SOCON Sonar Control Kavernenvermessung GmbH

ECHO - LOG

Heiligerlee H

12. survey

04.01.2018 184001

SOCON Sonar Control Kavernenvermessung GmbH
Windmühlenstr. 41 D - 31180 Giesen OT Emmerke
Telephone +49 5121 99819-0Telefax +49 5121 99819-88
e-mail: info@socon.com

Results of the Cavity Survey

by means of Echo-Sounding

in the cavity

Heiligerlee H

Date: 04.01.2018

Report No.: 184001

Customer: Akzo Nobel Industrial Chemicals B.V Heiligerlee

Responsible for the survey:

Surveyor :
Leadership :
Interpreter :
Control :

Contents

Summary of results

Legend

Enclosures:

- Volume (diagrams and lists)
- Diameter and radii (diagrams and lists)
- Perspective views
- Maximum plots (top view)
- Horizontal sections
- Maximum plot (side view)
- Vertical sections
- Logs

Summary of results

Well details

All depths are given as:	**MVD**
Datum level for all depths:	**surface**
Shoe of the cemented 13 3/8"-casing:	506.7 m
Reference depth for ECHO-LOG:	**506.7 m**
Pressure at the cavity head:	0.0 bar

Details of survey equipment

Measuring vehicle used:	L 114
Tools used:	Echo tool BSF 2 115

General details

Number of runs:	1
Measured horizontal sections:	48
Measured tilted sections:	34
Lowest survey depth:	1123.5 m

Maximum and minimum dimensions with ref. to the measuring axis

Reference direction: **magnetic north**

Determination out of 36 vertical sections derived from horizontally and tilted measured data at 5 degree intervals:

minimum radius:	0.0 m
depth:	1131.2 m
direction:	0°
maximum radius:	79.6 m
depth:	1091.0 m
direction:	140°
highest point of cavity:	786.5 m
horizontal distance:	40.2 m
direction:	65°
lowest point of cavity:	1232.0 m
horizontal distance:	24.2 m
direction:	45°
lowest point in the measuring axis:	1131.2 m

Determination out of 91 horizontal sections in the depths between 789.2 m and 1230.0 m at 5° degree intervals:

maximum radius:	79.6 m
depth:	1091.0 m
direction:	140°
maximum diameter:	127.4 m
depth:	792.0 m
direction:	3 - 183°

Volume

volume:	2 306 422.3 m³
depth range:	789.2 m <--> 1232.0 m

Interpretation

Supposing a rectilinear propagation of ultrasonic waves all recorded echo travel times were converted into distances by using the subsequent speeds of sound:

1817.1 m/s to 1821.1 m/s in brine (assumed)

In the case of recording several echoes along one trace of echo signals, the representative echo signal was selected according to the level of amplitude, transmission time, density of measured points and the shape of the cavity.

Horizontal sections

48 horizontal sections at following measured depths are included as graphical plots in this report:

789.2 m	792.0 m	796.0 m	801.0 m	806.0 m	811.0 m	816.0 m
821.0 m	826.0 m	831.0 m	836.0 m	841.0 m	851.0 m	861.0 m
881.0 m	901.0 m	926.0 m	951.0 m	976.0 m	1001.0 m	1016.0 m
1026.0 m	1036.0 m	1041.0 m	1046.0 m	1051.0 m	1053.5 m	1056.0 m
1058.5 m	1061.0 m	1066.0 m	1071.0 m	1076.0 m	1081.0 m	1086.0 m
1091.0 m	1096.0 m	1098.5 m	1101.0 m	1103.5 m	1106.0 m	1108.5 m
1111.0 m	1113.5 m	1116.0 m	1118.5 m	1121.0 m	1123.5 m	

The following 43 sections are constructed:

1125.0 m	1127.5 m	1130.0 m	1132.5 m	1135.0 m	1137.5 m	1140.0 m
1142.5 m	1145.0 m	1147.5 m	1150.0 m	1152.5 m	1155.0 m	1157.5 m
1160.0 m	1162.5 m	1165.0 m	1167.5 m	1170.0 m	1172.5 m	1175.0 m
1177.5 m	1180.0 m	1182.5 m	1185.0 m	1187.5 m	1190.0 m	1192.5 m
1195.0 m	1197.5 m	1200.0 m	1202.5 m	1205.0 m	1207.5 m	1210.0 m
1212.5 m	1215.0 m	1217.5 m	1220.0 m	1222.5 m	1225.0 m	1227.5 m
1230.0 m						

Tilted sections

34 sections recorded with tilted echo-transducer at following measured depths are presented in the vertical sections:

20 sections of these with upwards-tilted echo-transducer:

Depth / Tilting Angle

831.0 / 30	831.0 / 33	831.0 / 36	831.0 / 39	831.0 / 42	831.0 / 48
831.0 / 54	831.0 / 60	831.0 / 66	831.0 / 72	831.0 / 78	831.0 / 84
1096.0 / 36	1096.0 / 39	1096.0 / 42	1101.0 / 30	1101.0 / 36	1101.0 / 42
1101.0 / 48	1101.0 / 54				

14 sections of these with downwards-tilted echo-transducer:

Depth / Tilting Angle

1118.5 / 6	1118.5 / 12	1118.5 / 18	1118.5 / 24	1118.5 / 30	1118.5 / 36
1118.5 / 42	1118.5 / 48	1118.5 / 54	1118.5 / 60	1118.5 / 66	1118.5 / 72
1118.5 / 78	1118.5 / 84				

Vertical sections

The shape of the cavity was determined by interpretation of all horizontally and tilted measured data and is presented by 36 vertical sections in this report.

Maximum plots (top view)

The maximum plot presents the largest extension of the cavity in a top view. The first picture shows the areas of all horizontal sections and the area resulting out of the vertical sections (hatched). The resulting total area is shown in the second picture (cross hatching) together with the largest single area.

In both pictures the total centre of gravity of the cavity is shown with its distance and its direction referring to the measuring axis.
The total centre of gravity is derived out of the envelope, which is the connection line of the largest cavity extension in every direction

Perspective views

Several perspective drawings are included in this report to give a quick review of detailed relations.

Comparison with previously measured data

If there are data of previous surveys available these are presented with a different line style to mark out for changes.

Pockets in the cavity wall

Pockets in the cavity wall, which have been identified by the tilted echo-transducer, were transferred from the vertical sections to the respective horizontal sections.
The resulting additional areas have been added to the calculated areas.

LOG - Data

You will find the graphic representations of the following LOG data at the end of this report:

Parameter	from	to
Temperature:	495.0 m	1127.4m
Pressure:	495.2 m	1127.6 m
CCL:	493.8 m	1126.2 m

LEGEND

■ Measured point recorded with horizontal adjusted ultrasonic transducer

● Measured point recorded with tilted or vertical orientated ultrasonic transducer

▲ Interpolated point derived from the vertical sections

— Connection line between two measured points in order to calculate the volume

– – Assumed connection line (in areas which are not sufficiently covered by measured points)

GiN Grid-North

N Magnetic north determined with compass inside the tool
(magnetic compass in areas without tubing)
(fibre gyro compass in areas with tunings)

(N) Assumed north direction (for sections in magnetic disturbed surroundings without fibre gyro compass)

a Longest extension in section
(without considering of hidden leached pockets)

b Longest extension in section perpendicular to a
(without considering of hidden leached pockets)

a/b Ratio of longest extensions in section which are perpendicular to each other

(+ xx m²) Area in actual section resulting from hidden leached pockets

r~ Average radius

021835 29.04.2002 Job number and survey date

Volume list

Cavity: Heiligerlee H 184001 04.01.2018

Depth [m]	Radius [m]	Area [m²]	Depth range [m] from	Depth range [m] to	Volume [m³] partial	Volume [m³] total
789.2	27.7	2416.8	789.20	790.60	3383.5	3383.5
792.0	59.6	11167.7	790.60	794.00	37970.2	41353.7
796.0	59.7	11180.6	794.00	798.50	50312.7	91666.3
801.0	59.0	10923.8	798.50	803.50	54618.9	146285.2
806.0	54.6	9377.0	803.50	808.50	46884.8	193170.1
811.0	48.1	7275.0	808.50	813.50	36375.2	229545.3
816.0	42.6	5701.6	813.50	818.50	28507.9	258053.2
821.0	39.4	4887.3	818.50	823.50	24436.5	282489.7
826.0	37.9	4517.1	823.50	828.50	22585.3	305075.0
831.0	41.5	5418.5	828.50	833.50	27092.3	332167.3
836.0	46.1	6666.1	833.50	838.50	33330.3	365497.6
841.0	48.9	7508.2	838.50	846.00	56311.2	421808.8
851.0	49.9	7828.0	846.00	856.00	78279.8	500088.6
861.0	49.7	7754.9	856.00	871.00	116323.7	616412.3
881.0	49.4	7664.8	871.00	891.00	153295.8	769708.0
901.0	49.4	7673.1	891.00	913.50	172644.3	942352.4
926.0	50.6	8057.2	913.50	938.50	201431.0	1143783.4
951.0	52.8	8746.8	938.50	963.50	218670.0	1362453.3
976.0	54.1	9191.9	963.50	988.50	229797.3	1592250.6
1001.0	49.4	7671.5	988.50	1008.50	153430.4	1745681.0
1016.0	46.9	6906.5	1008.50	1021.00	86330.7	1832011.6
1026.0	39.7	4942.2	1021.00	1031.00	49422.1	1881433.7
1036.0	32.0	3225.6	1031.00	1038.50	24192.1	1905625.7
1041.0	29.6	2751.3	1038.50	1043.50	13756.3	1919382.0
1046.0	29.1	2664.7	1043.50	1048.50	13323.7	1932705.7
1051.0	30.7	2955.9	1048.50	1052.25	11084.7	1943790.4
1053.5	31.3	3073.7	1052.25	1054.75	7684.2	1951474.6
1056.0	31.9	3202.3	1054.75	1057.25	8005.7	1959480.3
1058.5	32.6	3345.8	1057.25	1059.75	8364.5	1967844.8
1061.0	32.7	3362.7	1059.75	1063.50	12610.1	1980454.9
1066.0	32.6	3335.6	1063.50	1068.50	16677.8	1997132.7
1071.0	32.6	3348.5	1068.50	1073.50	16742.6	2013875.2
1076.0	32.9	3391.1	1073.50	1078.50	16955.4	2030830.7
1081.0	33.4	3502.6	1078.50	1083.50	17513.1	2048343.8
1086.0	33.9	3614.0	1083.50	1088.50	18070.2	2066414.0
1091.0	33.7	3572.0	1088.50	1093.50	17860.0	2084274.0
1096.0	33.4	3509.8	1093.50	1097.25	13161.8	2097435.8
1098.5	33.4	3496.3	1097.25	1099.75	8740.7	2106176.4
1101.0	33.1	3446.3	1099.75	1102.25	8615.7	2114792.1
1103.5	32.4	3302.0	1102.25	1104.75	8255.0	2123047.1
1106.0	32.2	3249.5	1104.75	1107.25	8123.7	2131170.8
1108.5	32.2	3254.3	1107.25	1109.75	8135.7	2139306.5
1111.0	32.0	3218.7	1109.75	1112.25	8046.7	2147353.2
1113.5	31.4	3094.9	1112.25	1114.75	7737.4	2155090.5
1116.0	31.0	3022.0	1114.75	1117.25	7555.0	2162645.5
1118.5	30.5	2929.3	1117.25	1119.75	7323.1	2169968.6
1121.0	29.9	2811.4	1119.75	1122.25	7028.6	2176997.2
1123.5	29.6	2754.3	1122.25	1124.25	5508.6	2182505.8

SOCON Sonar Control Kavernenvermessung GmbH

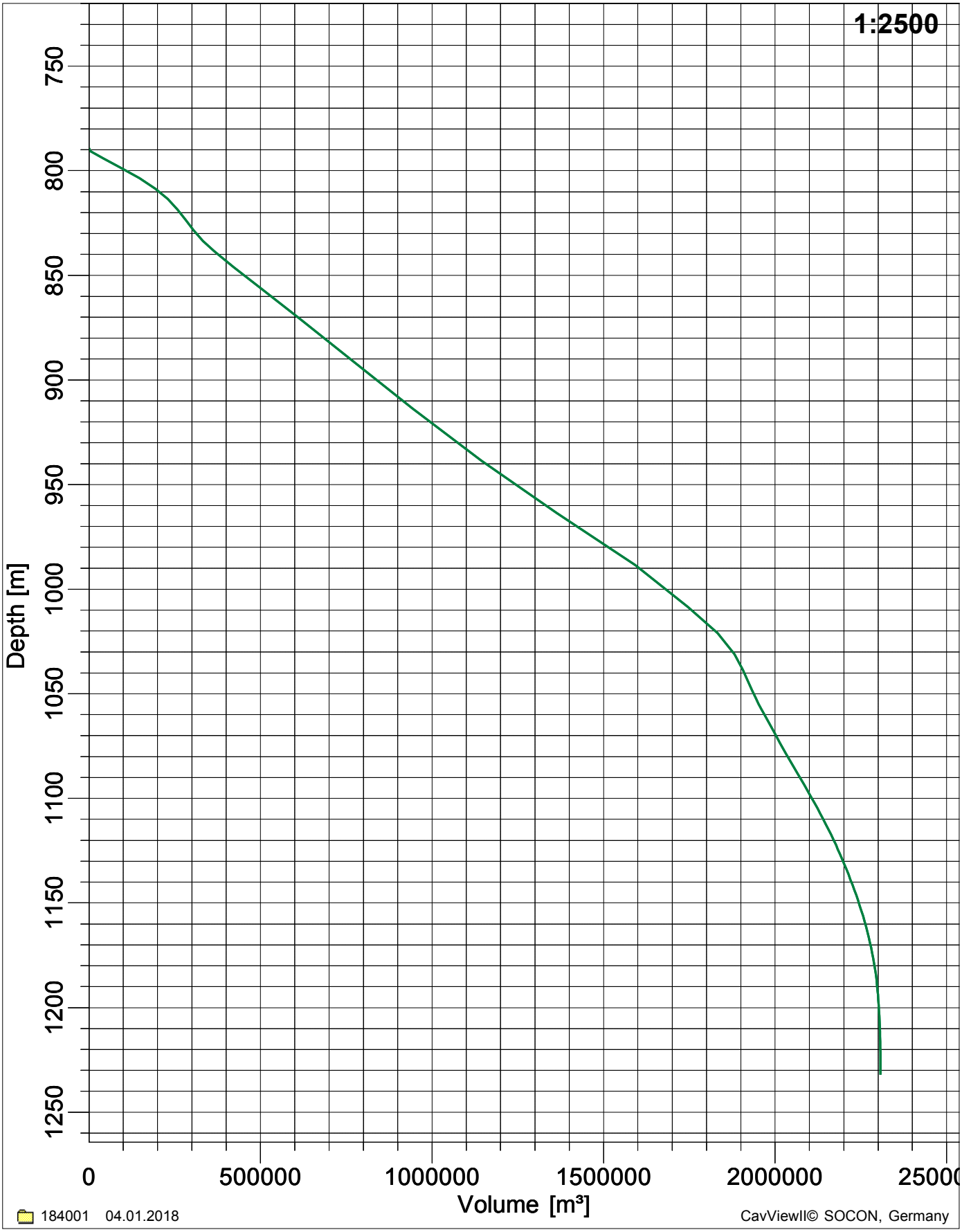
Volume list

Cavity: Heiligerlee H 184001 04.01.2018

Depth [m]	Radius [m]	Area [m²]	Depth range [m] from	Depth range [m] to	Volume [m³] partial	Volume [m³] total
1125.0	29.3	2693.5	1124.25	1126.25	5387.0	2187892.8
1127.5	28.9	2632.0	1126.25	1128.75	6580.0	2194472.8
1130.0	28.4	2530.5	1128.75	1131.25	6326.2	2200799.0
1132.5	28.3	2523.0	1131.25	1133.75	6307.5	2207106.5
1135.0	28.0	2469.5	1133.75	1136.25	6173.6	2213280.2
1137.5	27.7	2406.3	1136.25	1138.75	6015.8	2219296.0
1140.0	27.3	2338.1	1138.75	1141.25	5845.2	2225141.2
1142.5	26.8	2261.3	1141.25	1143.75	5653.2	2230794.5
1145.0	26.3	2177.2	1143.75	1146.25	5442.9	2236237.4
1147.5	25.7	2076.7	1146.25	1148.75	5191.8	2241429.2
1150.0	25.2	1992.2	1148.75	1151.25	4980.6	2246409.7
1152.5	24.7	1919.2	1151.25	1153.75	4798.1	2251207.8
1155.0	24.1	1830.7	1153.75	1156.25	4576.7	2255784.5
1157.5	23.8	1775.5	1156.25	1158.75	4438.8	2260223.3
1160.0	23.3	1703.3	1158.75	1161.25	4258.2	2264481.5
1162.5	22.7	1619.5	1161.25	1163.75	4048.7	2268530.2
1165.0	22.0	1526.2	1163.75	1166.25	3815.6	2272345.8
1167.5	21.3	1430.4	1166.25	1168.75	3576.0	2275921.8
1170.0	20.6	1334.7	1168.75	1171.25	3336.7	2279258.5
1172.5	19.9	1239.4	1171.25	1173.75	3098.5	2282357.0
1175.0	19.1	1151.7	1173.75	1176.25	2879.2	2285236.2
1177.5	18.4	1060.9	1176.25	1178.75	2652.4	2287888.5
1180.0	17.6	974.2	1178.75	1181.25	2435.4	2290323.9
1182.5	16.9	893.0	1181.25	1183.75	2232.6	2292556.5
1185.0	16.0	806.0	1183.75	1186.25	2015.1	2294571.6
1187.5	15.1	715.7	1186.25	1188.75	1789.3	2296360.9
1190.0	14.1	623.1	1188.75	1191.25	1557.6	2297918.5
1192.5	13.2	545.9	1191.25	1193.75	1364.8	2299283.3
1195.0	12.2	469.4	1193.75	1196.25	1173.6	2300456.9
1197.5	11.2	397.2	1196.25	1198.75	993.1	2301450.0
1200.0	10.5	344.9	1198.75	1201.25	862.2	2302312.2
1202.5	9.9	308.8	1201.25	1203.75	771.9	2303084.1
1205.0	9.4	275.1	1203.75	1206.25	687.8	2303771.9
1207.5	8.8	241.1	1206.25	1208.75	602.8	2304374.7
1210.0	8.1	206.8	1208.75	1211.25	516.9	2304891.6
1212.5	7.4	172.0	1211.25	1213.75	430.1	2305321.8
1215.0	6.7	140.7	1213.75	1216.25	351.8	2305673.5
1217.5	6.0	113.6	1216.25	1218.75	284.0	2305957.5
1220.0	5.2	85.9	1218.75	1221.25	214.8	2306172.3
1222.5	4.3	57.8	1221.25	1223.75	144.4	2306316.7
1225.0	3.0	29.1	1223.75	1226.25	72.7	2306389.4
1227.5	1.8	10.7	1226.25	1228.75	26.6	2306416.0
1230.0	0.8	1.9	1228.75	1232.00	6.3	**2306422.3**

SOCON Sonar Control Kavernenvermessung GmbH

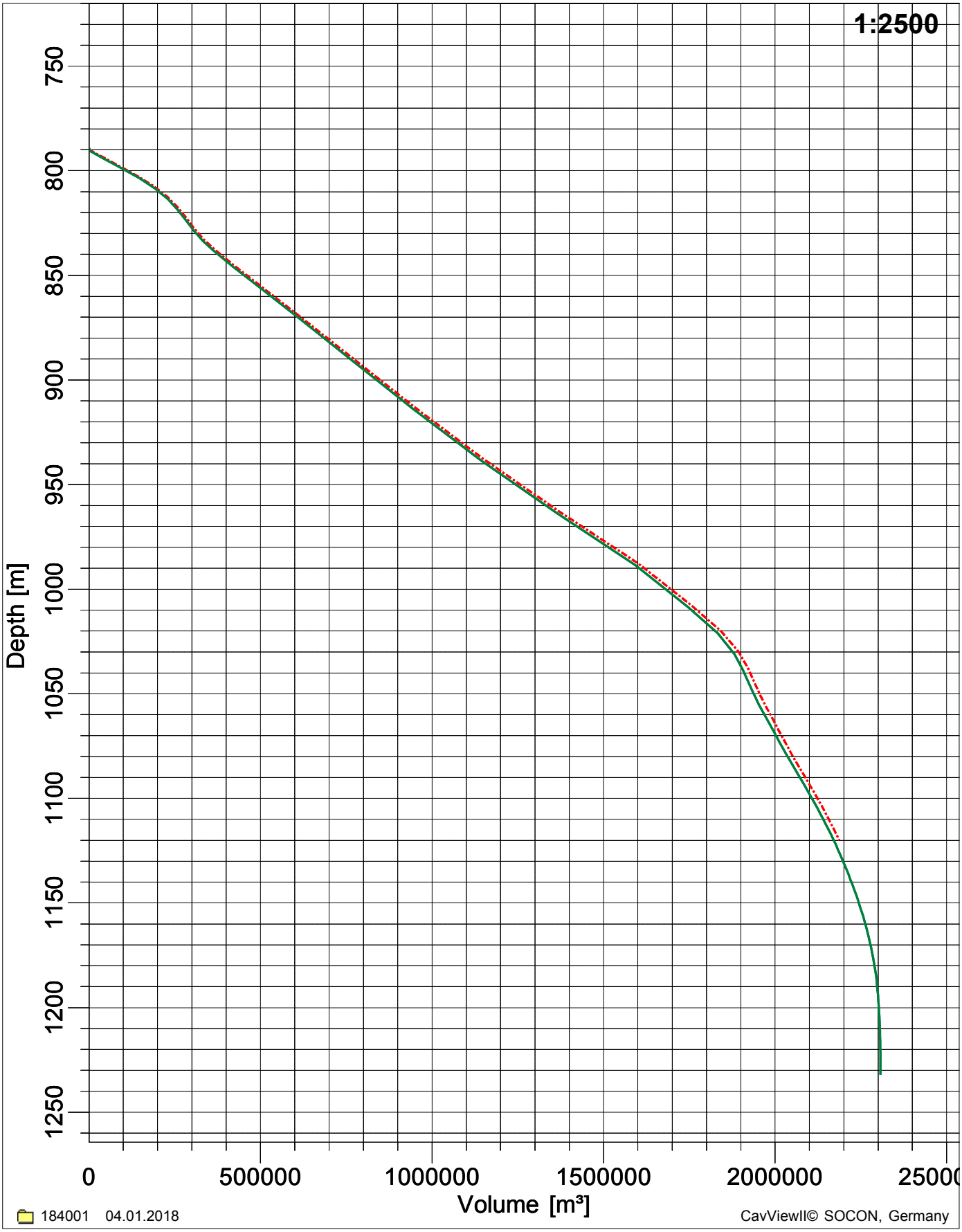
Heiligerlee H	TOTAL VOLUME	04.01.2018



Total volume = 2306422.3 m³

SOCON Sonar Control Kavernenvermessung GmbH

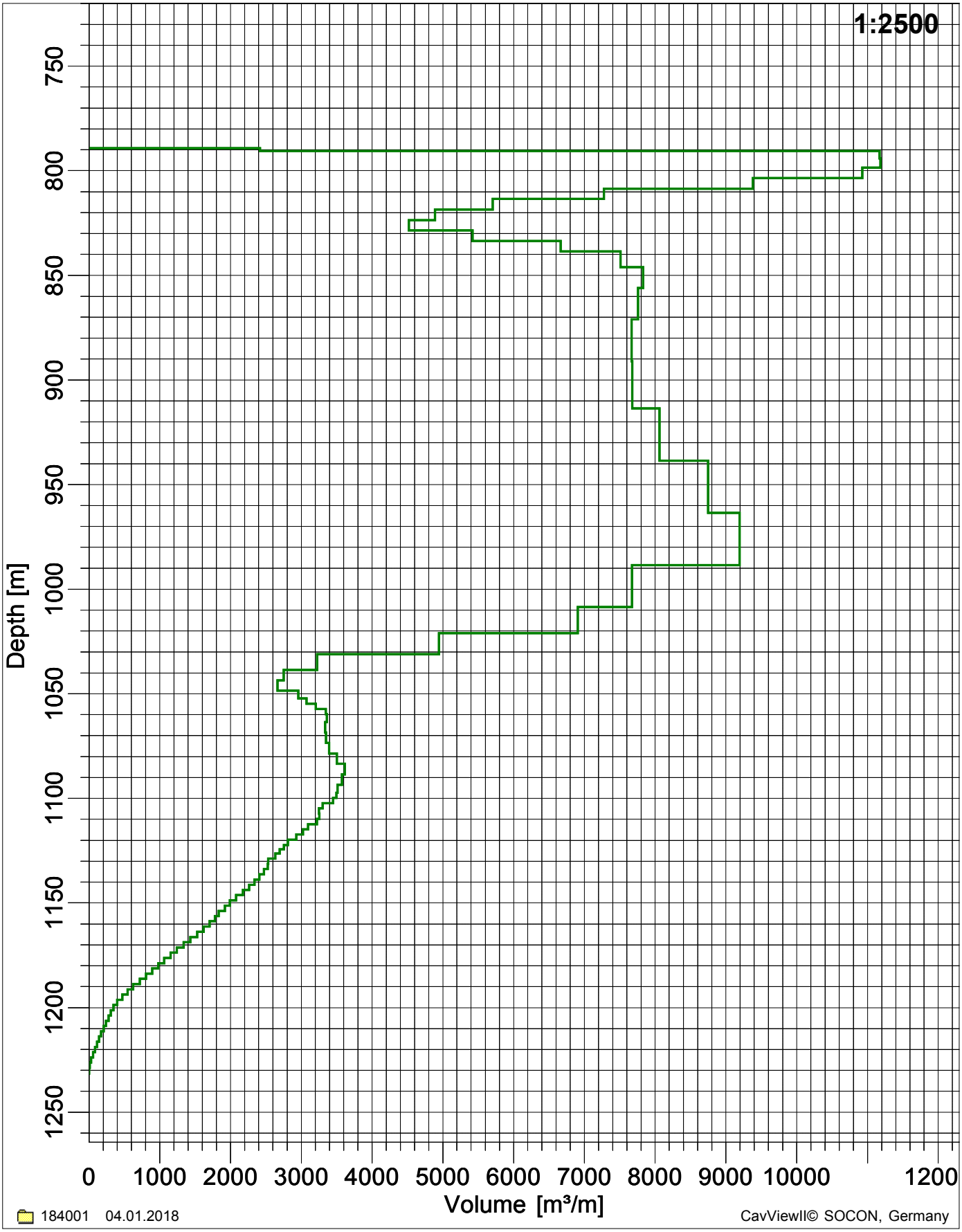
Heiligerlee H — TOTAL VOLUME — 04.01.2018



Total volume = 2306422.3 m³ — Total volume = 2186557.7 m³ (17.05.2016)

SOCON Sonar Control Kavernenvermessung GmbH

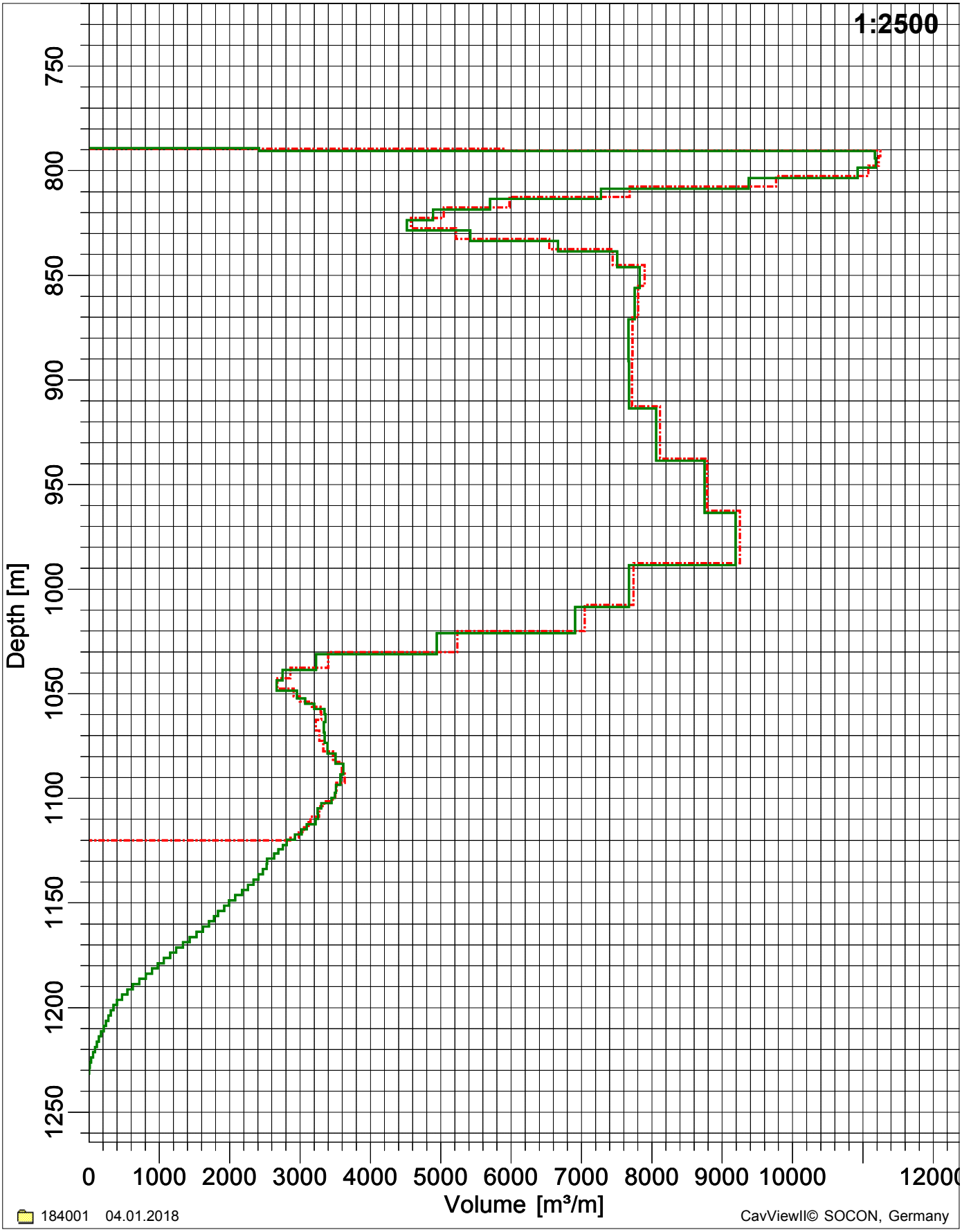
Heiligerlee H	PARTIAL VOLUME	04.01.2018



Partial volume

SOCON Sonar Control Kavernenvermessung GmbH

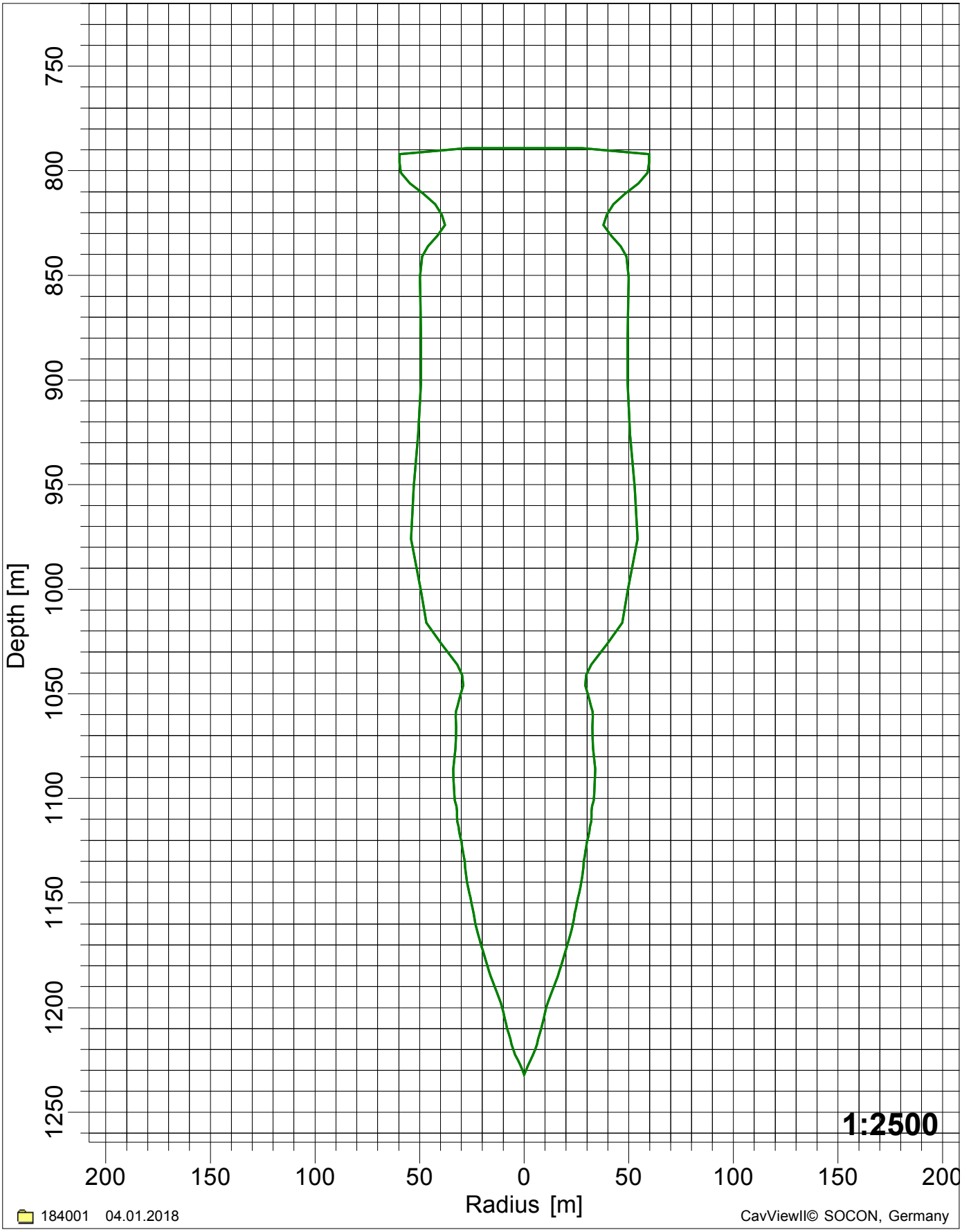
Heiligerlee H — PARTIAL VOLUME — 04.01.2018



Partial volume — Partial volume (17.05.2016)

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H — AVERAGE RADIUS — 04.01.2018

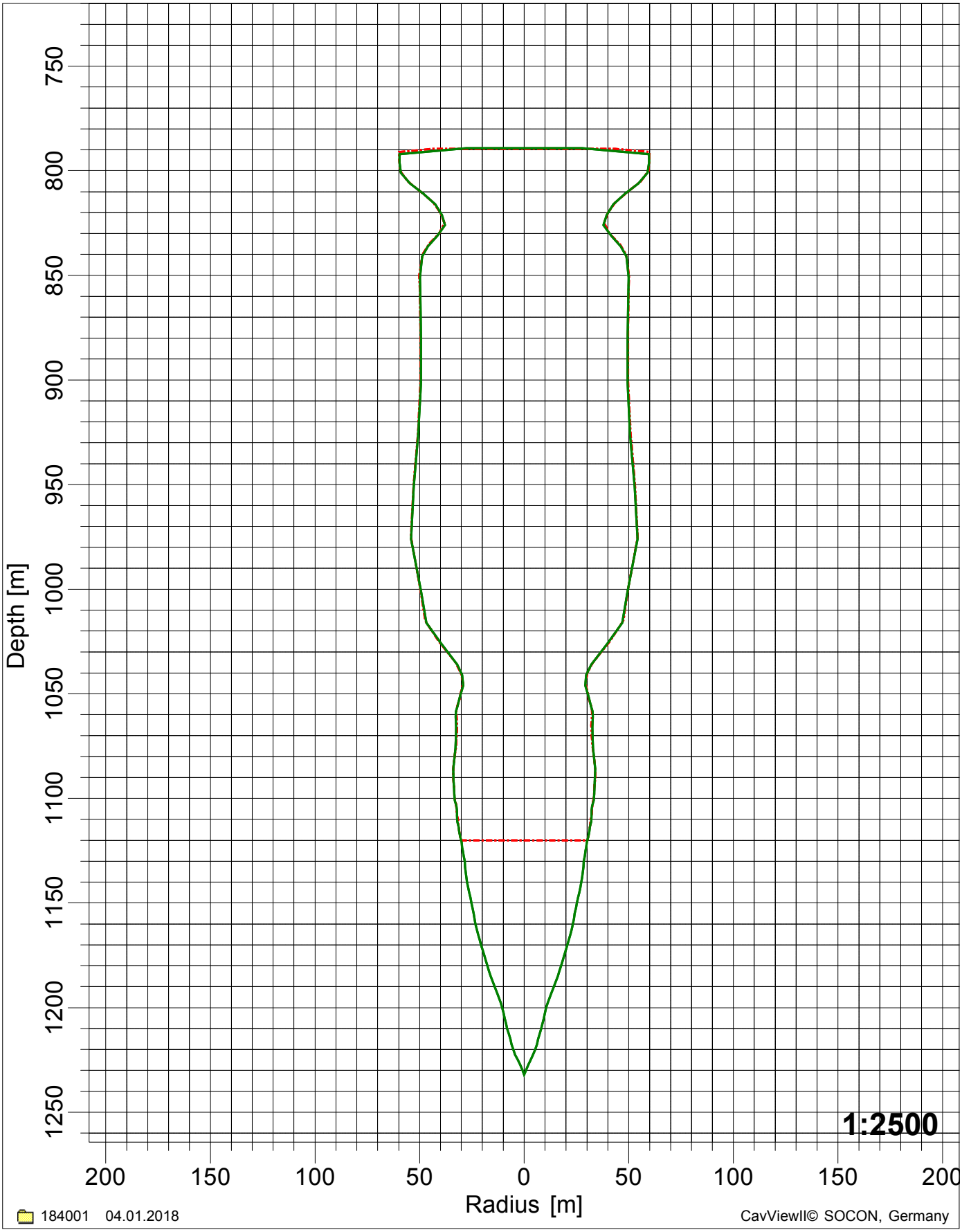


13 3/8" : 506.7 m

Average radius (04.01.2018)

SOCON Sonar Control Kavernenvermessung GmbH

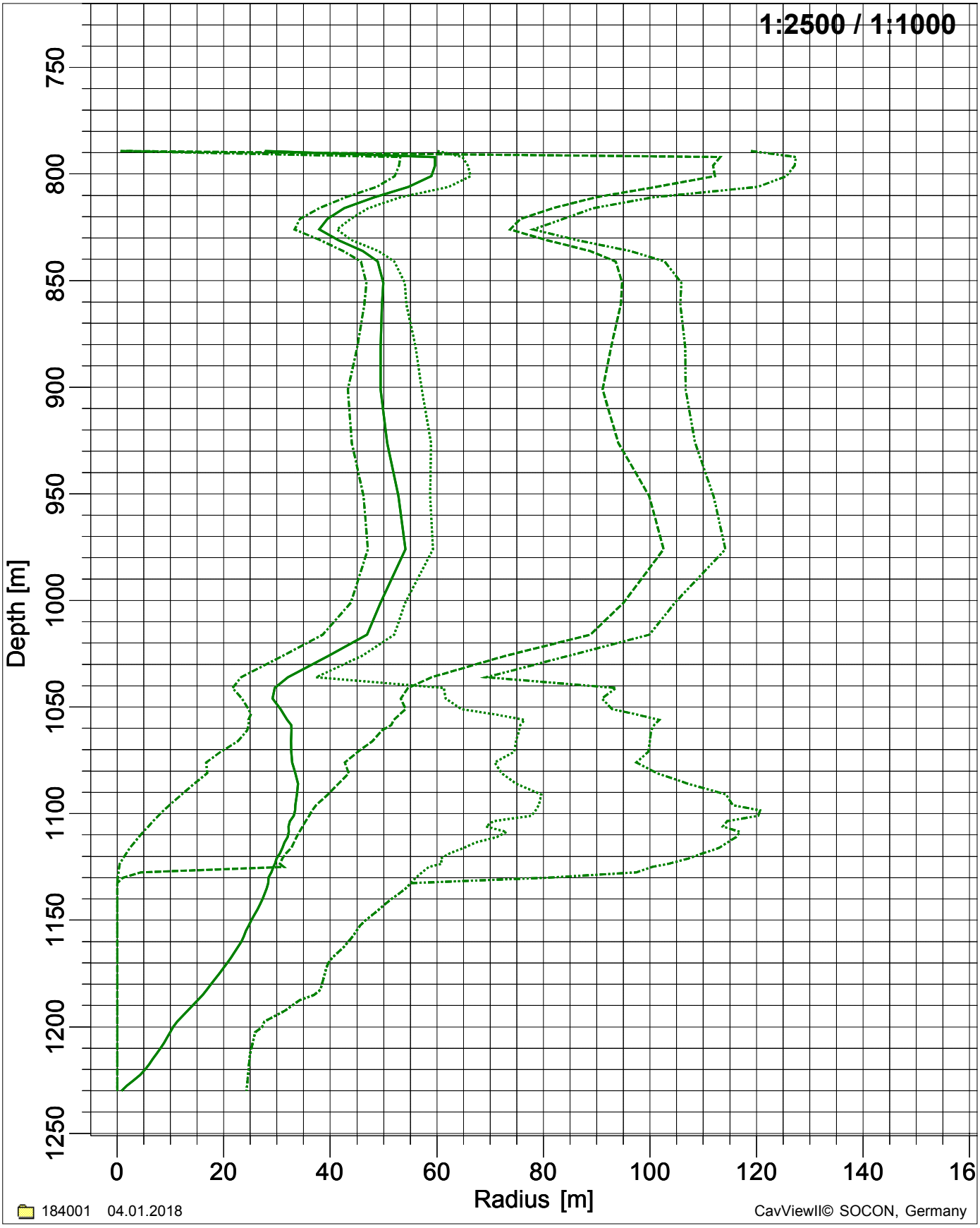
Heiligerlee H — AVERAGE RADIUS — 04.01.2018



Average radius (04.01.2018) | Average radius (17.05.2016) | 13 3/8" : 506.7 m

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H	Radii differences	04.01.2018



Average radius	Minimum radius	Maximum radius
Minimum diameter	Maximum diameter	

SOCON Sonar Control Kavernenvermessung GmbH

Table of radii and diameters

Cavity: Heiligerlee H 184001 04.01.2018

Depth [m]	Radius [MIN] [m]	[°]	Radius [MAX] [m]	[°]	Diameter [MIN] [m]	[°]	Diameter [MAX] [m]	[°]
789.2	0.6	214	60.1	0	1.7	138 <-> 318	118.9	0 <-> 180
792.0	53.1	243	64.8	103	113.2	59 <-> 239	127.4	3 <-> 183
796.0	52.9	293	65.8	113	111.9	61 <-> 241	127.1	178 <-> 358
801.0	52.1	295	66.4	358	112.2	67 <-> 247	125.6	178 <-> 358
806.0	48.7	268	62.2	193	101.2	73 <-> 253	120.2	13 <-> 193
811.0	42.8	273	53.1	97	89.7	68 <-> 248	100.4	133 <-> 313
816.0	37.9	298	47.1	98	81.8	70 <-> 250	89.4	8 <-> 188
821.0	34.3	281	43.8	123	75.7	56 <-> 236	83.7	163 <-> 343
826.0	33.3	293	41.2	13	73.7	113 <-> 293	78.0	3 <-> 183
831.0	38.1	258	44.0	103	80.6	47 <-> 227	86.3	173 <-> 353
836.0	42.3	258	49.0	153	88.7	54 <-> 234	96.2	168 <-> 348
841.0	45.7	268	52.0	148	93.6	54 <-> 234	102.7	168 <-> 348
851.0	46.8	23	54.0	348	94.8	52 <-> 232	105.9	168 <-> 348
861.0	46.4	266	54.3	128	94.5	33 <-> 213	105.7	158 <-> 338
881.0	45.1	255	56.0	123	92.7	49 <-> 229	106.6	133 <-> 313
901.0	43.3	249	57.1	118	91.1	50 <-> 230	106.7	133 <-> 313
926.0	44.0	240	58.9	118	94.0	50 <-> 230	108.5	158 <-> 338
951.0	46.2	251	58.7	123	99.8	60 <-> 240	111.9	148 <-> 328
976.0	47.0	249	59.2	123	102.6	71 <-> 251	114.2	153 <-> 333
1001.0	43.9	244	54.1	133	95.1	40 <-> 220	104.7	133 <-> 313
1016.0	38.6	198	52.0	123	88.8	18 <-> 198	99.9	133 <-> 313
1026.0	31.0	228	45.9	113	72.8	168 <-> 348	84.6	123 <-> 303
1036.0	23.2	258	37.3	103	59.0	47 <-> 227	69.3	123 <-> 303
1041.0	21.6	223	61.3	165	54.6	43 <-> 223	93.6	165 <-> 345
1046.0	23.4	283	61.6	160	53.2	163 <-> 343	91.0	160 <-> 340
1051.0	24.7	293	64.6	155	54.1	152 <-> 332	92.9	155 <-> 335
1053.5	25.0	254	71.1	150	53.0	163 <-> 343	97.5	150 <-> 330
1056.0	24.6	328	76.5	150	51.9	163 <-> 343	101.7	150 <-> 330
1058.5	24.7	328	75.7	150	51.4	163 <-> 343	100.8	150 <-> 330
1061.0	24.4	327	75.5	150	49.6	163 <-> 343	100.2	150 <-> 330
1066.0	22.7	212	74.8	143	47.9	32 <-> 212	100.0	143 <-> 323
1071.0	19.4	217	74.5	143	45.2	33 <-> 213	99.7	143 <-> 323
1076.0	16.7	217	70.9	143	42.7	37 <-> 217	97.4	143 <-> 323
1081.0	16.9	217	72.2	140	43.4	33 <-> 213	101.3	140 <-> 320
1086.0	14.4	221	74.9	140	41.5	41 <-> 221	107.1	140 <-> 320
1091.0	12.1	220	79.6	140	39.5	40 <-> 220	114.3	140 <-> 320
1096.0	9.7	220	79.1	138	37.3	42 <-> 222	115.6	138 <-> 318
1098.5	8.7	219	78.5	138	36.6	44 <-> 224	120.7	138 <-> 318
1101.0	7.7	221	77.7	138	36.0	46 <-> 226	120.3	138 <-> 318
1103.5	6.7	218	70.6	135	35.4	49 <-> 229	114.5	135 <-> 315
1106.0	5.8	220	69.2	135	34.8	49 <-> 229	113.7	135 <-> 315
1108.5	4.8	221	73.1	138	34.2	45 <-> 225	116.9	138 <-> 318
1111.0	4.0	217	71.2	138	33.7	47 <-> 227	116.2	138 <-> 318
1113.5	3.2	221	67.3	135	33.2	47 <-> 227	114.5	135 <-> 315
1116.0	2.4	220	65.1	135	32.7	28 <-> 208	113.0	133 <-> 313
1118.5	1.7	218	62.5	135	31.7	32 <-> 212	110.0	133 <-> 313
1121.0	1.1	221	60.7	128	31.0	33 <-> 213	107.2	133 <-> 313
1123.5	0.5	203	60.9	128	30.5	33 <-> 213	103.5	133 <-> 313
1125.0	0.4	205	58.4	130	31.3	30 <-> 210	100.4	135 <-> 315

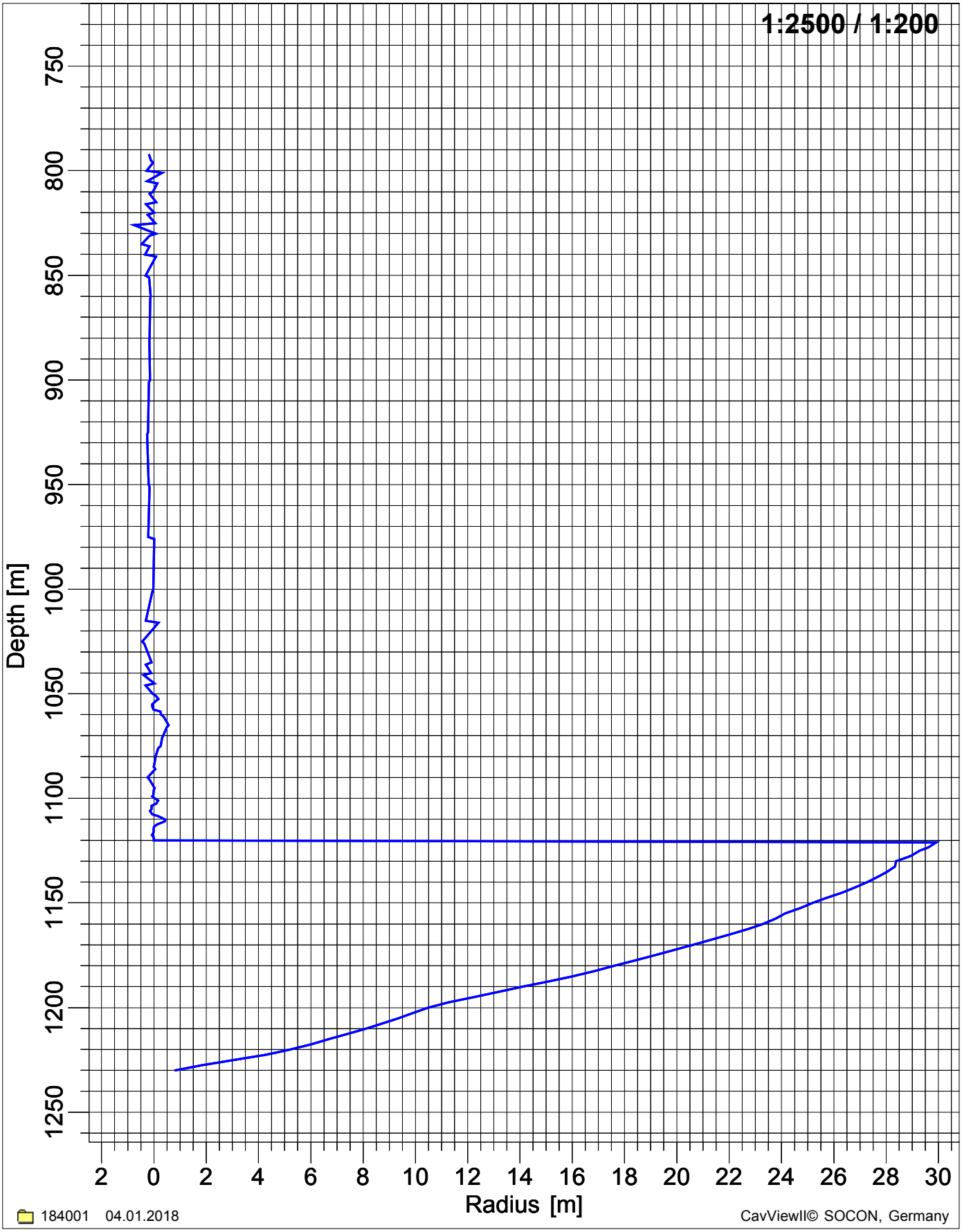
Table of radii and diameters

Cavity: Heiligerlee H 184001 04.01.2018

Depth [m]	Radius [MIN] [m]	[°]	Radius [MAX] [m]	[°]	Diameter [MIN] [m]	[°]	Diameter [MAX] [m]	[°]
1127.5	0.2	202	57.2	130	4.4	137 <-> 317	97.4	135 <-> 315
1130.0	0.1	200	56.0	130	1.1	137 <-> 317	80.9	135 <-> 315
1132.5	0.0	0	55.1	130	0.0	0 <-> 180	55.1	130 <-> 310
1135.0	0.0	0	54.1	130	0.0	0 <-> 180	54.1	130 <-> 310
1137.5	0.0	0	52.9	130	0.0	0 <-> 180	52.9	130 <-> 310
1140.0	0.0	0	51.5	130	0.0	0 <-> 180	51.5	130 <-> 310
1142.5	0.0	0	50.2	130	0.0	0 <-> 180	50.2	130 <-> 310
1145.0	0.0	0	49.1	130	0.0	0 <-> 180	49.1	130 <-> 310
1147.5	0.0	0	47.9	130	0.0	0 <-> 180	47.9	130 <-> 310
1150.0	0.0	0	46.6	130	0.0	0 <-> 180	46.6	130 <-> 310
1152.5	0.0	0	45.6	130	0.0	0 <-> 180	45.6	130 <-> 310
1155.0	0.0	0	44.9	130	0.0	0 <-> 180	44.9	130 <-> 310
1157.5	0.0	0	44.2	130	0.0	0 <-> 180	44.2	130 <-> 310
1160.0	0.0	0	43.4	130	0.0	0 <-> 180	43.4	130 <-> 310
1162.5	0.0	0	42.5	130	0.0	0 <-> 180	42.5	130 <-> 310
1165.0	0.0	0	41.5	130	0.0	0 <-> 180	41.5	130 <-> 310
1167.5	0.0	0	40.4	330	0.0	0 <-> 180	40.4	150 <-> 330
1170.0	0.0	0	39.6	335	0.0	0 <-> 180	39.6	155 <-> 335
1172.5	0.0	0	39.2	335	0.0	0 <-> 180	39.2	155 <-> 335
1175.0	0.0	0	39.0	335	0.0	0 <-> 180	39.0	155 <-> 335
1177.5	0.0	0	38.7	335	0.0	0 <-> 180	38.7	155 <-> 335
1180.0	0.0	0	38.4	335	0.0	0 <-> 180	38.4	155 <-> 335
1182.5	0.0	0	38.2	335	0.0	0 <-> 180	38.2	155 <-> 335
1185.0	0.0	0	36.9	335	0.0	0 <-> 180	36.9	155 <-> 335
1187.5	0.0	0	34.3	340	0.0	0 <-> 180	34.3	160 <-> 340
1190.0	0.0	0	32.8	345	0.0	0 <-> 180	32.8	165 <-> 345
1192.5	0.0	0	31.4	345	0.0	0 <-> 180	31.4	165 <-> 345
1195.0	0.0	0	29.5	345	0.0	0 <-> 180	29.5	165 <-> 345
1197.5	0.0	0	27.6	0	0.0	0 <-> 180	27.6	0 <-> 180
1200.0	0.0	0	27.2	120	0.0	0 <-> 180	27.2	120 <-> 300
1202.5	0.0	0	25.9	35	0.0	0 <-> 180	25.9	35 <-> 215
1205.0	0.0	0	25.7	35	0.0	0 <-> 180	25.7	35 <-> 215
1207.5	0.0	0	25.4	35	0.0	0 <-> 180	25.4	35 <-> 215
1210.0	0.0	0	25.2	35	0.0	0 <-> 180	25.2	35 <-> 215
1212.5	0.0	0	24.9	35	0.0	0 <-> 180	24.9	35 <-> 215
1215.0	0.0	0	24.8	45	0.0	0 <-> 180	24.8	45 <-> 225
1217.5	0.0	0	24.7	45	0.0	0 <-> 180	24.7	45 <-> 225
1220.0	0.0	0	24.6	45	0.0	0 <-> 180	24.6	45 <-> 225
1222.5	0.0	0	24.6	45	0.0	0 <-> 180	24.6	45 <-> 225
1225.0	0.0	0	24.5	45	0.0	0 <-> 180	24.5	45 <-> 225
1227.5	0.0	0	24.4	45	0.0	0 <-> 180	24.4	45 <-> 225
1230.0	0.0	0	24.3	45	0.0	0 <-> 180	24.3	45 <-> 225

SOCON Sonar Control Kavernenvermessung GmbH

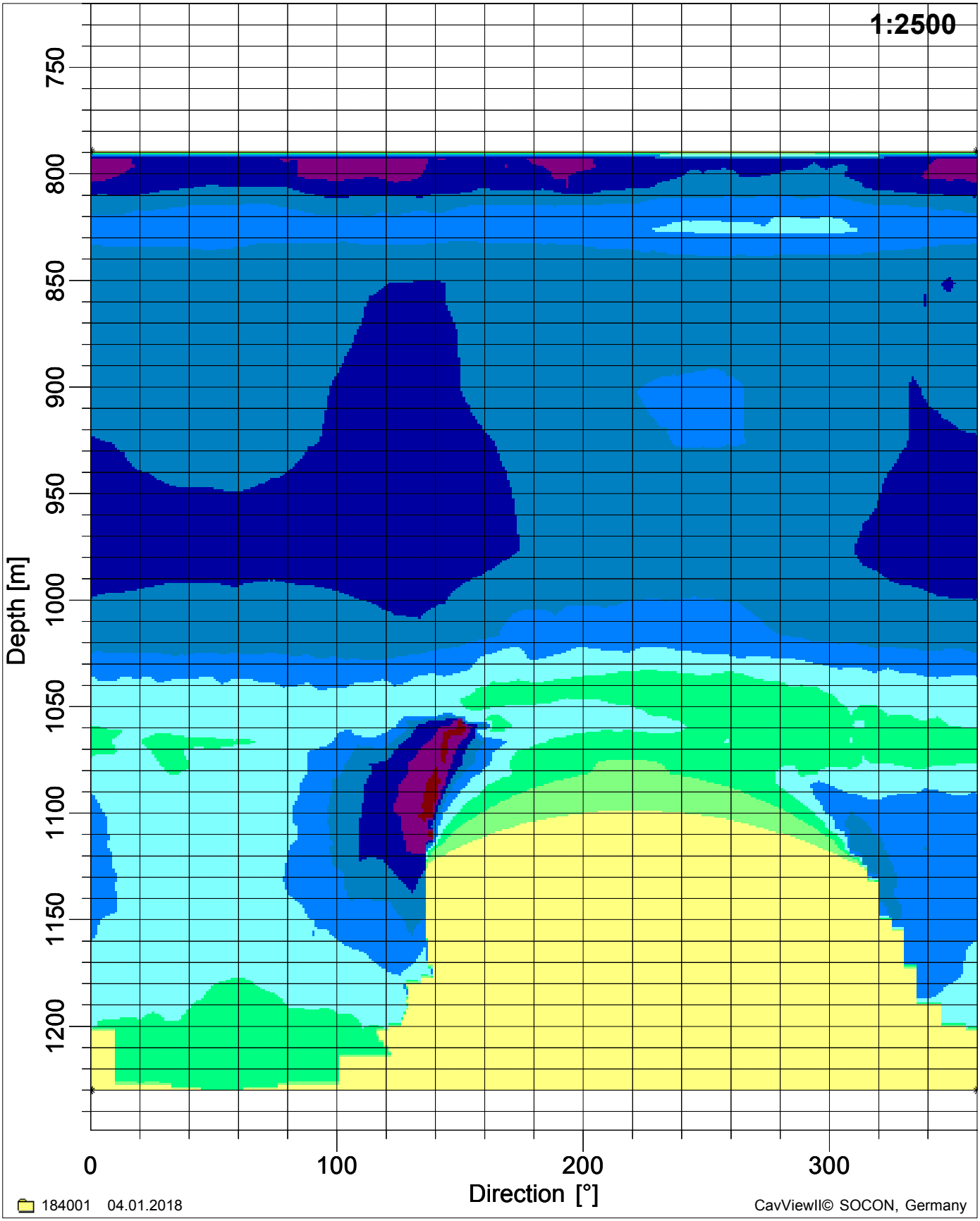
Heiligerlee H	Radii differences	04.01.2018



Difference - Average radius (04.01.2018/17.05.2016)

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H	RADII MAP	04.01.2018



0.00 - 8.85 m	8.85 - 17.69 m	17.69 - 26.54 m	26.54 - 35.38 m	35.38 - 44.23 m
44.23 - 53.07 m	53.07 - 61.92 m	61.92 - 70.76 m	70.76 - 79.61 m	

Heiligerlee H --> 0° <--

Heiligerlee H --> 60° <--

Heiligerlee H --> 120° <--

Heiligerlee H --> 180° <--

Heiligerlee H --> 240° <--

Heiligerlee H --> 300° <--

HORIZONTAL SECTIONS

Cavity: Heiligerlee H Report No.: 184001

Utilized speed of sound.: 1817.1 m/s to 1821.1 m/s

Measuring date: 04.01.2018 Scale: 1 : 1000

Horizontal sections measured at following depths:

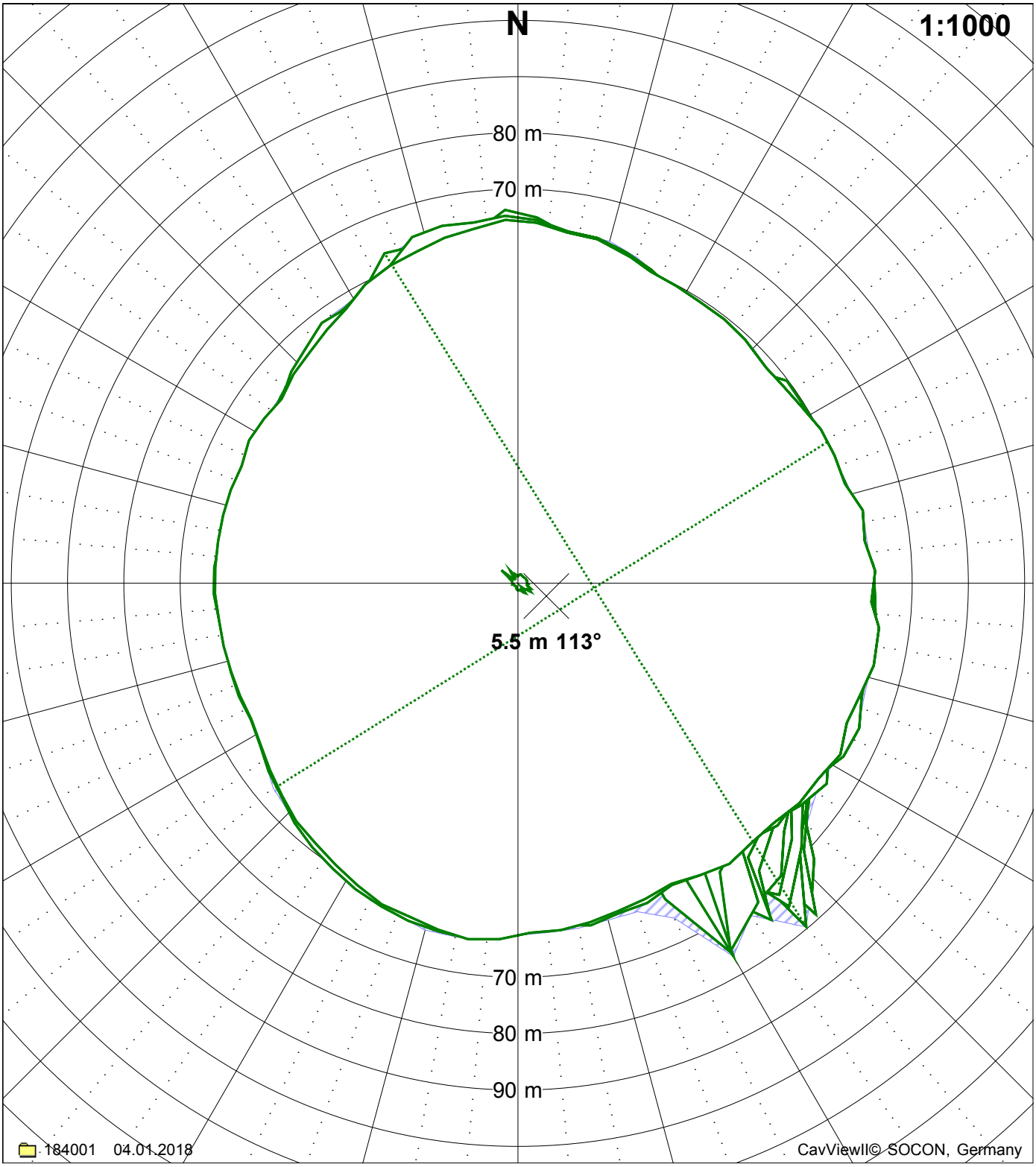
789.2 m	792.0 m	796.0 m	801.0 m	806.0 m	811.0 m	816.0 m
821.0 m	826.0 m	831.0 m	836.0 m	841.0 m	851.0 m	861.0 m
881.0 m	901.0 m	926.0 m	951.0 m	976.0 m	1001.0 m	1016.0 m
1026.0 m	1036.0 m	1041.0 m	1046.0 m	1051.0 m	1053.5 m	1056.0 m
1058.5 m	1061.0 m	1066.0 m	1071.0 m	1076.0 m	1081.0 m	1086.0 m
1091.0 m	1096.0 m	1098.5 m	1101.0 m	1103.5 m	1106.0 m	1108.5 m
1111.0 m	1113.5 m	1116.0 m	1118.5 m	1121.0 m	1123.5 m	

The following 43 sections are constructed:

1125.0 m	1127.5 m	1130.0 m	1132.5 m	1135.0 m	1137.5 m	1140.0 m
1142.5 m	1145.0 m	1147.5 m	1150.0 m	1152.5 m	1155.0 m	1157.5 m
1160.0 m	1162.5 m	1165.0 m	1167.5 m	1170.0 m	1172.5 m	1175.0 m
1177.5 m	1180.0 m	1182.5 m	1185.0 m	1187.5 m	1190.0 m	1192.5 m
1195.0 m	1197.5 m	1200.0 m	1202.5 m	1205.0 m	1207.5 m	1210.0 m
1212.5 m	1215.0 m	1217.5 m	1220.0 m	1222.5 m	1225.0 m	1227.5 m
1230.0 m						

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H	MAXPLOT	04.01.2018



V-Maxplot (04.01.2018) (11673.5 m²) | Horizontal sections | a/b

Center of gravity

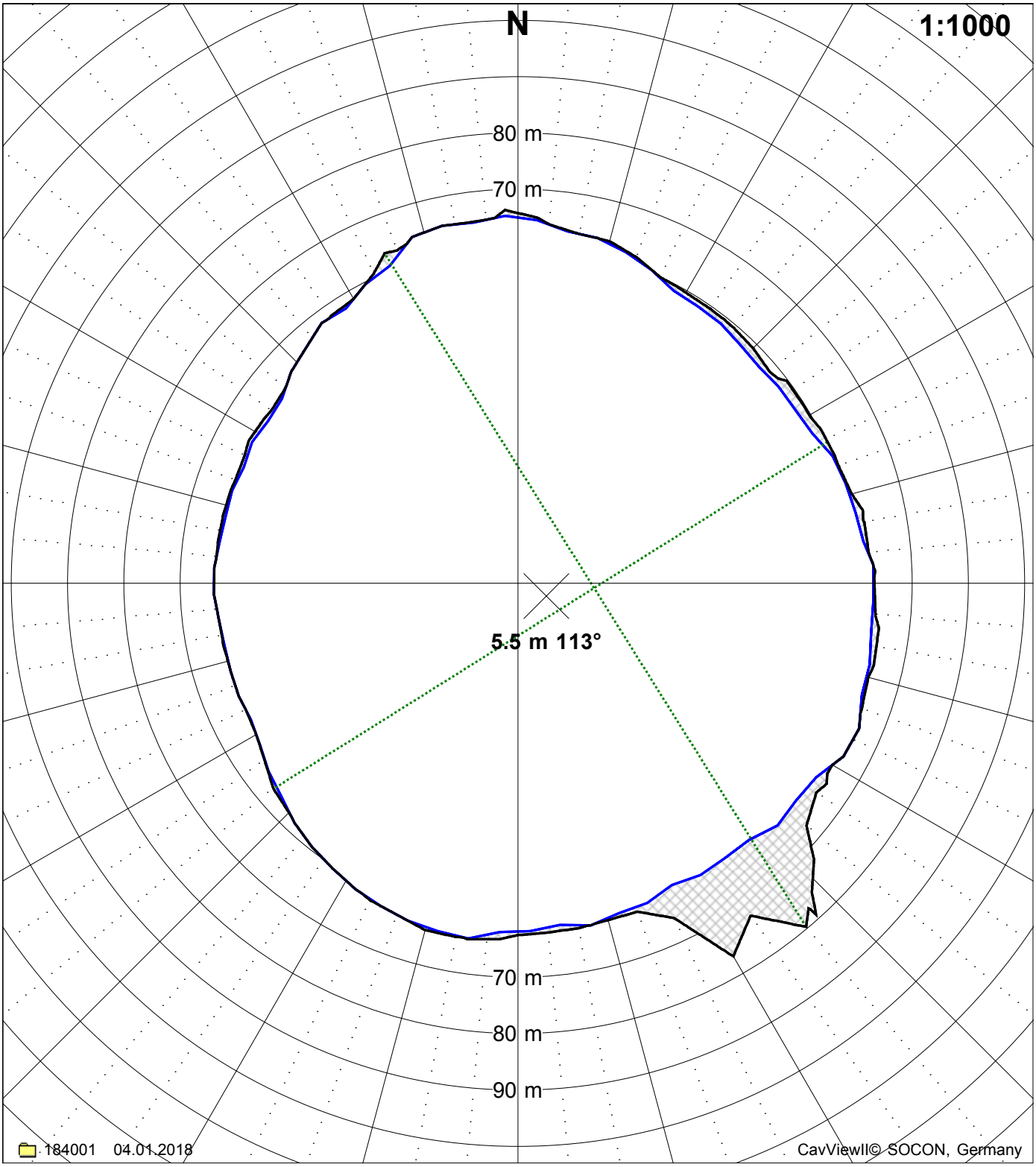
H/V-Maxplot: d_{max}: 136.5 m 140° <--> 320° r_{min}: 53.3 m -> 245° r~: 61.0 m r_{max}: 79.6 m -> 140°

H/V-Maxplot: a/b = 1.216 a = 141.1 m (139°-338°) b = 116.1 m (65°-230°)

Area from vertical sections: 11673.5 m², Area from horizontal and vertical sections: 11709.6 m²

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H	MAXPLOT	04.01.2018



a/b	Center of gravity	H/V-Maxplot (04.01.2018) (11709.6 m²)
Largest single area		

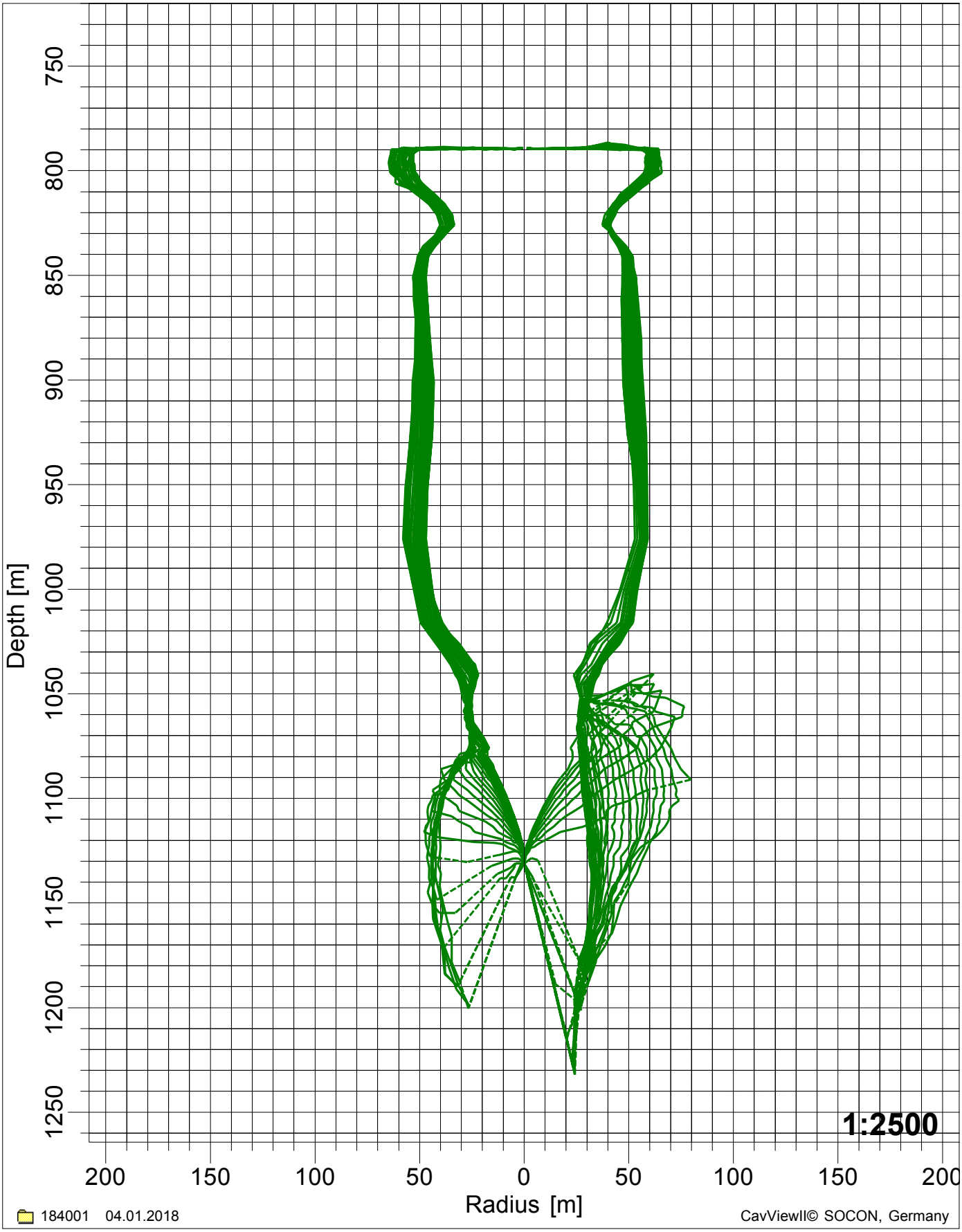
H/V-Maxplot: d_{max}: 136.5 m 140° <--> 320° r_{min}: 53.3 m -> 245° r~: 61.0 m r_{max}: 79.6 m -> 140°

H/V-Maxplot: a/b = 1.216 a = 141.1 m (139°-338°) b = 116.1 m (65°-230°)

Largest single area: 11180.6 m² in depth: 796.0 m

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H | **MAXPLOT** | **04.01.2018**

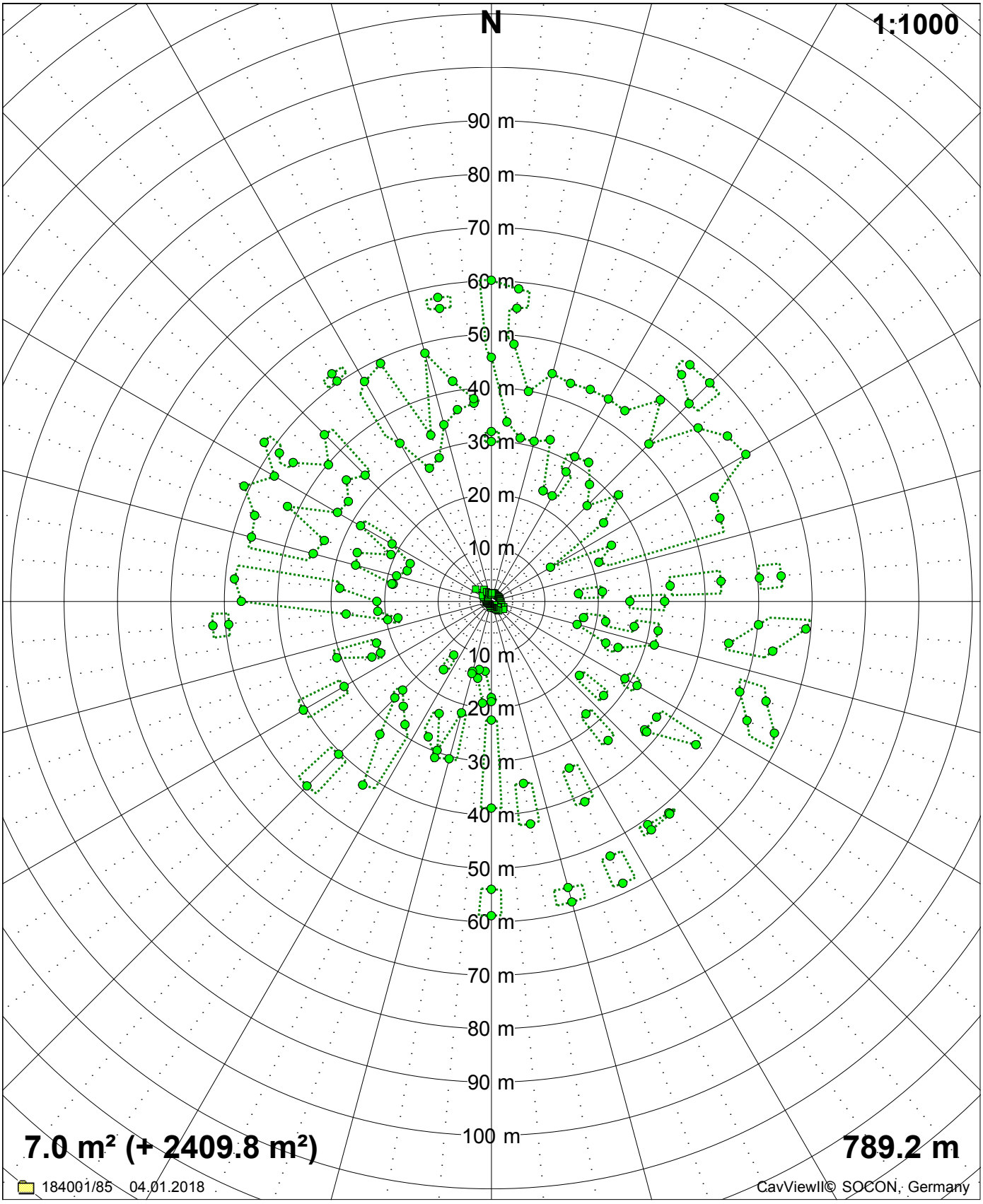


13 3/8" : 506.7 m

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



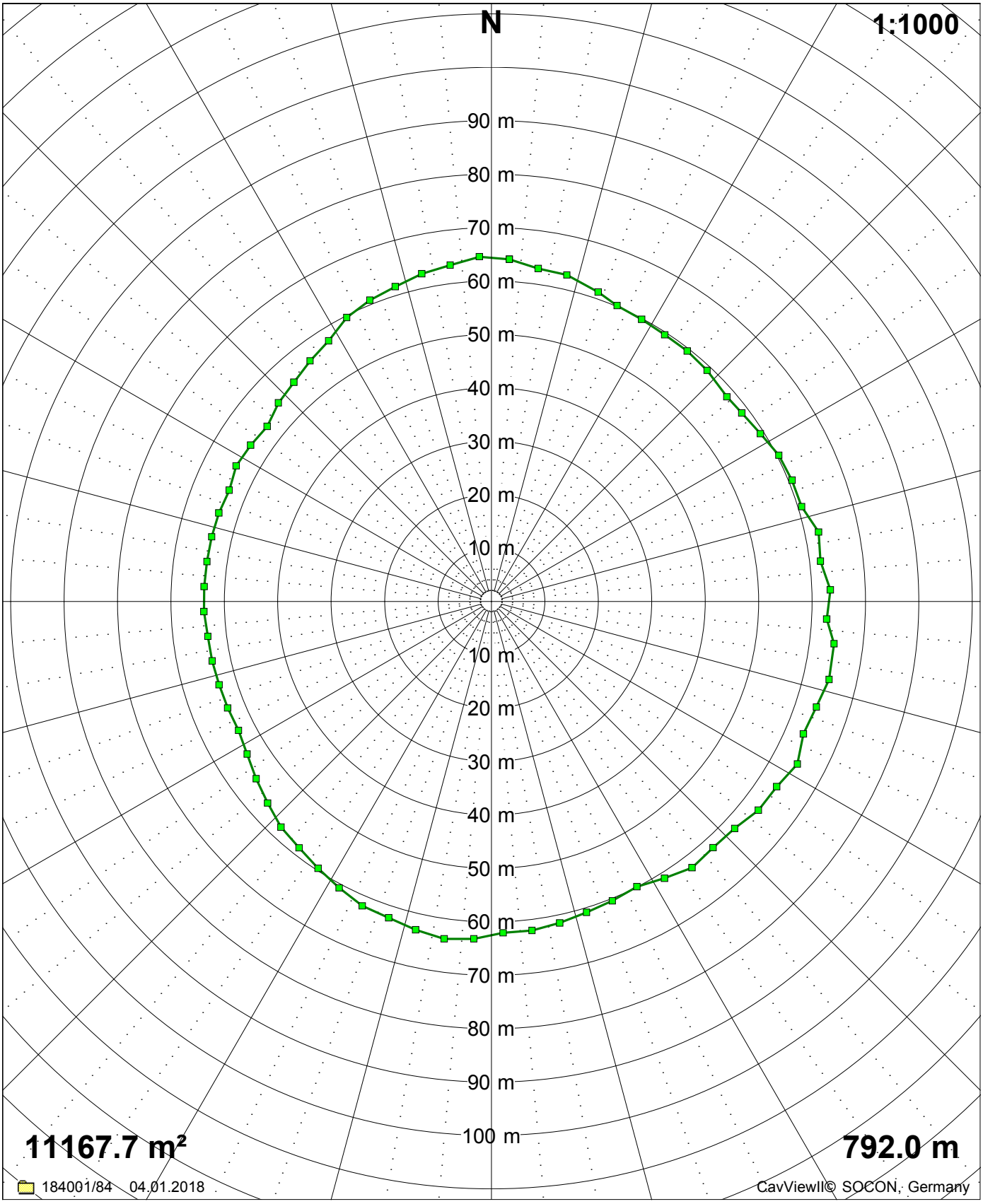
(04.01.2018) (2416.8 m²) | Leached pocket (04.01.2018)

d_{max}: 118.9 m 0° <--> 180° r_{min}: 0.6 m -> 214° r~: 27.7 m r_{max}: 60.1 m -> 0°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



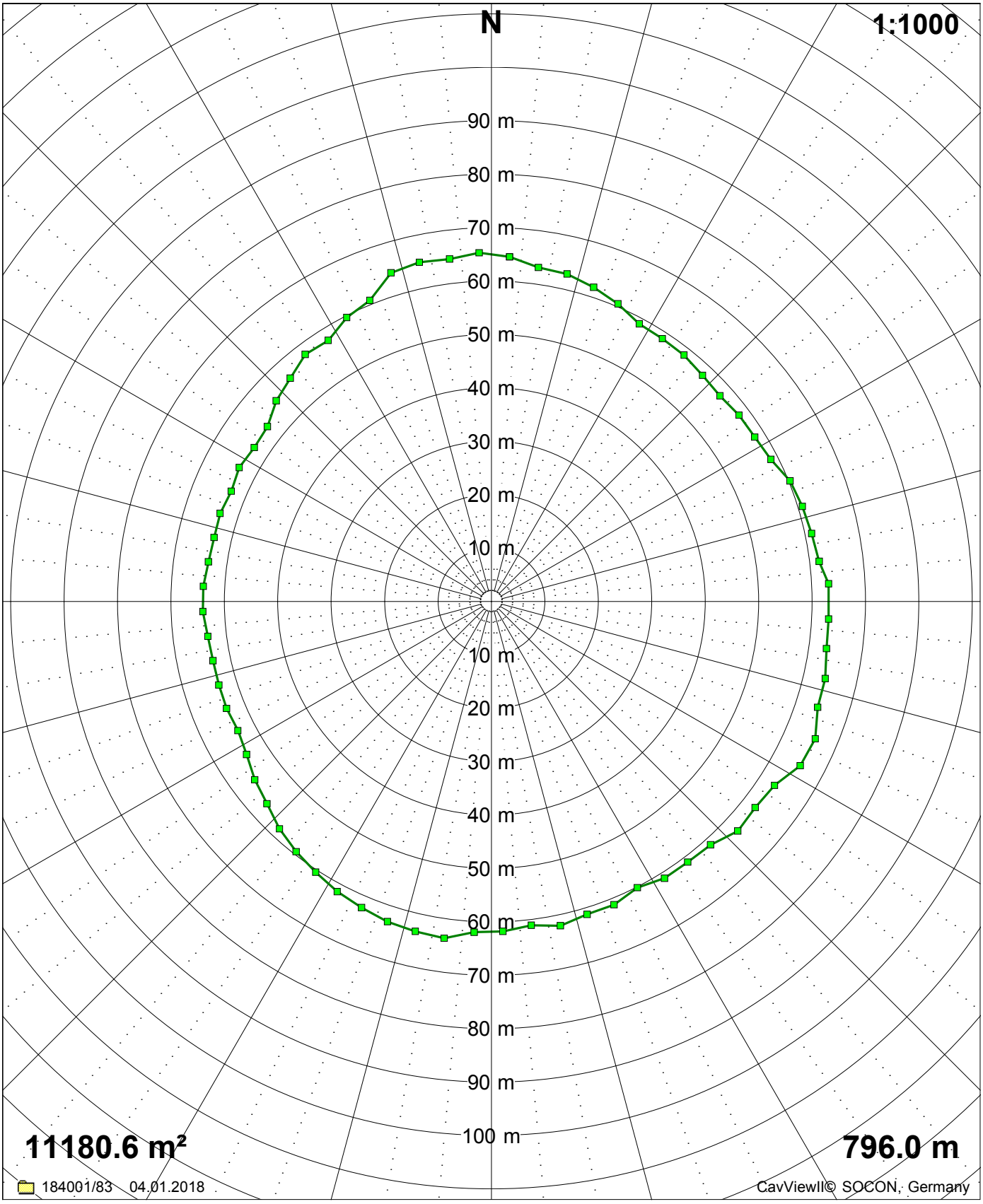
(04.01.2018) (11167.7 m²)

d_{max}: 127.4 m 3° <--> 183° r_{min}: 53.1 m -> 243° r~: 59.6 m r_{max}: 64.8 m -> 103°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



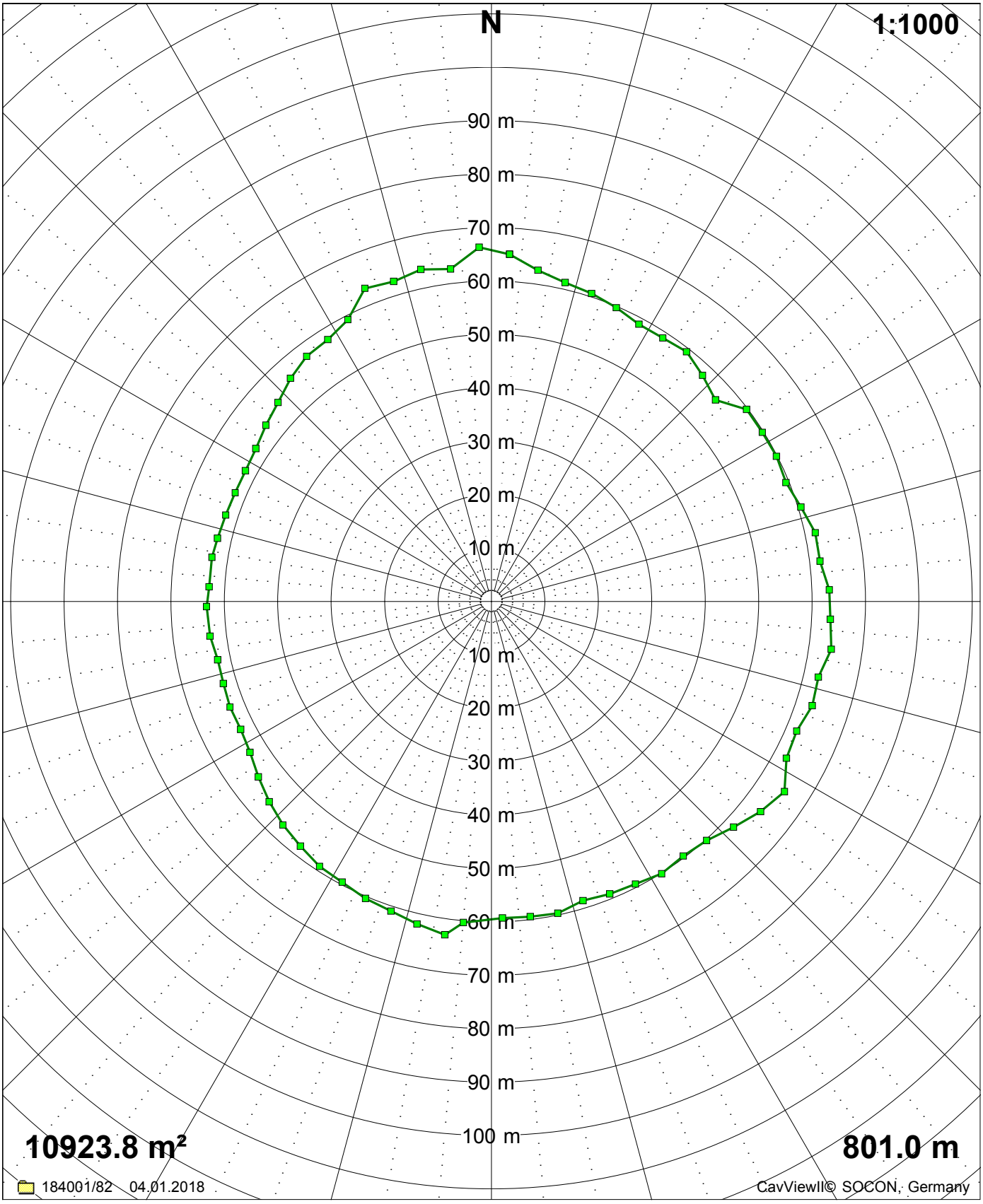
(04.01.2018) (11180.6 m²)

d_{max}: 127.1 m 178° <--> 358° r_{min}: 52.9 m -> 293° r~: 59.7 m r_{max}: 65.8 m -> 113°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



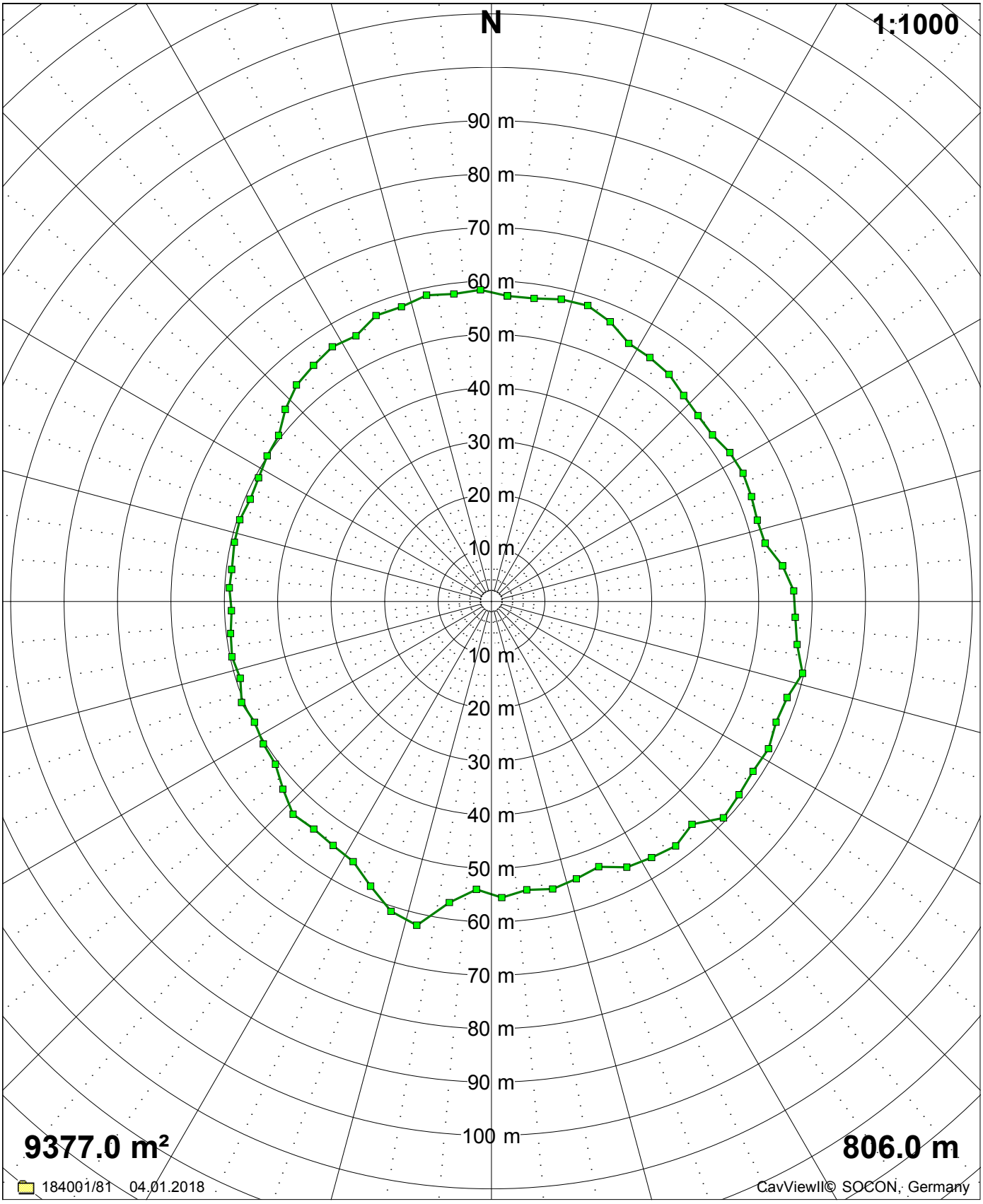
(04.01.2018) (10923.8 m²)

d_{max}: 125.6 m 178° <--> 358° r_{min}: 52.1 m -> 295° r~: 59.0 m r_{max}: 66.3 m -> 358°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



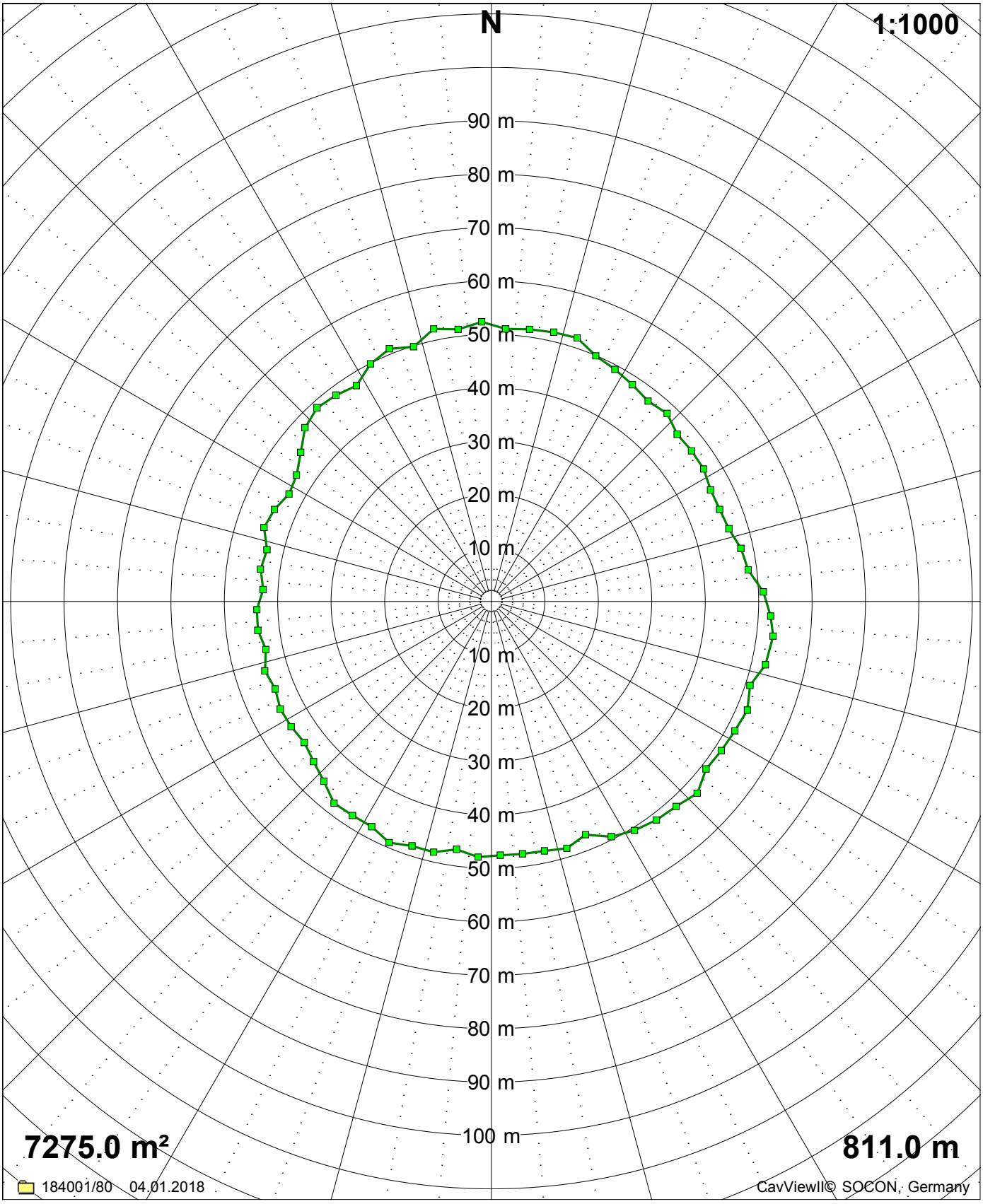
(04.01.2018) (9377.0 m²)

d_{max}: 120.2 m 13° <--> 193° r_{min}: 48.7 m -> 268° r~: 54.6 m r_{max}: 62.2 m -> 193°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



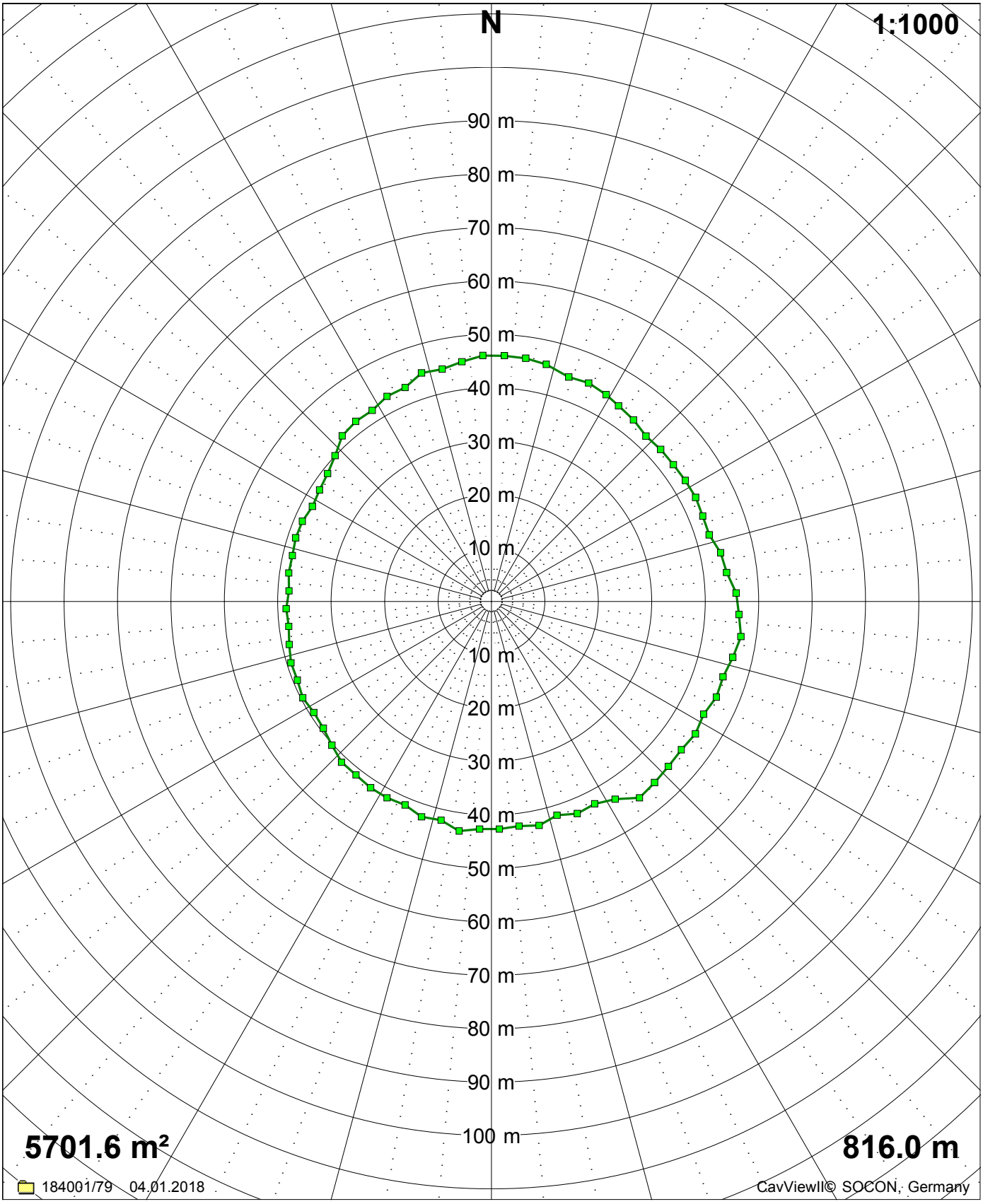
(04.01.2018) (7275.0 m²)

d_{max}: 100.4 m 133° <--> 313° r_{min}: 42.8 m -> 273° r~: 48.1 m r_{max}: 53.1 m -> 97°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



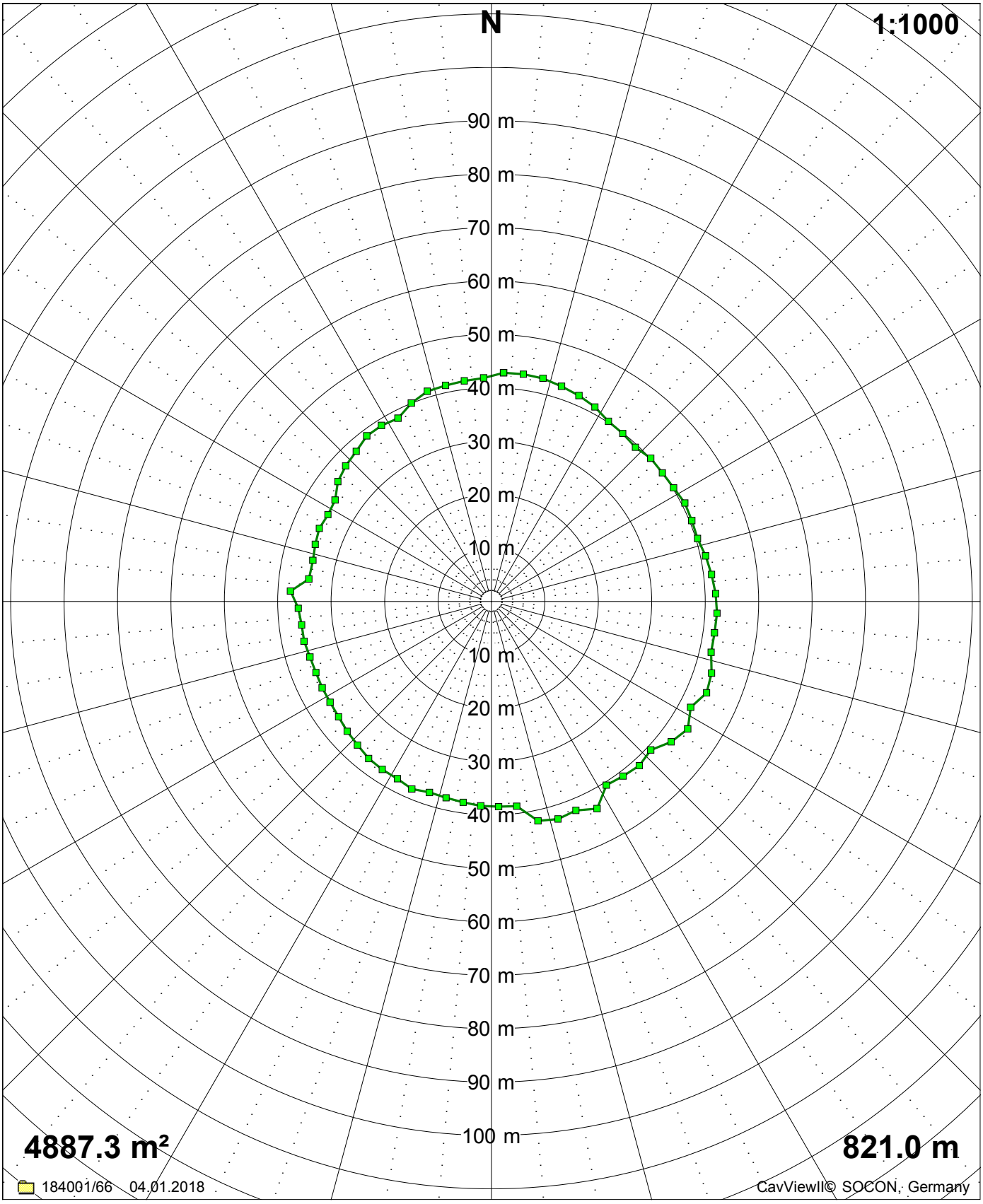
(04.01.2018) (5701.6 m²)

d_{max}: 89.4 m 8° <--> 188° r_{min}: 37.9 m -> 298° r~: 42.6 m r_{max}: 47.1 m -> 98°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



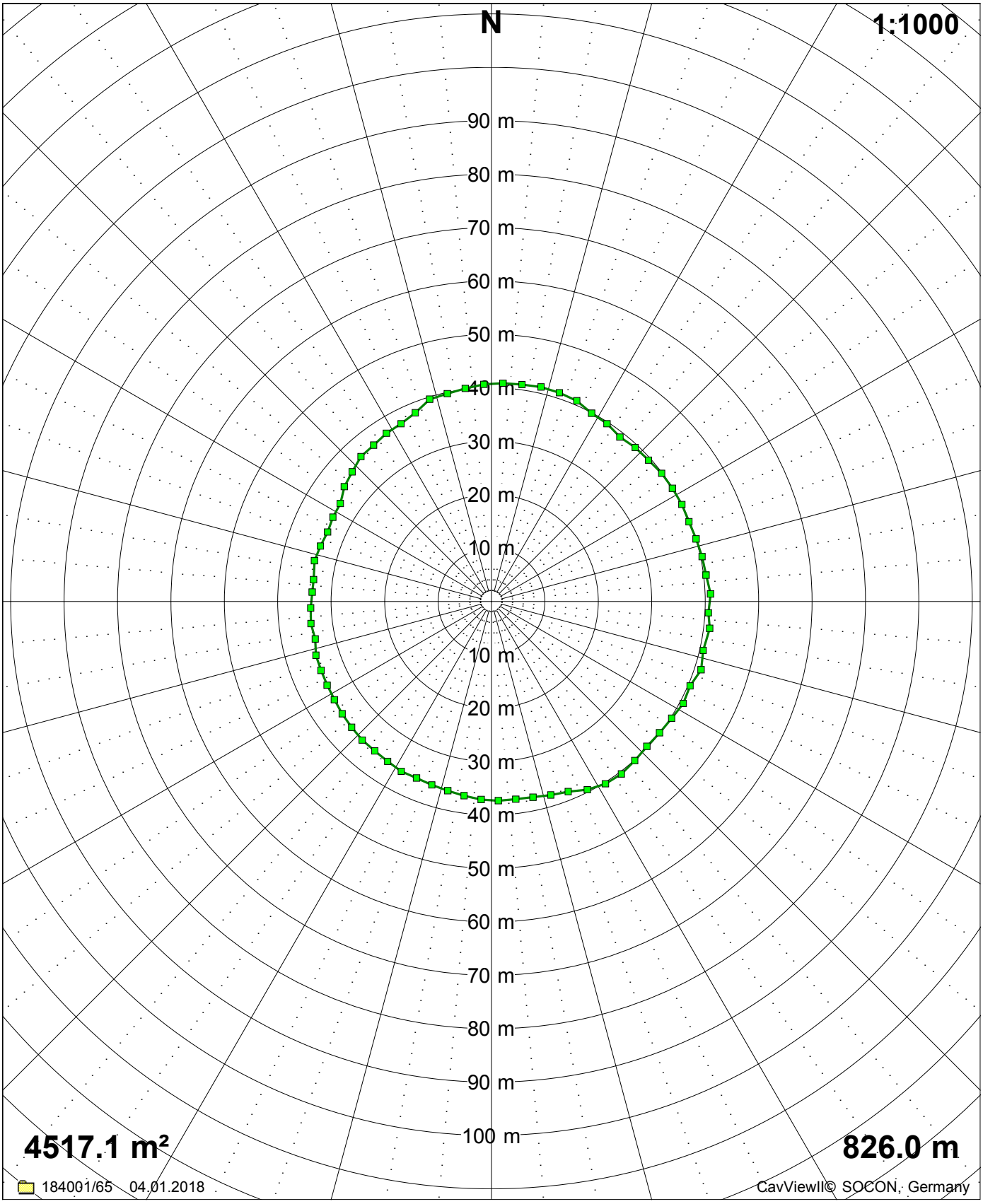
(04.01.2018) (4887.3 m²)

d_{max}: 83.7 m 163° <--> 343° r_{min}: 34.3 m -> 281° r~: 39.4 m r_{max}: 43.8 m -> 123°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



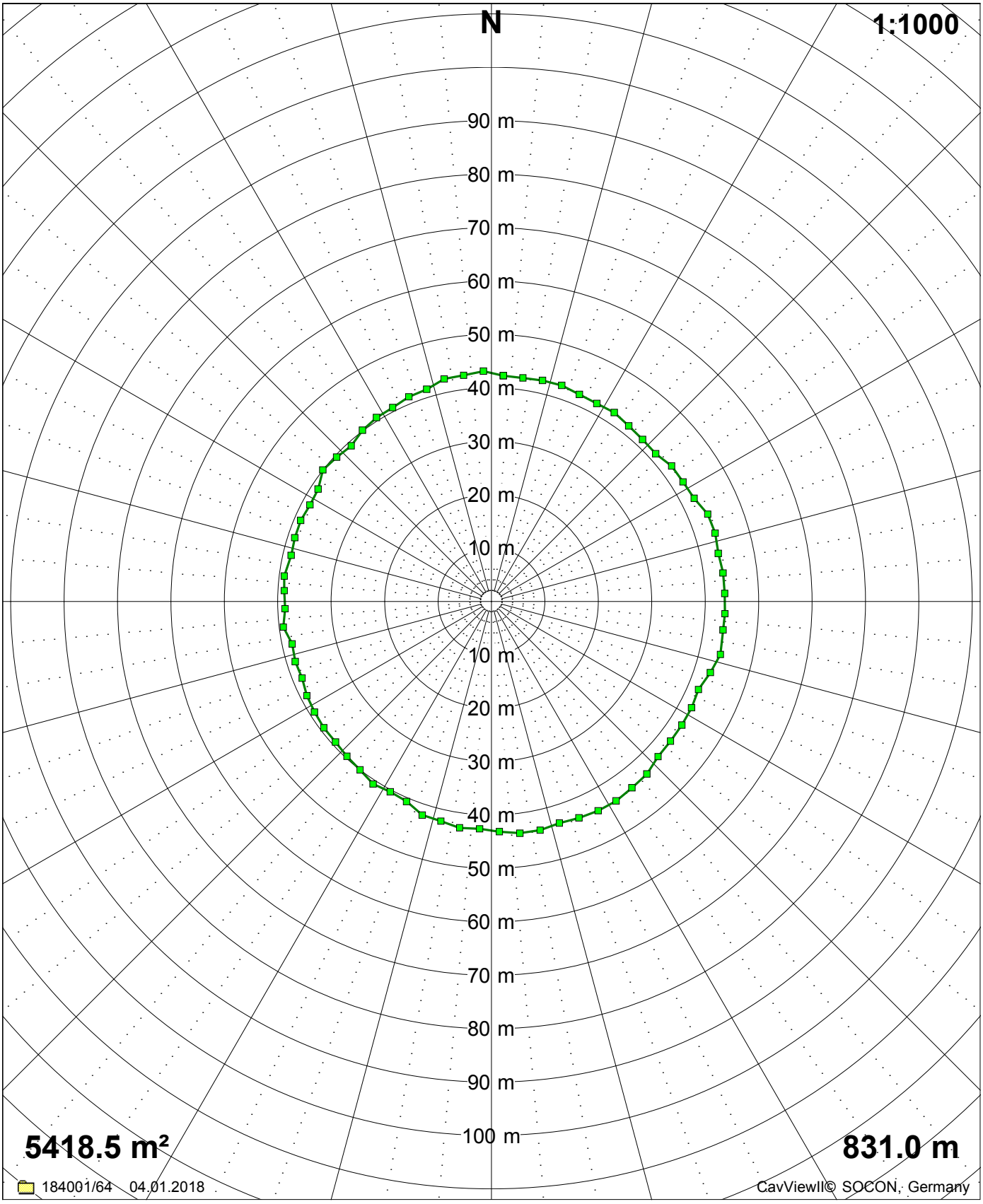
(04.01.2018) (4517.1 m²)

d_{max}: 78.0 m 3° <--> 183° r_{min}: 33.3 m -> 293° r~: 37.9 m r_{max}: 41.2 m -> 13°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



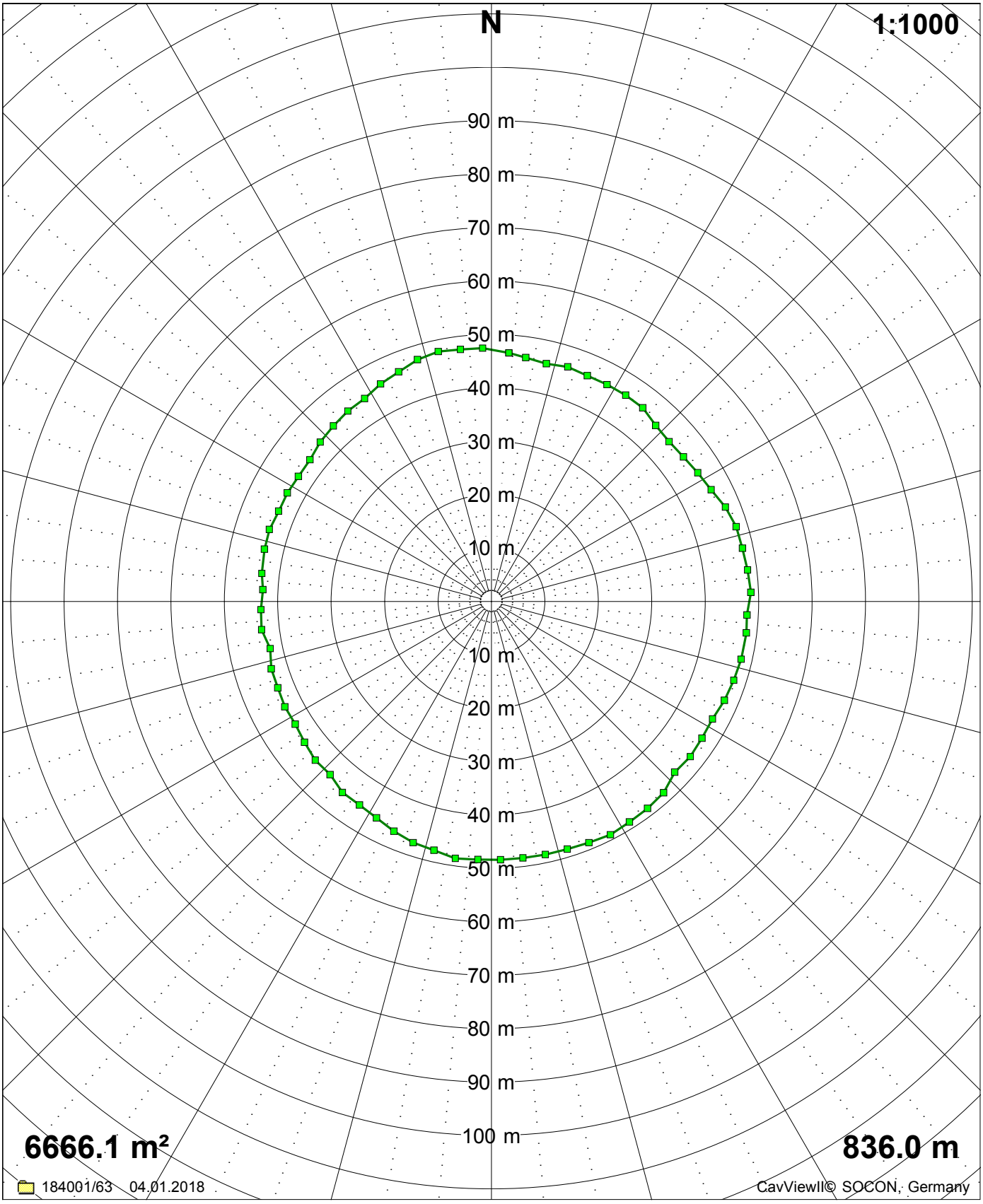
(04.01.2018) (5418.5 m²)

d_{max}: 86.3 m 173° <--> 353° r_{min}: 38.1 m -> 258° r~: 41.5 m r_{max}: 44.0 m -> 103°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



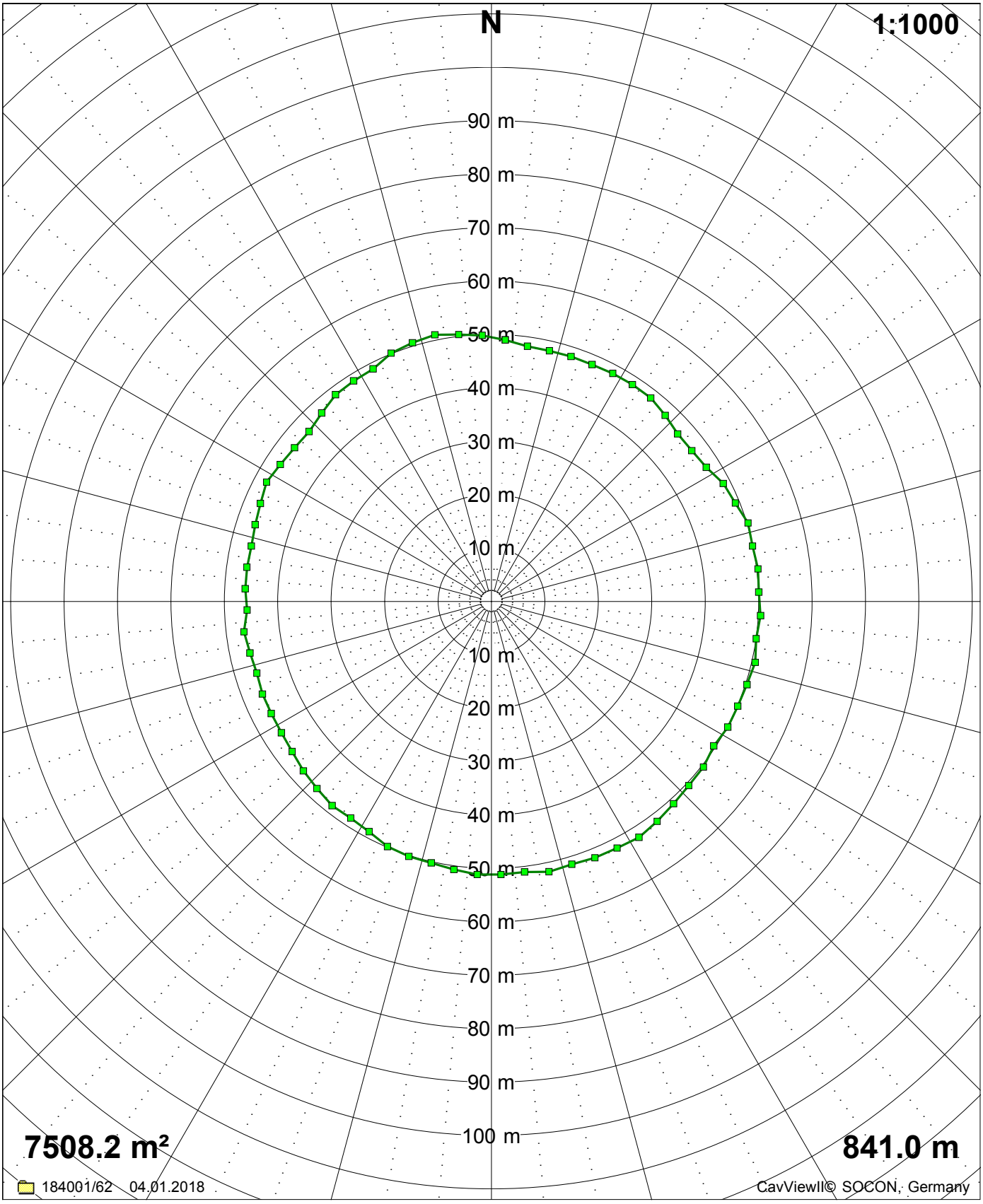
(04.01.2018) (6666.1 m²)

d_{max}: 96.2 m 168° <--> 348° r_{min}: 42.3 m -> 258° r~: 46.1 m r_{max}: 49.0 m -> 153°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



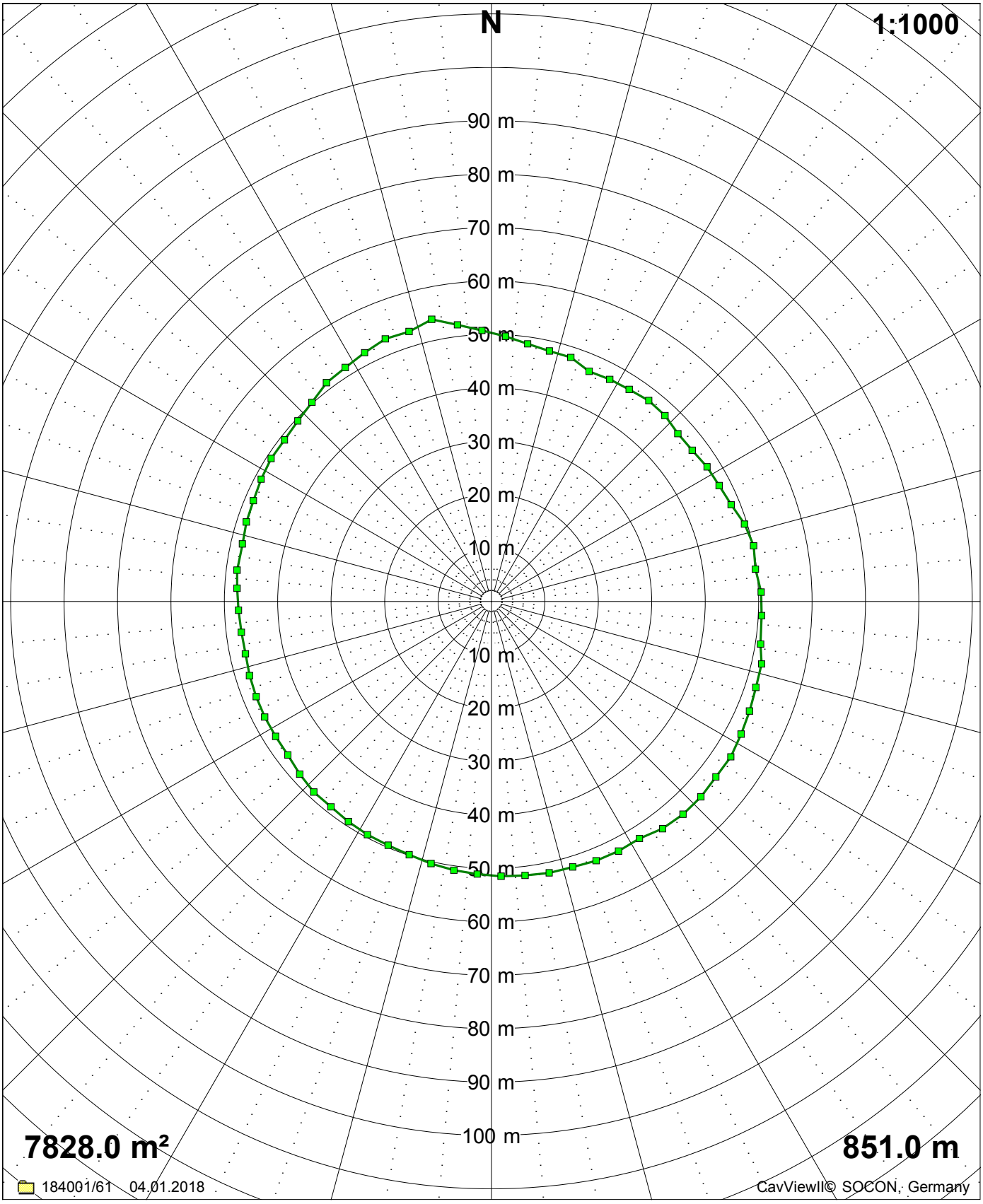
(04.01.2018) (7508.2 m²)

d_{max}: 102.7 m 168° <--> 348° r_{min}: 45.7 m -> 268° r~: 48.9 m r_{max}: 52.0 m -> 148°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



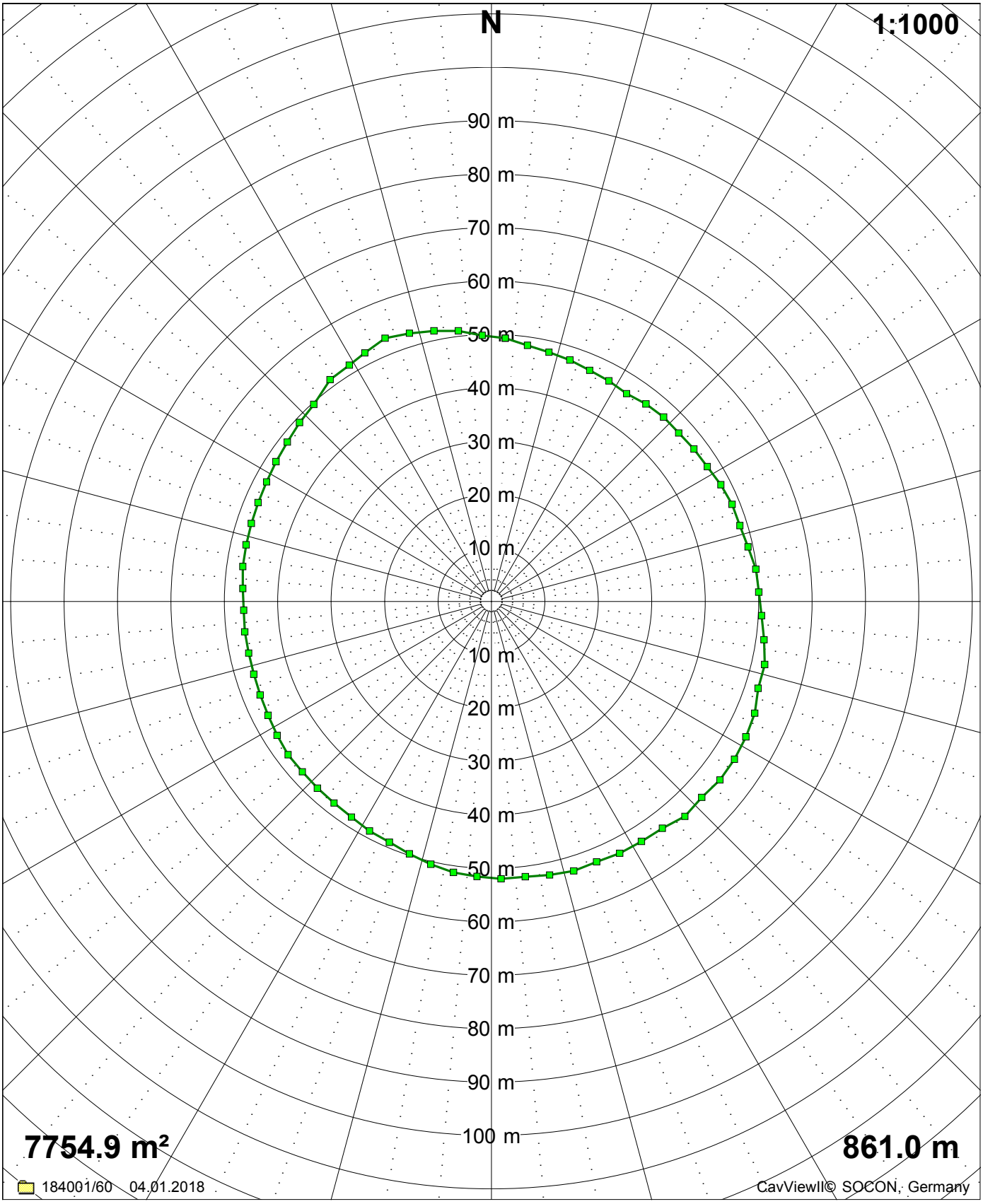
(04.01.2018) (7828.0 m²)

d_{max}: 105.9 m 168° <--> 348° r_{min}: 46.8 m -> 23° r~: 49.9 m r_{max}: 54.0 m -> 348°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



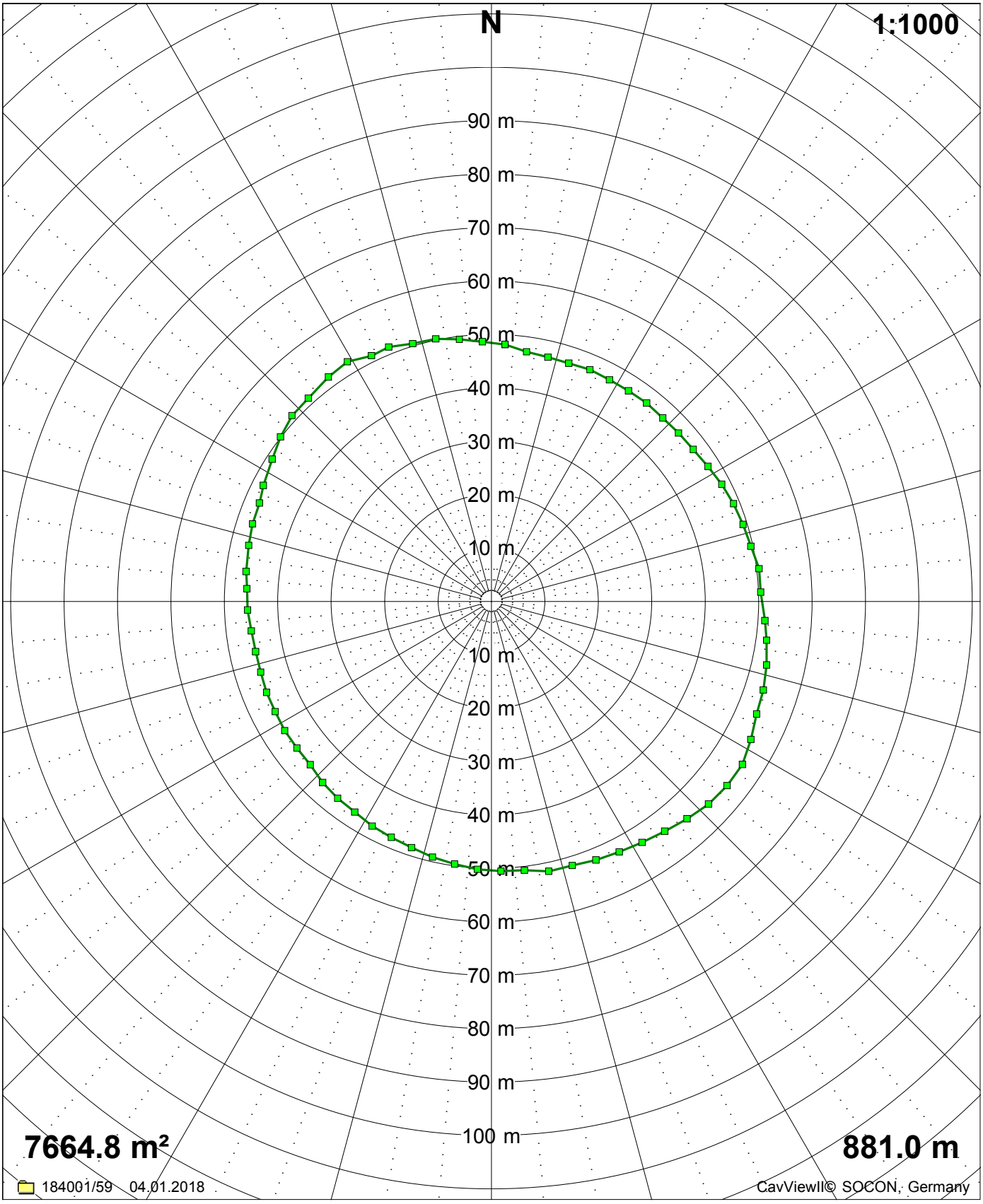
(04.01.2018) (7754.9 m²)

d_{max}: 105.7 m 158° <--> 338° r_{min}: 46.4 m -> 266° r~: 49.7 m r_{max}: 54.3 m -> 128°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



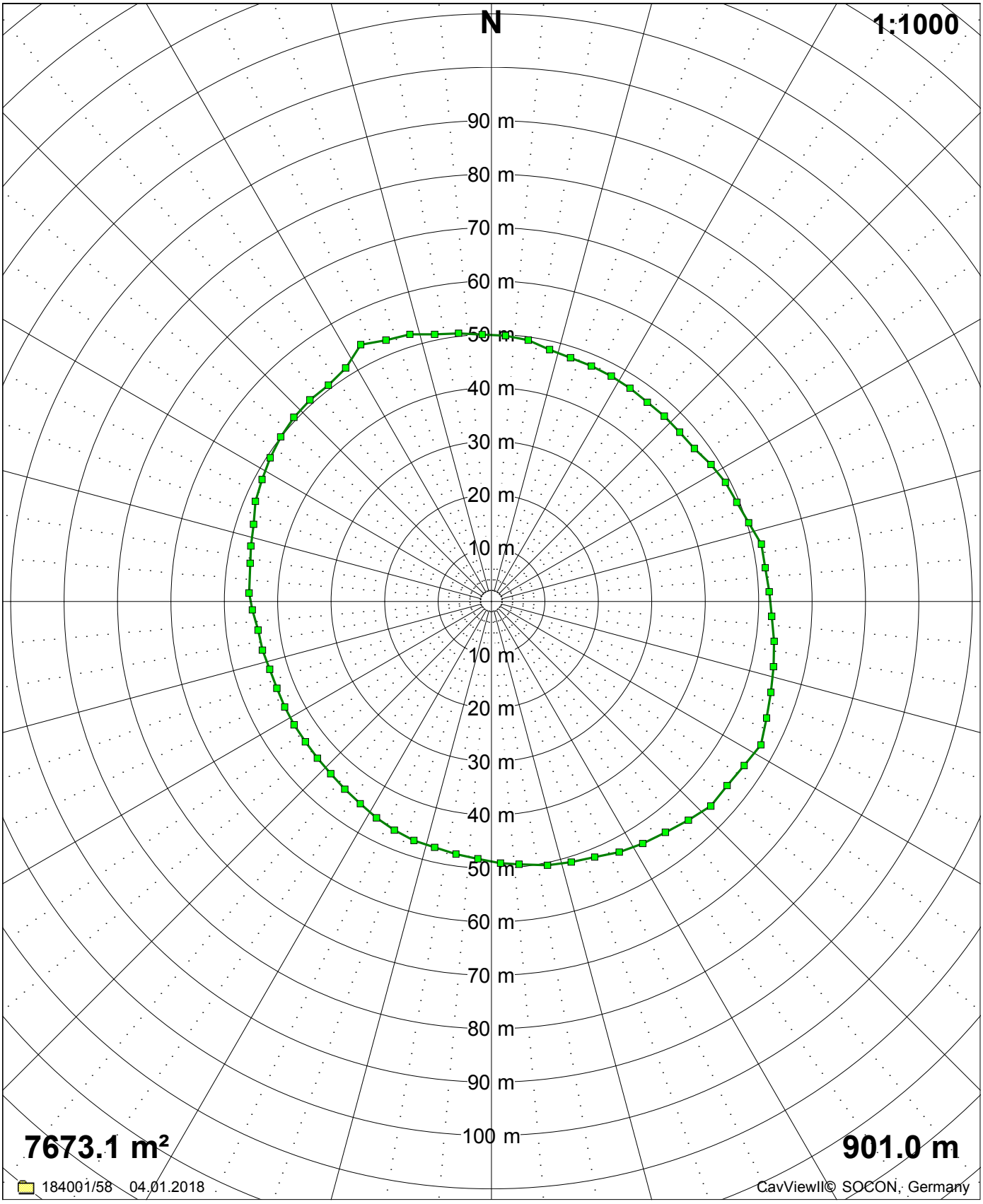
(04.01.2018) (7664.8 m²)

d_{max}: 106.6 m 133° <--> 313° r_{min}: 45.1 m -> 255° r~: 49.4 m r_{max}: 56.0 m -> 123°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



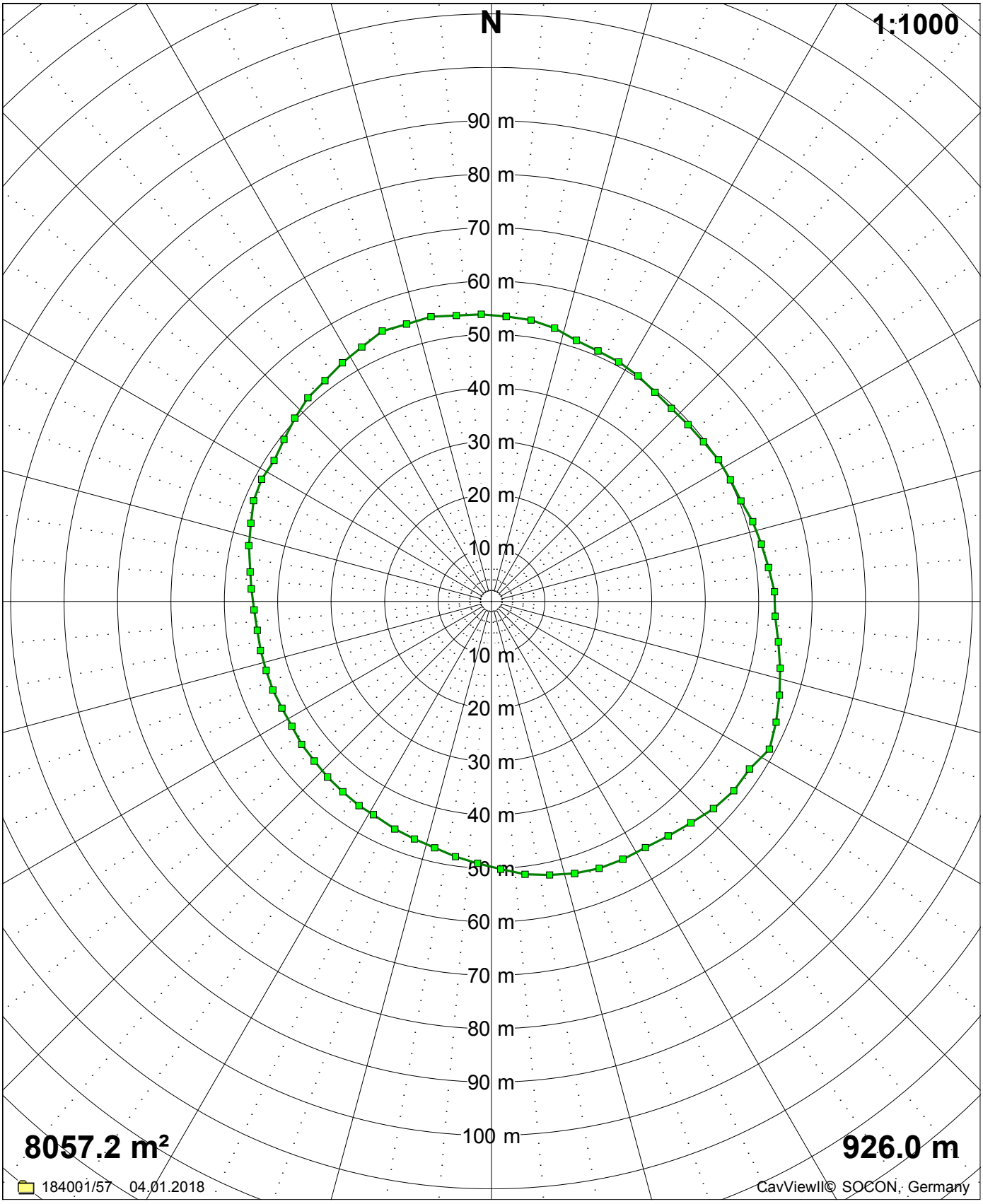
(04.01.2018) (7673.1 m²)

d_{max}: 106.7 m 133° <--> 313° r_{min}: 43.3 m -> 249° r~: 49.4 m r_{max}: 57.1 m -> 118°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



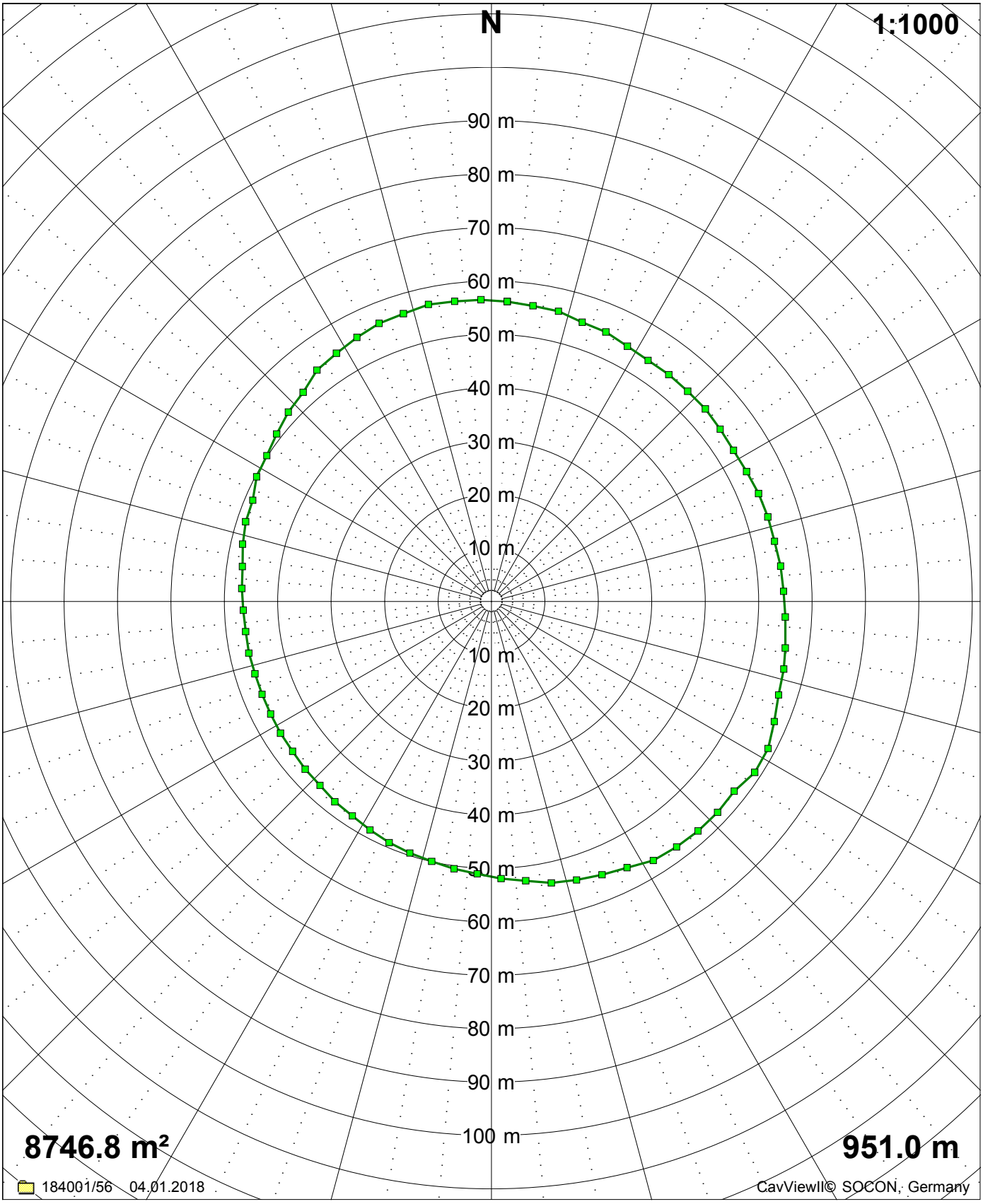
(04.01.2018) (8057.2 m²)

d_{max}: 108.5 m 158° <--> 338° r_{min}: 44.0 m -> 240° r~: 50.6 m r_{max}: 58.9 m -> 118°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



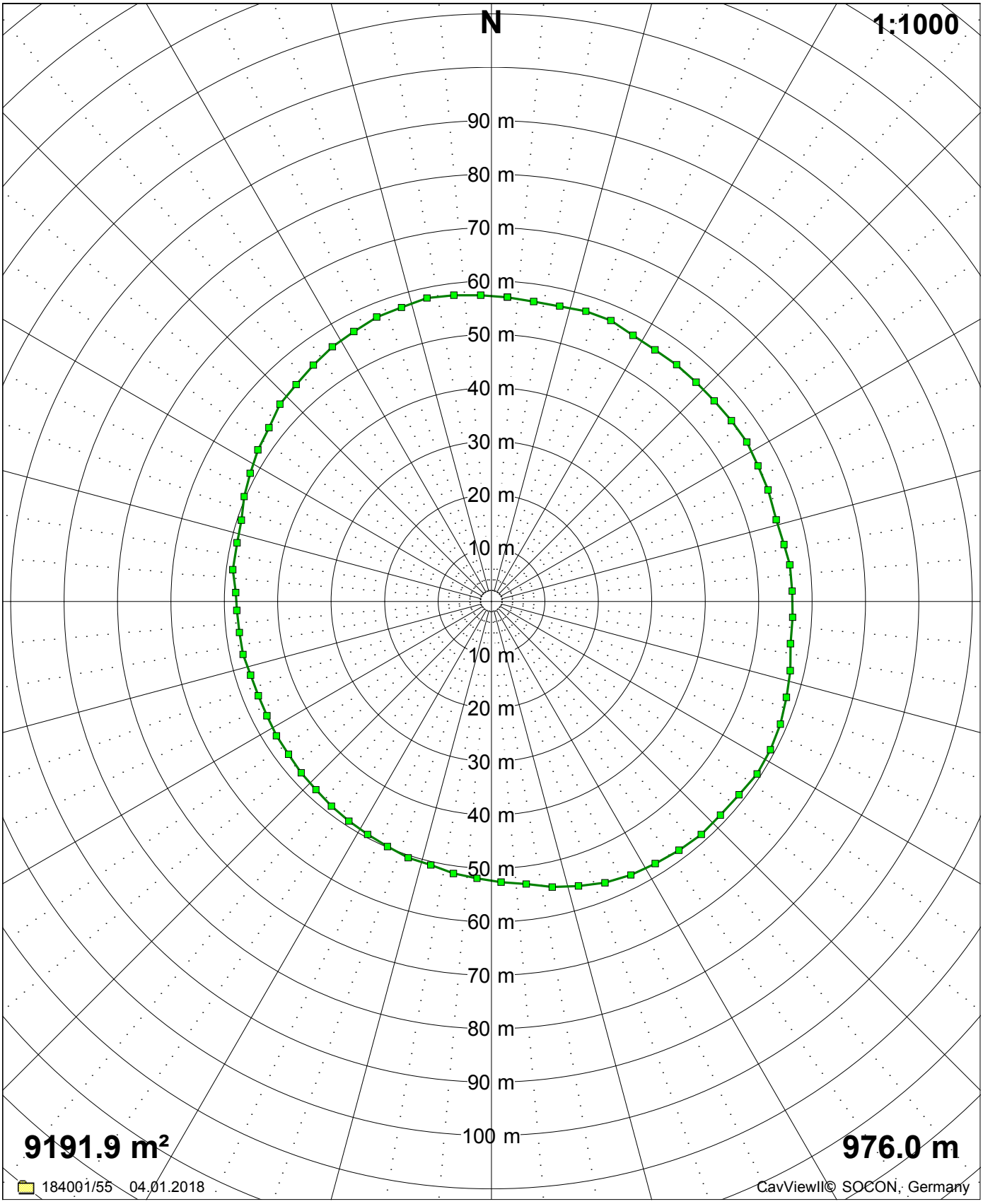
(04.01.2018) (8746.8 m²)

d_{max}: 111.9 m 148° <--> 328° r_{min}: 46.2 m -> 251° r~: 52.8 m r_{max}: 58.7 m -> 123°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



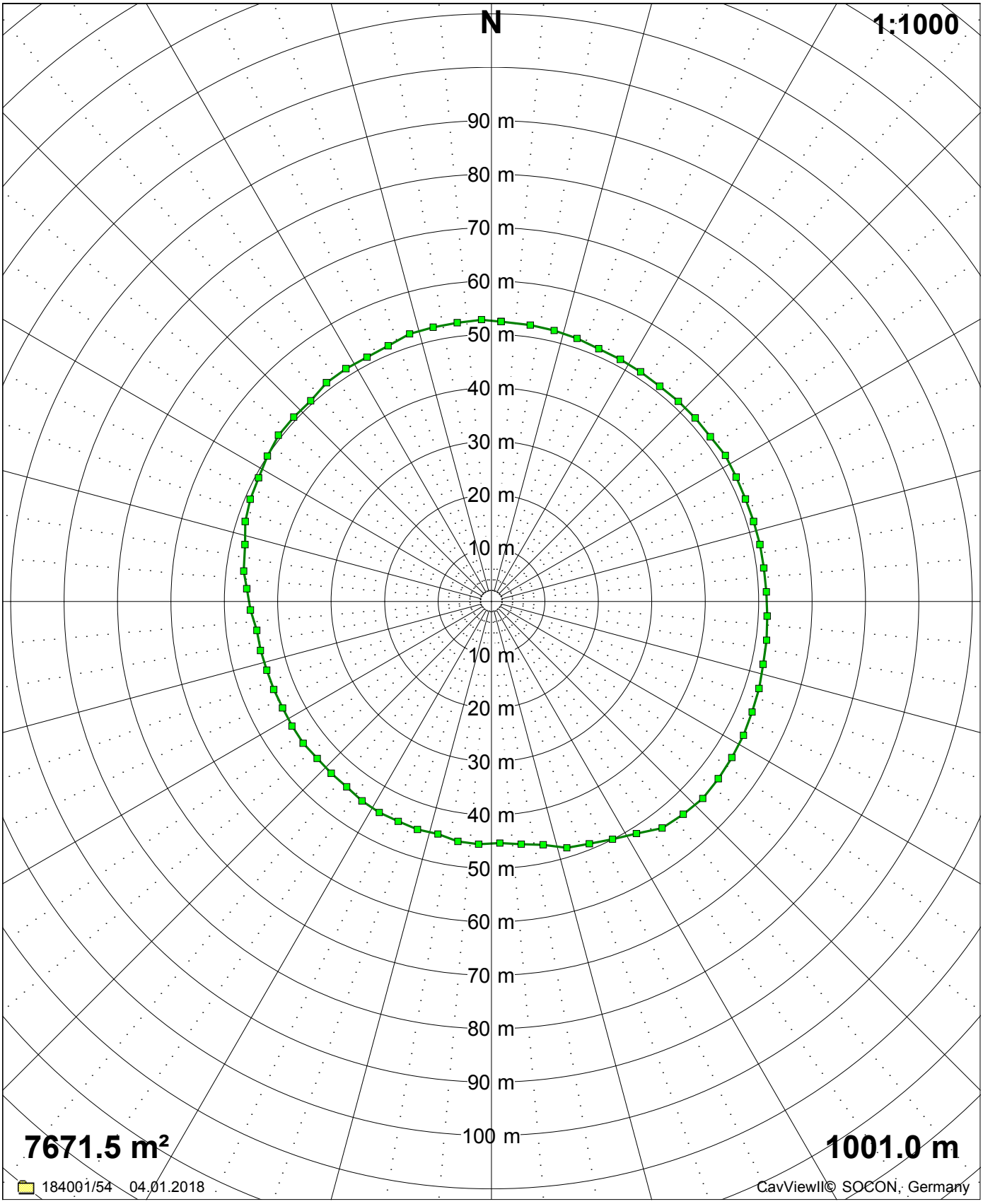
(04.01.2018) (9191.9 m²)

d_{max}: 114.2 m 153° <--> 333° r_{min}: 47.0 m -> 249° r~: 54.1 m r_{max}: 59.2 m -> 123°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



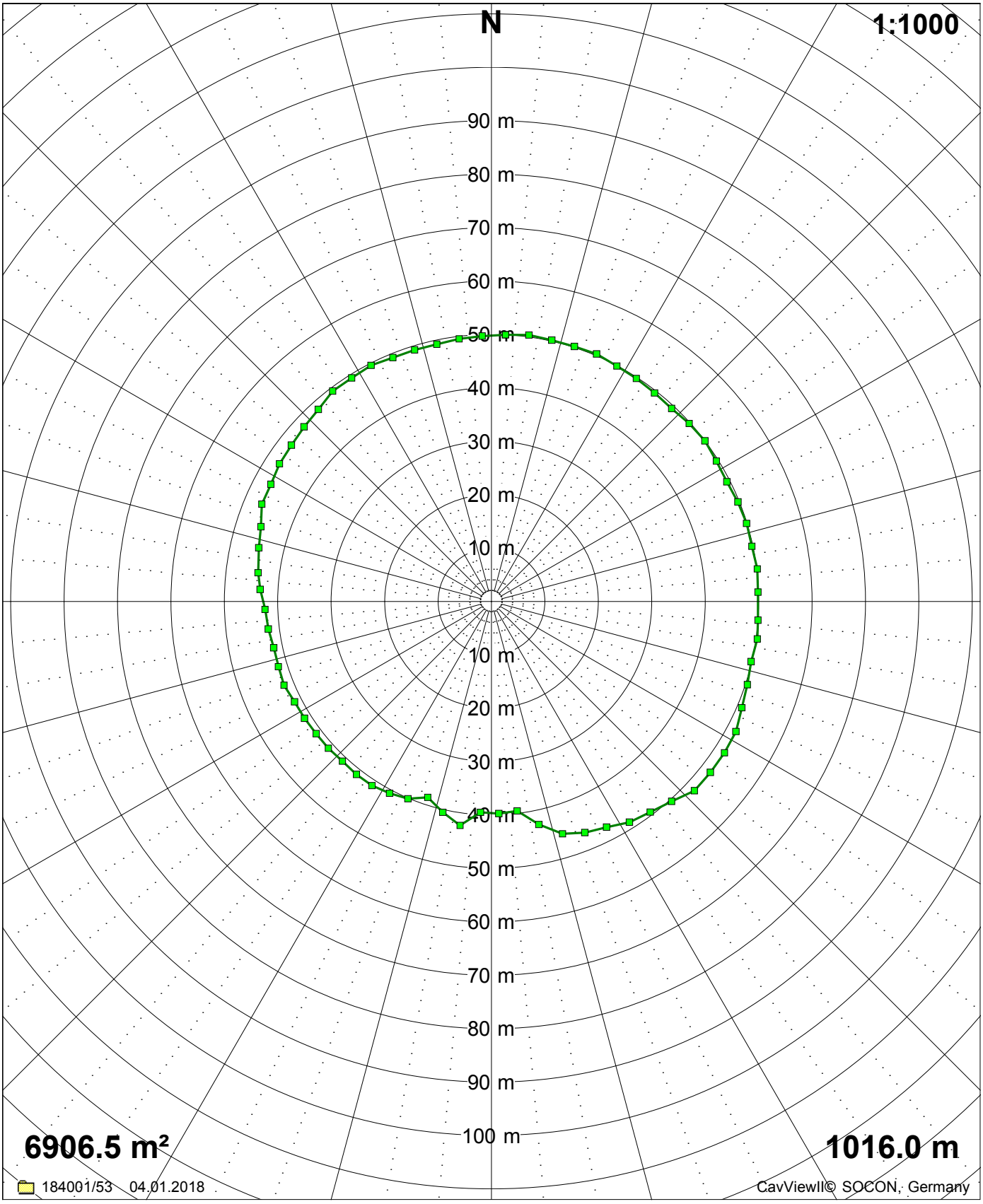
(04.01.2018) (7671.5 m²)

d_{max}: 104.7 m 133° <--> 313° r_{min}: 43.9 m -> 244° r~: 49.4 m r_{max}: 54.1 m -> 133°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



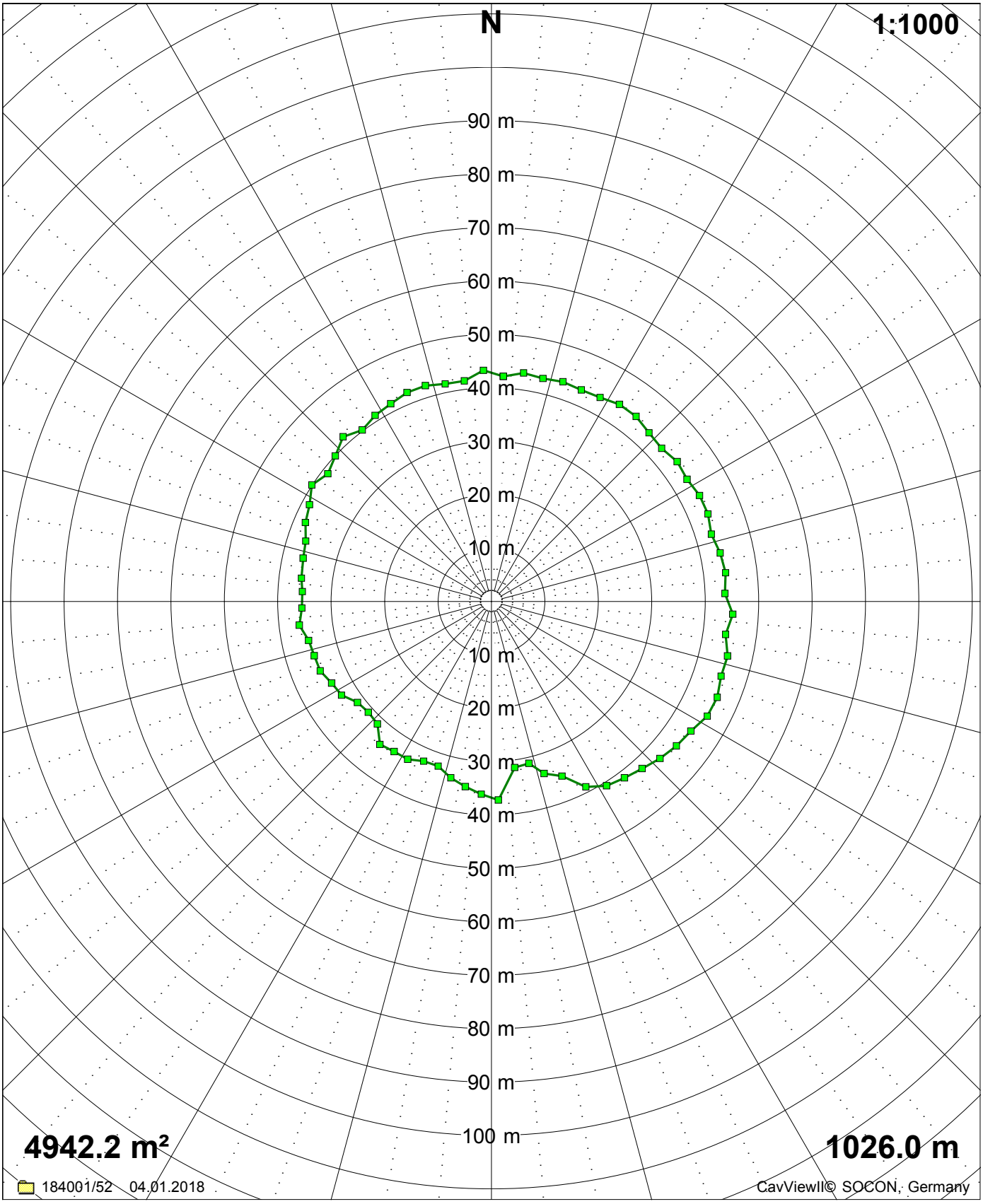
(04.01.2018) (6906.5 m²)

d_{max}: 99.9 m 133° <--> 313° r_{min}: 38.6 m -> 198° r~: 46.9 m r_{max}: 52.0 m -> 123°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



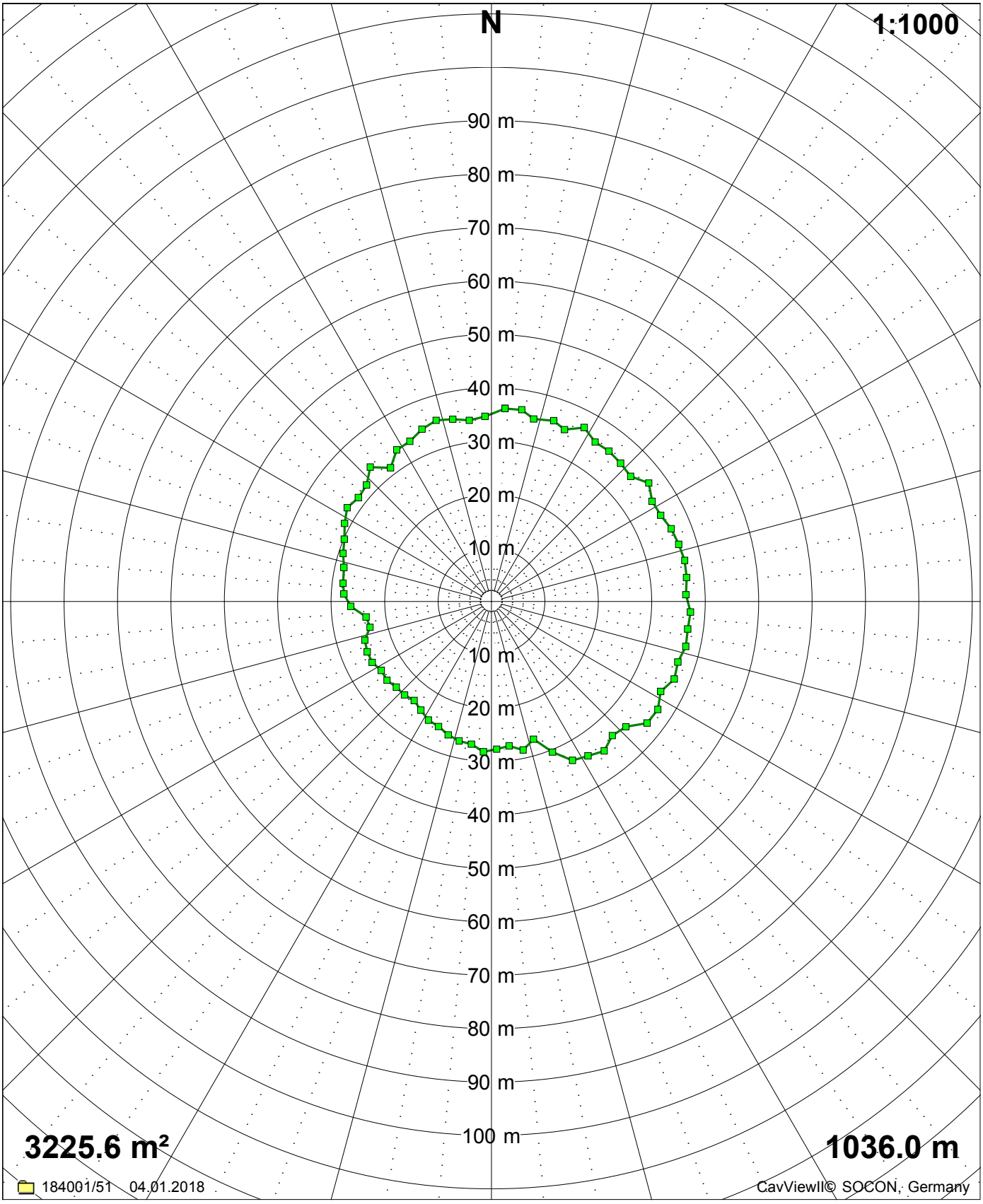
(04.01.2018) (4942.2 m²)

d_{max}: 84.6 m 123° <--> 303° r_{min}: 31.0 m -> 228° r~: 39.7 m r_{max}: 45.9 m -> 113°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



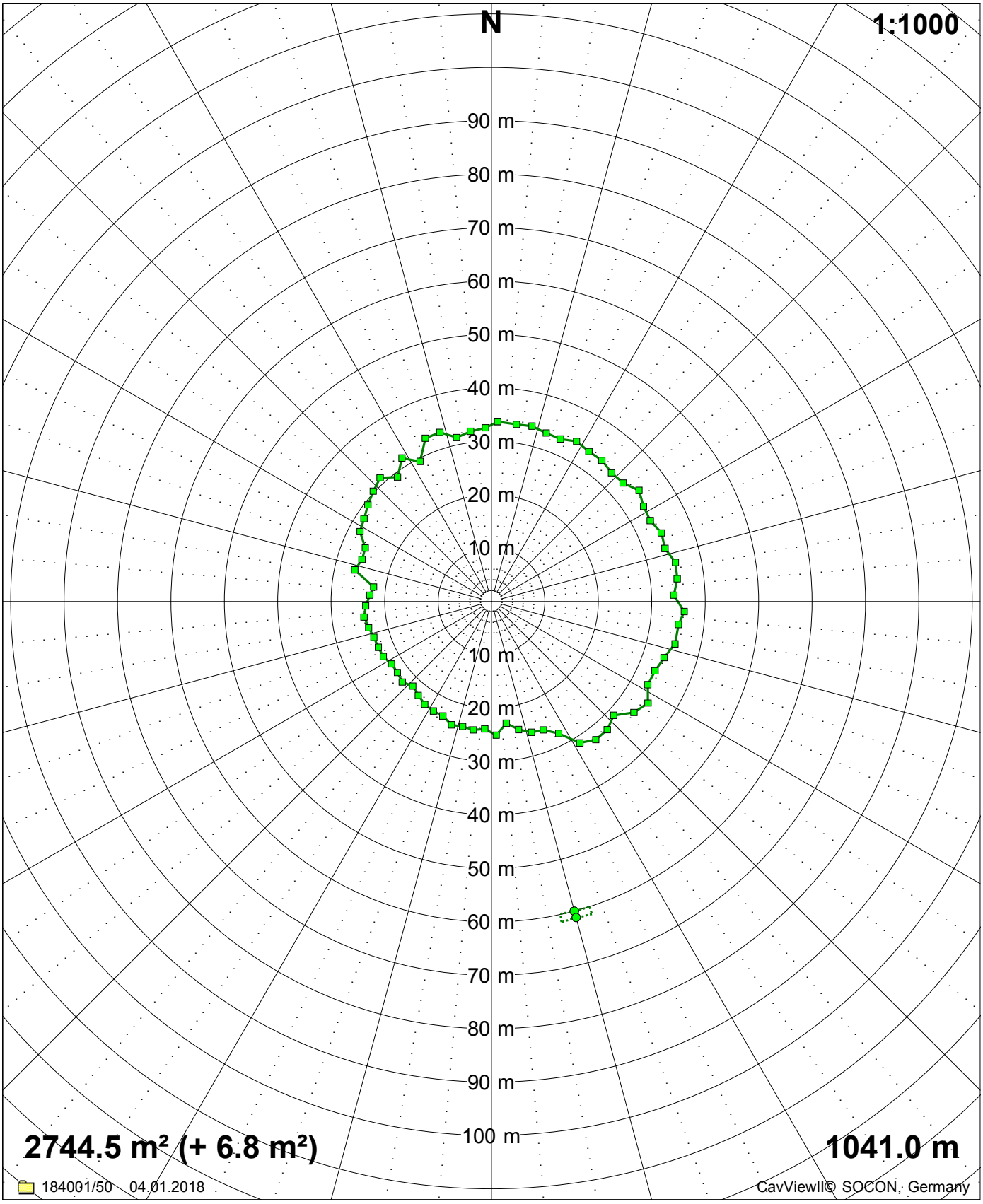
(04.01.2018) (3225.6 m²)

d_{max}: 69.3 m 123° <--> 303° r_{min}: 23.2 m -> 258° r~: 32.0 m r_{max}: 37.3 m -> 103°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



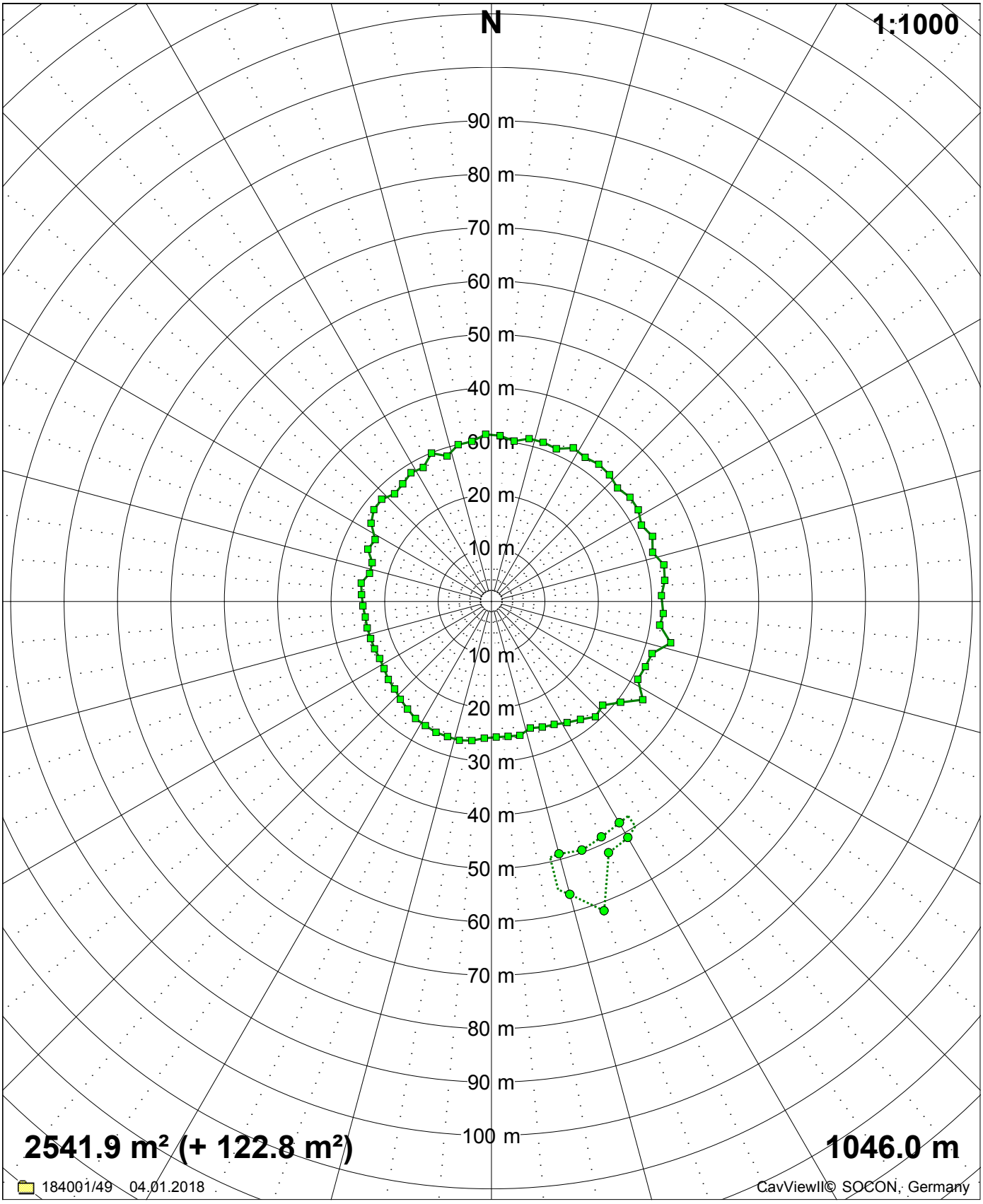
(04.01.2018) (2751.3 m²) | Leached pocket (04.01.2018)

d_{max}: 93.6 m 165° <--> 345° r_{min}: 21.6 m -> 223° r~: 29.6 m r_{max}: 61.3 m -> 165°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



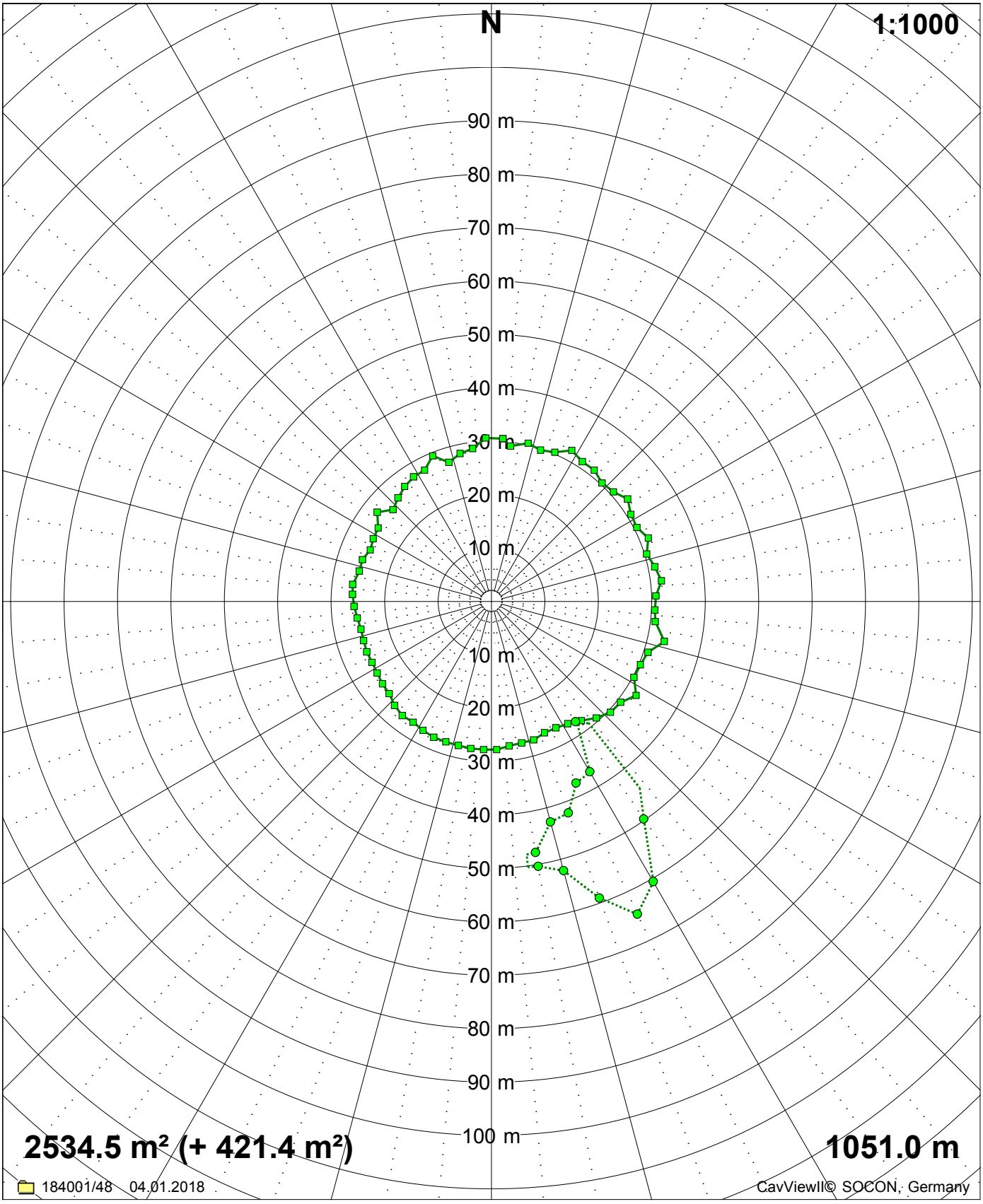
(04.01.2018) (2664.7 m²) | Leached pocket (04.01.2018)

d_{max}: 91.0 m 160° <--> 340° r_{min}: 23.4 m -> 283° r~: 29.1 m r_{max}: 61.6 m -> 160°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



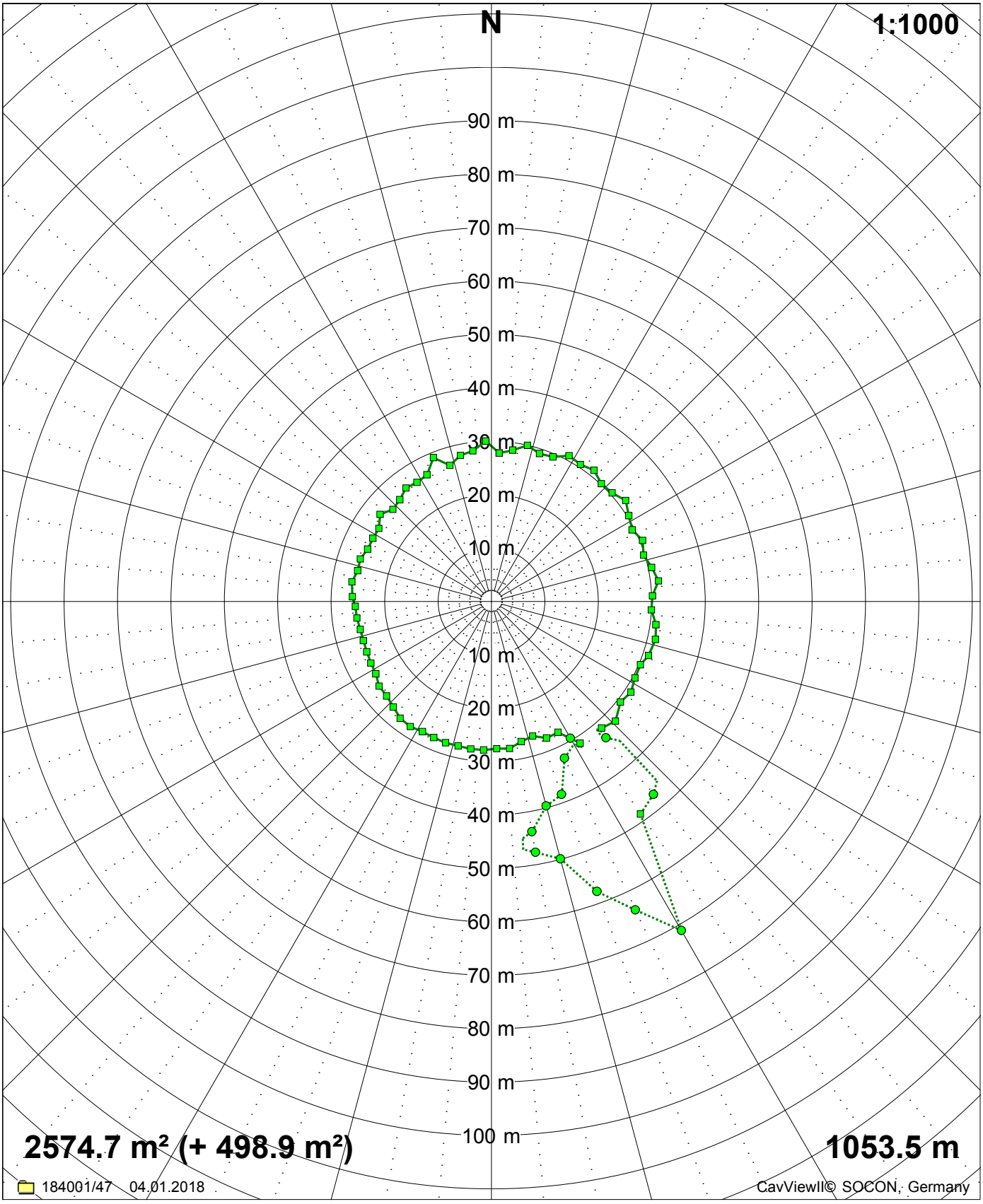
(04.01.2018) (2955.9 m²) | Leached pocket (04.01.2018)

d_{max}: 92.9 m 155° <--> 335° r_{min}: 24.7 m -> 293° r~: 30.7 m r_{max}: 64.6 m -> 155°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



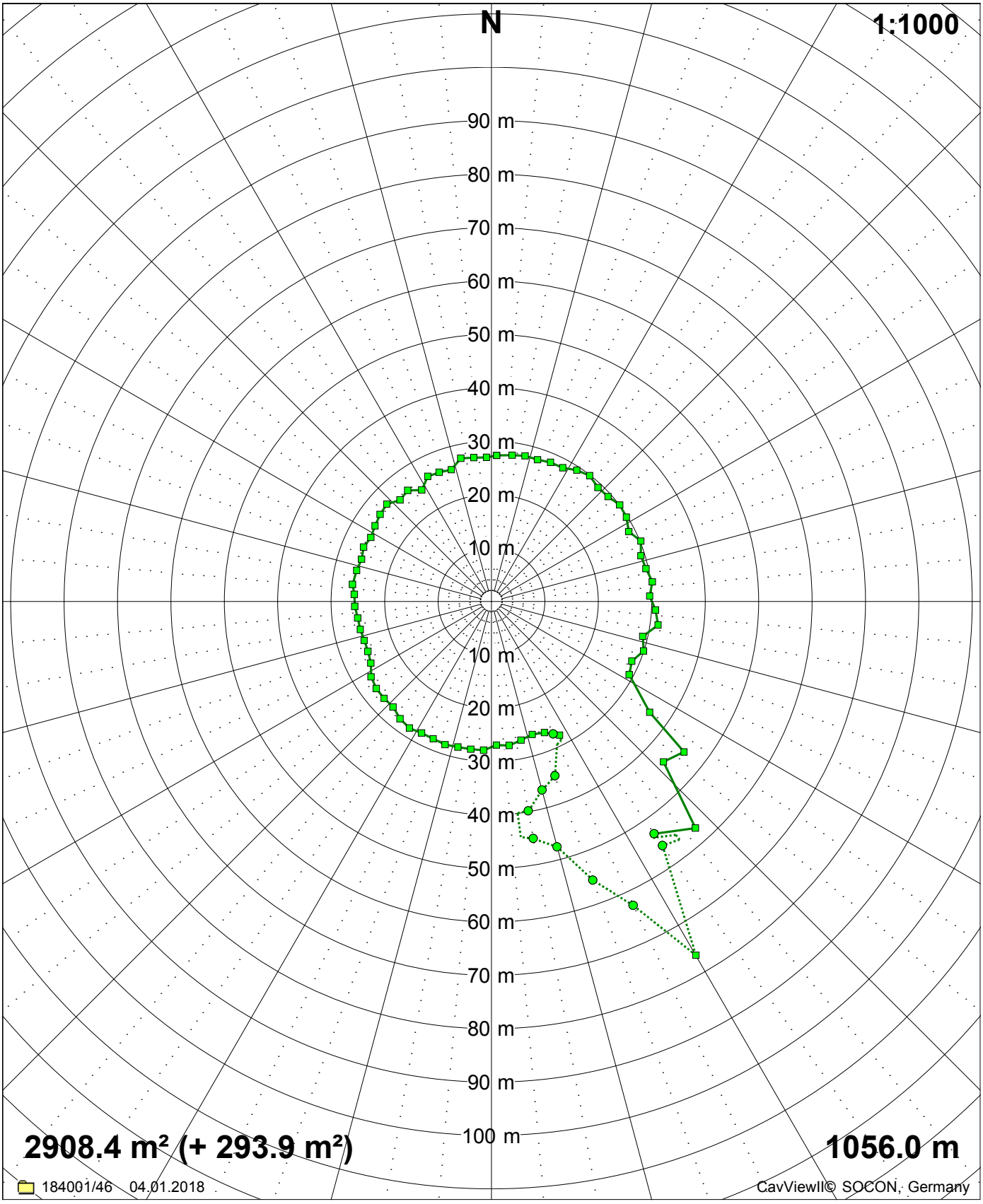
(04.01.2018) (3073.7 m²) | Leached pocket (04.01.2018)

d_{max}: 97.5 m 150° <--> 330° r_{min}: 25.0 m -> 254° r~: 31.3 m r_{max}: 71.1 m -> 150°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



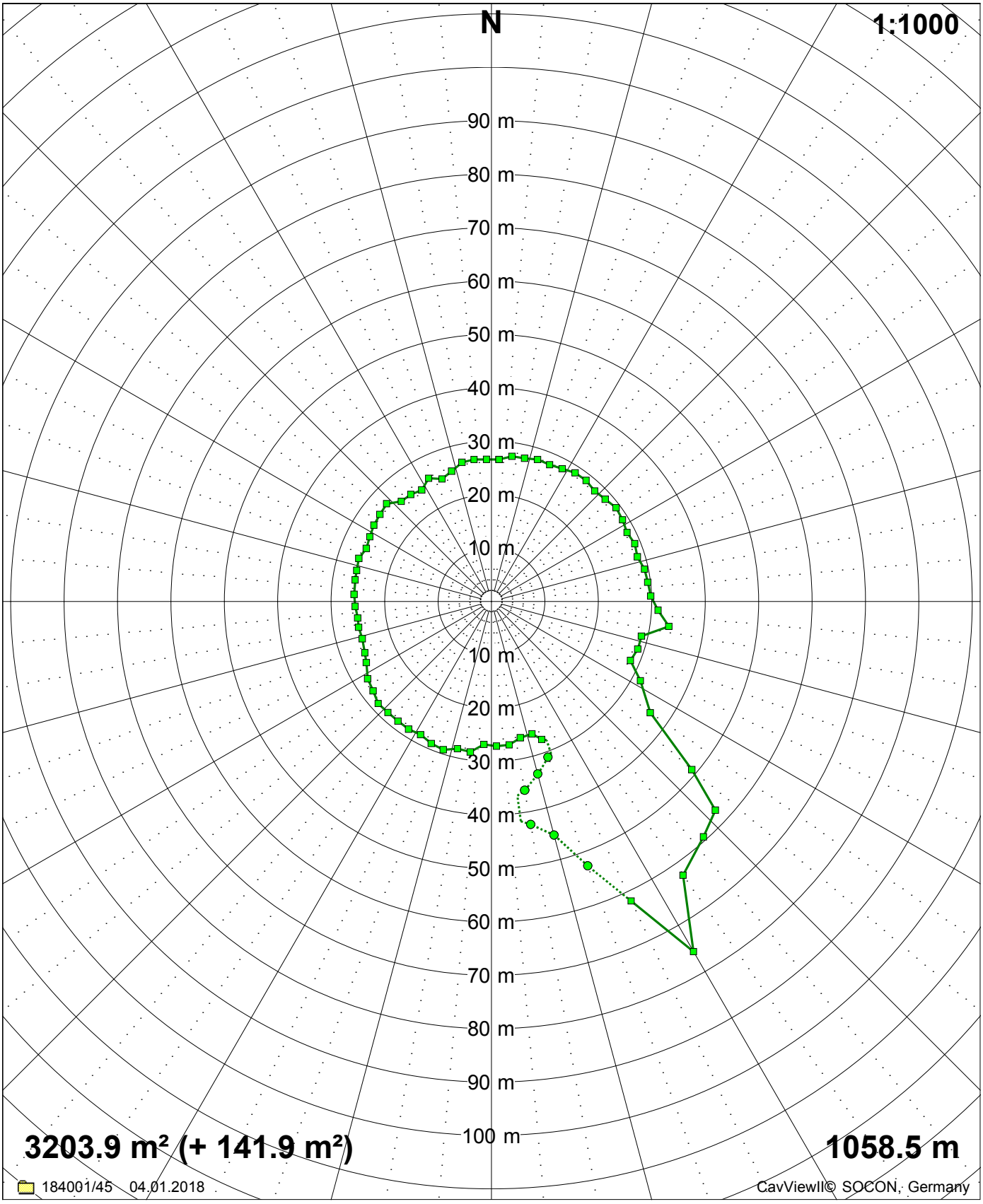
(04.01.2018) (3202.3 m²) | Leached pocket (04.01.2018)

d_{max}: 101.7 m 150° <--> 330° r_{min}: 24.6 m -> 328° r~: 31.9 m r_{max}: 76.5 m -> 150°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



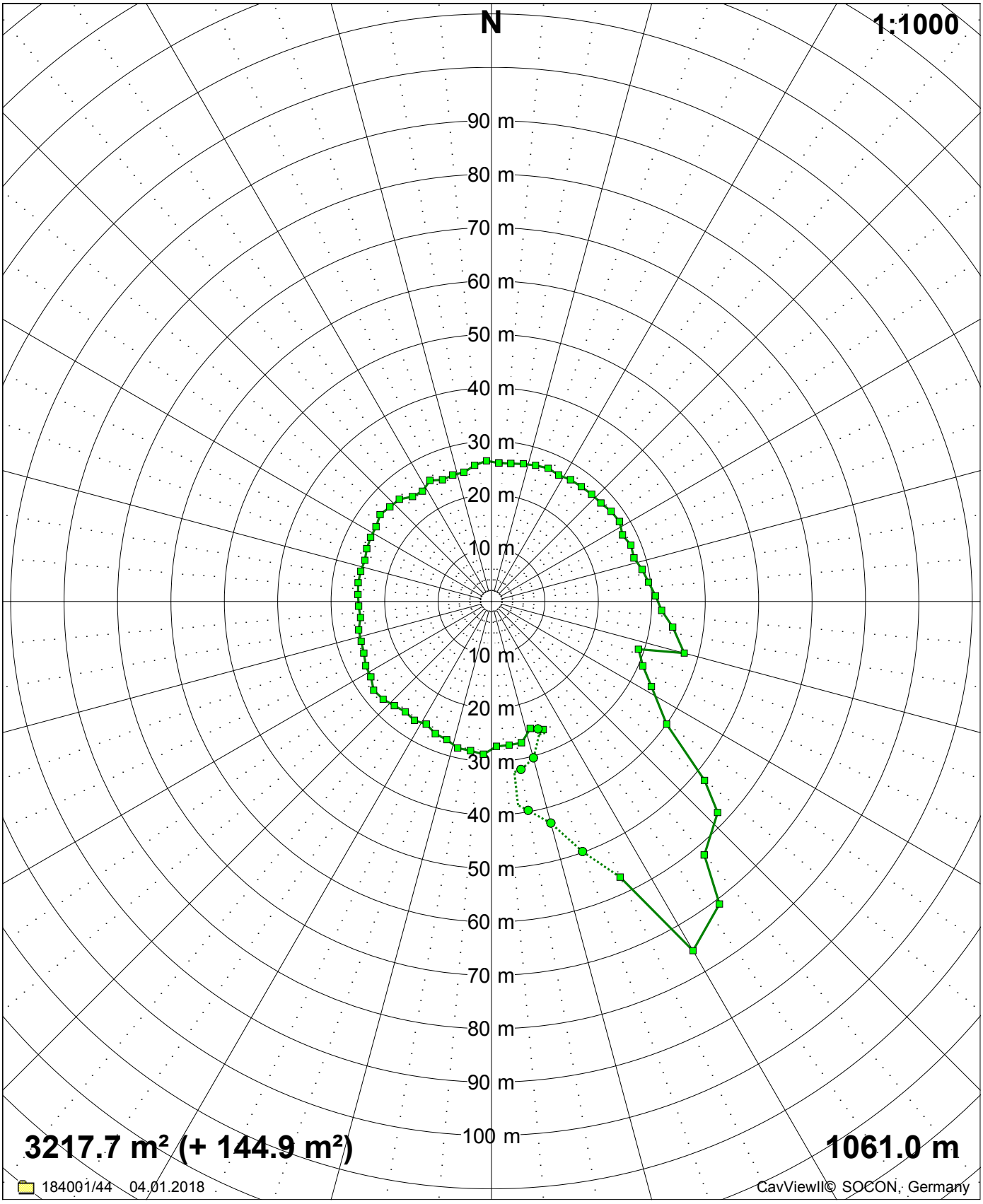
(04.01.2018) (3345.8 m²) | Leached pocket (04.01.2018)

d_{max}: 100.8 m 150° <--> 330° r_{min}: 24.7 m -> 328° r~: 32.6 m r_{max}: 75.7 m -> 150°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



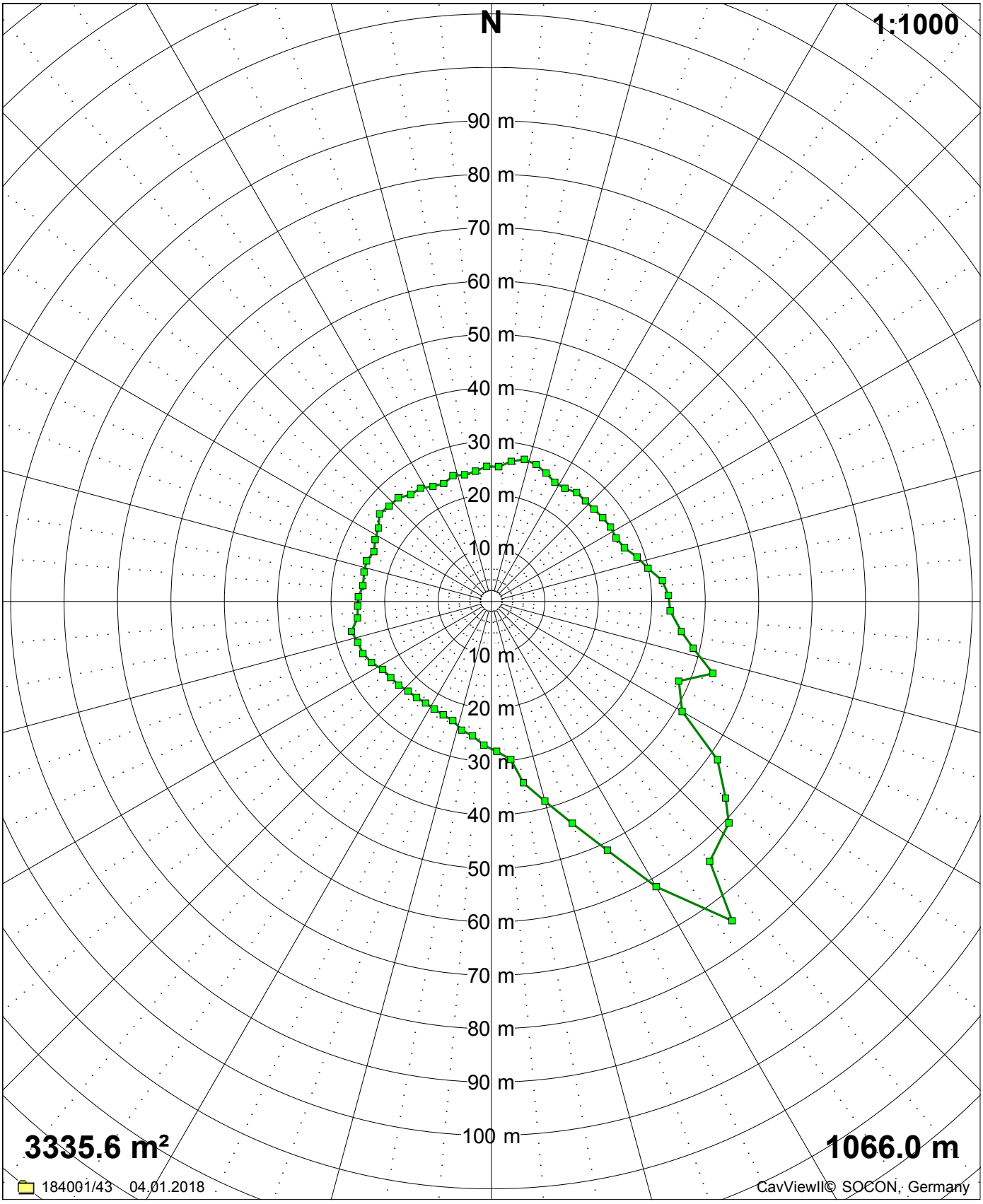
(04.01.2018) (3362.7 m²) | Leached pocket (04.01.2018)

d_{max}: 100.2 m 150° <--> 330° r_{min}: 24.4 m -> 327° r~: 32.7 m r_{max}: 75.5 m -> 150°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



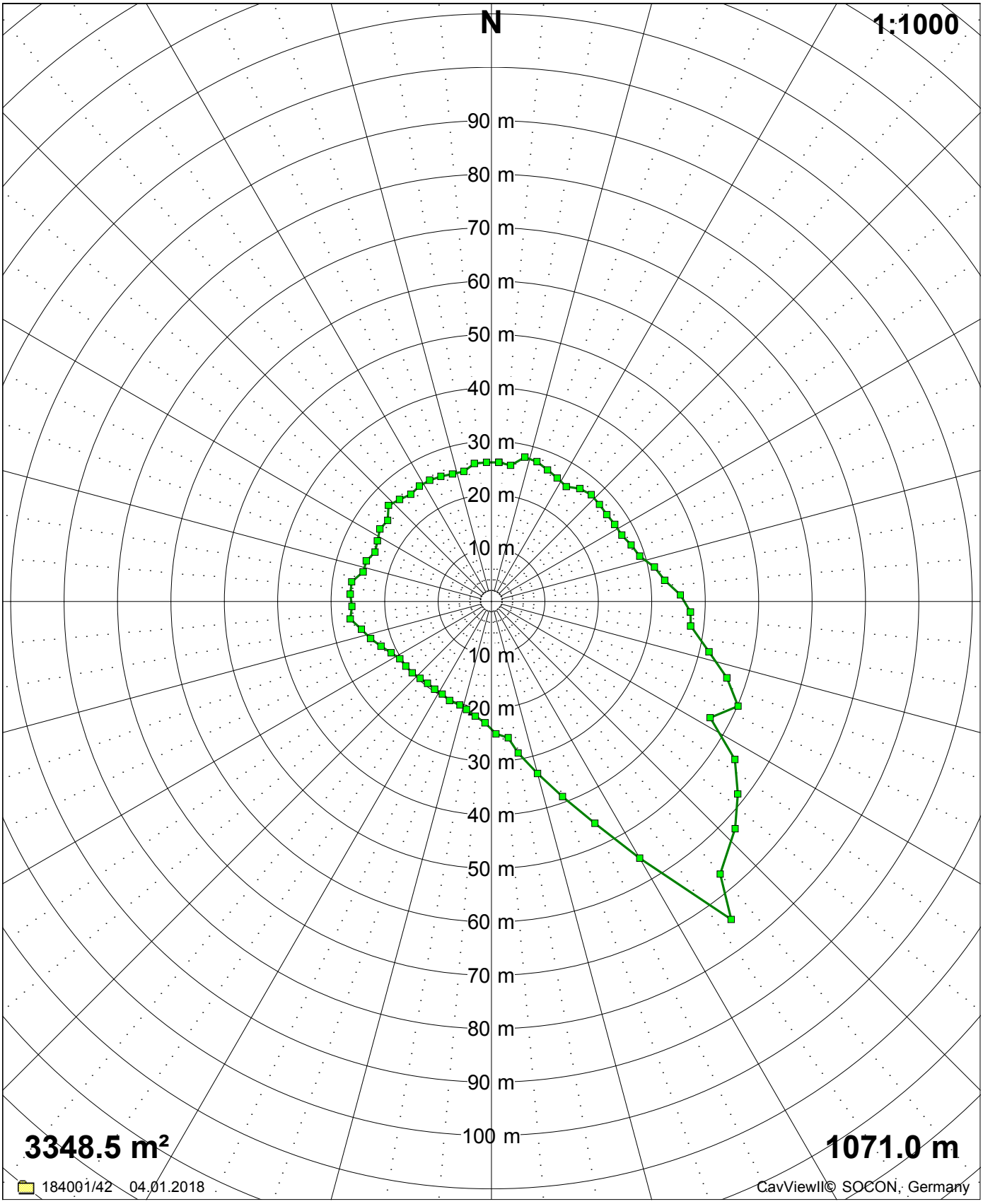
(04.01.2018) (3335.6 m²)

d_{max}: 100.0 m 143° <--> 323° r_{min}: 22.7 m -> 212° r~: 32.6 m r_{max}: 74.8 m -> 143°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



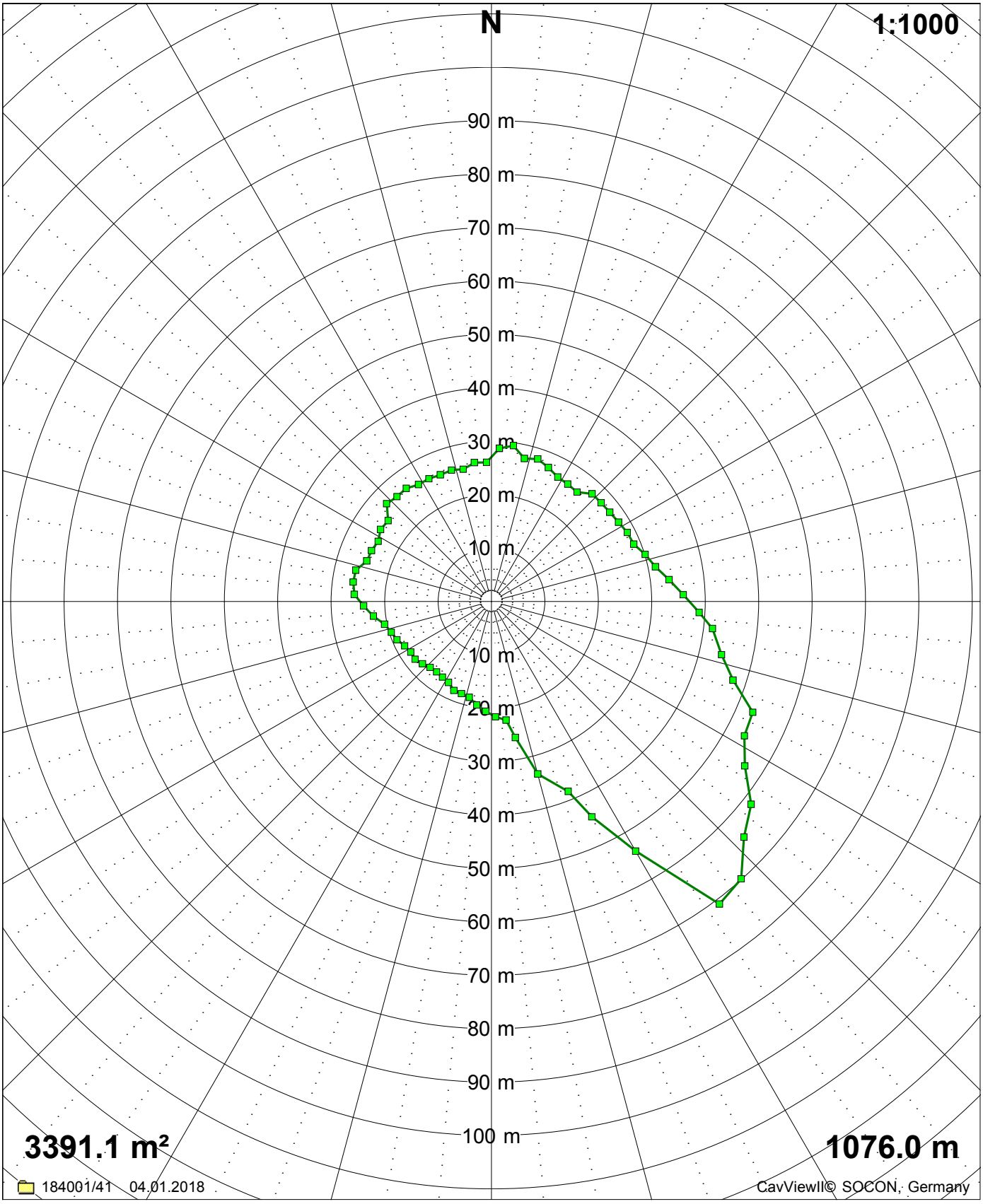
(04.01.2018) (3348.5 m²)

d_{max}: 99.7 m 143° <--> 323° r_{min}: 19.4 m -> 217° r~: 32.6 m r_{max}: 74.5 m -> 143°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



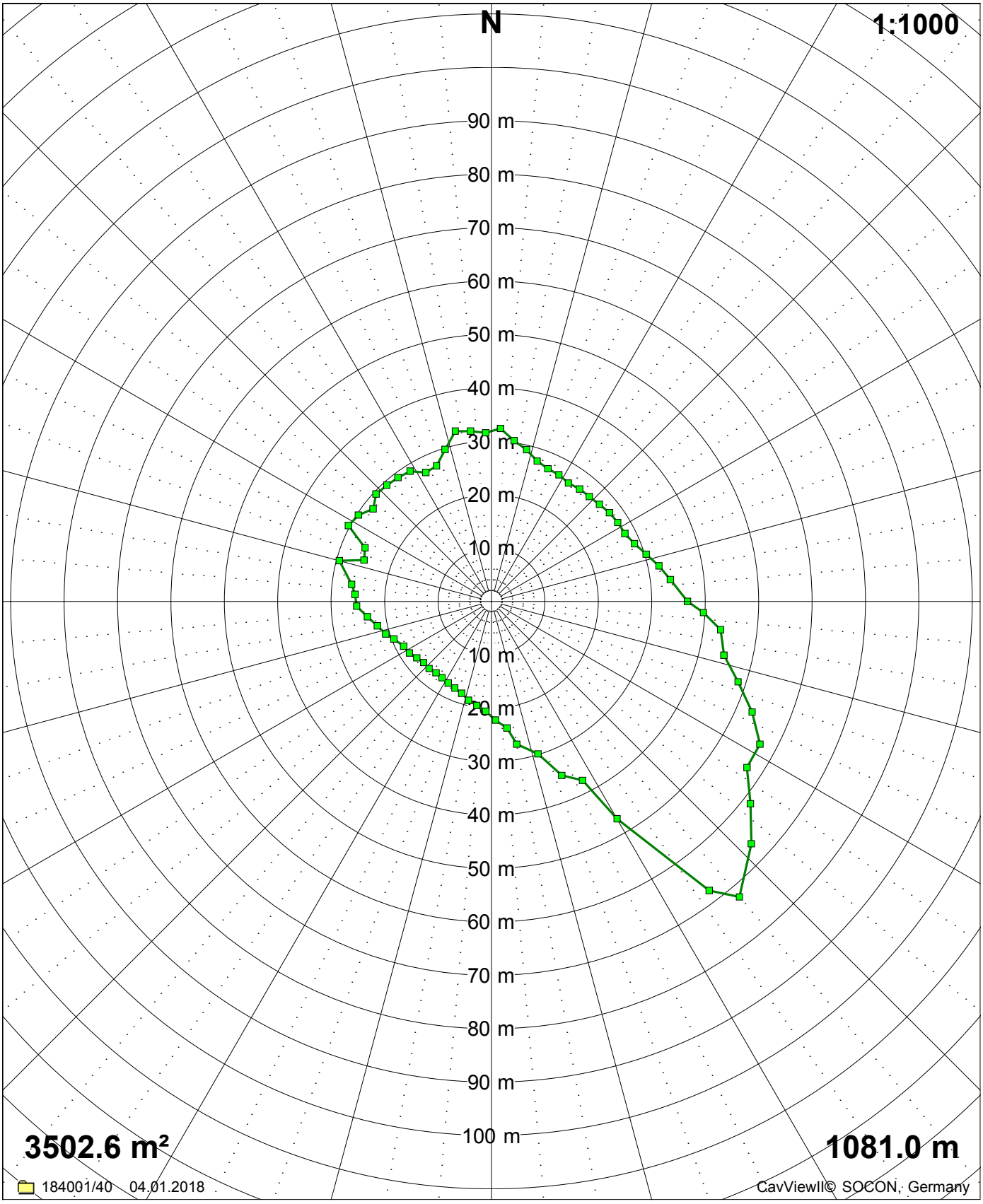
(04.01.2018) (3391.1 m²)

d_{max}: 97.4 m 143° <--> 323° r_{min}: 16.7 m -> 217° r~: 32.9 m r_{max}: 70.9 m -> 143°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



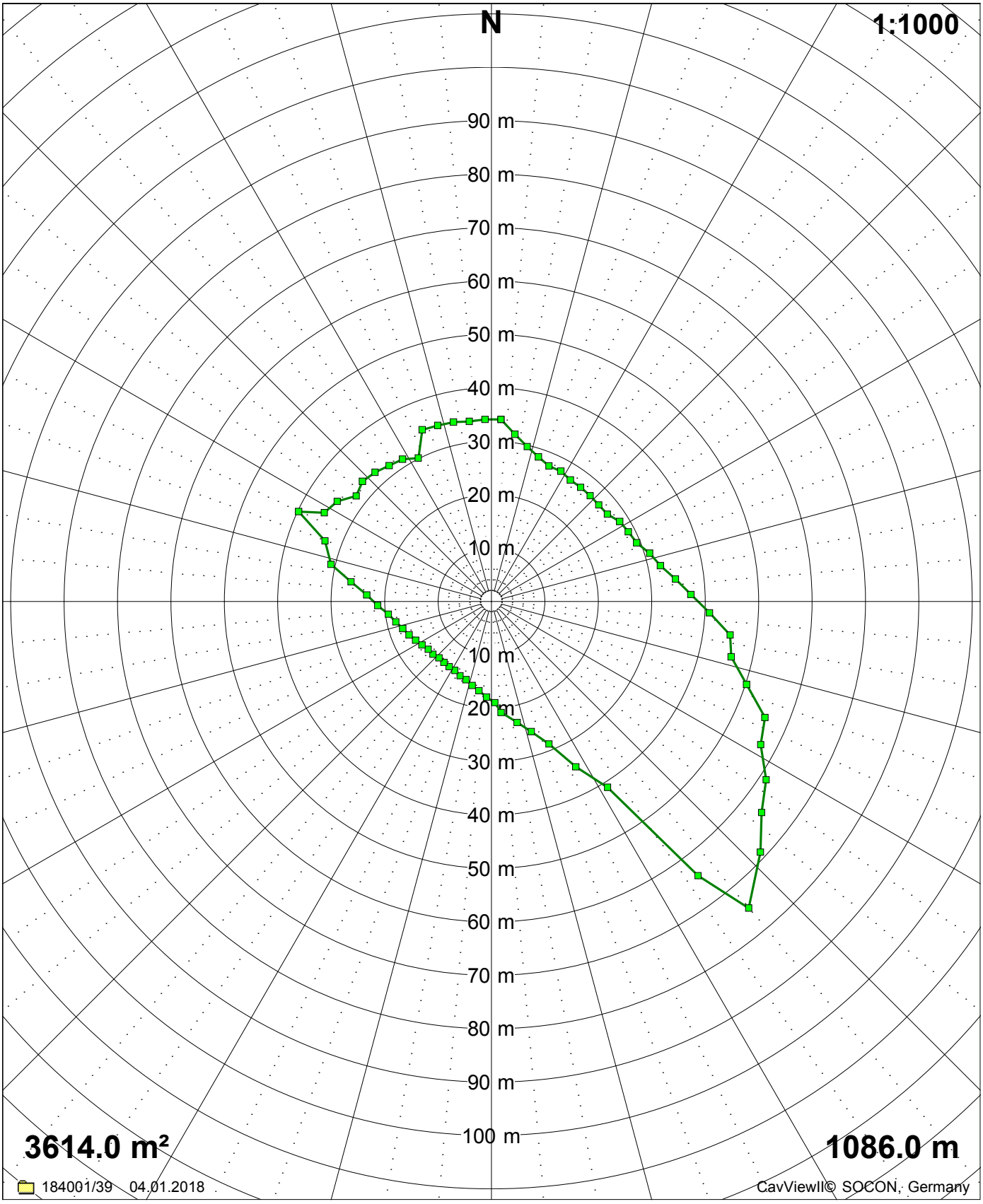
(04.01.2018) (3502.6 m²)

d_{max}: 101.3 m 140° <--> 320° r_{min}: 16.9 m -> 217° r~: 33.4 m r_{max}: 72.2 m -> 140°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



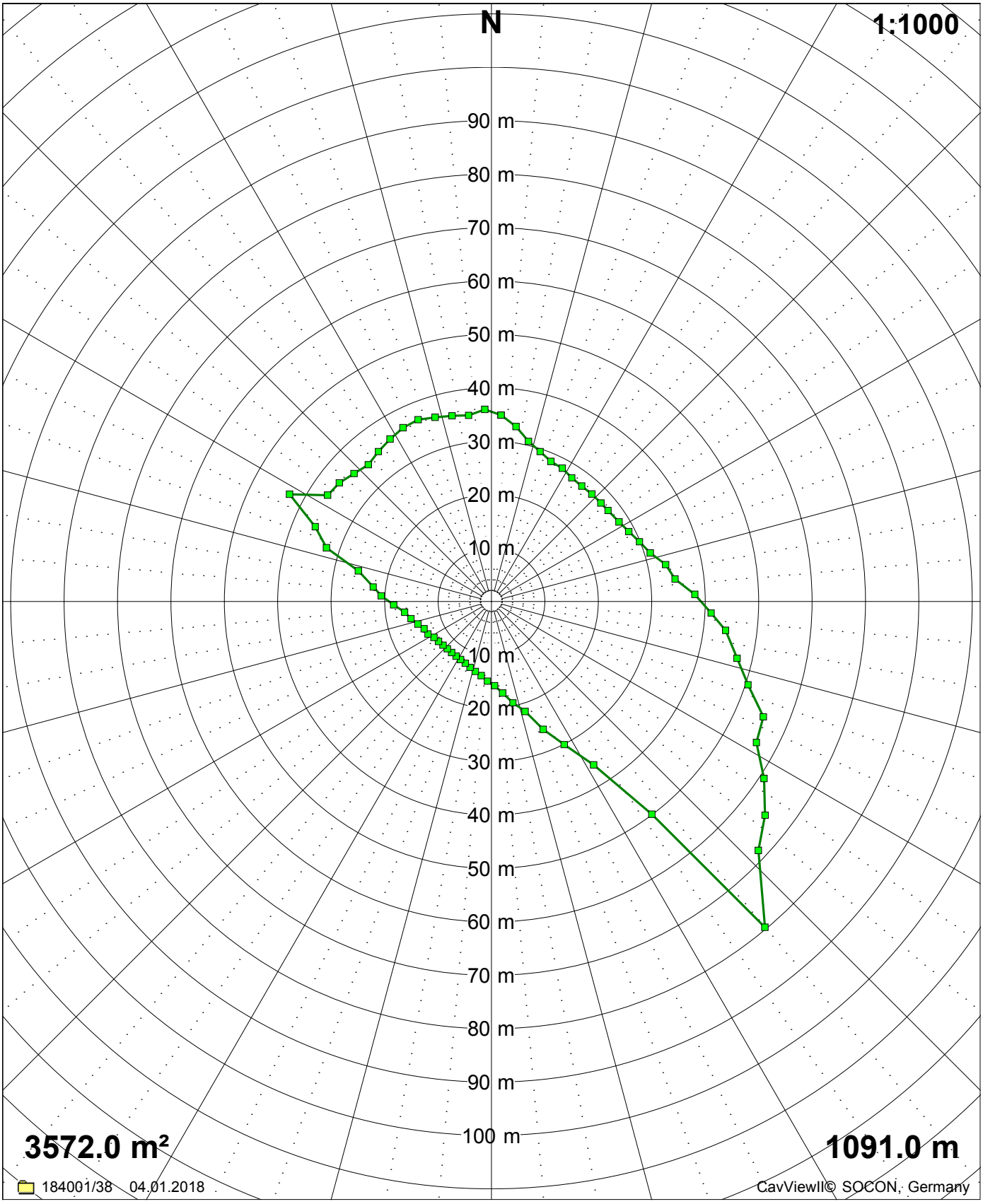
(04.01.2018) (3614.0 m²)

d_{max}: 107.1 m 140° <--> 320° r_{min}: 14.4 m -> 221° r~: 33.9 m r_{max}: 74.9 m -> 140°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



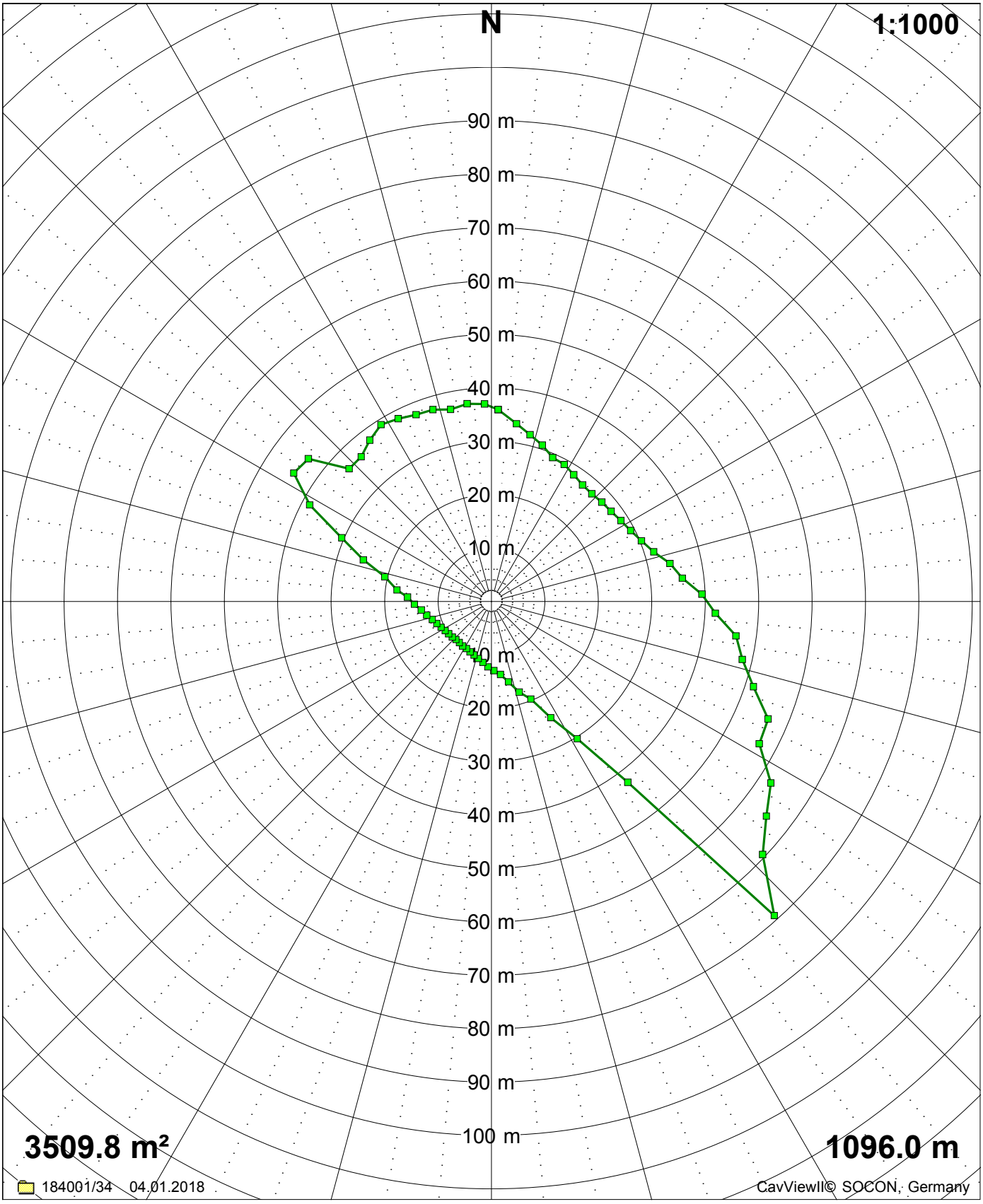
(04.01.2018) (3572.0 m²)

d_{max}: 114.3 m 140° <--> 320° r_{min}: 12.1 m -> 220° r~: 33.7 m r_{max}: 79.6 m -> 140°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



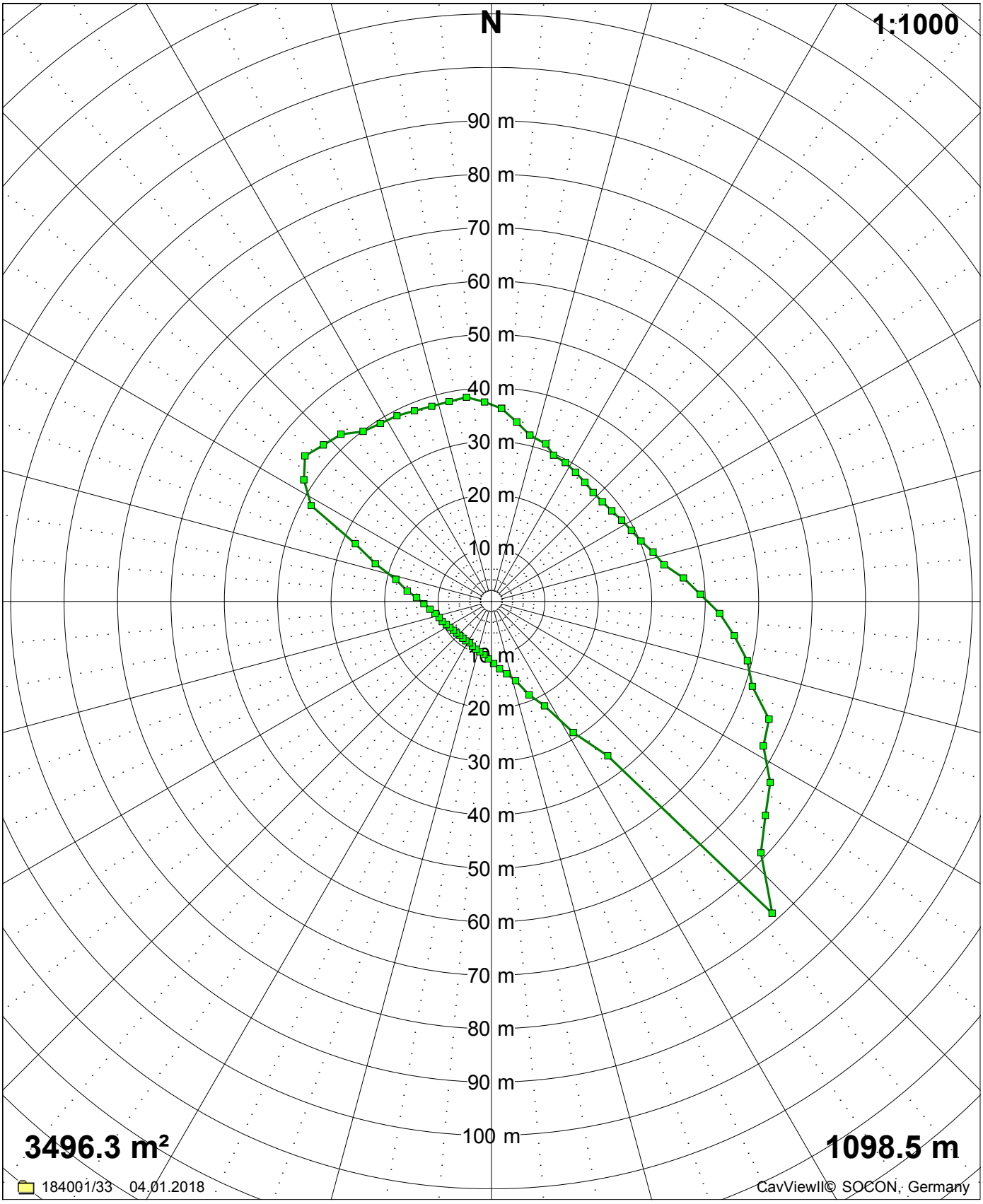
(04.01.2018) (3509.8 m²)

d_{max}: 115.6 m 138° <--> 318° r_{min}: 9.7 m -> 220° r~: 33.4 m r_{max}: 79.1 m -> 138°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



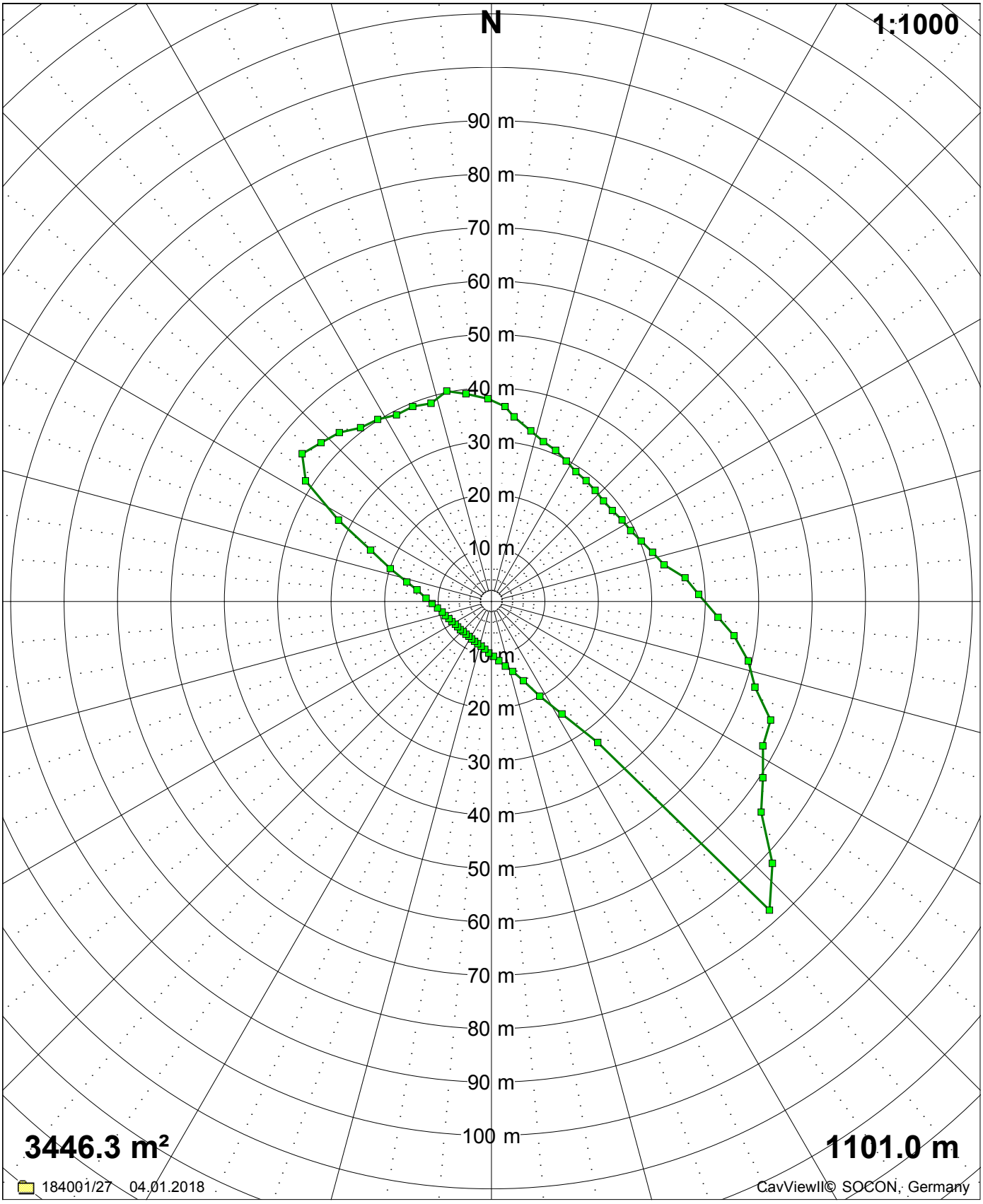
(04.01.2018) (3496.3 m²)

d_{max}: 120.7 m 138° <--> 318° r_{min}: 8.7 m -> 219° r~: 33.4 m r_{max}: 78.5 m -> 138°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



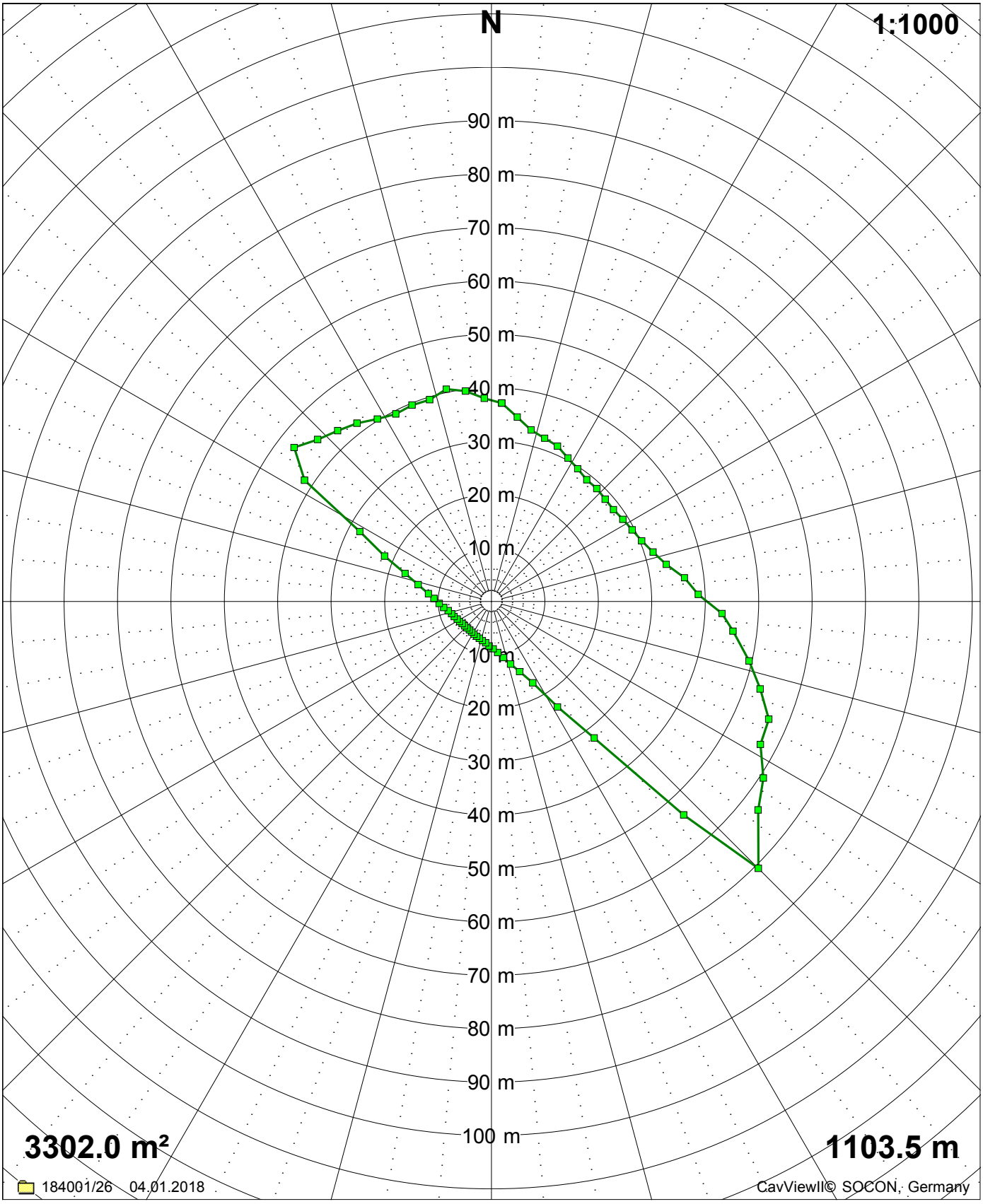
(04.01.2018) (3446.3 m²)

d_{max}: 120.3 m 138° <--> 318° r_{min}: 7.7 m -> 221° r~: 33.1 m r_{max}: 77.7 m -> 138°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



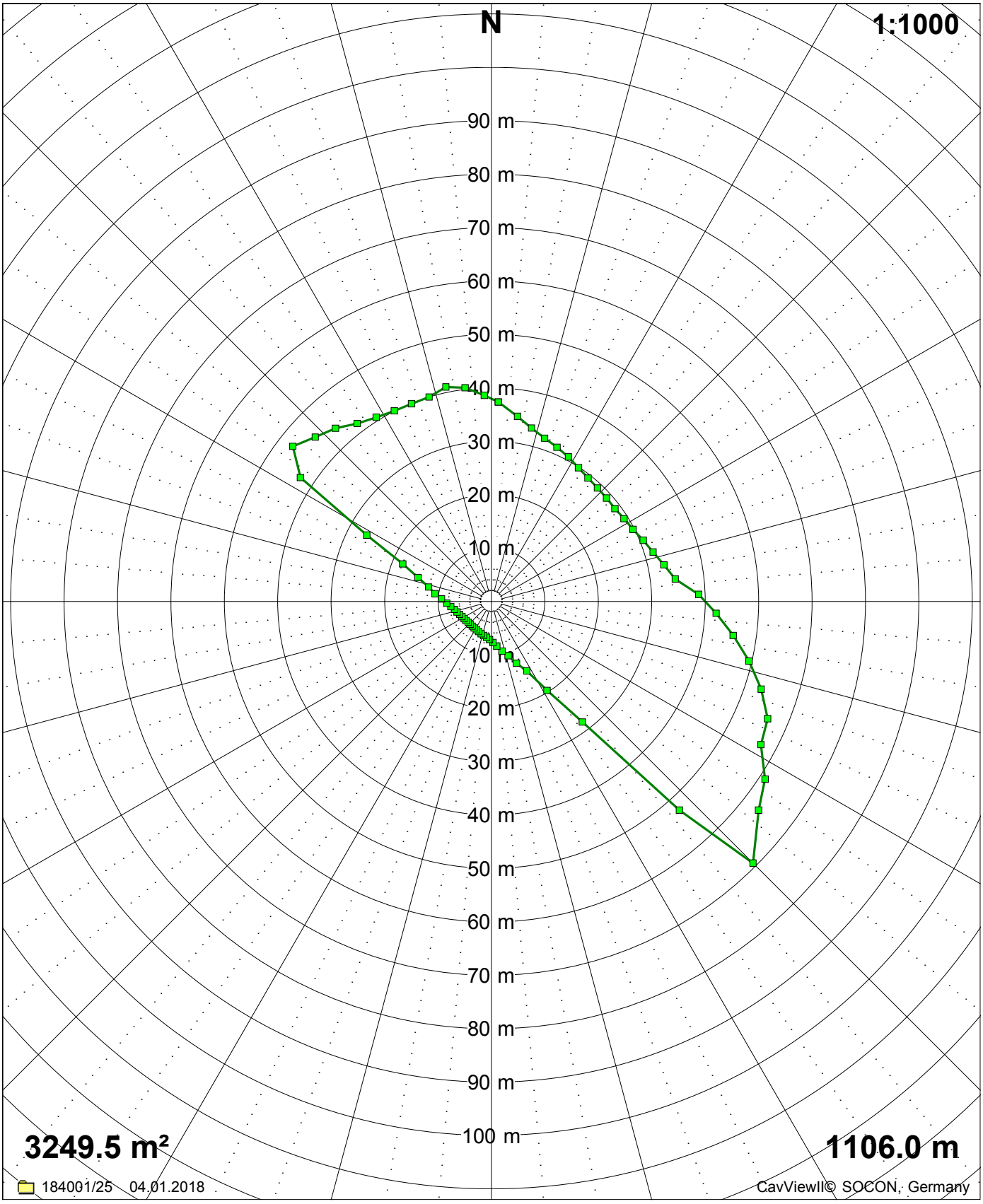
(04.01.2018) (3302.0 m²)

d_{max}: 114.5 m 135° <--> 315° r_{min}: 6.7 m -> 218° r~: 32.4 m r_{max}: 70.6 m -> 135°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



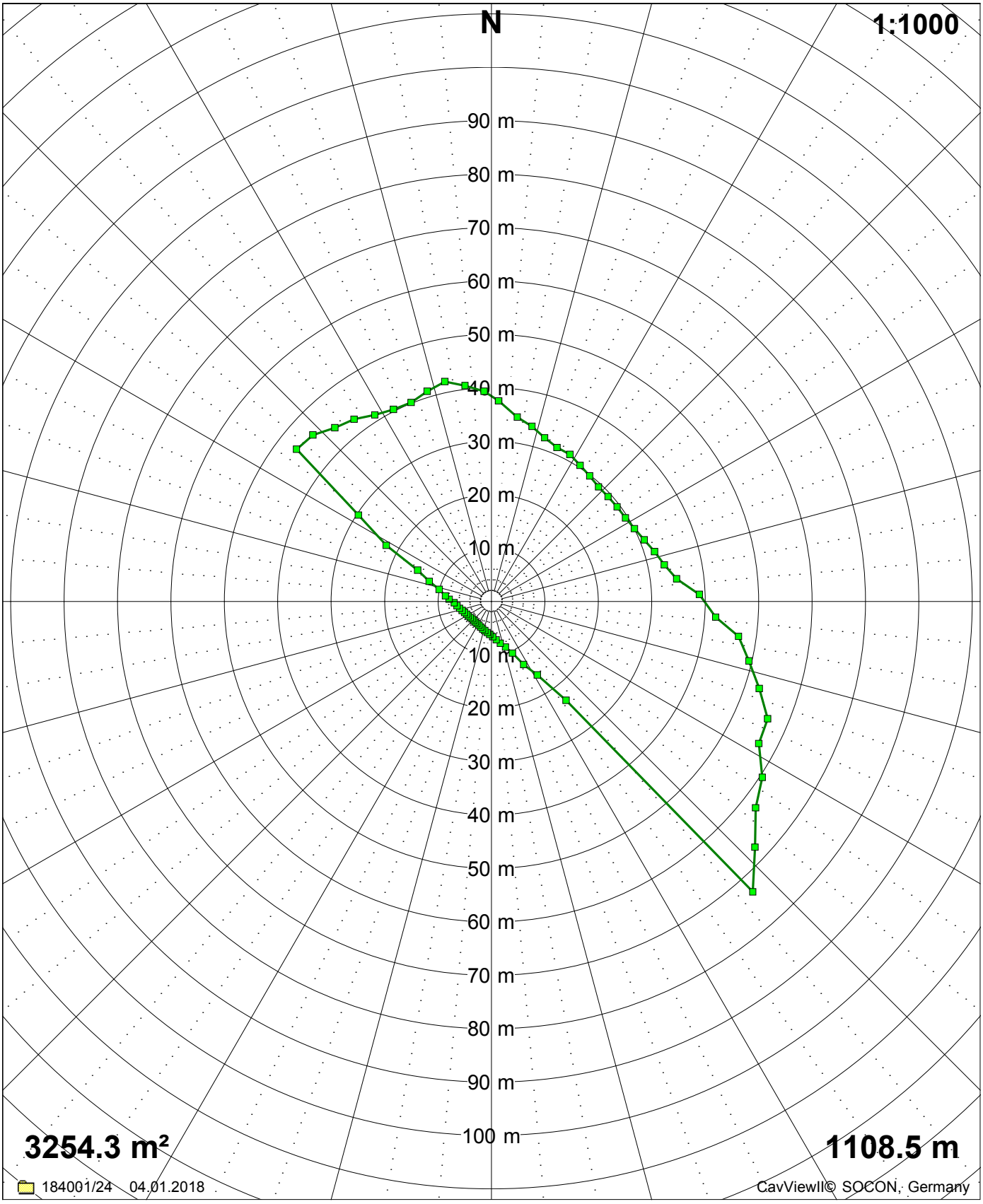
(04.01.2018) (3249.5 m²)

d_{max}: 113.7 m 135° <--> 315° r_{min}: 5.8 m -> 220° r~: 32.2 m r_{max}: 69.2 m -> 135°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



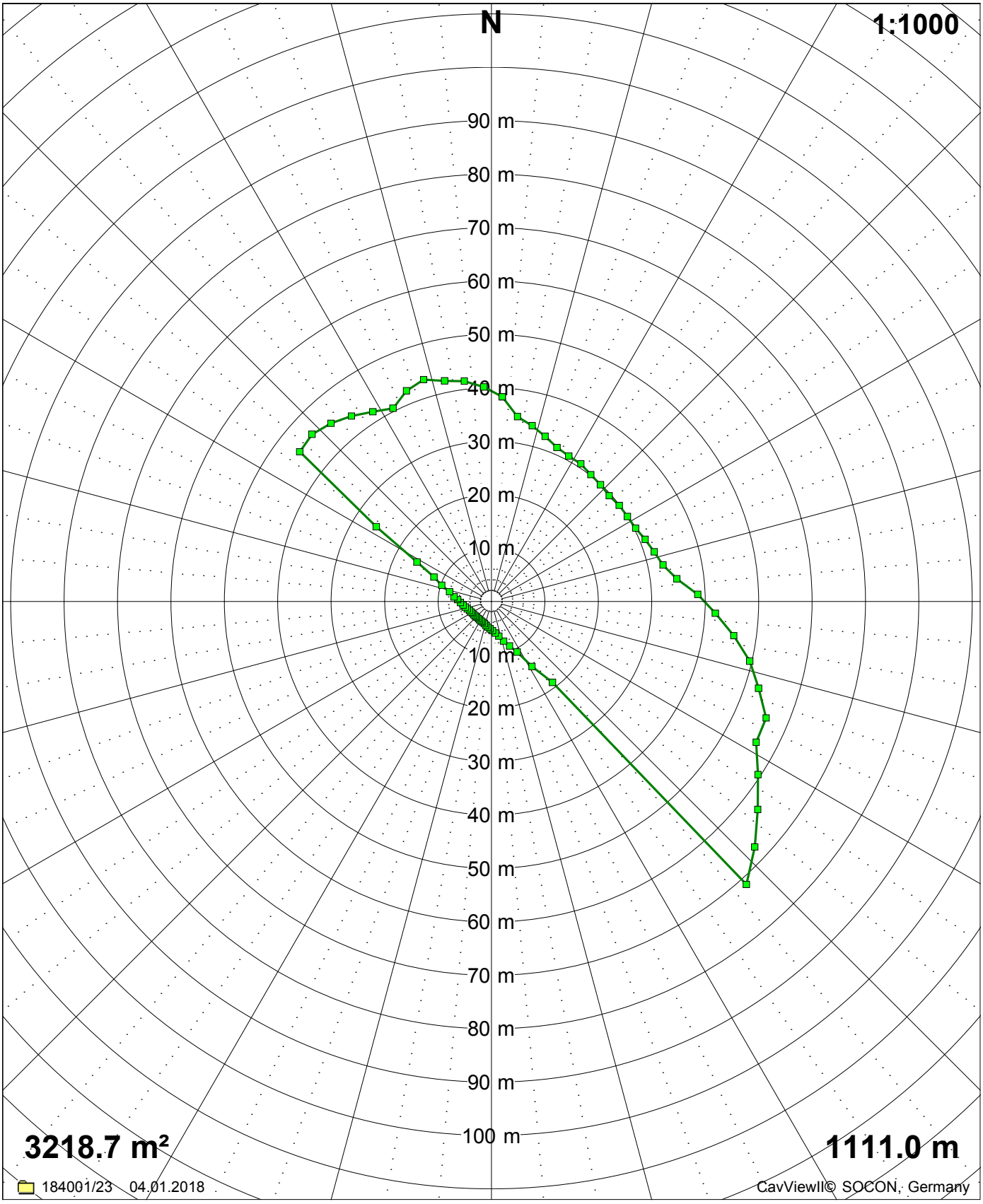
(04.01.2018) (3254.3 m²)

d_{max}: 116.9 m 138° <--> 318° r_{min}: 4.8 m -> 221° r~: 32.2 m r_{max}: 73.1 m -> 138°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



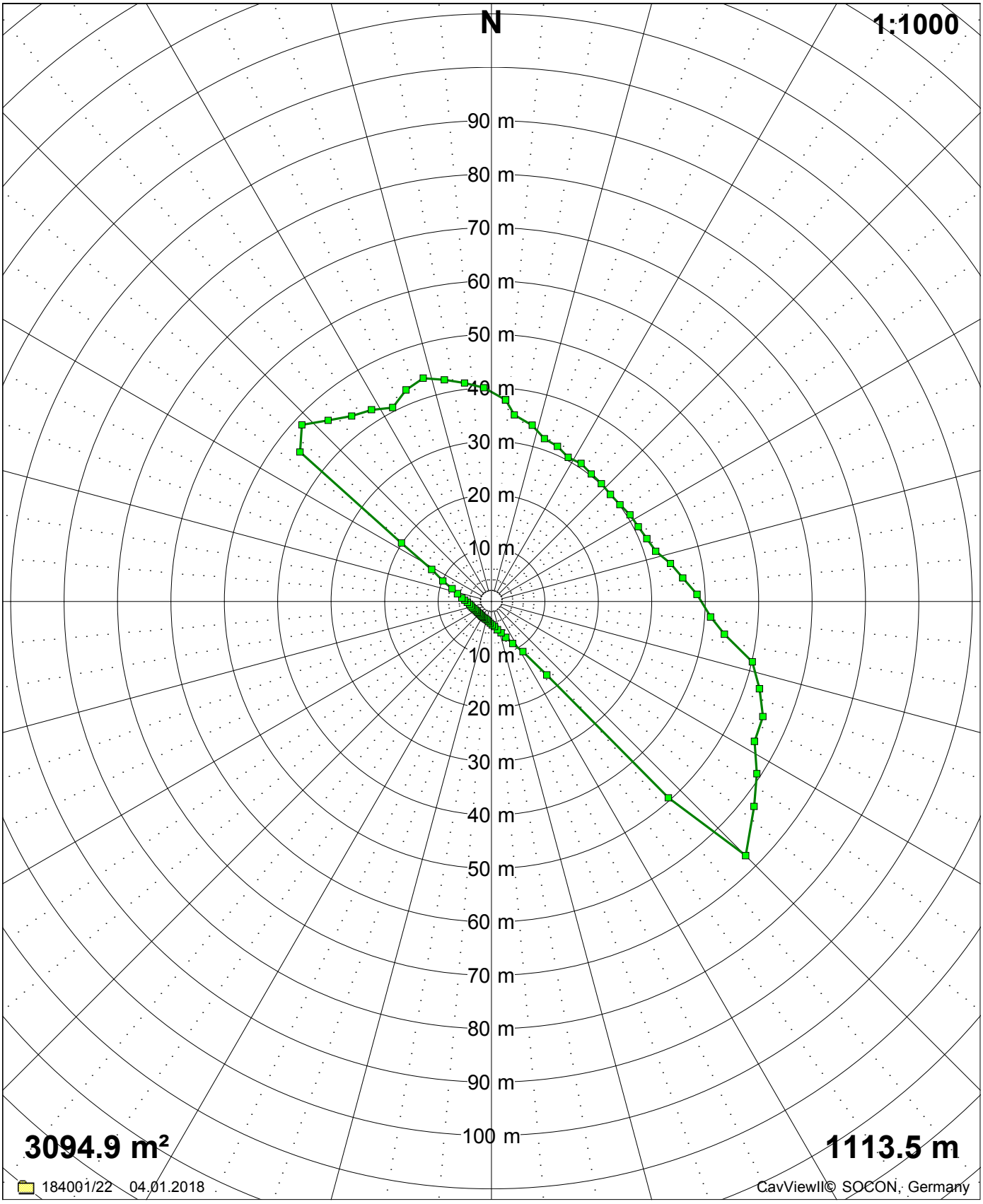
(04.01.2018) (3218.7 m²)

d_{max}: 116.2 m 138° <--> 318° r_{min}: 4.0 m -> 217° r~: 32.0 m r_{max}: 71.2 m -> 138°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



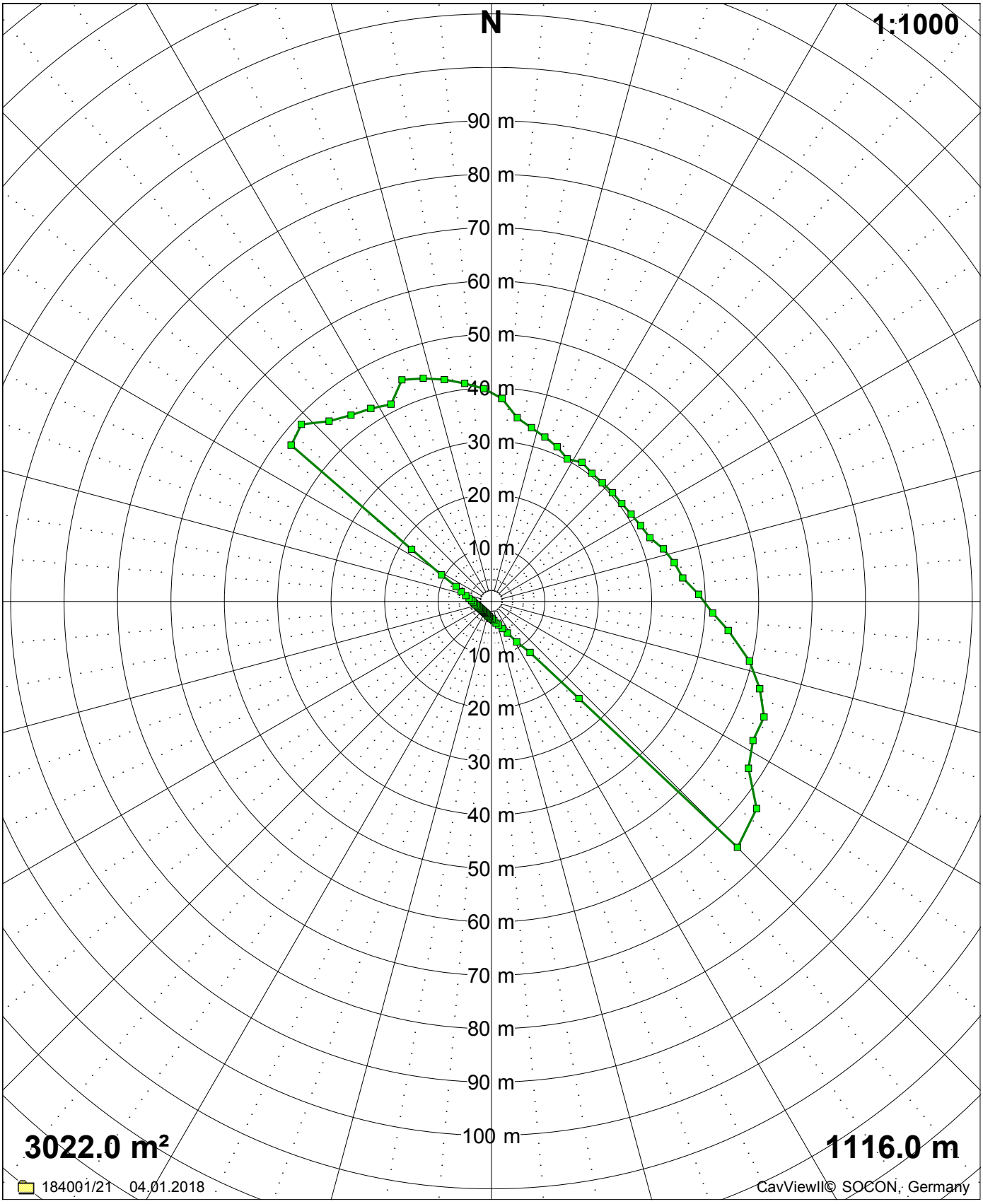
(04.01.2018) (3094.9 m²)

d_{max}: 114.5 m 135° <--> 315° r_{min}: 3.2 m -> 221° r~: 31.4 m r_{max}: 67.3 m -> 135°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



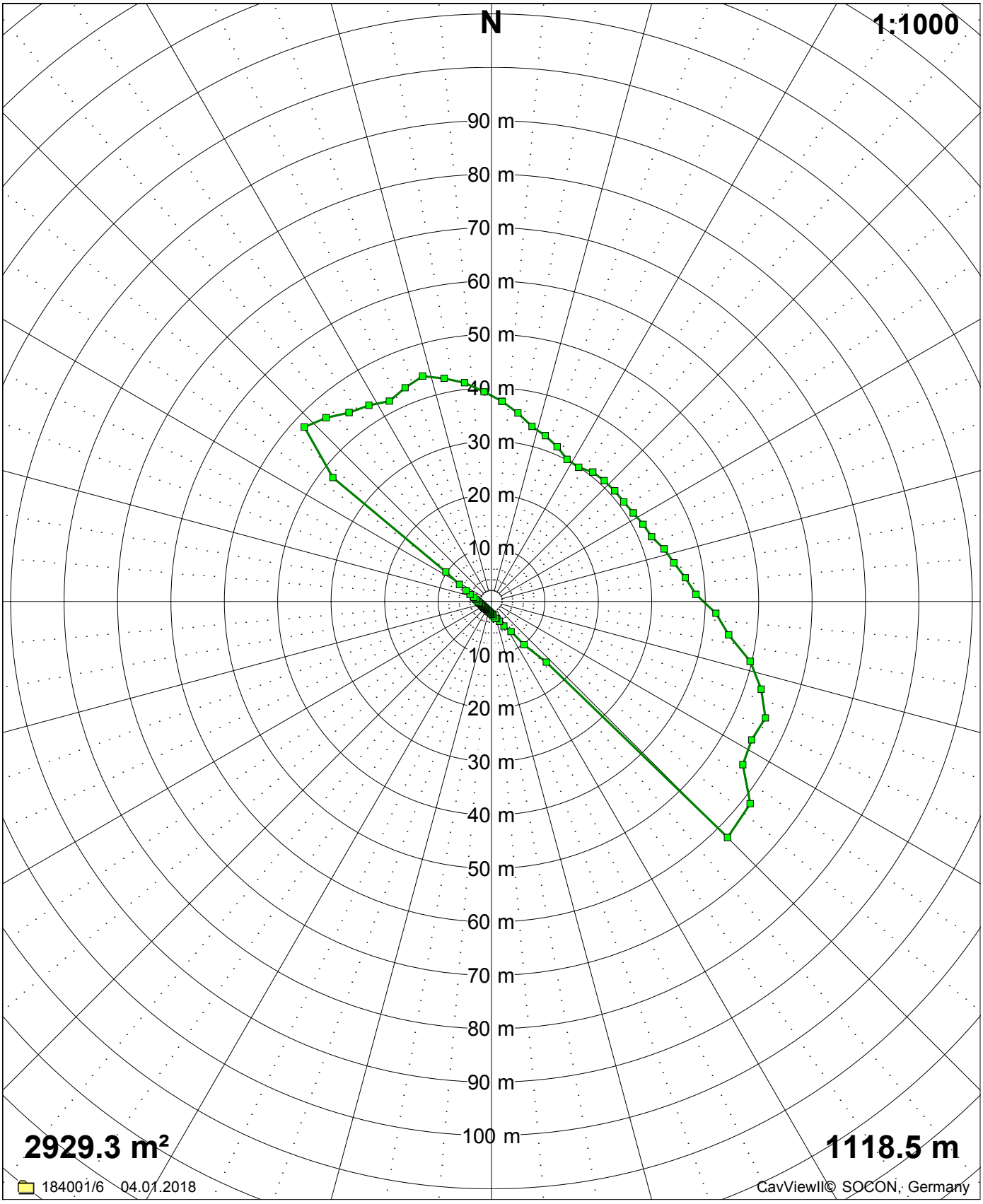
(04.01.2018) (3022.0 m²)

d_{max}: 113.0 m 133° <--> 313° r_{min}: 2.4 m -> 220° r~: 31.0 m r_{max}: 65.1 m -> 135°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



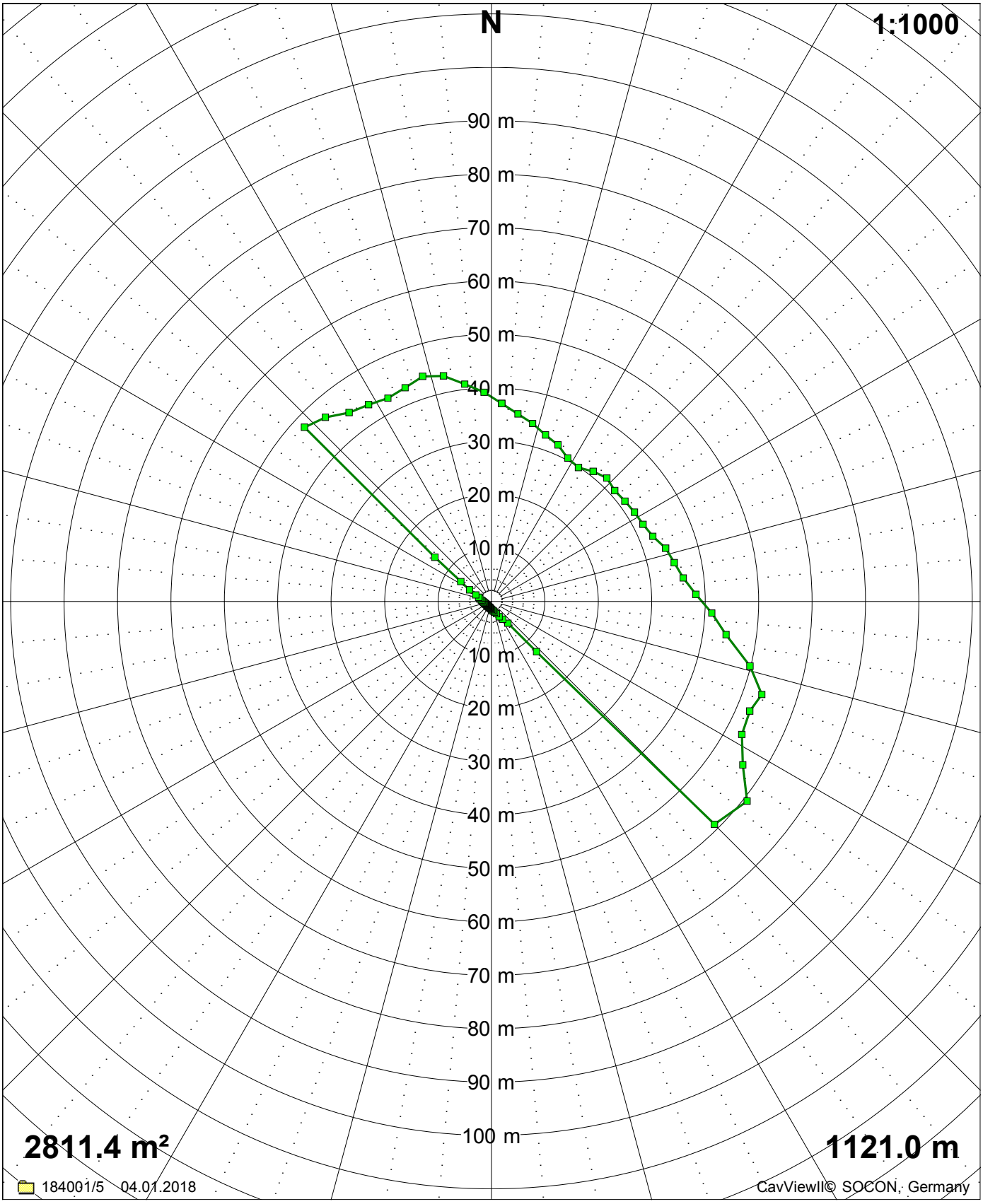
(04.01.2018) (2929.3 m²)

d_{max}: 110.0 m 133° <--> 313° r_{min}: 1.7 m -> 218° r~: 30.5 m r_{max}: 62.5 m -> 135°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



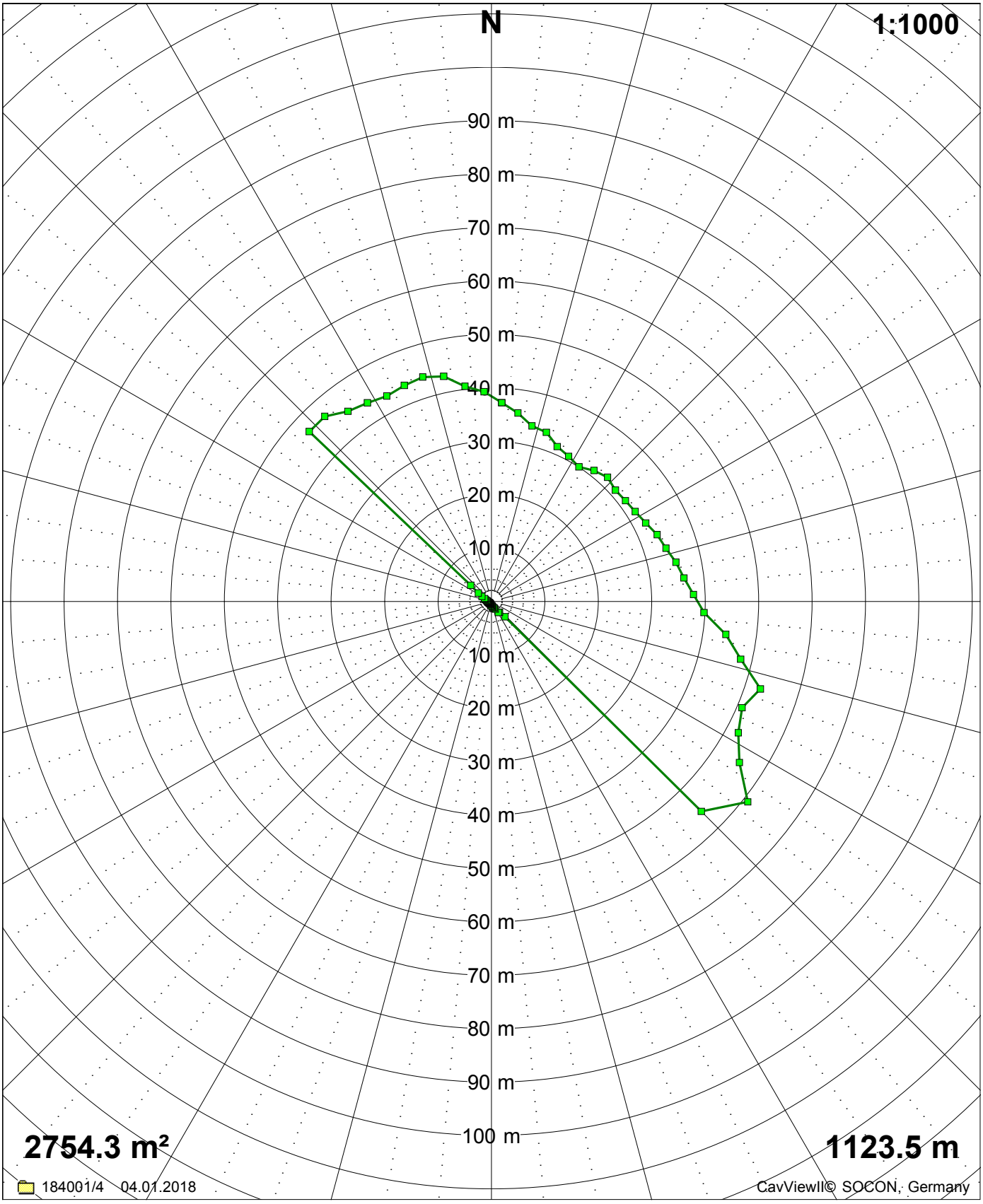
(04.01.2018) (2811.4 m²)

d_{max}: 107.2 m 133° <--> 313° r_{min}: 1.1 m -> 221° r~: 29.9 m r_{max}: 60.7 m -> 128°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



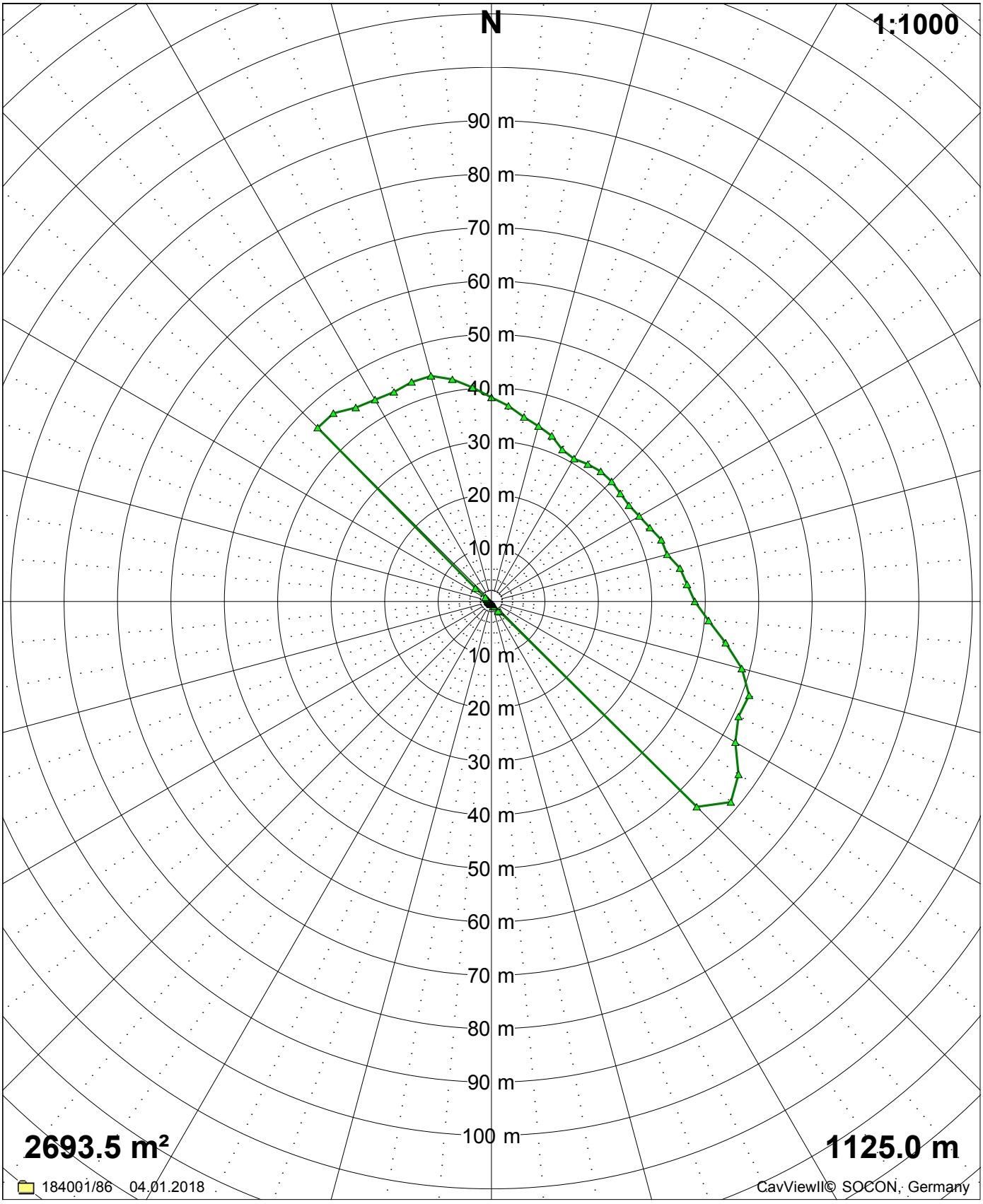
(04.01.2018) (2754.3 m²)

d_{max}: 103.5 m 133° <--> 313° r_{min}: 0.5 m -> 203° r~: 29.6 m r_{max}: 60.9 m -> 128°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



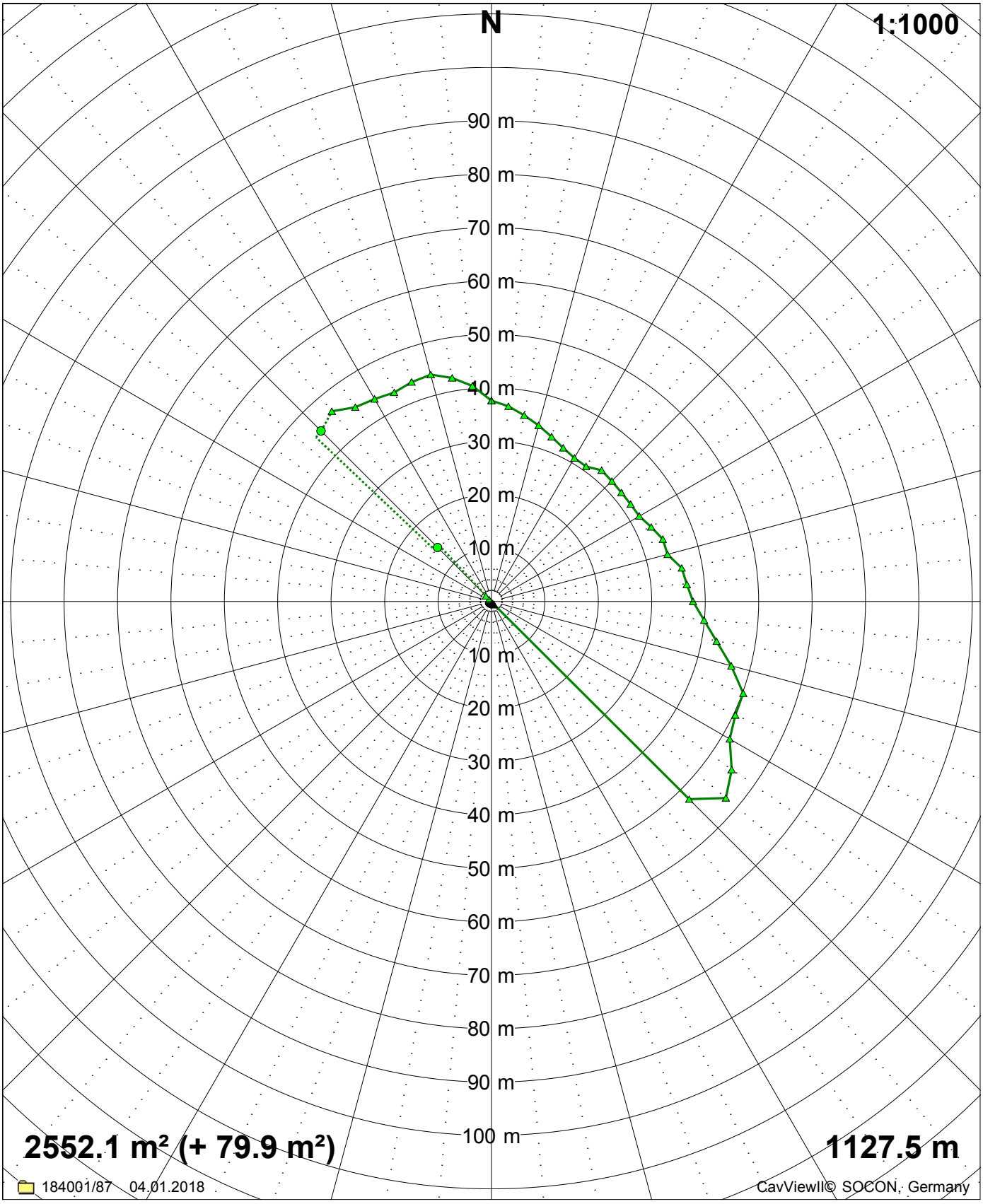
(04.01.2018) (2693.5 m²)

d_{max}: 100.4 m 135° <--> 315° r_{min}: 0.4 m -> 205° r~: 29.3 m r_{max}: 58.4 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



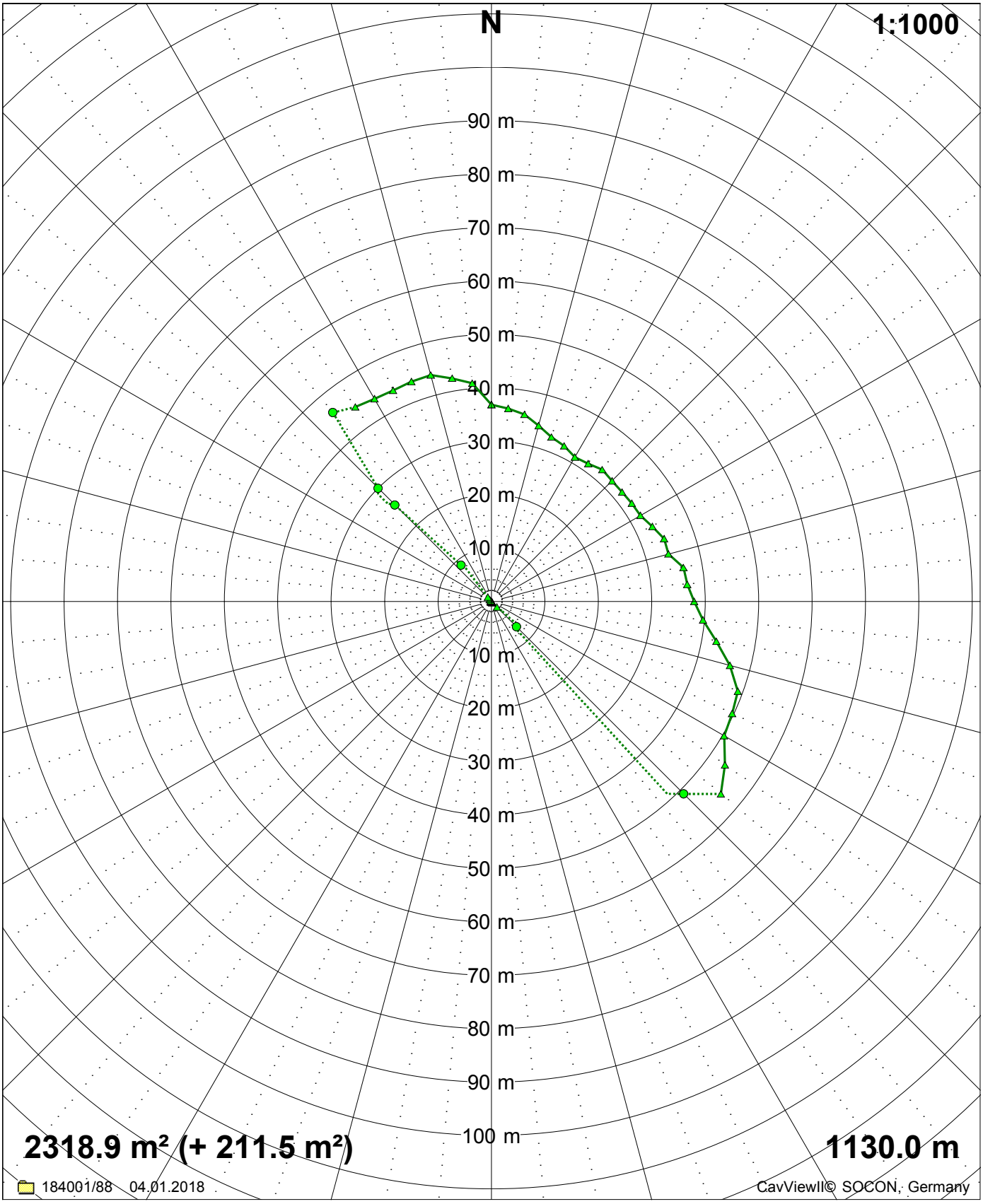
(04.01.2018) (2632.0 m²) | Leached pocket (04.01.2018)

d_{max}: 97.4 m 135° <--> 315° r_{min}: 0.2 m -> 202° r~: 28.9 m r_{max}: 57.2 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



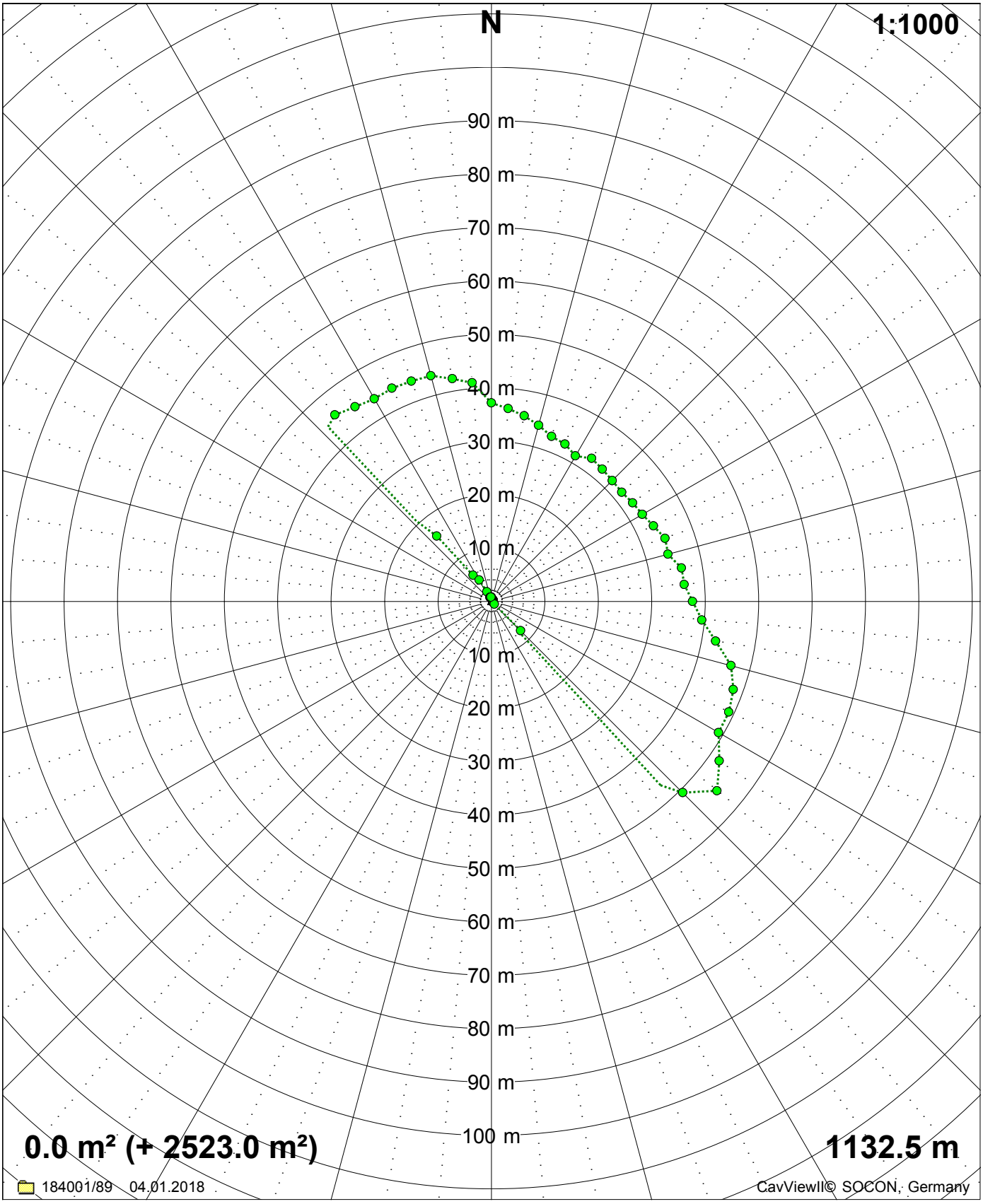
(04.01.2018) (2530.5 m²) | Leached pocket (04.01.2018)

d_{max}: 80.9 m 135° <--> 315° r_{min}: 0.1 m -> 200° r~: 28.4 m r_{max}: 56.0 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



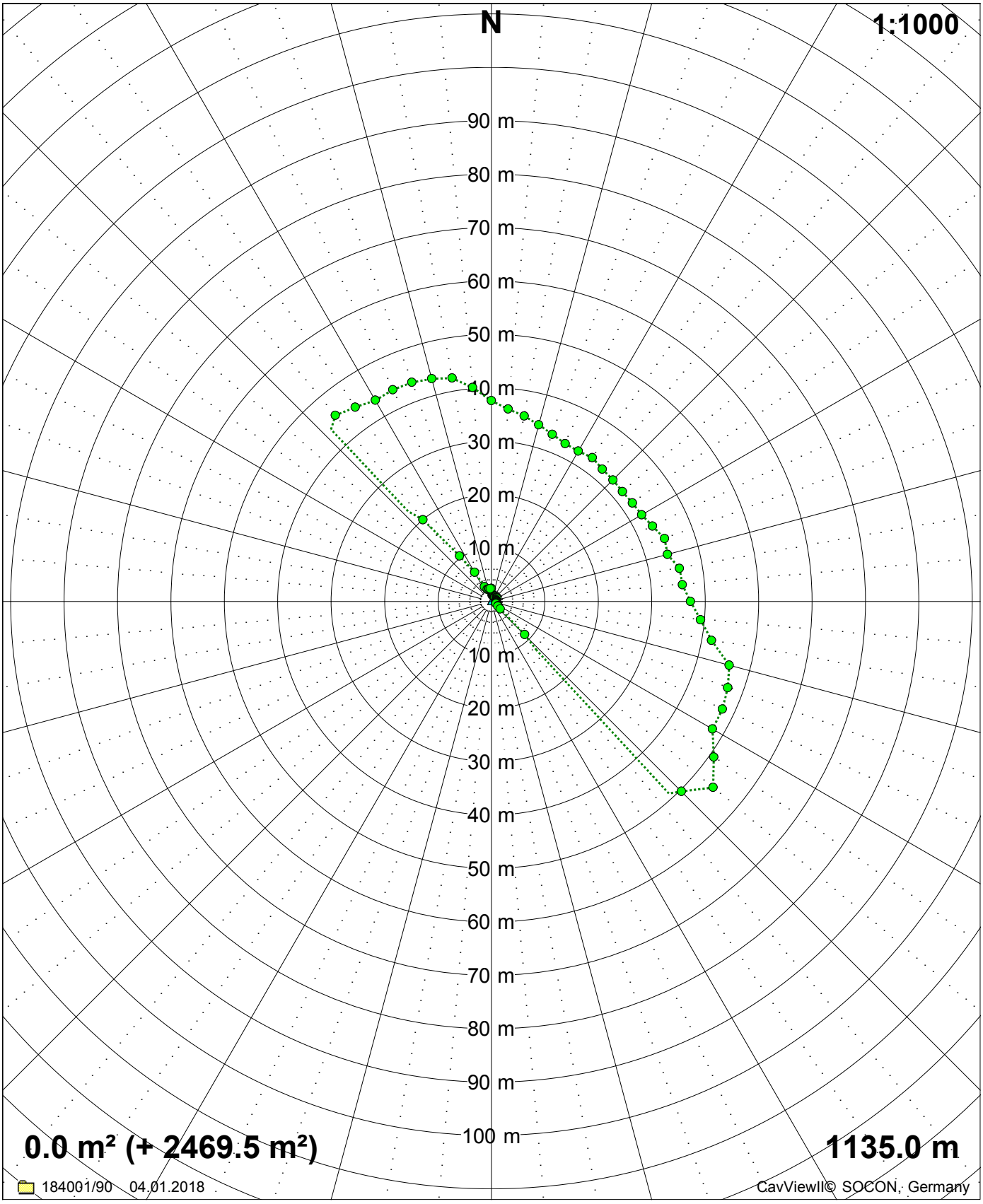
(04.01.2018) (2523.0 m²) | Leached pocket (04.01.2018)

d_{max}: 55.1 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 28.3 m r_{max}: 55.1 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



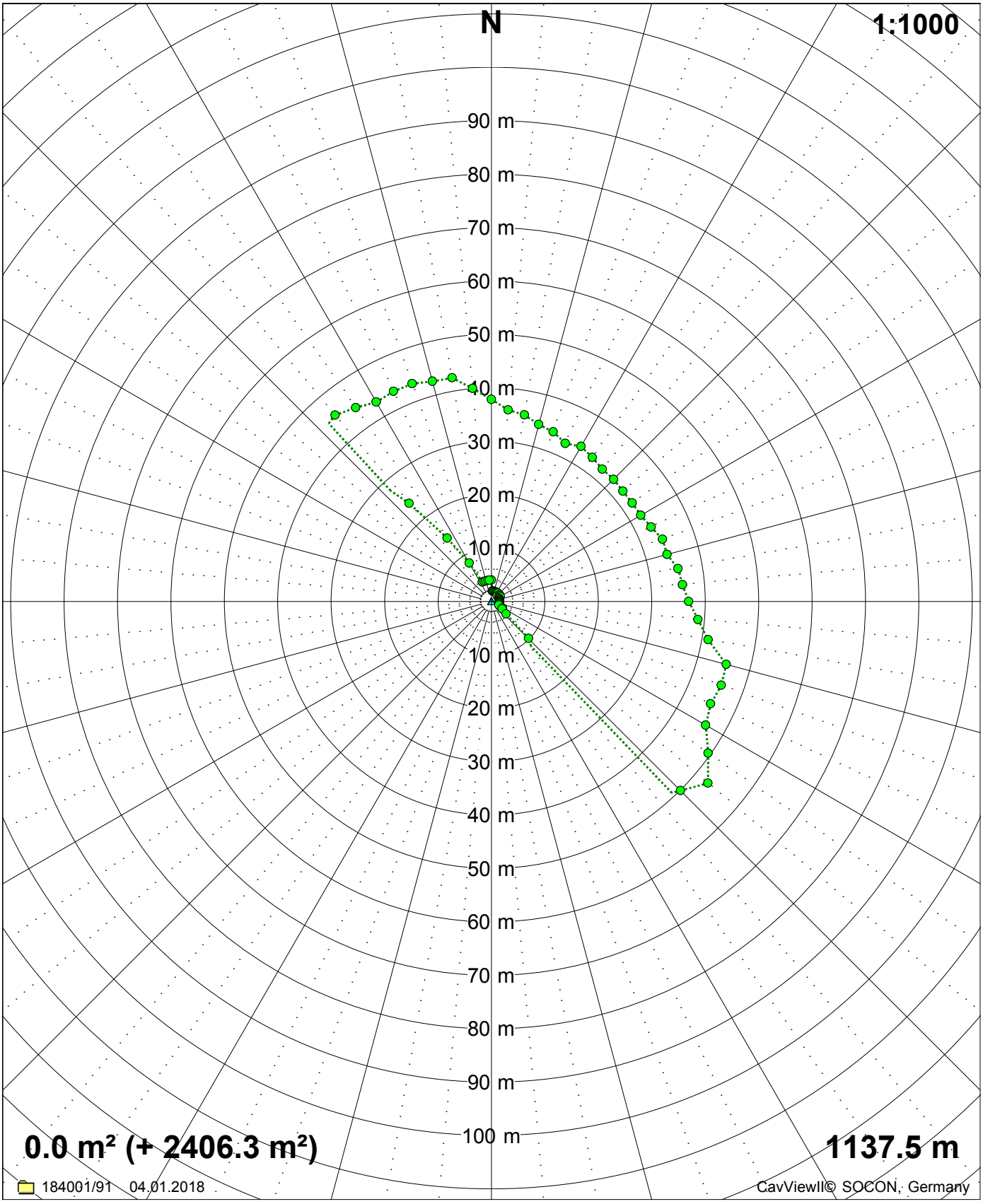
(04.01.2018) (2469.5 m²) | Leached pocket (04.01.2018)

d_{max}: 54.1 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 28.0 m r_{max}: 54.1 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



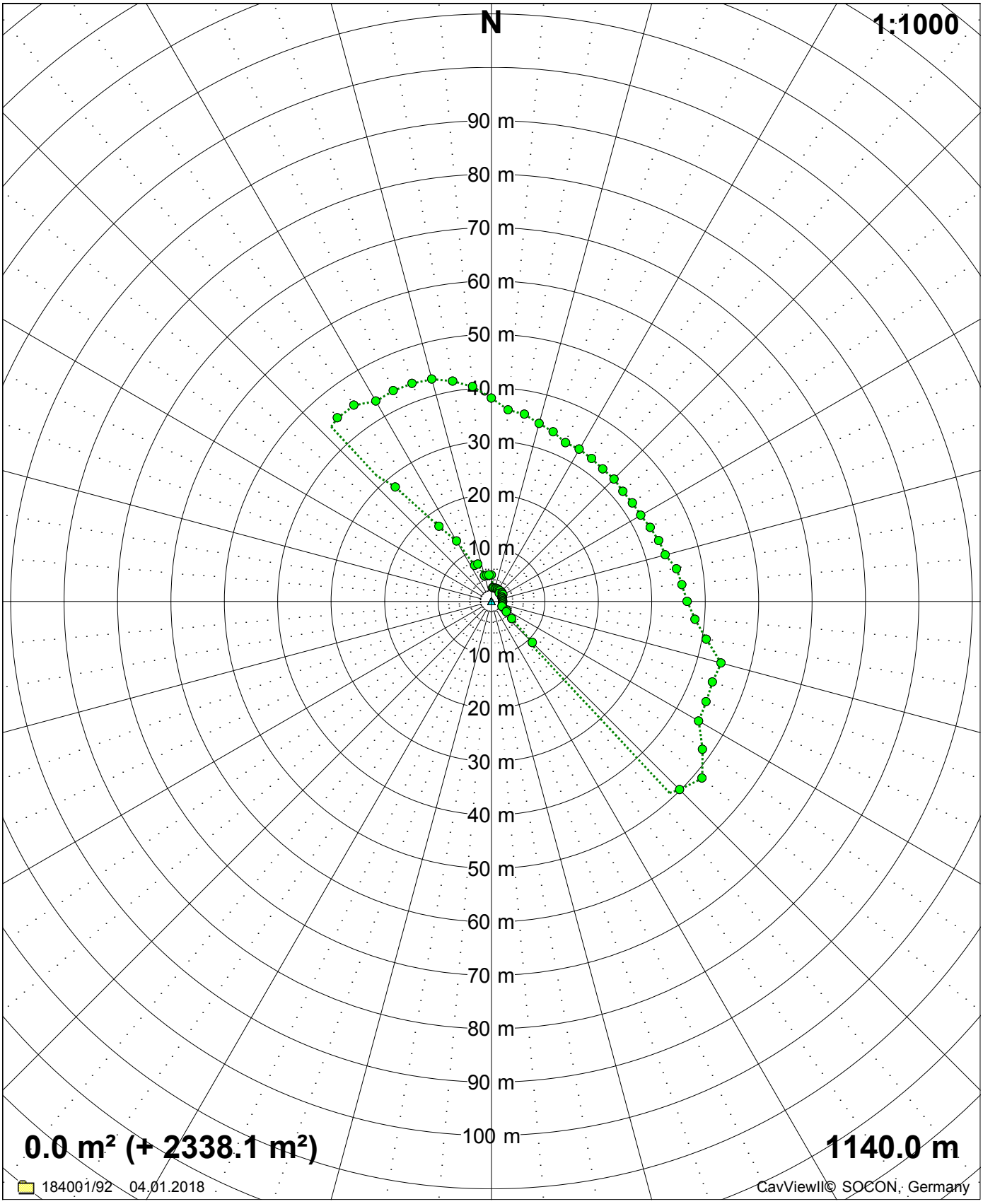
(04.01.2018) (2406.3 m²) | Leached pocket (04.01.2018)

d_{max}: 52.9 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 27.7 m r_{max}: 52.9 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



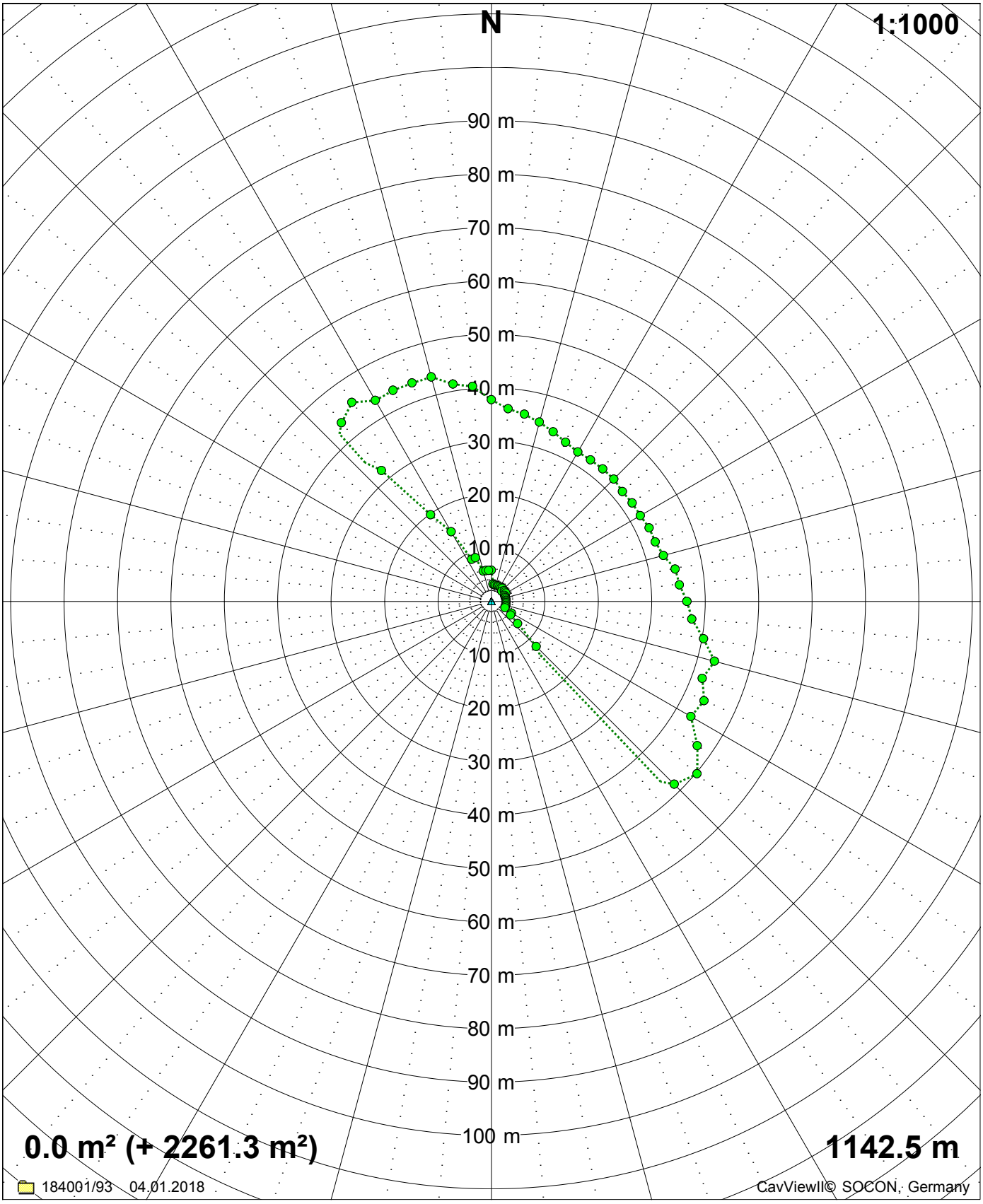
(04.01.2018) (2338.1 m²) | Leached pocket (04.01.2018)

d_{max}: 51.5 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 27.3 m r_{max}: 51.5 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



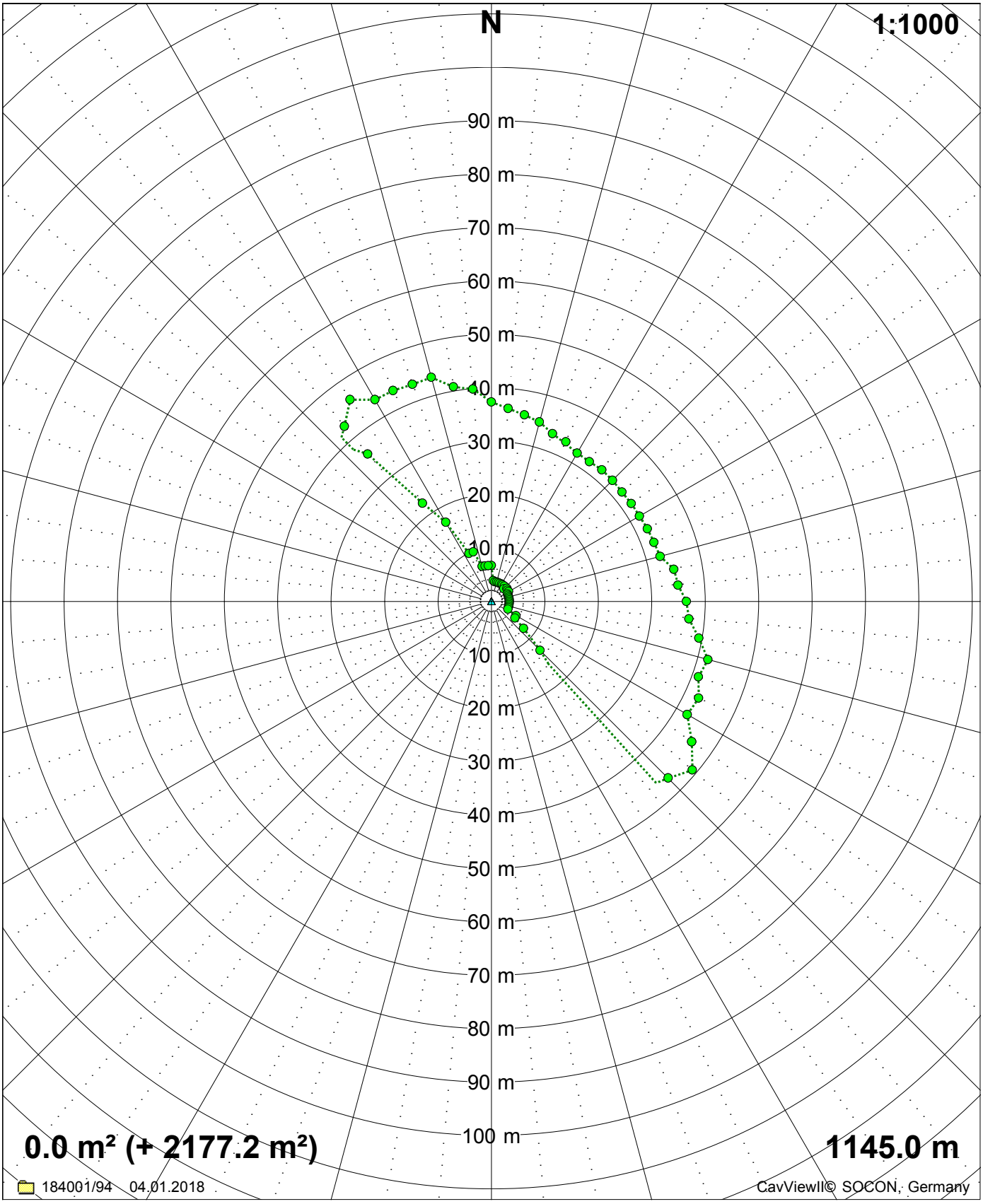
(04.01.2018) (2261.3 m²) | Leached pocket (04.01.2018)

d_{max}: 50.2 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 26.8 m r_{max}: 50.2 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



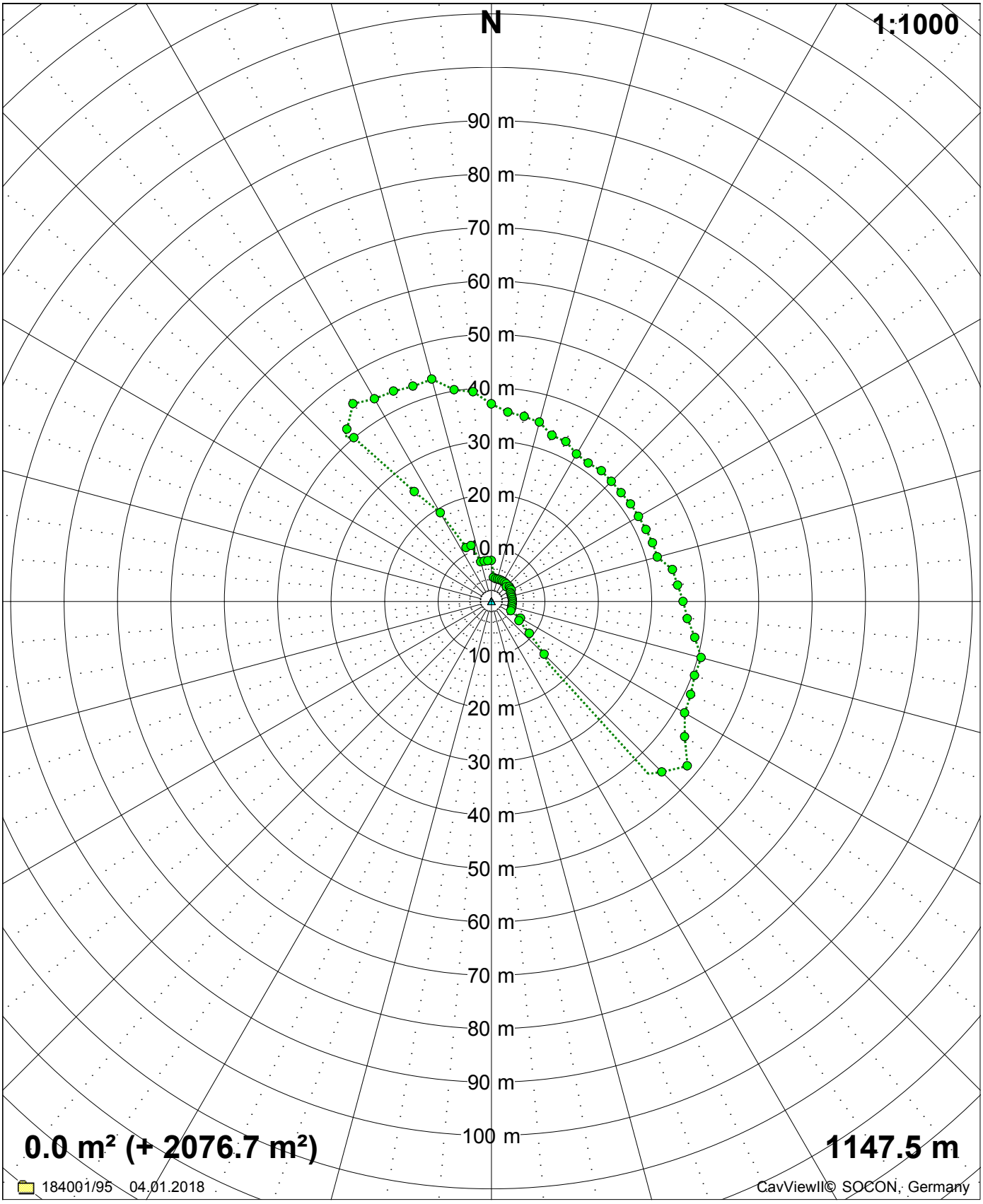
(04.01.2018) (2177.2 m²) | Leached pocket (04.01.2018)

d_{max}: 49.1 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 26.3 m r_{max}: 49.1 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



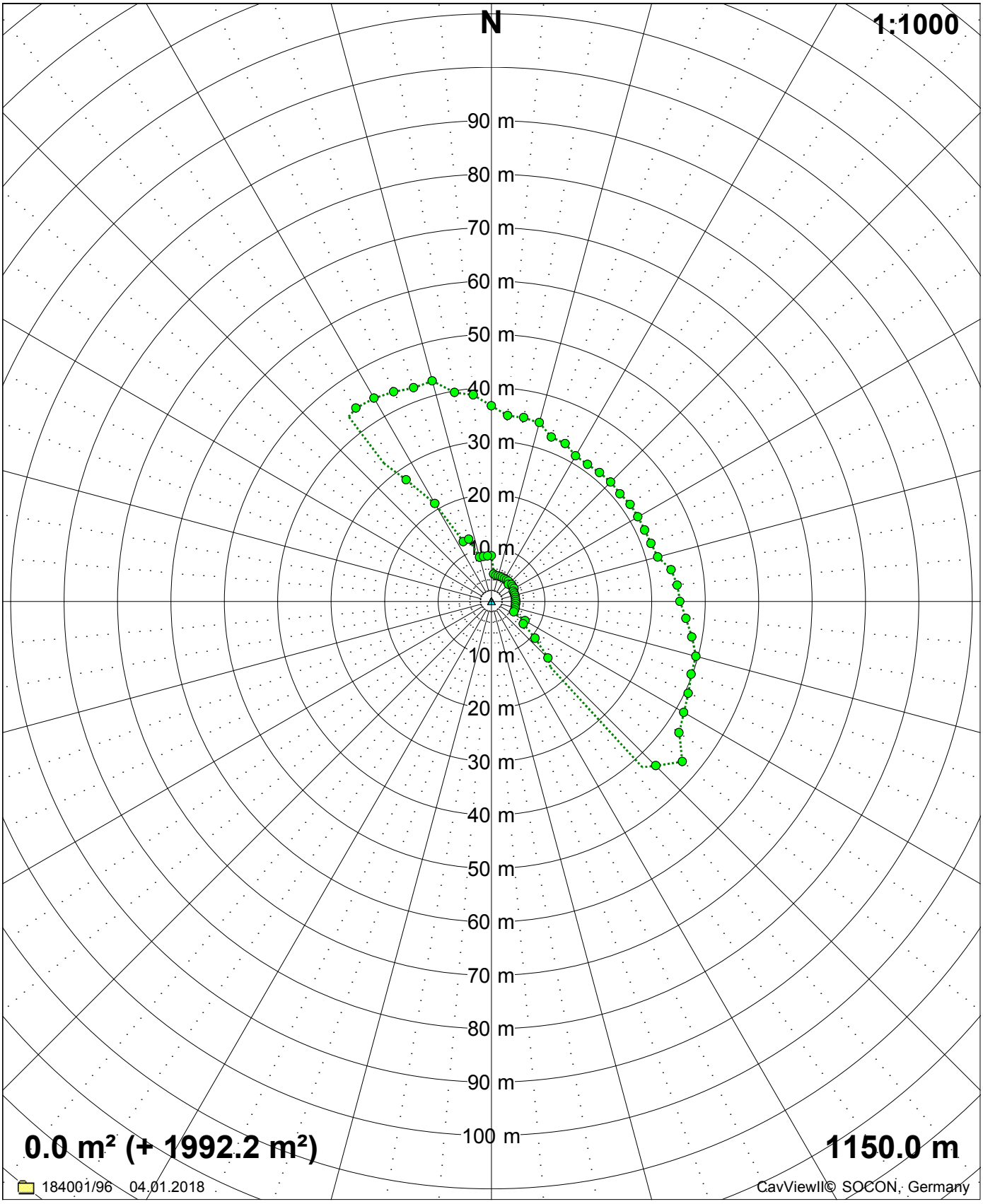
(04.01.2018) (2076.7 m²) | Leached pocket (04.01.2018)

d_{max}: 47.9 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 25.7 m r_{max}: 47.9 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



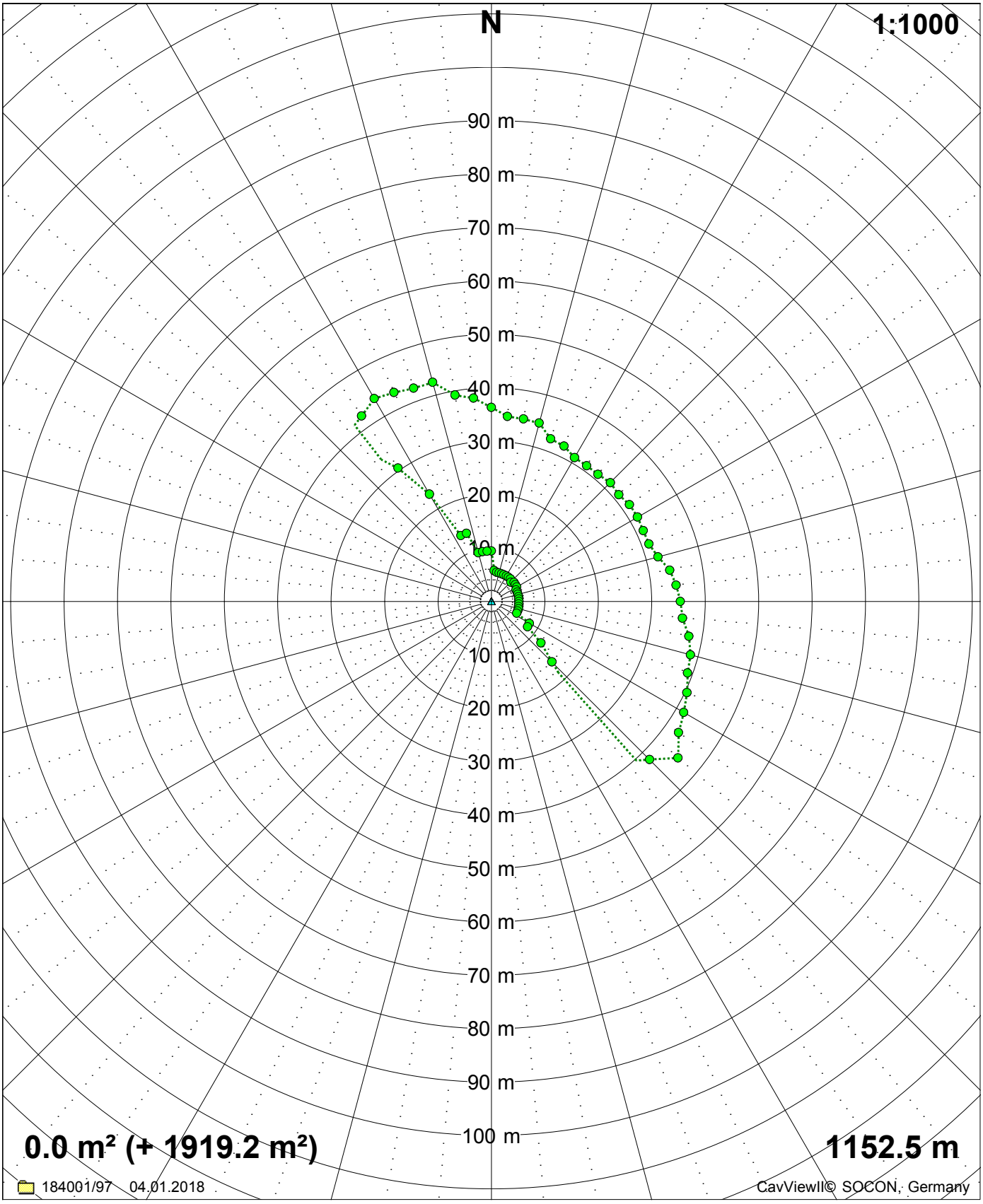
(04.01.2018) (1992.2 m²) | Leached pocket (04.01.2018)

d_{max}: 46.6 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 25.2 m r_{max}: 46.6 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



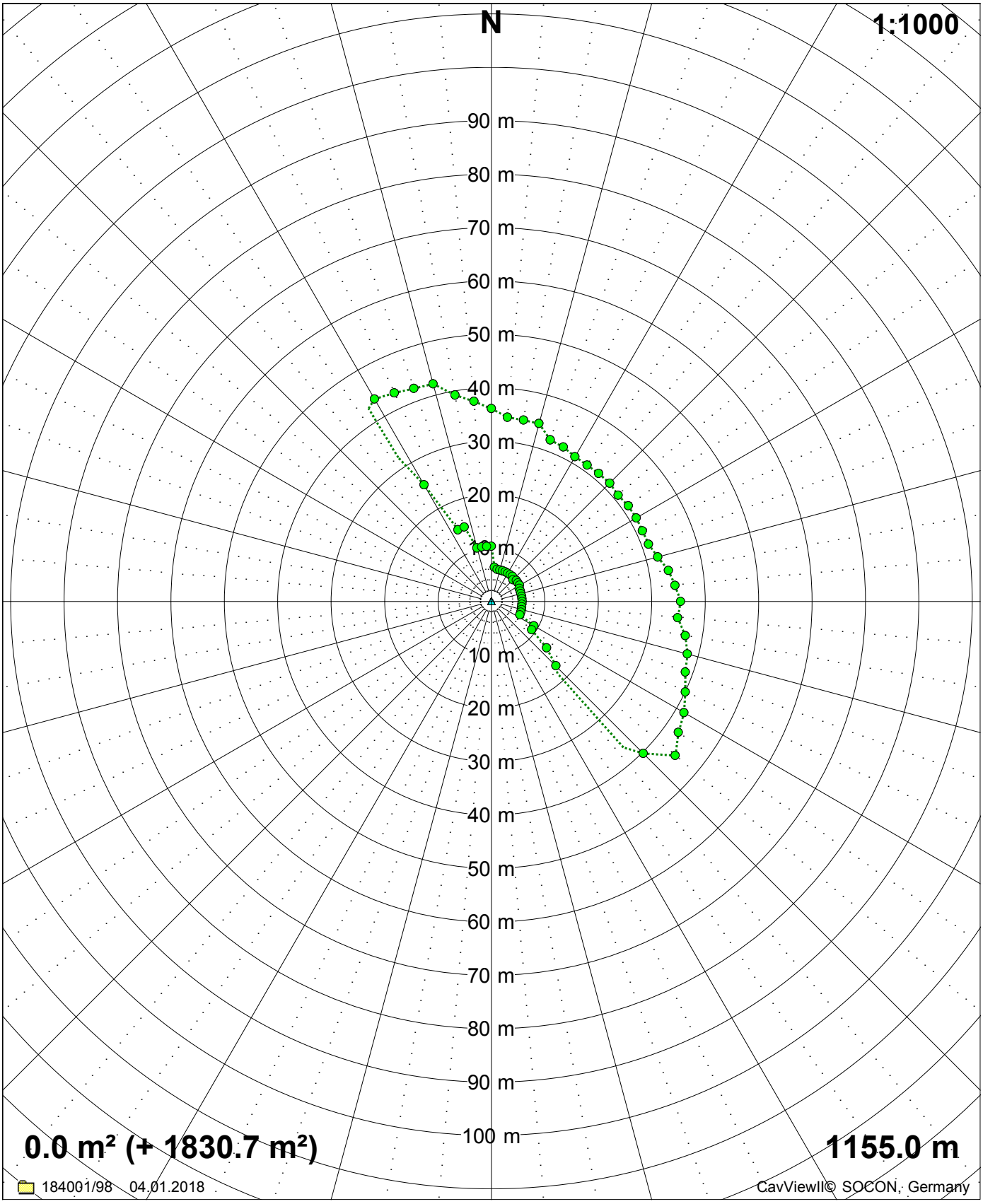
(04.01.2018) (1919.2 m²) | Leached pocket (04.01.2018)

d_{max}: 45.6 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 24.7 m r_{max}: 45.6 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



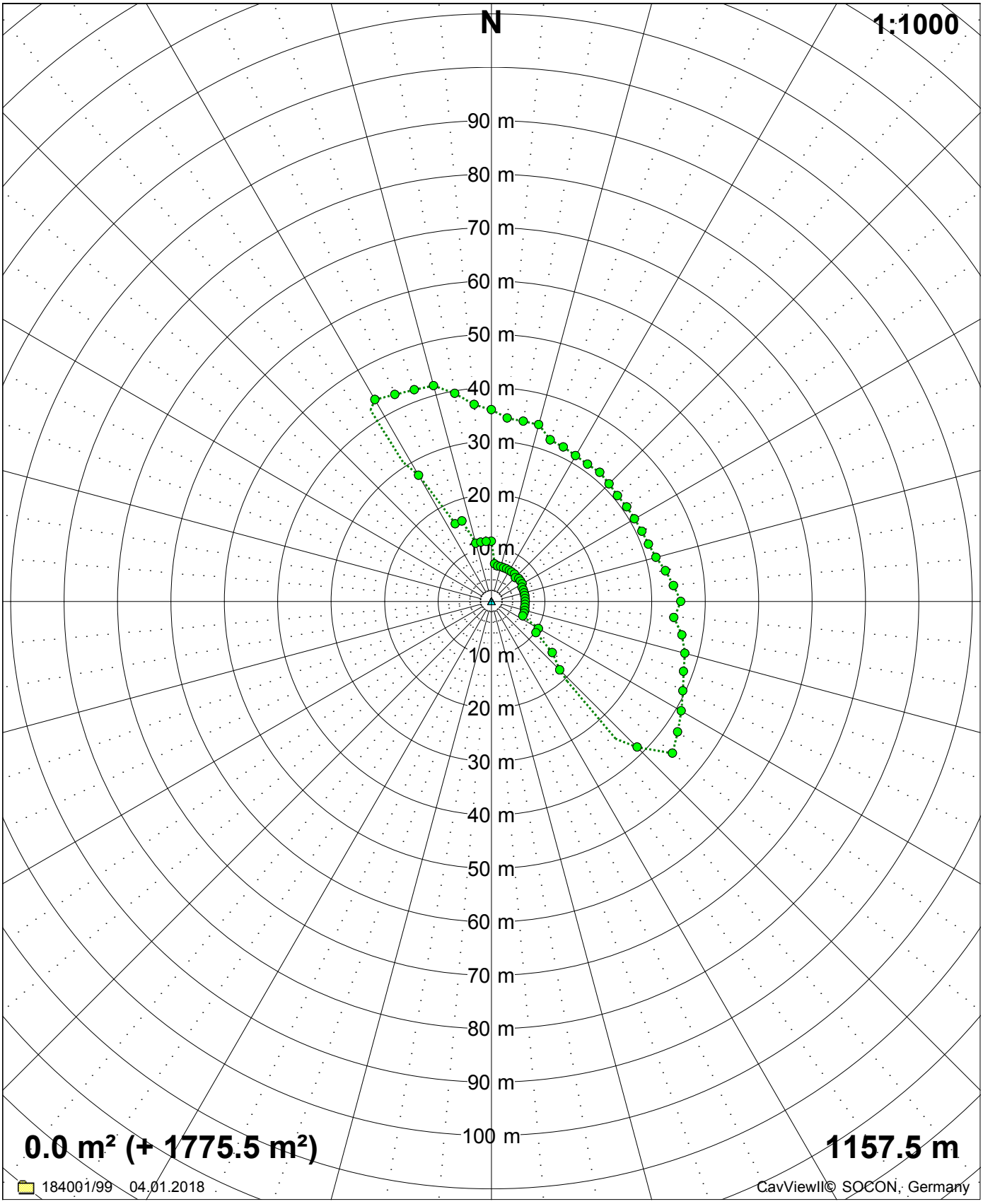
(04.01.2018) (1830.7 m²) | Leached pocket (04.01.2018)

d_{max}: 44.9 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 24.1 m r_{max}: 44.9 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



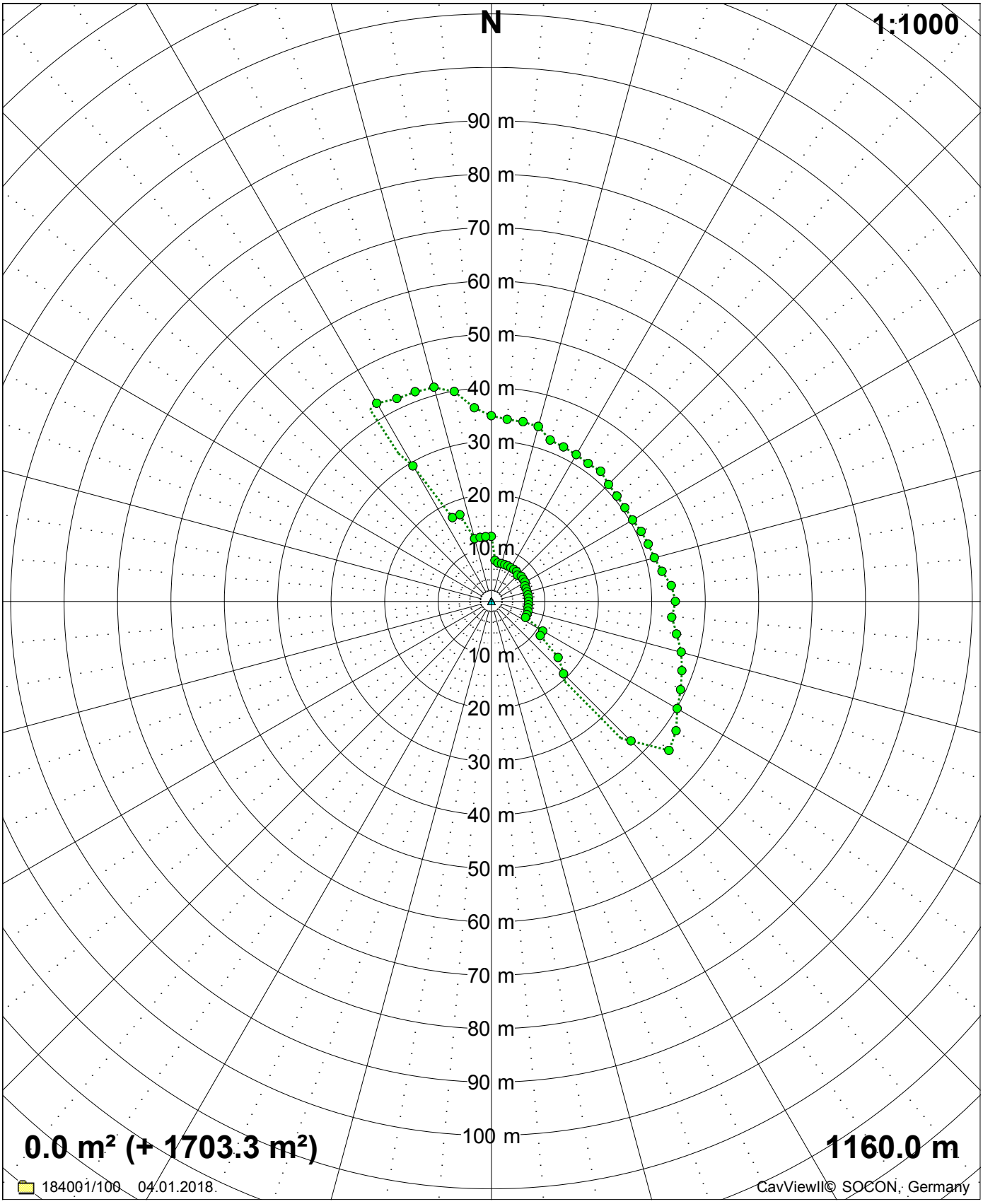
(04.01.2018) (1775.5 m²) | Leached pocket (04.01.2018)

d_{max}: 44.2 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 23.8 m r_{max}: 44.2 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



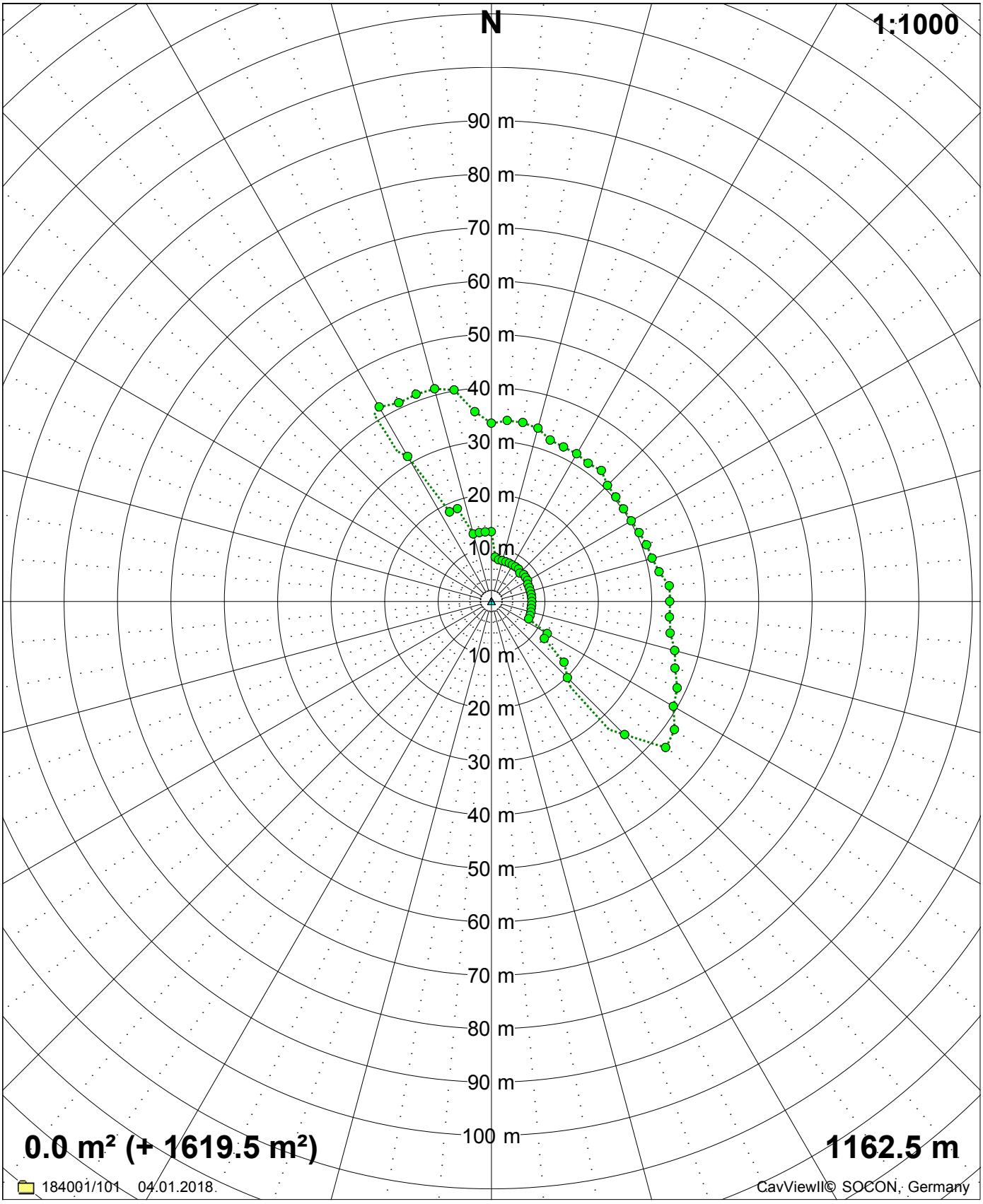
(04.01.2018) (1703.3 m²) | Leached pocket (04.01.2018)

d_{max}: 43.4 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 23.3 m r_{max}: 43.4 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



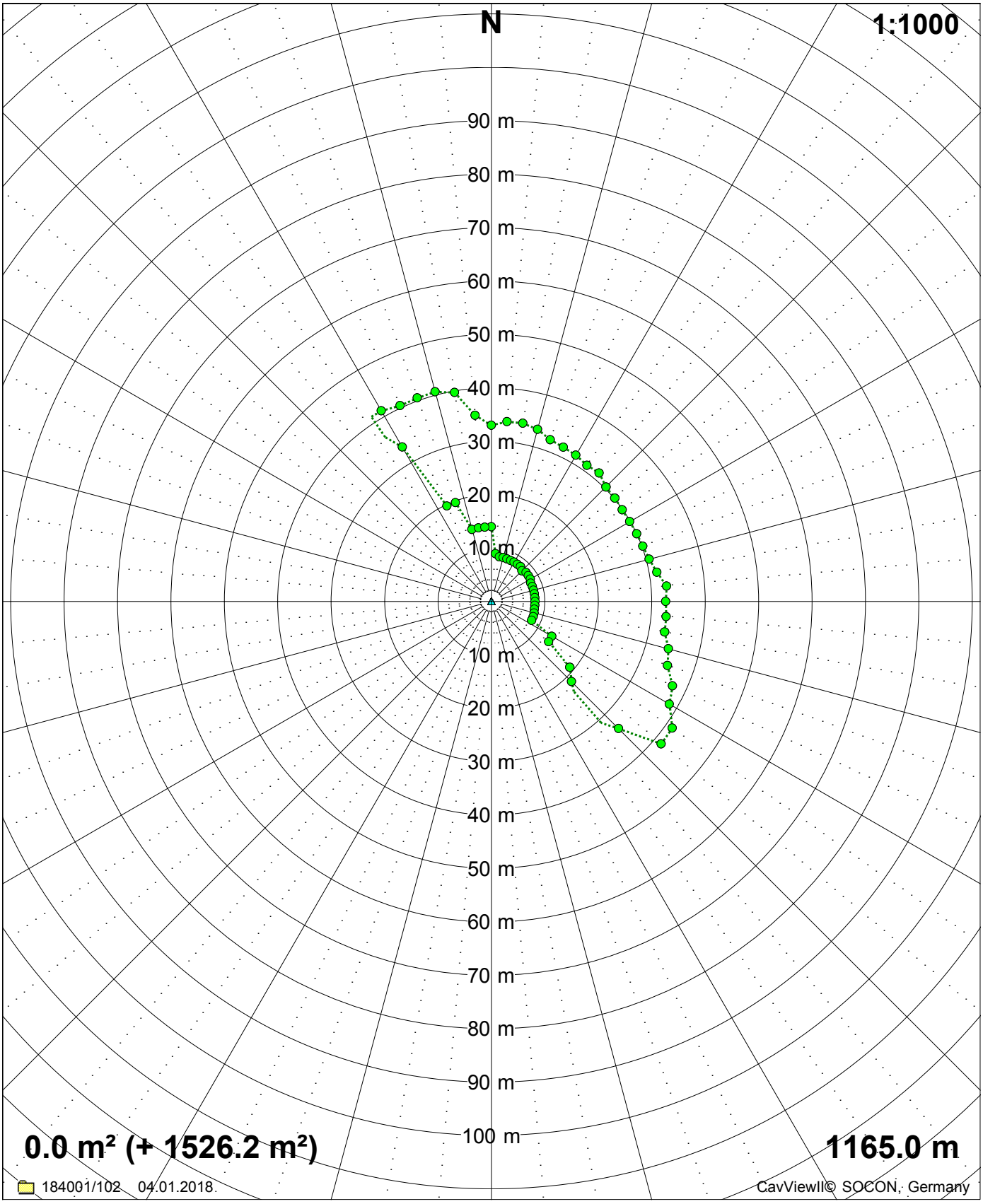
(04.01.2018) (1619.5 m²) | Leached pocket (04.01.2018)

d_{max}: 42.5 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 22.7 m r_{max}: 42.5 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



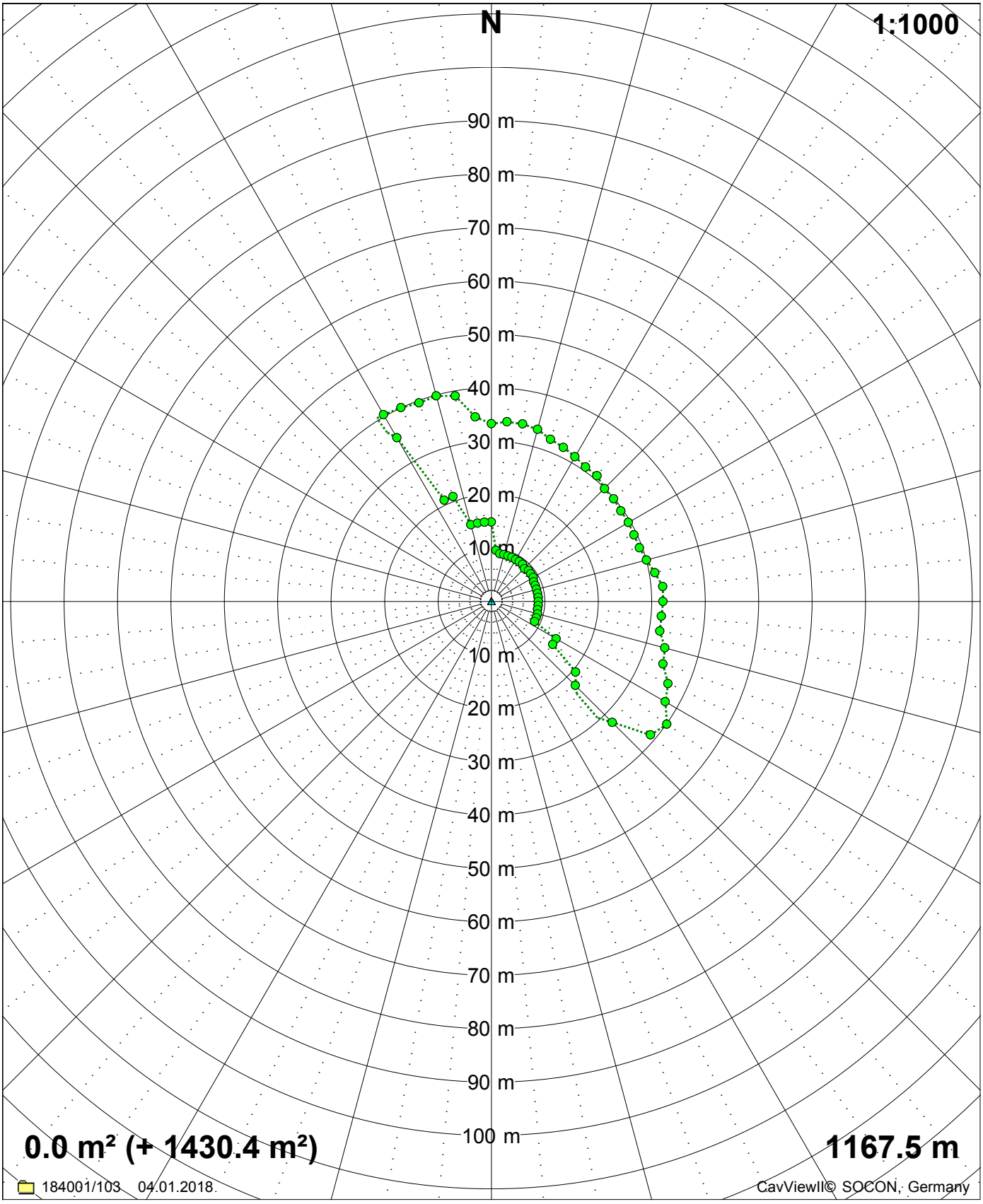
(04.01.2018) (1526.2 m²) | Leached pocket (04.01.2018)

d_{max}: 41.5 m 130° <--> 310° r_{min}: 0.0 m -> 0° r~: 22.0 m r_{max}: 41.5 m -> 130°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



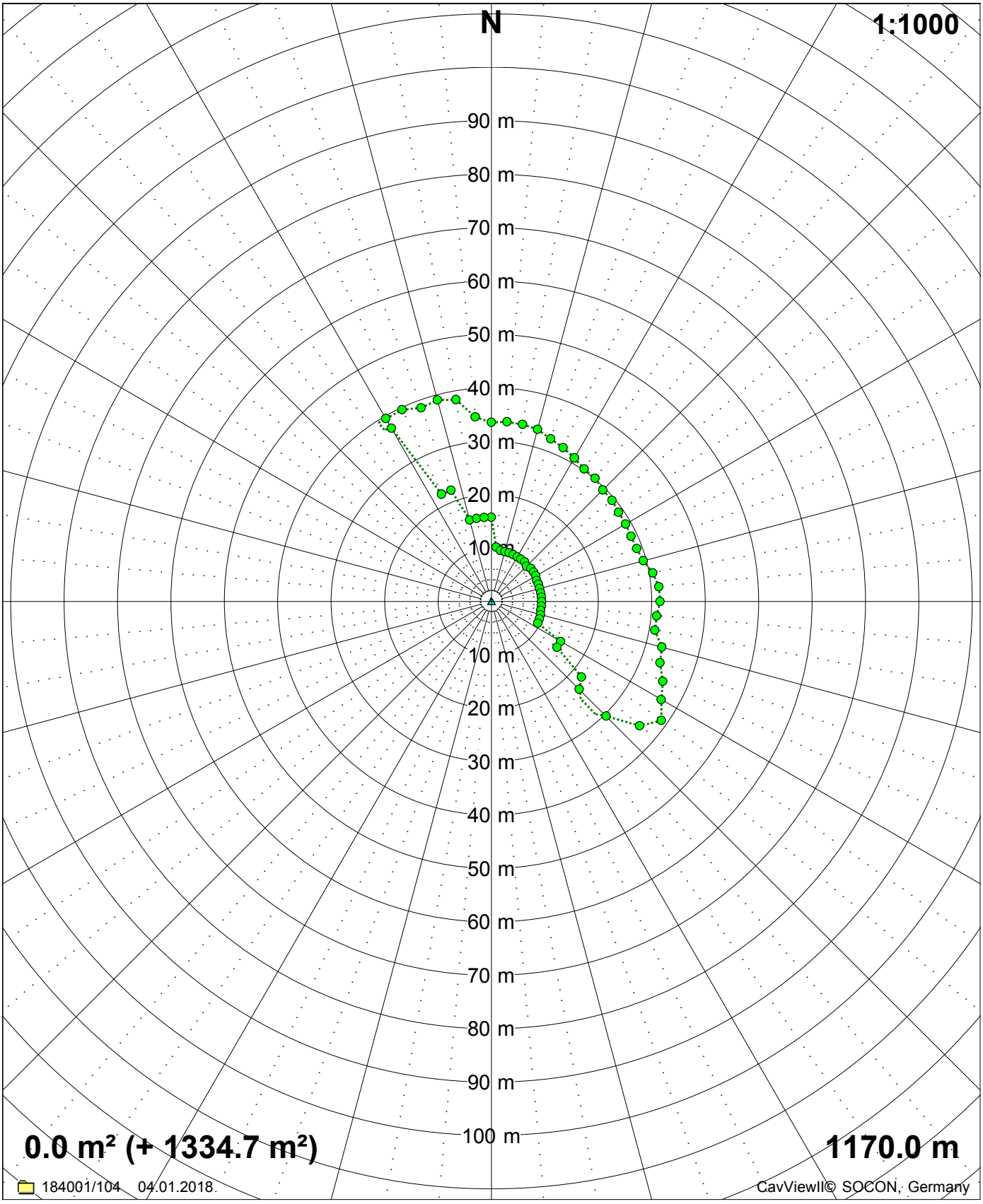
(04.01.2018) (1430.4 m²) | Leached pocket (04.01.2018)

d_{max}: 40.4 m 150° <--> 330° r_{min}: 0.0 m -> 0° r~: 21.3 m r_{max}: 40.4 m -> 330°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



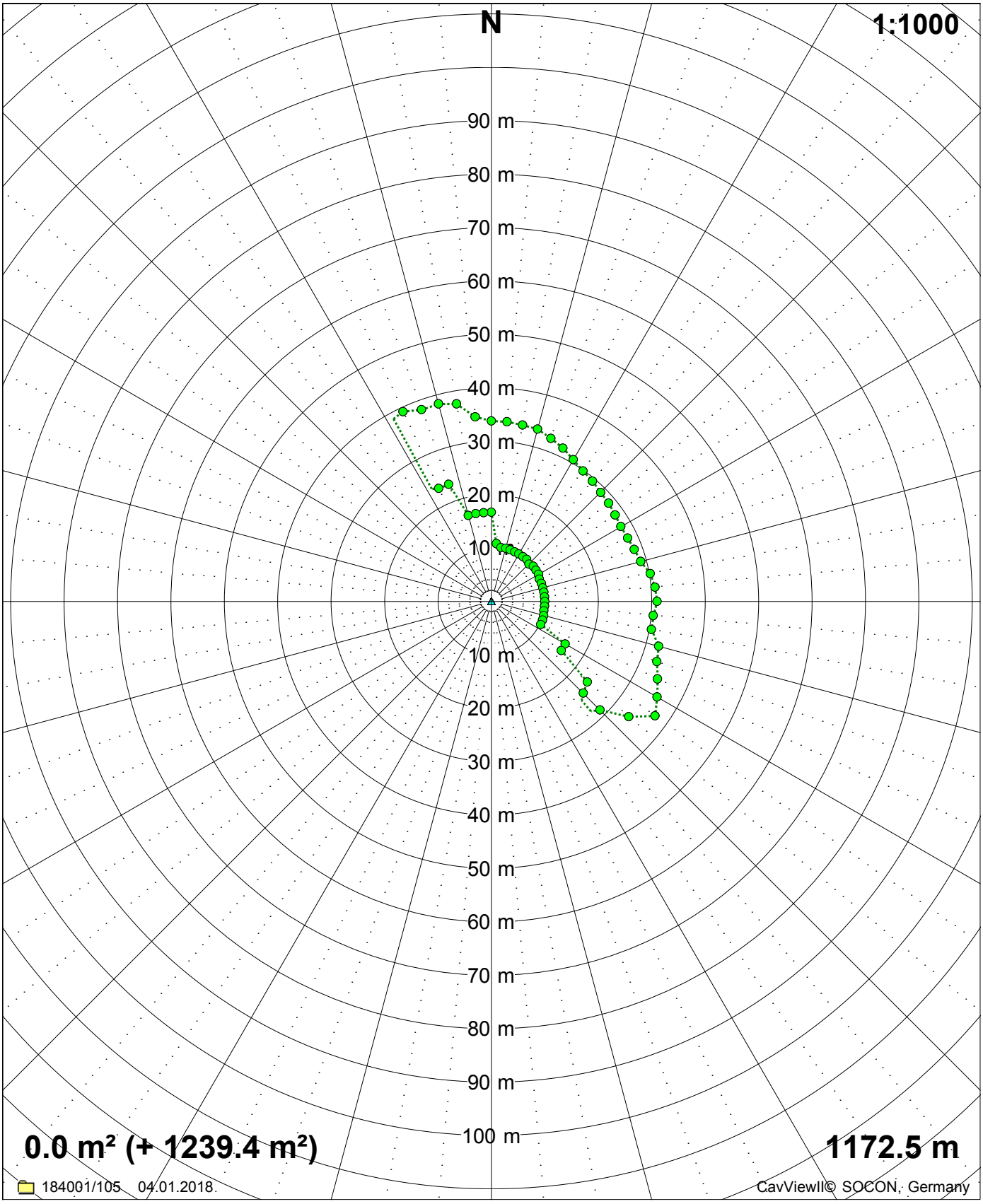
(04.01.2018) (1334.7 m²) | Leached pocket (04.01.2018)

d_{max}: 39.6 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 20.6 m r_{max}: 39.6 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



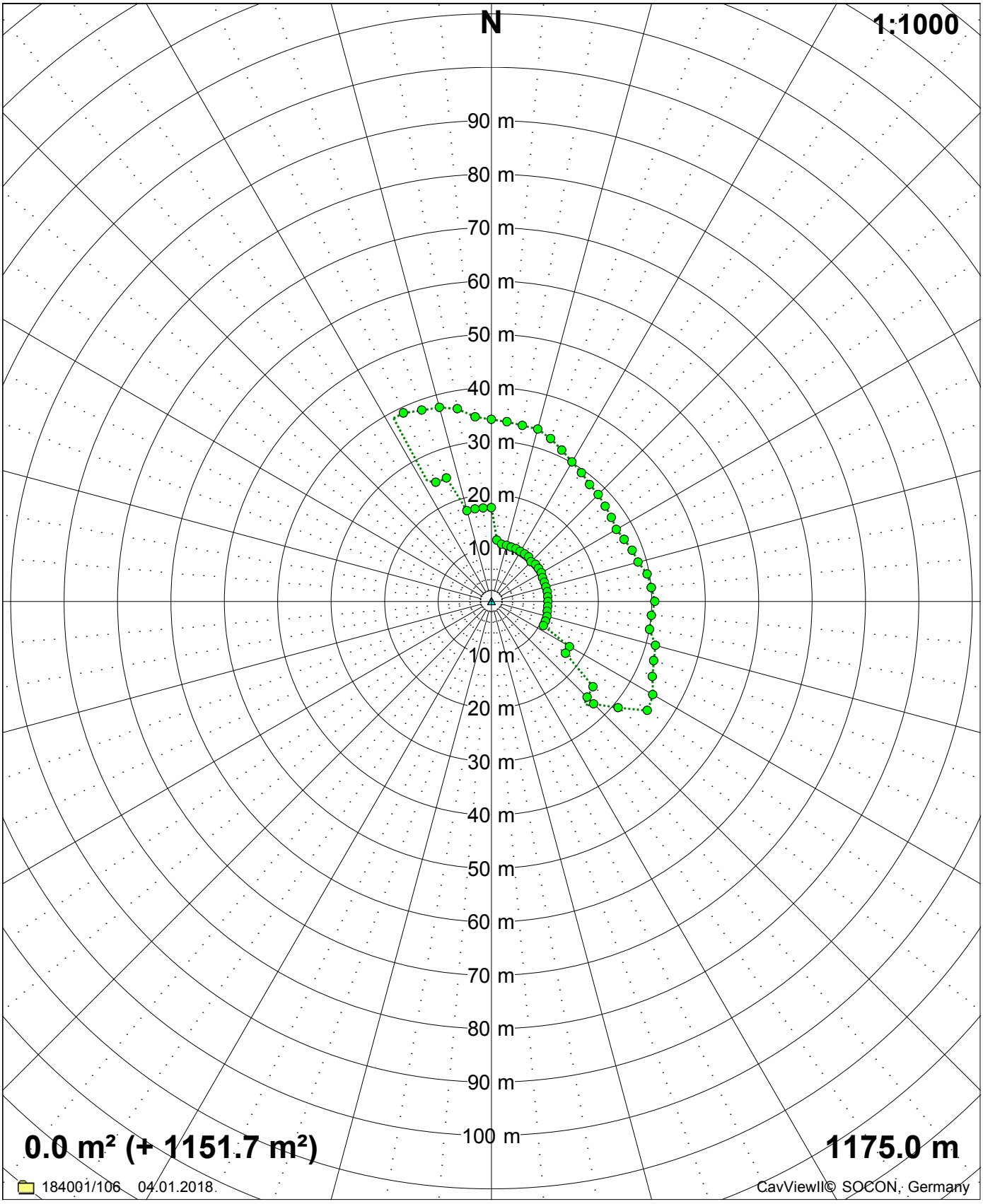
(04.01.2018) (1239.4 m²) | Leached pocket (04.01.2018)

d_{max}: 39.2 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 19.9 m r_{max}: 39.2 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



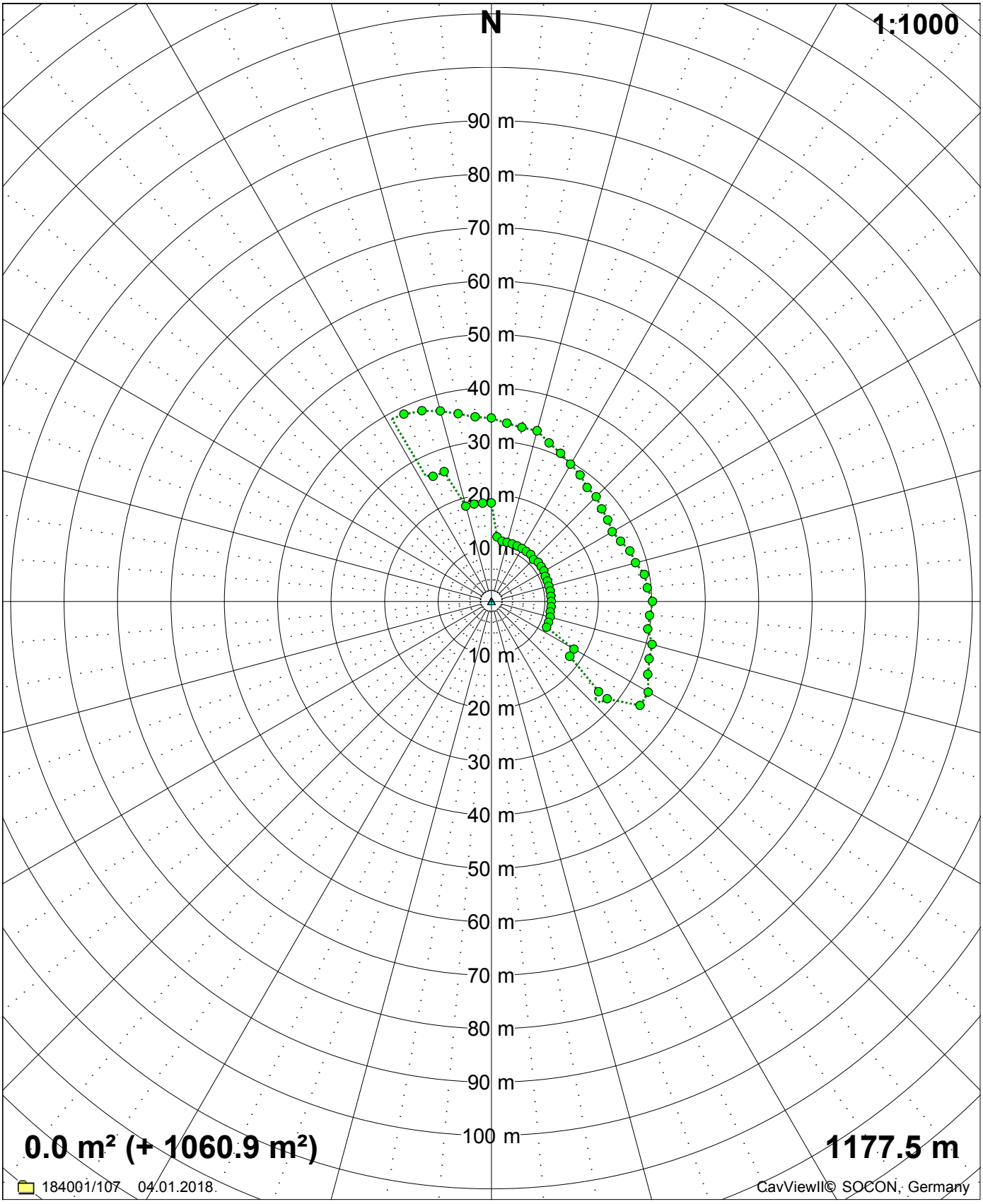
(04.01.2018) (1151.7 m²) | Leached pocket (04.01.2018)

d_{max}: 39.0 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 19.1 m r_{max}: 39.0 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



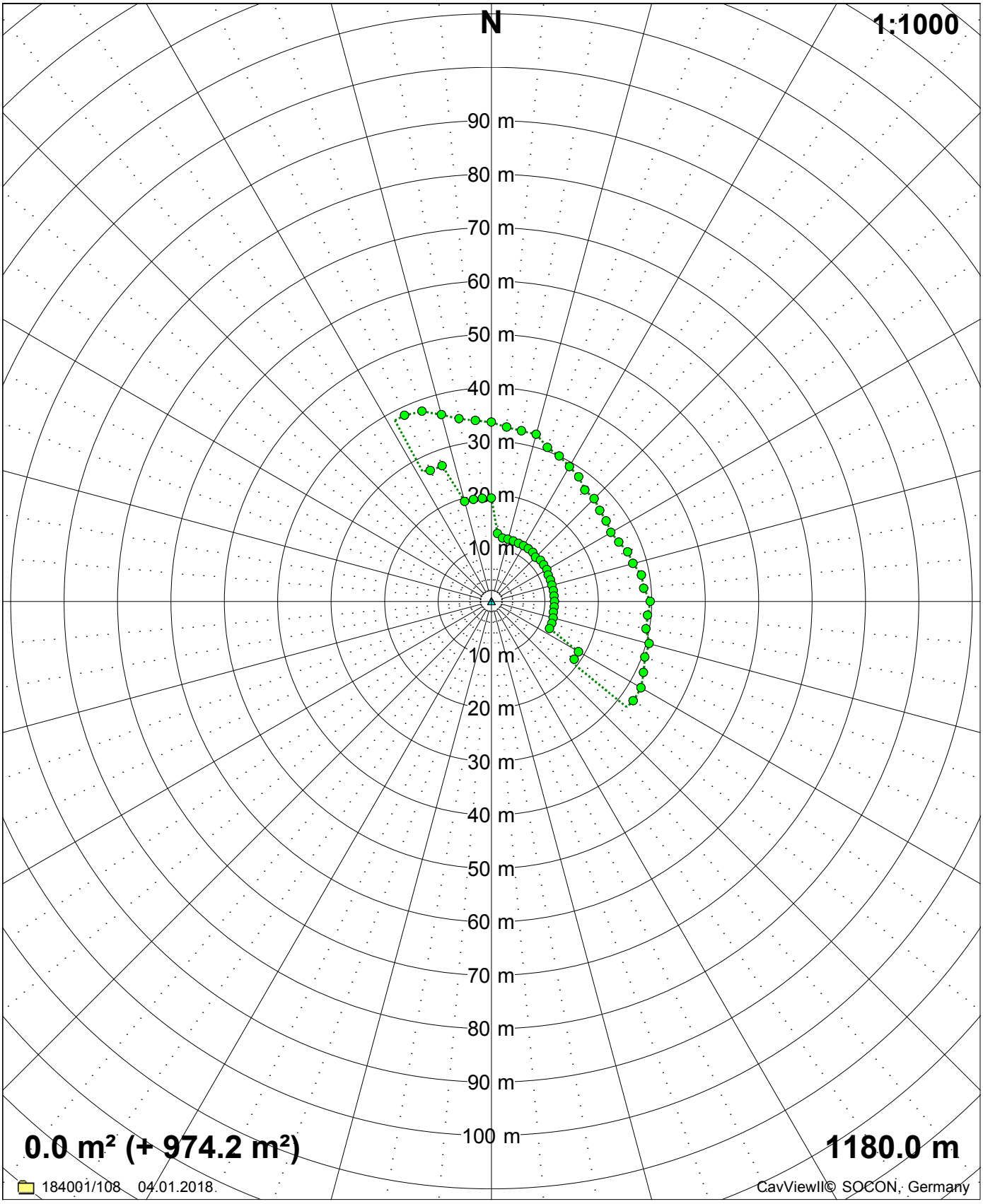
(04.01.2018) (1060.9 m²) | Leached pocket (04.01.2018)

d_{max}: 38.7 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 18.4 m r_{max}: 38.7 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



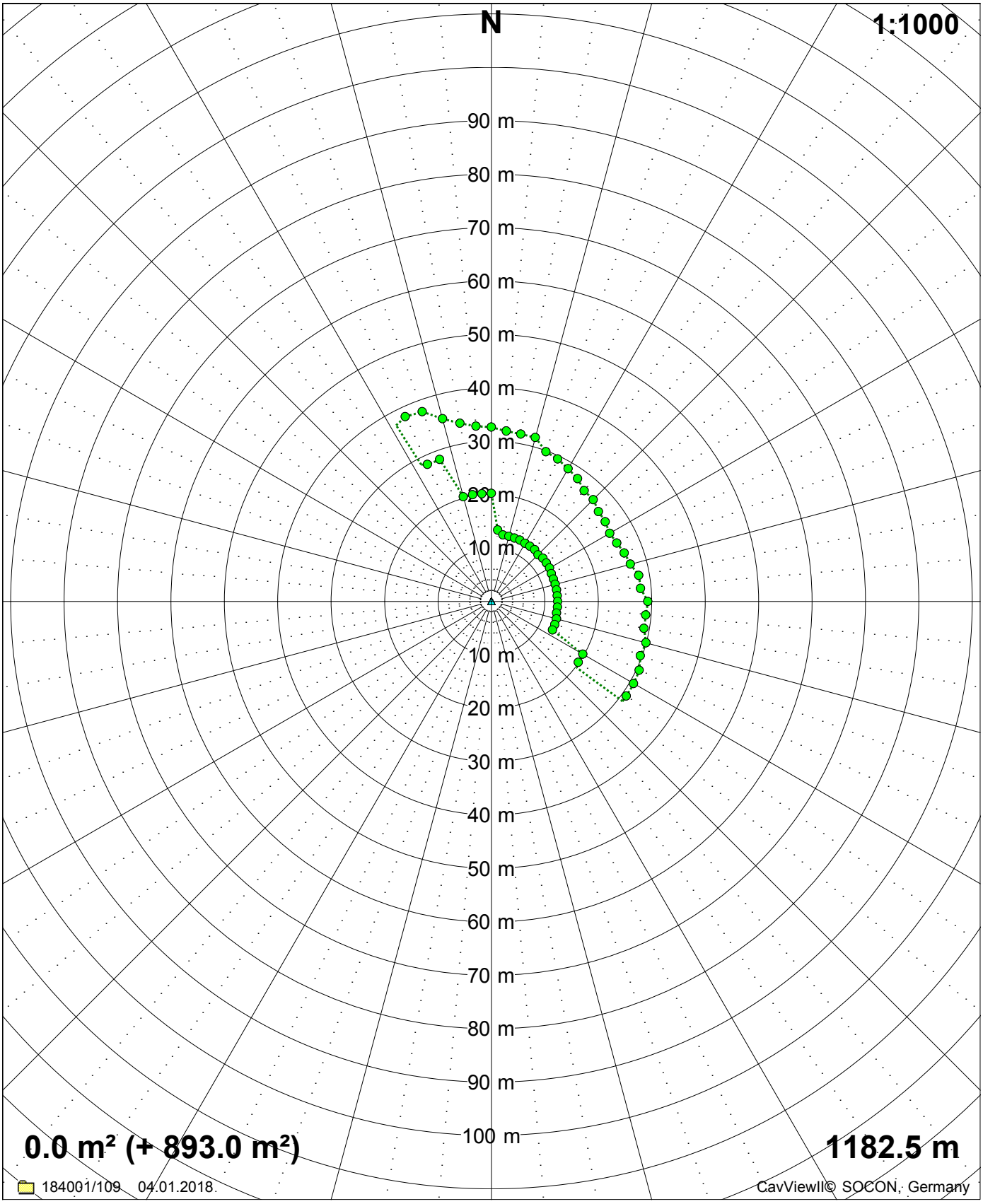
(04.01.2018) (974.2 m²) | Leached pocket (04.01.2018)

d_{max}: 38.4 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 17.6 m r_{max}: 38.4 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



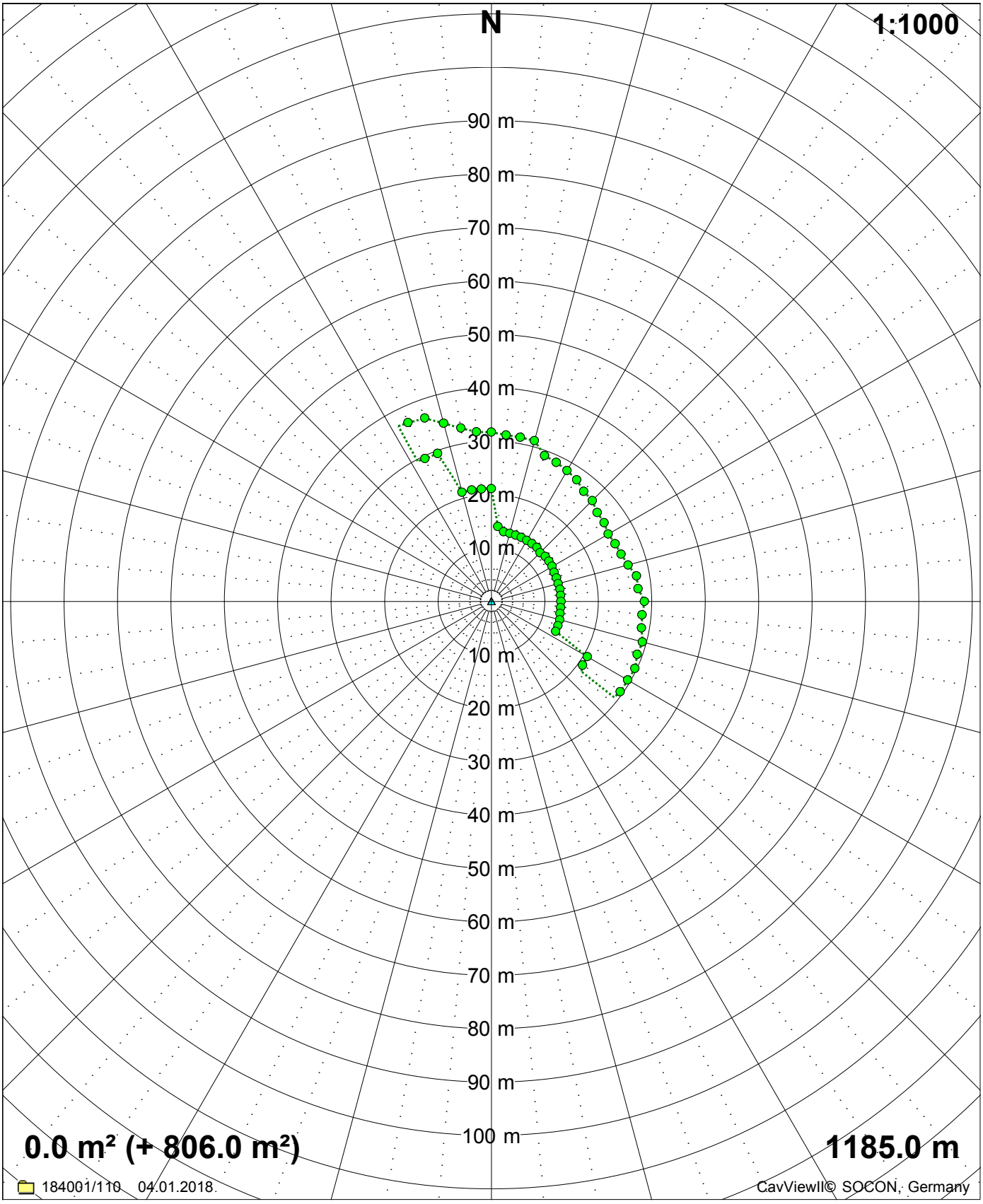
(04.01.2018) (893.0 m²) | Leached pocket (04.01.2018)

d_{max}: 38.2 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 16.9 m r_{max}: 38.2 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



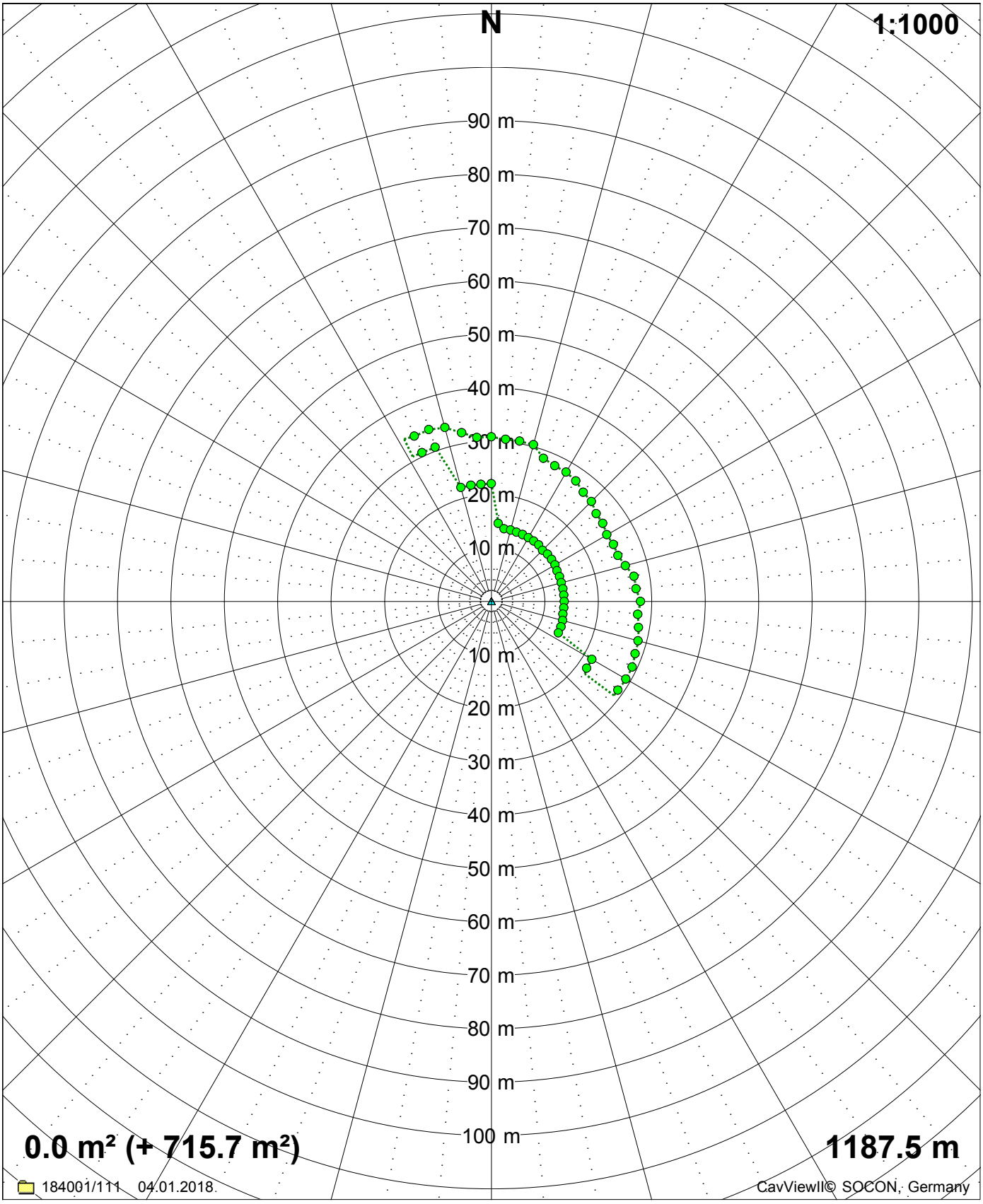
(04.01.2018) (806.0 m²) | Leached pocket (04.01.2018)

d_{max}: 36.9 m 155° <--> 335° r_{min}: 0.0 m -> 0° r~: 16.0 m r_{max}: 36.9 m -> 335°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



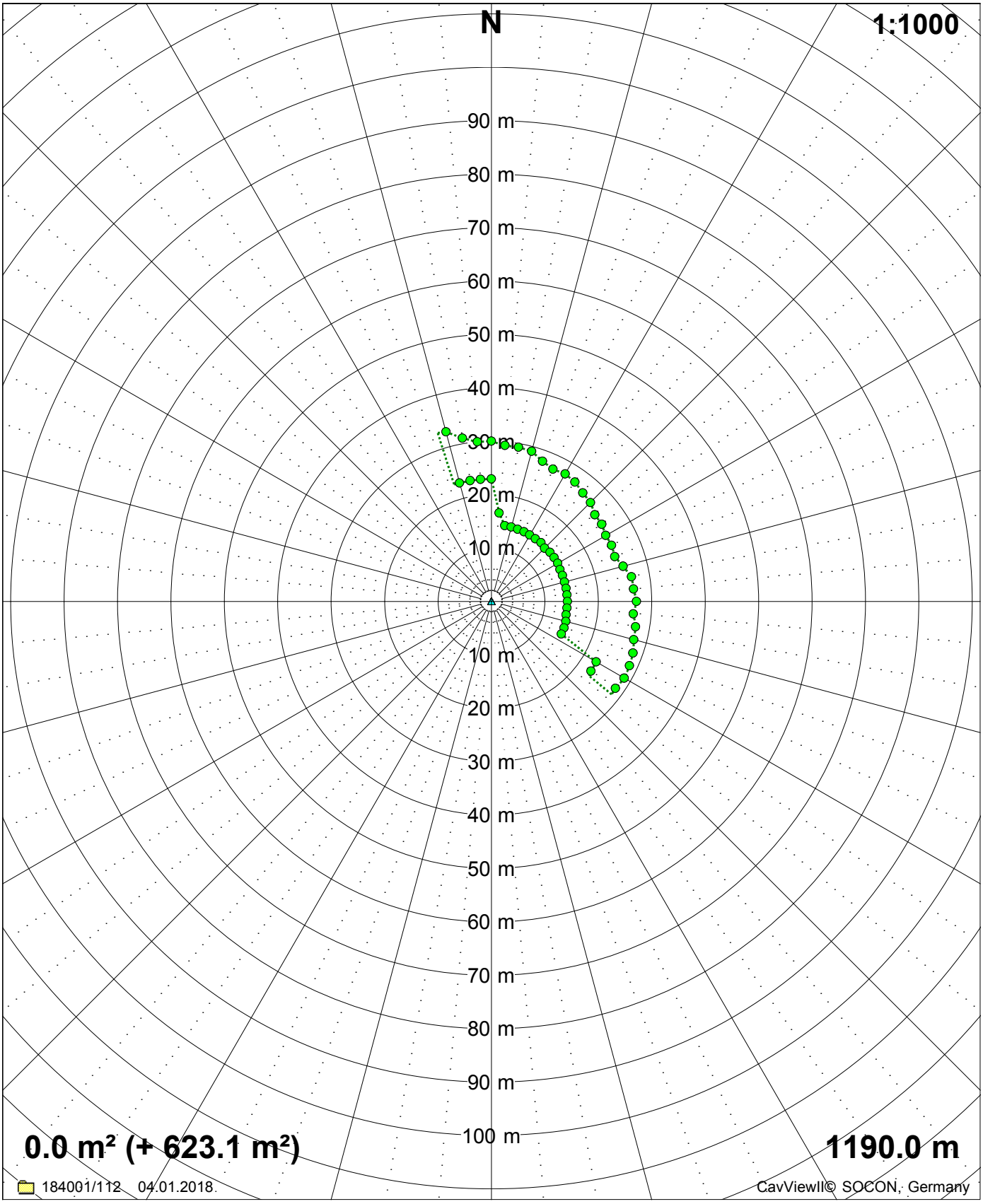
(04.01.2018) (715.7 m²) | Leached pocket (04.01.2018)

d_{max}: 34.3 m 160° <--> 340° r_{min}: 0.0 m -> 0° r~: 15.1 m r_{max}: 34.3 m -> 340°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



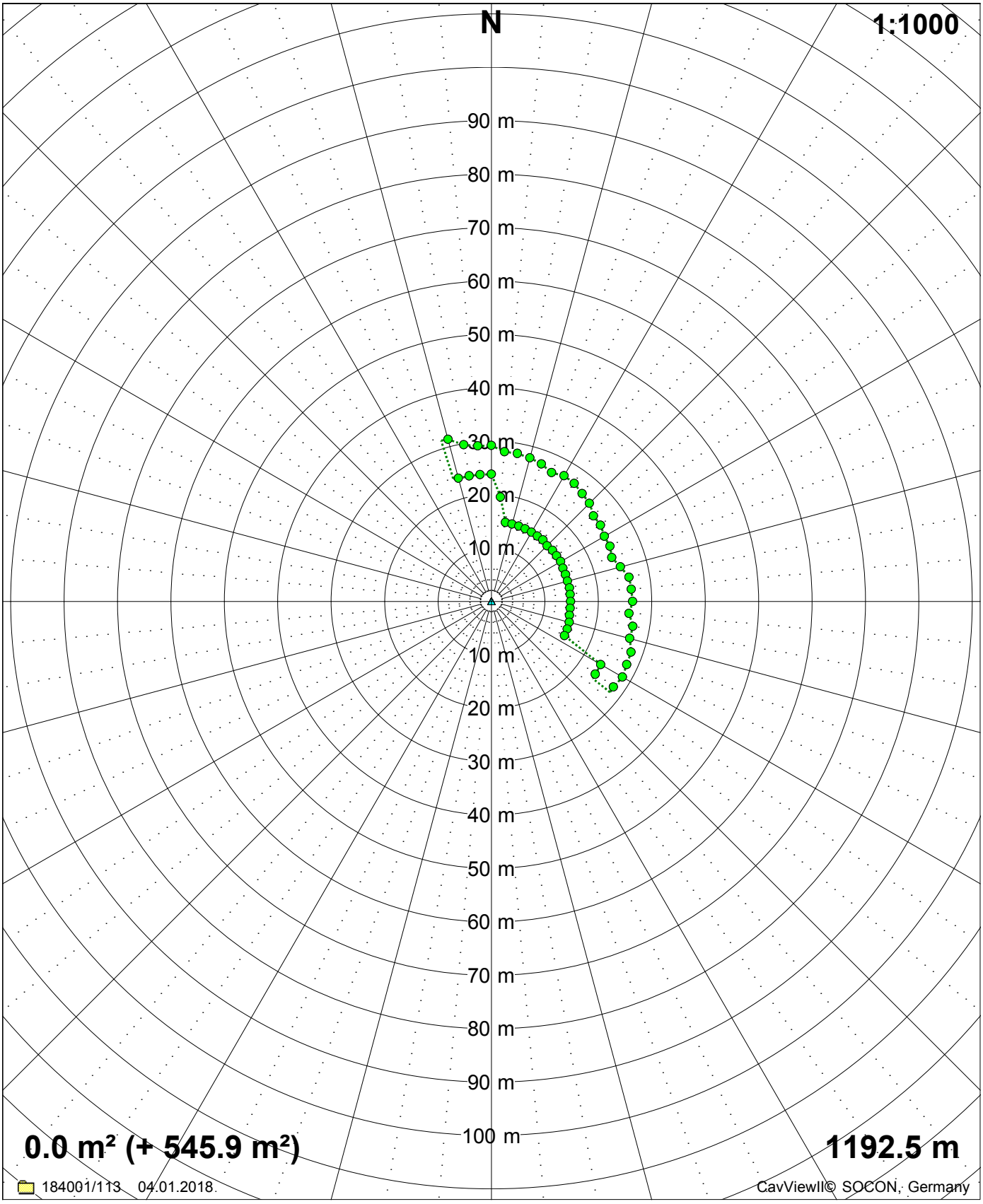
(04.01.2018) (623.1 m²) | Leached pocket (04.01.2018)

d_{max}: 32.8 m 165° <--> 345° r_{min}: 0.0 m -> 0° r~: 14.1 m r_{max}: 32.8 m -> 345°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



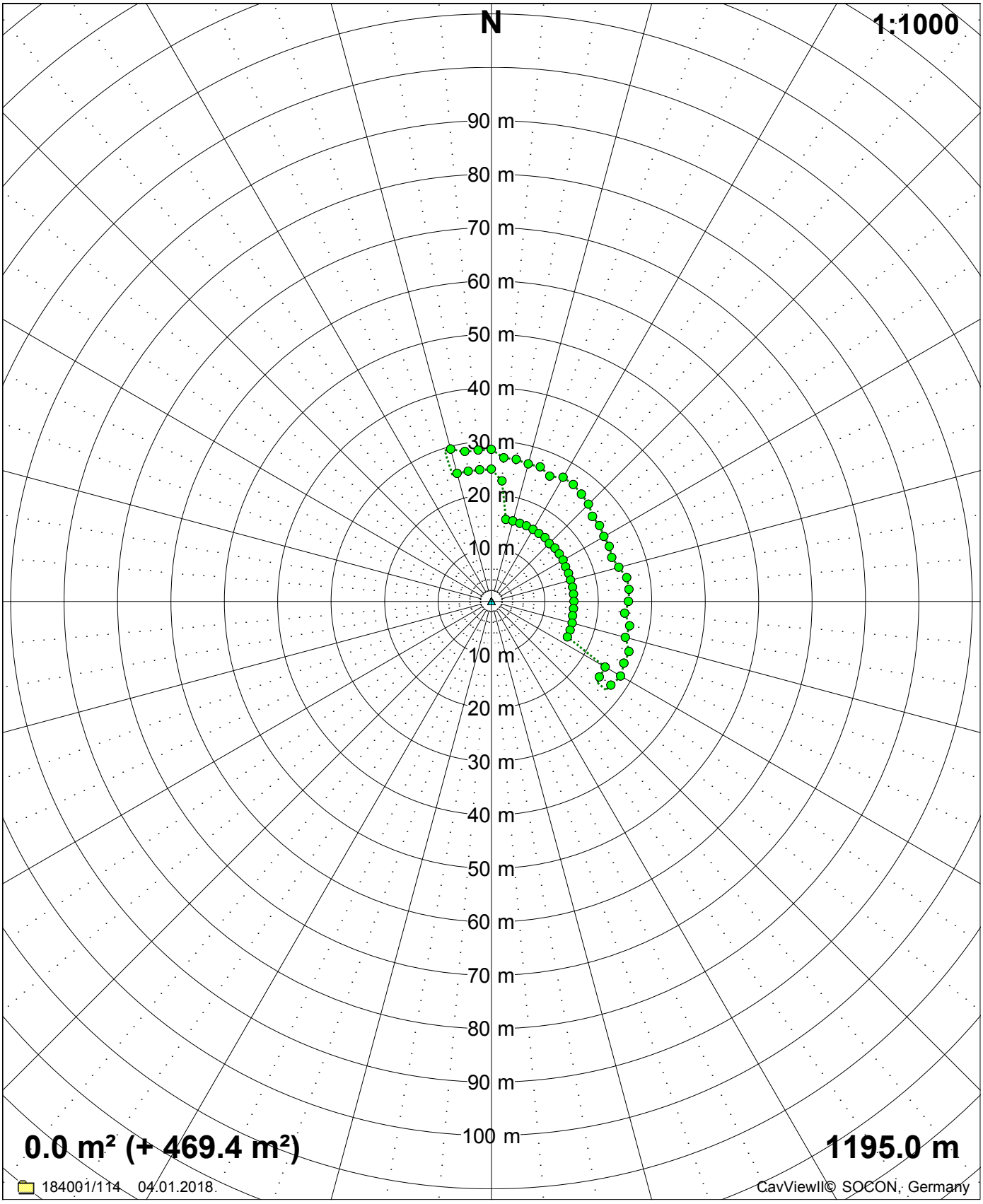
(04.01.2018) (545.9 m²) | Leached pocket (04.01.2018)

d_{max}: 31.4 m 165° <--> 345° r_{min}: 0.0 m -> 0° r~: 13.2 m r_{max}: 31.4 m -> 345°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



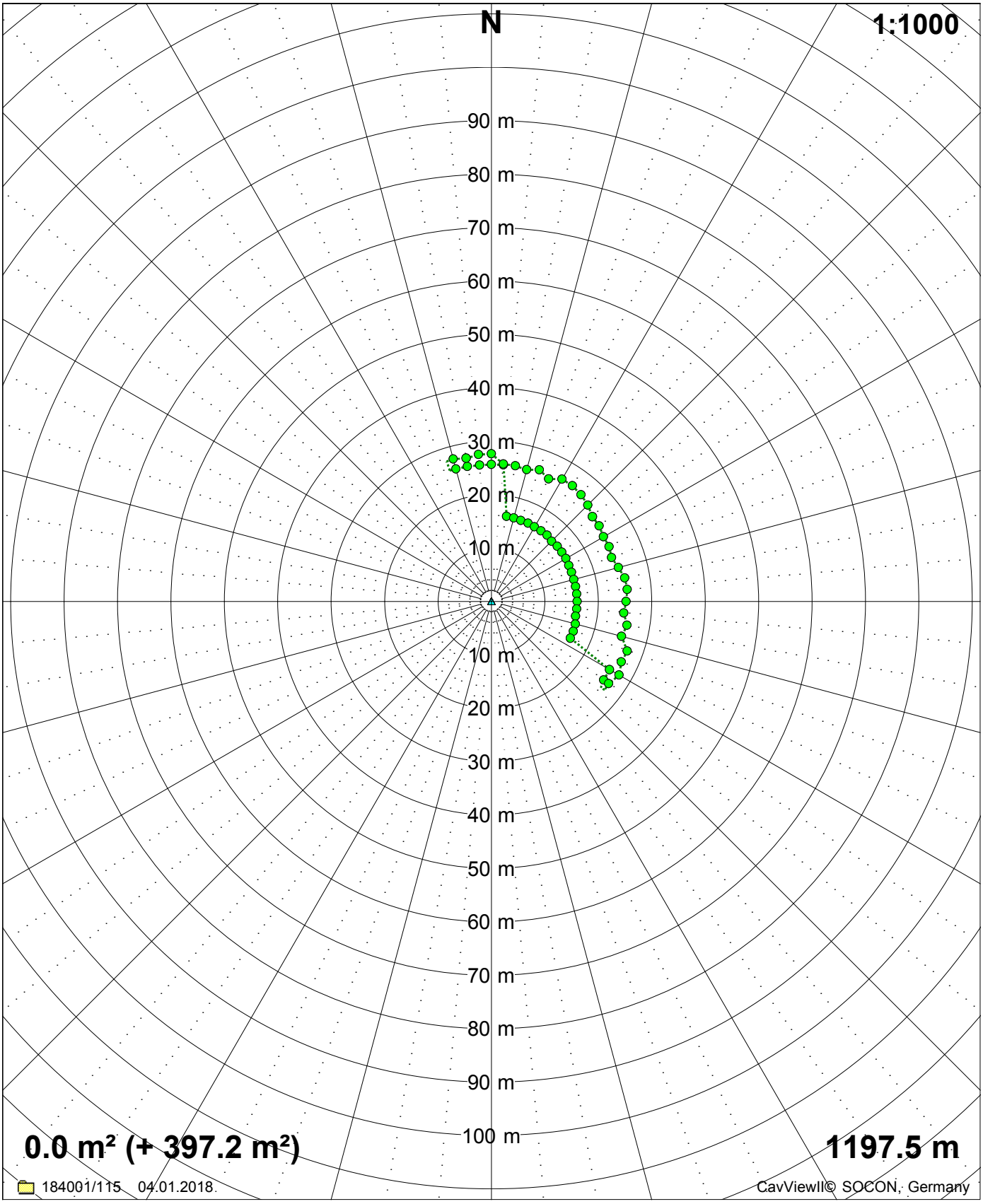
(04.01.2018) (469.4 m²) | Leached pocket (04.01.2018)

d_{max}: 29.5 m 165° <--> 345° r_{min}: 0.0 m -> 0° r~: 12.2 m r_{max}: 29.5 m -> 345°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



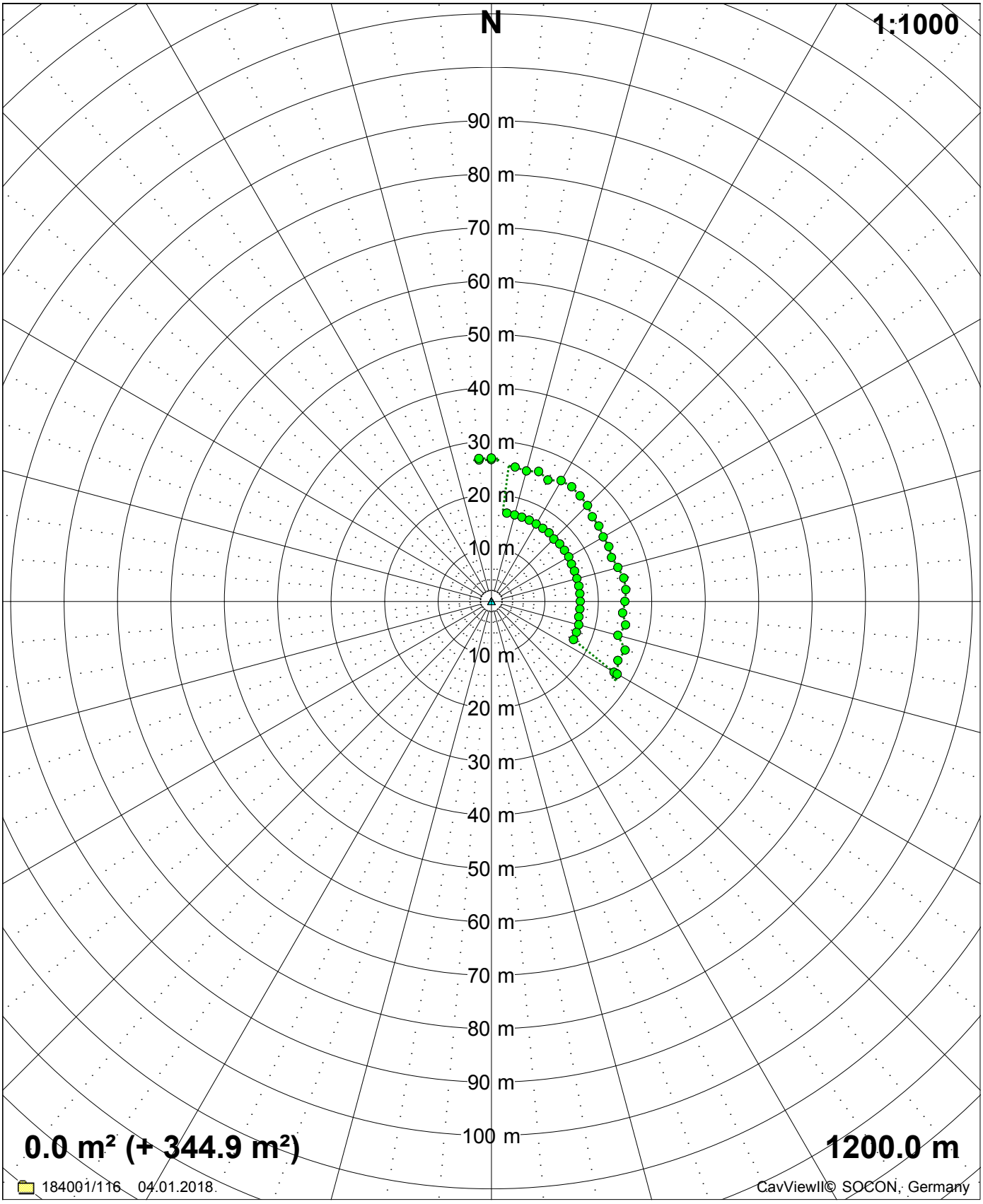
(04.01.2018) (397.2 m²) | Leached pocket (04.01.2018)

d_{max}: 27.6 m 0° <--> 180° r_{min}: 0.0 m -> 0° r~: 11.2 m r_{max}: 27.6 m -> 0°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



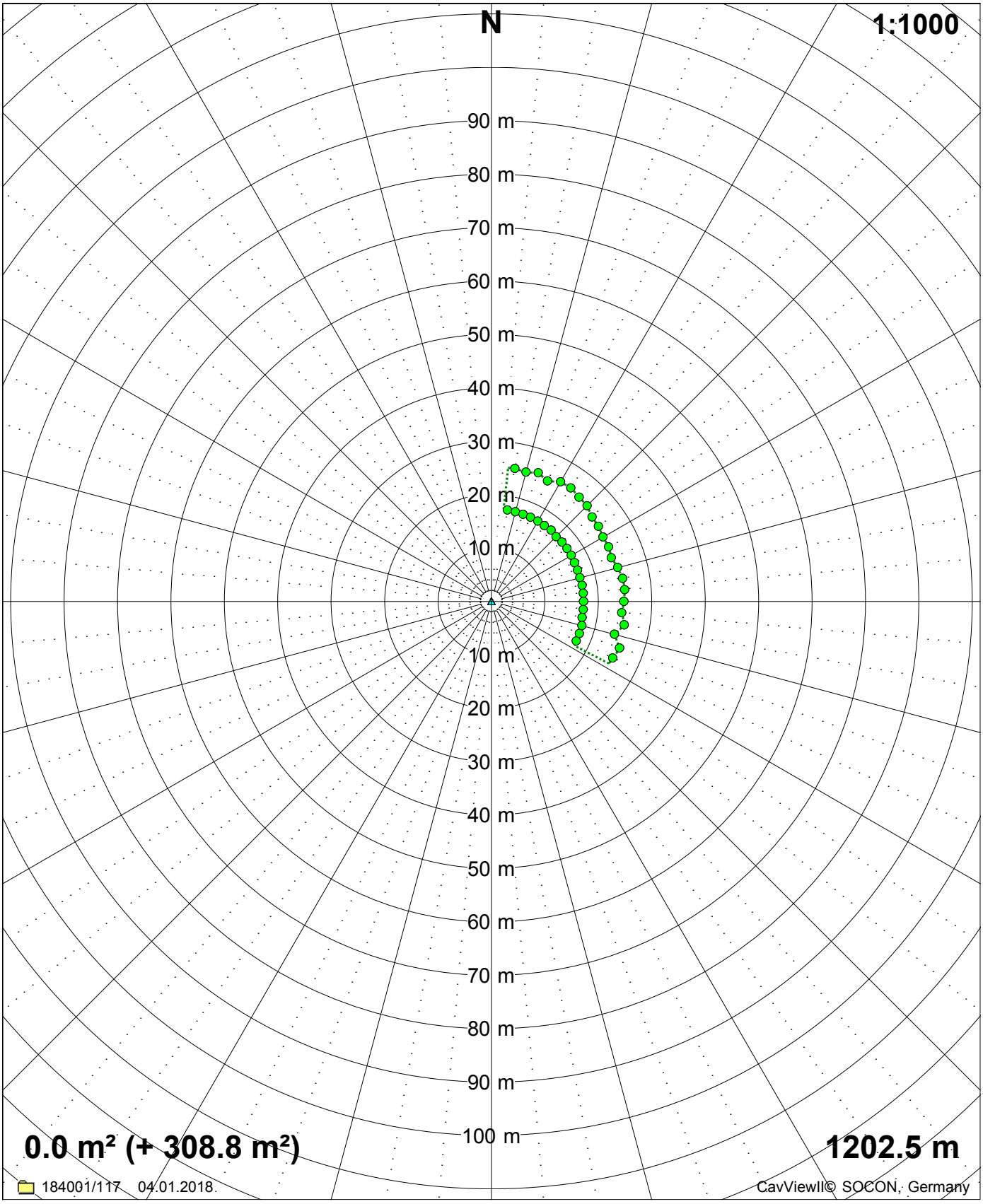
(04.01.2018) (344.9 m²) | Leached pocket (04.01.2018)

d_{max}: 27.2 m 120° <--> 300° r_{min}: 0.0 m -> 0° r~: 10.5 m r_{max}: 27.2 m -> 120°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



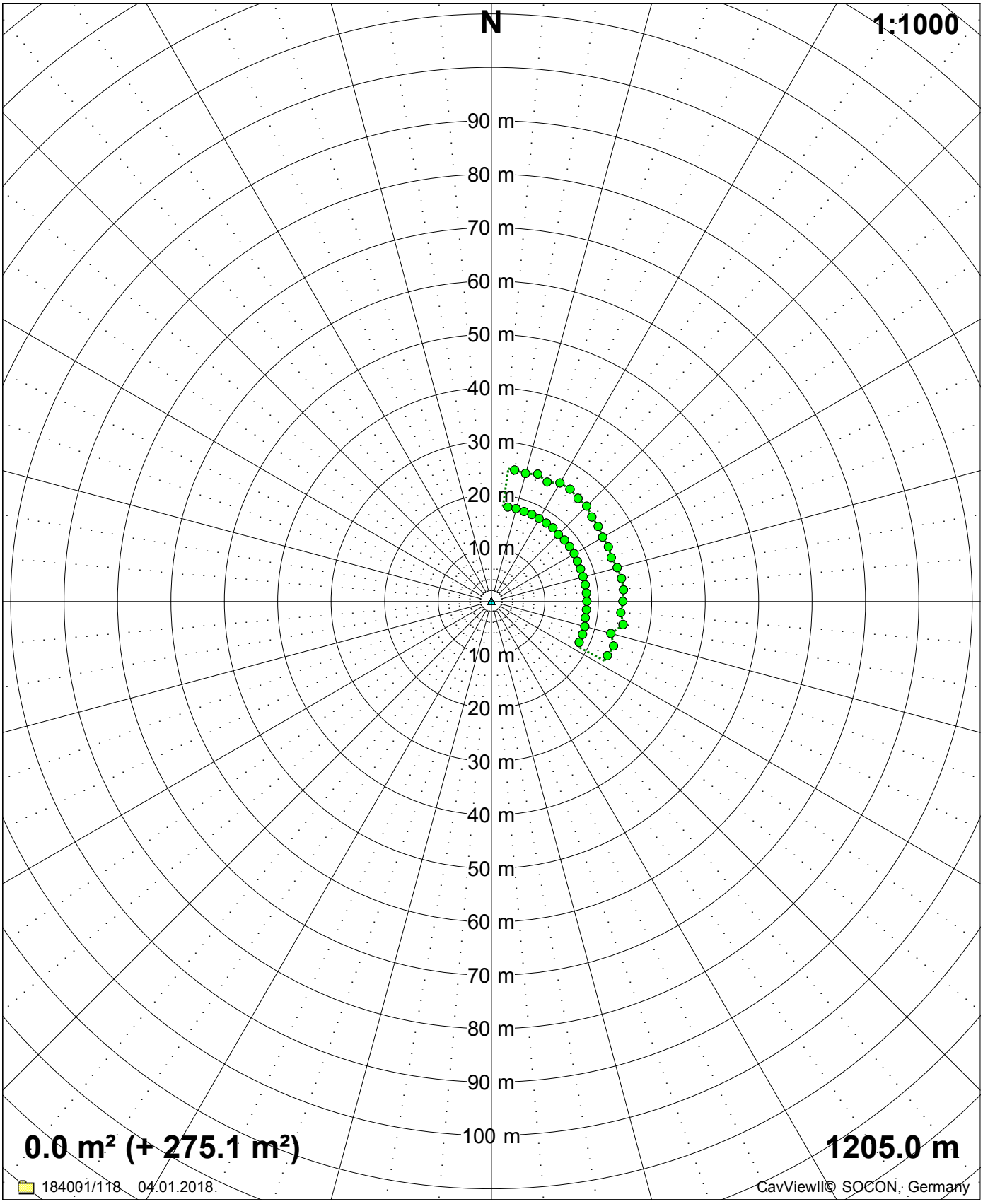
(04.01.2018) (308.8 m²) | Leached pocket (04.01.2018)

d_{max}: 25.9 m 35° <--> 215° r_{min}: 0.0 m -> 0° r~: 9.9 m r_{max}: 25.9 m -> 35°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



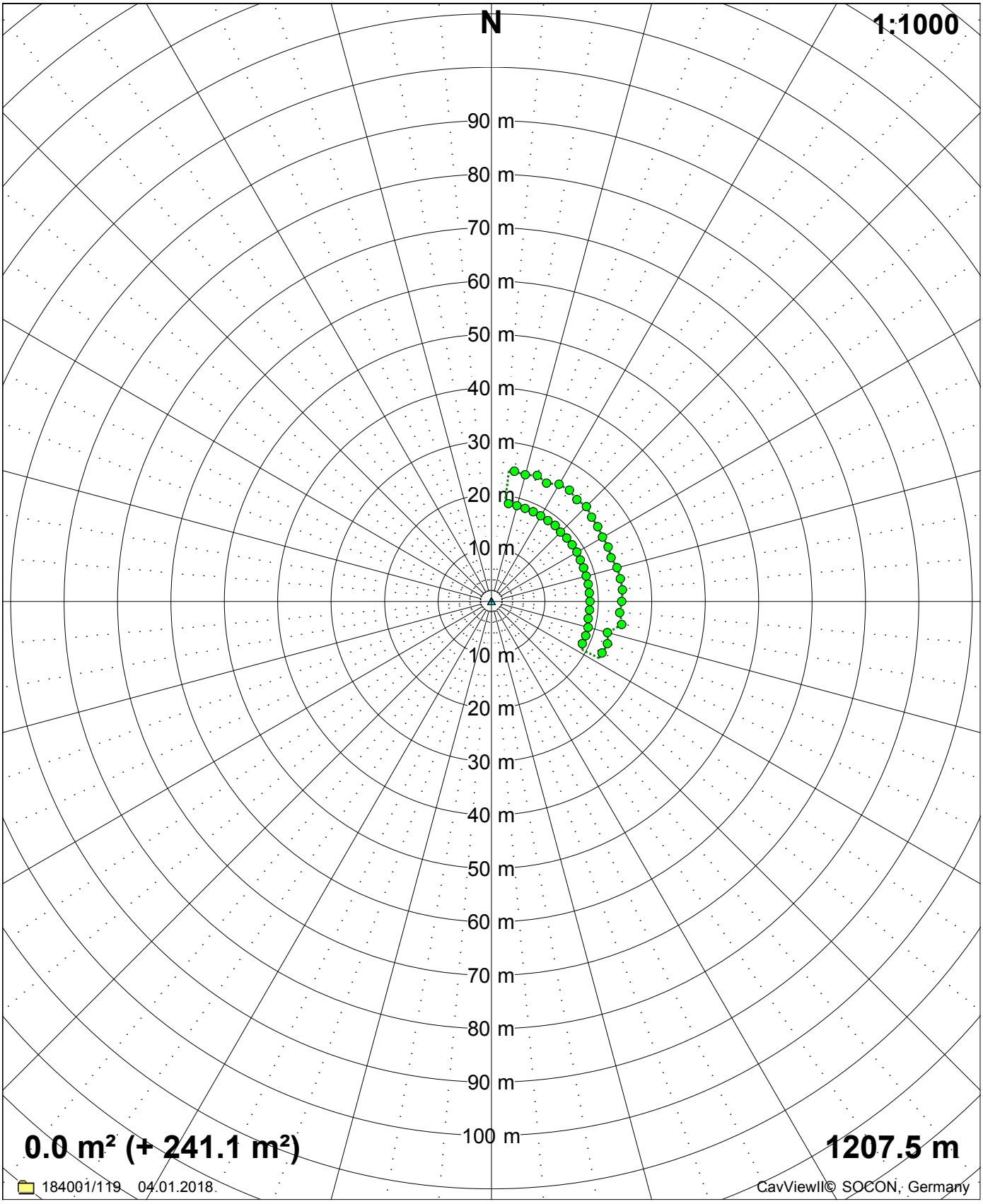
(04.01.2018) (275.1 m²) | Leached pocket (04.01.2018)

d_{max}: 25.7 m 35° <--> 215° r_{min}: 0.0 m -> 0° r~: 9.4 m r_{max}: 25.7 m -> 35°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



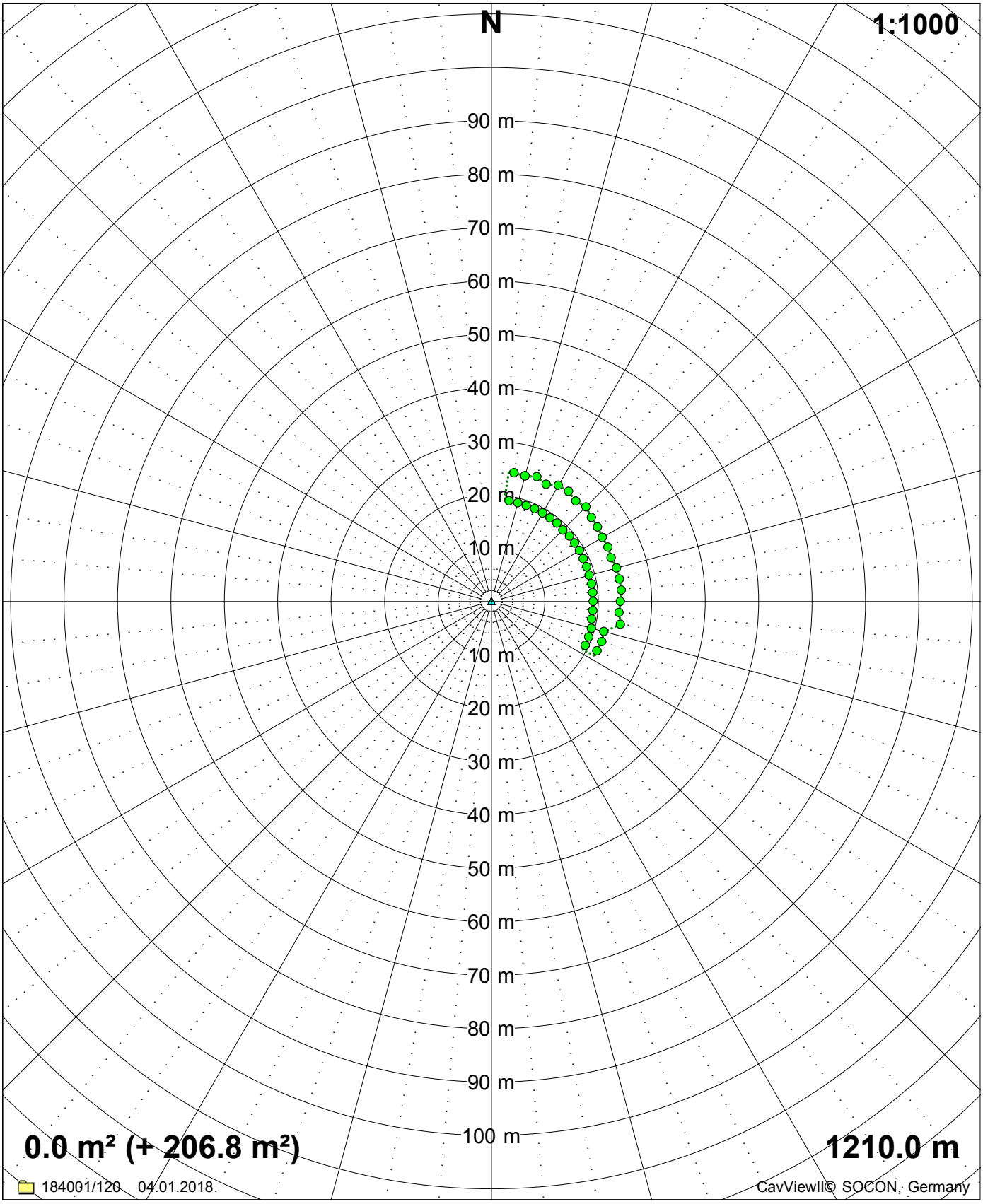
(04.01.2018) (241.1 m²) | Leached pocket (04.01.2018)

d_{max}: 25.4 m 35° <--> 215° r_{min}: 0.0 m -> 0° r~: 8.8 m r_{max}: 25.4 m -> 35°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



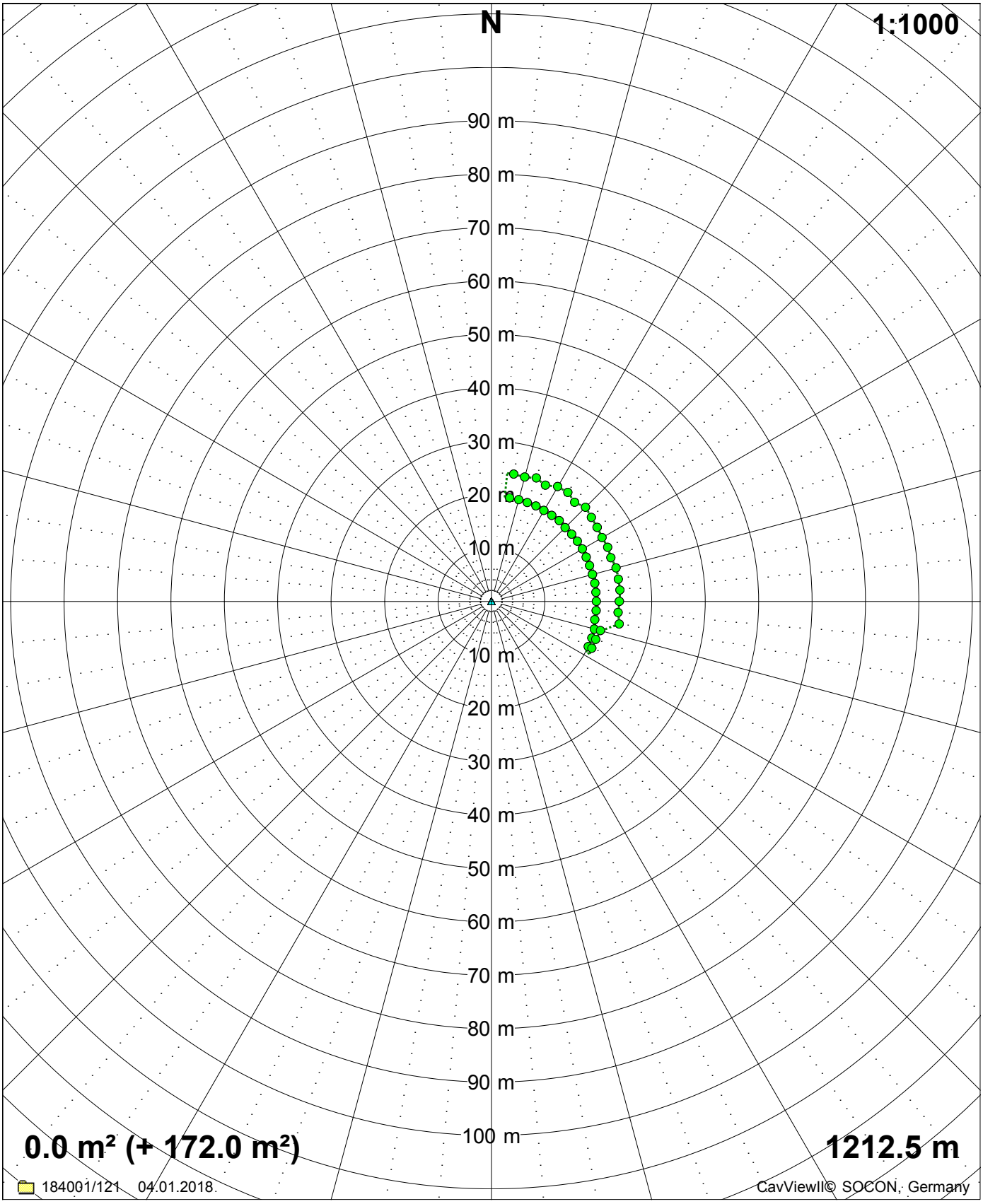
(04.01.2018) (206.8 m²) | Leached pocket (04.01.2018)

d_{max}: 25.2 m 35° <--> 215° r_{min}: 0.0 m -> 0° r~: 8.1 m r_{max}: 25.2 m -> 35°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



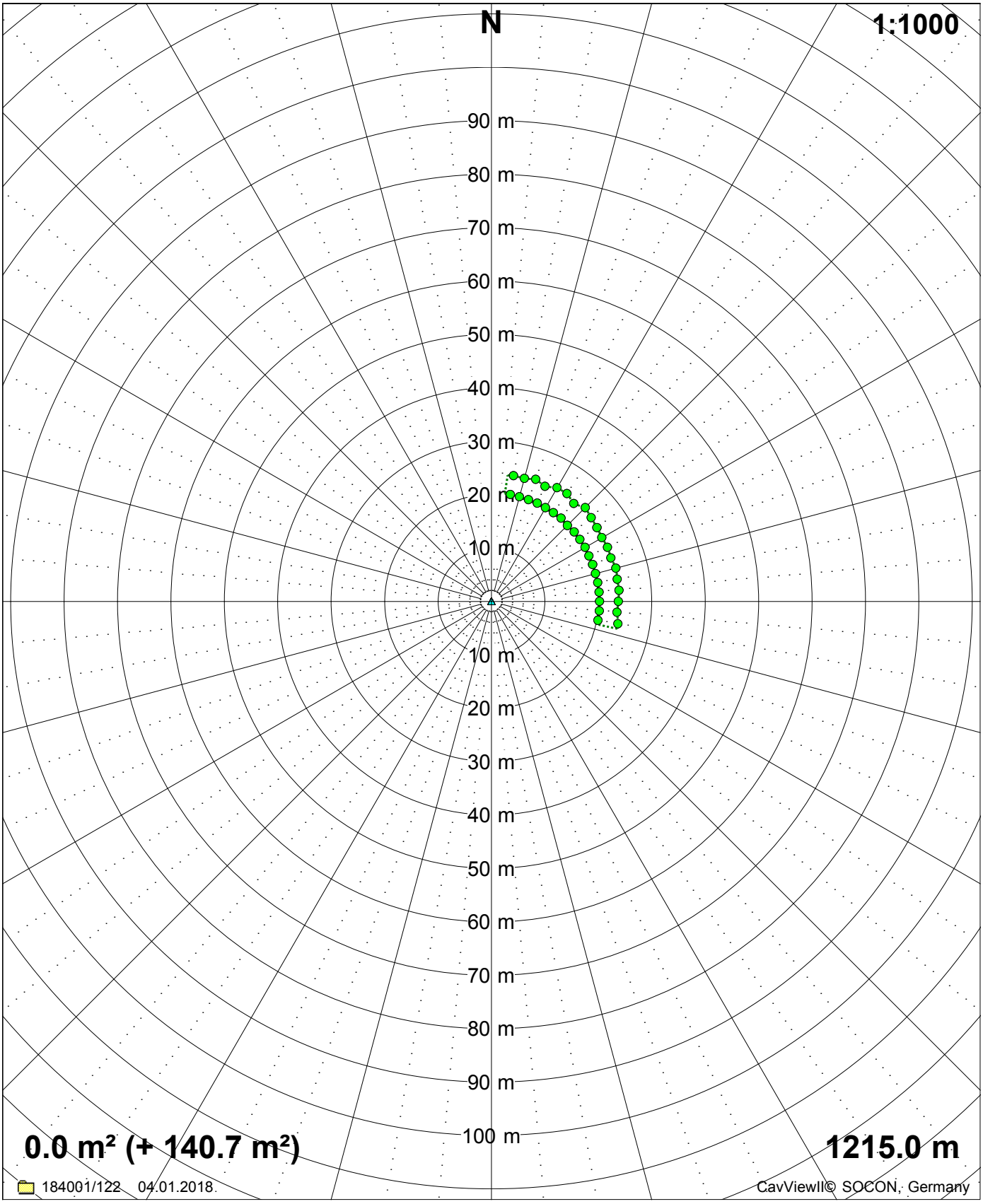
(04.01.2018) (172.0 m²) | Leached pocket (04.01.2018)

d_{max}: 24.9 m 35° <--> 215° r_{min}: 0.0 m -> 0° r~: 7.4 m r_{max}: 24.9 m -> 35°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



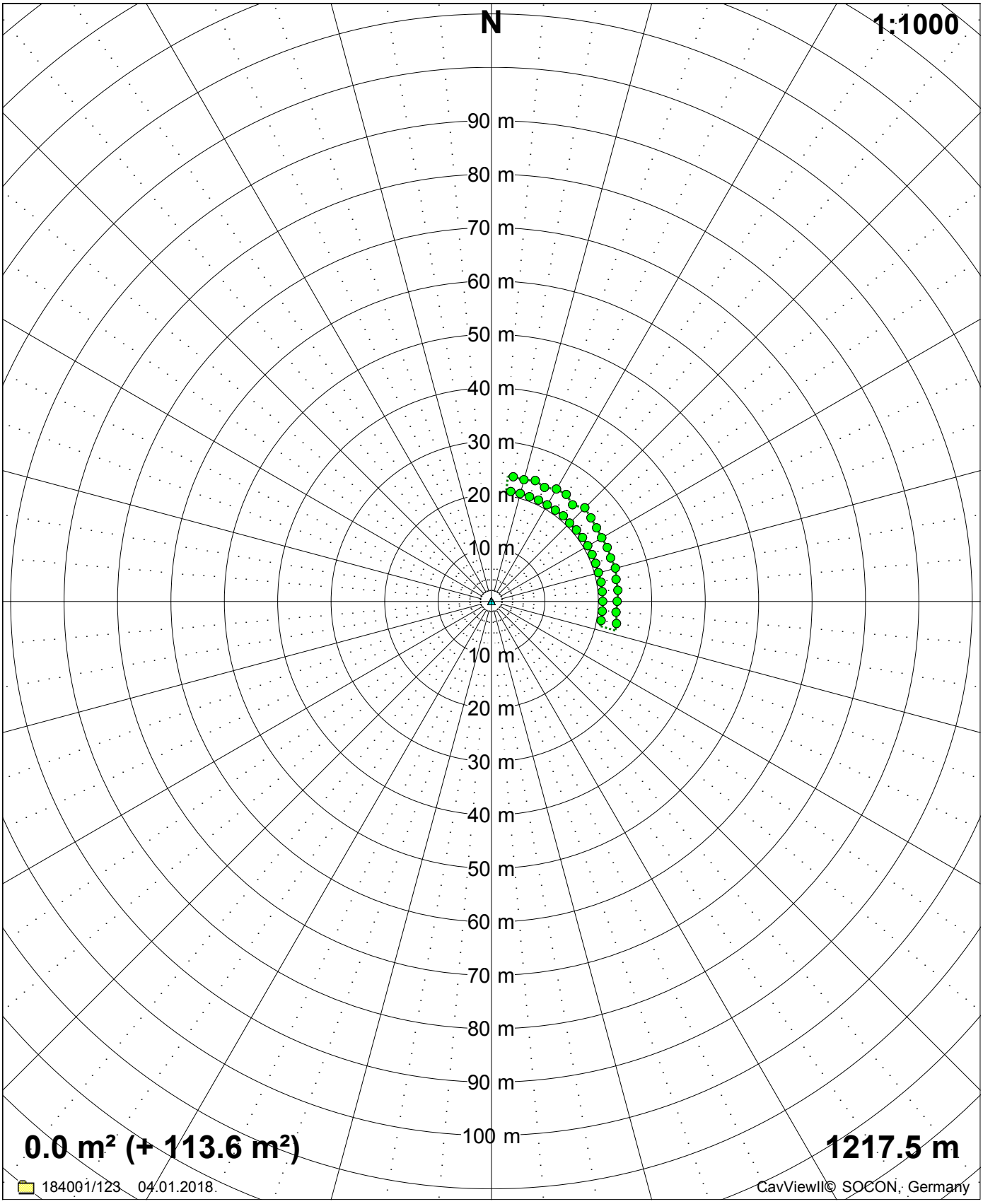
(04.01.2018) (140.7 m²) | Leached pocket (04.01.2018)

d_{max}: 24.8 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 6.7 m r_{max}: 24.8 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



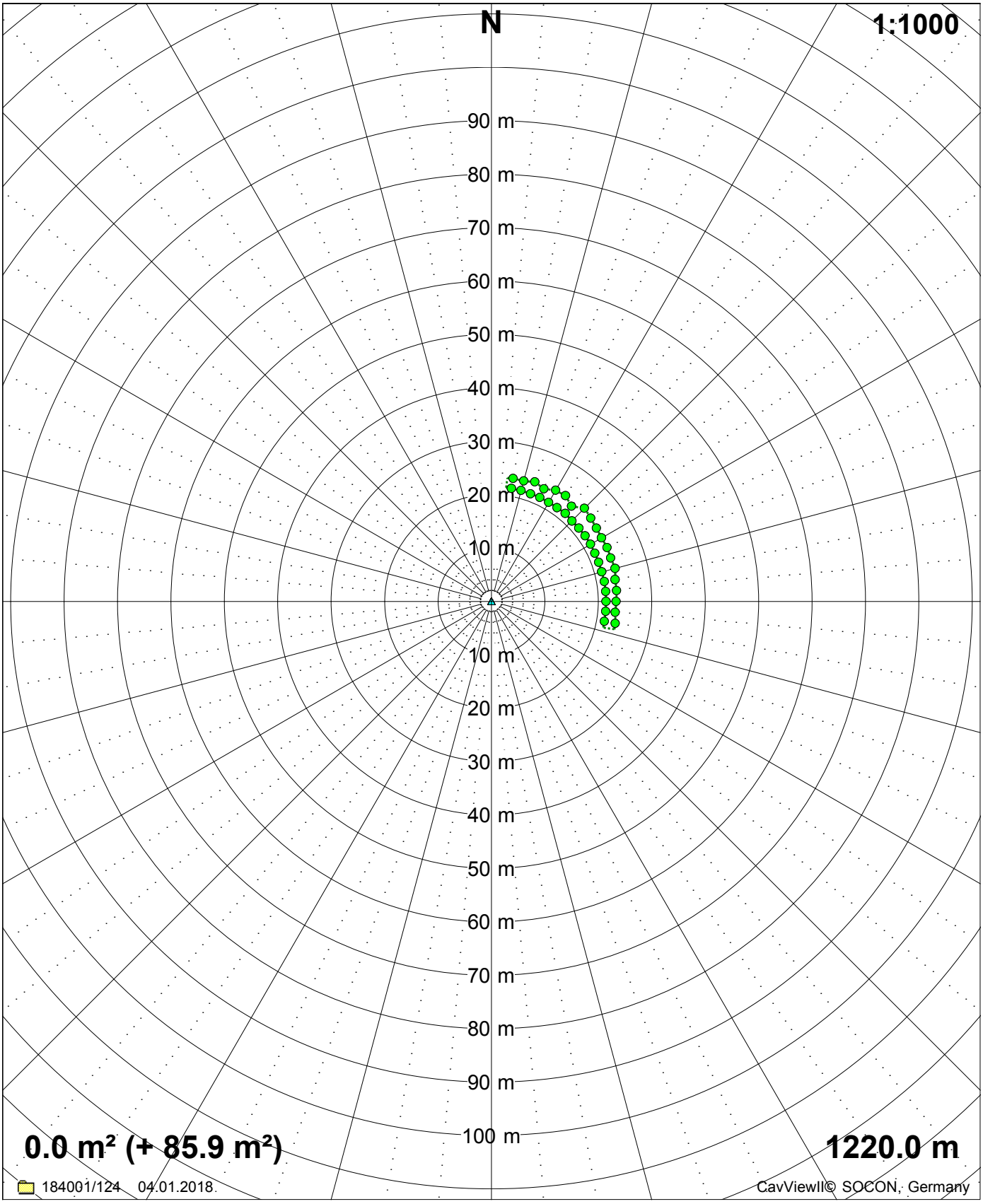
(04.01.2018) (113.6 m²) | Leached pocket (04.01.2018)

d_{max}: 24.7 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 6.0 m r_{max}: 24.7 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



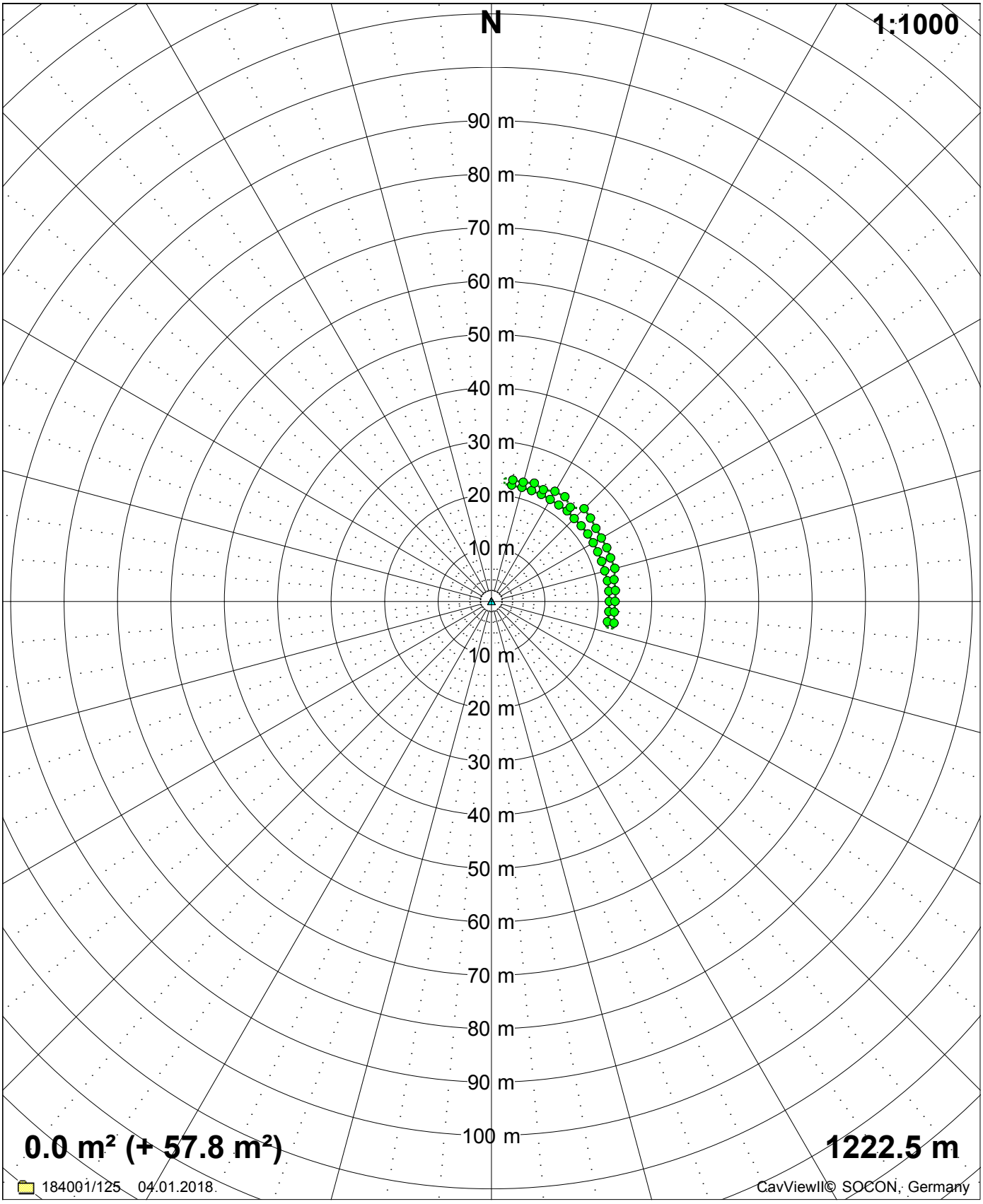
(04.01.2018) (85.9 m²) | Leached pocket (04.01.2018)

d_{max}: 24.6 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 5.2 m r_{max}: 24.6 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



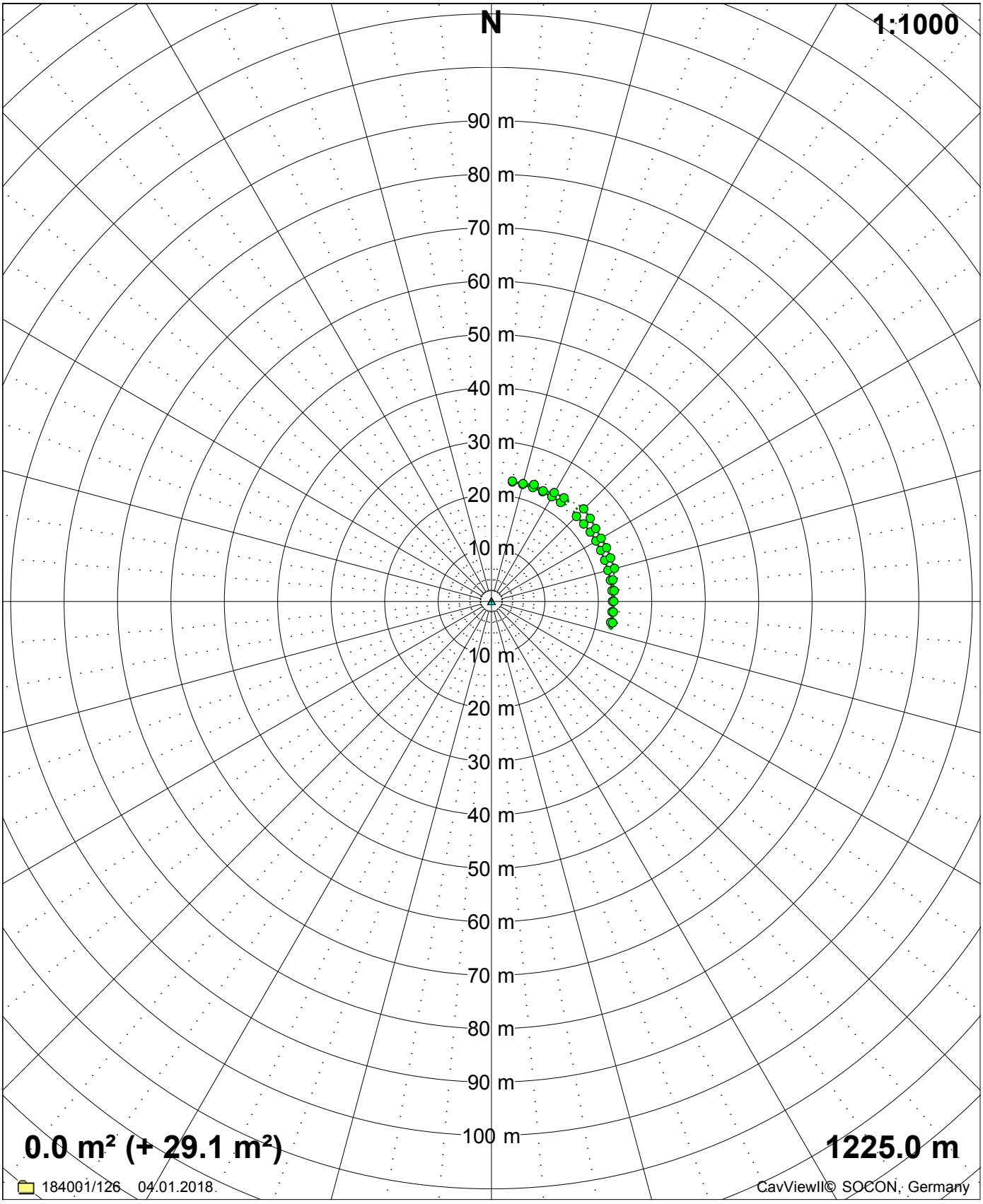
(04.01.2018) (57.8 m²) | Leached pocket (04.01.2018)

d_{max}: 24.6 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 4.3 m r_{max}: 24.6 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



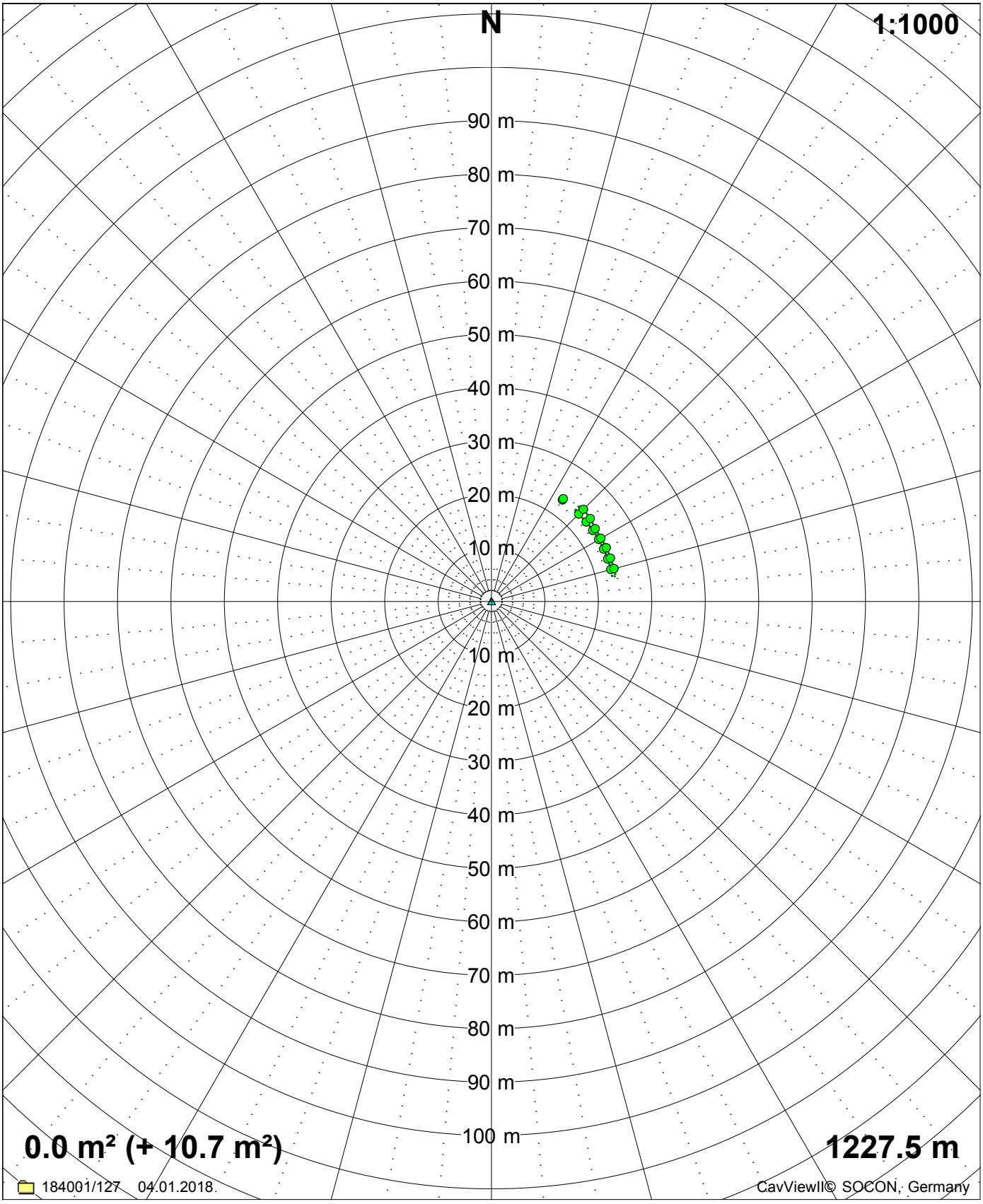
(04.01.2018) (29.1 m²) | Leached pocket (04.01.2018)

d_{max}: 24.5 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 3.0 m r_{max}: 24.5 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



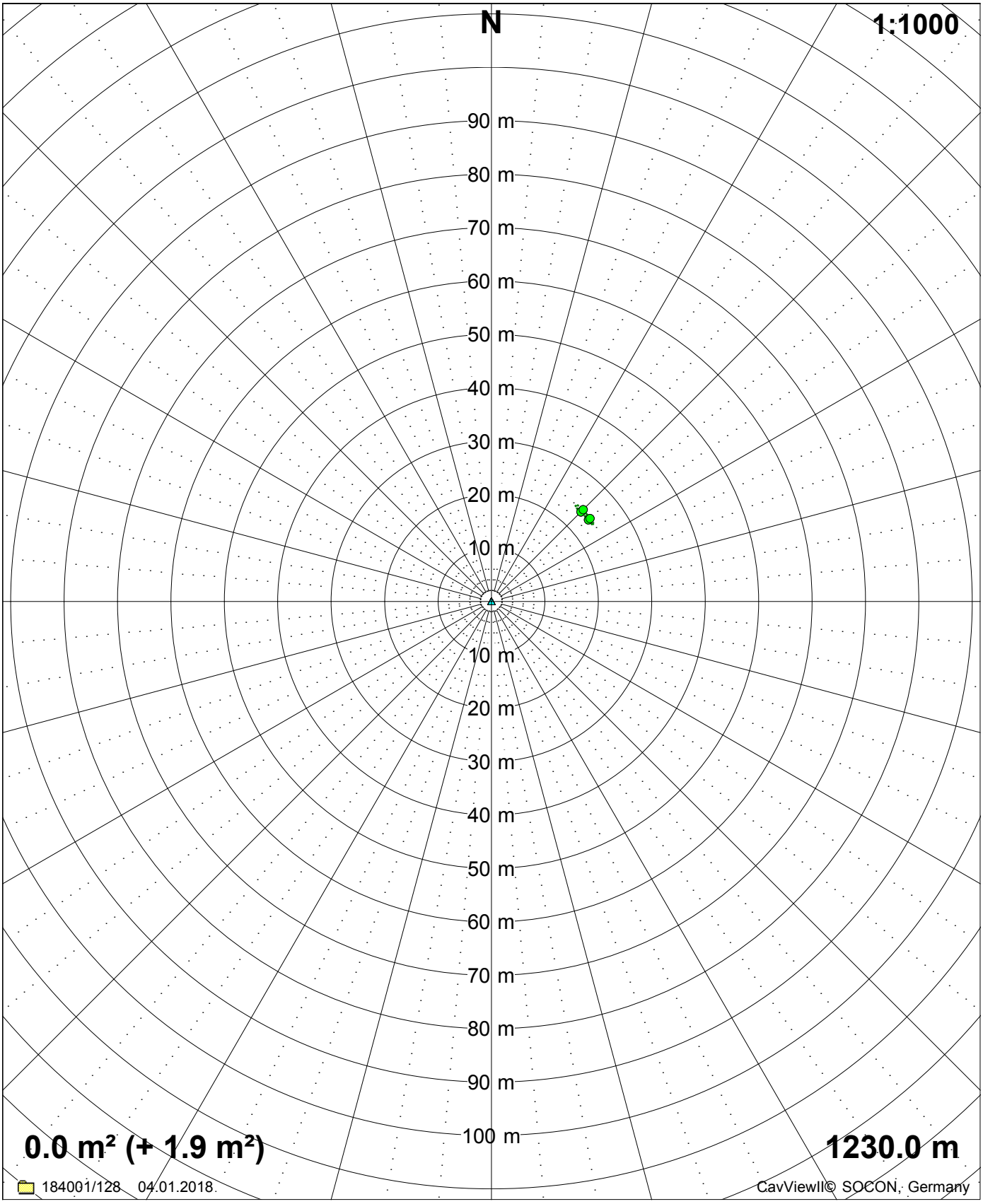
(04.01.2018) (10.7 m²) | Leached pocket (04.01.2018)

d_{max}: 24.4 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 1.8 m r_{max}: 24.4 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



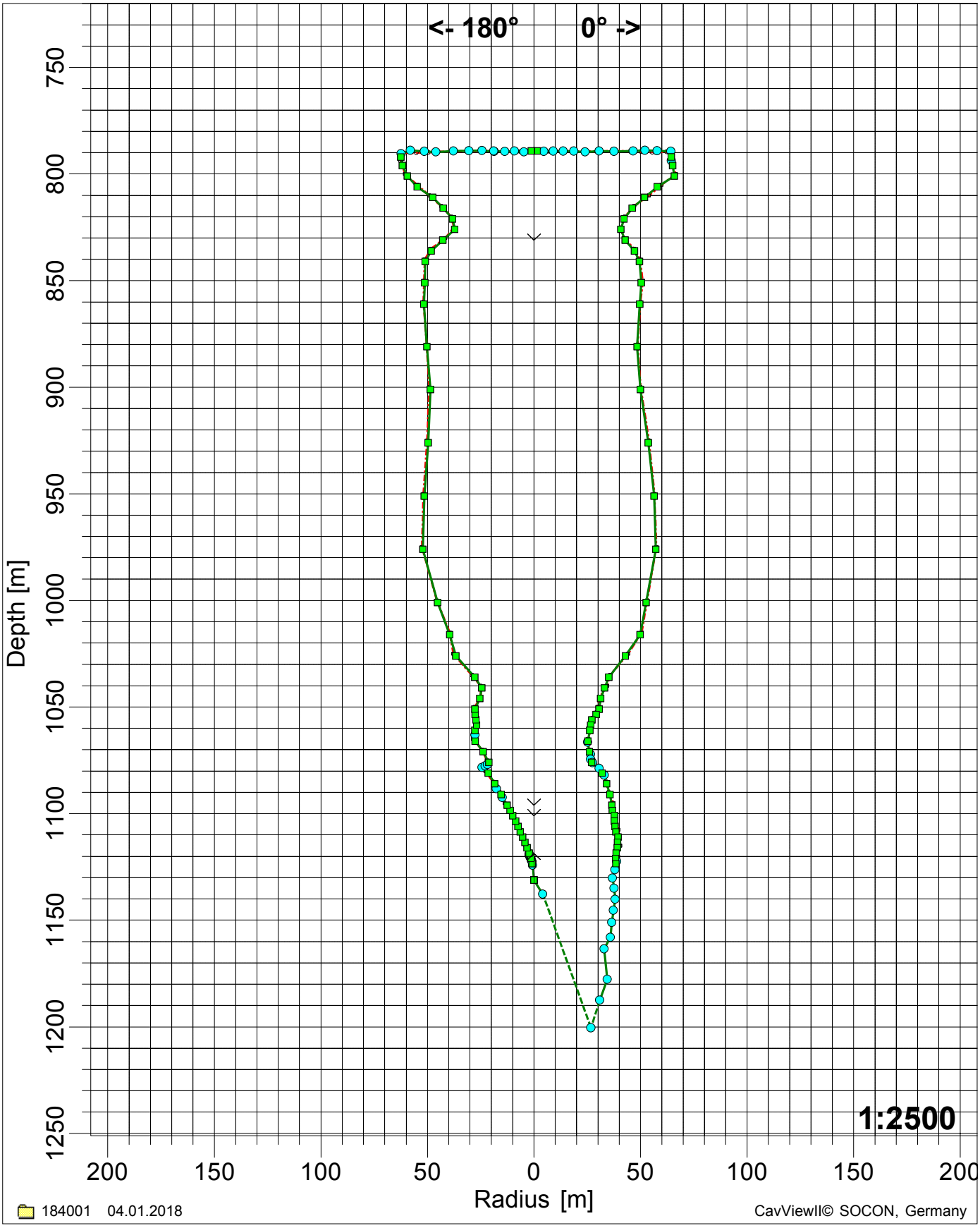
(04.01.2018) (1.9 m²) | Leached pocket (04.01.2018)

d_{max}: 24.3 m 45° <--> 225° r_{min}: 0.0 m -> 0° r~: 0.8 m r_{max}: 24.3 m -> 45°

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



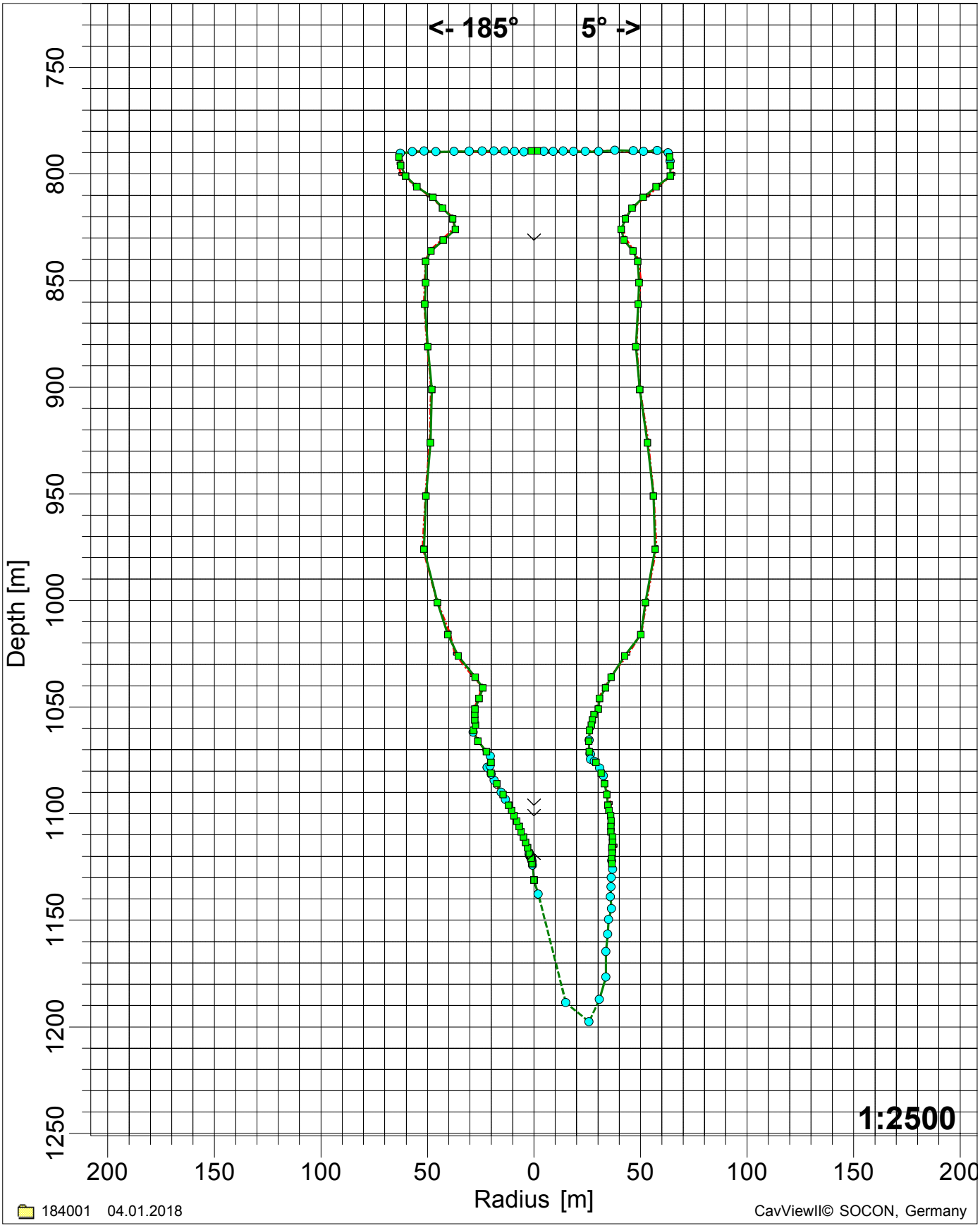
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

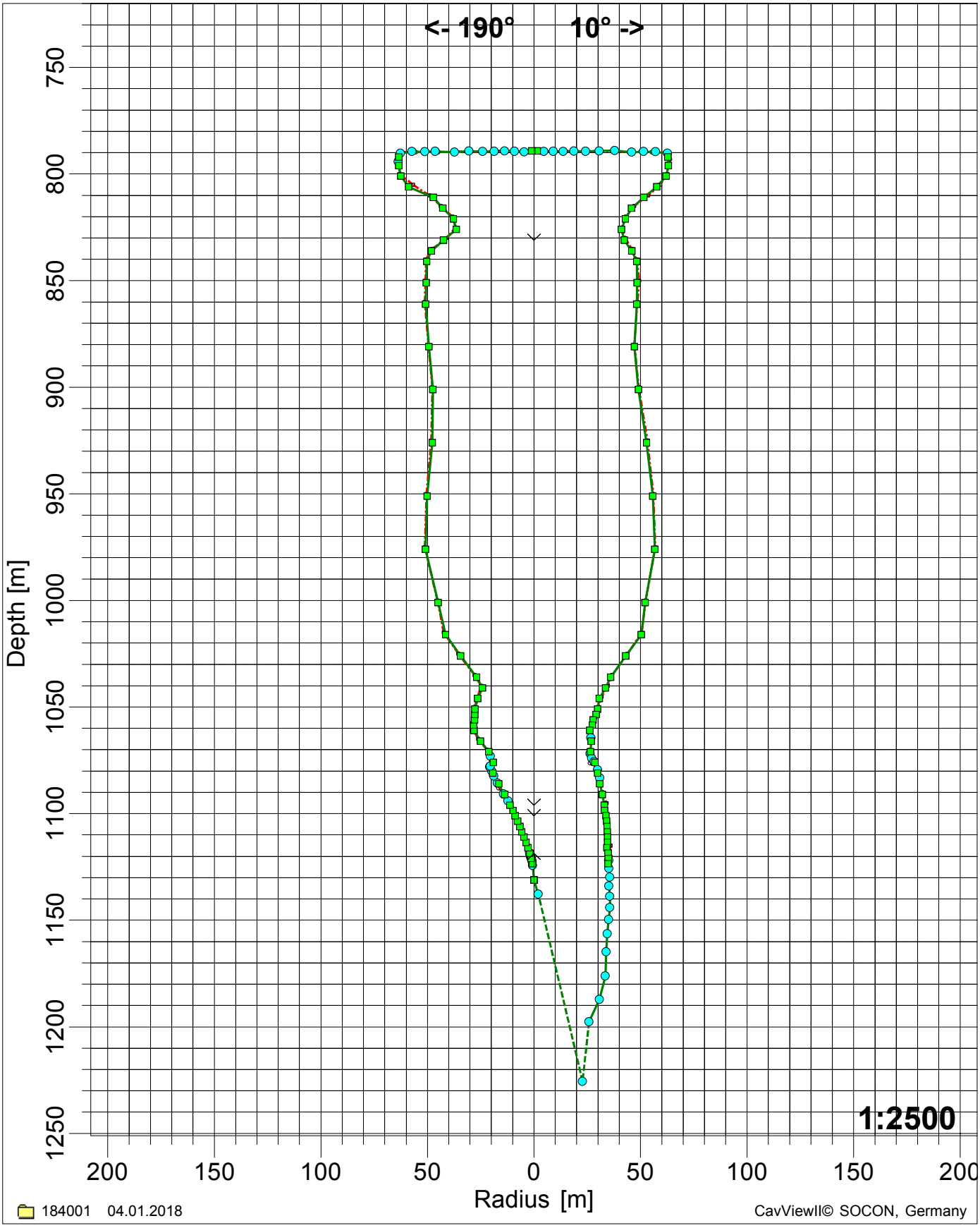


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

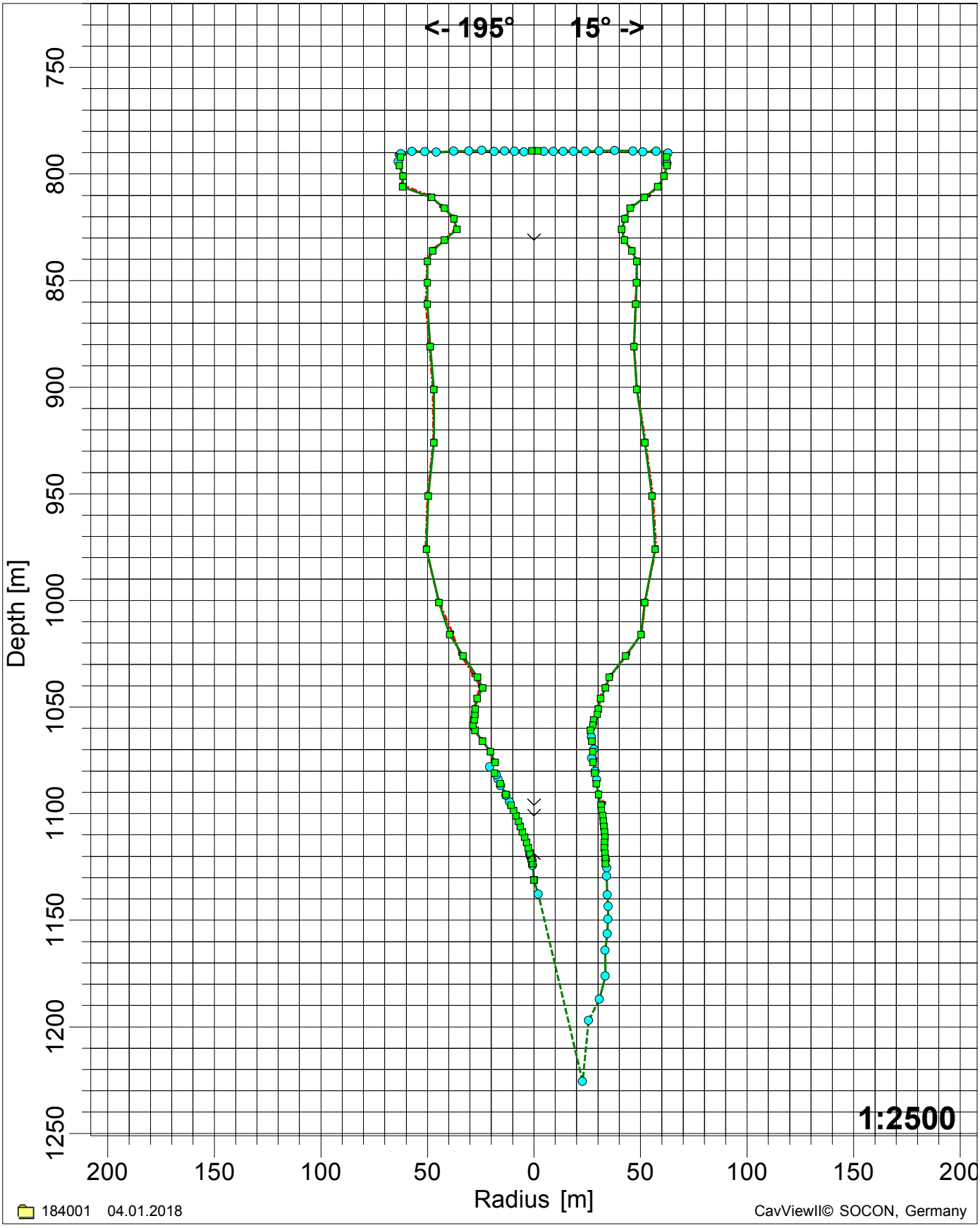


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

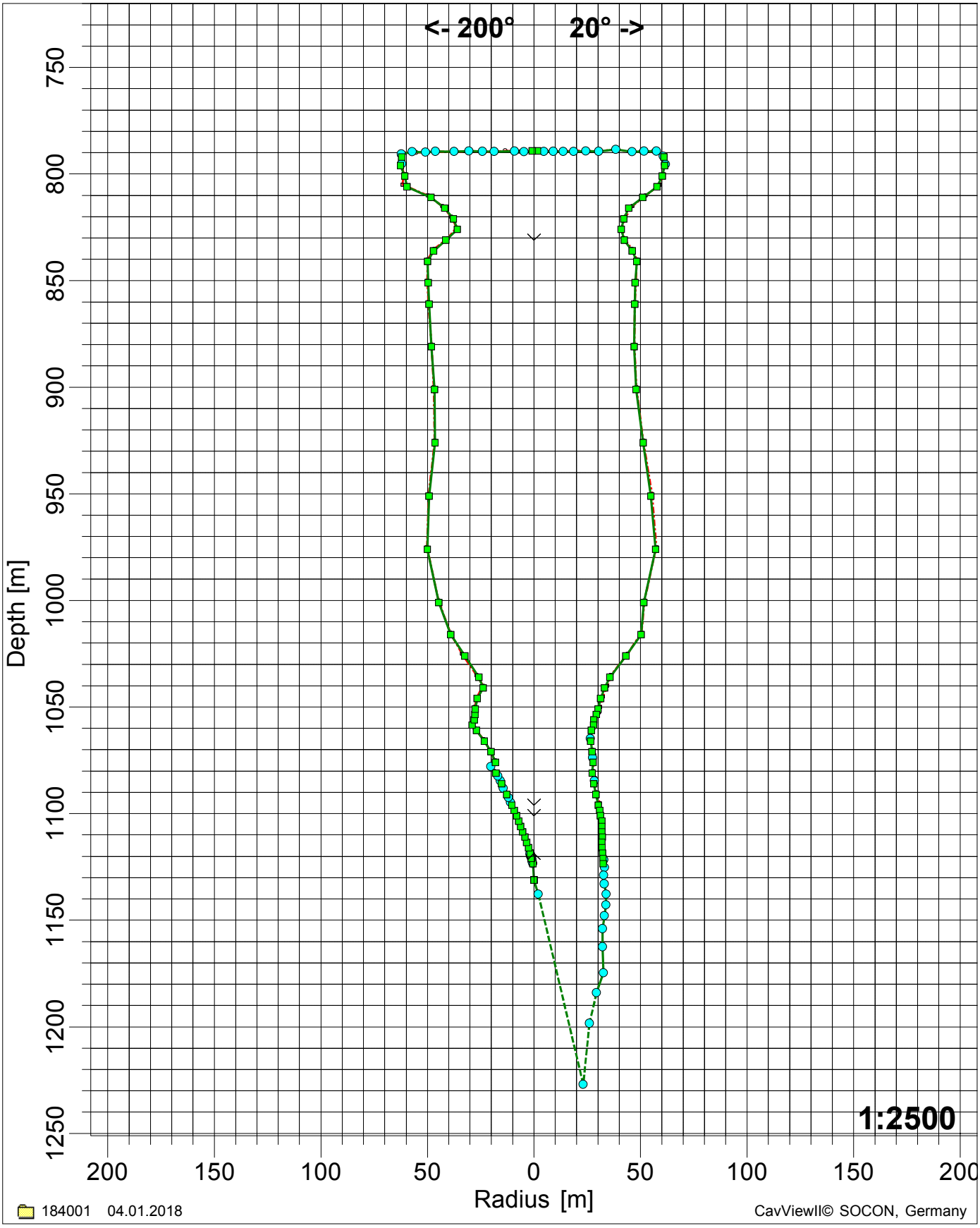


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

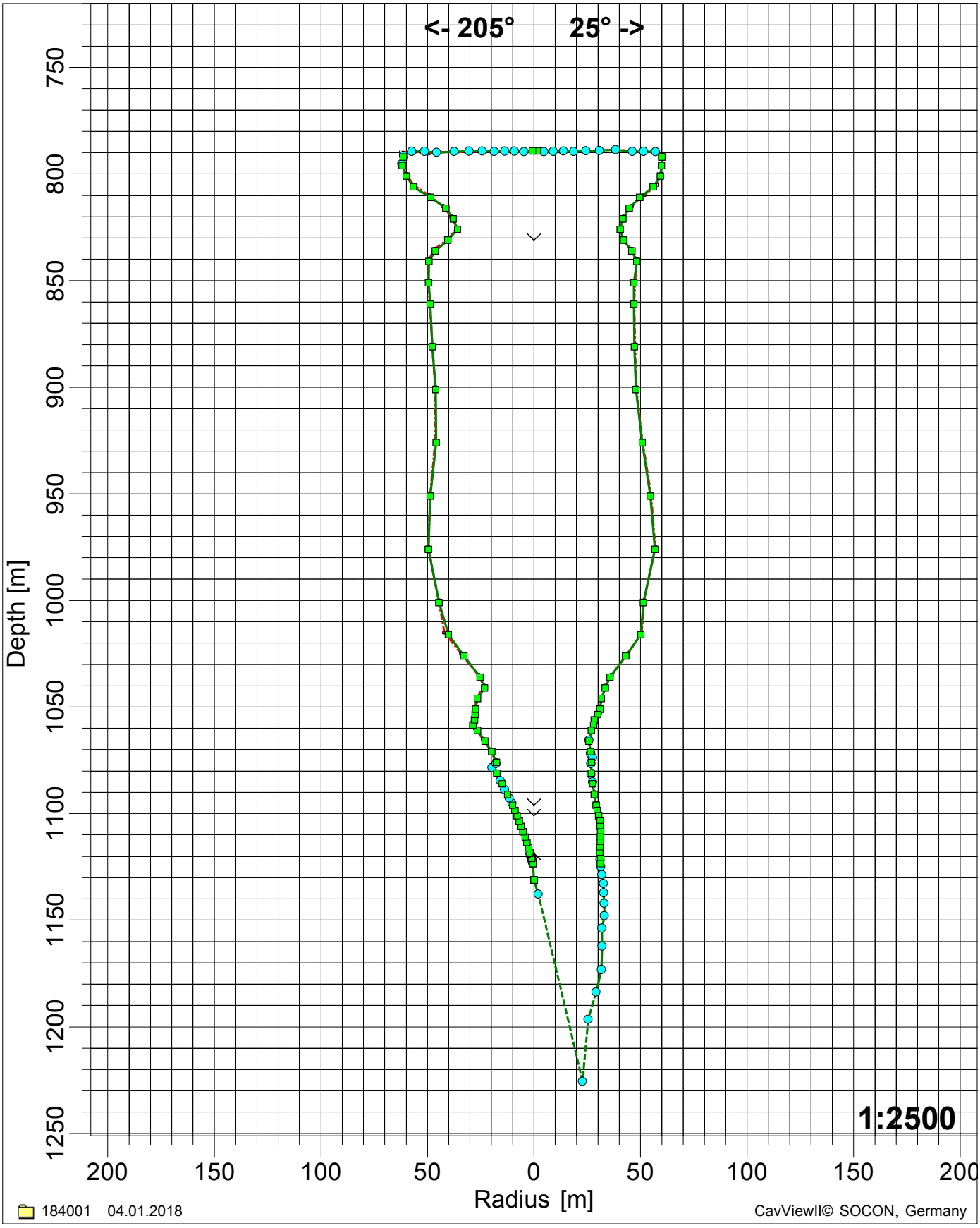


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



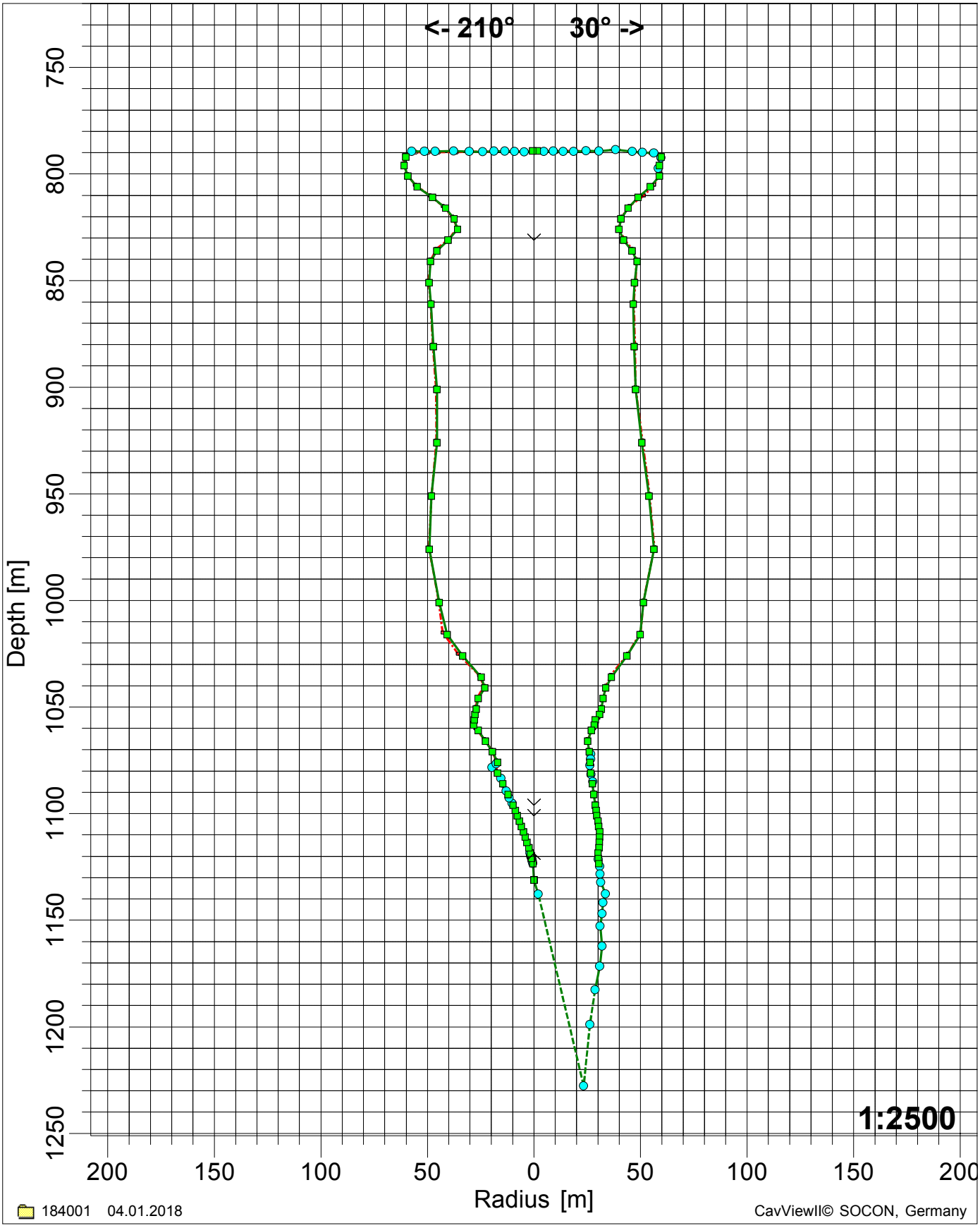
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



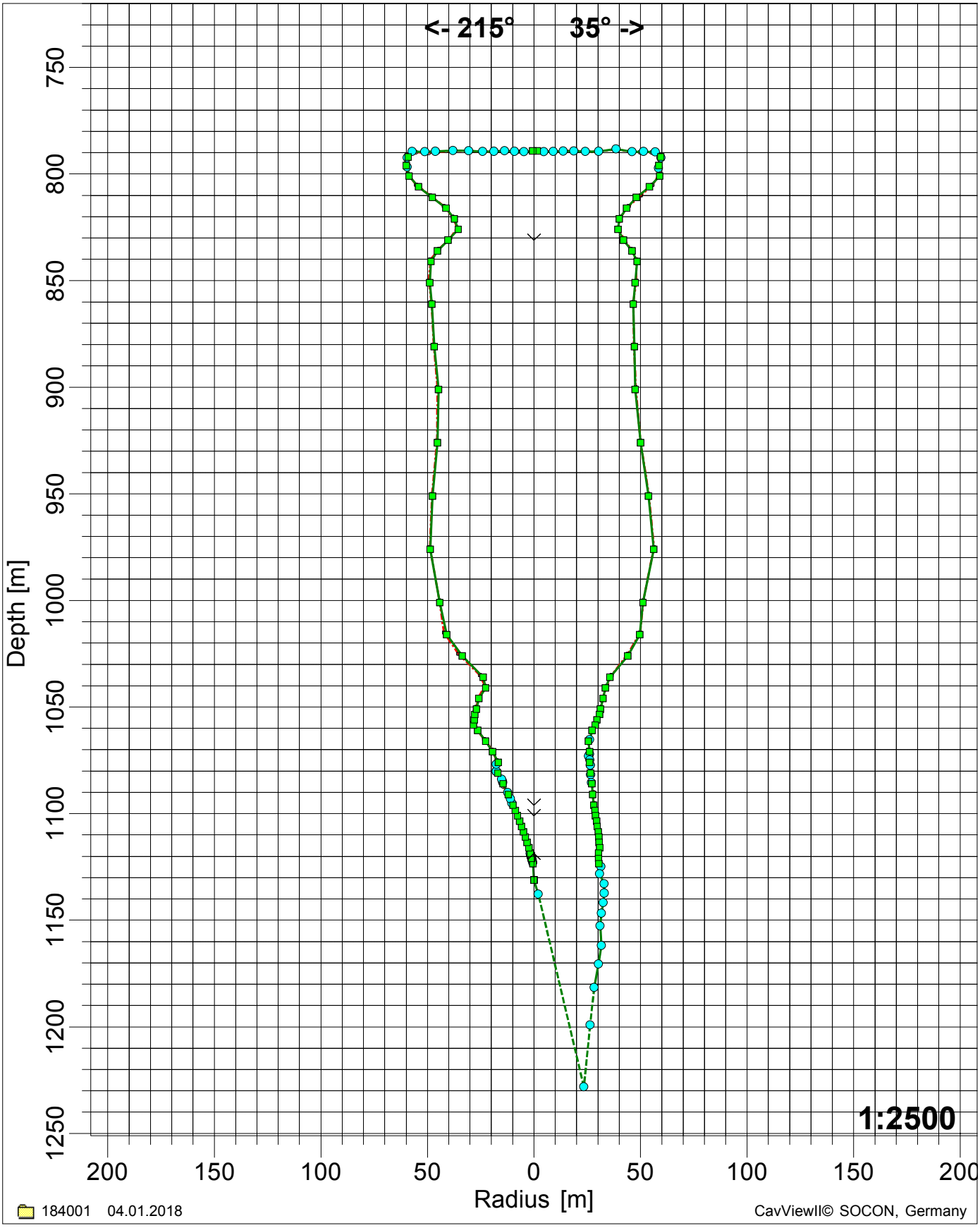
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



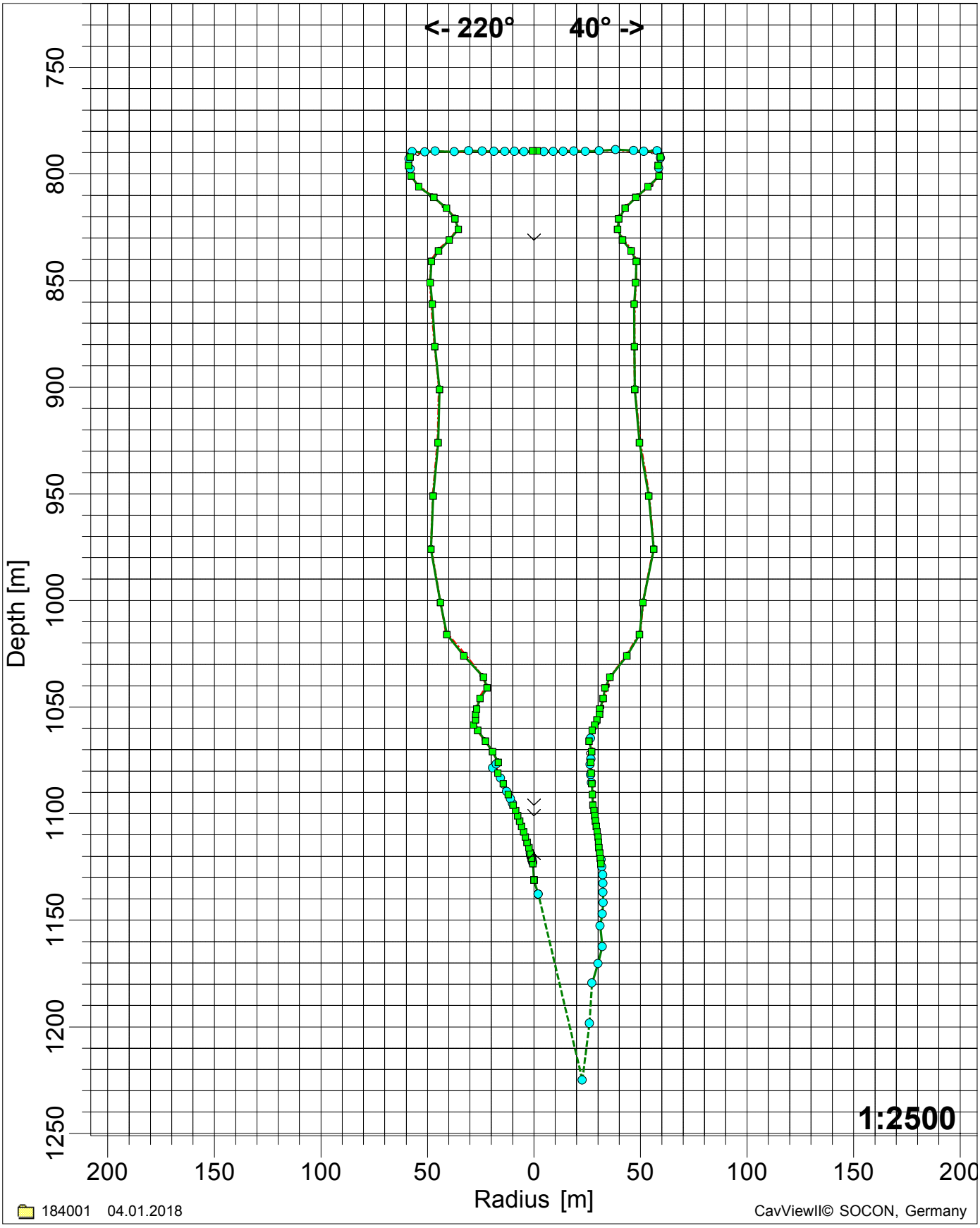
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

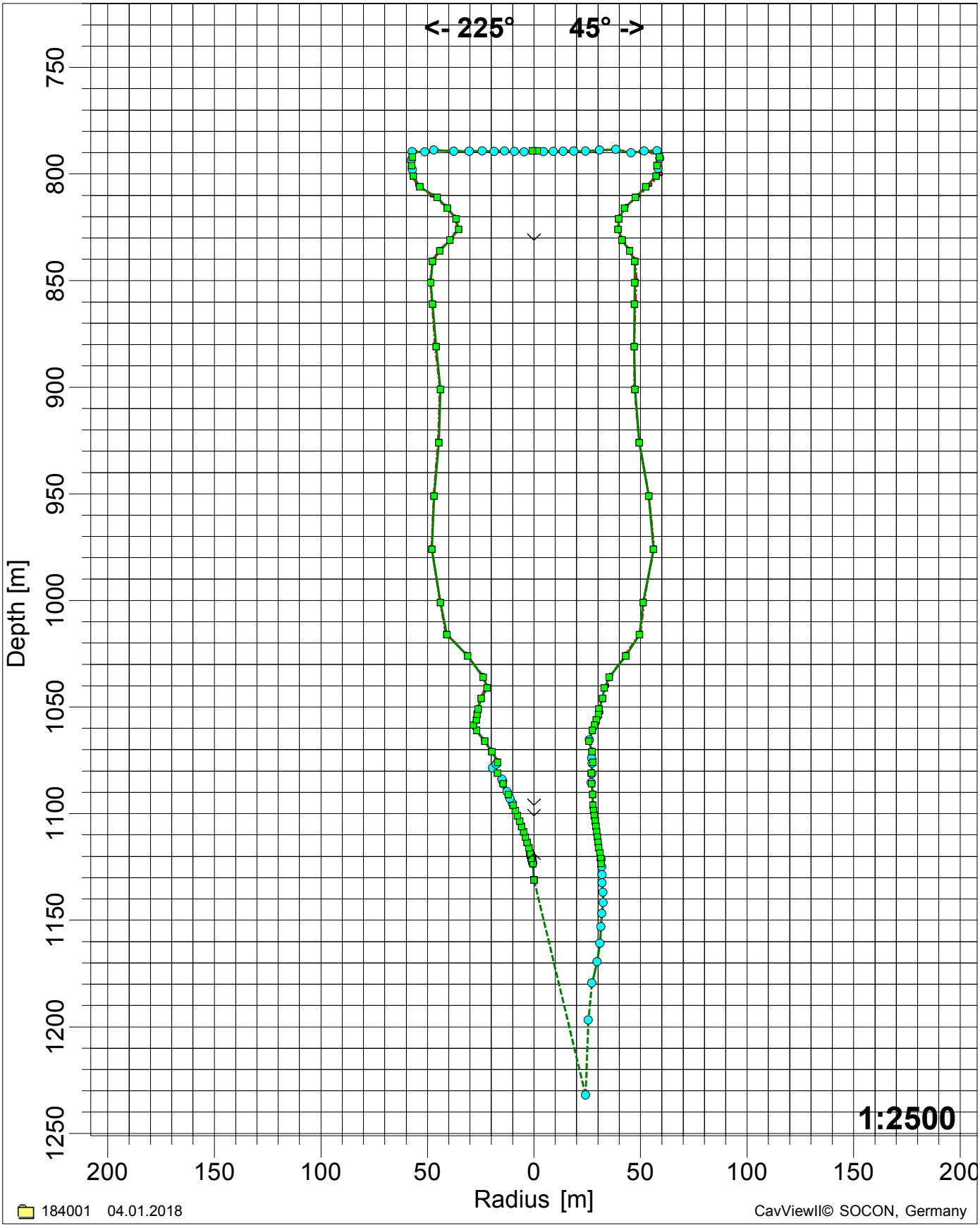


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

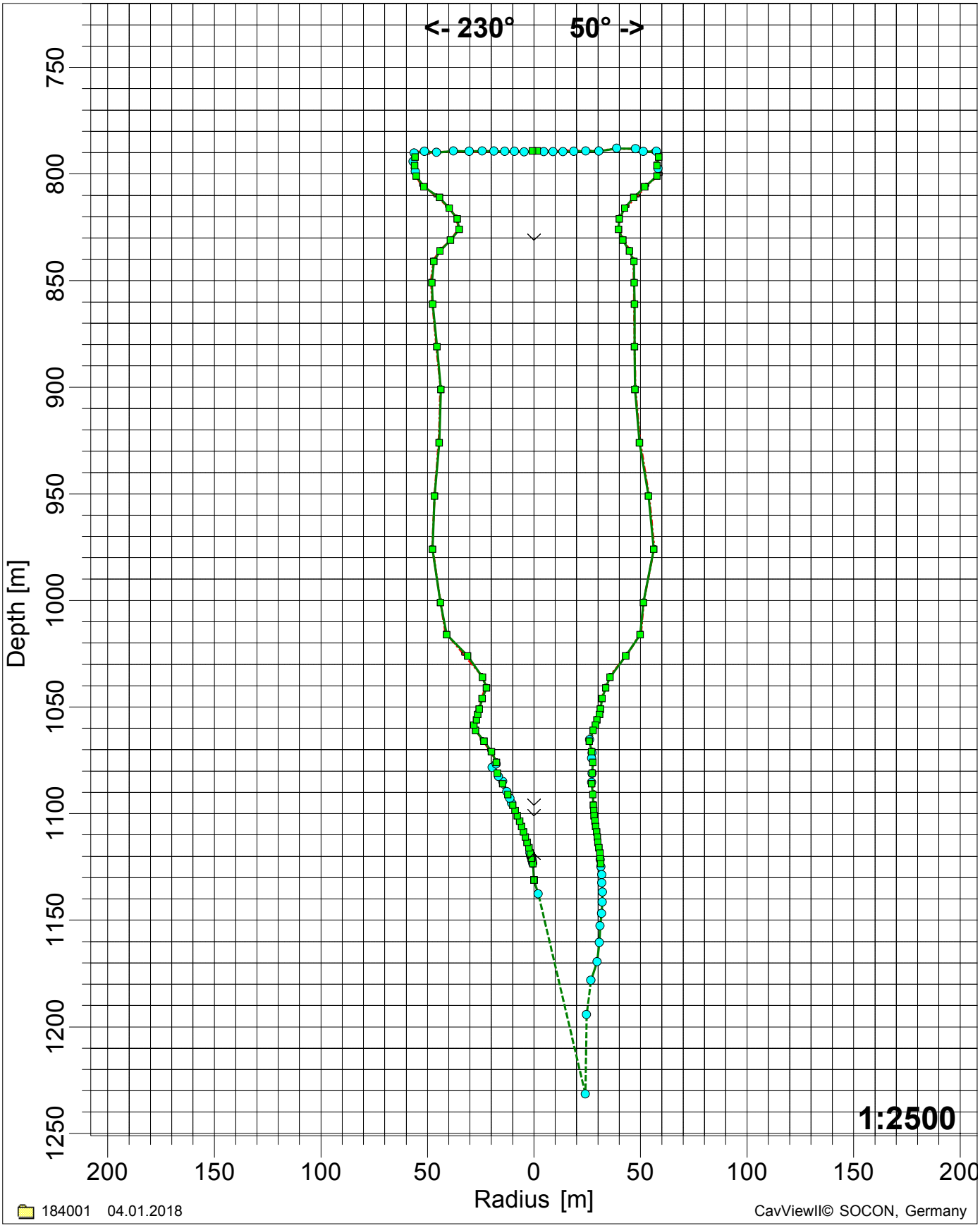


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

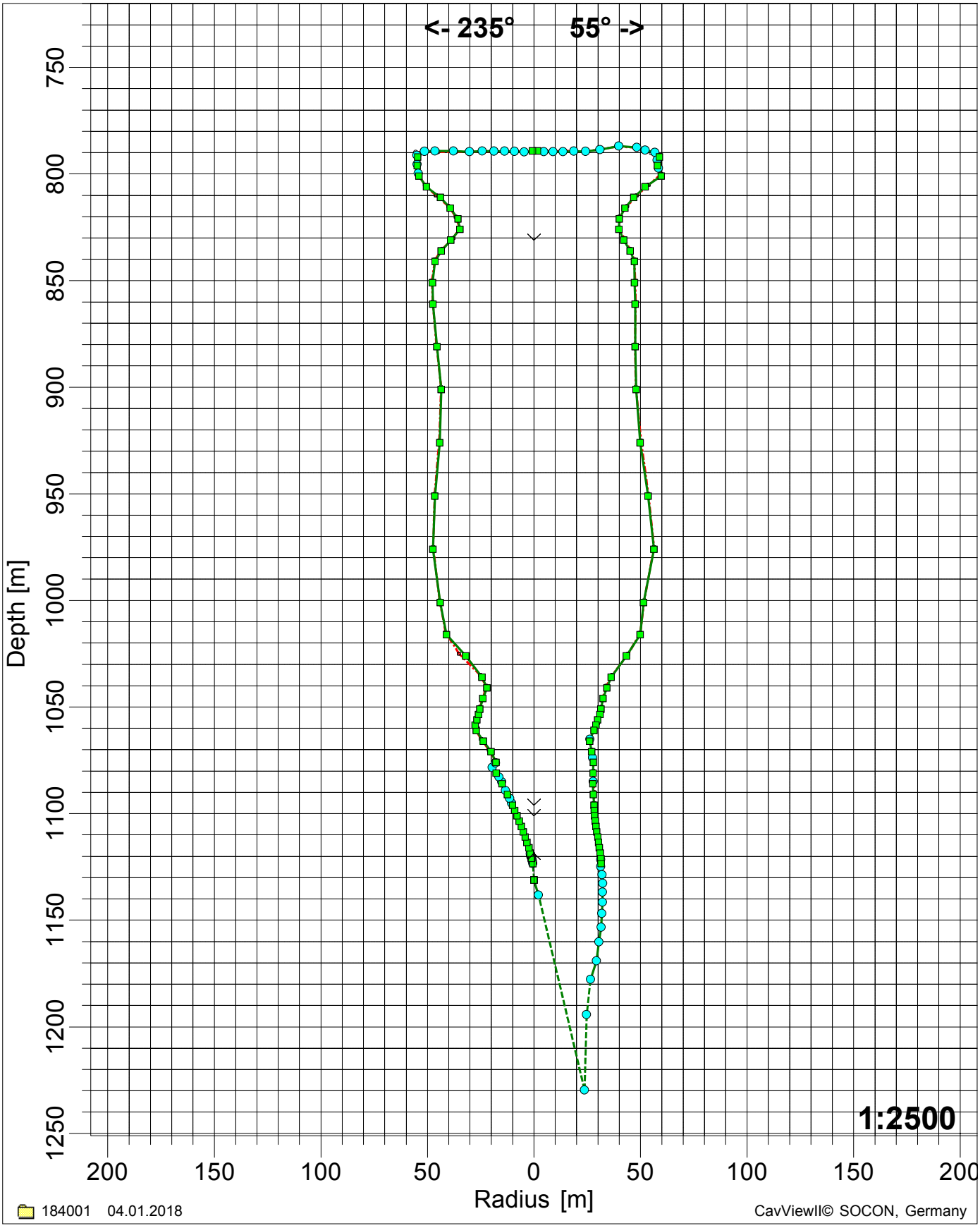


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



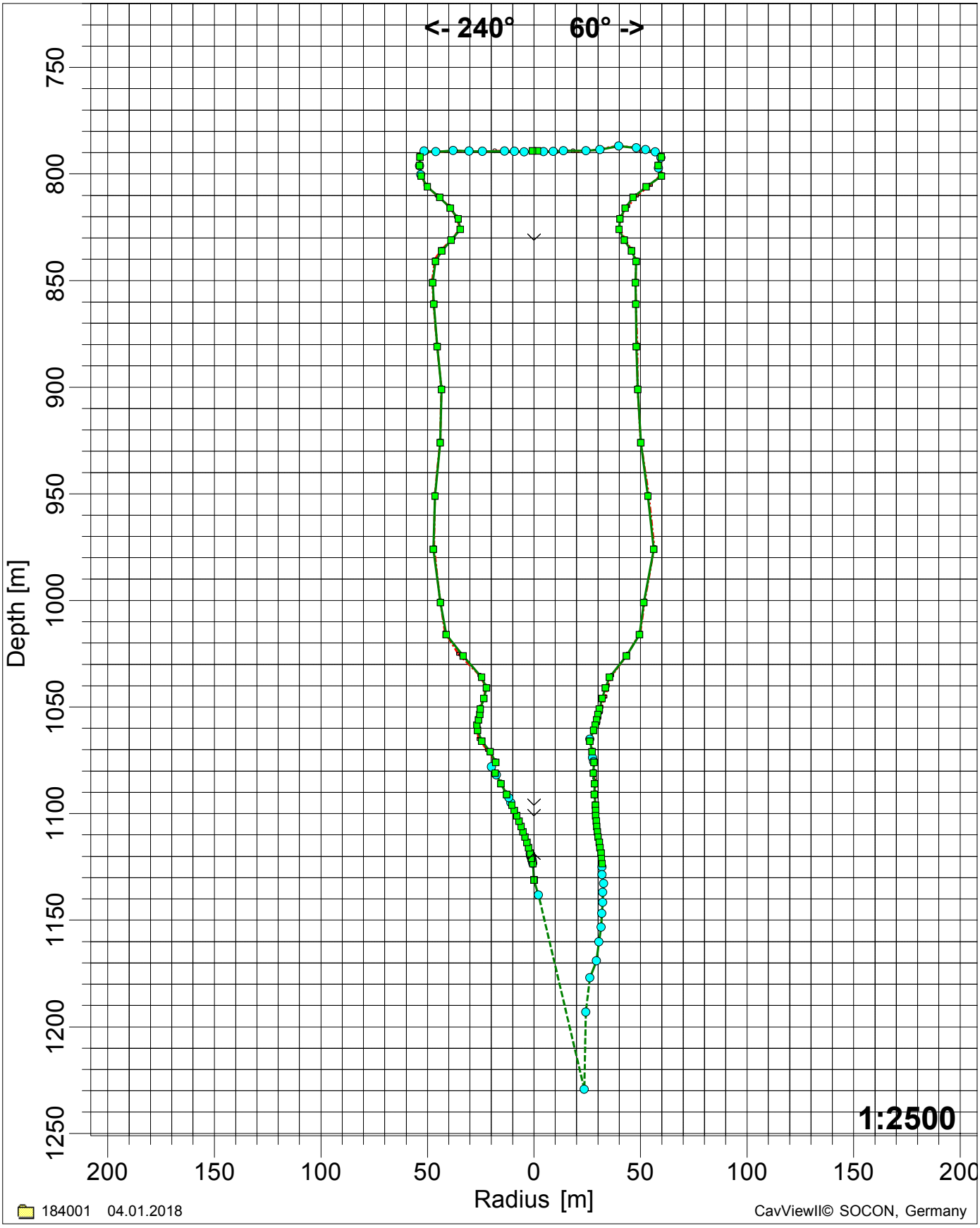
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

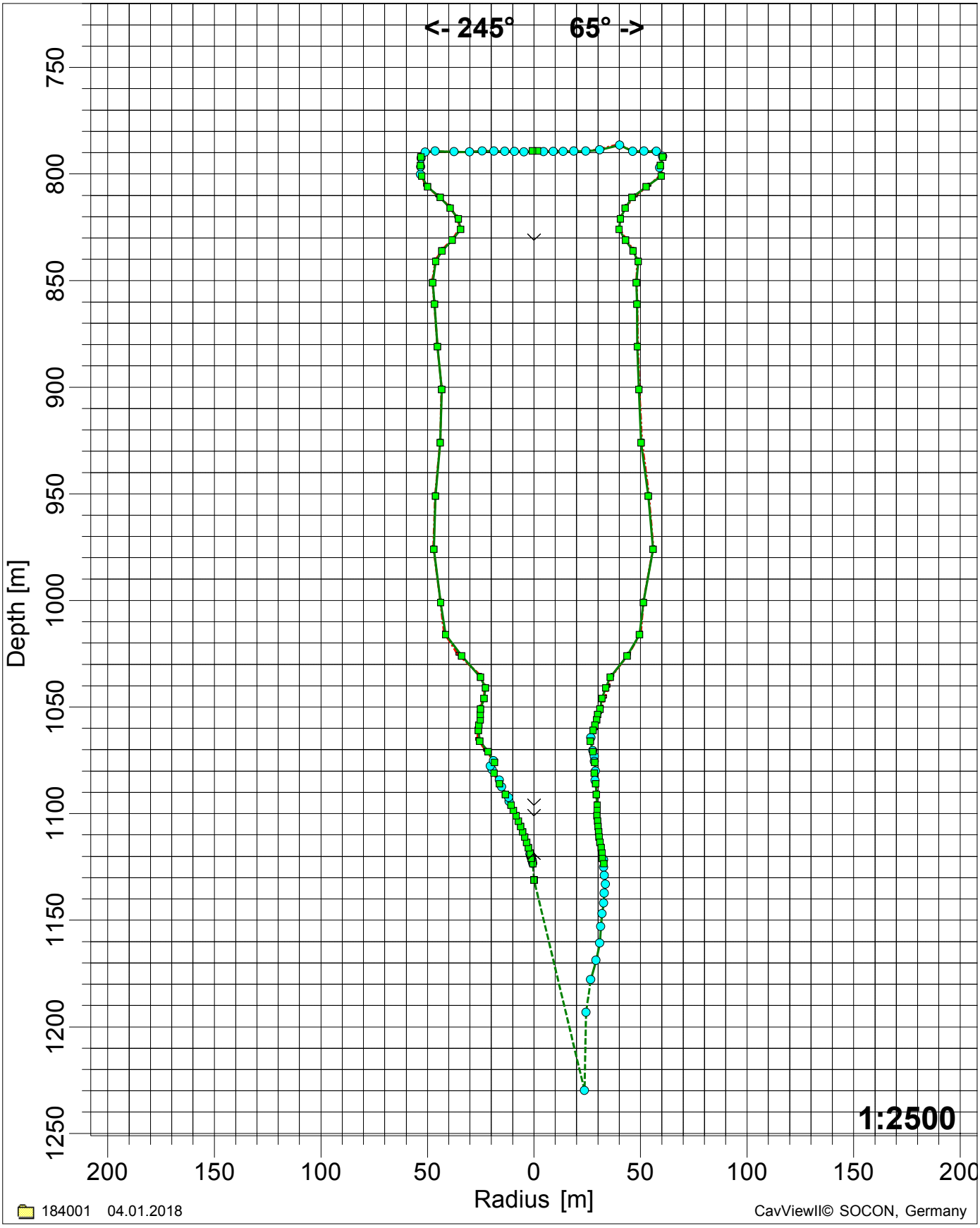


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



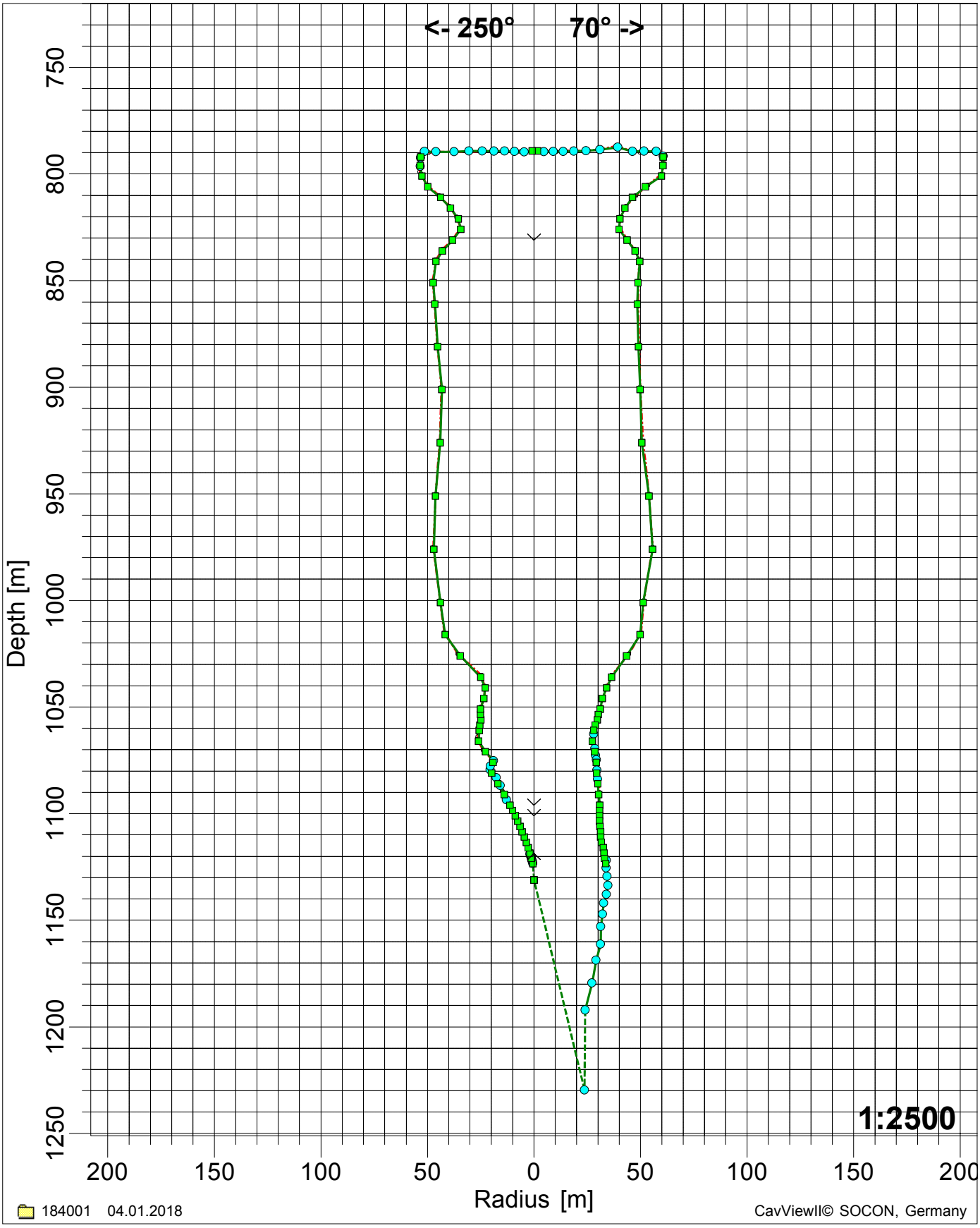
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

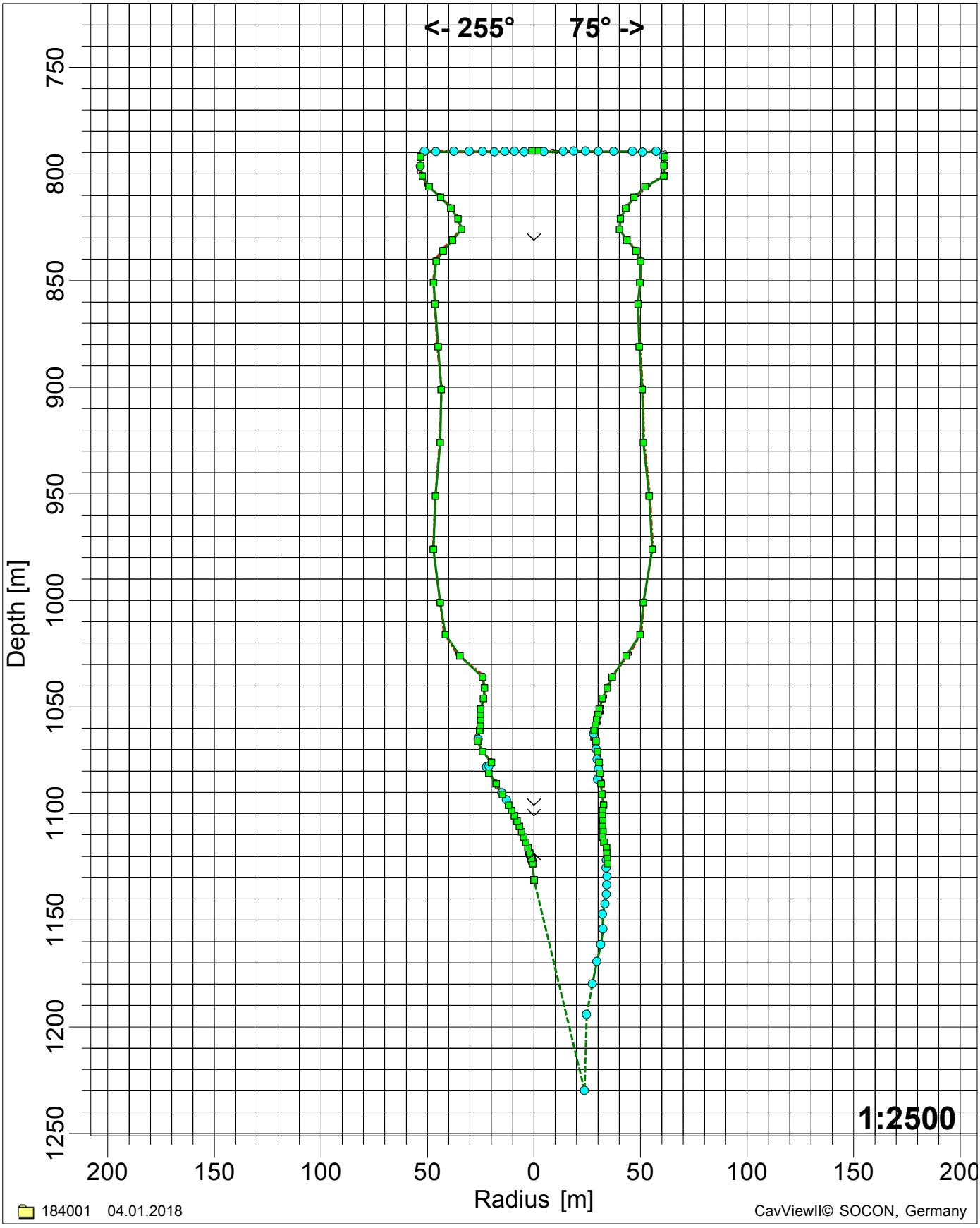


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

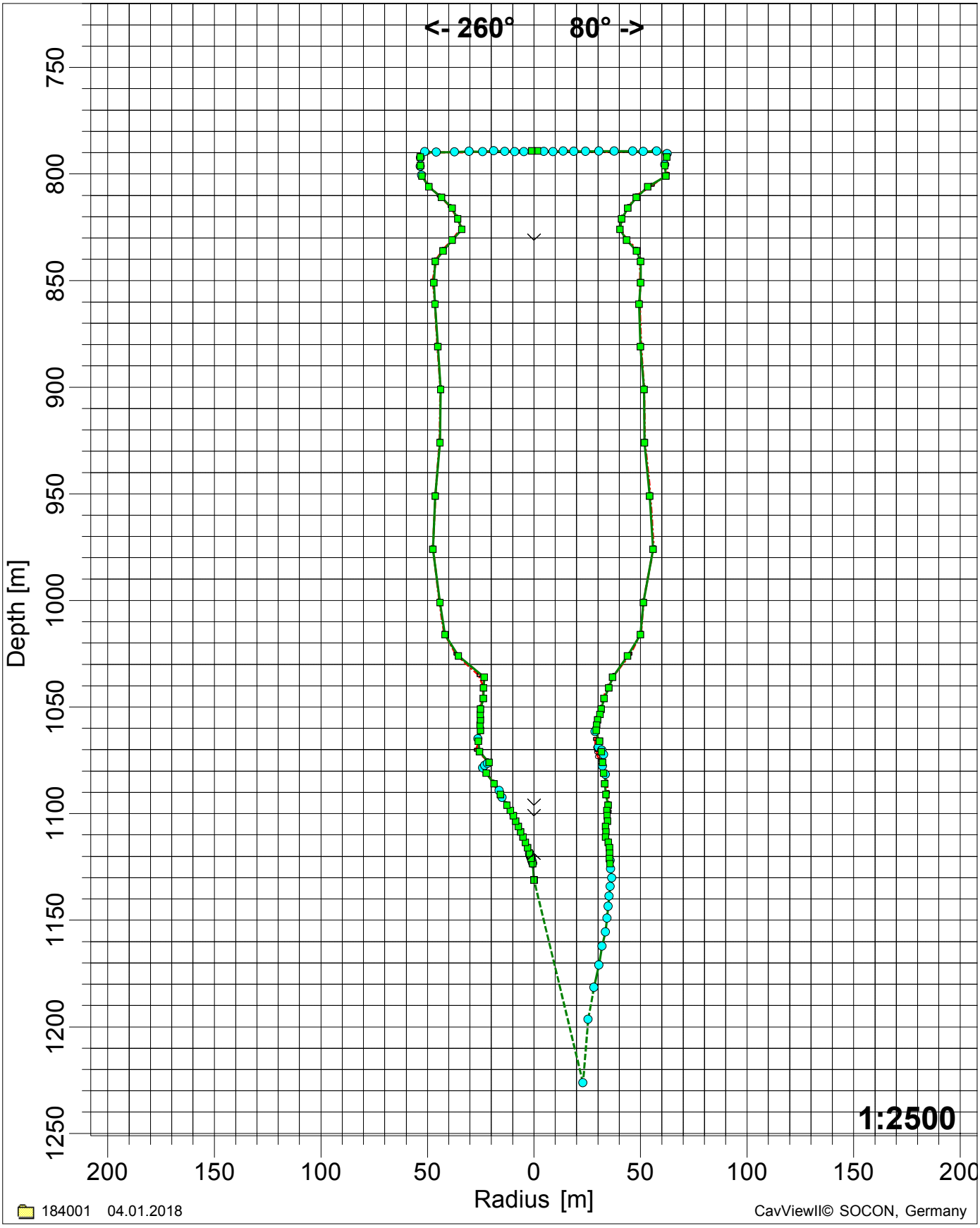


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

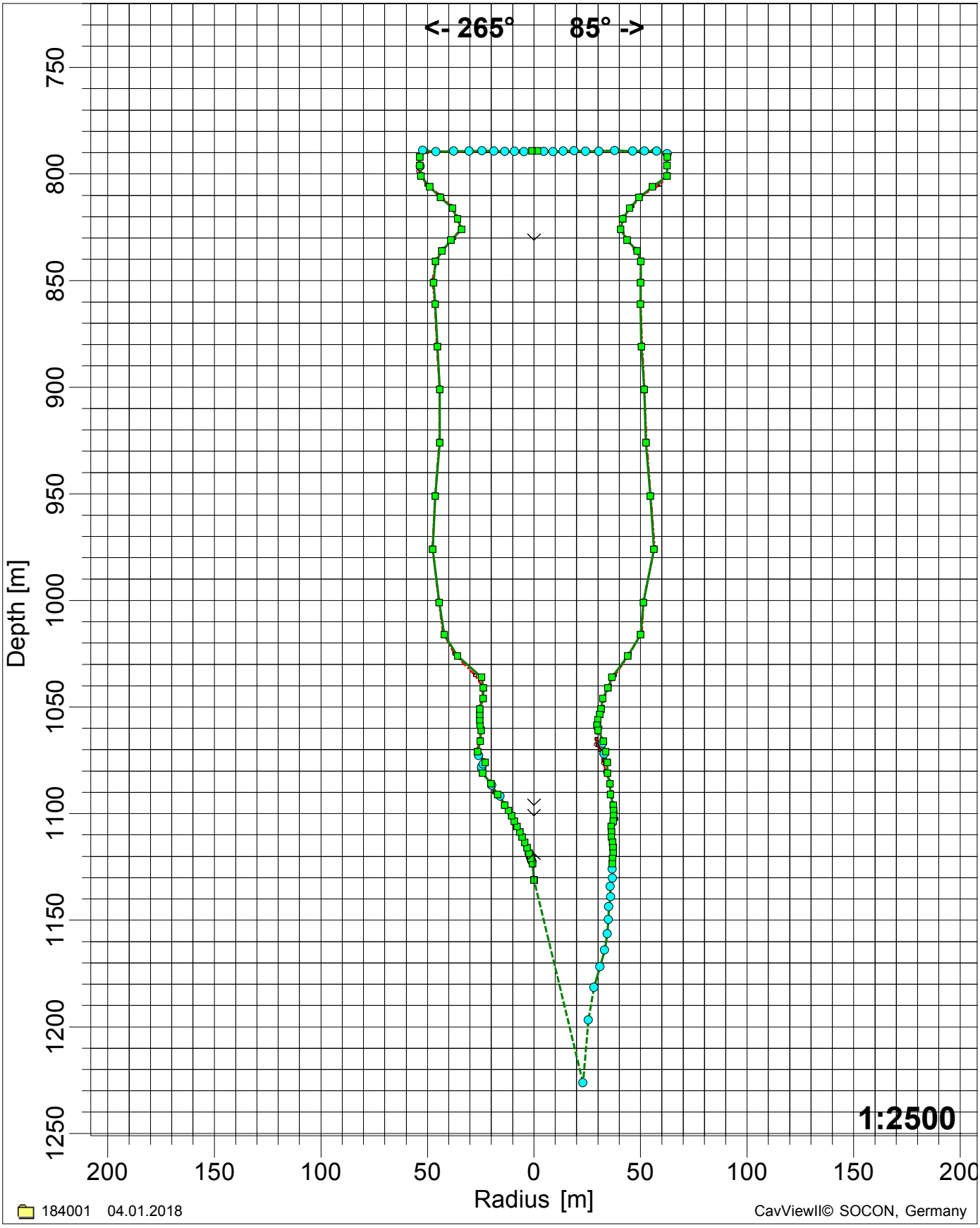


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



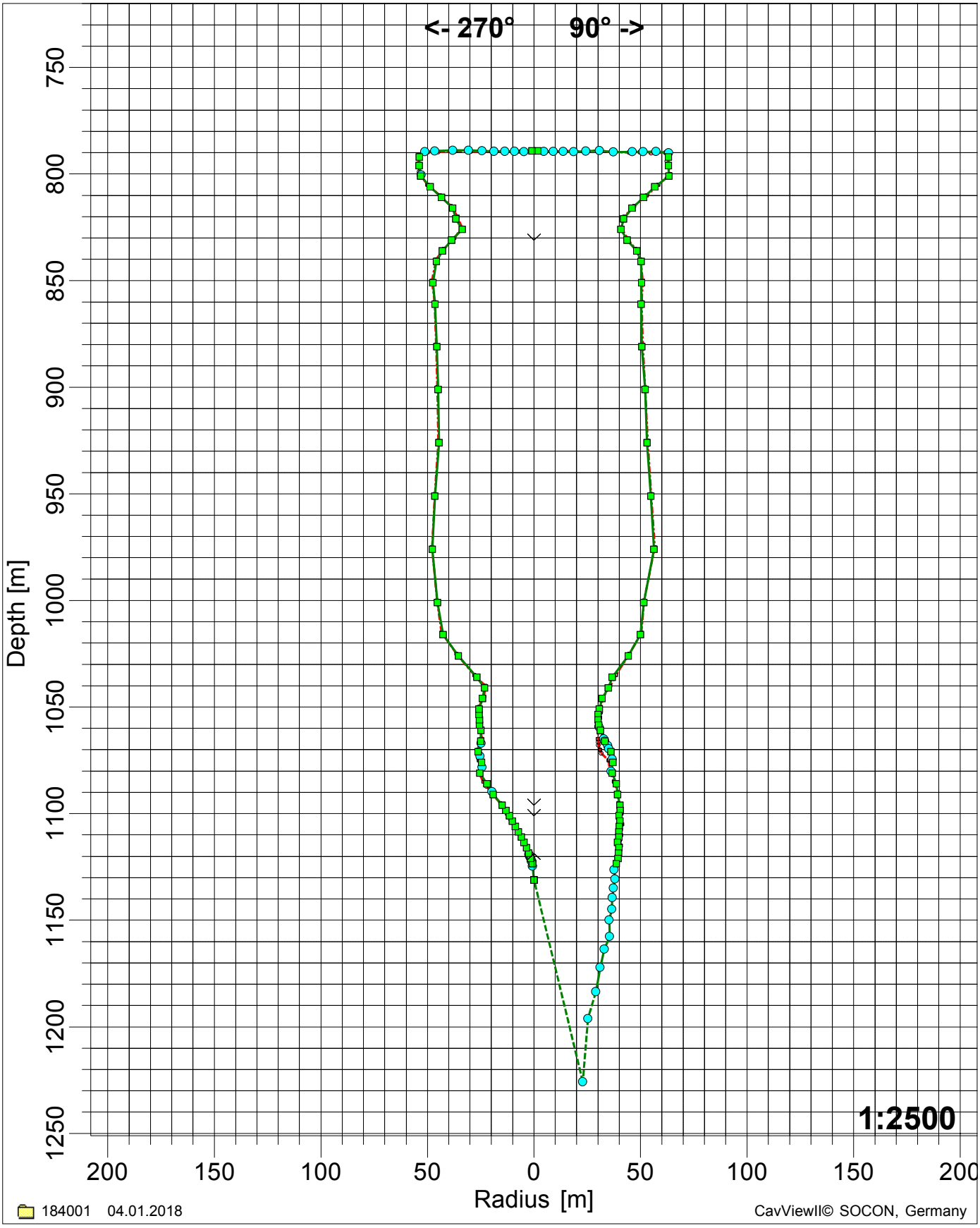
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



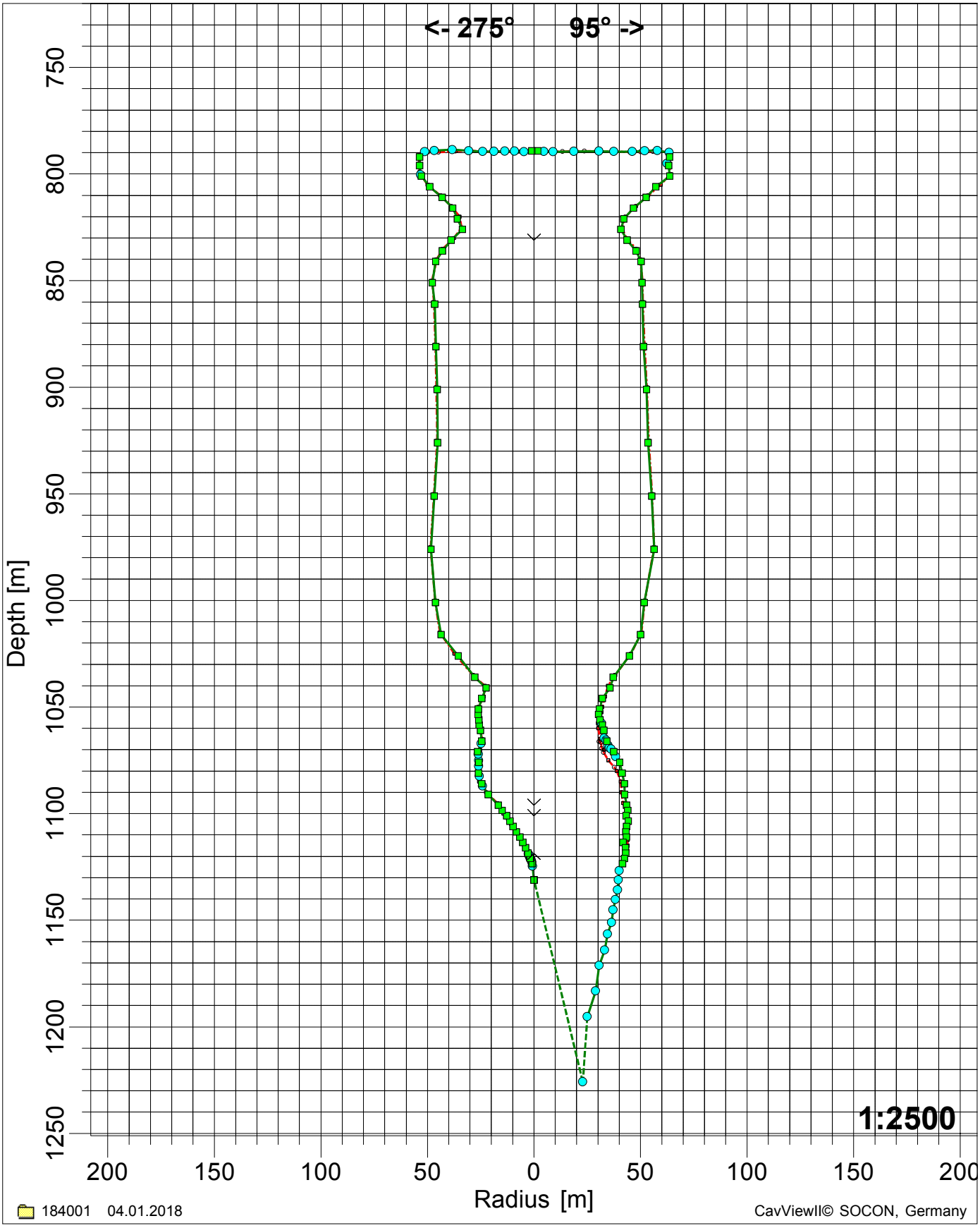
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



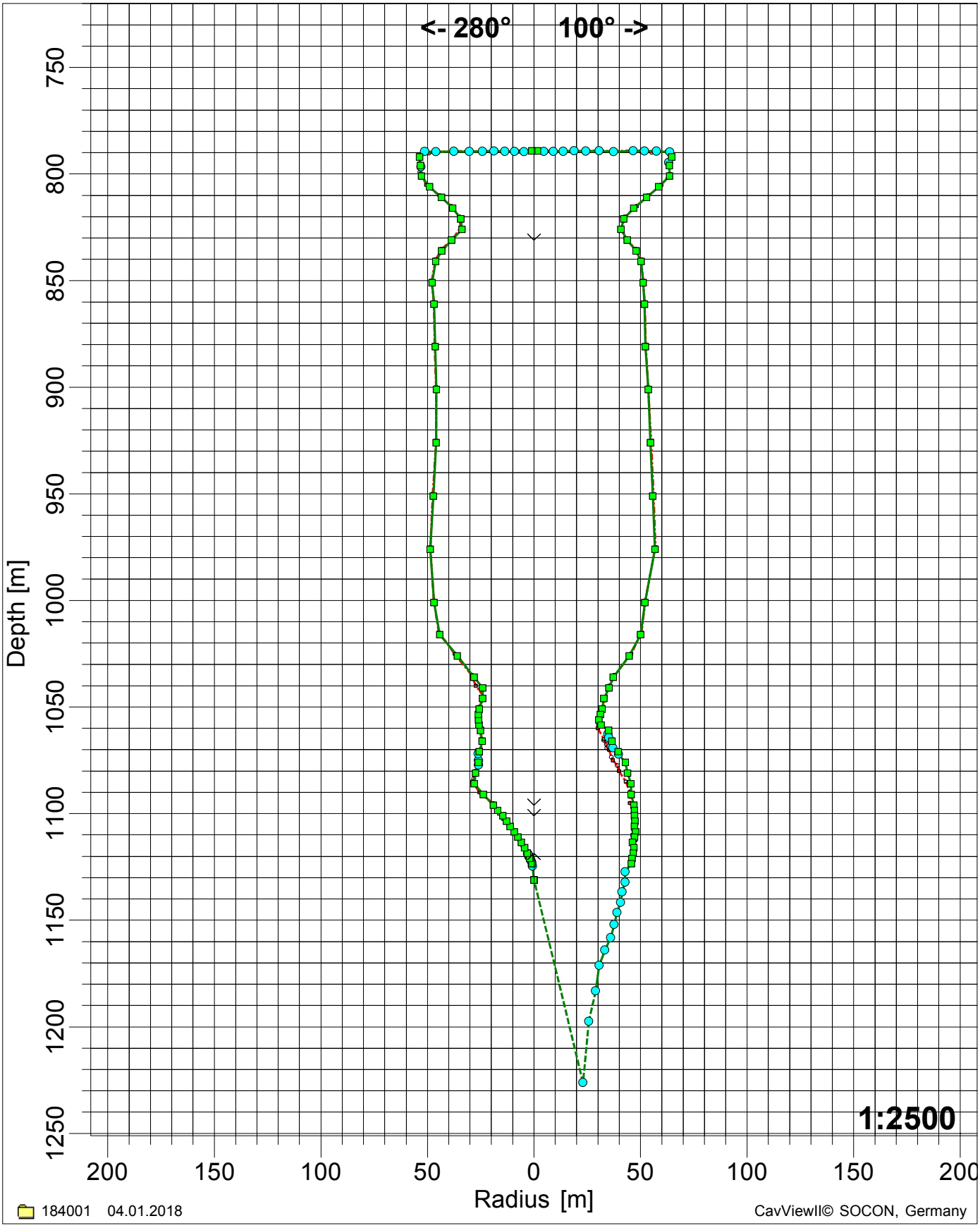
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



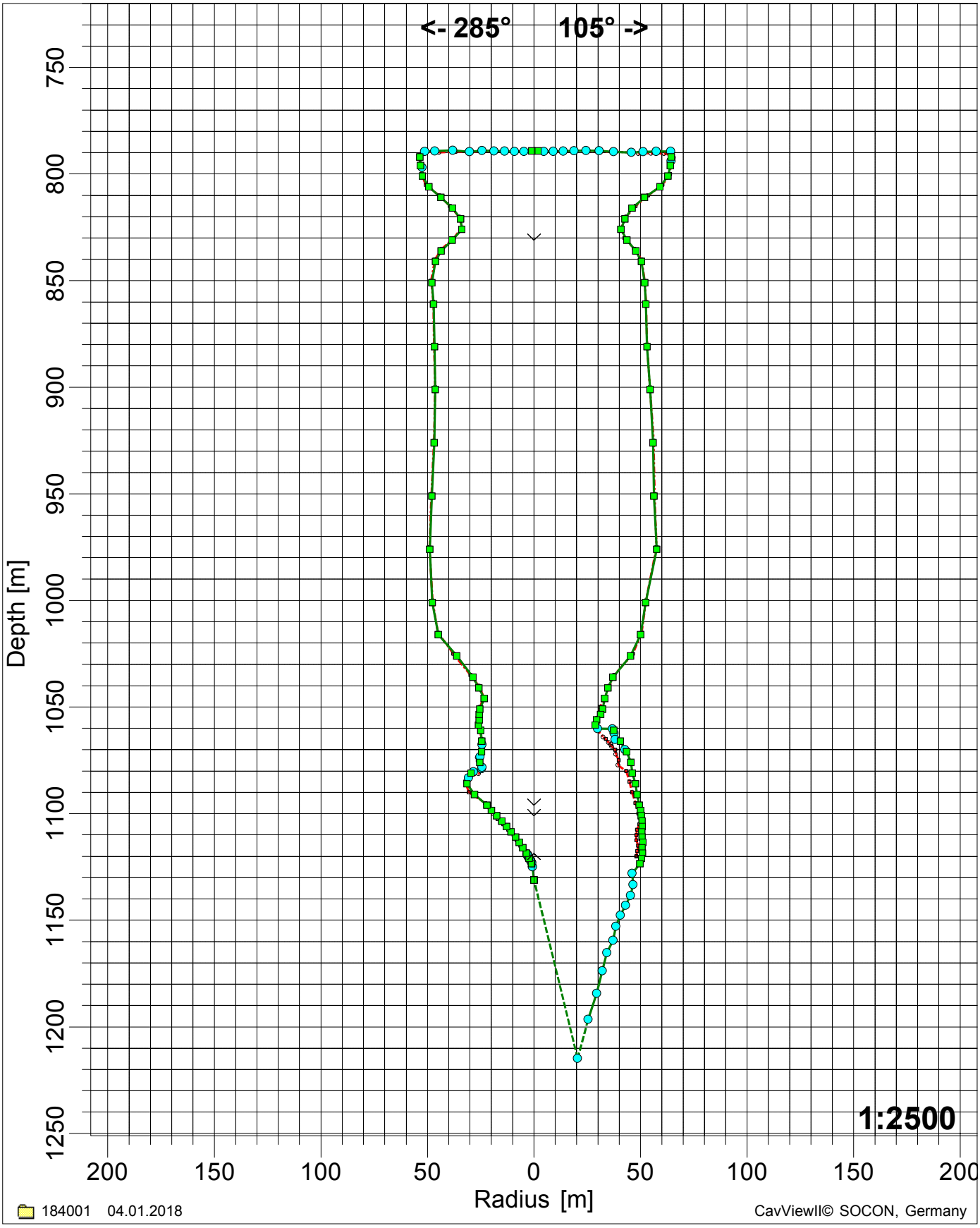
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

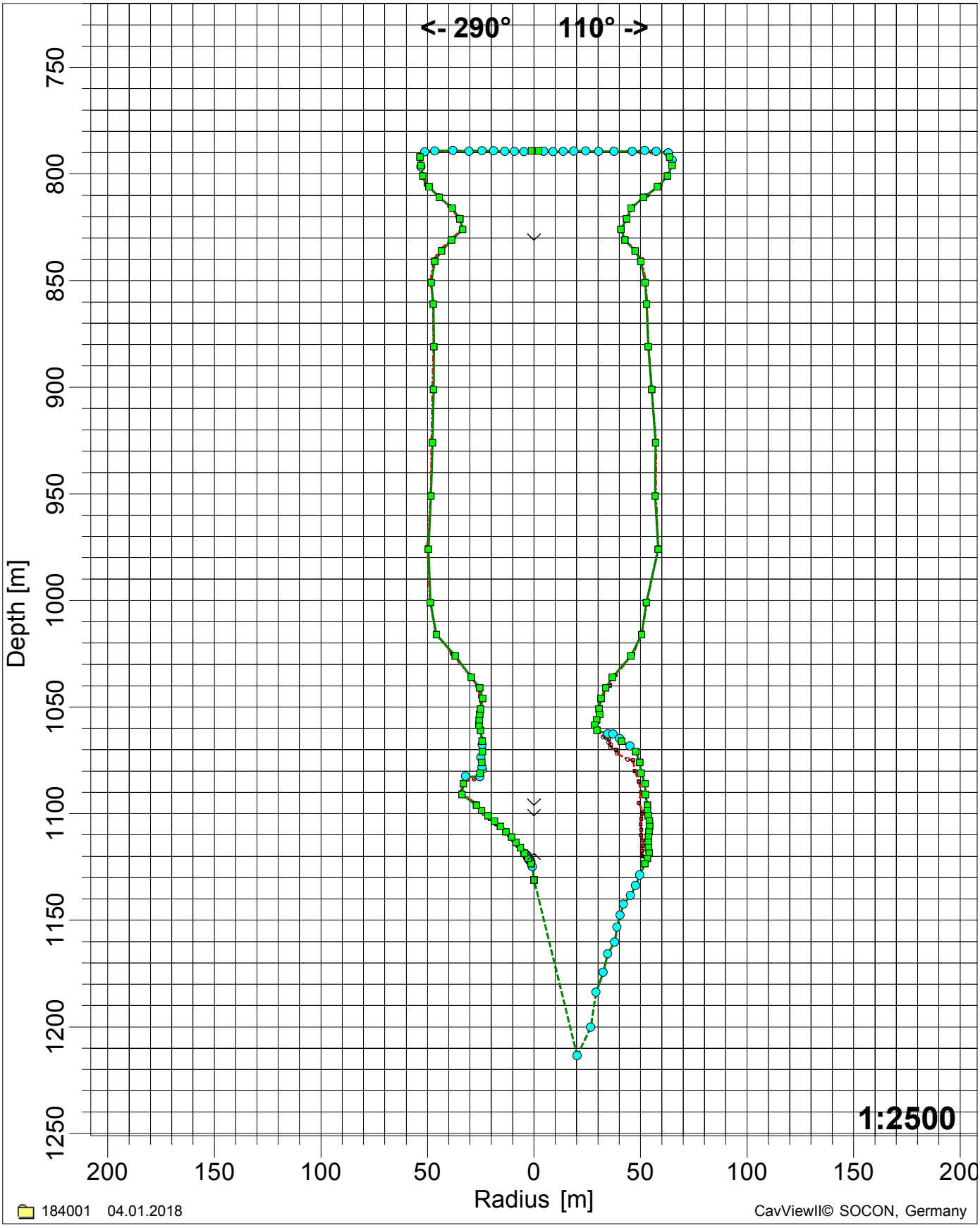


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

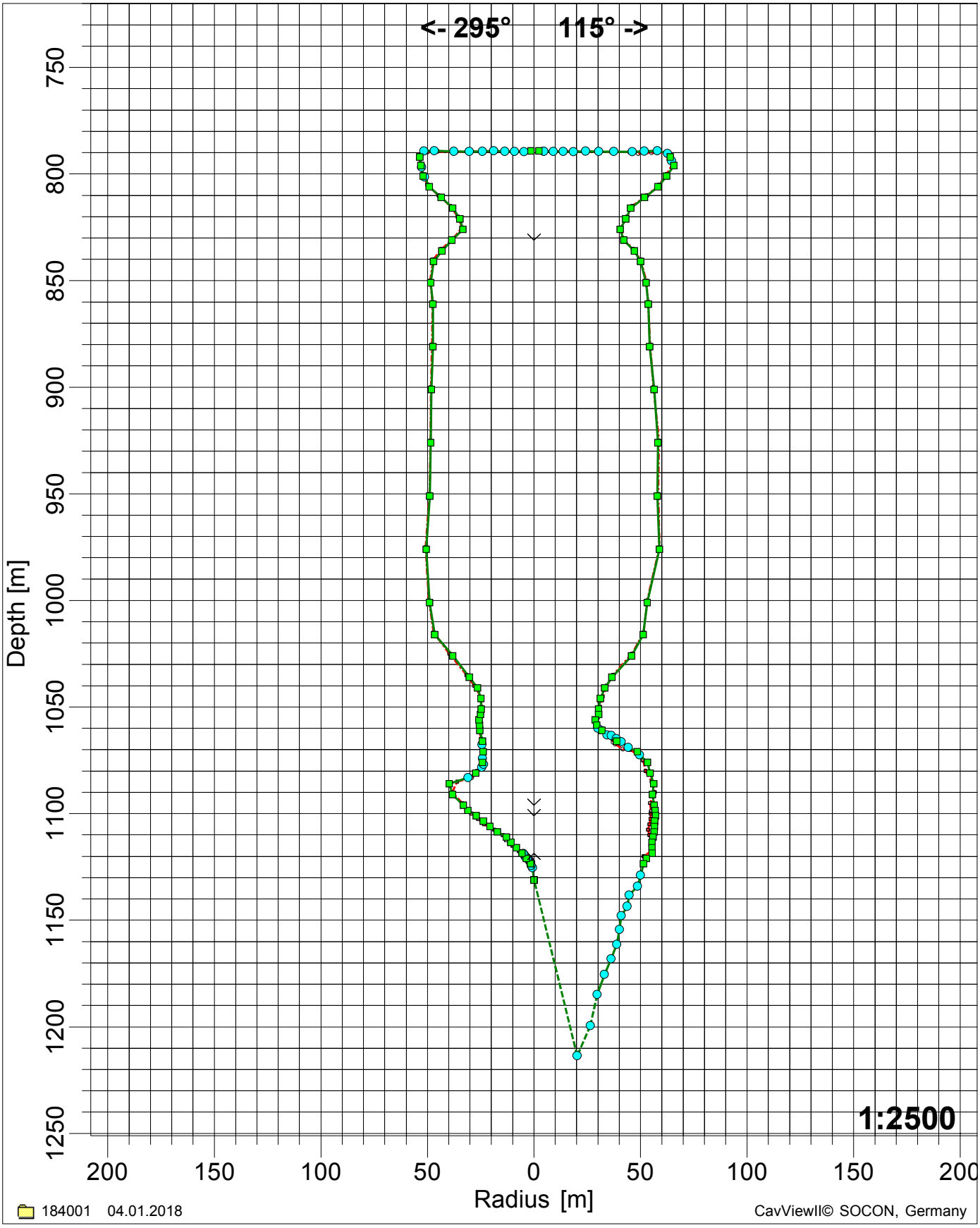


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



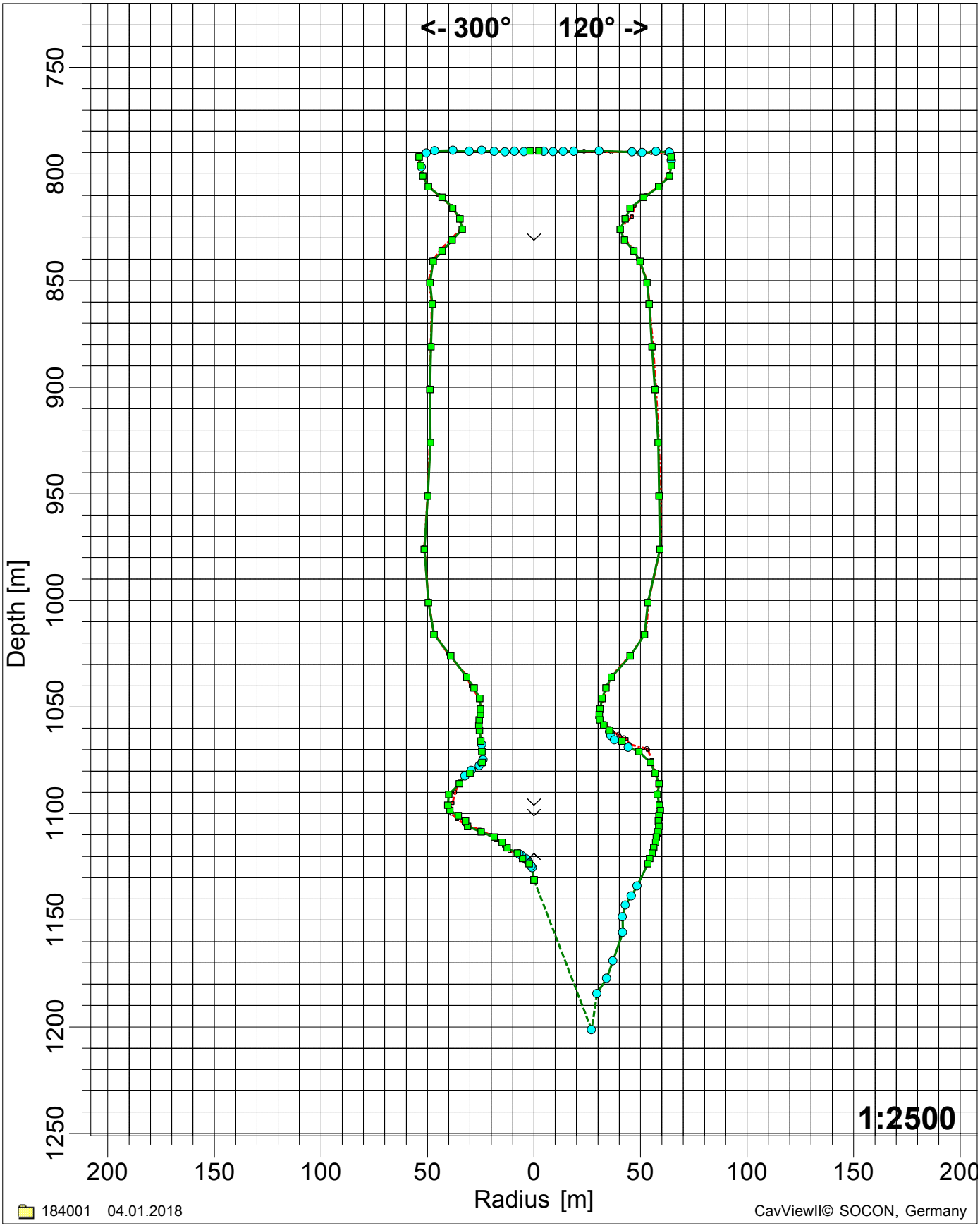
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



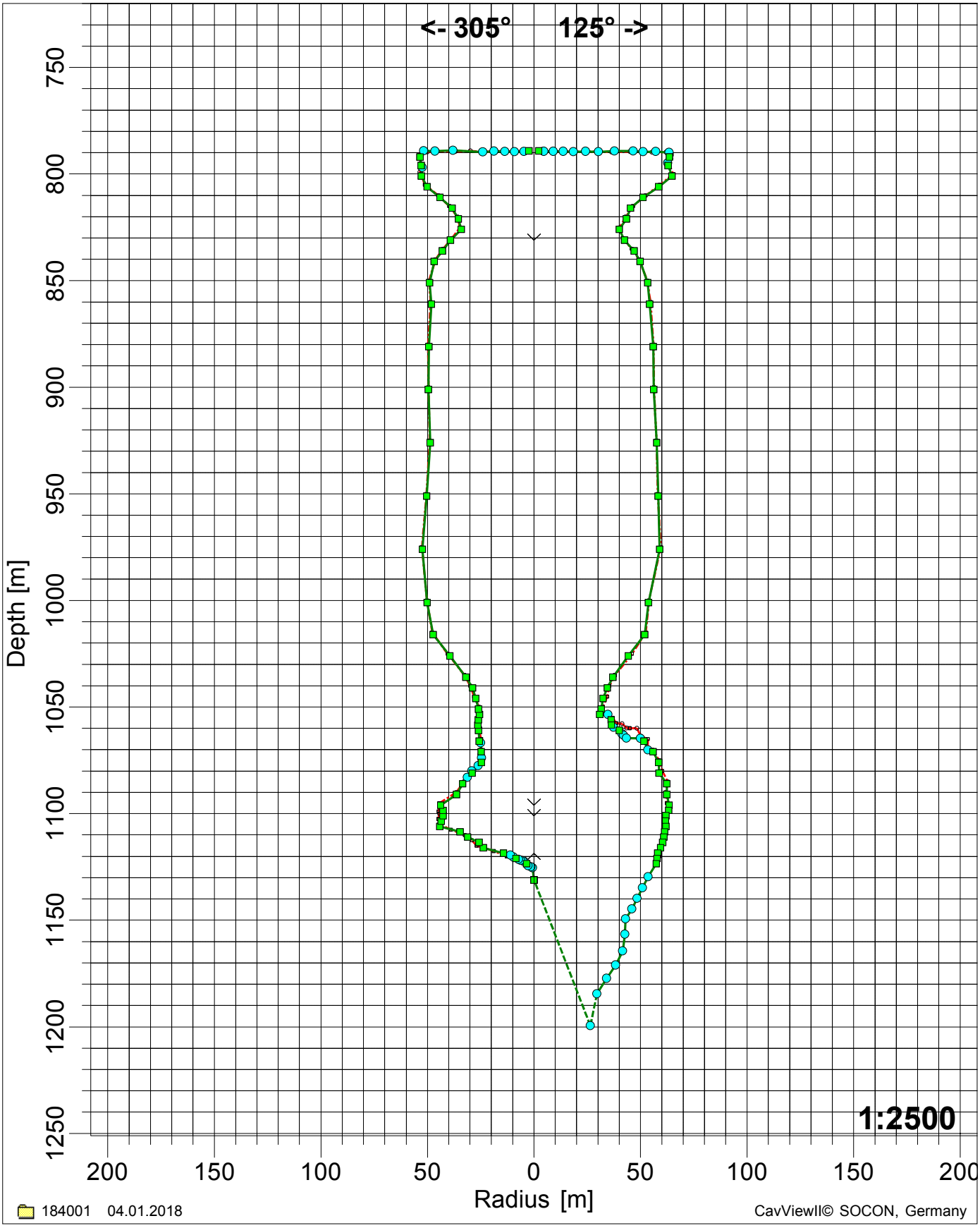
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

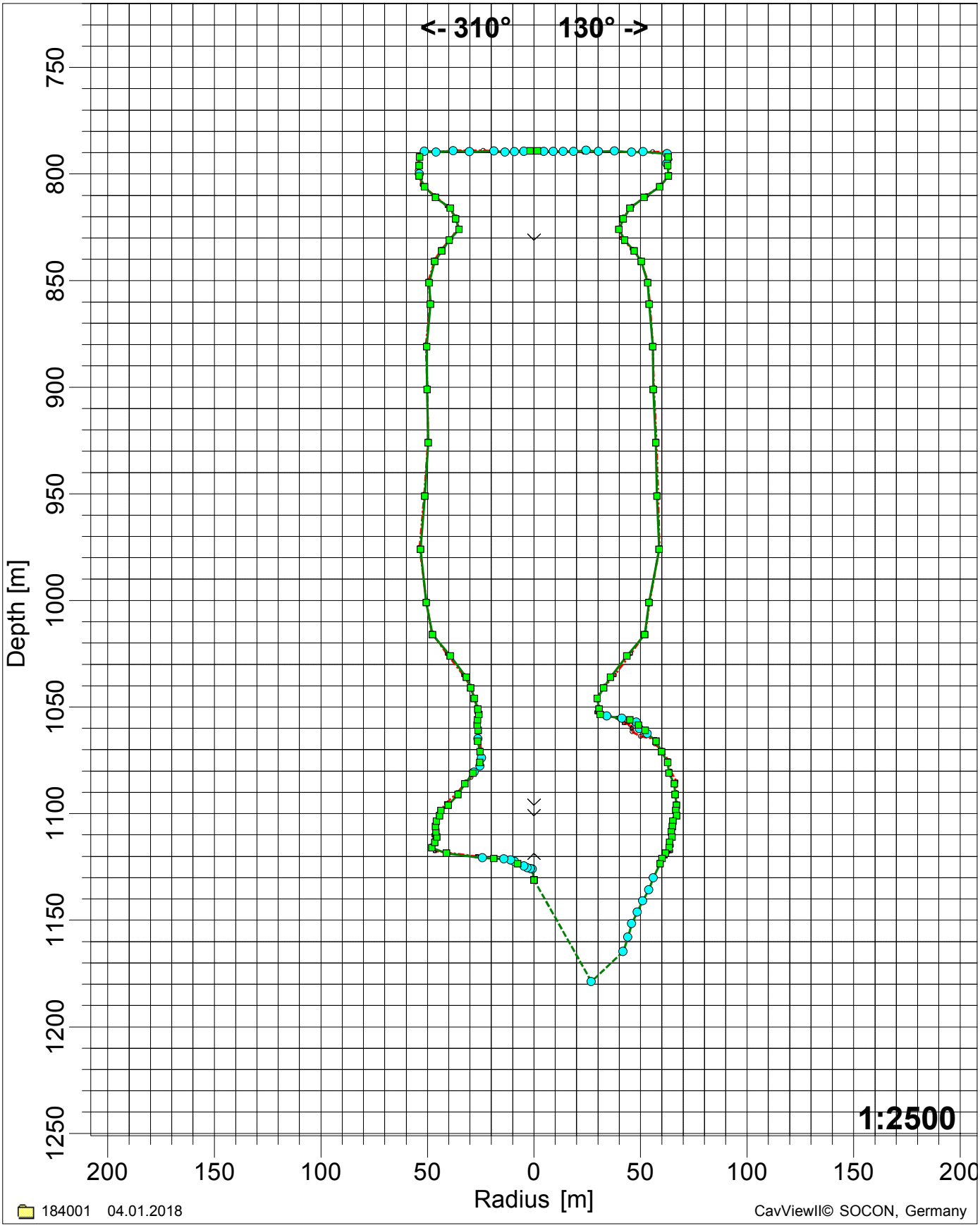


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



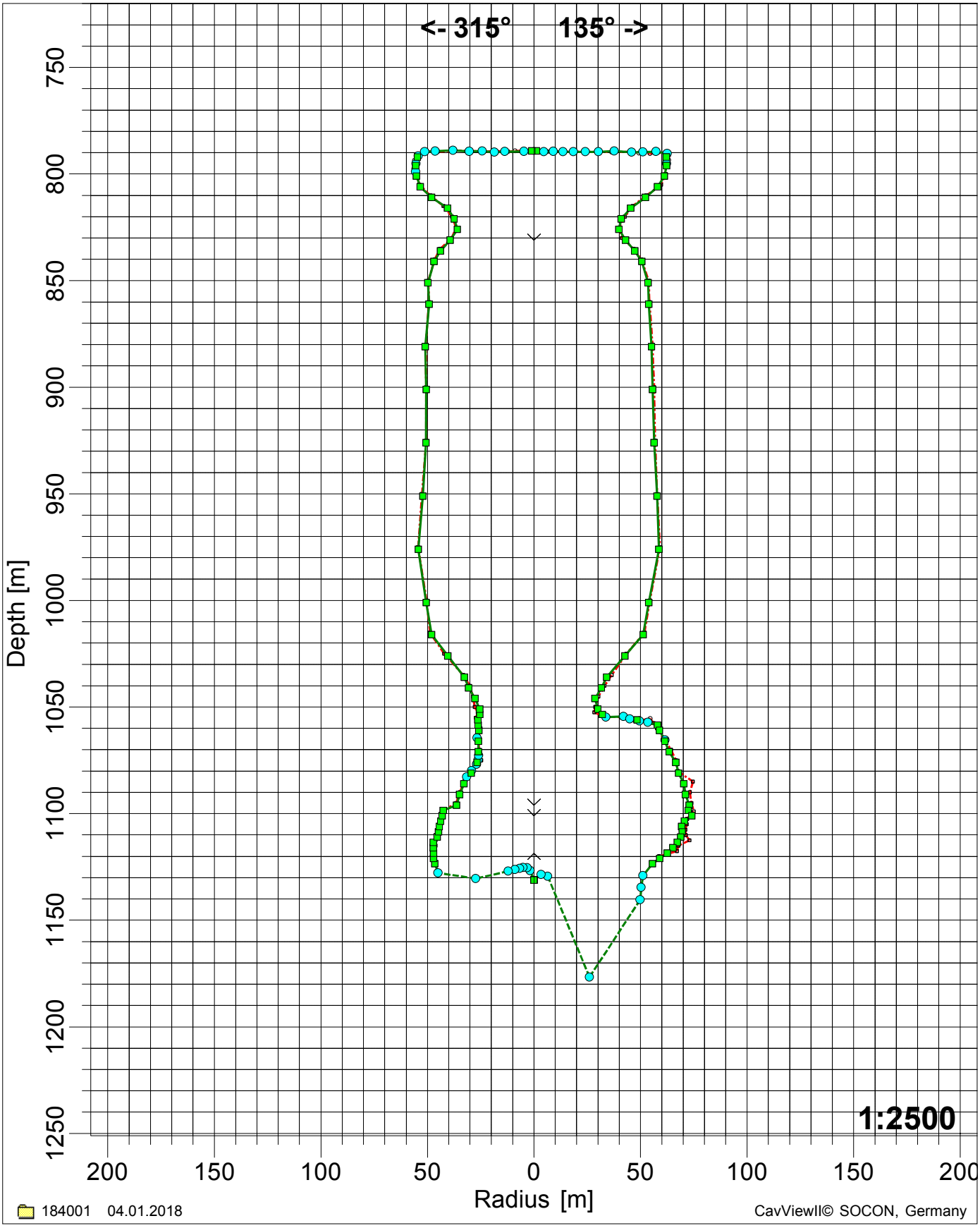
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



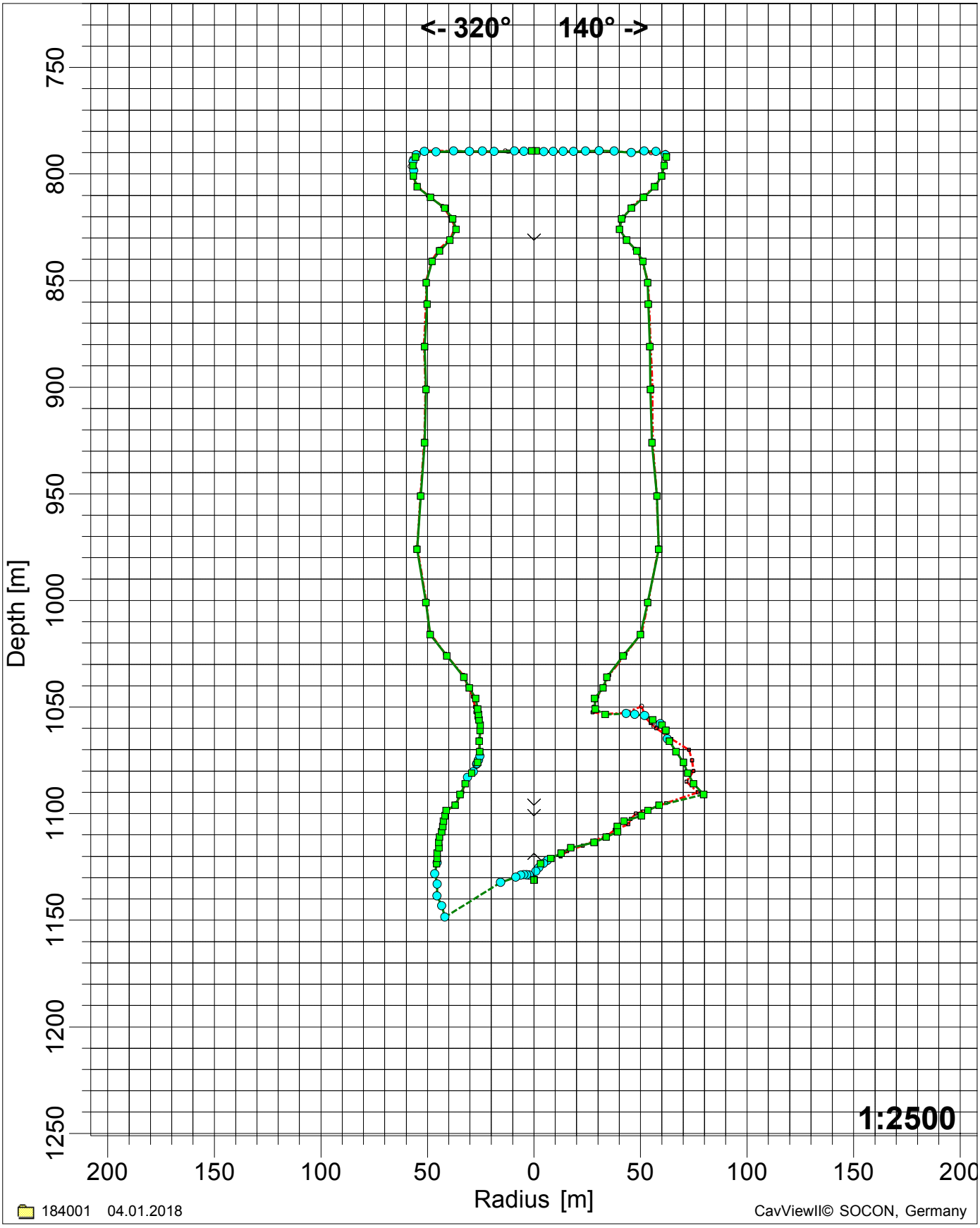
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



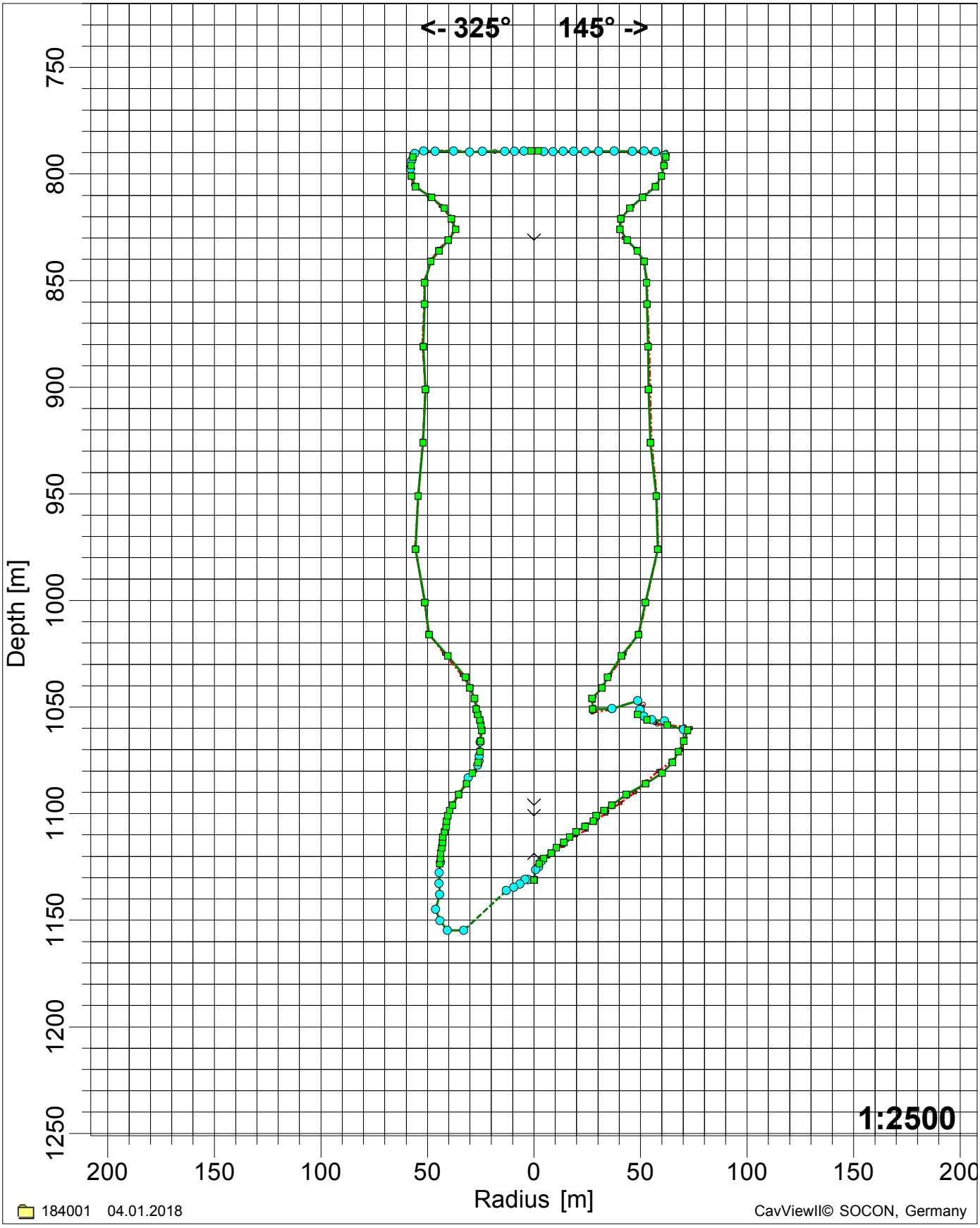
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

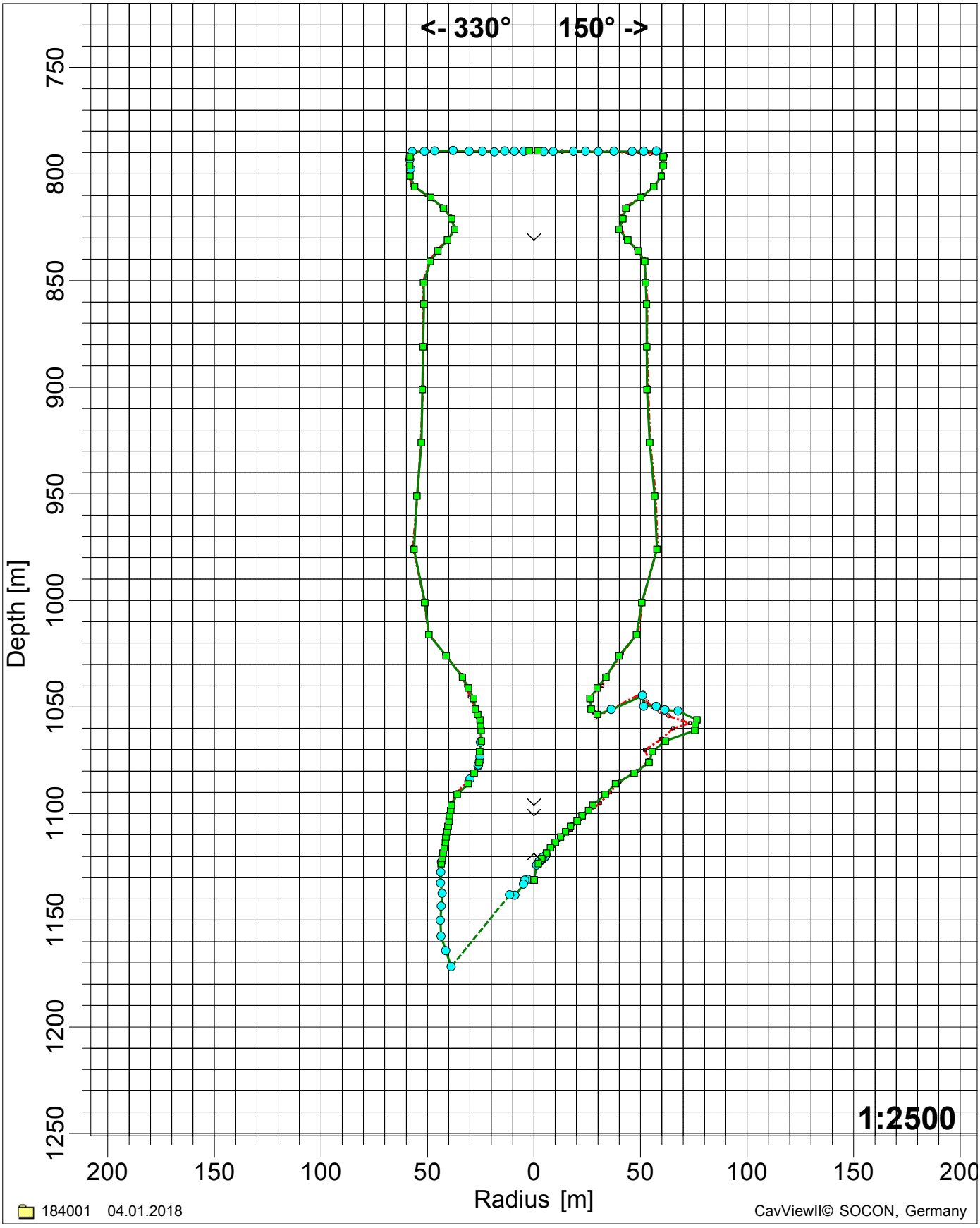


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



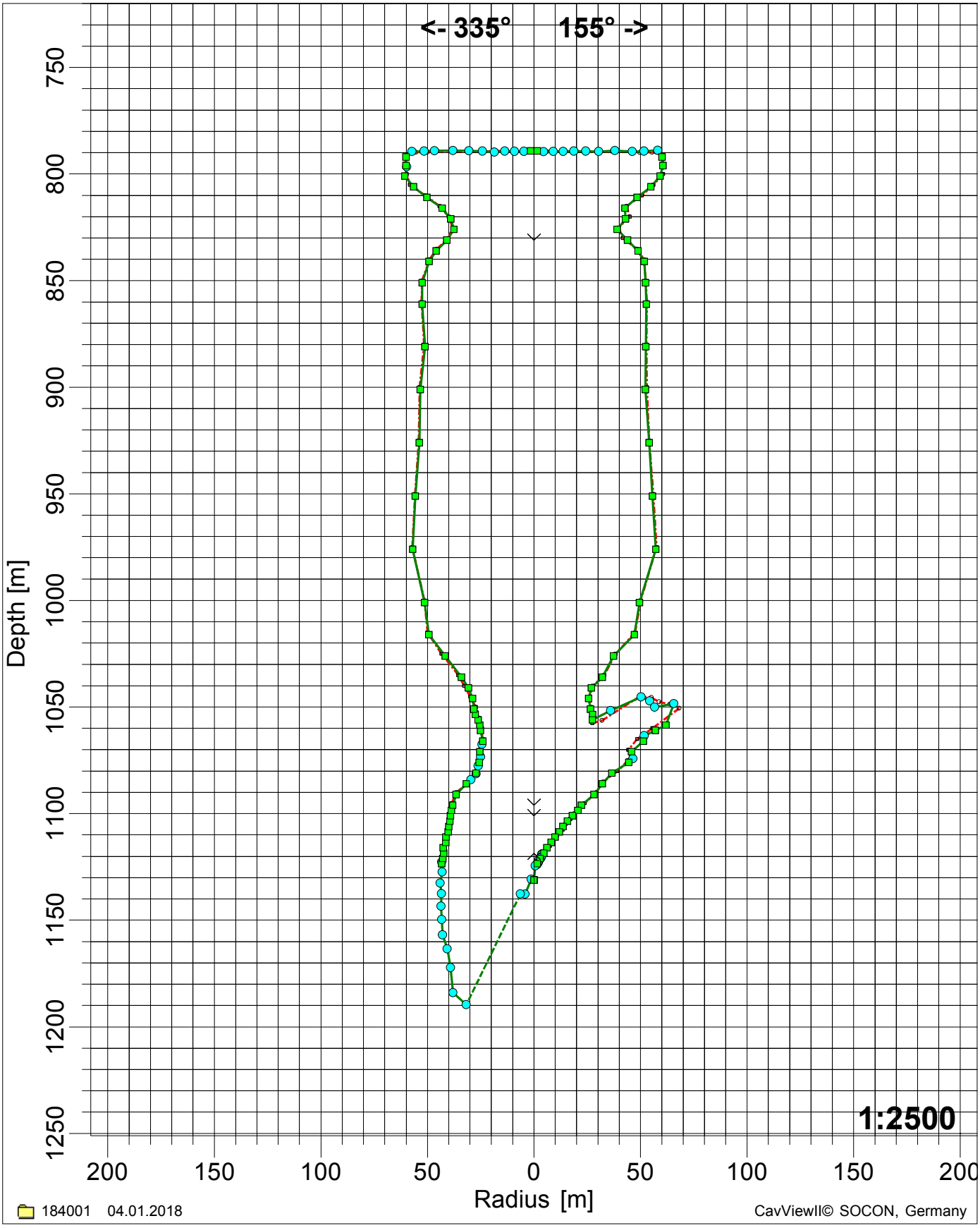
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



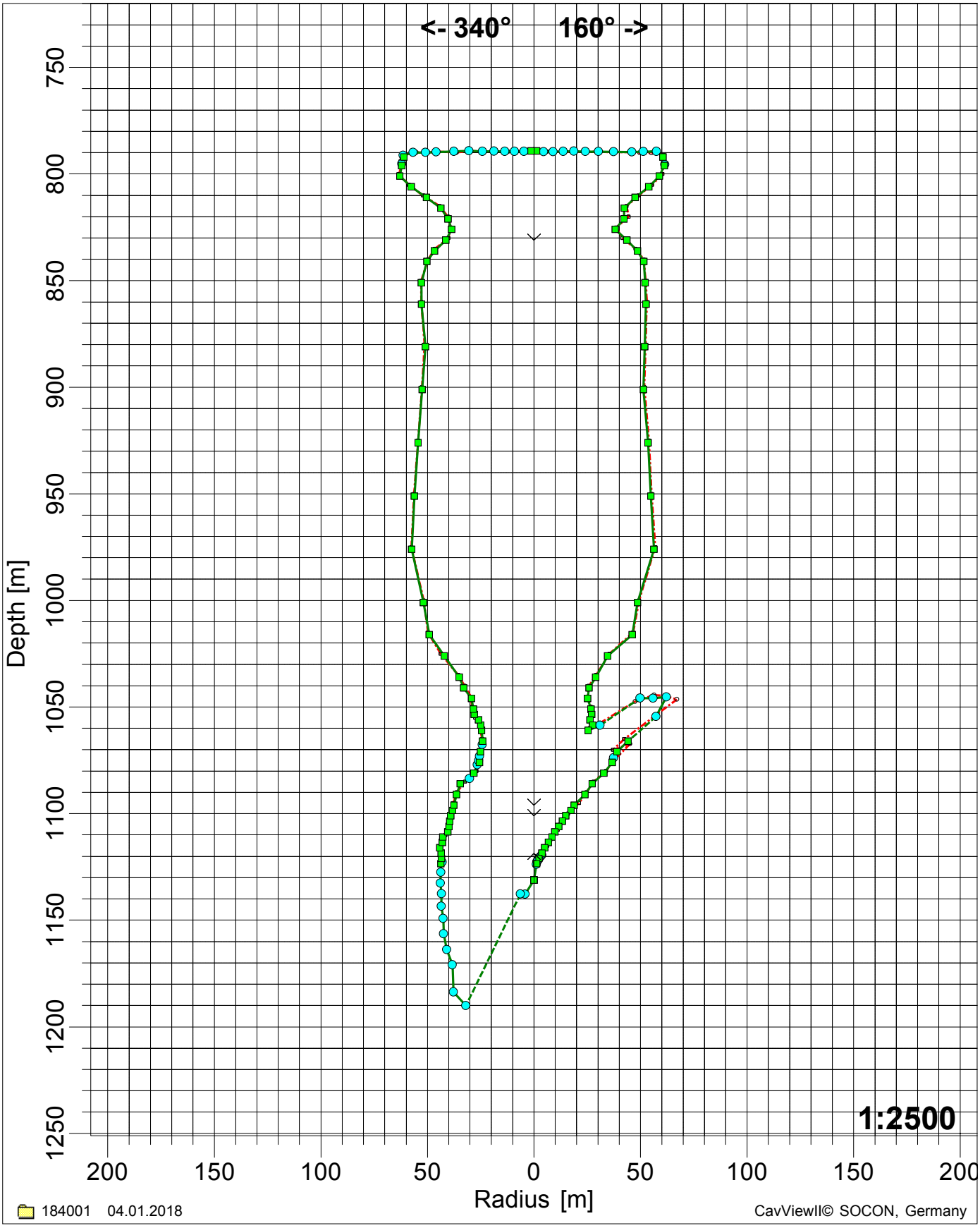
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

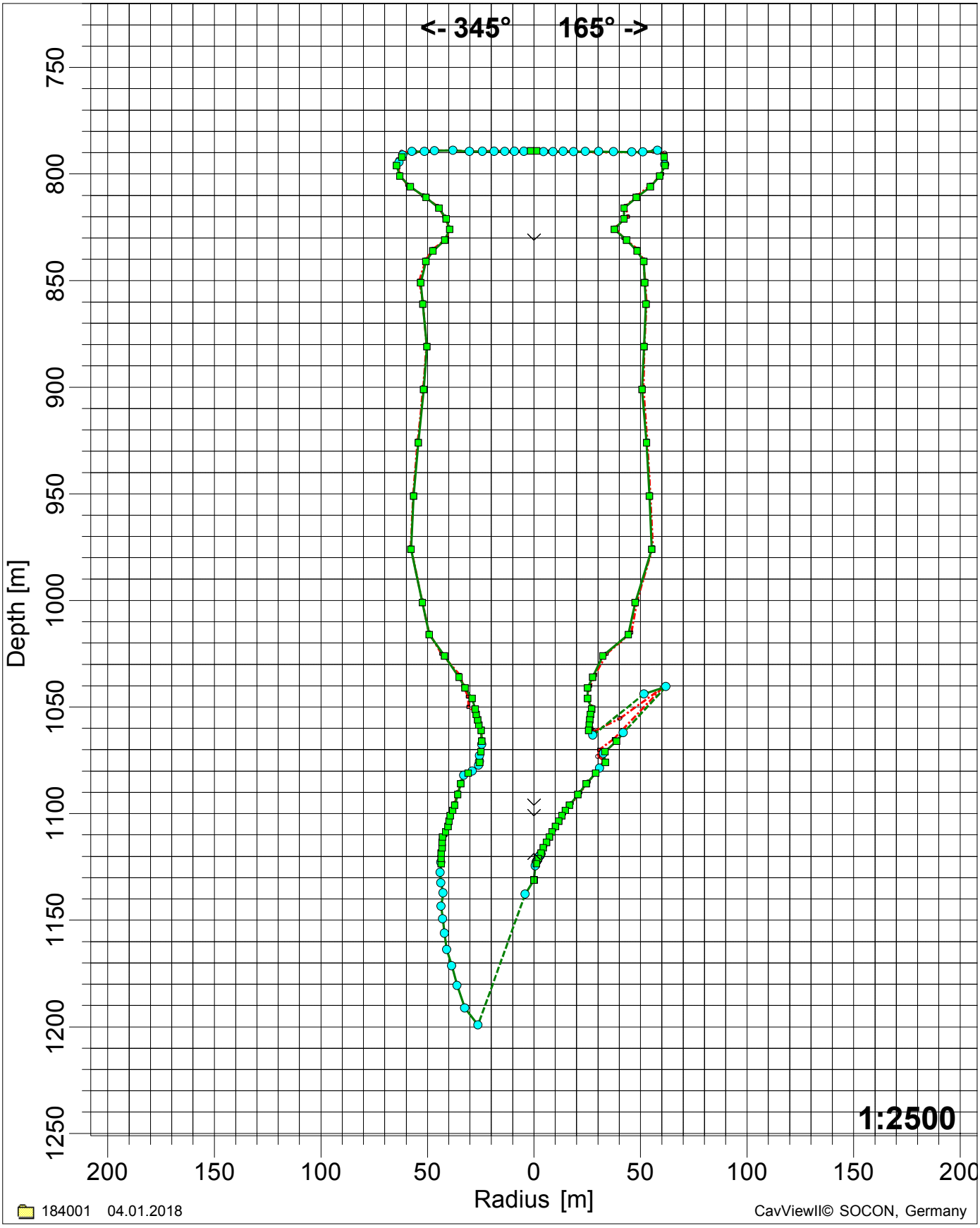


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

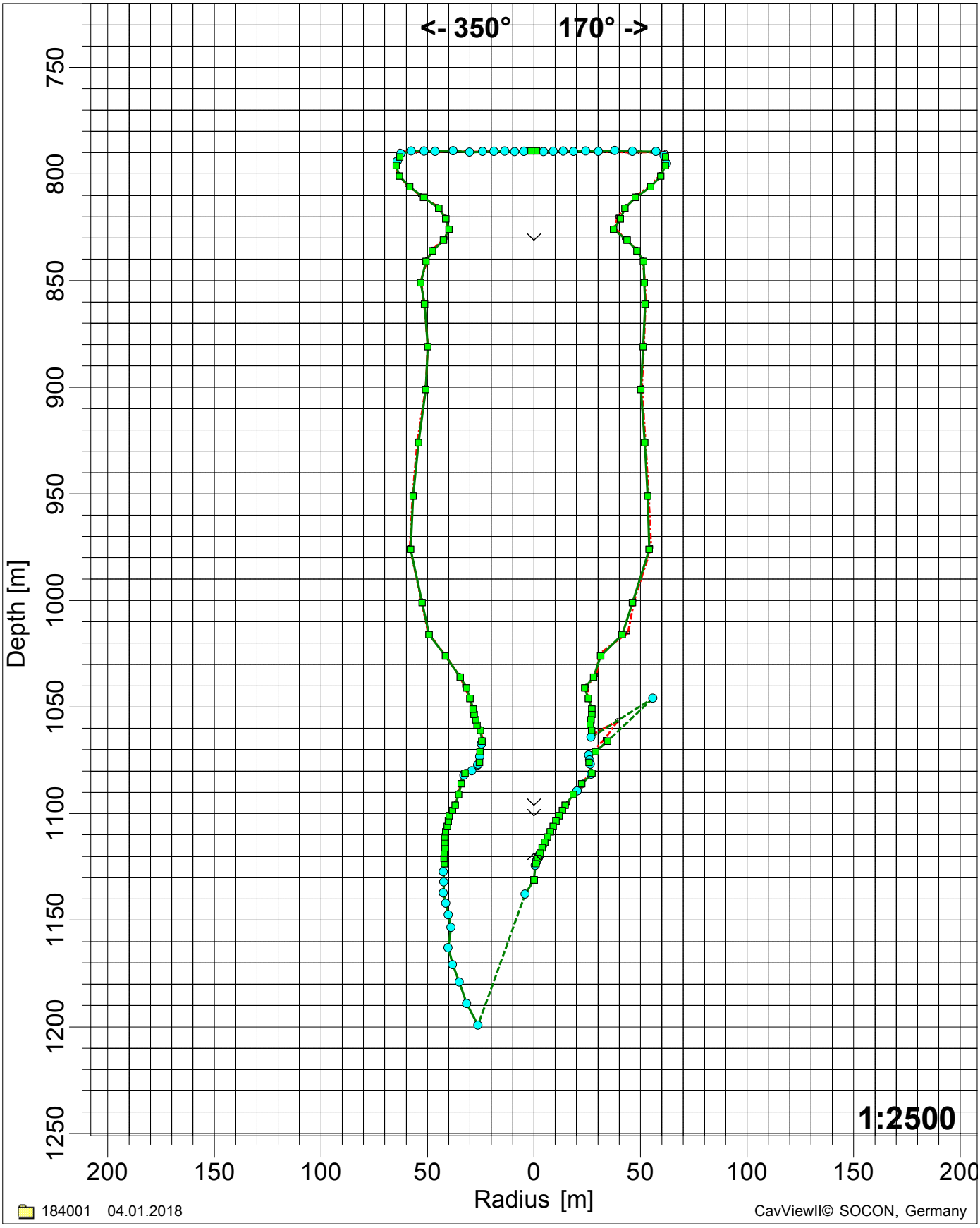


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018

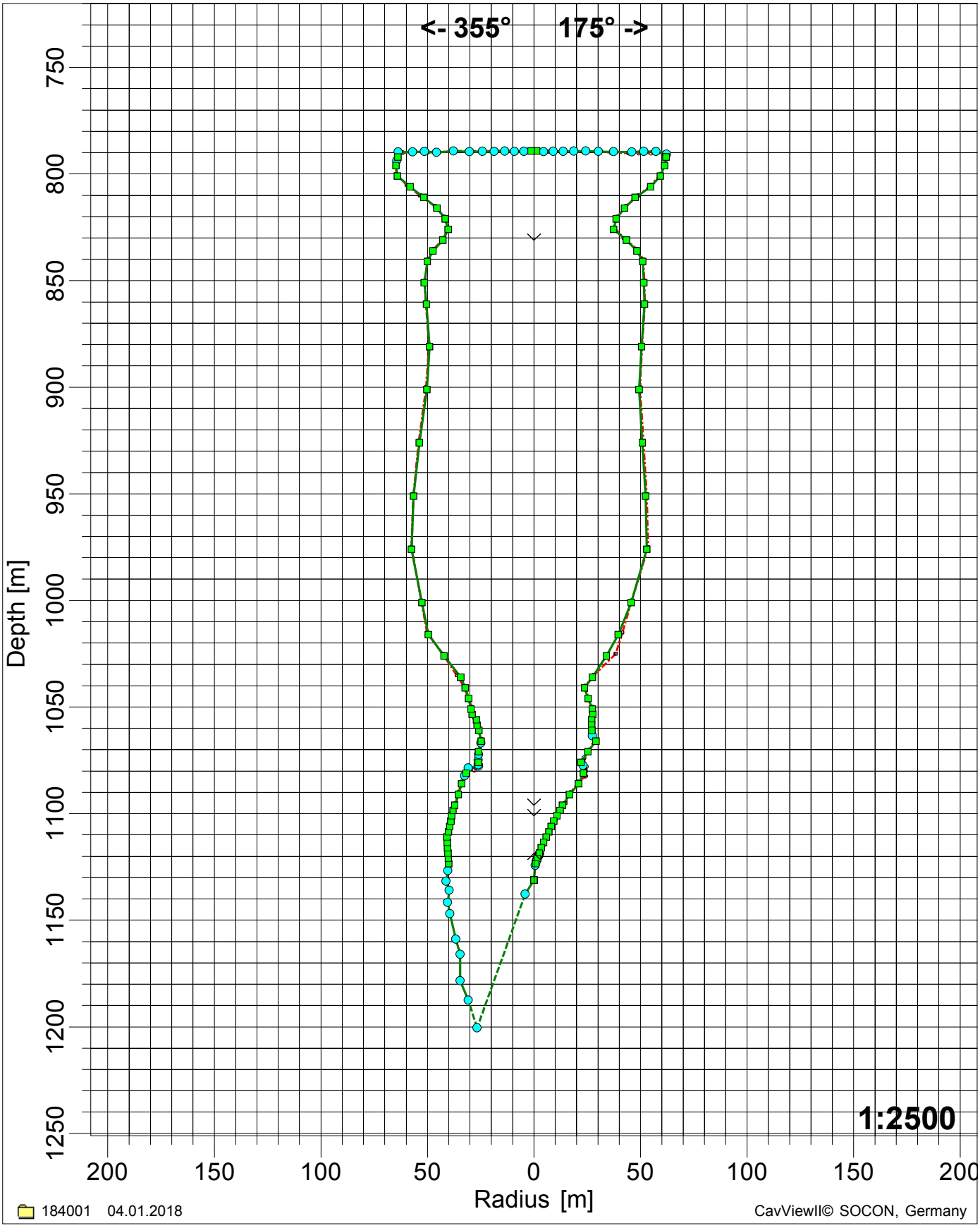


13 3/8" : 506.7 m	(17.05.2016)	(04.01.2018)
Tilting position		

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H

04.01.2018



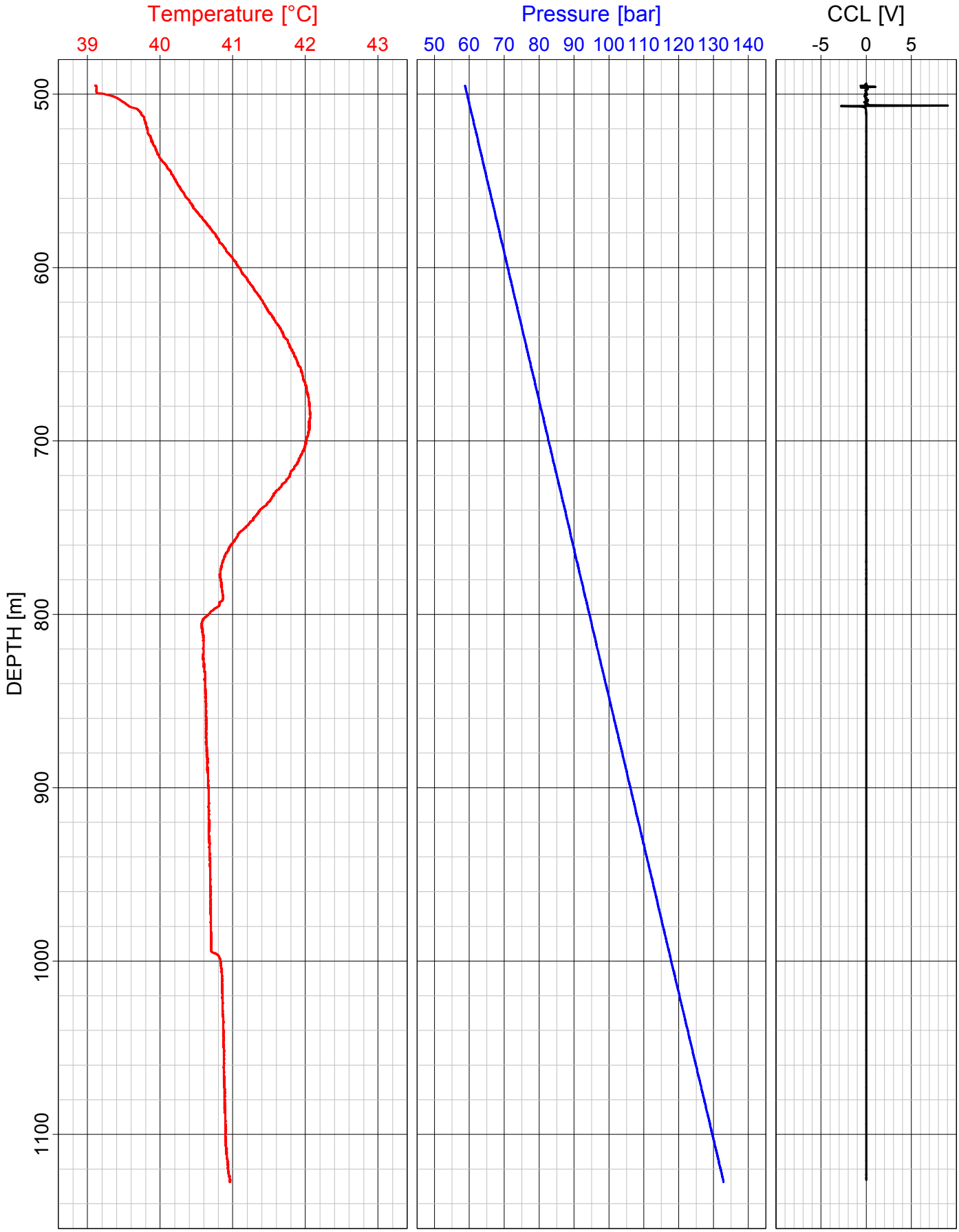
13 3/8" : 506.7 m | (17.05.2016) | (04.01.2018)

Tilting position

SOCON Sonar Control Kavernenvermessung GmbH

Heiligerlee H	1:3000	04.01.2018

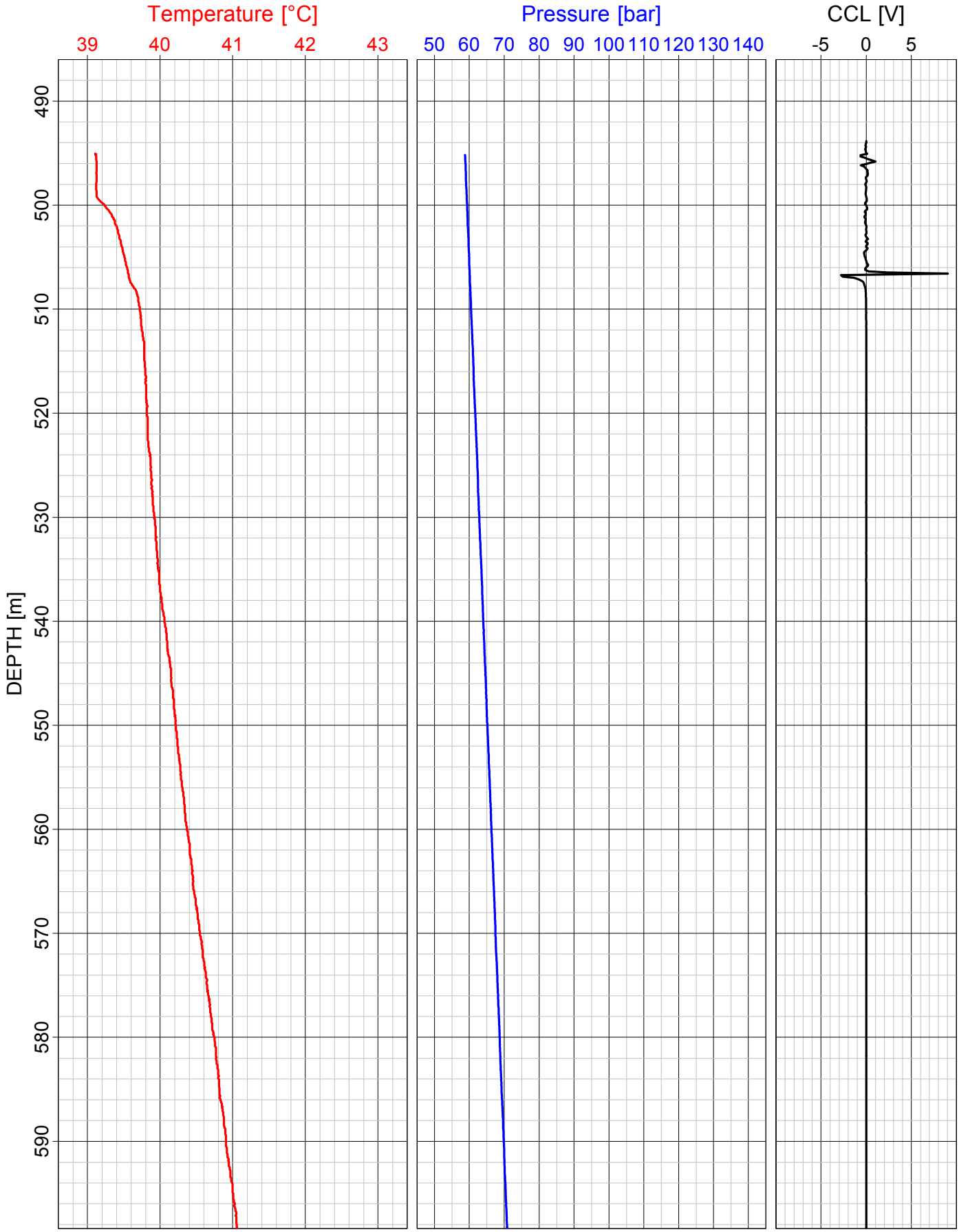
LCCS 13 3/8" at 506.7 m MD

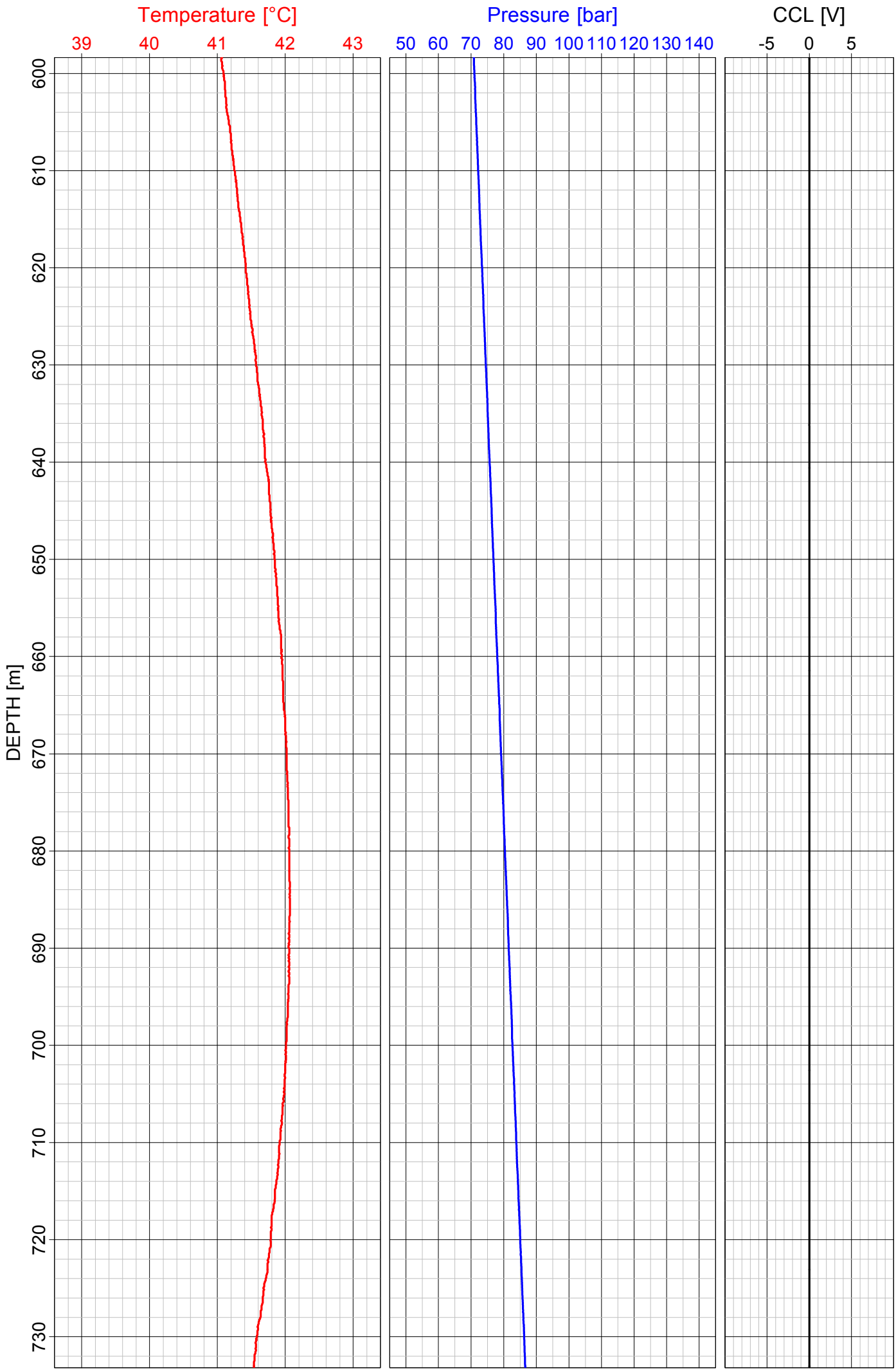


SOCON Sonar Control Kavernenvermessung GmbH

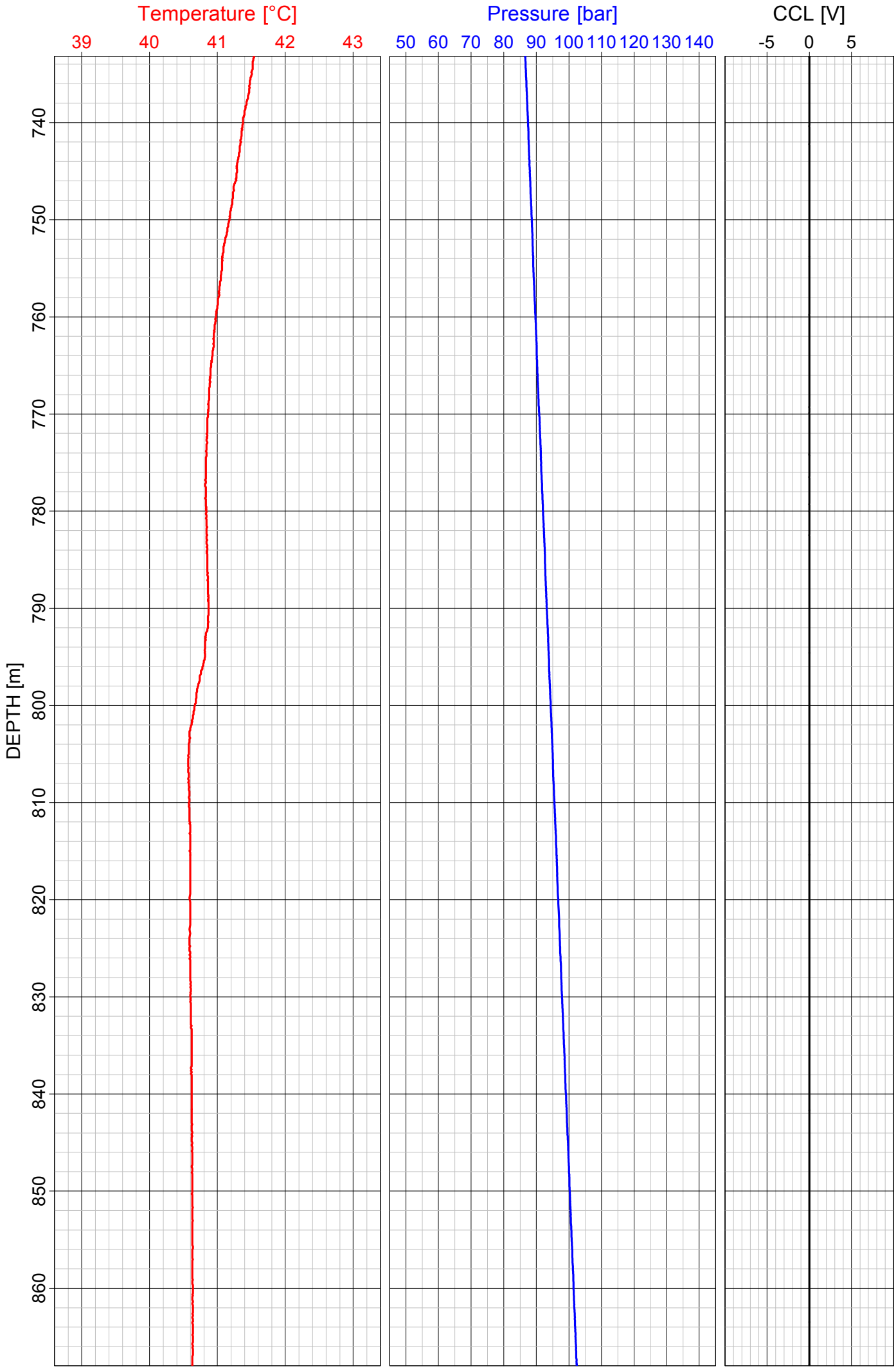
Heiligerlee H	1:500	04.01.2018

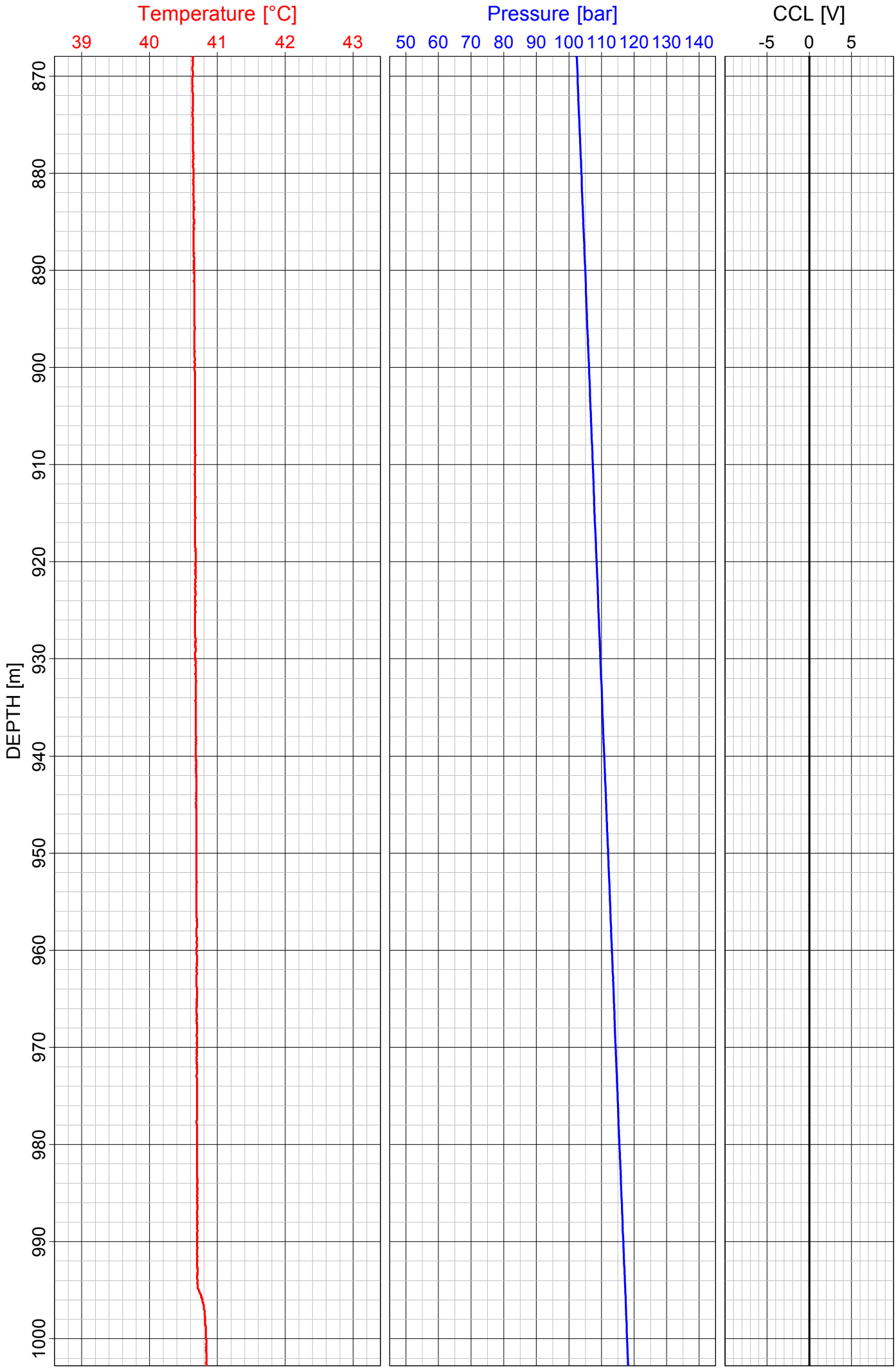
LCCS 13 3/8" at 506.7 m MD

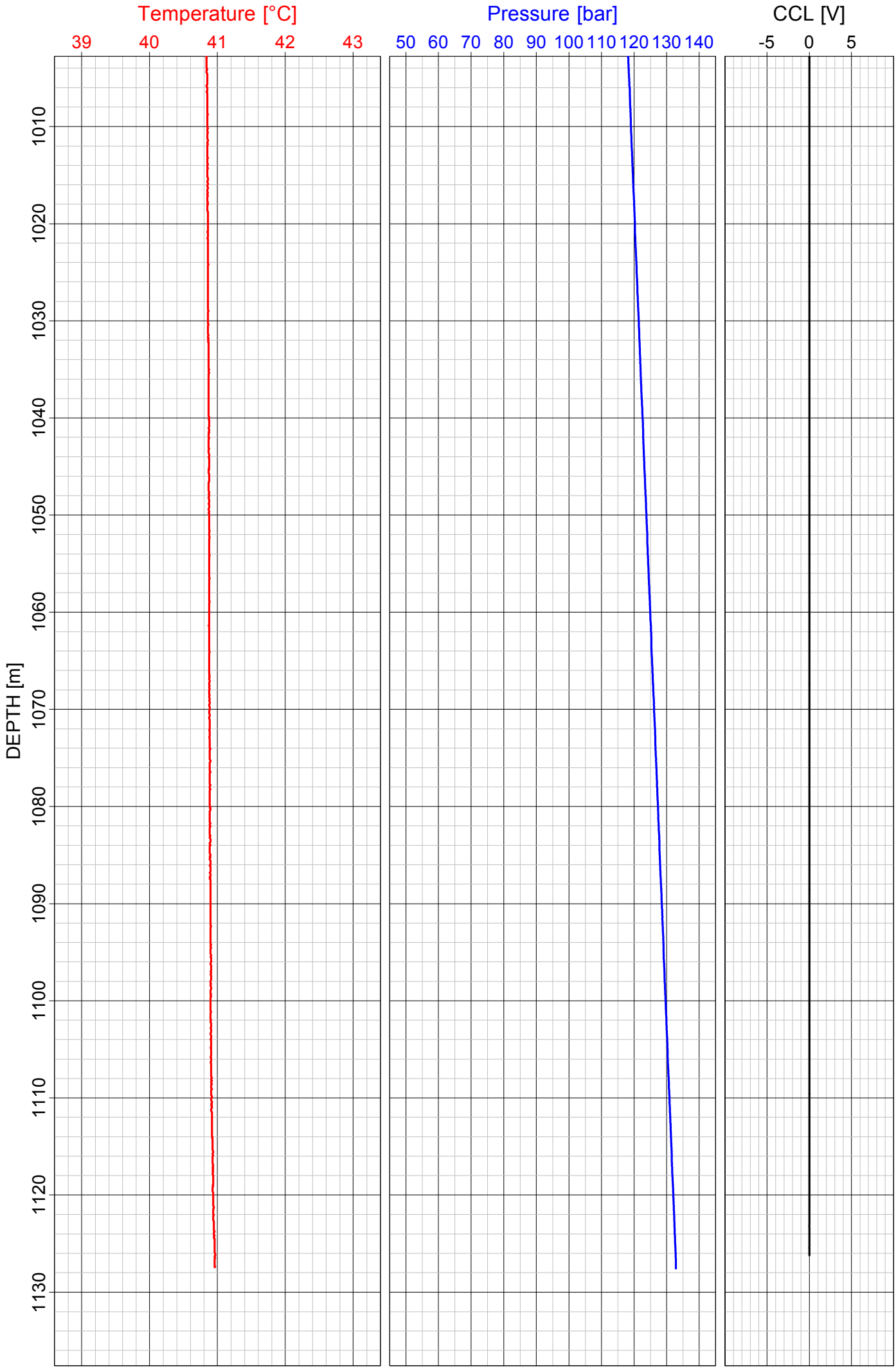




Heiligerlee H 184001 04.01.2018 Heiligerlee_H_184001_0003.L01 L 114/BSF2/115-2.34 12:38:41 04.01.2018 CavLog© SOCON GmbH


Temperature [°C]
39
40
41
42
43
Pressure [bar]
50
60
70
80
90
100
110
120
130
140
CCL [V]
-5
0
5
DEPTH [m]
740
750
760
770
780
790
800
810
820
830
840
850
860


Temperature [°C]
39
40
41
42
43
Pressure [bar]
50
60
70
80
90
100
110
120
130
140
CCL [V]
-5
0
5
DEPTH [m]
870
880
890
900
910
920
930
940
950
960
970
980
990
1000


Temperature [°C]
39
40
41
42
43
Pressure [bar]
50
60
70
80
90
100
110
120
130
140
CCL [V]
-5
0
5
DEPTH [m]
1010
1020
1030
1040
1050
1060
1070
1080
1090
1100
1110
1120
1130