OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

June 7 - 21, 2024

Former Electra Site, Statielei 111 Mortsel

HMVT-number:	210624-476662-Report ERH Mortsel_wk36
Date report:	November 7, 2024

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 June 7 - 21, 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 22 and 23 of 2024. During this period the site was visited 5 times.

In the reporting period the following works were performed:

- Vapor recovery test: VR and drip were shutdown for 2 weeks in SL109 to see what the effects would be of shutting down VR and drip completely.
    - Little to no contaminants of interest were found, except for 0,001 ppm (~1 ppb) PER on the second floor of SL109. Results have been discussed with OVAM.
- Removed grout in borehole E12, D07
- General checks and equipment maintenance
    - General data collection and inspections
        - PID measurements
        - Relative humidity measurements
    - Drained the condensate in the VGAC vessels and influent hose blowers.
        - No condensate was observed.
    - Repaired two UTP connectors of drip and TMP box in SL113
    - Repaired leaking drip connections.
    - Refilled salt in Watcon.
- Started test stop cooling
    - Stopped VR in South part of building 109 and adjacent filters.
    - Stopped drip in South part of building 109.
- Started demobilization works
    - Removed insulation PIR plates in SL105, SL107, SL109, 111 and 113 basement.
        - Put PIR plates into container for recycling. PIR plates were retrieved by Unilin.
    - Removed tracing cable.
    - Removed cables connecting electrodes.
        - Cables were put down on site ready for spooling.
        - Cables were stripped from any markings, damages repaired.

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 June 21st	Percentage of total
Operation Time (days)	137	213[1]	155%
Cumulative Energy Applied (MWh)	3.800	3.045	80%

Total energy for ERH and auxiliary Equipment was ca. 3.045 MWh. ERH was completely shut off on April 17th, the electricity consumption until that point was ca. 3.010 MWh, with ca. 2.905 MWh used for ERH.

The contractual remediation target has been met on March 18: the ERH treatment time was 118 days (86% of total estimated time). The global electricity consumption up to March 18 was ca. 2.500 MWh.

[1] This is with regard to the days that ERH was not active.

4 Temperature Monitoring

The site average subsurface temperature decreased during this reporting period of June 7 - 21 to 61,5 °C, a decrease of 6,4 °C. With the shutdown of ERH, temperatures appear to decrease around 0,4 – 0,45 °C per day (average). With the increase of the drip flowrate, the temperature decrease appears to increase slightly.

Subsurface temperatures at different depths per TMP location and over time are presented in **Figure 2**. The highest temperature on June 21st was 83,8 °C in TMP E05 at 6 m bgs.

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 26,6 °C, the maximum temperature is 34,5 °C in RTD T1 (SL 109 front).

5 Vapor Recovery

During the reporting period, up to the cooling test, the vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was maintained around 30 - 40 mbar. All pipe and field piezometer pressure measurements show negative values, indicating the system is working sufficiently to maintain negative pressure.

The test for stop cooling was started June 4th and ended on the 17th. The test is described in memo *240531-0476662-MEM-Test uitschakelen koeling*, d.d. May 31, 2024. Vapor recovery in the South part of building 109 and the adjacent filters was stopped. Negative pressure in the soil increased to ca. 70 mbar. The vapor flow rate remains stable around 1.650 m^3/hour.

Vapor monitoring

During every site visit HMVT performs PID vapor measurements of the ambient air and the extracted soil vapor. The most recent PID measurement for chlorinated volatile organic compounds (CVOC)in the extracted soil vapor, collected on June 21st, was 0,1 ppm. The PID-value in the soil vapor decreased this period. PID measurements are performed intermittently upon site visits near the electrodes that still show a high PID value.

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.

Two Mach4X vessels, containing respectively 18 and 10 m^3 of vapor GAC, are currently connected and functioning as vapor treatment. A third vessel, a MACH3S vessel, containing 2 m^3 of VGAC, was installed in series during the reporting period. HMVT performs PID vapor measurements of the influent and effluent of the GAC vessels on a regular basis. During the reporting period, the PID reading of the effluent of the first, second and third GAC filter was 0,0 ppm. TEC will periodically take vapor samples from the influent and effluent of each vessel for analyses in the laboratory.

The activated carbon vessels had a relatively low adsorption rate. A lot of attention was spent on condensation in the VGAC vessels. Measures were taken to decrease the humidity level of the vapor stream (extra cooling and insulation of tubing). Measurements showed that relative humidity complies to the requirement as obliged, namely < 50% (at a temperature of ca. 28 - 36 °C).

HMVT also made a memo about relative humidity in the soil vapor. Condensation will probably take place on the cold vessel wall, but not in the middle of the filter. During this reporting period the activated carbon filters were drained frequently. Condensate is rarely present in significant amounts during the reporting period.

7 Condensate and water treatment

During the reporting period 3 m^3 of water was recovered via condensed water by the vapor recovery system. The amount of condensate is decreasing because of the lower soil temperatures. A total of 2.510 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. From the samples of the 27th of March, no contaminants were detected in the effluent. Since then no samples were taken anymore.

8 Mass removal (by PID)

The mass removal calculation is based on the PID measurements in the influent of VGAC1. 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 0 kg (based on PCE), 1 kg less than the previous reporting period. The total mass recovered from the subsurface since the start of the project is circa 399 kg **(Figure 3.)**.

It has been discovered that a significant part of the extracted soil vapor contains different compounds such as aldehydes, alcohols and ketones. The quantity (level) of these compounds fluctuates per influent measurement. For this reason the PID value on the influent side is not representative for just PCE.

When reviewing the 6 laboratory results from January 12 to March 14, the average VOCl percentage was 66% ± 13%. However, it also stands out that the percentage of VOCls in the total is decreasing. For comparison, it was 86% in the sample of the January 12, while having decreased to 55% on March 14. The latest analyses show that the proportion of VOCls is decreasing even more. As vapour inlet concentrations appeared to decrease even further, this was not further investigated.

9 Health & Safety

During the reporting period no mentionable affairs regarding health and safety occurred.

Step & Touch

ERH is shut off, so no Step & Touch measurements were performed during this period. Step & Touch will no longer be necessary after this period.

Ambient air monitoring

During the reporting period, no presence of CVOC in daily ambient air monitoring was measured (PID). No PPMs were measured during the reporting period. TEC will provide the measurement data from the VaporSafe.

10 Settlement measurements

The settlement measurements are being monitored on a three weekly basis by buro Teugels. The latest 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 map on the right side.

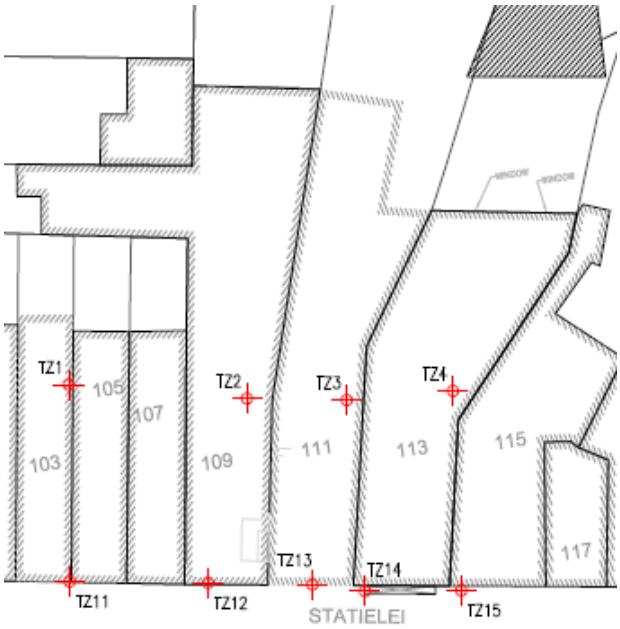


Table 2. Results settlement measurements

TEUGELS

dossier nr.:	2227978
werf:	Wegrosan - Mortsel Statielei
datum:	29/05/'24
Operator:	K.J. - S.B.

ZETTINGSMETING

Nr. pt	19/04/23	Δ	TOT Δ	20/03/24	Δ	TOT Δ	26/03/24	Δ	TOT Δ	03/04/24	Δ	TOT Δ	19/04/24	Δ	TOT Δ	10/05/'24	Δ	TOT Δ	29/05/'24	Δ	TOT Δ
TZ1	5,705			5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,702	-1	-3	5,700	-2	-5
TZ2	8,780			8,776	0	-4	8,776	0	-4	8,776	0	-4	8,776	0	-4	8,774	-2	-6	8,773	-1	-7
TZ3	12,178			12,176	0	-2	12,175	-1	-3	12,175	0	-3	12,175	0	-3	12,174	-1	-4	12,172	-2	-6
TZ4	9,256			9,255	0	-1	9,254	-1	-2	9,254	0	-2	9,254	0	-2	9,254	0	-2	9,252	-2	-4
TZ11	5,211			5,209	-1	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2	5,208	-1	-3
TZ12	8,150			8,146	0	-4	8,146	0	-4	8,146	0	-4	8,146	0	-4	8,145	-1	-5	8,143	-2	-7
TZ13	11,095			11,095	-1	0	11,095	0	0	11,095	0	0	11,095	0	0	11,094	-1	-1	11,092	-2	-3
TZ14	8,922			8,924	0	2	8,924	0	2	8,924	0	2	8,923	-1	1	8,922	-1	0	8,920	-2	-2
TZ15	3,971			3,971	1	0	3,971	0	0	3,971	0	0	3,971	0	0	3,970	-1	-1	3,968	-2	-3

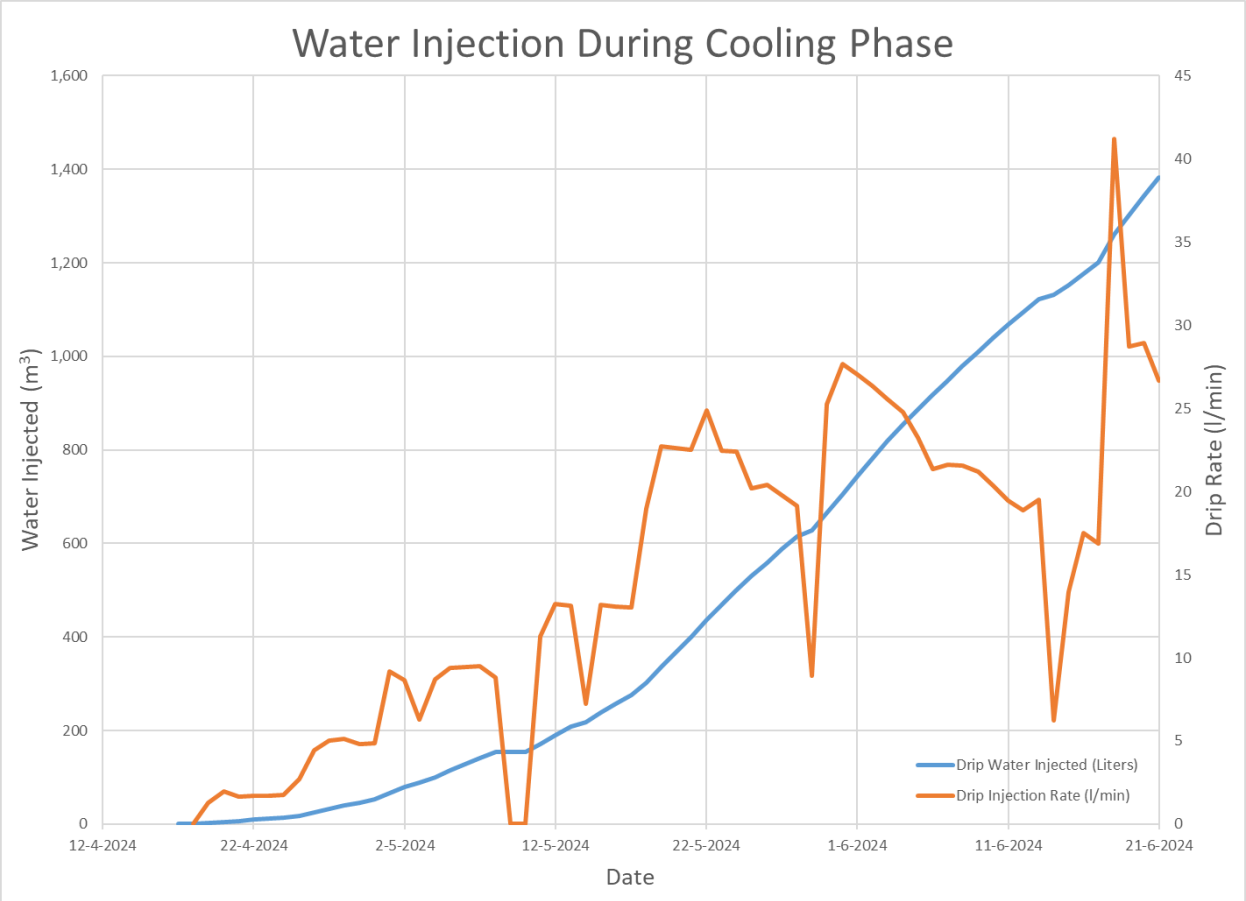
OPMERKINGEN
Ref.meting: 19/04/23
Δ : verschil t.o.v. vorige meting
TOT Δ : verschil t.o.v. ref.meting

Limited settlements (2 – 7 mm) have been measured in buildings Statielei 103, 109 and 111. There appears to be little to no development in terms of settlement. According to stability engineer Herman Peiffer, settlements over 6 mm can pose a potential problem.

According to Herman Peiffer, the lack of cracks in the building walls, ceilings, other structures, indicate no direct consequences of the settlement. Also since the settlement is similar to the front and back, there is no indication that certain tension would build up in specific parts of the building. However, since a limit has been reached of 7 mm, the measurement frequency should increase, as well as monitoring for cracks in walls, ceilings, etc. If settling continues, Herman should be contacted again and will come to visit the site.

11 Dripping

We started dripping tap water on April 18 (after shutdown of ERH). We slightly increased the drip water flow. The drip flow and volume are shown in the Figure below.



Drip rate is steadily increasing up to ca. 40 m^3/day. June 4th we started the cooling test and drip in the filters in building SL 109 was stopped. On the 17th drip continued again. As a result of this the drip rate decreased temporarily.

12 Further remarks

None.

13 Planned Activities

Planned activities for the following two weeks (24 and 25) involve:

- Further demobilization (Electrode cable spooling and transport)
- Ambient air monitoring.

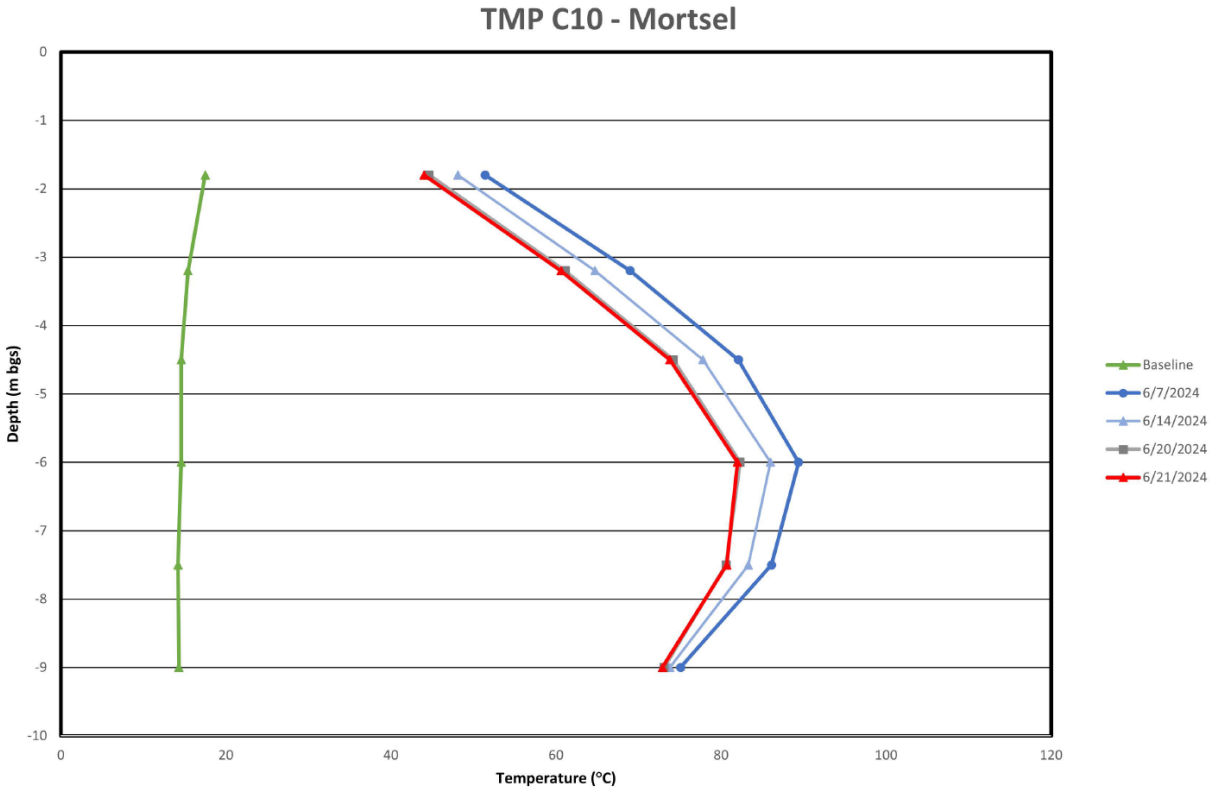
Figures

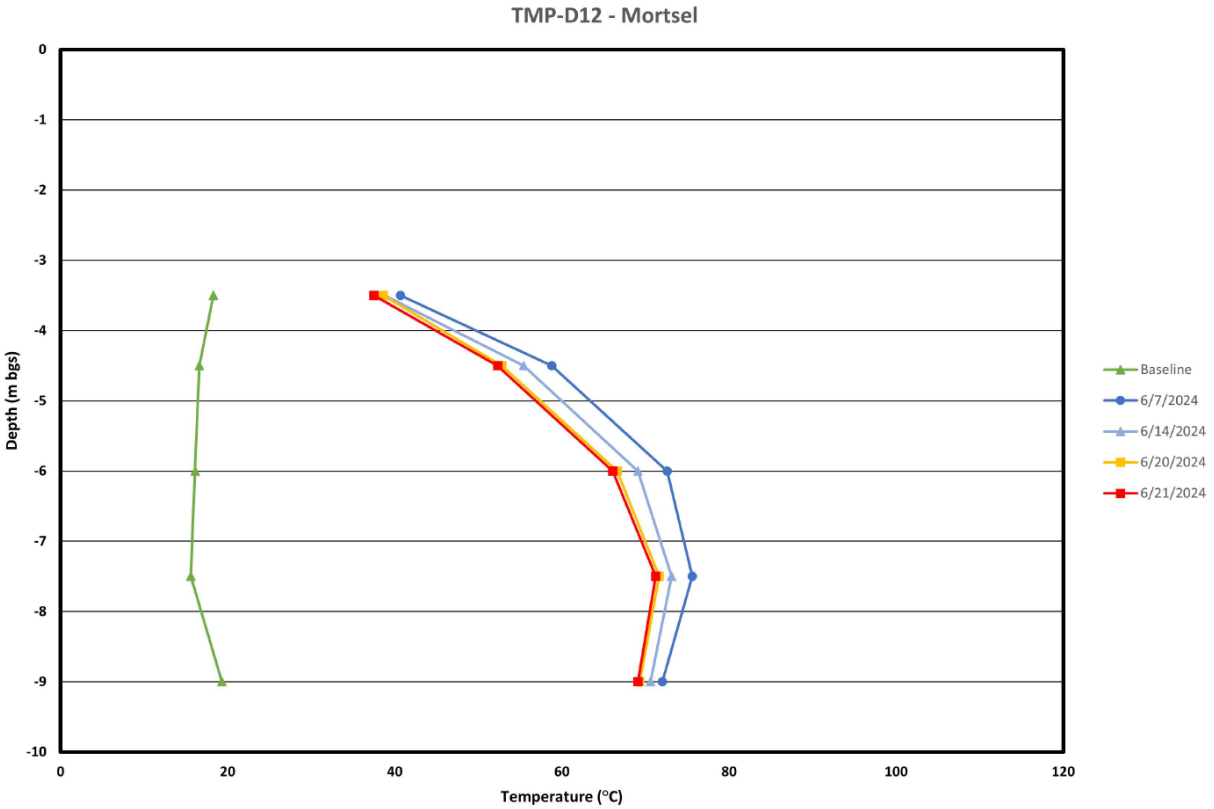
1. Site plan
2. Average Temperature vs. Time (by TMP)
3. Cumulative Mass Removed vs. Time

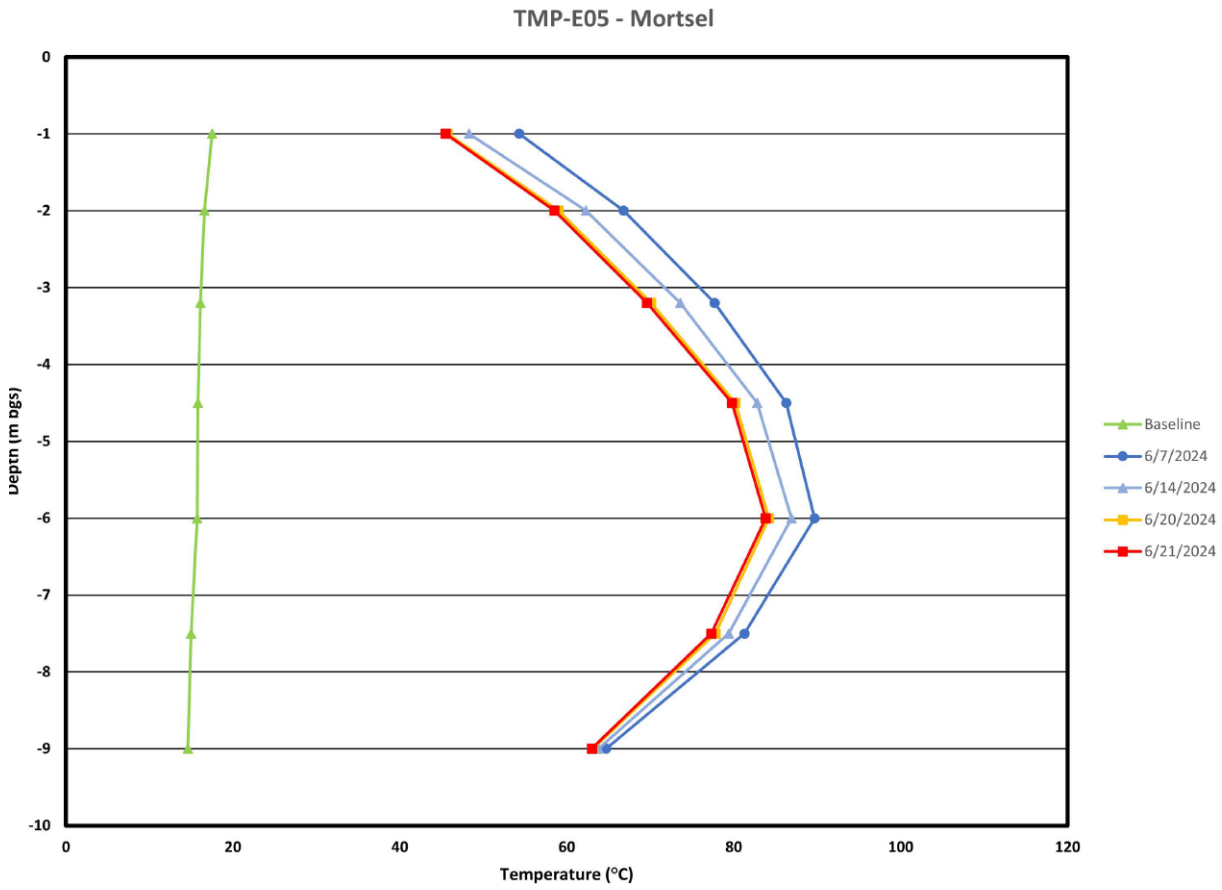
Figure 1: Site plan

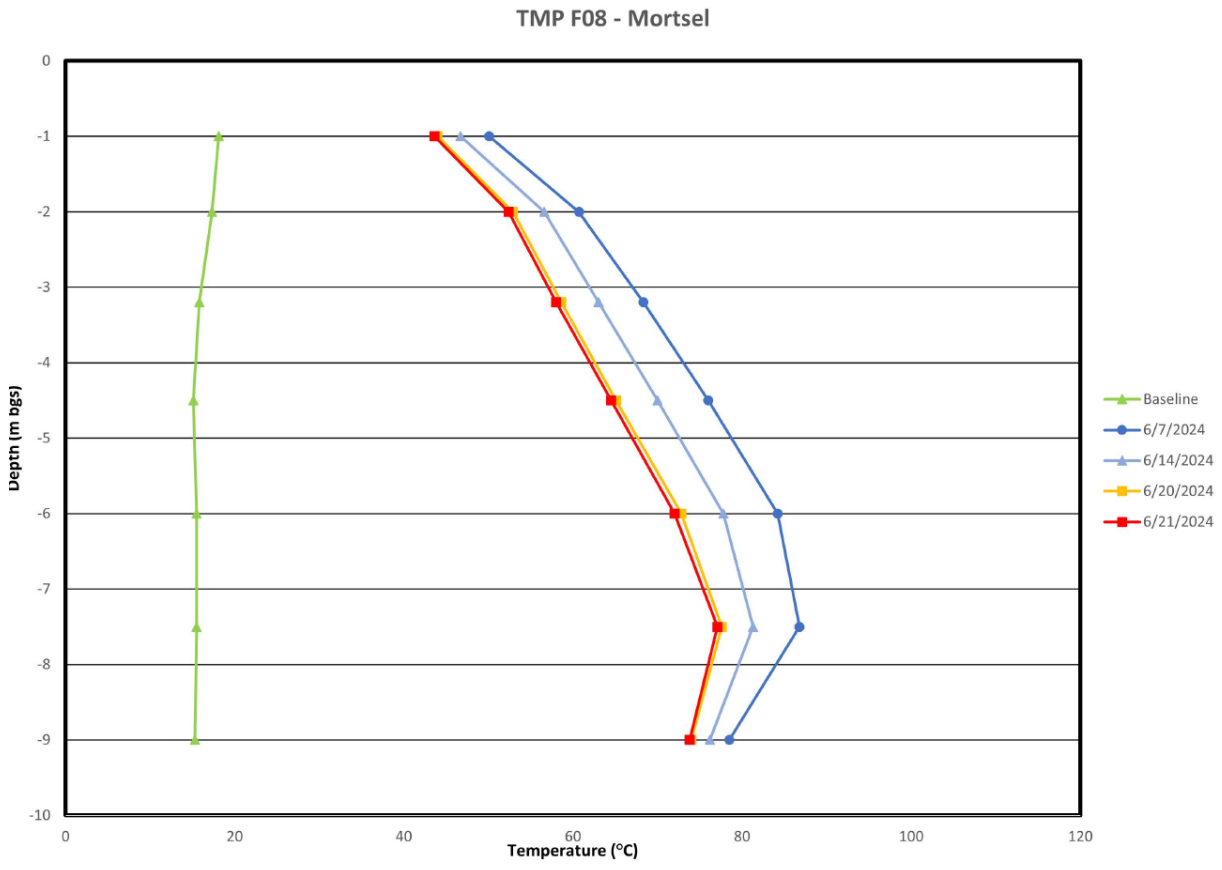
The as built site plan is attached separately

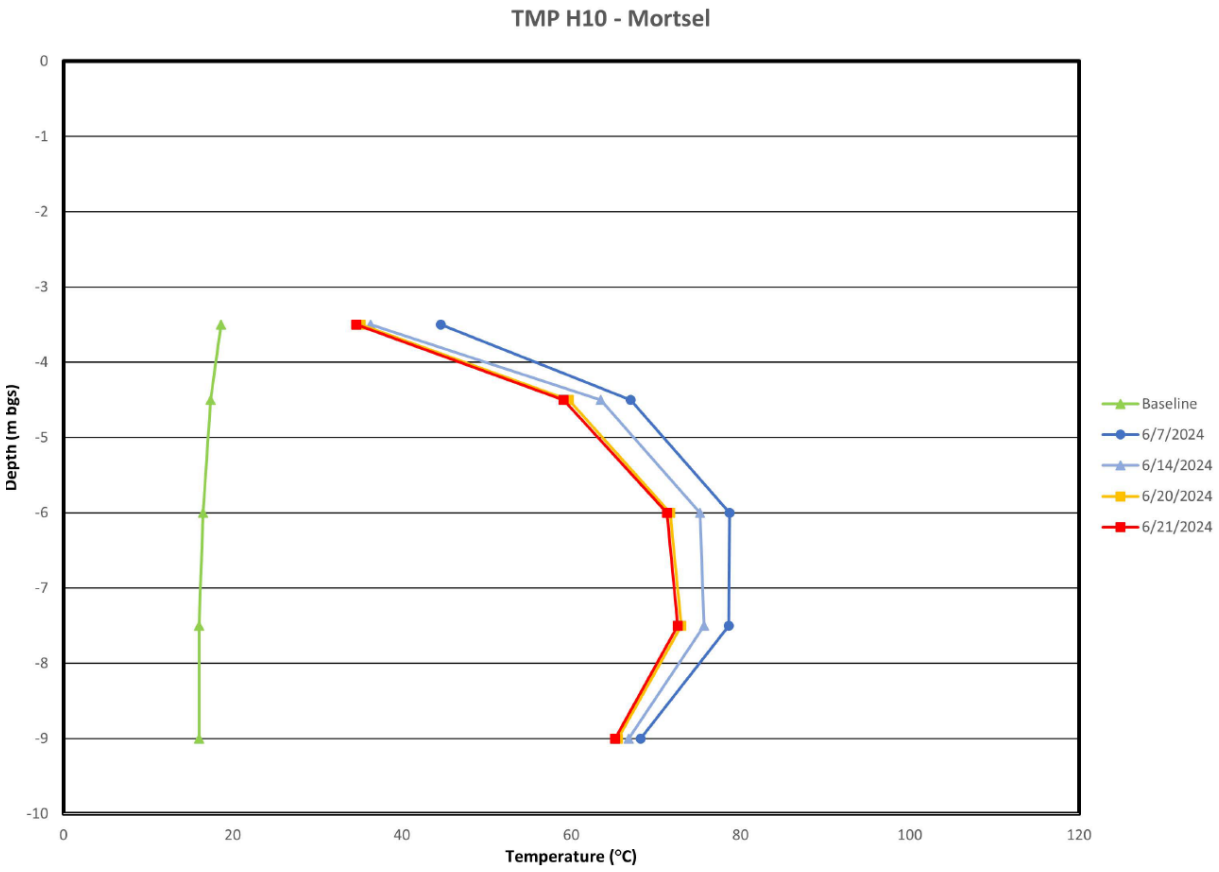
Figure 2. Average Temperature vs. Time (By TMP)

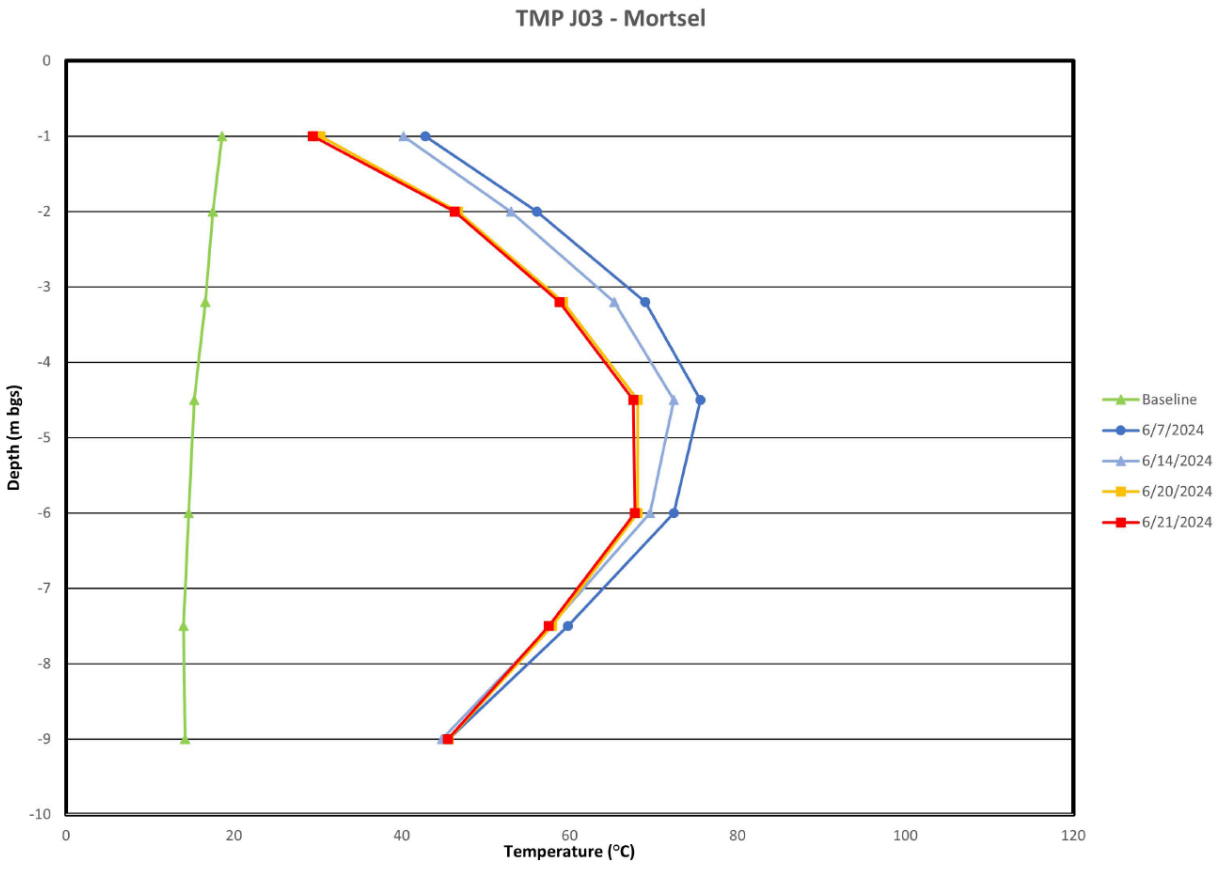


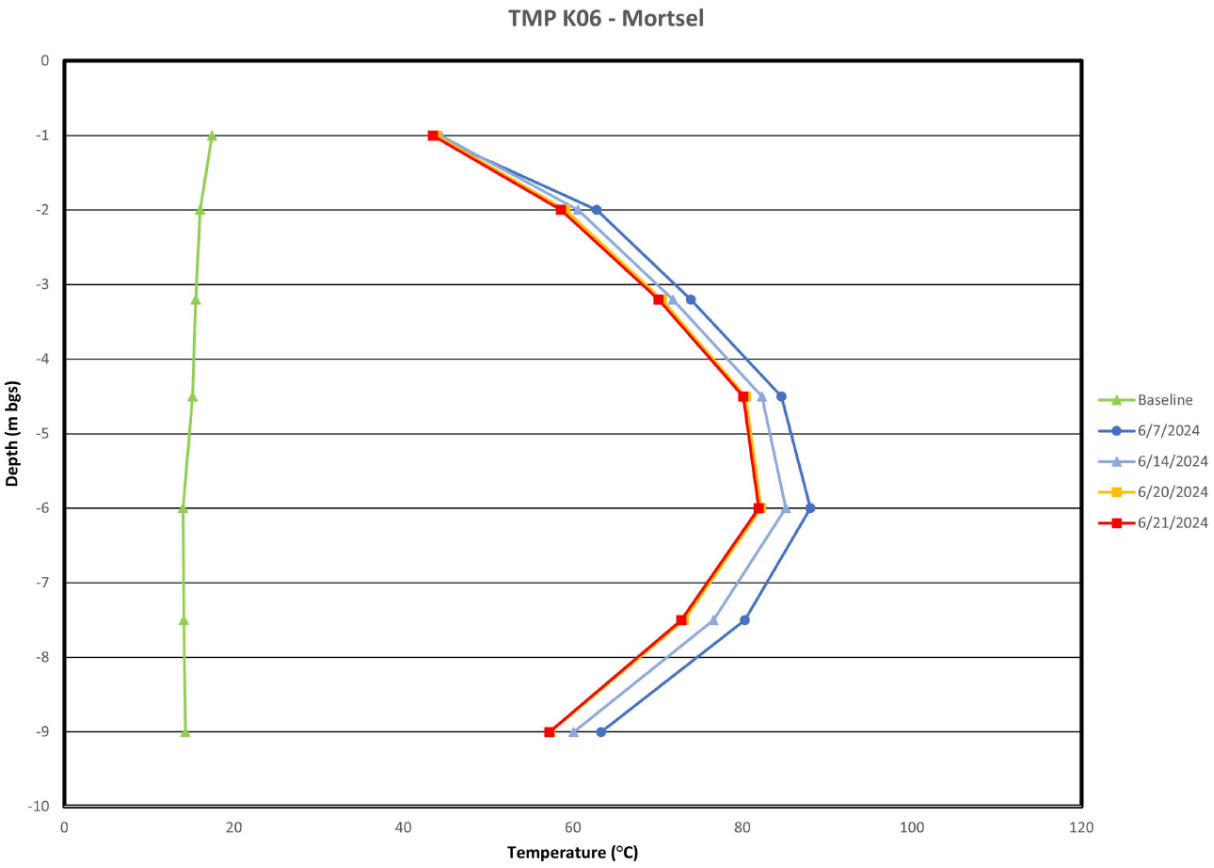


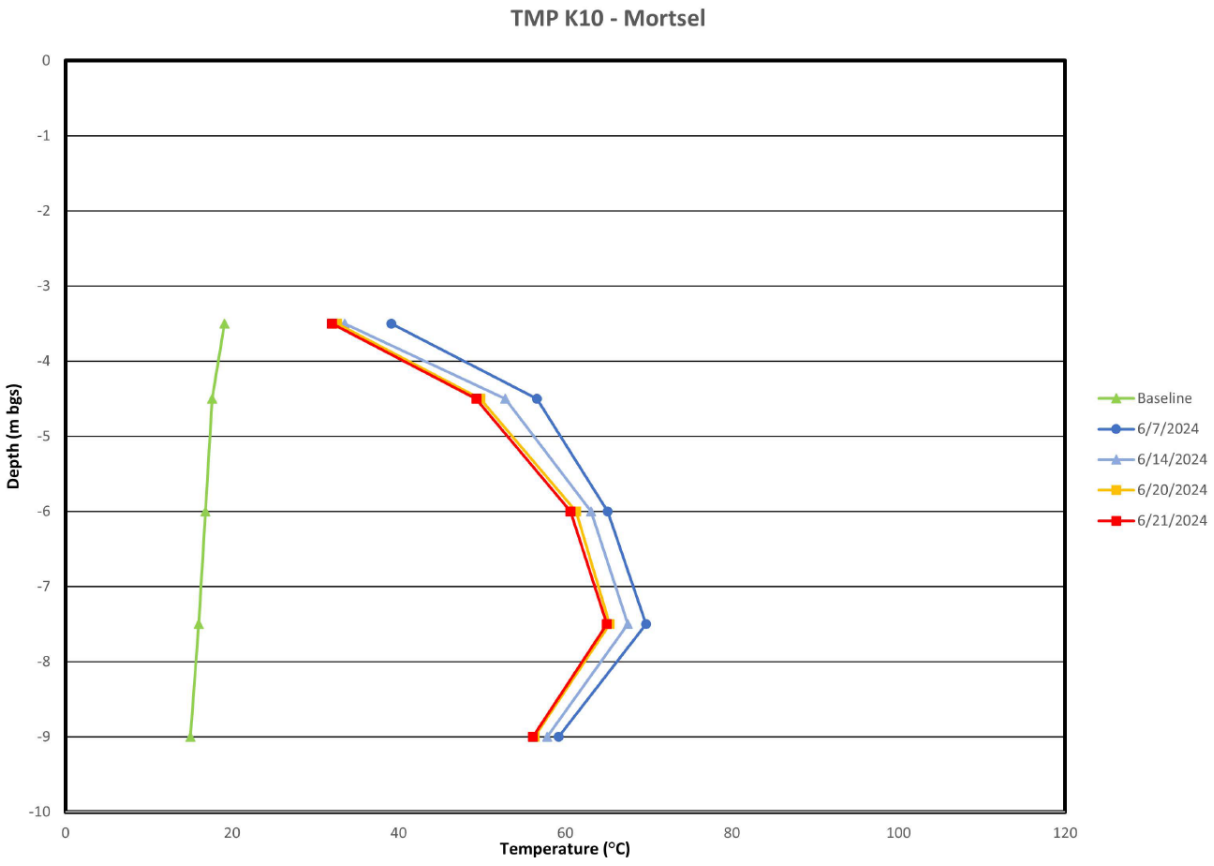

TMP-E05 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
6/7/2024
6/14/2024
6/20/2024
6/21/2024

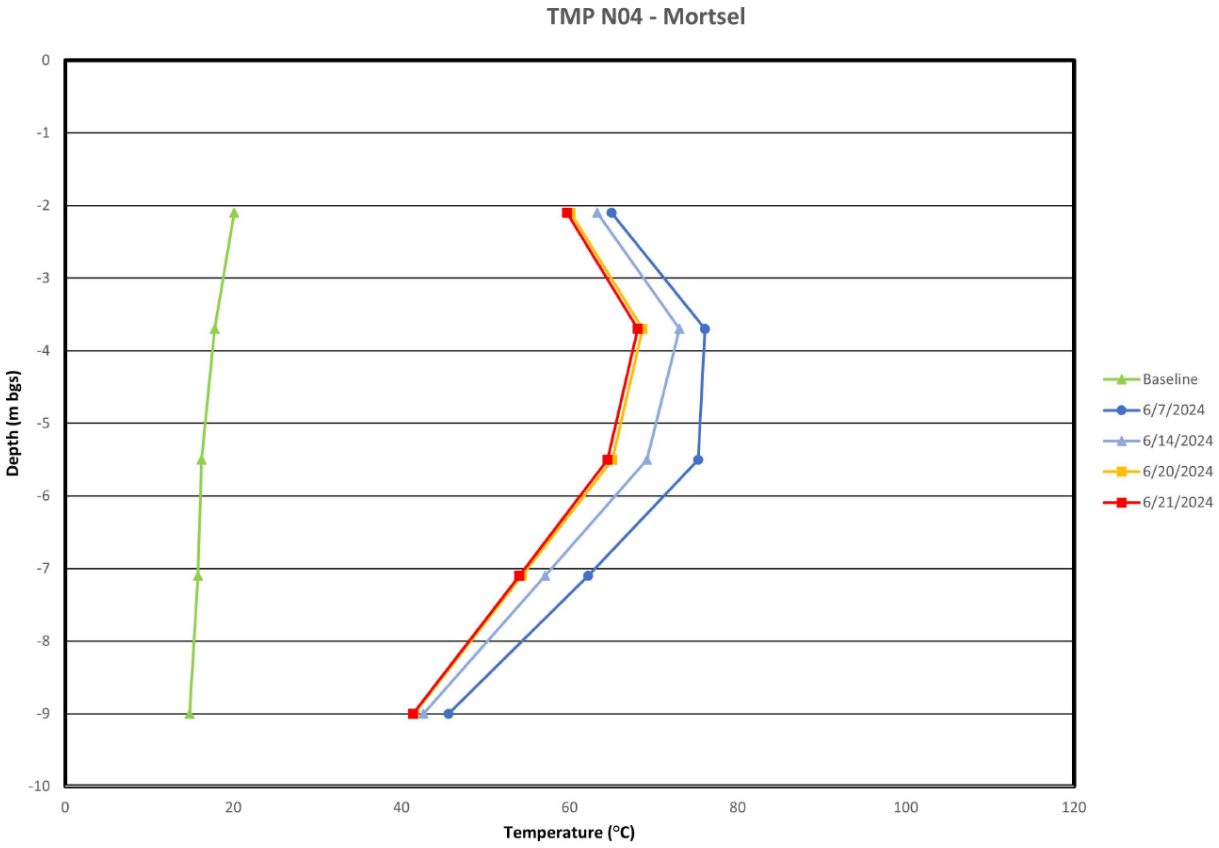

TMP F08 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
6/7/2024
6/14/2024
6/20/2024
6/21/2024


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
6/7/2024
6/14/2024
6/20/2024
6/21/2024


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
6/7/2024
6/14/2024
6/20/2024
6/21/2024


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
6/7/2024
6/14/2024
6/20/2024
6/21/2024


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
6/7/2024
6/14/2024
6/20/2024
6/21/2024


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
6/7/2024
6/14/2024
6/20/2024
6/21/2024

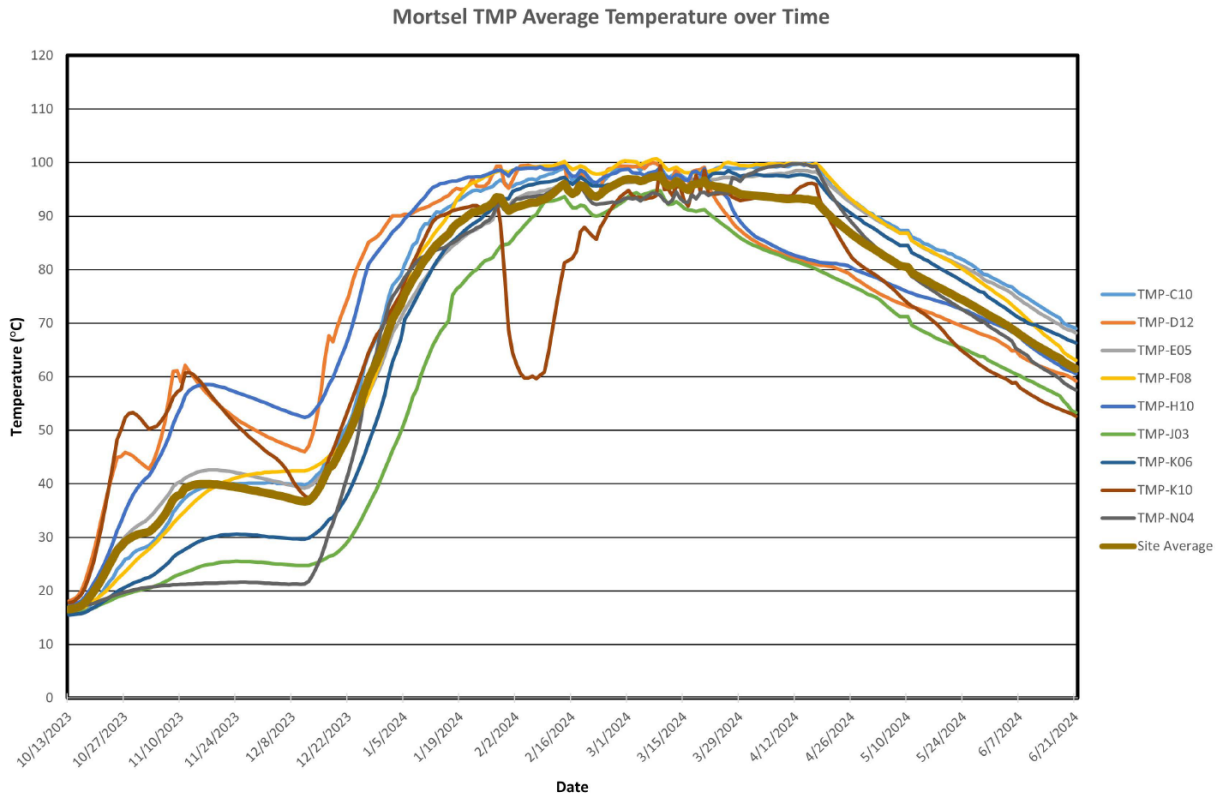

Mortsel TMP Average Temperature over Time
Temperature (°C)
120
110
100
90
80
70
60
50
40
30
20
10
0
10/13/2023
10/27/2023
11/10/2023
11/24/2023
12/8/2023
12/22/2023
1/5/2024
1/19/2024
2/2/2024
2/16/2024
3/1/2024
3/15/2024
3/29/2024
4/12/2024
4/26/2024
5/10/2024
5/24/2024
6/7/2024
6/21/2024
Date
TMP-C10
TMP-D12
TMP-E05
TMP-F08
TMP-H10
TMP-J03
TMP-K06
TMP-K10
TMP-N04
Site Average

Figure 3. Cumulative Mass Removed vs. Time