STORMWATER QUALITY MONITORING IN VIIMSI

Kristjan Suits
Department of Civil Engineering and Architecture
Tallinn University of Technology

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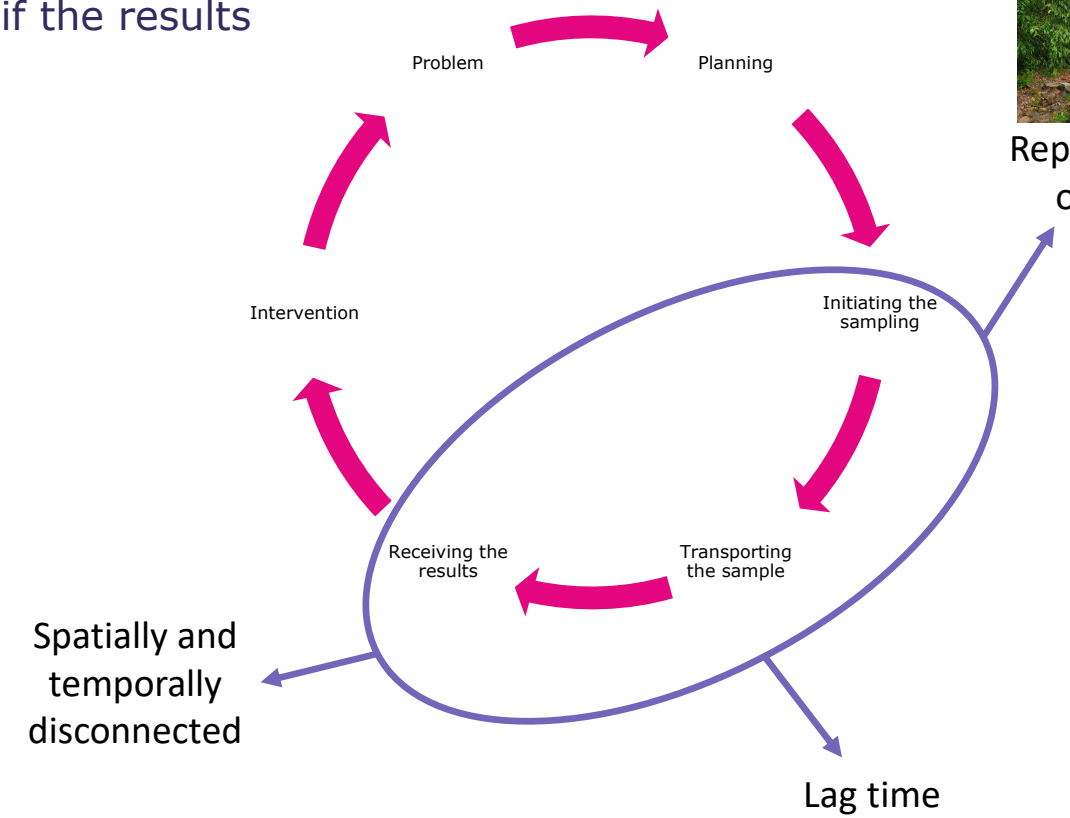
CURRENT STORMWATER SAMPLING IS PROBLEMATIC

- What are we actually representing with a grab sample?
- Is the snapshot of the water quality sufficient for planning an intervention?
- How can you solve the problems if the results are not in real time?

Representativeness of the sample



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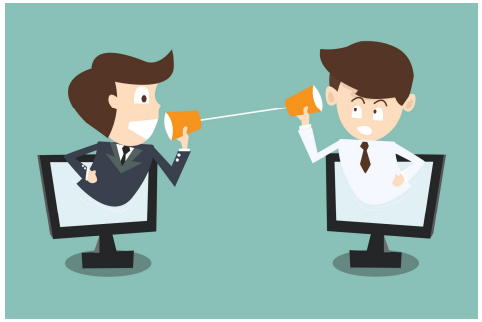
WHAT ARE THE TYPICAL CHALLENGES RELATED TO STORMWATER SAMPLING?

- Sample collection
  - Lack of standardized procedures
  - Timing the sample collection
  - Accuracy of weather forecasts (lack of local rainfalls)
  - Defining a rainfall event
- Communication:
  - Responsibility of the contractor (verification of sample collection)
  - Simplicity (contractor wishes not to deviate from the contract)
- Practical issues:
  - Grab sampling
  - Laboratory opening hours



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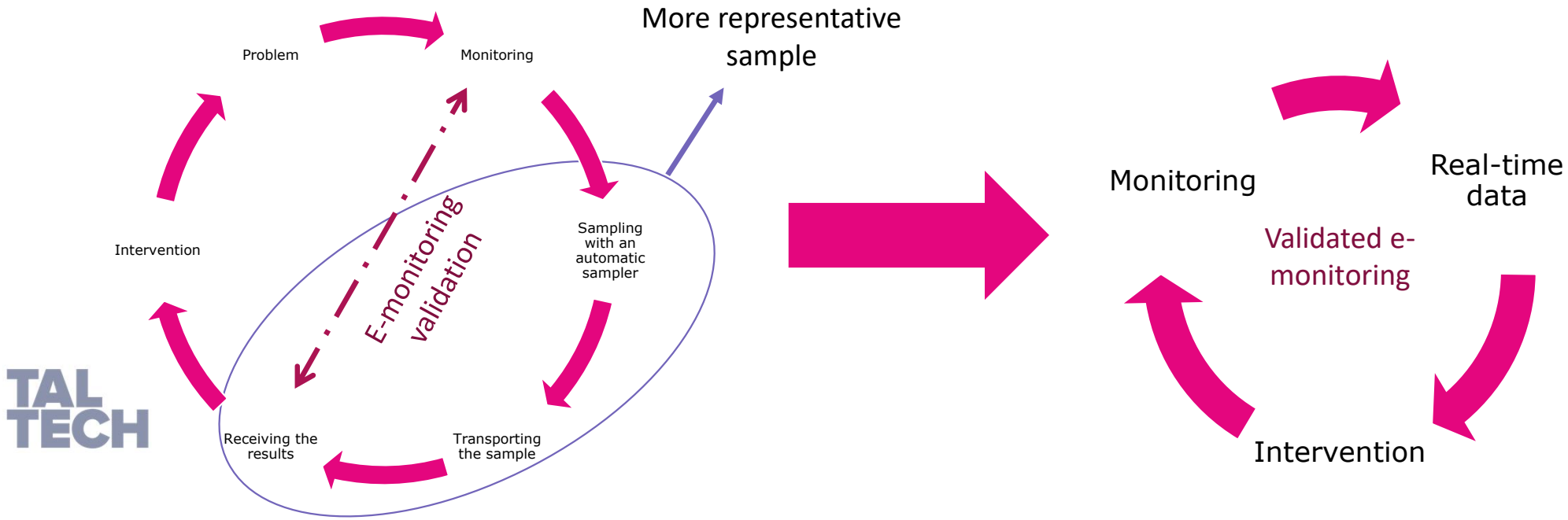
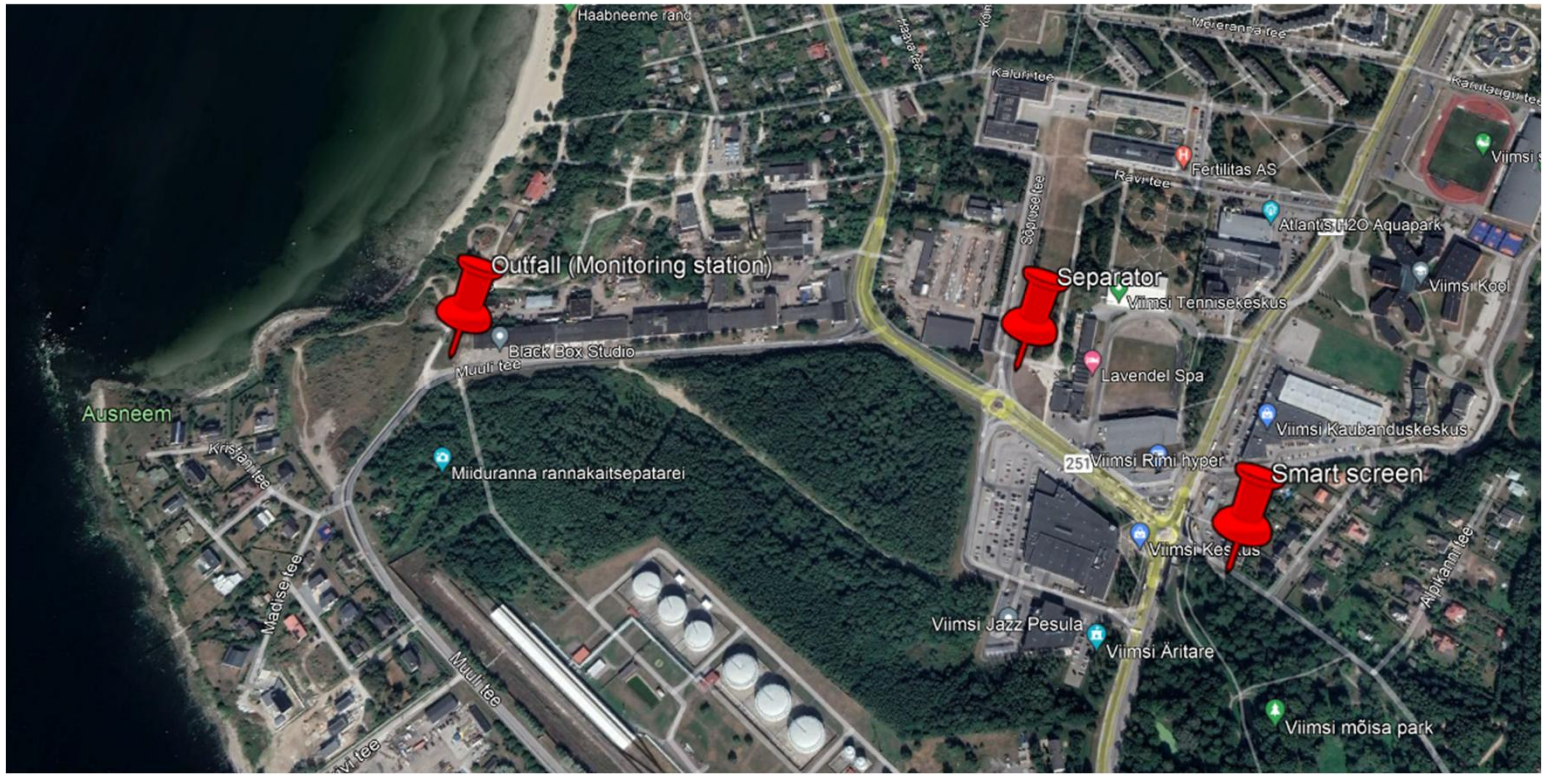
HOW CAN WE IMPROVE THE UTILITY OF SAMPLING? PATH TOWARDS E-MONITORING

- E-monitoring system is comprised of sensors, communication devices, actuators and software.
- Monitoring allows to better deal with the stochastic nature of stormwater quality and quantity.
- E-monitoring has the potential to provide high-resolution data on the changes in water quality and quantity.



BUILT E-MONITORING SOLUTION IN VIIMSI

- Outfall (Monitoring station) – DO, turbidity, EC, pH, oil and temperature sensors and flow and level sensors.
- Smart screen – EC, turbidity, temperature and level sensor, vessel for garbage collection with filling alarm.
- Separator – oil and sediment level sensors, pH, temperature, turbidity, EC, DO sensors.



EXPECTED IMPACT OF THE INSTALLED SYSTEM

- Collect data on stormwater quality and quantity dynamics.
- Visualize the data on a continuous basis in VAAL (Viimsi Municipality's system).
- Future perspective (1): collect sufficient data for establishing site-specific water quality baselines.
- Future perspective (2): Combining the system with control devices for managing stormwater quality / quantity.
- Tangible result (1): Trash screen is working as designed, collecting rubbish and informing upon filling.
- Tangible result (2): Oil separator is installed and according to manufacturers specification the outlet should not have more than 3 mg/l TSS and 0.05 mg/l oil concentration.

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SAMPLING

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OVERVIEW OF SAMPLING STRATEGY

- Viimsi had very little historical data on stormwater quality
- Monitored points – 4
- Samples – 7 (28 total)
- ~ 20 000 € spent on sampling
- Wet / dry weather samples – 4 / 3
- Primary goal was to evaluate the extent to which heavy metals are bound to sediments in Viimsi catchment area.
- **Grab sampling (discrete)** was assumed to represent continuous measurements better.

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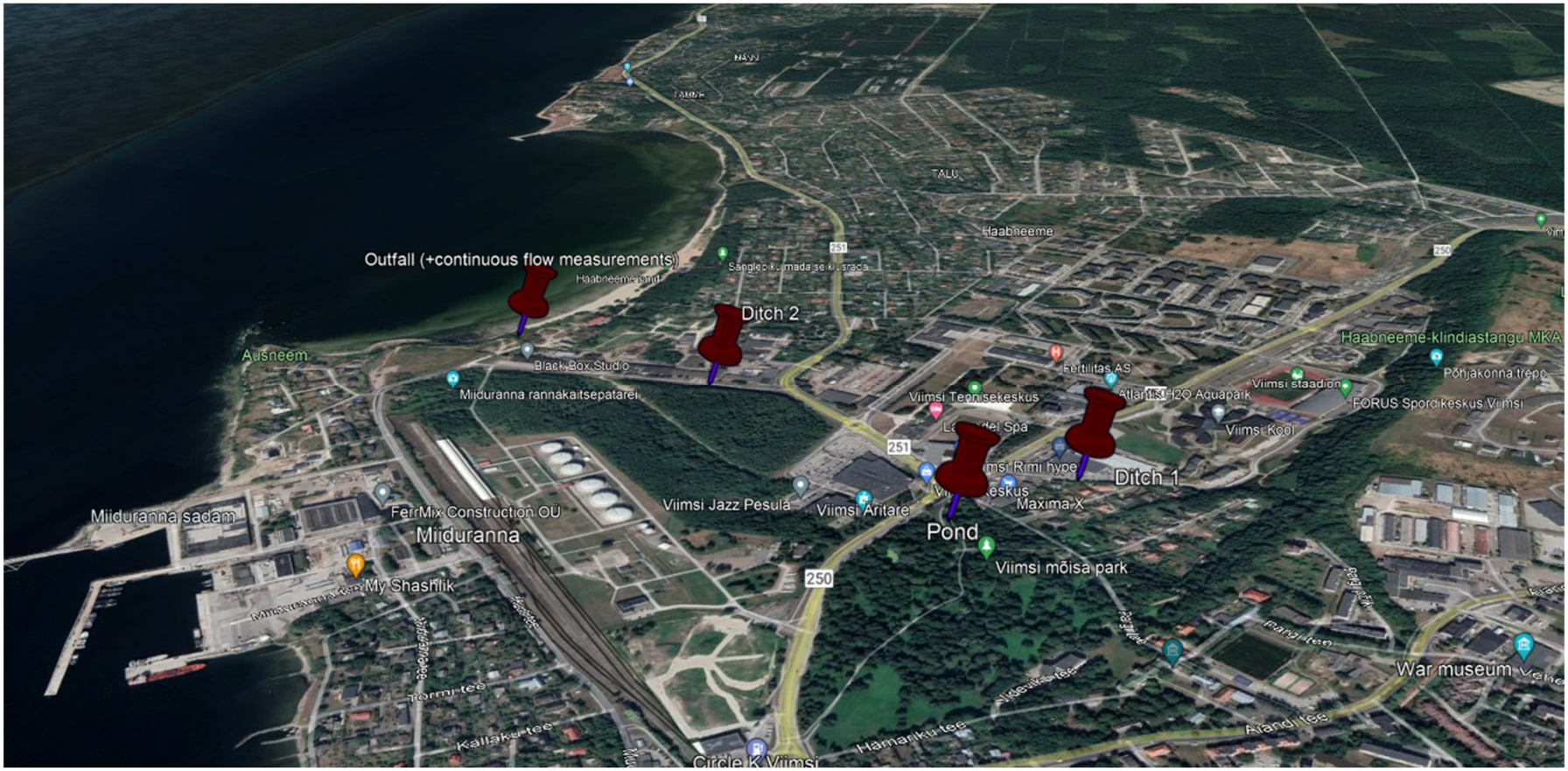
SAMPLING LOCATIONS IN VIIMSI



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LIST OF MONITORED PARAMETERS

- EC
- TSS
- Turbidity
- pH/ORP
- Dissolved oxygen
- TOC
- Ions (HCO3, Cl, SO4, Ca, Mg, Na, K)
- Nutrients (TP, TN)
- Metals (Cd, As, Al, Cr, Pb, Zn, Cu, Fe, Ni)
- Pathogens (E.coli, enterococci)
- Water level, flow velocity, flow rate

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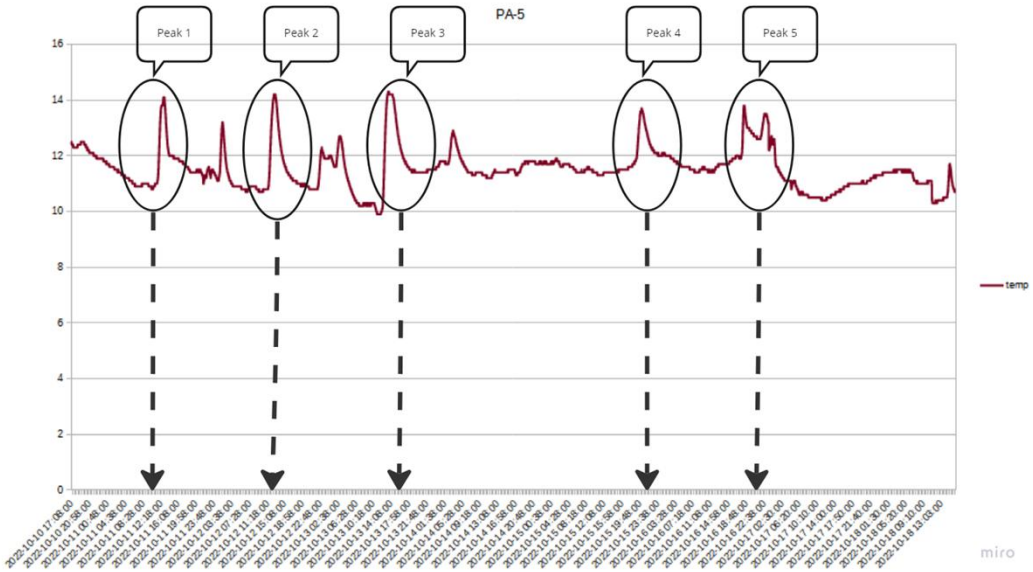
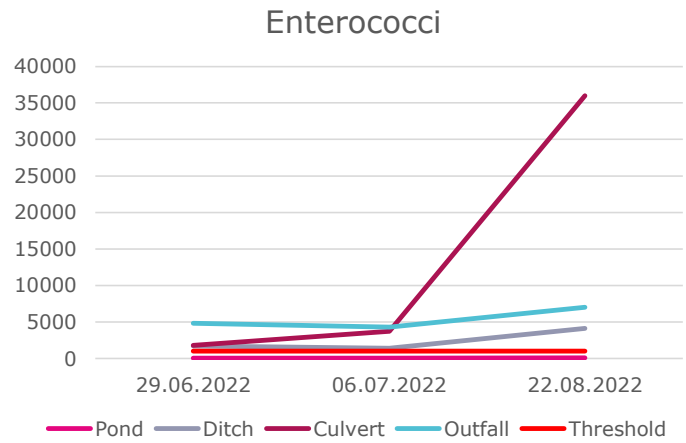
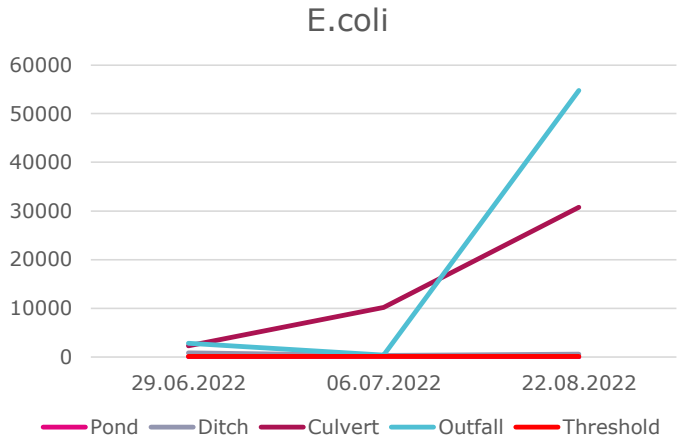
OVERVIEW OF MEASUREMENTS (MIN, MAX, AVERAGE)

- Sampling showed microbiological contamination in the catchment.
- Occasional peaks of Al, Fe, Cl, SO4, temperature were noted (e-monitoring shall give further input to locate the sources).







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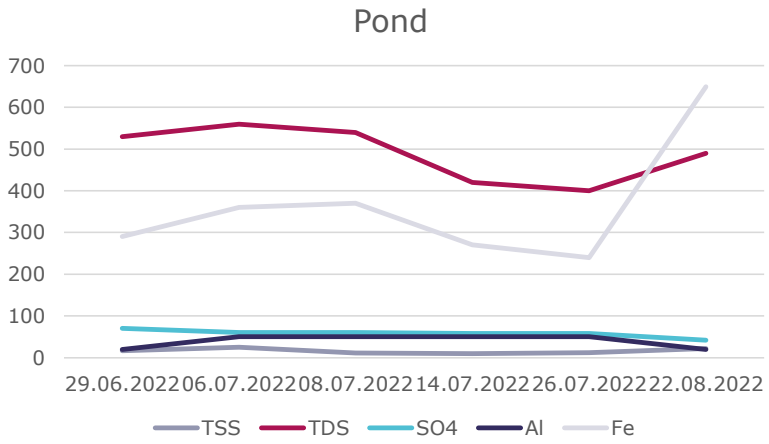
Pond
700
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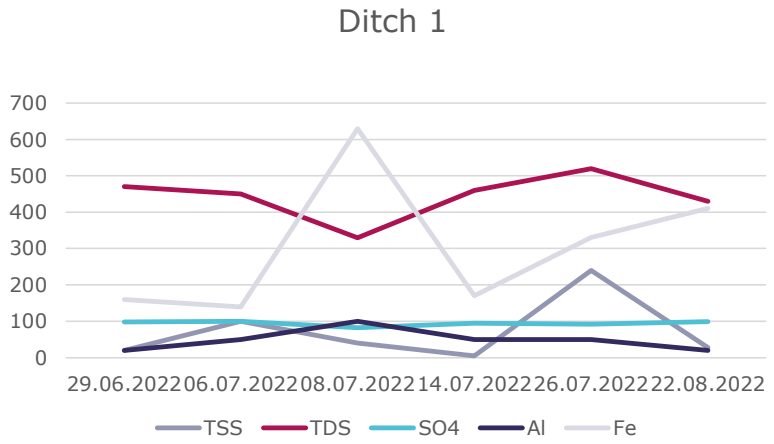
300
200
100
0
29.06.2022
06.07.2022
08.07.2022
14.07.2022
26.07.2022
22.08.2022
TSS
TDS
SO4
Al
Fe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29.06.2022
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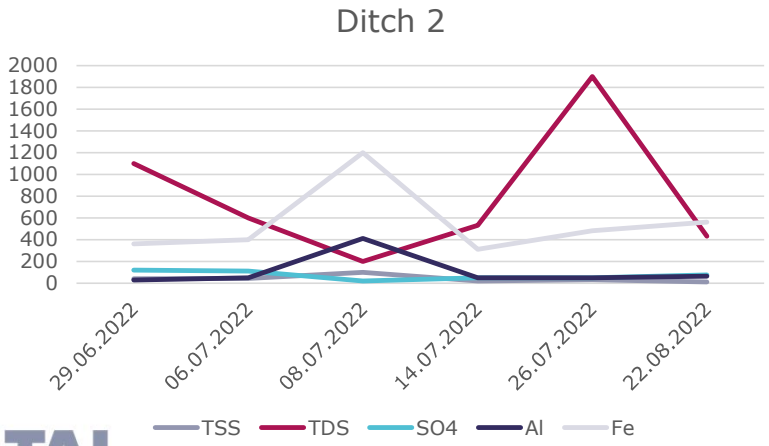
26.07.2022
22.08.2022
TSS
TDS
SO4
Al
Fe


Ditch 2
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29.06.2022
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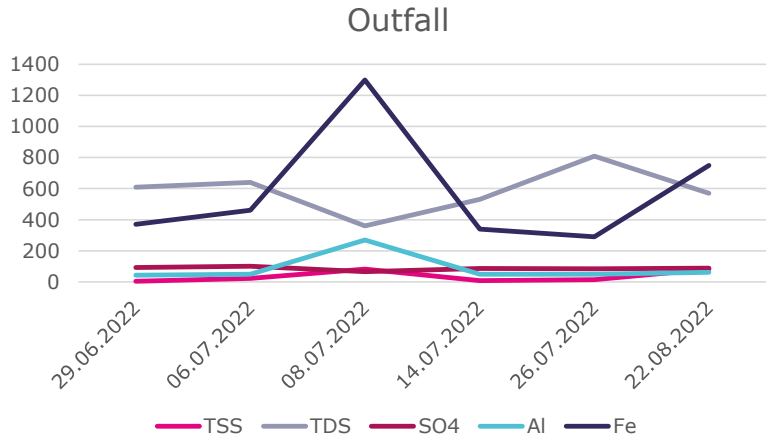
26.07.2022
22.08.2022
TSS
TDS
SO4
Al
Fe


Outfall
1400
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29.06.2022
06.07.2022
08.07.2022
14.07.2022
26.07.2022
22.08.2022
TSS
TDS
SO4
Al
Fe

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CONCLUSIONS

- CleanStormWater project allowed Viimsi's municipality to install the first of its kind stormwater e-monitoring solution in Estonia.
- The data collection has began and it is going to continue well past this project, the feasibility of installing such a system shall be evaluated.
- The site is going to be a test-bed for future research on stormwater quality in Estonia.
- Interventions have a clear effect in terms of preventing oil and rubbish from entering the Baltic Sea.
- The sampling undertaken during the project helped to determine some of the illegal connections that contribute to the pollution of the Baltic Sea.
- The project also directs the efforts to determine the other sources of pollution (as peaks in concentrations were detected).

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THANK YOU FOR ATTENTION

KRISTJANSUITS@TALTECH.EE

EUROPEAN UNION
European Regional Development Fund

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