OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

October 27 – November 10, 2023

Former Electra Site, Statielei 111 Mortsel

HMVT-number: 231027-476662-Report ERH Mortsel_wk2.docx

Date report: November 17, 2023

HMVT
Maxwellstraat 31
Postbus 174
6710 BD Ede
T +31 (0)318 – 624 624
F +31 (0)318 – 624 913
www.hmvt.eu

Client

OVAM, Afdeling Bodembeheer
Stationsstraat 110
2800 Mechelen, Belgium

Consultant

Terra Engineering & Consultancy
Industriepark Rosteyne
9060 Zelzate

Clearing date	Version:	Written by:	Checked by:
	01	Carl Wildman Michelle Nannista Joshua Both	Jack van Rossum

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 October 27 to November 10, 2023. **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

Vapor extraction started on October 10, 2023. ERH started on October 12 at 16:00 hr. Between October the 27nd and November the 2nd the ERH was shut off following the incident involving the Gen-III. 1 November most of the electrodes of the GEN III were connected to the Beyke; in total 89 electrodes on Beyke, 15 electrodes not operational.

2 November the system was restarted and ERH was operational until November 8. That day ERH was shut down because of increased PID readings in the effluent of the vapor GAC vessels.

The following works were performed:

- ✓ Voltage surveys and step & touch tests
- ✓ Maintenance of equipment
- ✓ PID measurements ambient air and process treatment
- ✓ Temperature measurement
- ✓ Site walks and inspections
- ✓ 1st of November: moving electrodes from Gen III to Beyke XFMR following the incident
- ✓ Moving some electrode connections between bus bars
- ✓ 10 November: install extra vapor GAC vessel (3 in series)

On November 10 the system was ready for startup, but start of the system was not allowed due to the missing electrical inspection (AREI).

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 November 10	Percentage of total
Operation Time (days)	137	21[1]	15%
Cumulative Energy Applied (kWh)	3.800.000	284.088	7,5%

4 Temperature Monitoring

During the reporting period of 27 October to 10 November the site average subsurface temperature increased from 29,2 degrees Celsius (°C) to 38,1°C, an increase of 8,9 °C this period. This represents an average heat up rate of approximately 0,64 °C/day. The highest individual temperature measurement within the treatment volume was 97˚C at TMP D12 at 6 meters below ground surface (bgs). Total temperature increase is 22°C. Average subsurface temperatures per TMP location over time are presented in **Figure 2.**

The site is heating slower than projected due to 85 - 90% of the site being in operation instead of the whole site and because of repeated shutdown after the incident. From the graphs in figure 2, it can be seen that the momentum of heating was increasing before the last shutdown.

[1] This is with regard to the days that ERH was not active. Including those days would give an operation time of 29 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 16,1 °C, the maximum temperature is 17,8°C in RTD T4. These temperatures are lower than the former period.

5 Vapor Recovery

During the reporting period, the average vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was approximately 50 millibar (mbar) as compared to the previous 63 mbar. This is due to the system running at a lower frequency due to the temporary shut-off of ERH. All field piezometer pressure measurements show negative values. The vapor stream flowrate, as measured after the vapor recovery blower, averaged circa 760 m³/hour as opposed to the previous 980 m³/hour, also due to the temporary shut-off of ERH.

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 November 10 was 51 ppm, a slight increase as opposed to the previous 37 ppm. During the reporting period, the highest recorded influent CVOC concentration was 230 ppm, at the beginning of vapor recovery (before ERH started, test phase).

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/m³ if total mass is higher than 2.000 g/hr.

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 was 1,3 ppm on November 8. In consultation with OVAM it was decided to shut down ERH and lower the vapor flow, although concentrations were still below the emission limits.

At that moment preparations to replace the GAC had already been taken, though the quick breakthrough came unexpectedly soon as compared to other projects. We installed an extra GAC filter November 10, after which the following measurements were reported:

- ✓ Influent GAC filter 1: 51,5 ppm
- ✓ Effluent GAC filter 1: 31,8 ppm
- ✓ Effluent GAC filter 2: 0,8 ppm
- ✓ Effluent GAC filter 3: 0,0 ppm

Currently, 3 VGAC vessels are installed in series, as opposed to the previous 2, to ensure no uncontrolled emission to the air will take place. We consider to install a bigger GAC vessel to increase the operational time for the GAC. TEC will periodically take vapor samples from the influent and effluent of each vessel.

7 Condensate and water treatment

During the reporting period 9,0 m³ of water was recovered via condensed water by the vapor recovery system. A total of 13 m³ 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 in groundwater is 10 µg/l. TEC will periodically take samples from the water treatment system.

8 Mass removal (by PID)

The mass removal 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 38 kg. The total mass recovered from the subsurface since the start of the project is circa 151 kg **(Figure 3.)**.

9 Health & Safety

During the reporting period the breakthrough of the second GAC filter happened unexpectedly quickly. Although the ppm value in the effluent was low, measures were already taken to prevent such an event from happening. Now 3 GAC filters are placed in series.

Furthermore, following the events of the fire in the GEN-III additional measures have been undertaken to prevent this kind of incident:

- ✓ Safety device: An extra security into Cars (PLC system): in case high electrical currents in the secondary cables of the Varivolts ERH will shut down (> 2 seconds).
- ✓ Procedure: The modifications of the electrodes have been checked by TRS (Chris Thomas) and Frans van Donselaar E-Services.

Step & Touch

The highest measured voltage (step and touch) during the reporting period was < 200 mV. This is due to preventive measures from the previous period, and likely the change in electrodes to the busbars in the Beyke.

Ambient air monitoring

During the reporting period, the highest observed CVOC concentration in daily ambient air monitoring was 0,1 ppm (0,06 ppm PCE), recorded inside building SL 111. TEC will provide the measurement data from the VaporSafe.

10 Planned Activities

In week 46 activities are planned to install the sound silencers for the blowers, in order to be able to run the blowers at a higher frequency. We will also start insulating the drip pipes, including tracing. The electrical system has to be tested by an independent certified body.

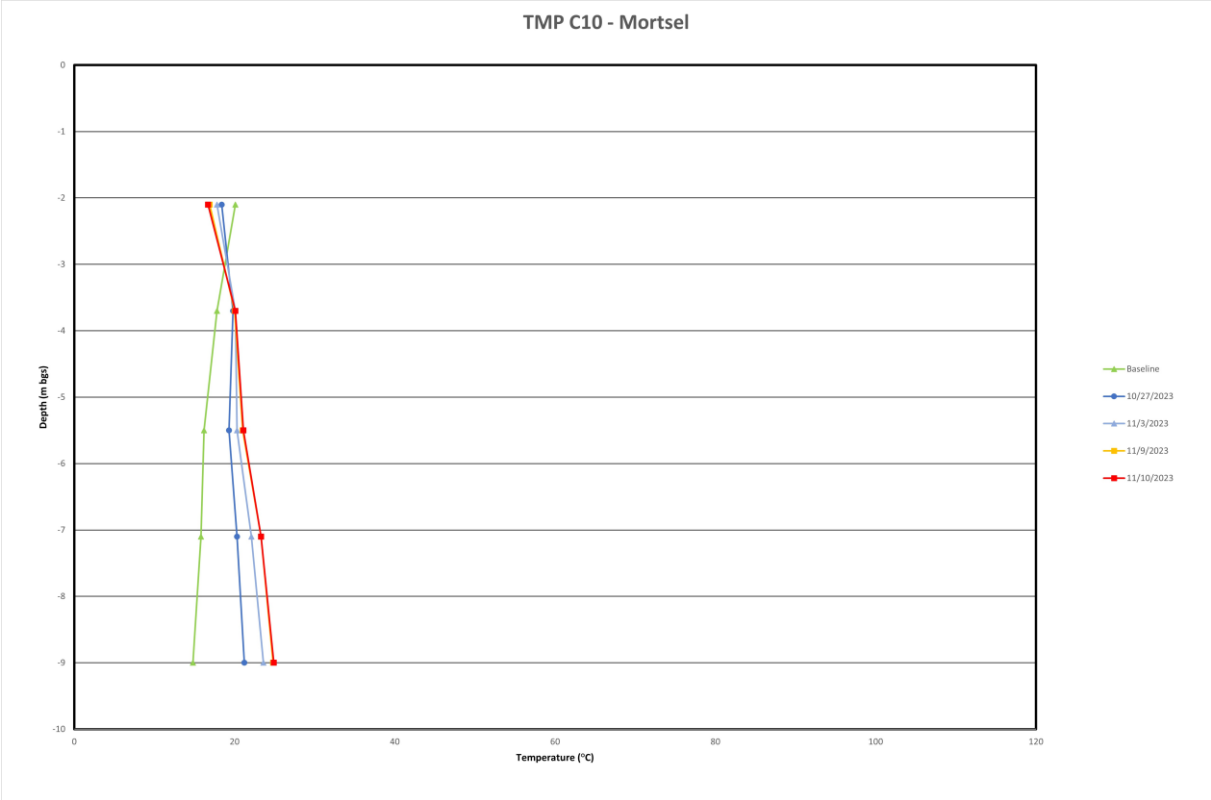
Once we can restart ERH HMVT personnel will visit the site to collect operations data, and perform weekly maintenance. HMVT personnel will perform regular PID measurements and collect vapor and water samples.

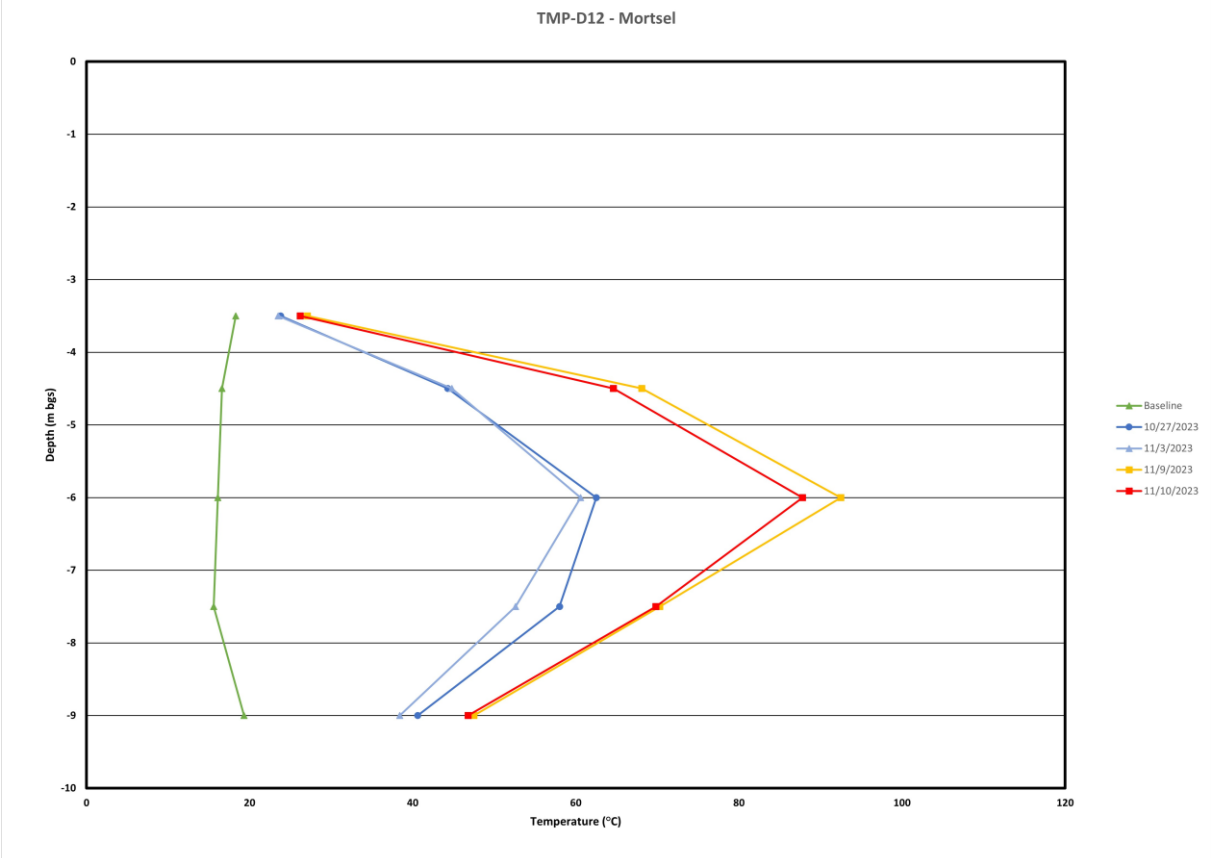
Figures

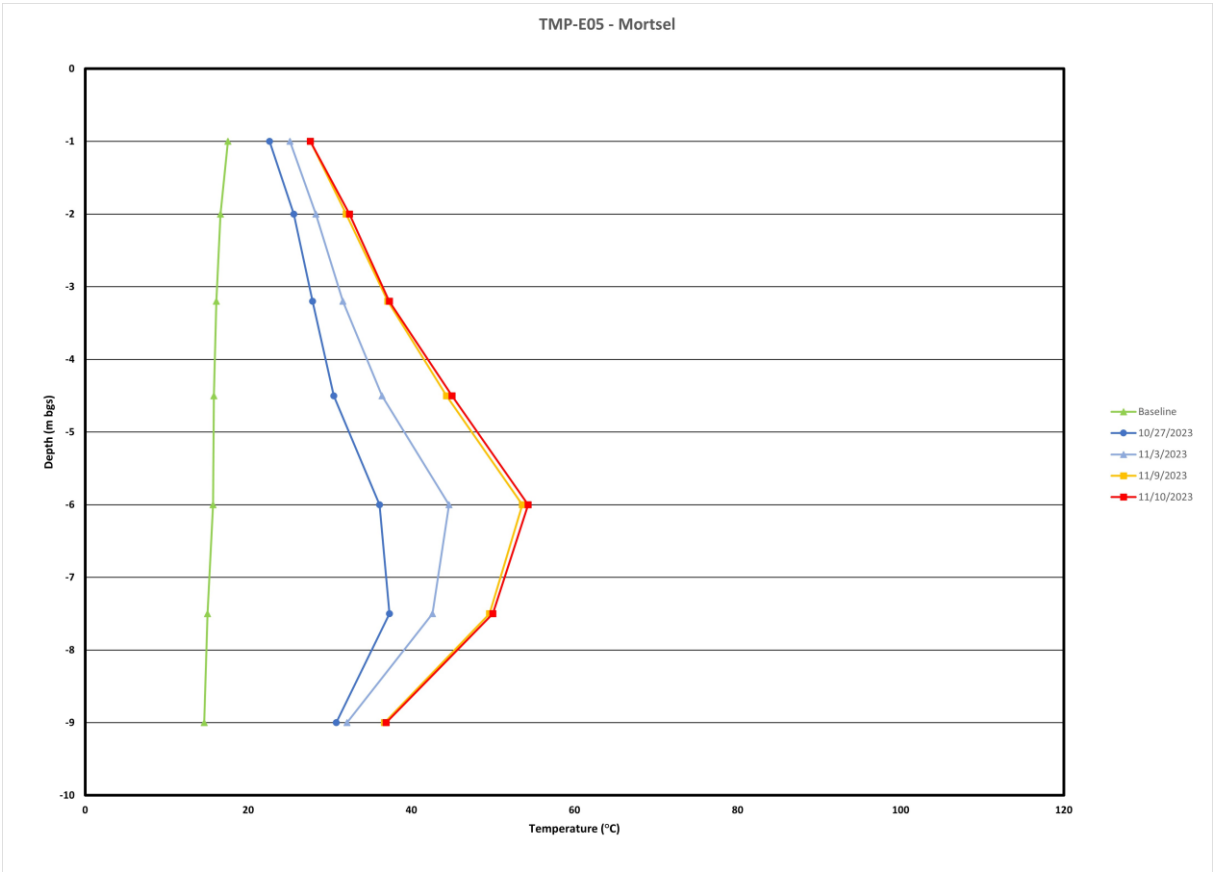
Figure 1: Site plan

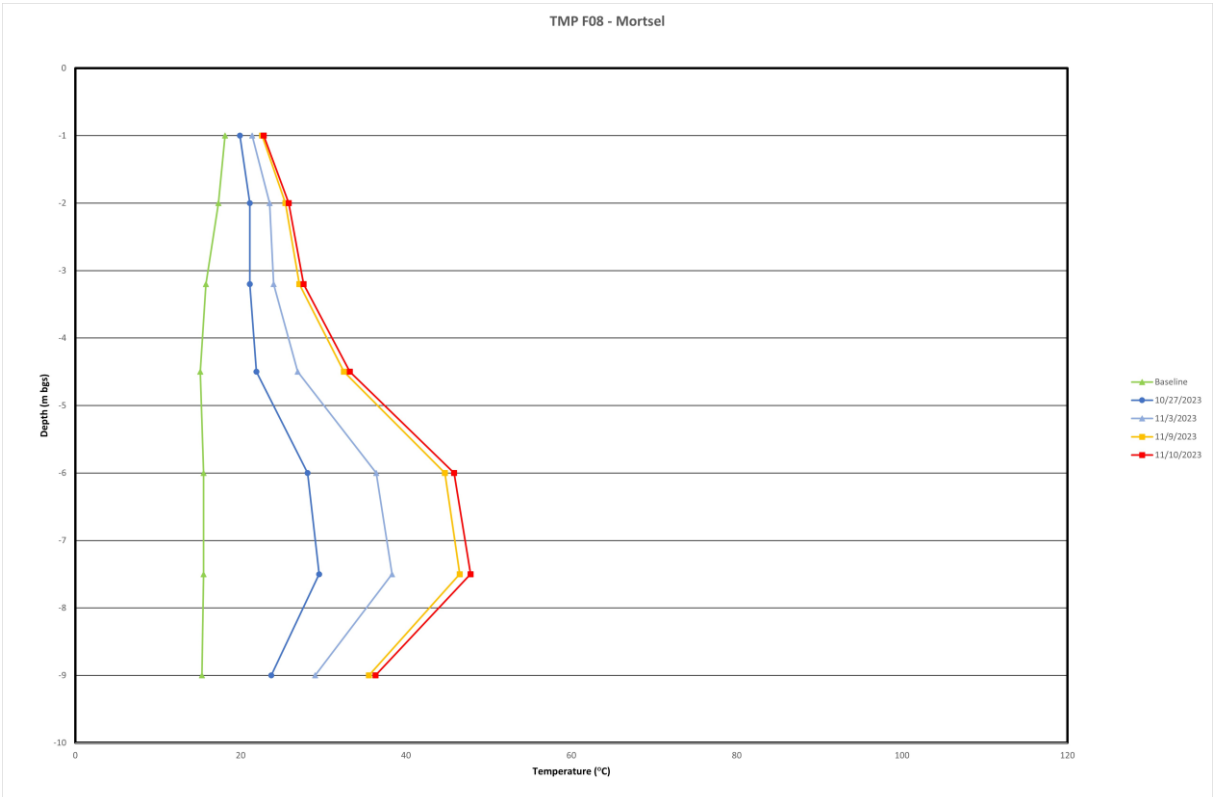
The as built site plan is attached separately

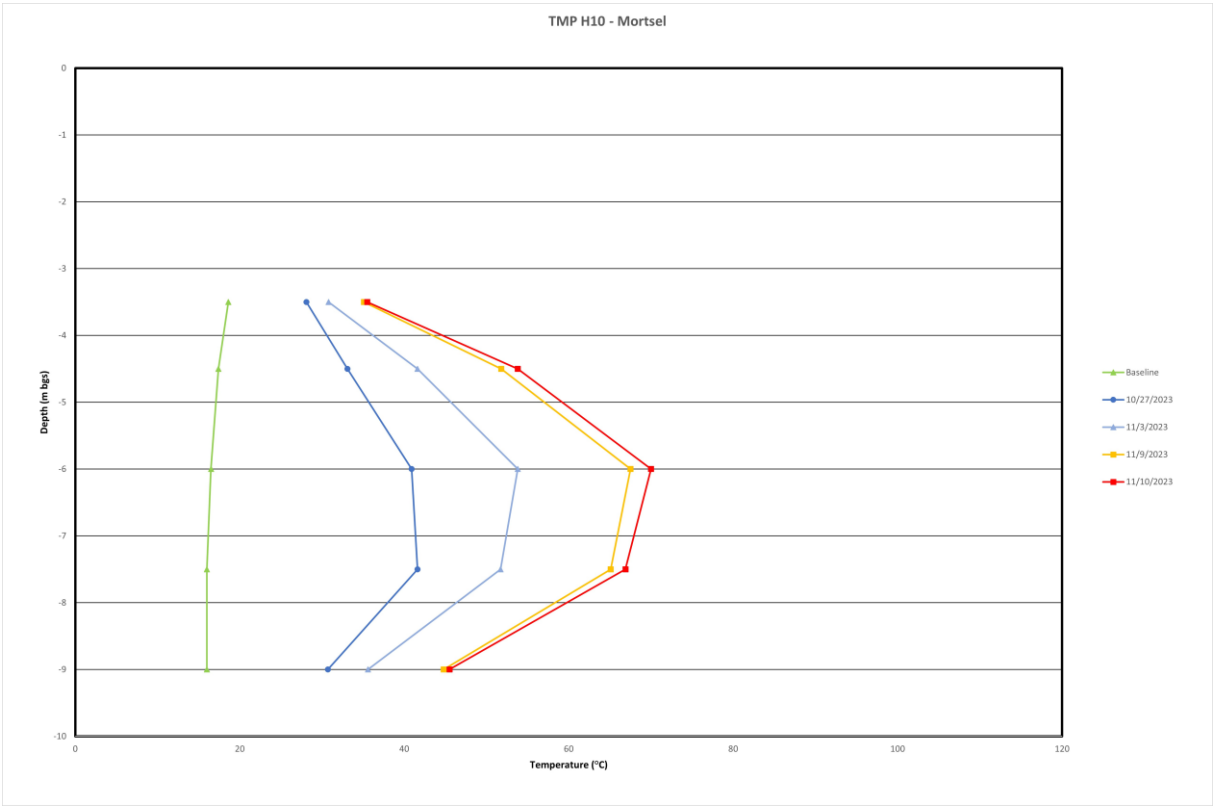
Figure 2. Average Temperature vs. Time (By TMP)

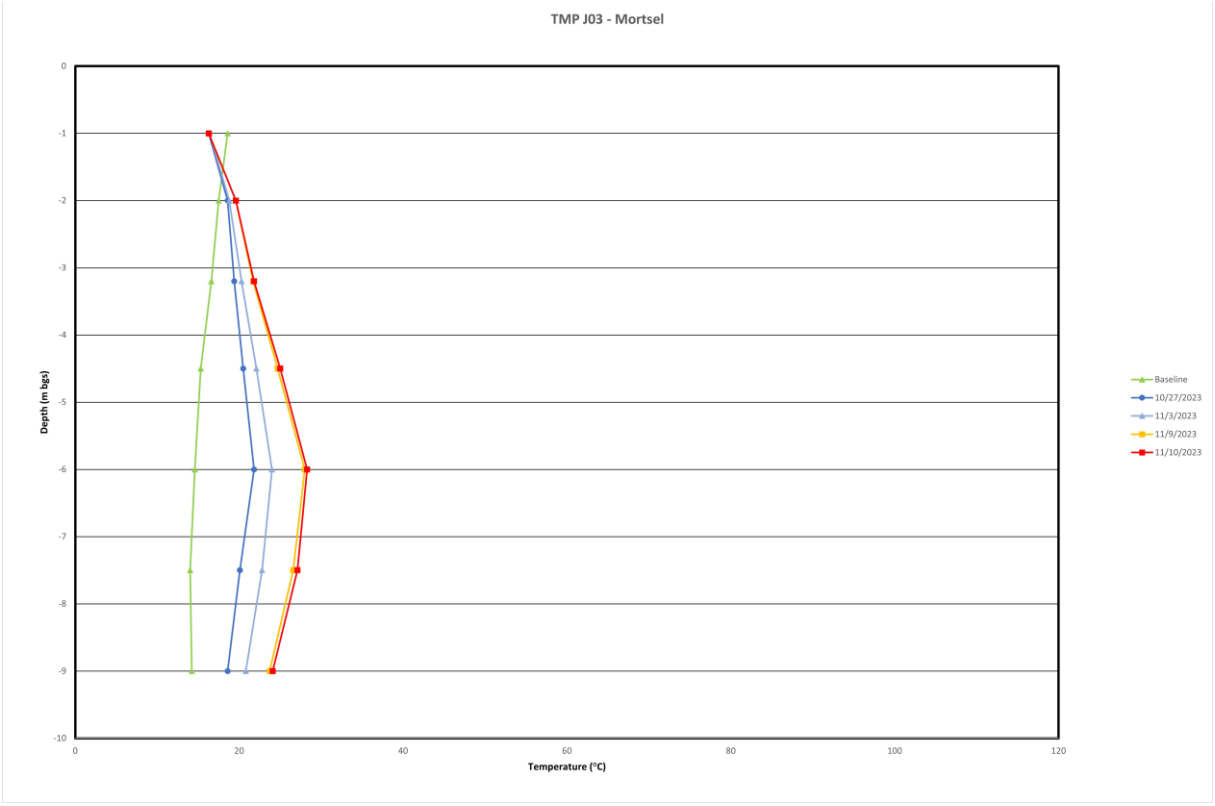


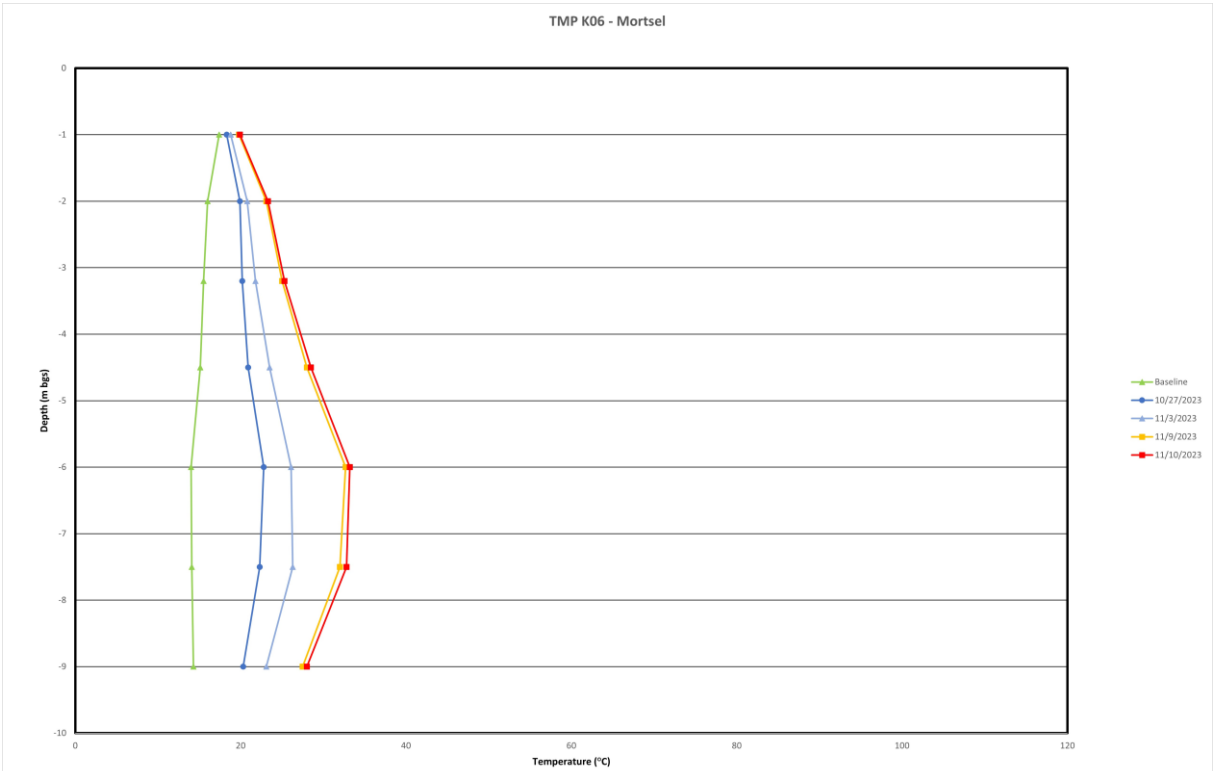


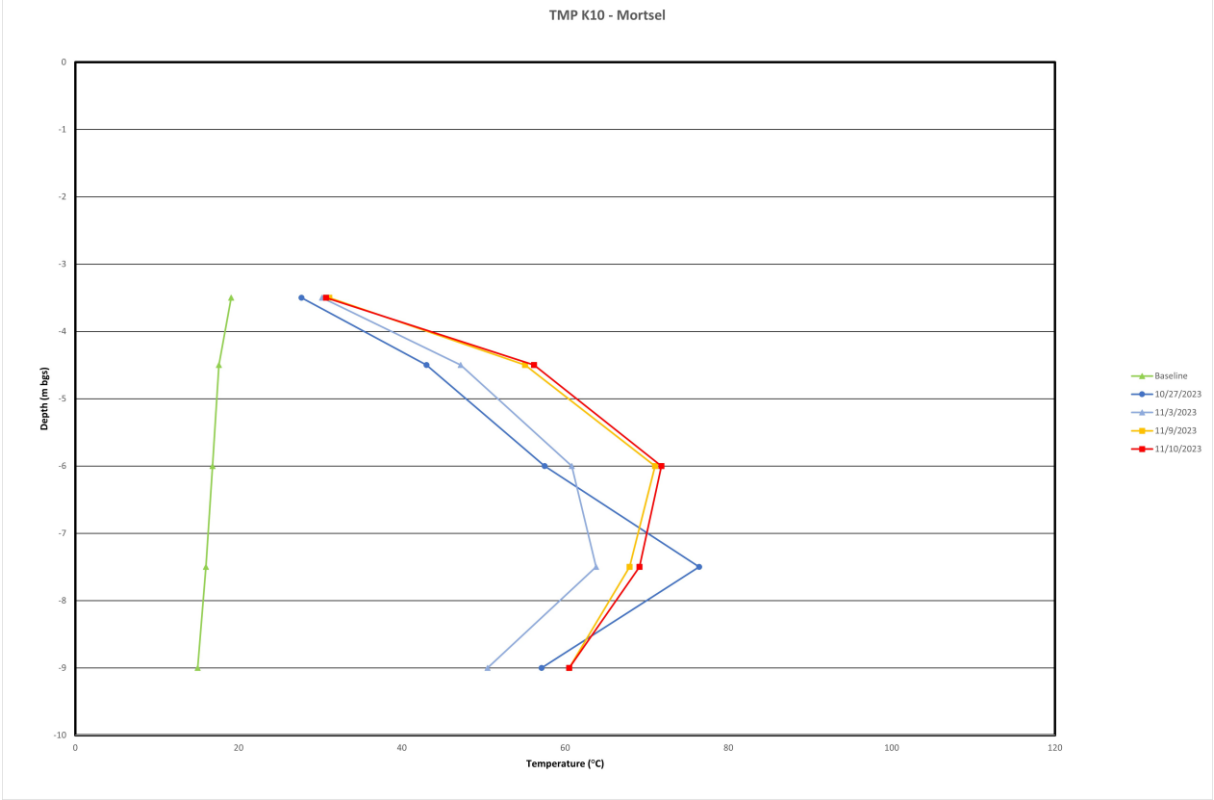

TMP-E05 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
10/27/2023
11/3/2023
11/9/2023
11/10/2023

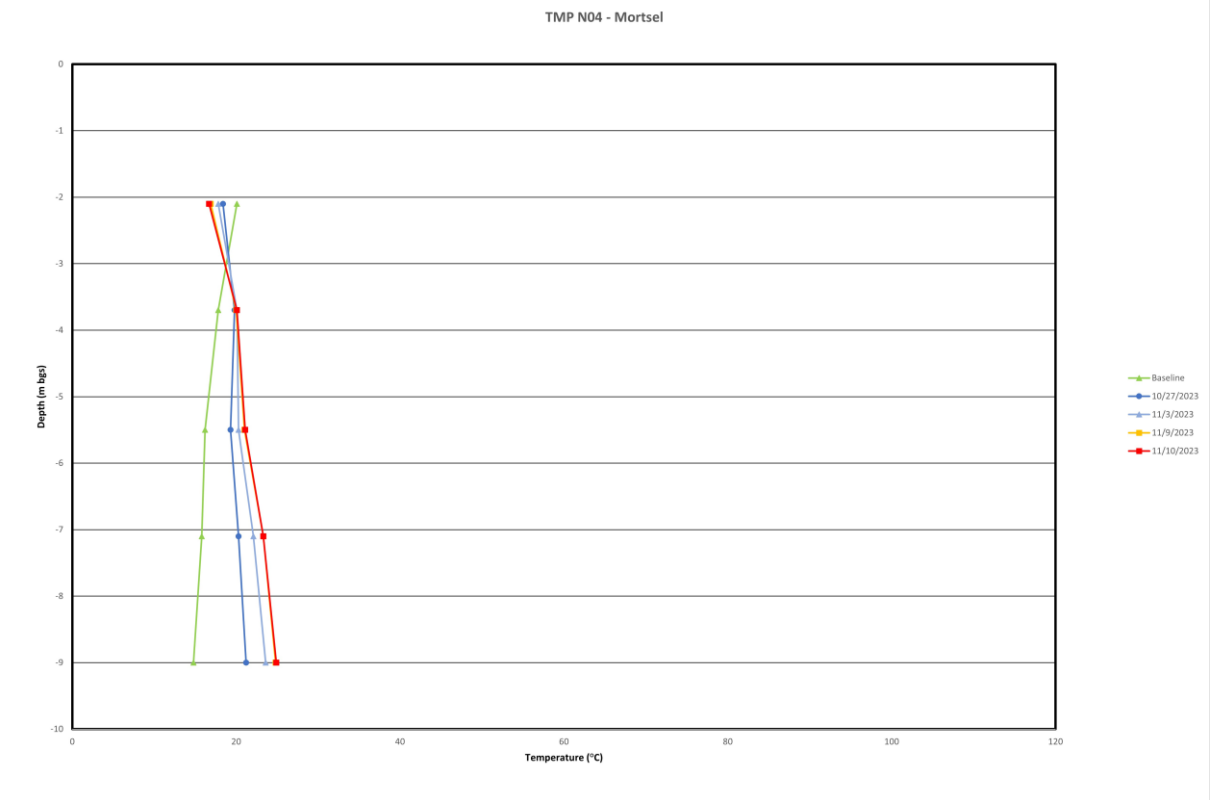

TMP F08 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
10/27/2023
11/3/2023
11/9/2023
11/10/2023


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
10/27/2023
11/3/2023
11/9/2023
11/10/2023


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
10/27/2023
11/3/2023
11/9/2023
11/10/2023


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
10/27/2023
11/3/2023
11/9/2023
11/10/2023


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
10/27/2023
11/3/2023
11/9/2023
11/10/2023


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
10/27/2023
11/3/2023
11/9/2023
11/10/2023

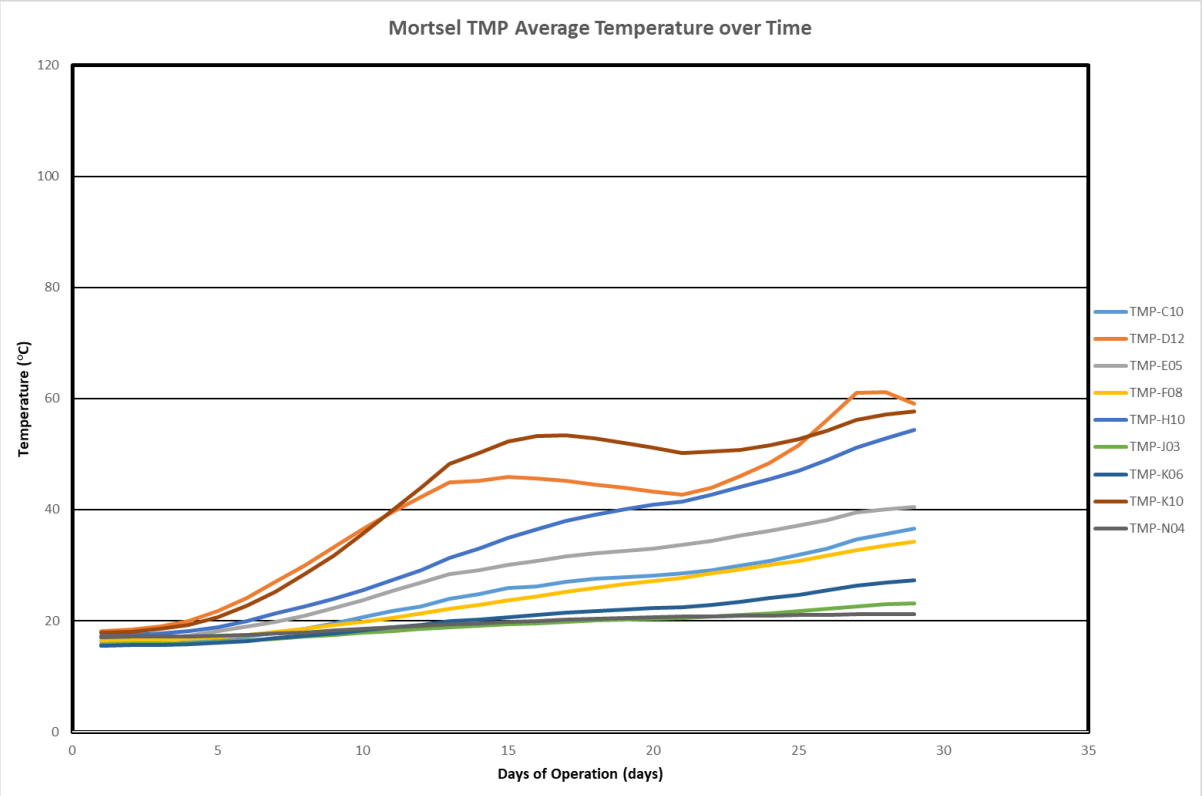

Mortsel TMP Average Temperature over Time
Temperature (°C)
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
Days of Operation (days)
TMP-C10
TMP-D12
TMP-E05
TMP-F08
TMP-H10
TMP-J03
TMP-K06
TMP-K10
TMP-N04

Figure 3. Cumulative Mass Removed vs. Time