328.48	4823.48	16.40	1.68	18.96	0.13	19.03	84.92
4850.00	1.30	330.88	4848.48	15.96	2.15	18.68	0.48	18.81	83.42

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
4875.00	1.33	331.18	4873.47	15.49	2.66	18.41	0.13	18.60	81.79
4900.00	1.33	330.72	4898.46	15.02	3.16	18.12	0.04	18.40	80.10
4925.00	1.31	328.43	4923.46	14.54	3.66	17.83	0.22	18.20	78.40
4950.00	1.30	327.11	4948.45	14.06	4.14	17.53	0.13	18.01	76.70
4975.00	1.27	322.72	4973.44	13.57	4.60	17.21	0.41	17.81	75.03
5000.00	1.20	305.12	4998.44	13.07	4.97	16.82	1.53	17.54	73.53
5025.00	1.37	278.77	5023.43	12.52	5.17	16.31	2.43	17.11	72.42
5050.00	1.50	272.27	5048.42	11.94	5.23	15.69	0.82	16.54	71.58
5075.00	1.54	270.51	5073.42	11.33	5.24	15.03	0.26	15.92	70.77
5100.00	1.51	270.62	5098.41	10.73	5.25	14.37	0.14	15.30	69.92
5125.00	1.55	270.17	5123.40	10.12	5.25	13.70	0.17	14.67	69.02
5150.00	1.54	269.00	5148.39	9.52	5.25	13.03	0.13	14.05	68.05
5175.00	1.50	270.24	5173.38	8.92	5.25	12.36	0.20	13.43	67.01
5200.00	1.46	271.09	5198.37	8.33	5.25	11.72	0.18	12.84	65.85
5225.00	1.41	268.87	5223.36	7.77	5.25	11.09	0.31	12.27	64.65
5250.00	1.41	267.73	5248.36	7.22	5.23	10.47	0.11	11.71	63.45
5275.00	1.34	268.05	5273.35	6.69	5.21	9.88	0.28	11.17	62.17
5300.00	1.30	267.15	5298.34	6.18	5.19	9.30	0.17	10.65	60.84
5325.00	1.10	269.90	5323.34	5.71	5.17	8.78	0.82	10.19	59.48
5350.00	1.06	278.35	5348.33	5.27	5.21	8.31	0.66	9.80	57.92
5375.00	1.05	283.80	5373.33	4.83	5.30	7.86	0.41	9.47	56.02
5400.00	1.09	282.14	5398.32	4.37	5.40	7.40	0.20	9.16	53.89
5425.00	1.18	280.05	5423.32	3.89	5.49	6.92	0.41	8.83	51.53
5450.00	1.21	278.03	5448.31	3.39	5.58	6.40	0.21	8.49	48.94
5475.00	1.23	279.86	5473.31	2.88	5.66	5.88	0.16	8.16	46.07
5500.00	1.23	277.14	5498.30	2.37	5.74	5.34	0.24	7.84	42.97
5525.00	1.25	276.17	5523.30	1.85	5.80	4.81	0.10	7.53	39.64
5550.00	1.25	276.67	5548.29	1.34	5.86	4.26	0.05	7.25	36.03
5575.00	1.26	274.00	5573.28	0.82	5.91	3.72	0.24	6.98	32.16
5600.00	1.24	272.18	5598.28	0.32	5.94	3.17	0.19	6.74	28.10
5625.00	1.25	271.13	5623.27	-0.18	5.96	2.63	0.09	6.51	23.82
5650.00	1.23	272.14	5648.27	-0.67	5.97	2.09	0.11	6.33	19.30

MD ft	INC deg	AZIM deg	TVD ft	VS ft	+N/-S ft	+E/-W ft	DLS "/100ft	CLOSURE DIST ft	CLOSURE DIR deg
5675.00	1.26	272.27	5673.26	-1.17	5.99	1.55	0.13	6.19	14.49
5700.00	1.26	273.45	5698.25	-1.68	6.02	1.00	0.10	6.10	9.44
5725.00	1.20	273.20	5723.25	-2.17	6.05	0.47	0.24	6.07	4.41
5750.00	1.15	272.26	5748.24	-2.65	6.08	-0.04	0.18	6.08	359.58
5775.00	1.11	270.78	5773.24	-3.10	6.09	-0.54	0.21	6.11	354.95
5800.00	1.10	270.15	5798.23	-3.54	6.09	-1.02	0.06	6.18	350.49
5825.00	1.12	271.97	5823.23	-3.98	6.10	-1.51	0.16	6.29	346.14
5850.00	1.06	270.51	5848.22	-4.41	6.11	-1.98	0.27	6.43	342.04
5875.00	1.02	268.76	5873.22	-4.82	6.11	-2.43	0.20	6.58	338.28
5900.00	0.97	271.27	5898.22	-5.21	6.11	-2.87	0.27	6.75	334.86
5925.00	0.96	271.84	5923.21	-5.60	6.12	-3.29	0.04	6.95	331.76
5950.00	0.90	270.16	5948.21	-5.97	6.13	-3.69	0.29	7.16	328.93
5975.00	0.90	268.06	5973.21	-6.32	6.12	-4.09	0.13	7.36	326.29
6000.00	0.91	267.20	5998.20	-6.67	6.11	-4.48	0.06	7.57	323.74
6025.00	1.00	266.78	6023.20	-7.03	6.09	-4.90	0.39	7.81	321.18
6050.00	0.91	267.44	6048.20	-7.40	6.06	-5.31	0.37	8.06	318.77
6075.00	0.88	268.90	6073.19	-7.75	6.05	-5.71	0.15	8.32	316.69
6100.00	0.87	266.12	6098.19	-8.09	6.04	-6.09	0.17	8.57	314.75
6125.00	0.90	264.97	6123.19	-8.42	6.01	-6.47	0.12	8.83	312.85
6150.00	0.84	261.04	6148.19	-8.74	5.96	-6.85	0.33	9.08	311.02
6175.00	0.87	260.54	6173.18	-9.05	5.90	-7.22	0.13	9.32	309.25
6200.00	0.92	263.11	6198.18	-9.38	5.84	-7.61	0.26	9.59	307.53
6225.00	0.93	263.72	6223.18	-9.72	5.80	-8.01	0.04	9.89	305.90
6250.00	0.93	264.78	6248.17	-10.07	5.76	-8.41	0.07	10.19	304.39
6275.00	0.95	264.22	6273.17	-10.42	5.72	-8.82	0.08	10.51	302.95
6300.00	0.97	269.23	6298.17	-10.79	5.69	-9.24	0.35	10.85	301.65
6325.00	1.01	269.76	6323.16	-11.18	5.69	-9.67	0.15	11.22	300.47
6350.00	0.96	267.73	6348.16	-11.56	5.68	-10.10	0.22	11.59	299.35
6375.00	0.90	265.93	6373.16	-11.92	5.66	-10.51	0.27	11.93	298.30
6400.00	0.89	266.02	6398.15	-12.26	5.63	-10.90	0.04	12.27	297.33
6425.00	0.94	263.23	6423.15	-12.60	5.59	-11.29	0.25	12.60	296.35
6450.00	0.94	263.49	6448.15	-12.95	5.55	-11.70	0.03	12.95	295.36

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
6475.00	0.98	251.30	6473.14	-13.28	5.45	-12.11	0.83	13.28	294.25
6500.00	1.21	222.93	6498.14	-13.51	5.19	-12.49	2.33	13.53	292.57
6525.00	1.51	213.33	6523.13	-13.64	4.72	-12.85	1.48	13.69	290.19
6550.00	1.57	210.53	6548.12	-13.71	4.15	-13.21	0.40	13.84	287.47
6575.00	1.38	197.36	6573.11	-13.70	3.57	-13.47	1.55	13.94	284.85
6600.00	1.21	162.24	6598.11	-13.48	3.03	-13.48	3.20	13.82	282.68
6625.00	1.25	148.68	6623.10	-13.07	2.55	-13.26	1.17	13.50	280.88
6650.00	1.22	144.41	6648.10	-12.61	2.10	-12.96	0.38	13.13	279.20
6675.00	1.23	141.73	6673.09	-12.14	1.67	-12.64	0.23	12.75	277.53
6700.00	1.27	140.47	6698.08	-11.64	1.25	-12.30	0.18	12.36	275.79
6725.00	1.18	142.94	6723.08	-11.17	0.83	-11.97	0.40	11.99	273.96
6750.00	1.11	139.83	6748.07	-10.72	0.44	-11.65	0.39	11.66	272.15
6775.00	1.14	134.12	6773.07	-10.26	0.08	-11.32	0.46	11.32	270.41
6800.00	1.18	131.05	6798.06	-9.78	-0.26	-10.95	0.29	10.95	268.64
6825.00	1.25	132.17	6823.06	-9.27	-0.61	-10.55	0.32	10.57	266.68
6850.00	1.21	136.20	6848.05	-8.76	-0.99	-10.17	0.39	10.22	264.46
6875.00	1.15	137.92	6873.05	-8.28	-1.36	-9.82	0.29	9.91	262.10
6900.00	1.15	131.02	6898.04	-7.81	-1.71	-9.46	0.55	9.61	259.74
6925.00	1.18	128.17	6923.04	-7.32	-2.04	-9.07	0.26	9.29	257.34
6950.00	1.11	127.22	6948.03	-6.83	-2.34	-8.67	0.28	8.98	254.88
6975.00	1.08	126.85	6973.03	-6.36	-2.63	-8.29	0.12	8.70	252.38
7000.00	1.07	124.87	6998.02	-5.90	-2.91	-7.91	0.17	8.43	249.82
7025.00	1.16	126.56	7023.02	-5.42	-3.19	-7.51	0.41	8.16	246.99
7050.00	1.11	129.16	7048.01	-4.94	-3.49	-7.12	0.31	7.93	243.87
7075.00	0.99	130.16	7073.01	-4.49	-3.79	-6.77	0.48	7.76	240.79
7100.00	1.00	128.49	7098.01	-4.07	-4.06	-6.44	0.13	7.61	237.75
7125.00	1.02	126.28	7123.00	-3.64	-4.33	-6.09	0.18	7.47	234.57
7150.00	1.07	123.00	7148.00	-3.19	-4.59	-5.71	0.31	7.32	231.21
7175.00	1.11	124.17	7172.99	-2.72	-4.85	-5.31	0.17	7.19	227.59
7200.00	1.07	124.76	7197.99	-2.25	-5.12	-4.92	0.18	7.10	223.86
7225.00	1.04	123.57	7222.98	-1.80	-5.38	-4.54	0.13	7.04	220.17
7250.00	1.08	124.36	7247.98	-1.34	-5.64	-4.16	0.18	7.00	216.40

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
7275.00	1.11	124.47	7272.97	-0.86	-5.91	-3.76	0.11	7.00	212.48
7300.00	1.09	125.28	7297.97	-0.39	-6.18	-3.37	0.10	7.04	208.56
7325.00	1.03	124.22	7322.97	0.07	-6.45	-2.99	0.27	7.11	204.85
7350.00	1.01	123.69	7347.96	0.51	-6.70	-2.62	0.09	7.19	201.35
7375.00	1.01	123.32	7372.96	0.94	-6.94	-2.25	0.03	7.29	197.98
7400.00	0.98	123.96	7397.95	1.37	-7.18	-1.89	0.10	7.42	194.75
7425.00	0.97	125.91	7422.95	1.79	-7.42	-1.54	0.14	7.58	191.72
7450.00	1.02	125.81	7447.95	2.22	-7.68	-1.19	0.18	7.77	188.79
7475.00	1.05	124.03	7472.94	2.67	-7.94	-0.82	0.19	7.98	185.87
7500.00	1.04	120.27	7497.94	3.12	-8.18	-0.43	0.28	8.19	183.01
7525.00	0.99	120.66	7522.93	3.56	-8.40	-0.05	0.21	8.40	180.34
7550.00	1.00	121.12	7547.93	3.99	-8.63	0.32	0.06	8.63	177.87
7575.00	0.98	119.14	7572.93	4.42	-8.84	0.69	0.15	8.87	175.51
7600.00	0.76	125.07	7597.92	4.80	-9.04	1.02	0.94	9.10	173.58
7625.00	0.43	181.33	7622.92	5.00	-9.23	1.15	2.54	9.30	172.89
7650.00	0.61	226.10	7647.92	4.99	-9.42	1.05	1.72	9.47	173.62
7675.00	0.77	228.78	7672.92	4.87	-9.62	0.83	0.66	9.66	175.07
7700.00	0.79	228.90	7697.92	4.74	-9.84	0.57	0.07	9.86	176.67
7725.00	0.88	227.92	7722.92	4.60	-10.09	0.30	0.34	10.09	178.29
7750.00	0.90	227.84	7747.91	4.45	-10.34	0.01	0.09	10.34	179.92
7775.00	0.87	225.15	7772.91	4.31	-10.61	-0.26	0.20	10.61	181.43
7800.00	0.80	224.63	7797.91	4.19	-10.87	-0.52	0.29	10.88	182.75
7825.00	0.75	223.41	7822.90	4.08	-11.11	-0.76	0.18	11.14	183.90
7850.00	0.69	216.89	7847.90	4.00	-11.35	-0.96	0.41	11.39	184.84
7875.00	0.69	208.59	7872.90	3.96	-11.60	-1.12	0.40	11.66	185.53
7900.00	0.71	208.78	7897.90	3.94	-11.87	-1.27	0.07	11.94	186.10
7925.00	0.69	211.73	7922.90	3.92	-12.13	-1.42	0.16	12.22	186.69
7950.00	0.69	203.21	7947.90	3.91	-12.40	-1.56	0.41	12.50	187.18
7975.00	0.58	202.04	7972.89	3.92	-12.66	-1.67	0.46	12.77	187.51
8000.00	0.64	207.03	7997.89	3.92	-12.90	-1.78	0.32	13.02	187.86
8025.00	0.78	202.20	8022.89	3.93	-13.18	-1.91	0.62	13.32	188.24
8050.00	0.74	203.48	8047.89	3.94	-13.49	-2.04	0.18	13.64	188.59

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
8075.00	0.84	204.54	8072.89	3.95	-13.81	-2.18	0.40	13.98	188.97
8100.00	0.77	206.57	8097.88	3.95	-14.12	-2.33	0.32	14.31	189.37
8125.00	0.78	198.93	8122.88	3.97	-14.43	-2.46	0.42	14.64	189.67
8150.00	0.78	204.02	8147.88	3.99	-14.75	-2.58	0.28	14.98	189.94
8175.00	0.82	202.26	8172.88	4.00	-15.07	-2.72	0.17	15.32	190.24
8200.00	0.73	205.68	8197.87	4.01	-15.38	-2.86	0.40	15.64	190.53
8225.00	0.72	204.60	8222.87	4.01	-15.67	-2.99	0.06	15.95	190.81
8250.00	0.69	209.59	8247.87	4.01	-15.94	-3.13	0.28	16.25	191.12
8275.00	0.48	190.54	8272.87	4.02	-16.17	-3.23	1.14	16.49	191.28
8300.00	0.29	154.85	8297.87	4.10	-16.33	-3.22	1.18	16.65	191.15
8325.00	0.25	131.88	8322.87	4.20	-16.43	-3.15	0.46	16.73	190.86
8350.00	0.31	125.98	8347.87	4.32	-16.50	-3.06	0.25	16.78	190.49
8375.00	0.28	122.62	8372.87	4.44	-16.58	-2.95	0.12	16.84	190.09
8400.00	0.27	145.72	8397.87	4.55	-16.66	-2.86	0.44	16.90	189.76
8425.00	0.33	128.10	8422.87	4.68	-16.75	-2.77	0.45	16.98	189.41
8450.00	0.26	120.15	8447.87	4.80	-16.82	-2.67	0.33	17.03	189.01
8475.00	0.42	120.64	8472.87	4.95	-16.90	-2.54	0.64	17.09	188.55
8500.00	0.37	132.98	8497.87	5.12	-17.00	-2.40	0.39	17.17	188.04
8525.00	0.34	123.41	8522.86	5.27	-17.10	-2.28	0.27	17.25	187.60
8550.00	0.37	117.73	8547.86	5.42	-17.17	-2.15	0.19	17.31	187.14
8575.00	0.37	121.61	8572.86	5.58	-17.25	-2.01	0.10	17.37	186.64
8600.00	0.42	113.64	8597.86	5.76	-17.33	-1.86	0.28	17.43	186.12
8625.00	0.41	112.41	8622.86	5.94	-17.40	-1.69	0.04	17.49	185.55
8650.00	0.42	114.66	8647.86	6.12	-17.48	-1.52	0.08	17.54	184.98
8675.00	0.41	118.52	8672.86	6.30	-17.56	-1.36	0.13	17.61	184.44
8700.00	0.40	108.96	8697.86	6.47	-17.63	-1.20	0.27	17.67	183.90
8725.00	0.45	111.73	8722.86	6.66	-17.69	-1.03	0.20	17.72	183.32
8750.00	0.43	109.88	8747.86	6.85	-17.76	-0.85	0.08	17.78	182.73
8775.00	0.46	110.60	8772.86	7.05	-17.83	-0.66	0.12	17.84	182.13
8800.00	0.45	108.77	8797.86	7.24	-17.90	-0.48	0.08	17.90	181.52
8825.00	0.46	111.95	8822.86	7.44	-17.97	-0.29	0.11	17.97	180.92
8850.00	0.45	107.41	8847.86	7.64	-18.03	-0.10	0.15	18.03	180.32

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
8875.00	0.46	113.46	8872.86	7.84	-18.10	0.09	0.19	18.10	179.73
8900.00	0.49	100.85	8897.85	8.04	-18.16	0.28	0.44	18.17	179.11
8925.00	0.53	97.20	8922.85	8.26	-18.20	0.50	0.19	18.20	178.42
8950.00	0.53	95.02	8947.85	8.48	-18.22	0.73	0.08	18.24	177.70
8975.00	0.51	98.28	8972.85	8.69	-18.25	0.96	0.14	18.27	177.00
9000.00	0.59	83.63	8997.85	8.90	-18.25	1.19	0.66	18.29	176.26
9025.00	0.48	79.89	9022.85	9.10	-18.22	1.42	0.47	18.27	175.53
9050.00	0.55	85.13	9047.85	9.29	-18.19	1.65	0.33	18.26	174.83
9075.00	0.55	78.79	9072.85	9.49	-18.16	1.88	0.24	18.25	174.08
9100.00	0.53	80.30	9097.85	9.68	-18.11	2.12	0.08	18.24	173.34
9125.00	0.70	75.72	9122.84	9.89	-18.06	2.38	0.70	18.21	172.49
9150.00	1.08	85.15	9147.84	10.21	-18.00	2.76	1.59	18.21	171.28
9175.00	1.64	88.36	9172.83	10.73	-17.97	3.35	2.29	18.28	169.43
9200.00	1.77	87.52	9197.82	11.39	-17.94	4.10	0.52	18.40	167.13
9225.00	1.79	87.59	9222.81	12.08	-17.91	4.87	0.06	18.56	164.78
9250.00	1.87	87.99	9247.80	12.79	-17.88	5.67	0.35	18.75	162.40
9275.00	1.83	88.95	9272.79	13.51	-17.85	6.48	0.22	18.99	160.06
9300.00	2.23	90.03	9297.77	14.30	-17.85	7.36	1.61	19.31	157.59
9325.00	3.29	87.79	9322.74	15.38	-17.82	8.56	4.28	19.77	154.34
9350.00	4.21	86.01	9347.69	16.81	-17.73	10.19	3.70	20.45	150.10
9375.00	4.57	85.00	9372.61	18.47	-17.58	12.10	1.47	21.34	145.45
9400.00	4.62	84.59	9397.53	20.20	-17.40	14.10	0.25	22.39	140.98
9425.00	4.59	84.99	9422.45	21.92	-17.21	16.10	0.20	23.57	136.92
9450.00	4.67	85.33	9447.37	23.67	-17.04	18.11	0.34	24.87	133.27
9475.00	4.66	85.05	9472.29	25.42	-16.87	20.13	0.10	26.27	129.97
9500.00	4.70	84.19	9497.20	27.17	-16.68	22.16	0.34	27.74	126.97
9525.00	4.67	82.72	9522.12	28.91	-16.45	24.19	0.50	29.25	124.22
9550.00	5.07	80.38	9547.03	30.67	-16.14	26.29	1.79	30.84	121.54
9575.00	5.49	77.67	9571.92	32.52	-15.70	28.55	1.96	32.58	118.81
9600.00	5.54	76.23	9596.81	34.40	-15.15	30.89	0.60	34.40	116.13
9625.00	5.56	75.19	9621.69	36.26	-14.56	33.23	0.40	36.28	113.66
9650.00	5.33	72.61	9646.58	38.04	-13.90	35.51	1.33	38.13	111.38

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
9675.00	4.81	70.51	9671.48	39.63	-13.20	37.61	2.20	39.86	109.35
9700.00	3.97	69.73	9696.41	40.98	-12.55	39.41	3.39	41.36	107.67
9725.00	3.40	68.38	9721.36	42.09	-11.98	40.91	2.28	42.62	106.32
9750.00	3.06	69.09	9746.32	43.06	-11.47	42.22	1.37	43.75	105.20
9775.00	2.61	69.57	9771.29	43.92	-11.03	43.38	1.81	44.76	104.27
9800.00	2.08	69.19	9796.26	44.63	-10.67	44.34	2.10	45.60	103.53
9825.00	1.76	73.23	9821.25	45.23	-10.40	45.13	1.41	46.31	102.98
9850.00	1.64	73.87	9846.24	45.78	-10.19	45.84	0.46	46.96	102.53
9875.00	1.50	71.71	9871.23	46.29	-9.99	46.50	0.62	47.56	102.12
9900.00	1.38	70.52	9896.22	46.74	-9.78	47.09	0.51	48.10	101.74
9925.00	1.35	69.55	9921.21	47.16	-9.58	47.65	0.13	48.61	101.37
9950.00	1.32	70.52	9946.21	47.57	-9.38	48.20	0.17	49.10	101.01
9975.00	1.18	82.40	9971.20	47.98	-9.25	48.73	1.17	49.60	100.75
10000.00	1.33	113.82	9996.20	48.49	-9.33	49.25	2.79	50.12	100.73
10025.00	2.13	135.87	10021.18	49.22	-9.79	49.84	4.11	50.79	101.11
10050.00	2.62	143.96	10046.16	50.16	-10.58	50.50	2.34	51.59	101.83
10075.00	2.76	146.76	10071.14	51.17	-11.55	51.16	0.79	52.45	102.72
10100.00	3.02	148.87	10096.10	52.24	-12.61	51.83	1.12	53.35	103.68
10125.00	3.50	148.55	10121.06	53.42	-13.83	52.57	1.91	54.36	104.74
10150.00	3.92	144.51	10146.01	54.81	-15.18	53.47	2.00	55.58	105.85
10175.00	4.12	138.07	10170.95	56.38	-16.54	54.56	1.96	57.01	106.86
10200.00	4.15	132.70	10195.88	58.07	-17.82	55.83	1.55	58.60	107.70
10225.00	4.13	129.30	10220.82	59.81	-19.00	57.19	0.98	60.26	108.38
10250.00	3.97	126.45	10245.76	61.54	-20.09	58.58	1.03	61.93	108.93
10275.00	3.77	124.22	10270.70	63.20	-21.07	59.96	1.00	63.55	109.36
10300.00	3.70	121.11	10295.65	64.81	-21.95	61.33	0.86	65.14	109.69
10325.00	3.71	119.24	10320.59	66.43	-22.76	62.73	0.48	66.73	109.94
10350.00	3.70	117.30	10345.54	68.04	-23.52	64.15	0.50	68.33	110.14
10375.00	3.52	114.72	10370.49	69.61	-24.21	65.56	0.99	69.89	110.27
10400.00	2.93	111.69	10395.45	71.02	-24.77	66.85	2.46	71.29	110.33
10425.00	2.27	104.20	10420.43	72.14	-25.13	67.93	2.94	72.43	110.30
10450.00	1.76	93.60	10445.41	72.98	-25.27	68.79	2.54	73.29	110.17

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
10475.00	1.58	87.49	10470.40	73.64	-25.28	69.52	0.99	73.97	109.99
10500.00	1.57	87.10	10495.39	74.25	-25.25	70.20	0.06	74.61	109.78
10525.00	1.66	92.99	10520.38	74.89	-25.25	70.91	0.76	75.27	109.60
10550.00	1.96	109.26	10545.37	75.65	-25.41	71.68	2.36	76.05	109.52
10575.00	2.37	123.20	10570.35	76.59	-25.84	72.51	2.66	76.98	109.61
10600.00	2.67	127.89	10595.33	77.67	-26.48	73.40	1.45	78.03	109.83
10625.00	2.95	130.44	10620.30	78.86	-27.25	74.35	1.25	79.19	110.13
10650.00	3.22	131.32	10645.26	80.15	-28.13	75.37	1.10	80.45	110.47
10675.00	3.26	132.01	10670.22	81.51	-29.07	76.43	0.21	81.77	110.83
10700.00	3.29	132.76	10695.18	82.88	-30.04	77.48	0.21	83.10	111.19
10725.00	3.27	131.98	10720.14	84.24	-31.00	78.54	0.21	84.44	111.54
10750.00	3.23	132.50	10745.10	85.60	-31.95	79.59	0.18	85.76	111.87
10775.00	3.27	133.32	10770.06	86.95	-32.92	80.63	0.24	87.09	112.21
10800.00	3.29	132.86	10795.02	88.31	-33.89	81.67	0.12	88.42	112.54
10825.00	3.23	135.36	10819.98	89.66	-34.88	82.69	0.61	89.75	112.87
10850.00	3.17	136.77	10844.94	90.97	-35.89	83.66	0.40	91.03	113.22
10875.00	3.08	138.35	10869.90	92.23	-36.89	84.58	0.49	92.28	113.57
10900.00	2.89	138.97	10894.87	93.42	-37.87	85.44	0.80	93.46	113.90
10925.00	2.69	140.33	10919.84	94.53	-38.80	86.23	0.84	94.55	114.22
10950.00	2.25	145.08	10944.81	95.49	-39.65	86.88	1.92	95.50	114.53
10975.00	1.89	147.26	10969.80	96.27	-40.40	87.39	1.47	96.27	114.81
11000.00	1.66	144.06	10994.79	96.94	-41.04	87.82	1.00	96.94	115.05
11025.00	1.44	142.61	11019.78	97.53	-41.58	88.23	0.89	97.54	115.24
11050.00	1.17	139.49	11044.77	98.05	-42.03	88.58	1.12	98.05	115.38
11052.00	1.15	139.17	11046.77	98.09	-42.06	88.61	1.12	98.09	115.39



COG Operating LLC

Lea Co., MN

Vast State

22H

Wellbore #1

Design: Wellbore #1

Standard Survey Report

12 June, 2017



NABORS



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

Project	Lea Co., MN		
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	Vast State				
Site Position:		Northing:	377,879.600 usft	Latitude:	32° 2' 12.19925 N
From:	Map	Easting:	730,586.600 usft	Longitude:	103° 35' 21.13916 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.39 °

Well	22H					
Well Position	+N/-S	0.00 ft	Northing:	377,880.000 usft	Latitude:	32° 2' 12.20048 N
	+E/-W	0.00 ft	Easting:	730,626.600 usft	Longitude:	103° 35' 20.67446 W
Position Uncertainty		2.00 ft	Wellhead Elevation:	ft	Ground Level:	3,260.50 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/27/2017	6.87	59.78	47,969.90000000

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	359.66	

Survey Program	Date	6/12/2017			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	11,052.00	Survey #3 SDI Gyro (Wellbore #1)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
11,140.00	11,749.00	Survey #4 NDS Surveys (Wellbore #1)	MWD+HRGM	OWSG MWD + HRGM	
11,749.00	17,233.00	Survey #5 NDS Lateral Surveys (Wellbore	MWD+HRGM	OWSG MWD + HRGM	

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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.39	70.38	100.00	0.11	0.32	0.11	0.39	0.39	0.00
125.00	0.45	69.67	125.00	0.18	0.49	0.17	0.24	0.24	-2.84
150.00	0.64	71.74	150.00	0.25	0.72	0.25	0.76	0.76	8.28
175.00	0.50	65.00	175.00	0.34	0.95	0.34	0.62	-0.56	-26.96
200.00	0.42	65.33	200.00	0.43	1.13	0.42	0.32	-0.32	1.32
225.00	0.38	76.37	224.99	0.49	1.29	0.48	0.35	-0.16	44.16
250.00	0.41	84.95	249.99	0.51	1.46	0.51	0.26	0.12	34.32
275.00	0.56	84.34	274.99	0.53	1.68	0.52	0.60	0.60	-2.44



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
300.00	0.58	82.83	299.99	0.56	1.92	0.55	0.10	0.08	-6.04
325.00	0.55	76.04	324.99	0.61	2.16	0.59	0.29	-0.12	-27.16
350.00	0.57	73.76	349.99	0.67	2.40	0.66	0.12	0.08	-9.12
375.00	0.49	71.29	374.99	0.74	2.62	0.72	0.33	-0.32	-9.88
400.00	0.45	73.88	399.99	0.80	2.82	0.78	0.18	-0.16	10.36
425.00	0.39	78.28	424.99	0.85	2.99	0.83	0.27	-0.24	17.60
450.00	0.34	87.87	449.99	0.87	3.15	0.85	0.32	-0.20	38.36
475.00	0.38	92.16	474.99	0.87	3.31	0.85	0.19	0.16	17.16
500.00	0.37	85.35	499.99	0.87	3.47	0.85	0.18	-0.04	-27.24
525.00	0.29	80.41	524.99	0.89	3.61	0.86	0.34	-0.32	-19.76
550.00	0.19	82.28	549.98	0.90	3.72	0.88	0.40	-0.40	7.48
575.00	0.06	135.45	574.98	0.90	3.77	0.88	0.65	-0.52	212.68
600.00	0.13	182.41	599.98	0.86	3.78	0.84	0.40	0.28	187.84
625.00	0.21	187.20	624.98	0.79	3.77	0.76	0.32	0.32	19.16
650.00	0.23	168.82	649.98	0.69	3.77	0.67	0.29	0.08	-73.52
675.00	0.27	165.62	674.98	0.59	3.80	0.56	0.17	0.16	-12.80
700.00	0.27	171.33	699.98	0.47	3.82	0.45	0.11	0.00	22.84
725.00	0.18	159.58	724.98	0.38	3.84	0.35	0.40	-0.36	-47.00
750.00	0.18	183.10	749.98	0.30	3.86	0.28	0.29	0.00	94.08
775.00	0.22	208.82	774.98	0.22	3.83	0.20	0.39	0.16	102.88
800.00	0.25	217.65	799.98	0.13	3.77	0.11	0.19	0.12	35.32
825.00	0.34	194.89	824.98	0.02	3.72	0.00	0.58	0.36	-91.04
850.00	0.35	179.32	849.98	-0.13	3.70	-0.15	0.38	0.04	-62.28
875.00	0.28	177.22	874.98	-0.27	3.71	-0.29	0.28	-0.28	-8.40
900.00	0.25	195.35	899.98	-0.38	3.70	-0.40	0.35	-0.12	72.52
925.00	0.35	207.25	924.98	-0.50	3.65	-0.52	0.47	0.40	47.60
950.00	0.39	207.57	949.98	-0.64	3.57	-0.67	0.16	0.16	1.28
975.00	0.48	208.55	974.98	-0.81	3.48	-0.83	0.36	0.36	3.92
1,000.00	0.53	204.71	999.98	-1.01	3.38	-1.03	0.24	0.20	-15.36
1,025.00	0.55	204.94	1,024.98	-1.22	3.28	-1.24	0.08	0.08	0.92
1,050.00	0.51	194.64	1,049.98	-1.44	3.21	-1.46	0.41	-0.16	-41.20
1,075.00	0.51	199.36	1,074.98	-1.65	3.14	-1.67	0.17	0.00	18.88
1,100.00	0.50	196.88	1,099.98	-1.86	3.07	-1.88	0.10	-0.04	-9.92
1,125.00	0.39	192.99	1,124.97	-2.05	3.02	-2.07	0.46	-0.44	-15.56
1,150.00	0.38	198.29	1,149.97	-2.21	2.98	-2.23	0.15	-0.04	21.20
1,175.00	0.40	207.06	1,174.97	-2.37	2.91	-2.38	0.25	0.08	35.08
1,200.00	0.44	203.66	1,199.97	-2.53	2.83	-2.55	0.19	0.16	-13.60
1,225.00	0.48	201.77	1,224.97	-2.72	2.76	-2.73	0.17	0.16	-7.56
1,250.00	0.44	198.87	1,249.97	-2.91	2.69	-2.92	0.19	-0.16	-11.60
1,275.00	0.44	187.43	1,274.97	-3.09	2.64	-3.11	0.35	0.00	-45.76
1,300.00	0.42	185.74	1,299.97	-3.28	2.62	-3.29	0.09	-0.08	-6.76
1,325.00	0.27	167.42	1,324.97	-3.43	2.62	-3.44	0.74	-0.60	-73.28
1,350.00	0.09	153.12	1,349.97	-3.50	2.65	-3.52	0.74	-0.72	-57.20



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
1,375.00	0.09	62.51	1,374.97	-3.51	2.67	-3.53	0.51	0.00	-362.44
1,400.00	0.41	23.94	1,399.97	-3.42	2.73	-3.44	1.38	1.28	-154.28
1,425.00	0.62	14.70	1,424.97	-3.21	2.80	-3.22	0.90	0.84	-36.96
1,450.00	0.81	12.61	1,449.97	-2.90	2.87	-2.92	0.77	0.76	-8.36
1,475.00	0.92	15.38	1,474.96	-2.54	2.96	-2.56	0.47	0.44	11.08
1,500.00	0.96	12.06	1,499.96	-2.14	3.06	-2.16	0.27	0.16	-13.28
1,525.00	1.08	7.88	1,524.96	-1.70	3.13	-1.72	0.56	0.48	-16.72
1,550.00	1.08	6.32	1,549.95	-1.23	3.19	-1.25	0.12	0.00	-6.24
1,575.00	1.08	0.77	1,574.95	-0.76	3.22	-0.78	0.42	0.00	-22.20
1,600.00	1.02	355.26	1,599.94	-0.31	3.21	-0.33	0.47	-0.24	-22.04
1,625.00	1.03	352.99	1,624.94	0.14	3.16	0.12	0.17	0.04	-9.08
1,650.00	1.17	349.87	1,649.93	0.61	3.09	0.59	0.61	0.56	-12.48
1,675.00	1.22	347.43	1,674.93	1.12	2.99	1.11	0.29	0.20	-9.76
1,700.00	1.22	345.52	1,699.92	1.64	2.86	1.62	0.16	0.00	-7.64
1,725.00	1.28	340.59	1,724.92	2.16	2.70	2.15	0.49	0.24	-19.72
1,750.00	1.26	336.64	1,749.91	2.68	2.50	2.66	0.36	-0.08	-15.80
1,775.00	1.26	336.23	1,774.90	3.18	2.28	3.17	0.04	0.00	-1.64
1,800.00	1.31	334.16	1,799.90	3.69	2.04	3.68	0.27	0.20	-8.28
1,825.00	1.35	330.26	1,824.89	4.20	1.77	4.19	0.40	0.16	-15.60
1,850.00	1.34	327.84	1,849.88	4.71	1.47	4.70	0.23	-0.04	-9.68
1,875.00	1.35	330.83	1,874.88	5.21	1.17	5.20	0.28	0.04	11.96
1,900.00	1.36	330.25	1,899.87	5.73	0.88	5.72	0.07	0.04	-2.32
1,925.00	1.35	326.49	1,924.86	6.23	0.57	6.23	0.36	-0.04	-15.04
1,950.00	1.27	323.92	1,949.86	6.70	0.25	6.70	0.40	-0.32	-10.28
1,975.00	1.29	328.09	1,974.85	7.16	-0.06	7.16	0.38	0.08	16.68
2,000.00	1.35	328.94	1,999.84	7.65	-0.37	7.65	0.25	0.24	3.40
2,025.00	1.39	325.86	2,024.84	8.16	-0.69	8.16	0.34	0.16	-12.32
2,050.00	1.44	323.87	2,049.83	8.66	-1.04	8.67	0.28	0.20	-7.96
2,075.00	1.50	320.36	2,074.82	9.17	-1.44	9.17	0.43	0.24	-14.04
2,100.00	1.51	319.47	2,099.81	9.67	-1.86	9.68	0.10	0.04	-3.56
2,125.00	1.57	318.87	2,124.80	10.18	-2.30	10.19	0.25	0.24	-2.40
2,150.00	1.57	315.28	2,149.79	10.68	-2.77	10.69	0.39	0.00	-14.36
2,175.00	1.57	312.00	2,174.79	11.15	-3.26	11.17	0.36	0.00	-13.12
2,200.00	1.52	313.35	2,199.78	11.61	-3.76	11.63	0.25	-0.20	5.40
2,225.00	1.36	307.47	2,224.77	12.02	-4.23	12.04	0.87	-0.64	-23.52
2,250.00	1.11	288.69	2,249.76	12.27	-4.70	12.30	1.89	-1.00	-75.12
2,275.00	0.95	249.29	2,274.76	12.28	-5.12	12.31	2.84	-0.64	-157.60
2,300.00	1.07	227.61	2,299.75	12.05	-5.49	12.08	1.59	0.48	-86.72
2,325.00	1.21	219.45	2,324.75	11.69	-5.83	11.72	0.86	0.56	-32.64
2,350.00	1.17	219.65	2,349.74	11.29	-6.16	11.32	0.16	-0.16	0.80
2,375.00	1.15	219.51	2,374.74	10.90	-6.48	10.93	0.08	-0.08	-0.56
2,400.00	1.16	220.13	2,399.73	10.51	-6.80	10.55	0.06	0.04	2.48
2,425.00	1.21	220.99	2,424.73	10.12	-7.14	10.16	0.21	0.20	3.44



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
2,450.00	1.26	220.05	2,449.72	9.71	-7.49	9.75	0.22	0.20	-3.76
2,475.00	1.25	219.15	2,474.72	9.28	-7.84	9.33	0.09	-0.04	-3.60
2,500.00	1.26	219.85	2,499.71	8.86	-8.19	8.91	0.07	0.04	2.80
2,525.00	1.29	218.75	2,524.71	8.43	-8.54	8.48	0.15	0.12	-4.40
2,550.00	1.27	218.30	2,549.70	7.99	-8.89	8.05	0.09	-0.08	-1.80
2,575.00	1.28	217.91	2,574.69	7.56	-9.23	7.61	0.05	0.04	-1.56
2,600.00	1.32	216.60	2,599.69	7.11	-9.57	7.16	0.20	0.16	-5.24
2,625.00	1.32	217.70	2,624.68	6.65	-9.92	6.70	0.10	0.00	4.40
2,650.00	1.29	220.28	2,649.67	6.20	-10.28	6.26	0.26	-0.12	10.32
2,675.00	1.30	219.94	2,674.67	5.77	-10.64	5.83	0.05	0.04	-1.36
2,700.00	1.27	217.46	2,699.66	5.33	-10.99	5.40	0.25	-0.12	-9.92
2,725.00	1.23	215.17	2,724.65	4.89	-11.32	4.96	0.26	-0.16	-9.16
2,750.00	1.24	217.49	2,749.65	4.46	-11.64	4.53	0.20	0.04	9.28
2,775.00	1.28	218.06	2,774.64	4.03	-11.97	4.10	0.17	0.16	2.28
2,800.00	1.24	217.24	2,799.64	3.59	-12.31	3.66	0.18	-0.16	-3.28
2,825.00	1.27	220.71	2,824.63	3.17	-12.65	3.24	0.33	0.12	13.88
2,850.00	1.33	218.20	2,849.62	2.73	-13.01	2.81	0.33	0.24	-10.04
2,875.00	1.40	219.65	2,874.62	2.26	-13.39	2.34	0.31	0.28	5.80
2,900.00	1.43	219.33	2,899.61	1.79	-13.78	1.87	0.12	0.12	-1.28
2,925.00	1.46	216.73	2,924.60	1.29	-14.17	1.38	0.29	0.12	-10.40
2,950.00	1.51	214.94	2,949.59	0.77	-14.55	0.85	0.27	0.20	-7.16
2,975.00	1.63	212.04	2,974.58	0.19	-14.92	0.28	0.58	0.48	-11.60
3,000.00	1.69	210.33	2,999.57	-0.42	-15.30	-0.33	0.31	0.24	-6.84
3,025.00	1.68	210.03	3,024.56	-1.06	-15.67	-0.97	0.05	-0.04	-1.20
3,050.00	1.67	210.06	3,049.55	-1.69	-16.04	-1.60	0.04	-0.04	0.12
3,075.00	1.70	210.22	3,074.54	-2.33	-16.40	-2.23	0.12	0.12	0.64
3,100.00	1.73	211.16	3,099.53	-2.97	-16.79	-2.87	0.16	0.12	3.76
3,125.00	1.59	208.51	3,124.52	-3.60	-17.15	-3.50	0.64	-0.56	-10.60
3,150.00	1.46	204.52	3,149.51	-4.19	-17.44	-4.09	0.67	-0.52	-15.96
3,175.00	1.25	202.12	3,174.50	-4.74	-17.68	-4.63	0.87	-0.84	-9.60
3,200.00	1.19	200.98	3,199.50	-5.23	-17.88	-5.13	0.26	-0.24	-4.56
3,225.00	1.18	198.82	3,224.49	-5.72	-18.05	-5.61	0.18	-0.04	-8.64
3,250.00	1.08	195.40	3,249.49	-6.19	-18.20	-6.08	0.48	-0.40	-13.68
3,275.00	1.04	175.65	3,274.48	-6.64	-18.24	-6.53	1.46	-0.16	-79.00
3,300.00	1.38	138.35	3,299.48	-7.09	-18.02	-6.99	3.35	1.36	-149.20
3,325.00	1.58	129.37	3,324.47	-7.54	-17.56	-7.43	1.22	0.80	-35.92
3,350.00	1.69	124.45	3,349.46	-7.96	-16.99	-7.86	0.71	0.44	-19.68
3,375.00	1.80	121.96	3,374.45	-8.38	-16.35	-8.28	0.53	0.44	-9.96
3,400.00	1.86	119.12	3,399.44	-8.79	-15.66	-8.69	0.43	0.24	-11.36
3,425.00	1.91	116.92	3,424.42	-9.17	-14.94	-9.08	0.35	0.20	-8.80
3,450.00	2.06	117.22	3,449.41	-9.57	-14.17	-9.48	0.60	0.60	1.20
3,475.00	2.35	115.18	3,474.39	-9.99	-13.30	-9.91	1.20	1.16	-8.16
3,500.00	2.61	111.36	3,499.36	-10.41	-12.31	-10.34	1.23	1.04	-15.28
3,525.00	2.89	108.74	3,524.34	-10.82	-11.18	-10.76	1.23	1.12	-10.48



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
3,550.00	3.07	106.45	3,549.30	-11.22	-9.94	-11.16	0.86	0.72	-9.16
3,575.00	3.32	104.80	3,574.26	-11.59	-8.60	-11.54	1.07	1.00	-6.60
3,600.00	3.61	103.37	3,599.22	-11.96	-7.14	-11.92	1.21	1.16	-5.72
3,625.00	3.75	100.58	3,624.17	-12.29	-5.57	-12.26	0.91	0.56	-11.16
3,650.00	3.60	94.15	3,649.11	-12.50	-3.98	-12.47	1.75	-0.60	-25.72
3,675.00	3.30	78.81	3,674.07	-12.41	-2.49	-12.40	3.87	-1.20	-61.36
3,700.00	3.32	69.74	3,699.03	-12.02	-1.11	-12.02	2.09	0.08	-36.28
3,725.00	3.46	66.79	3,723.98	-11.48	0.27	-11.48	0.89	0.56	-11.80
3,750.00	3.60	65.14	3,748.94	-10.85	1.67	-10.86	0.69	0.56	-6.60
3,775.00	3.76	64.72	3,773.89	-10.17	3.13	-10.19	0.65	0.64	-1.68
3,800.00	3.73	64.67	3,798.83	-9.47	4.60	-9.50	0.12	-0.12	-0.20
3,825.00	3.73	63.84	3,823.78	-8.76	6.07	-8.80	0.22	0.00	-3.32
3,850.00	3.26	59.78	3,848.73	-8.05	7.41	-8.09	2.12	-1.88	-16.24
3,875.00	2.43	49.25	3,873.70	-7.34	8.43	-7.39	3.91	-3.32	-42.12
3,900.00	1.83	40.50	3,898.68	-6.69	9.09	-6.75	2.72	-2.40	-35.00
3,925.00	1.59	35.92	3,923.67	-6.11	9.55	-6.17	1.10	-0.96	-18.32
3,950.00	1.55	36.26	3,948.66	-5.56	9.95	-5.62	0.16	-0.16	1.36
3,975.00	1.60	39.12	3,973.65	-5.01	10.37	-5.07	0.37	0.20	11.44
4,000.00	1.65	42.40	3,998.64	-4.48	10.84	-4.54	0.42	0.20	13.12
4,025.00	1.58	42.75	4,023.63	-3.96	11.31	-4.02	0.28	-0.28	1.40
4,050.00	1.44	42.15	4,048.63	-3.47	11.76	-3.54	0.56	-0.56	-2.40
4,075.00	1.35	43.24	4,073.62	-3.02	12.17	-3.10	0.38	-0.36	4.36
4,100.00	1.35	46.30	4,098.61	-2.61	12.59	-2.68	0.29	0.00	12.24
4,125.00	1.41	45.58	4,123.60	-2.19	13.02	-2.26	0.25	0.24	-2.88
4,150.00	1.40	42.54	4,148.60	-1.75	13.44	-1.83	0.30	-0.04	-12.16
4,175.00	1.43	45.86	4,173.59	-1.30	13.87	-1.39	0.35	0.12	13.28
4,200.00	1.47	55.63	4,198.58	-0.91	14.36	-0.99	1.00	0.16	39.08
4,225.00	1.58	64.58	4,223.57	-0.58	14.94	-0.67	1.05	0.44	35.80
4,250.00	1.80	73.36	4,248.56	-0.32	15.63	-0.41	1.36	0.88	35.12
4,275.00	2.02	77.84	4,273.55	-0.11	16.43	-0.21	1.06	0.88	17.92
4,300.00	1.88	78.86	4,298.53	0.06	17.27	-0.04	0.58	-0.56	4.08
4,325.00	1.42	81.56	4,323.52	0.18	17.97	0.08	1.87	-1.84	10.80
4,350.00	0.82	93.58	4,348.52	0.22	18.46	0.11	2.56	-2.40	48.08
4,375.00	0.46	100.14	4,373.52	0.19	18.74	0.08	1.47	-1.44	26.24
4,400.00	0.20	63.49	4,398.52	0.19	18.88	0.08	1.29	-1.04	-146.60
4,425.00	0.31	341.40	4,423.52	0.28	18.89	0.16	1.38	0.44	-328.36
4,450.00	0.42	340.10	4,448.52	0.43	18.84	0.31	0.44	0.44	-5.20
4,475.00	0.44	341.31	4,473.51	0.60	18.78	0.49	0.09	0.08	4.84
4,500.00	0.46	341.40	4,498.51	0.79	18.72	0.68	0.08	0.08	0.36
4,525.00	0.27	342.94	4,523.51	0.94	18.67	0.83	0.76	-0.76	6.16
4,550.00	0.10	102.12	4,548.51	0.99	18.67	0.88	1.32	-0.68	476.72
4,575.00	0.47	125.28	4,573.51	0.93	18.77	0.82	1.52	1.48	92.64
4,600.00	0.73	127.88	4,598.51	0.77	18.98	0.66	1.05	1.04	10.40



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
4,625.00	0.84	131.78	4,623.51	0.55	19.25	0.44	0.49	0.44	15.60
4,650.00	0.92	131.26	4,648.51	0.30	19.53	0.18	0.32	0.32	-2.08
4,675.00	0.81	127.63	4,673.50	0.06	19.82	-0.06	0.49	-0.44	-14.52
4,700.00	0.28	97.81	4,698.50	-0.06	20.03	-0.18	2.34	-2.12	-119.28
4,725.00	0.65	330.33	4,723.50	0.06	20.02	-0.06	3.40	1.48	-509.92
4,750.00	1.10	324.86	4,748.50	0.38	19.81	0.26	1.83	1.80	-21.88
4,775.00	1.20	325.36	4,773.49	0.79	19.52	0.67	0.40	0.40	2.00
4,800.00	1.22	327.37	4,798.49	1.23	19.23	1.11	0.19	0.08	8.04
4,825.00	1.19	328.48	4,823.48	1.67	18.95	1.56	0.15	-0.12	4.44
4,850.00	1.30	330.88	4,848.48	2.14	18.68	2.03	0.49	0.44	9.60
4,875.00	1.33	331.18	4,873.47	2.64	18.40	2.53	0.12	0.12	1.20
4,900.00	1.33	330.72	4,898.46	3.15	18.12	3.04	0.04	0.00	-1.84
4,925.00	1.31	328.43	4,923.46	3.65	17.82	3.54	0.23	-0.08	-9.16
4,950.00	1.30	327.11	4,948.45	4.13	17.52	4.02	0.13	-0.04	-5.28
4,975.00	1.27	322.72	4,973.44	4.59	17.20	4.48	0.41	-0.12	-17.56
5,000.00	1.20	305.12	4,998.44	4.96	16.82	4.86	1.54	-0.28	-70.40
5,025.00	1.37	278.77	5,023.43	5.15	16.31	5.06	2.43	0.68	-105.40
5,050.00	1.50	272.27	5,048.42	5.21	15.68	5.12	0.83	0.52	-26.00
5,075.00	1.54	270.51	5,073.42	5.23	15.02	5.14	0.25	0.16	-7.04
5,100.00	1.51	270.62	5,098.41	5.23	14.36	5.15	0.12	-0.12	0.44
5,125.00	1.55	270.17	5,123.40	5.24	13.69	5.16	0.17	0.16	-1.80
5,150.00	1.54	269.00	5,148.39	5.23	13.02	5.16	0.13	-0.04	-4.68
5,175.00	1.50	270.24	5,173.38	5.23	12.35	5.16	0.21	-0.16	4.96
5,200.00	1.46	271.09	5,198.37	5.24	11.71	5.17	0.18	-0.16	3.40
5,225.00	1.41	268.87	5,223.36	5.24	11.08	5.17	0.30	-0.20	-8.88
5,250.00	1.41	267.73	5,248.36	5.22	10.47	5.16	0.11	0.00	-4.56
5,275.00	1.34	268.05	5,273.35	5.20	9.87	5.14	0.28	-0.28	1.28
5,300.00	1.30	267.15	5,298.34	5.17	9.29	5.12	0.18	-0.16	-3.60
5,325.00	1.10	269.90	5,323.34	5.16	8.77	5.11	0.83	-0.80	11.00
5,350.00	1.06	278.35	5,348.33	5.19	8.30	5.14	0.66	-0.16	33.80
5,375.00	1.05	283.80	5,373.33	5.28	7.85	5.23	0.40	-0.04	21.80
5,400.00	1.09	282.14	5,398.32	5.38	7.39	5.34	0.20	0.16	-6.64
5,425.00	1.18	280.05	5,423.32	5.48	6.91	5.44	0.40	0.36	-8.36
5,450.00	1.21	278.03	5,448.31	5.56	6.39	5.52	0.21	0.12	-8.08
5,475.00	1.23	279.86	5,473.31	5.64	5.87	5.61	0.18	0.08	7.32
5,500.00	1.23	277.14	5,498.30	5.72	5.34	5.69	0.23	0.00	-10.88
5,525.00	1.25	276.17	5,523.30	5.79	4.80	5.76	0.12	0.08	-3.88
5,550.00	1.25	276.67	5,548.29	5.85	4.26	5.82	0.04	0.00	2.00
5,575.00	1.26	274.00	5,573.28	5.90	3.71	5.88	0.24	0.04	-10.68
5,600.00	1.24	272.18	5,598.28	5.93	3.17	5.91	0.18	-0.08	-7.28
5,625.00	1.25	271.13	5,623.27	5.94	2.62	5.93	0.10	0.04	-4.20
5,650.00	1.23	272.14	5,648.27	5.96	2.08	5.95	0.12	-0.08	4.04
5,675.00	1.26	272.27	5,673.26	5.98	1.54	5.97	0.12	0.12	0.52



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
5,700.00	1.26	273.45	5,698.25	6.01	0.99	6.00	0.10	0.00	4.72
5,725.00	1.20	273.20	5,723.25	6.04	0.46	6.04	0.24	-0.24	-1.00
5,750.00	1.15	272.26	5,748.24	6.06	-0.06	6.06	0.21	-0.20	-3.76
5,775.00	1.11	270.78	5,773.24	6.08	-0.55	6.08	0.20	-0.16	-5.92
5,800.00	1.10	270.15	5,798.23	6.08	-1.03	6.09	0.06	-0.04	-2.52
5,825.00	1.12	271.97	5,823.23	6.09	-1.52	6.10	0.16	0.08	7.28
5,850.00	1.06	270.51	5,848.22	6.10	-1.99	6.11	0.26	-0.24	-5.84
5,875.00	1.02	268.76	5,873.22	6.10	-2.44	6.11	0.20	-0.16	-7.00
5,900.00	0.97	271.27	5,898.22	6.10	-2.88	6.11	0.27	-0.20	10.04
5,925.00	0.96	271.84	5,923.21	6.11	-3.30	6.13	0.06	-0.04	2.28
5,950.00	0.90	270.16	5,948.21	6.11	-3.71	6.14	0.26	-0.24	-6.72
5,975.00	0.90	268.06	5,973.21	6.11	-4.10	6.13	0.13	0.00	-8.40
6,000.00	0.91	267.20	5,998.20	6.09	-4.49	6.12	0.07	0.04	-3.44
6,025.00	1.00	266.78	6,023.20	6.07	-4.91	6.10	0.36	0.36	-1.68
6,050.00	0.91	267.44	6,048.20	6.05	-5.32	6.08	0.36	-0.36	2.64
6,075.00	0.88	268.90	6,073.19	6.04	-5.71	6.07	0.15	-0.12	5.84
6,100.00	0.87	266.12	6,098.19	6.02	-6.10	6.06	0.17	-0.04	-11.12
6,125.00	0.90	264.97	6,123.19	5.99	-6.48	6.03	0.14	0.12	-4.60
6,150.00	0.84	261.04	6,148.18	5.94	-6.86	5.99	0.34	-0.24	-15.72
6,175.00	0.87	260.54	6,173.18	5.88	-7.23	5.93	0.12	0.12	-2.00
6,200.00	0.92	263.11	6,198.18	5.83	-7.61	5.87	0.26	0.20	10.28
6,225.00	0.93	263.72	6,223.18	5.78	-8.01	5.83	0.06	0.04	2.44
6,250.00	0.93	264.78	6,248.17	5.74	-8.42	5.79	0.07	0.00	4.24
6,275.00	0.95	264.22	6,273.17	5.70	-8.83	5.76	0.09	0.08	-2.24
6,300.00	0.97	269.23	6,298.17	5.68	-9.24	5.73	0.35	0.08	20.04
6,325.00	1.01	269.76	6,323.16	5.68	-9.68	5.73	0.16	0.16	2.12
6,350.00	0.96	267.73	6,348.16	5.67	-10.10	5.73	0.24	-0.20	-8.12
6,375.00	0.90	265.93	6,373.16	5.64	-10.51	5.71	0.27	-0.24	-7.20
6,400.00	0.89	266.02	6,398.15	5.62	-10.90	5.68	0.04	-0.04	0.36
6,425.00	0.94	263.23	6,423.15	5.58	-11.30	5.65	0.27	0.20	-11.16
6,450.00	0.94	263.49	6,448.15	5.53	-11.70	5.60	0.02	0.00	1.04
6,475.00	0.98	251.30	6,473.14	5.44	-12.11	5.51	0.83	0.16	-48.76
6,500.00	1.21	222.93	6,498.14	5.18	-12.49	5.25	2.32	0.92	-113.48
6,525.00	1.51	213.33	6,523.13	4.71	-12.85	4.79	1.50	1.20	-38.40
6,550.00	1.57	210.53	6,548.12	4.14	-13.21	4.22	0.38	0.24	-11.20
6,575.00	1.38	197.36	6,573.11	3.56	-13.47	3.64	1.55	-0.76	-52.68
6,600.00	1.21	162.24	6,598.11	3.02	-13.48	3.10	3.19	-0.68	-140.48
6,625.00	1.25	148.68	6,623.10	2.53	-13.26	2.61	1.17	0.16	-54.24
6,650.00	1.22	144.41	6,648.10	2.08	-12.96	2.16	0.39	-0.12	-17.08
6,675.00	1.23	141.73	6,673.09	1.66	-12.64	1.73	0.23	0.04	-10.72
6,700.00	1.27	140.47	6,698.08	1.23	-12.30	1.31	0.19	0.16	-5.04
6,725.00	1.18	142.94	6,723.08	0.81	-11.97	0.89	0.42	-0.36	9.88
6,750.00	1.11	139.83	6,748.07	0.42	-11.66	0.49	0.37	-0.28	-12.44
6,775.00	1.14	134.12	6,773.07	0.07	-11.32	0.13	0.46	0.12	-22.84



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
6,800.00	1.18	131.05	6,798.06	-0.28	-10.95	-0.21	0.30	0.16	-12.28
6,825.00	1.25	132.17	6,823.06	-0.63	-10.55	-0.57	0.30	0.28	4.48
6,850.00	1.21	136.20	6,848.05	-1.00	-10.17	-0.94	0.38	-0.16	16.12
6,875.00	1.15	137.92	6,873.05	-1.38	-9.82	-1.32	0.28	-0.24	6.88
6,900.00	1.15	131.02	6,898.04	-1.73	-9.46	-1.67	0.55	0.00	-27.60
6,925.00	1.18	128.17	6,923.04	-2.05	-9.07	-2.00	0.26	0.12	-11.40
6,950.00	1.11	127.22	6,948.03	-2.36	-8.67	-2.31	0.29	-0.28	-3.80
6,975.00	1.08	126.85	6,973.03	-2.65	-8.29	-2.60	0.12	-0.12	-1.48
7,000.00	1.07	124.87	6,998.02	-2.92	-7.91	-2.87	0.15	-0.04	-7.92
7,025.00	1.16	126.56	7,023.02	-3.21	-7.52	-3.16	0.38	0.36	6.76
7,050.00	1.11	129.16	7,048.01	-3.51	-7.13	-3.47	0.29	-0.20	10.40
7,075.00	0.99	130.16	7,073.01	-3.80	-6.77	-3.76	0.49	-0.48	4.00
7,100.00	1.00	128.49	7,098.01	-4.08	-6.44	-4.04	0.12	0.04	-6.68
7,125.00	1.02	126.28	7,123.00	-4.34	-6.09	-4.31	0.18	0.08	-8.84
7,150.00	1.07	123.00	7,148.00	-4.60	-5.71	-4.57	0.31	0.20	-13.12
7,175.00	1.11	124.17	7,172.99	-4.87	-5.32	-4.83	0.18	0.16	4.68
7,200.00	1.07	124.76	7,197.99	-5.14	-4.92	-5.11	0.17	-0.16	2.36
7,225.00	1.04	123.57	7,222.98	-5.39	-4.54	-5.37	0.15	-0.12	-4.76
7,250.00	1.08	124.36	7,247.98	-5.65	-4.16	-5.63	0.17	0.16	3.16
7,275.00	1.11	124.47	7,272.97	-5.92	-3.76	-5.90	0.12	0.12	0.44
7,300.00	1.09	125.28	7,297.97	-6.20	-3.37	-6.18	0.10	-0.08	3.24
7,325.00	1.03	124.22	7,322.97	-6.46	-2.99	-6.44	0.25	-0.24	-4.24
7,350.00	1.01	123.69	7,347.96	-6.71	-2.62	-6.69	0.09	-0.08	-2.12
7,375.00	1.01	123.32	7,372.96	-6.95	-2.25	-6.94	0.03	0.00	-1.48
7,400.00	0.98	123.96	7,397.95	-7.19	-1.89	-7.18	0.13	-0.12	2.56
7,425.00	0.97	125.91	7,422.95	-7.44	-1.54	-7.43	0.14	-0.04	7.80
7,450.00	1.02	125.81	7,447.95	-7.69	-1.19	-7.68	0.20	0.20	-0.40
7,475.00	1.05	124.03	7,472.94	-7.95	-0.82	-7.94	0.18	0.12	-7.12
7,500.00	1.04	120.27	7,497.94	-8.19	-0.44	-8.19	0.28	-0.04	-15.04
7,525.00	0.99	120.66	7,522.93	-8.42	-0.05	-8.42	0.20	-0.20	1.56
7,550.00	1.00	121.12	7,547.93	-8.64	0.32	-8.64	0.05	0.04	1.84
7,575.00	0.98	119.14	7,572.93	-8.86	0.69	-8.86	0.16	-0.08	-7.92
7,600.00	0.76	125.07	7,597.92	-9.06	1.01	-9.06	0.95	-0.88	23.72
7,625.00	0.43	181.33	7,622.92	-9.24	1.15	-9.25	2.53	-1.32	225.04
7,650.00	0.61	226.10	7,647.92	-9.43	1.05	-9.44	1.72	0.72	179.08
7,675.00	0.77	228.78	7,672.92	-9.63	0.83	-9.64	0.65	0.64	10.72
7,700.00	0.79	228.90	7,697.92	-9.86	0.57	-9.86	0.08	0.08	0.48
7,725.00	0.88	227.92	7,722.92	-10.10	0.30	-10.10	0.36	0.36	-3.92
7,750.00	0.90	227.84	7,747.91	-10.36	0.01	-10.36	0.08	0.08	-0.32
7,775.00	0.87	225.15	7,772.91	-10.63	-0.27	-10.62	0.20	-0.12	-10.76
7,800.00	0.80	224.63	7,797.91	-10.88	-0.53	-10.88	0.28	-0.28	-2.08
7,825.00	0.75	223.41	7,822.90	-11.13	-0.76	-11.12	0.21	-0.20	-4.88
7,850.00	0.69	216.89	7,847.90	-11.37	-0.96	-11.36	0.41	-0.24	-26.08



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
7,875.00	0.69	208.59	7,872.90	-11.62	-1.13	-11.61	0.40	0.00	-33.20
7,900.00	0.71	208.78	7,897.90	-11.89	-1.27	-11.88	0.08	0.08	0.76
7,925.00	0.69	211.73	7,922.90	-12.15	-1.43	-12.14	0.16	-0.08	11.80
7,950.00	0.69	203.21	7,947.90	-12.42	-1.57	-12.41	0.41	0.00	-34.08
7,975.00	0.58	202.04	7,972.89	-12.67	-1.67	-12.66	0.44	-0.44	-4.68
8,000.00	0.64	207.03	7,997.89	-12.91	-1.78	-12.90	0.32	0.24	19.96
8,025.00	0.78	202.20	8,022.89	-13.20	-1.91	-13.18	0.61	0.56	-19.32
8,050.00	0.74	203.48	8,047.89	-13.50	-2.04	-13.49	0.17	-0.16	5.12
8,075.00	0.84	204.54	8,072.89	-13.82	-2.18	-13.80	0.40	0.40	4.24
8,100.00	0.77	206.57	8,097.88	-14.13	-2.33	-14.12	0.30	-0.28	8.12
8,125.00	0.78	198.93	8,122.88	-14.44	-2.46	-14.43	0.41	0.04	-30.56
8,150.00	0.78	204.02	8,147.88	-14.76	-2.59	-14.74	0.28	0.00	20.36
8,175.00	0.82	202.26	8,172.88	-15.08	-2.72	-15.06	0.19	0.16	-7.04
8,200.00	0.73	205.68	8,197.87	-15.39	-2.86	-15.37	0.40	-0.36	13.68
8,225.00	0.72	204.60	8,222.87	-15.68	-2.99	-15.66	0.07	-0.04	-4.32
8,250.00	0.69	209.59	8,247.87	-15.95	-3.13	-15.93	0.27	-0.12	19.96
8,275.00	0.48	190.54	8,272.87	-16.18	-3.23	-16.16	1.13	-0.84	-76.20
8,300.00	0.29	154.85	8,297.87	-16.34	-3.22	-16.33	1.19	-0.76	-142.76
8,325.00	0.25	131.88	8,322.87	-16.44	-3.15	-16.42	0.46	-0.16	-91.88
8,350.00	0.31	125.98	8,347.87	-16.51	-3.06	-16.50	0.27	0.24	-23.60
8,375.00	0.28	122.62	8,372.87	-16.59	-2.95	-16.57	0.14	-0.12	-13.44
8,400.00	0.27	145.72	8,397.87	-16.67	-2.87	-16.65	0.44	-0.04	92.40
8,425.00	0.33	128.10	8,422.87	-16.76	-2.78	-16.75	0.44	0.24	-70.48
8,450.00	0.26	120.15	8,447.87	-16.83	-2.67	-16.82	0.32	-0.28	-31.80
8,475.00	0.42	120.64	8,472.87	-16.91	-2.54	-16.89	0.64	0.64	1.96
8,500.00	0.37	132.98	8,497.87	-17.01	-2.41	-17.00	0.39	-0.20	49.36
8,525.00	0.34	123.41	8,522.86	-17.11	-2.28	-17.09	0.27	-0.12	-38.28
8,550.00	0.37	117.73	8,547.86	-17.19	-2.15	-17.17	0.18	0.12	-22.72
8,575.00	0.37	121.61	8,572.86	-17.27	-2.01	-17.25	0.10	0.00	15.52
8,600.00	0.42	113.64	8,597.86	-17.34	-1.86	-17.33	0.30	0.20	-31.88
8,625.00	0.41	112.41	8,622.86	-17.42	-1.69	-17.41	0.05	-0.04	-4.92
8,650.00	0.42	114.66	8,647.86	-17.49	-1.53	-17.48	0.08	0.04	9.00
8,675.00	0.41	118.52	8,672.86	-17.57	-1.36	-17.56	0.12	-0.04	15.44
8,700.00	0.40	108.96	8,697.86	-17.64	-1.20	-17.63	0.27	-0.04	-38.24
8,725.00	0.45	111.73	8,722.86	-17.70	-1.03	-17.70	0.22	0.20	11.08
8,750.00	0.43	109.88	8,747.86	-17.77	-0.85	-17.77	0.10	-0.08	-7.40
8,775.00	0.46	110.60	8,772.86	-17.84	-0.67	-17.84	0.12	0.12	2.88
8,800.00	0.45	108.77	8,797.86	-17.91	-0.48	-17.90	0.07	-0.04	-7.32
8,825.00	0.46	111.95	8,822.86	-17.98	-0.29	-17.97	0.11	0.04	12.72
8,850.00	0.45	107.41	8,847.86	-18.04	-0.11	-18.04	0.15	-0.04	-18.16
8,875.00	0.46	113.46	8,872.86	-18.11	0.08	-18.11	0.20	0.04	24.20
8,900.00	0.49	100.85	8,897.85	-18.17	0.28	-18.17	0.43	0.12	-50.44
8,925.00	0.53	97.20	8,922.85	-18.21	0.49	-18.21	0.21	0.16	-14.60



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
8,950.00	0.53	95.02	8,947.85	-18.23	0.72	-18.24	0.08	0.00	-8.72
8,975.00	0.51	98.28	8,972.85	-18.26	0.95	-18.26	0.14	-0.08	13.04
9,000.00	0.59	83.63	8,997.85	-18.26	1.19	-18.27	0.64	0.32	-58.60
9,025.00	0.48	79.89	9,022.85	-18.23	1.42	-18.23	0.46	-0.44	-14.96
9,050.00	0.55	85.13	9,047.85	-18.20	1.64	-18.21	0.34	0.28	20.96
9,075.00	0.55	78.79	9,072.85	-18.16	1.88	-18.18	0.24	0.00	-25.36
9,100.00	0.53	80.30	9,097.85	-18.12	2.11	-18.13	0.10	-0.08	6.04
9,125.00	0.70	75.72	9,122.84	-18.06	2.37	-18.08	0.71	0.68	-18.32
9,150.00	1.08	85.15	9,147.84	-18.01	2.76	-18.02	1.62	1.52	37.72
9,175.00	1.64	88.36	9,172.83	-17.98	3.35	-18.00	2.26	2.24	12.84
9,200.00	1.77	87.52	9,197.82	-17.95	4.09	-17.97	0.53	0.52	-3.36
9,225.00	1.79	87.59	9,222.81	-17.92	4.87	-17.95	0.08	0.08	0.28
9,250.00	1.87	87.99	9,247.80	-17.89	5.66	-17.92	0.32	0.32	1.60
9,275.00	1.83	88.95	9,272.79	-17.86	6.47	-17.90	0.20	-0.16	3.84
9,300.00	2.23	90.03	9,297.77	-17.86	7.36	-17.90	1.61	1.60	4.32
9,325.00	3.29	87.79	9,322.74	-17.83	8.56	-17.88	4.26	4.24	-8.96
9,350.00	4.21	86.01	9,347.69	-17.74	10.19	-17.80	3.71	3.68	-7.12
9,375.00	4.57	85.00	9,372.61	-17.59	12.10	-17.66	1.47	1.44	-4.04
9,400.00	4.62	84.59	9,397.53	-17.41	14.09	-17.49	0.24	0.20	-1.64
9,425.00	4.59	84.99	9,422.45	-17.22	16.09	-17.32	0.18	-0.12	1.60
9,450.00	4.67	85.33	9,447.37	-17.05	18.10	-17.16	0.34	0.32	1.36
9,475.00	4.66	85.05	9,472.29	-16.88	20.13	-17.00	0.10	-0.04	-1.12
9,500.00	4.70	84.19	9,497.20	-16.69	22.16	-16.82	0.32	0.16	-3.44
9,525.00	4.67	82.72	9,522.12	-16.46	24.19	-16.60	0.50	-0.12	-5.88
9,550.00	5.07	80.38	9,547.03	-16.15	26.29	-16.30	1.79	1.60	-9.36
9,575.00	5.49	77.67	9,571.92	-15.71	28.55	-15.87	1.95	1.68	-10.84
9,600.00	5.54	76.23	9,596.81	-15.16	30.89	-15.35	0.59	0.20	-5.76
9,625.00	5.56	75.19	9,621.69	-14.57	33.23	-14.76	0.41	0.08	-4.16
9,650.00	5.33	72.61	9,646.58	-13.91	35.51	-14.12	1.34	-0.92	-10.32
9,675.00	4.81	70.51	9,671.48	-13.21	37.60	-13.44	2.21	-2.08	-8.40
9,700.00	3.97	69.73	9,696.41	-12.56	39.40	-12.80	3.37	-3.36	-3.12
9,725.00	3.40	68.38	9,721.36	-11.99	40.91	-12.23	2.31	-2.28	-5.40
9,750.00	3.06	69.09	9,746.32	-11.48	42.22	-11.73	1.37	-1.36	2.84
9,775.00	2.61	69.57	9,771.29	-11.04	43.37	-11.30	1.80	-1.80	1.92
9,800.00	2.08	69.19	9,796.26	-10.68	44.33	-10.95	2.12	-2.12	-1.52
9,825.00	1.76	73.23	9,821.25	-10.41	45.12	-10.68	1.39	-1.28	16.16
9,850.00	1.64	73.87	9,846.24	-10.20	45.83	-10.47	0.49	-0.48	2.56
9,875.00	1.50	71.71	9,871.23	-10.00	46.49	-10.27	0.61	-0.56	-8.64
9,900.00	1.38	70.52	9,896.22	-9.80	47.08	-10.07	0.49	-0.48	-4.76
9,925.00	1.35	69.55	9,921.21	-9.59	47.64	-9.87	0.15	-0.12	-3.88
9,950.00	1.32	70.52	9,946.21	-9.39	48.19	-9.68	0.15	-0.12	3.88
9,975.00	1.18	82.40	9,971.20	-9.26	48.72	-9.55	1.18	-0.56	47.52
10,000.00	1.33	113.82	9,996.20	-9.35	49.24	-9.64	2.78	0.60	125.68
10,025.00	2.13	135.87	10,021.18	-9.80	49.83	-10.09	4.11	3.20	88.20



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
10,050.00	2.62	143.96	10,046.16	-10.59	50.49	-10.89	2.37	1.96	32.36
10,075.00	2.76	146.76	10,071.14	-11.56	51.15	-11.86	0.77	0.56	11.20
10,100.00	3.02	148.87	10,096.10	-12.62	51.82	-12.93	1.12	1.04	8.44
10,125.00	3.50	148.55	10,121.06	-13.84	52.56	-14.15	1.92	1.92	-1.28
10,150.00	3.92	144.51	10,146.01	-15.19	53.46	-15.50	1.98	1.68	-16.16
10,175.00	4.12	138.07	10,170.95	-16.55	54.55	-16.87	1.97	0.80	-25.76
10,200.00	4.15	132.70	10,195.88	-17.83	55.82	-18.16	1.55	0.12	-21.48
10,225.00	4.13	129.30	10,220.82	-19.02	57.18	-19.35	0.98	-0.08	-13.60
10,250.00	3.97	126.45	10,245.76	-20.10	58.57	-20.45	1.03	-0.64	-11.40
10,275.00	3.77	124.22	10,270.70	-21.08	59.95	-21.43	1.00	-0.80	-8.92
10,300.00	3.70	121.11	10,295.65	-21.96	61.32	-22.32	0.86	-0.28	-12.44
10,325.00	3.71	119.24	10,320.59	-22.77	62.71	-23.14	0.48	0.04	-7.48
10,350.00	3.70	117.30	10,345.54	-23.53	64.14	-23.91	0.50	-0.04	-7.76
10,375.00	3.52	114.72	10,370.49	-24.22	65.55	-24.61	0.97	-0.72	-10.32
10,400.00	2.93	111.69	10,395.45	-24.78	66.84	-25.18	2.46	-2.36	-12.12
10,425.00	2.27	104.20	10,420.43	-25.14	67.91	-25.54	2.96	-2.64	-29.96
10,450.00	1.76	93.60	10,445.41	-25.28	68.78	-25.69	2.52	-2.04	-42.40
10,475.00	1.58	87.49	10,470.40	-25.29	69.51	-25.70	1.01	-0.72	-24.44
10,500.00	1.57	87.10	10,495.39	-25.26	70.19	-25.68	0.06	-0.04	-1.56
10,525.00	1.66	92.99	10,520.38	-25.26	70.90	-25.68	0.75	0.36	23.56
10,550.00	1.96	109.26	10,545.37	-25.42	71.66	-25.85	2.37	1.20	65.08
10,575.00	2.37	123.20	10,570.35	-25.85	72.50	-26.28	2.66	1.64	55.76
10,600.00	2.67	127.89	10,595.33	-26.49	73.39	-26.92	1.46	1.20	18.76
10,625.00	2.95	130.44	10,620.30	-27.26	74.34	-27.70	1.23	1.12	10.20
10,650.00	3.22	131.32	10,645.26	-28.14	75.36	-28.59	1.10	1.08	3.52
10,675.00	3.26	132.01	10,670.22	-29.08	76.41	-29.53	0.22	0.16	2.76
10,700.00	3.29	132.76	10,695.18	-30.04	77.47	-30.50	0.21	0.12	3.00
10,725.00	3.27	131.98	10,720.14	-31.01	78.52	-31.47	0.20	-0.08	-3.12
10,750.00	3.23	132.50	10,745.10	-31.96	79.57	-32.43	0.20	-0.16	2.08
10,775.00	3.27	133.32	10,770.06	-32.93	80.61	-33.40	0.25	0.16	3.28
10,800.00	3.29	132.86	10,795.02	-33.90	81.65	-34.39	0.13	0.08	-1.84
10,825.00	3.23	135.36	10,819.98	-34.89	82.67	-35.38	0.62	-0.24	10.00
10,850.00	3.17	136.77	10,844.94	-35.90	83.64	-36.39	0.40	-0.24	5.64
10,875.00	3.08	138.35	10,869.90	-36.90	84.56	-37.40	0.50	-0.36	6.32
10,900.00	2.89	138.97	10,894.87	-37.88	85.42	-38.39	0.77	-0.76	2.48
10,925.00	2.69	140.33	10,919.84	-38.81	86.21	-39.32	0.84	-0.80	5.44
10,950.00	2.25	145.08	10,944.81	-39.66	86.87	-40.18	1.94	-1.76	19.00
10,975.00	1.89	147.26	10,969.80	-40.41	87.37	-40.93	1.47	-1.44	8.72
11,000.00	1.66	144.06	10,994.79	-41.05	87.81	-41.57	1.00	-0.92	-12.80
11,025.00	1.44	142.61	11,019.78	-41.59	88.21	-42.12	0.89	-0.88	-5.80
11,050.00	1.17	139.49	11,044.77	-42.04	88.57	-42.56	1.12	-1.08	-12.48
11,052.00	1.15	139.17	11,046.77	-42.07	88.59	-42.59	1.05	-1.00	-16.00
11,140.00	0.44	106.14	11,134.76	-42.83	89.49	-43.36	0.93	-0.81	-37.53



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
11,234.00	0.81	281.04	11,228.76	-42.80	89.19	-43.33	1.33	0.39	186.06
11,328.00	0.88	285.26	11,322.75	-42.48	87.84	-43.01	0.10	0.07	4.49
11,422.00	1.50	58.15	11,416.74	-41.65	88.19	-42.17	2.34	0.66	141.37
11,517.00	1.75	74.67	11,511.70	-40.61	90.64	-41.14	0.56	0.26	17.39
11,611.00	1.44	86.63	11,605.67	-40.16	93.21	-40.71	0.48	-0.33	12.72
11,705.00	1.50	81.18	11,699.63	-39.90	95.60	-40.47	0.16	0.06	-5.80
11,749.00	1.50	77.49	11,743.62	-39.69	96.73	-40.26	0.22	0.00	-8.39
11,871.00	1.88	74.85	11,865.57	-38.82	100.22	-39.41	0.32	0.31	-2.16
11,985.95	2.38	52.22	11,980.44	-36.86	103.93	-37.48	0.84	0.43	-19.68
VS 22H - KOP									
11,997.00	2.44	50.59	11,991.48	-36.57	104.29	-37.19	0.84	0.57	-14.78
12,029.00	3.88	34.77	12,023.43	-35.25	105.44	-35.88	5.22	4.50	-49.44
12,059.00	5.63	23.70	12,053.33	-33.07	106.61	-33.70	6.56	5.83	-36.90
12,091.00	8.00	15.26	12,085.10	-29.48	107.82	-30.12	8.02	7.41	-26.38
12,122.00	9.88	7.52	12,115.72	-24.77	108.74	-25.41	7.19	6.06	-24.97
12,154.00	11.25	9.81	12,147.18	-18.97	109.63	-19.62	4.48	4.28	7.16
12,184.00	13.31	7.00	12,176.49	-12.66	110.55	-13.31	7.15	6.87	-9.37
12,216.00	18.69	6.47	12,207.24	-3.90	111.58	-4.56	16.82	16.81	-1.66
12,247.00	22.88	2.95	12,236.22	7.06	112.45	6.39	14.10	13.52	-11.35
12,279.00	26.88	2.95	12,265.24	20.50	113.14	19.83	12.50	12.50	0.00
12,310.00	28.56	6.29	12,292.68	34.87	114.31	34.19	7.38	5.42	10.77
12,342.00	33.75	7.00	12,320.06	51.31	116.24	50.62	16.26	16.22	2.22
12,372.00	38.75	7.35	12,344.24	68.90	118.45	68.20	16.68	16.67	1.17
12,404.00	43.88	5.94	12,368.27	89.88	120.88	89.16	16.29	16.03	-4.41
12,436.00	48.06	8.40	12,390.51	112.69	123.77	111.96	14.18	13.06	7.69
12,467.00	53.38	5.94	12,410.13	136.49	126.75	135.74	18.23	17.16	-7.94
12,481.65	56.06	4.77	12,418.59	148.40	127.86	147.64	19.42	18.30	-7.97
VS 22H - FTP									
12,499.00	59.25	3.48	12,427.87	163.02	128.91	162.25	19.42	18.38	-7.45
12,530.00	64.38	1.90	12,442.51	190.30	130.18	189.53	17.15	16.55	-5.10
12,553.00	72.19	1.20	12,451.01	211.64	130.76	210.87	34.07	33.96	-3.04
12,584.00	77.06	0.49	12,459.23	241.52	131.20	240.74	15.86	15.71	-2.29
12,678.00	83.63	7.00	12,475.00	333.89	137.29	333.07	9.77	6.99	6.93
12,773.00	91.31	13.50	12,479.20	427.16	154.18	426.23	10.58	8.08	6.84
12,867.00	95.38	14.38	12,473.72	518.21	176.78	517.16	4.43	4.33	0.94
12,961.00	94.44	12.80	12,465.67	609.24	198.78	608.05	1.95	-1.00	-1.68
13,055.00	90.31	6.65	12,461.77	701.75	214.63	700.46	7.88	-4.39	-6.54
13,150.00	91.13	2.78	12,460.58	796.40	222.43	795.07	4.16	0.86	-4.07
13,244.00	91.50	359.44	12,458.42	890.35	224.26	889.00	3.57	0.39	-3.55
13,339.00	93.38	0.32	12,454.38	985.25	224.06	983.91	2.18	1.98	0.93
13,432.00	92.00	356.45	12,450.01	1,078.09	221.44	1,076.76	4.41	-1.48	-4.16
13,526.00	93.31	356.63	12,445.65	1,171.82	215.77	1,170.52	1.41	1.39	0.19
13,620.00	95.81	356.63	12,438.18	1,265.35	210.26	1,264.08	2.66	2.66	0.00
13,713.00	95.81	356.45	12,428.77	1,357.71	204.68	1,356.47	0.19	0.00	-0.19



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 22H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3285.50ft (Original Well Elev)
Well:	22H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	RyanUSA_Compass

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)
13,808.00	94.00	355.57	12,420.65	1,452.12	198.09	1,450.92	2.12	-1.91	-0.93
13,902.00	95.25	356.27	12,413.07	1,545.58	191.42	1,544.42	1.52	1.33	0.74
13,996.00	92.81	356.10	12,406.46	1,639.13	185.19	1,638.00	2.60	-2.60	-0.18
14,091.00	88.94	357.86	12,405.01	1,733.97	180.18	1,732.87	4.47	-4.07	1.85
14,185.00	90.63	357.86	12,405.36	1,827.90	176.67	1,826.82	1.80	1.80	0.00
14,279.00	94.31	358.21	12,401.31	1,921.74	173.45	1,920.67	3.93	3.91	0.37
14,373.00	93.06	358.03	12,395.27	2,015.49	170.38	2,014.44	1.34	-1.33	-0.19
14,467.00	87.94	359.09	12,394.45	2,109.43	168.01	2,108.39	5.56	-5.45	1.13
14,561.00	89.44	358.21	12,396.60	2,203.37	165.80	2,202.35	1.85	1.60	-0.94
14,655.00	91.63	358.21	12,395.72	2,297.32	162.86	2,296.31	2.33	2.33	0.00
14,749.00	89.44	357.15	12,394.84	2,391.23	159.06	2,390.24	2.59	-2.33	-1.13
14,843.00	89.81	356.63	12,395.46	2,485.09	153.96	2,484.13	0.68	0.39	-0.55
14,858.41	90.38	356.63	12,395.43	2,500.47	153.05	2,499.52	3.72	3.72	0.00
VS 22H - T1									
14,937.00	93.31	356.63	12,392.90	2,578.87	148.44	2,577.95	3.72	3.72	0.00
15,031.00	95.38	358.03	12,385.78	2,672.50	144.07	2,671.59	2.66	2.20	1.49
15,125.00	98.13	358.74	12,374.72	2,765.80	141.44	2,764.91	3.02	2.93	0.76
15,219.00	93.13	359.97	12,365.50	2,859.31	140.39	2,858.42	5.48	-5.32	1.31
15,313.00	93.81	0.32	12,359.81	2,953.13	140.63	2,952.25	0.81	0.72	0.37
15,407.00	93.19	0.85	12,354.08	3,046.95	141.58	3,046.06	0.87	-0.66	0.56
15,501.00	90.88	359.97	12,350.74	3,140.88	142.26	3,139.98	2.63	-2.46	-0.94
15,595.00	92.44	359.09	12,348.02	3,234.84	141.49	3,233.94	1.91	1.66	-0.94
15,688.00	94.63	359.26	12,342.28	3,327.64	140.15	3,326.75	2.36	2.35	0.18
15,782.00	95.38	359.97	12,334.08	3,421.28	139.52	3,420.39	1.10	0.80	0.76
15,876.00	94.06	0.32	12,326.35	3,514.96	139.76	3,514.07	1.45	-1.40	0.37
15,970.00	88.50	359.09	12,324.25	3,608.90	139.27	3,608.01	6.06	-5.91	-1.31
16,064.00	88.94	358.38	12,326.35	3,702.85	137.20	3,701.97	0.89	0.47	-0.76
16,158.00	91.13	357.51	12,326.29	3,796.78	133.83	3,795.92	2.51	2.33	-0.93
16,252.00	93.38	358.74	12,322.59	3,890.65	130.75	3,889.81	2.73	2.39	1.31
16,346.00	95.31	358.38	12,315.47	3,984.35	128.40	3,983.51	2.09	2.05	-0.38
16,363.78	95.29	358.51	12,313.83	4,002.05	127.92	4,001.22	0.76	-0.13	0.76
VS 22H - T2									
16,440.00	95.19	359.09	12,306.87	4,077.93	126.33	4,077.11	0.76	-0.13	0.76
16,534.00	93.63	0.14	12,299.64	4,171.64	125.70	4,170.83	2.00	-1.66	1.12
16,628.00	91.31	359.61	12,295.59	4,265.55	125.50	4,264.73	2.53	-2.47	-0.56
16,722.00	91.31	1.37	12,293.44	4,359.52	126.30	4,358.69	1.87	0.00	1.87
16,816.00	91.94	2.08	12,290.77	4,453.44	129.13	4,452.59	1.01	0.67	0.76
16,910.00	91.69	1.72	12,287.80	4,547.34	132.25	4,546.47	0.47	-0.27	-0.38
17,003.00	90.69	359.61	12,285.87	4,640.31	133.32	4,639.43	2.51	-1.08	-2.27
17,097.00	91.25	358.38	12,284.27	4,734.28	131.68	4,733.41	1.44	0.60	-1.31
17,171.00	90.94	356.80	12,282.86	4,808.19	128.56	4,807.35	2.18	-0.42	-2.14
17,232.95	90.94	356.80	12,281.84	4,870.04	125.11	4,869.21	0.00	0.00	0.00
VS 22H - BHL									
17,233.00	90.94	356.80	12,281.84	4,870.09	125.10	4,869.26	0.00	0.00	0.00