OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

December 22, 2023 - January 5, 2024

Former Electra Site, Statielei 111 Mortsel

HMVT-number: 240109-476662-Report ERH Mortsel_wk12

Date report: January 11, 2024

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1 Introduction

This letter report contains a brief description of the Electrical Resistance Heating (ERH) remediation system operations performed at the former Electra Site at Statielei 105 – 113 in Mortsel. The time period addressed in this report is from December 22, 2023 to January 5, 2024. **Figure 1** contains a site map displaying the locations of the thermal treatment area, electrodes, temperature monitoring points (TMPs) and other pertinent Site features.

2 System Operation Activities

The weeks of the reporting period involve week 52 of 2023 and week 1 of 2024, these were the holidays. During this period, the site was visited 6 times.

In the reporting period the following works were performed:

- General data collection.
- Placed an additional Mach4X on site.
- Cable changes to optimize system.
- Re-mounted the foil on the wall of nr. 103 (extra work)
- Fixed the fence at the site entrance.
- General checks and equipment maintenance.
    - IR alarm, RTDs, driplines, relays of interlock PCU400
    - Fixed leak on pressure side of blower 2
    - Replaced KO tank pump in basement SL 113
    - Replaced V-strings (fan belts) of blower cooling tower
    - Drained secondary containment of water treatment
    - Cleaned all sample valves on the LGACS

3 ERH Application Summary

The ERH system operational parameters from the current reporting period are presented in **Table 1** below.

Table 1. ERH System Parameters

ERH System Parameters	Estimated	Up to January 5	Percentage of total
Operation Time (days)	137[1]	45[3]	32,8%
Cumulative Energy Applied (kWh)	3.800.000[2]	846.664	22,2%

Total energy for ERH and auxiliary Equipment was ca. 847 MWh. Energy applied for ERH up to January 5 was ca. 818 MWh.

4 Temperature Monitoring

During the reporting period of December 22 to January 5 the site average subsurface temperature increased from 49,3 degrees Celsius (°C) to 75,4°C, an increase of 26,1°C this period. This represents an average temperature increase of approximately 1,86°C/day. The site temperature is rising very fast now. The temperature in some RTD's is approaching the boiling temperature, so the daily temperature increase will decrease in the next period.

The highest individual temperature measurement within the treatment volume is 101˚C at TMP N04 at 9 meters below ground surface (bgs). Subsurface temperatures at different depths per TMP location and over time are presented in **Figure 2**.

[1] Extra days for higher concentrations in soil not included.

[2] Extra energy for higher concentrations in soil not included.

[3] This is with regard to the days that ERH was not active. Including those days would give an operation time of 85 days.

In total 4 shallow RTD's are installed near utilities (Statielei 109 front and Statielei 113 back) to measure the temperature close to the utilities. The average temperature at the utility RTDs is 18°C, the maximum temperature is 21,9°C in RTD T3. These temperatures are lower than the previous period.

5 Vapor Recovery

During the reporting period the vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was increased from approximately 83 millibar (mbar) to 100 mbar. Since the re-start of ERH, the blowers could run at a higher frequency in order to remove the released vapour at an increased rate, without jeopardizing the increase in temperature. All field piezometer pressure measurements show negative values, indicating the system is working sufficiently to maintain negative pressure.

The vapor stream flow rate, as measured after the vapor recovery blower, averaged circa 1.040 m^3/hour.

Vapor monitoring

During every site visit HMVT performs PID vapor measurements of the ambient air and the vapor stream. The most recent round of chlorinated volatile organic compounds (CVOC) vapor PID screening results, collected on the 5th of January was 95,5 ppm, a 5-fold increase as opposed to the previous 18,7 ppm (December 22). During the reporting period, the highest recorded influent CVOC concentration was 99,4 ppm, on November 30. This indicates increased removal which can be attributed to the increase in soil temperature due to ERH.

6 Vapor treatment

The extracted soil vapors are treated with granular activated carbon (GAC). The emission limit, as defined in the tender document, for PCE and TCE is 100 mg/m^3 if total mass is higher than 2.000 g/hr. The client wants to limit the emissions to zero.

HMVT performs PID vapor measurements of the vapor treatment on a regular base. During the reporting period, the PID reading of the effluent of the second GAC filter consistently was 0,0 ppm.

Currently, 2 VGAC vessels are installed in series, the first one being a DESOTEC filter containing 3 m^3 of VGAC, followed by one Mach4X vessel from Chemviron containing 18 m^3 of VGAC. A third spare GAC vessel, containing 10 m^3 of GAC, is on site. TEC will periodically take vapor samples from the influent and effluent of each vessel.

7 Condensate and water treatment

During the reporting period 204 m^3 of water was recovered via condensed water by the vapor recovery system. A total of 251 m^3 of condensate has been produced since the start-up of the ERH system.

The condensate produced from the steam condensers is collected and treated in 2 liquid granular activated carbon vessels, before being discharged to the sewer. The discharge limit for PCE and TCE is 10 µg/l. TEC will periodically take samples from the water treatment system.

8 Mass removal (by PID)

The mass removal calculation is based on the PID measurements in the influent of GAC1. We use a 10,6 eV bulb, so the correction factor for PCE is 0,57. During the reporting period, the total mass removed from the subsurface was approximately 84 kg. The total mass recovered from the subsurface since the start of the project is circa 288 kg **(Figure 3.)**.

9 Health & Safety

During the reporting period, there were no mentionable affairs regarding health and safety.

Step & Touch

The highest measured voltage (step and touch) during the reporting period was negligible at <100 mV.

Ambient air monitoring

During the reporting period, no presence of CVOC in daily ambient air monitoring was measured (0,0 ppm). TEC will provide the measurement data from the VaporSafe.

10 Settlement measurements

The settlement measurements are being monitored on a weekly basis by buro Teugels. The results of the measurements can be found in table 2, displayed in meters. Settlement is expressed in mm. The measuring points can be found in the accompanying map underneath.

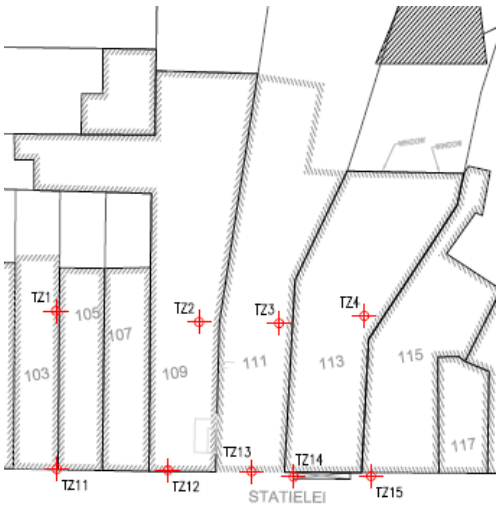
Table 2. Results settlement measurements

dossier nr.:	2227978
werf:	Wegrosan - Mortsel Statielei
datum:	5/01/2024
Operator:	K.J. - S.B.

ZETTINGSMETING

Nr. pt	19/04/23	Δ	TOT Δ	6/12/2023	Δ	TOT Δ	8/12/2023	Δ	TOT Δ	15/12/23	Δ	TOT Δ	22/12/23	Δ	TOT Δ	05/01/24	Δ	TOT Δ
TZ1	5,705			5,703	-2	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2
TZ2	8,780			8,777	-3	-3	8,778	1	-2	8,778	0	-2	8,778	0	-2	8,778	0	-2
TZ3	12,178			12,177	-1	-1	12,177	0	-1	12,177	0	-1	12,176	-1	-2	12,176	0	-2
TZ4	9,256			9,256	0	0	9,256	0	0	9,256	0	0	9,256	0	0	9,256	0	0
TZ11	5,211			5,209	-2	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2
TZ12	8,150			8,147	-3	-3	8,147	0	-3	8,147	0	-3	8,147	0	-3	8,147	0	-3
TZ13	11,095			11,095	0	0	11,095	0	0	11,095	0	0	11,095	0	0	11,095	0	0
TZ14	8,922			8,922	0	0	8,922	0	0	8,922	0	0	8,922	0	0	8,922	0	0
TZ15	3,971			3,971	0	0	3,971	0	0	3,971	0	0	3,970	-1	-1	3,970	0	-1

OPMERKINGEN
Ref.meting: 19/04/23
Δ : verschil t.o.v. vorige meting
TOT Δ : verschil t.o.v. ref.meting



Limited settlements (2 – 3 mm) have been measured in buildings Statielei 103, 109 and 111. since the beginning of the activities. The settlements seem to be stable. Settlements will be monitored on a weekly basis.

11 Planned Activities

Planned activities for the following two weeks (2 and 3) involve:

- Regular monitoring and maintenance activities.
- Improving the effluent side of the 2nd Mach4X filter.
- Replacing connection locks in PCU400.
- Placing extra rubber mats at places where cables are not covered yet.
- Installing the new pump housing for the Busch blowers (likely week 3 or 4).
- Optimize electrode settings
- Probably start dripping

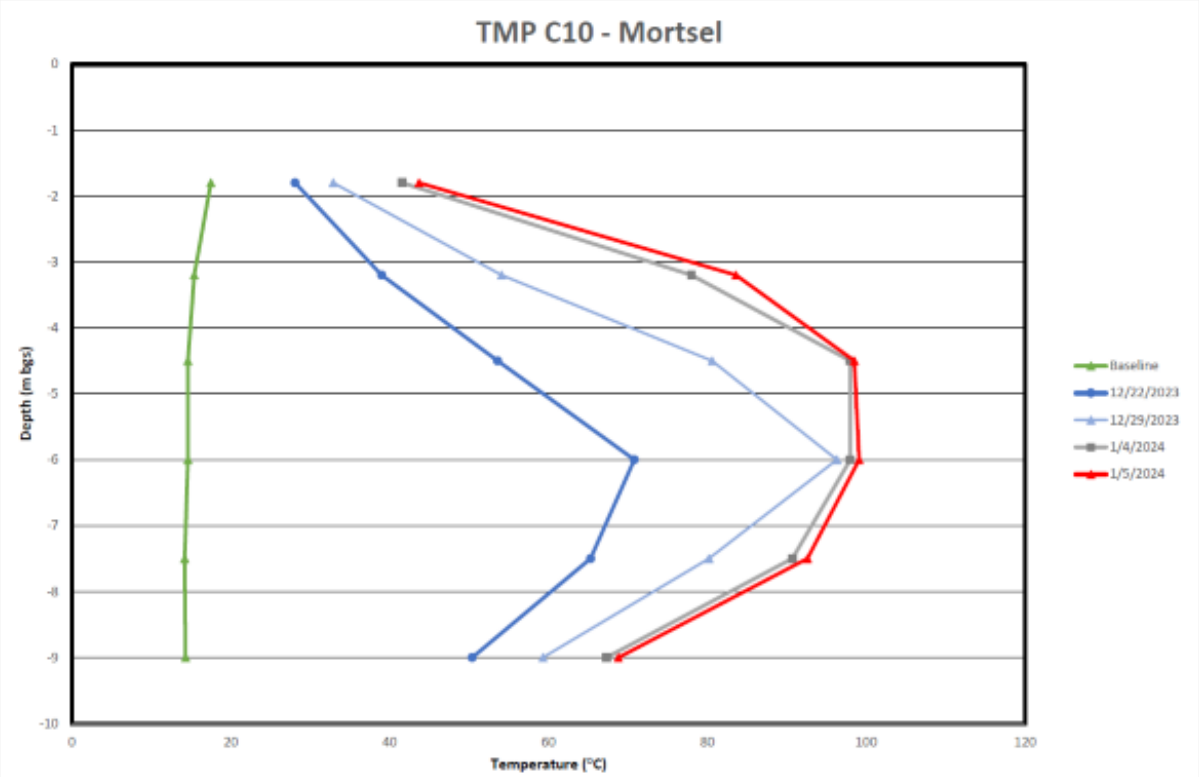
Figures

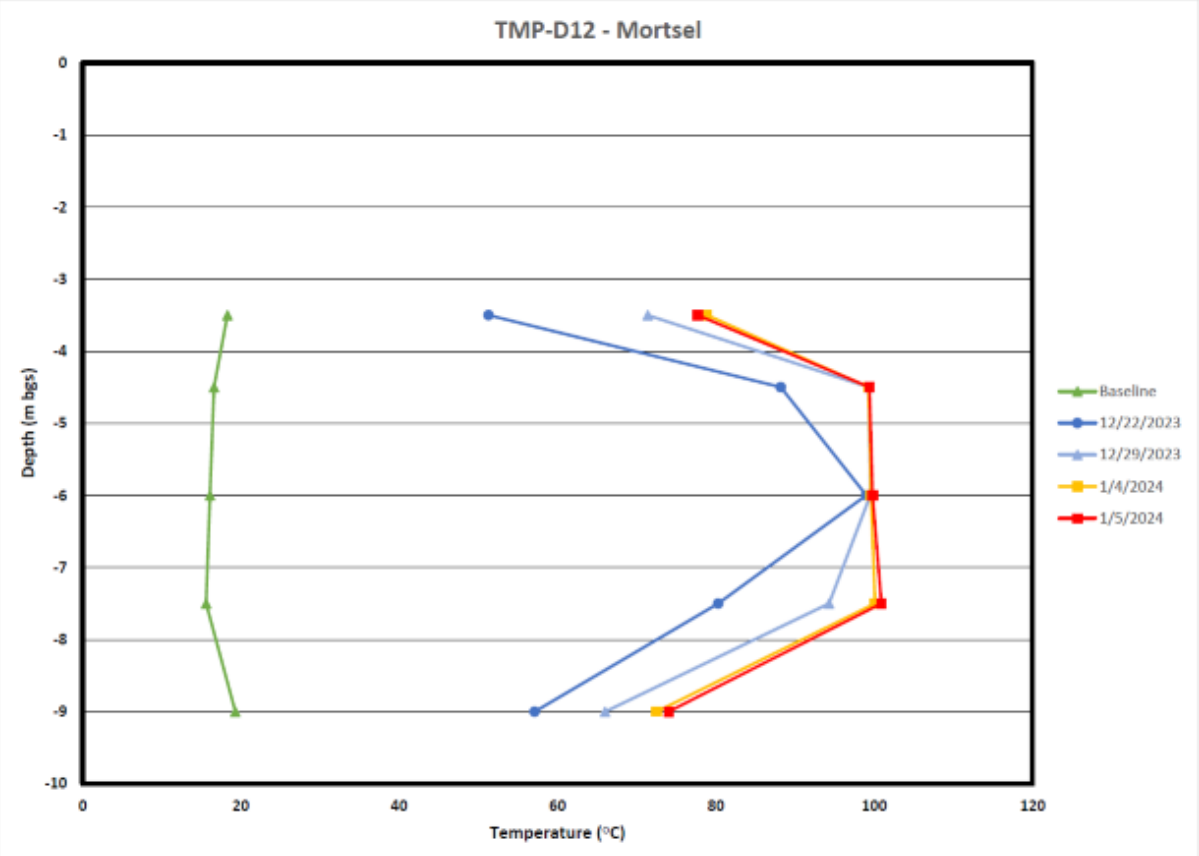
1. Site plan
2. Average Temperature vs. Time (by TMP)
3. Cumulative Mass Removed vs. Time

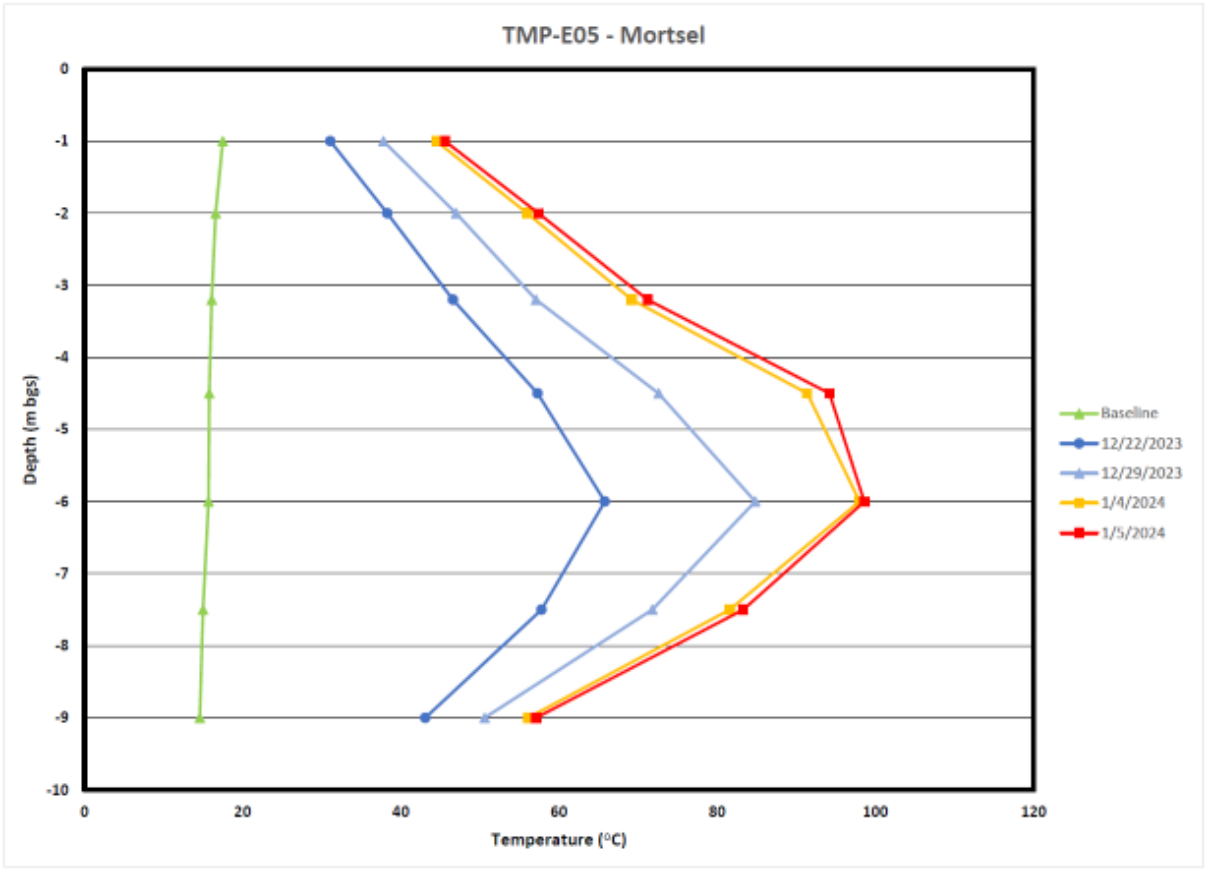
Figure 1: Site plan

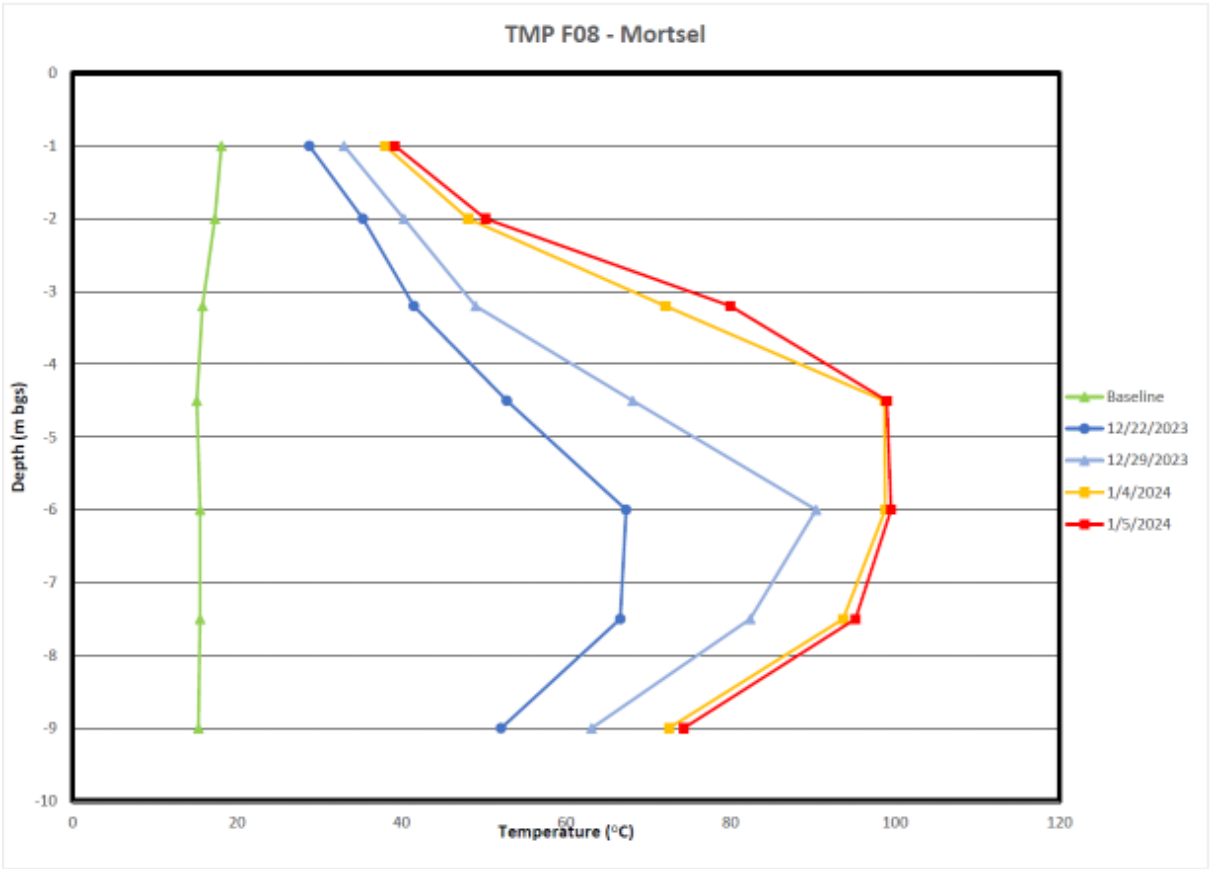
The as built site plan is attached separately

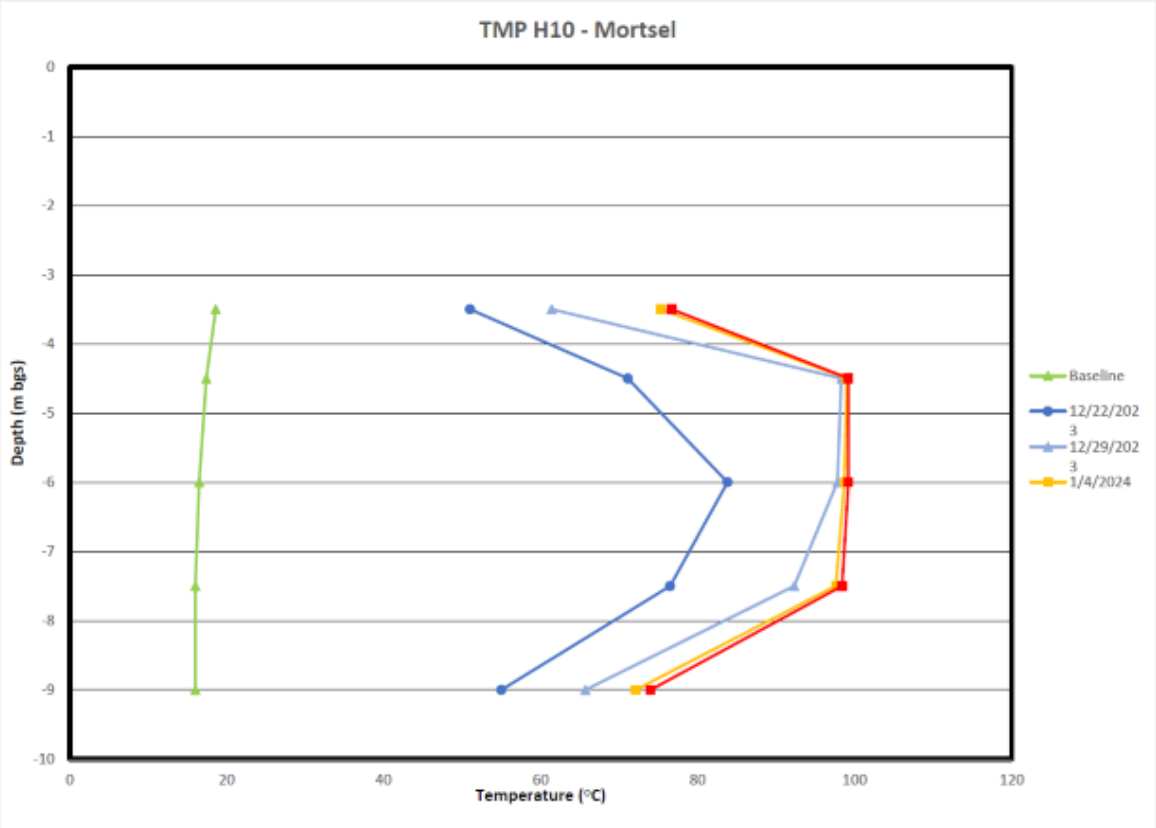
Figure 2. Average Temperature vs. Time (By TMP)

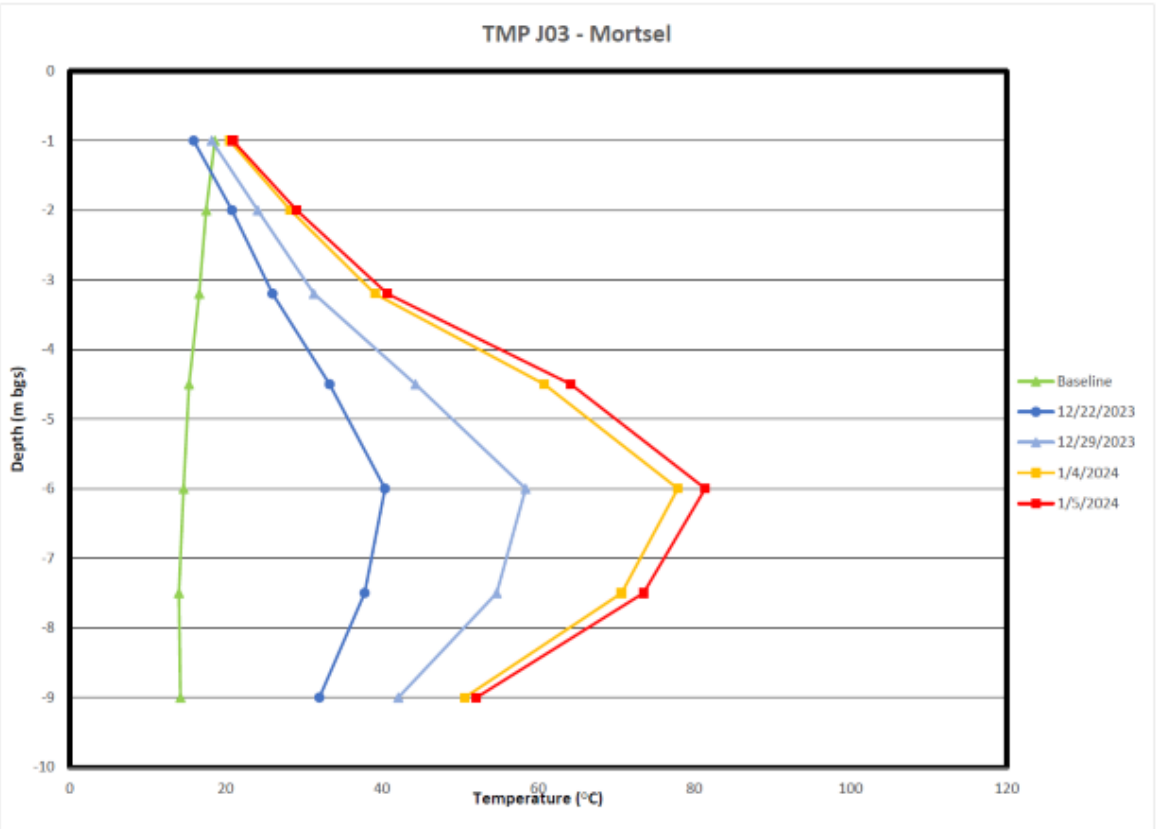


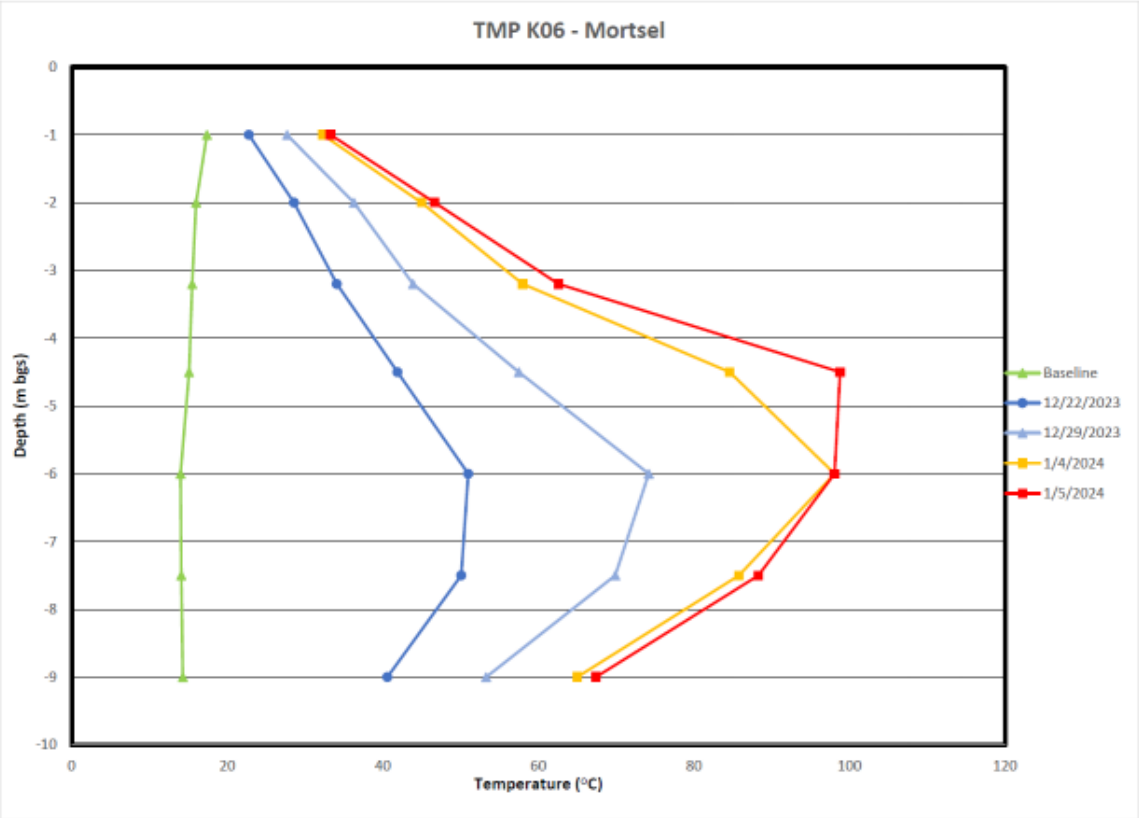


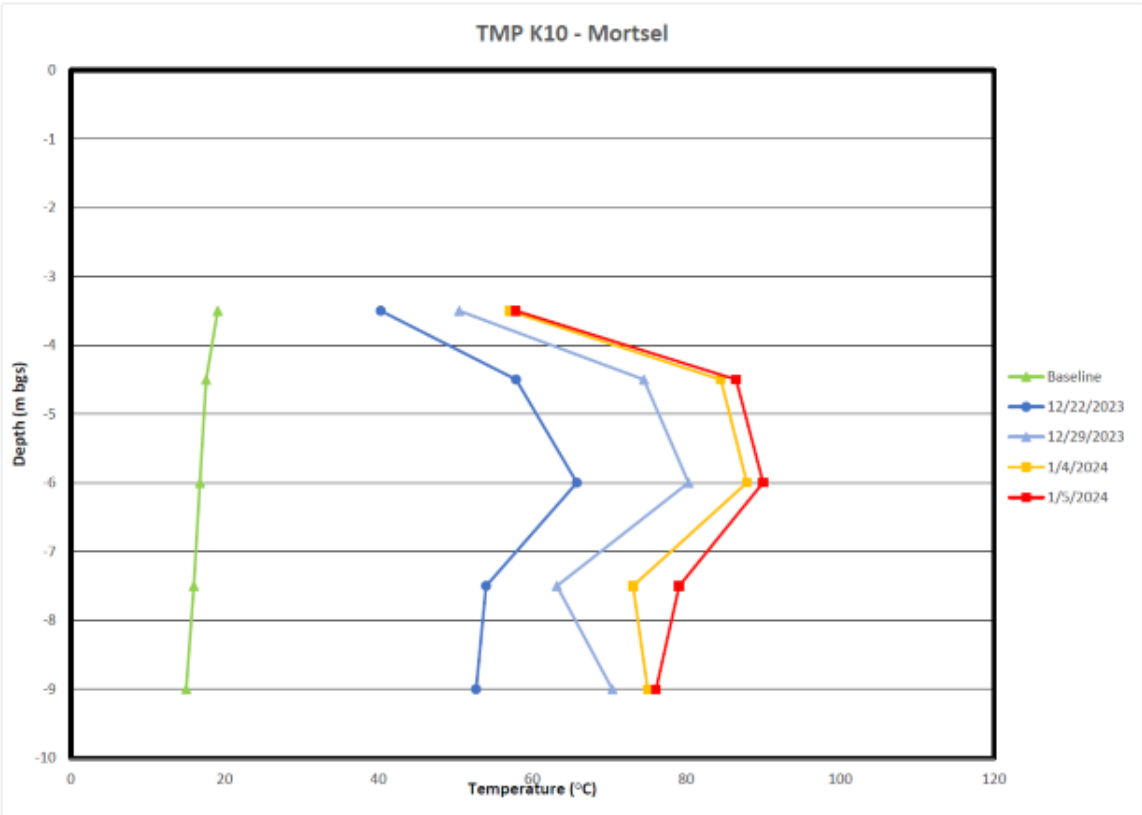

TMP-E05 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024

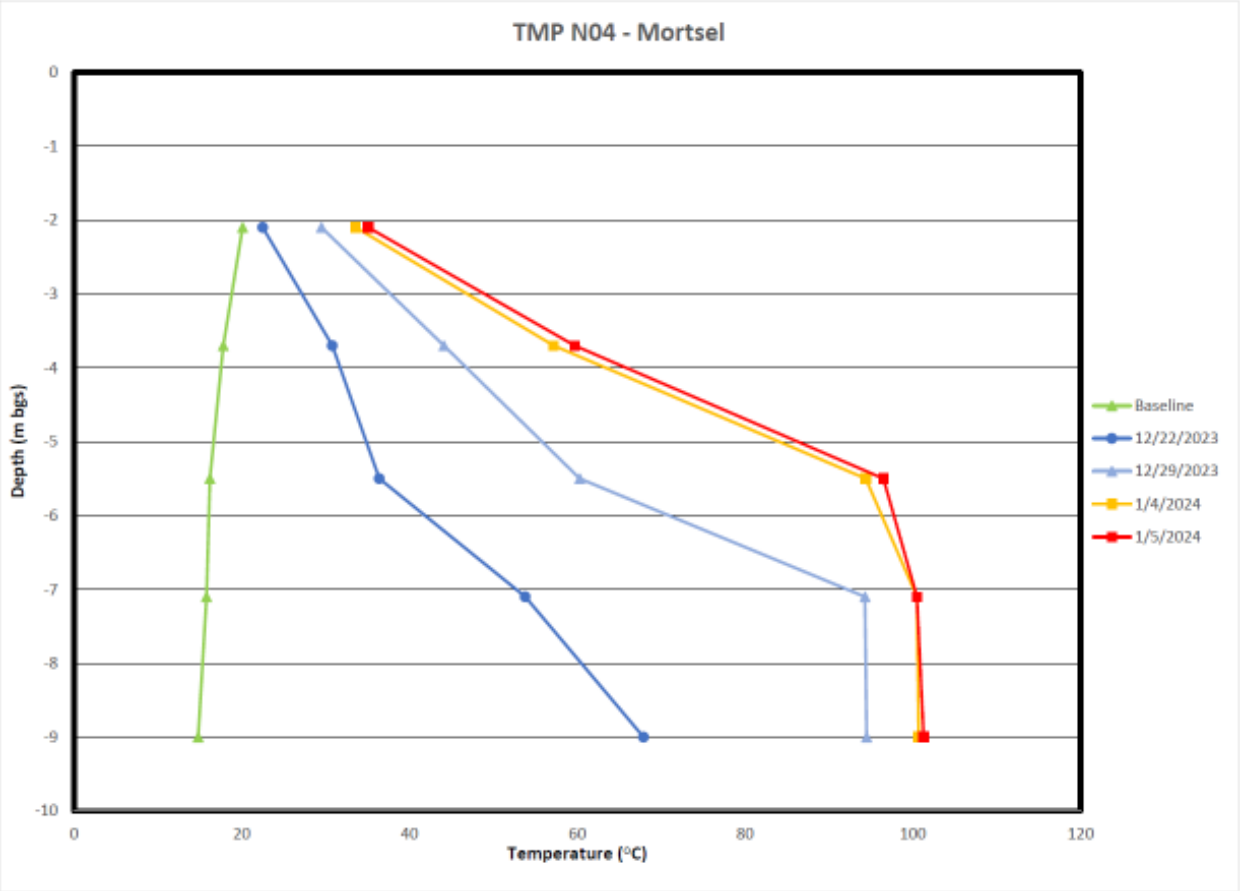

TMP F08 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024


TMP H10 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024


TMP J03 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024


TMP K06 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024


TMP K10 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024


TMP N04 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
12/22/2023
12/29/2023
1/4/2024
1/5/2024

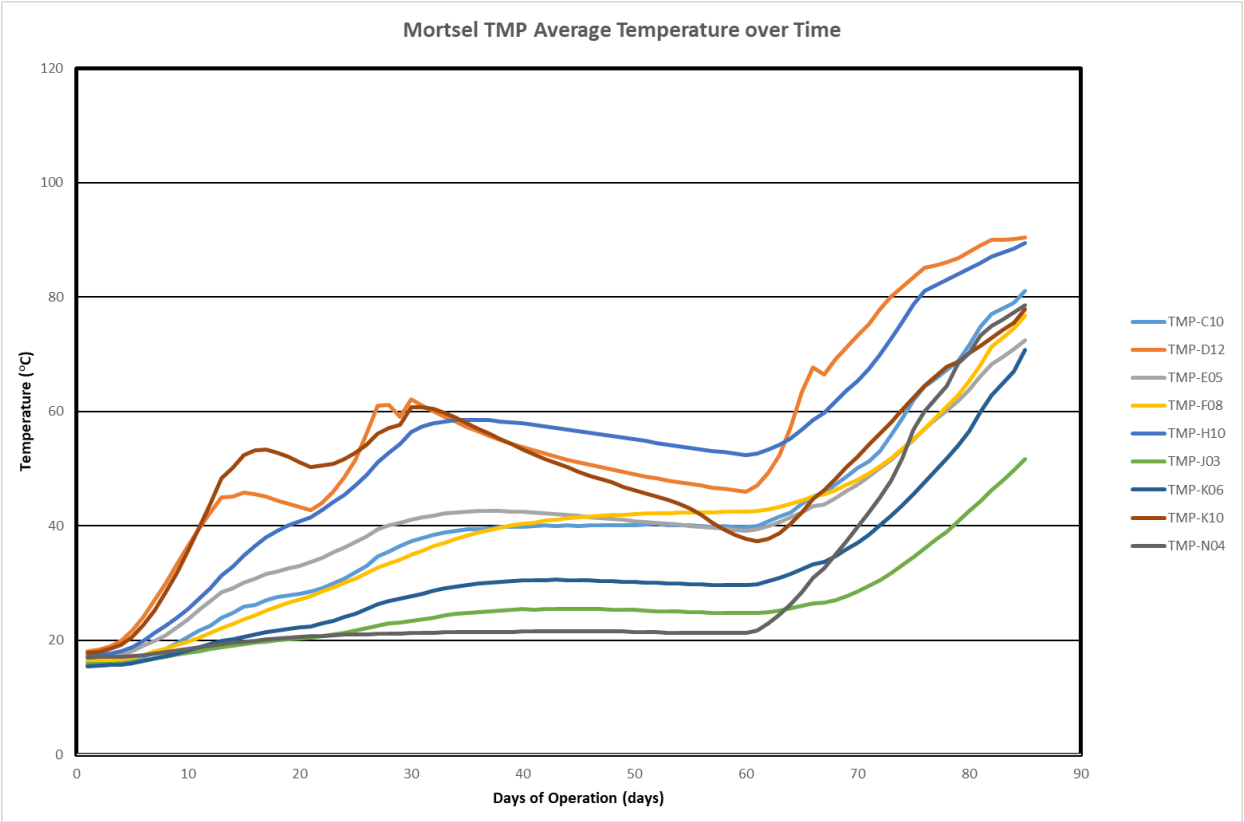

Mortsel TMP Average Temperature over Time
Temperature (°C)
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
Days of Operation (days)
TMP-C10
TMP-D12
TMP-E05
TMP-F08
TMP-H10
TMP-J03
TMP-K06
TMP-K10
TMP-N04

Figure 3. Cumulative Mass Removed vs. Time