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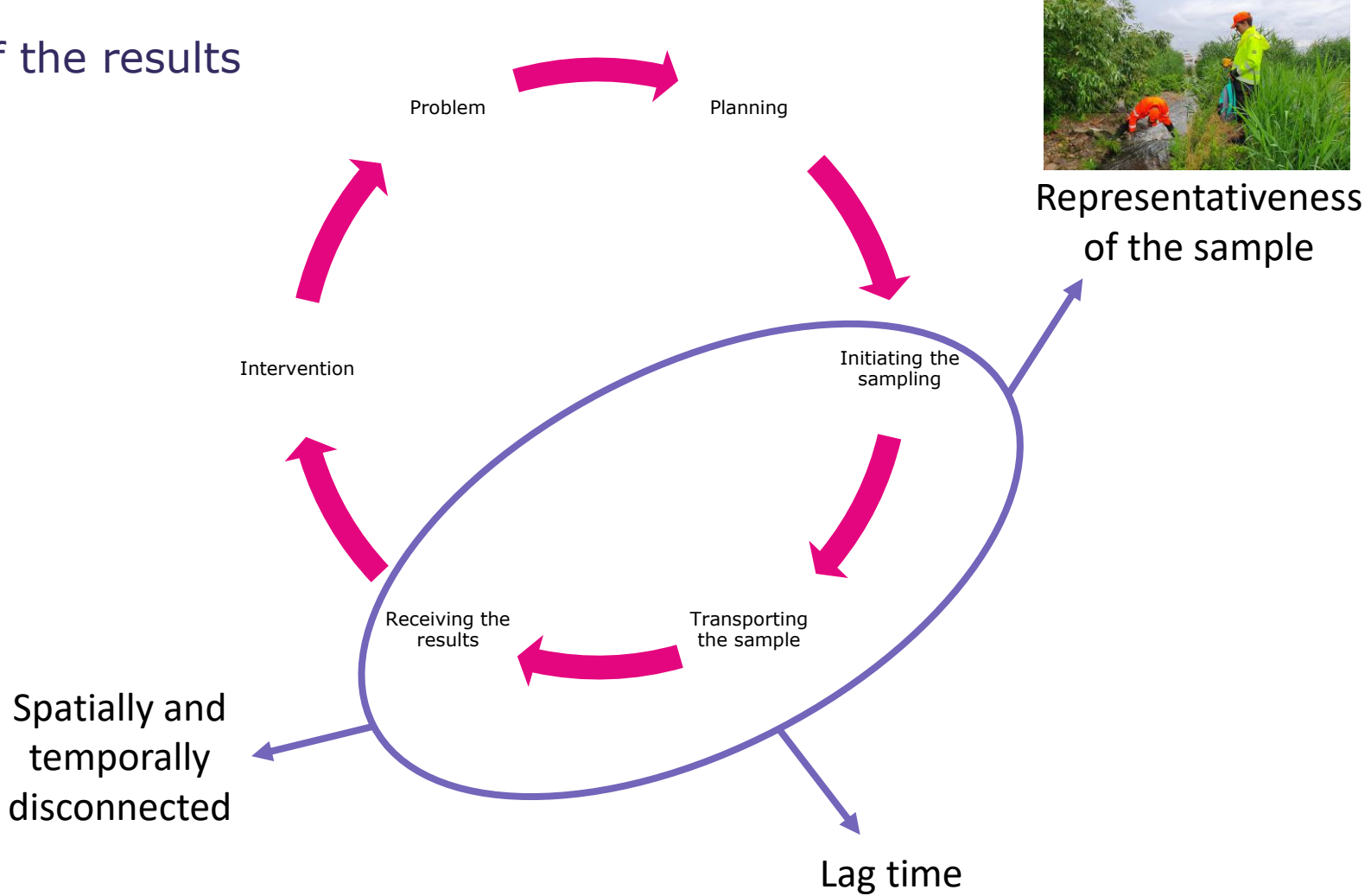
STORMWATER QUALITY MONITORING IN VIIMSI

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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?



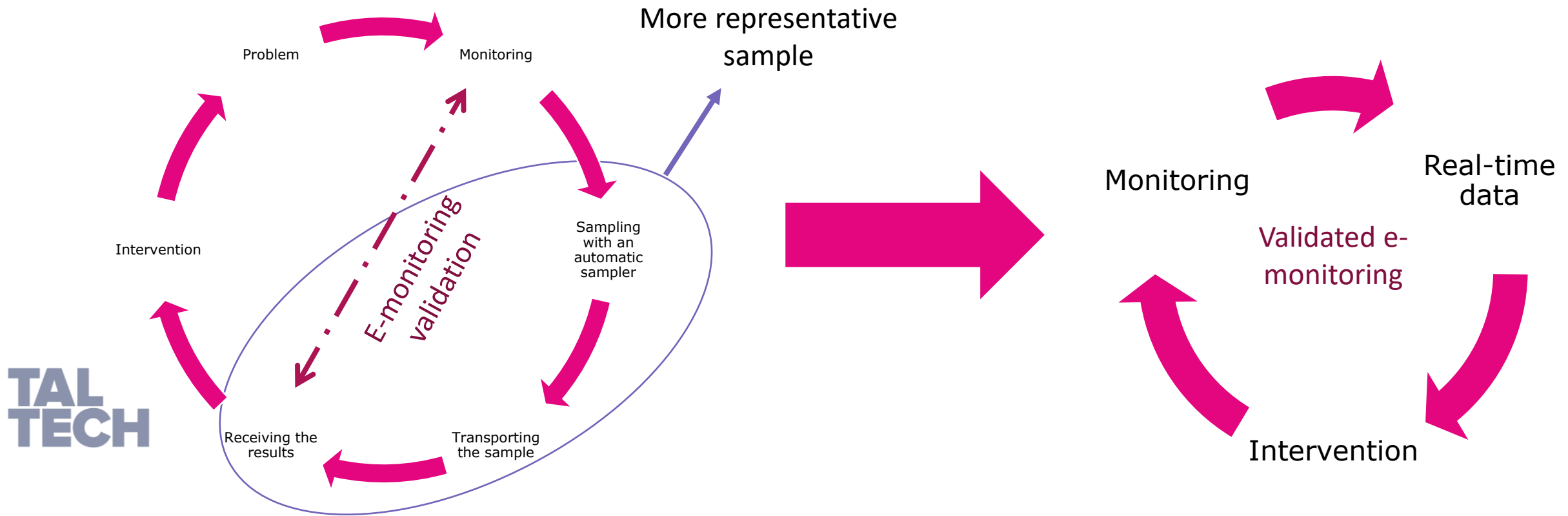
WHAT ARE THE TYPICAL CHALLENGES RELATED TO STORMWATER SAMPLING?

- 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



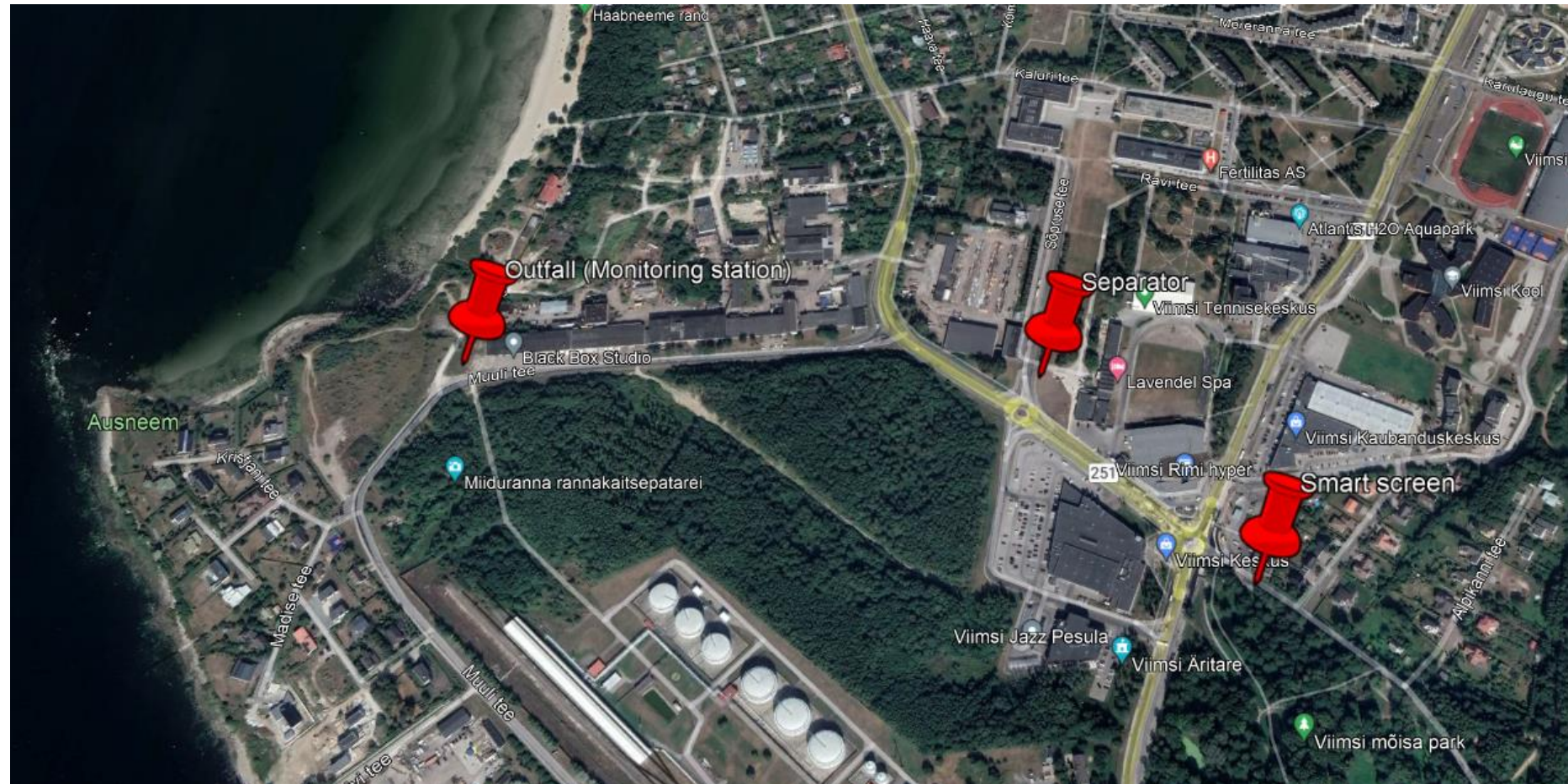
HOW CAN WE IMPROVE THE UTILITY OF SAMPLING? PATH TOWARDS E-MONITORING

- 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

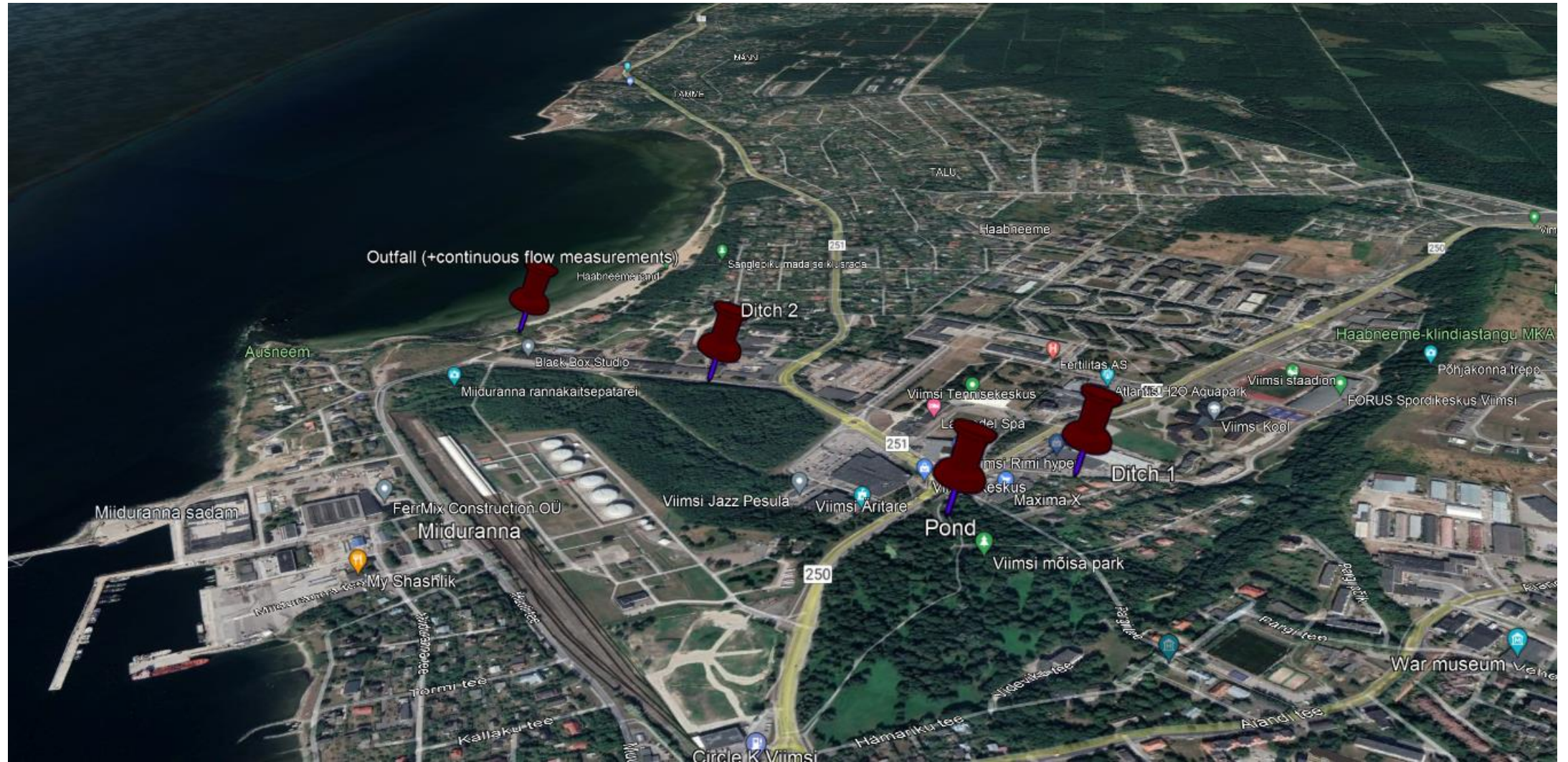
- Collect data on stormwater quality and quantity dynamics.
- Visualize the data on a continuous basis in VAAL (Viimsi Municipality's system).
- Future perspective (1): collect sufficient data for establishing site-specific water quality baselines.
- Future perspective (2): Combining the system with 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.

SAMPLING

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.

SAMPLING LOCATIONS IN VIIMSI



LIST OF MONITORED PARAMETERS

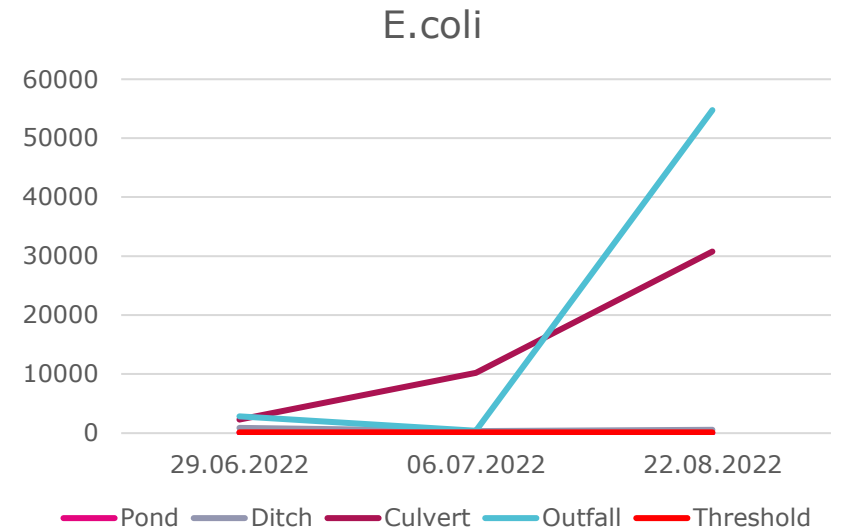
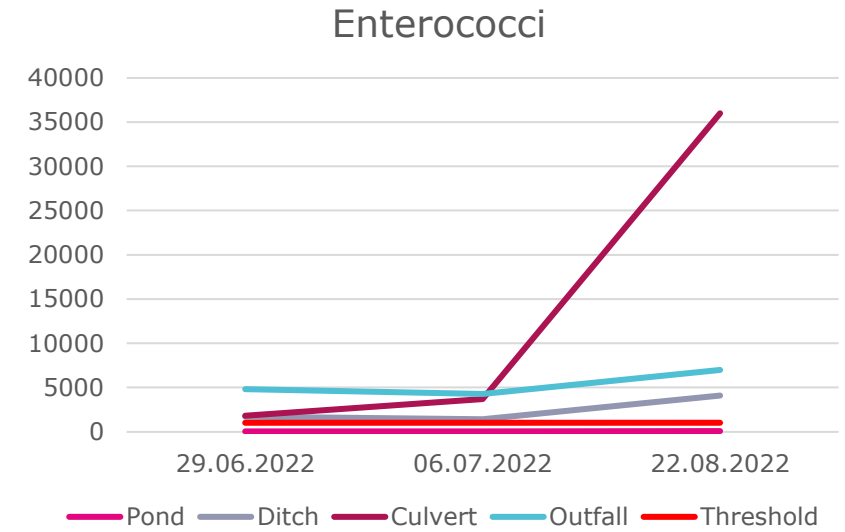
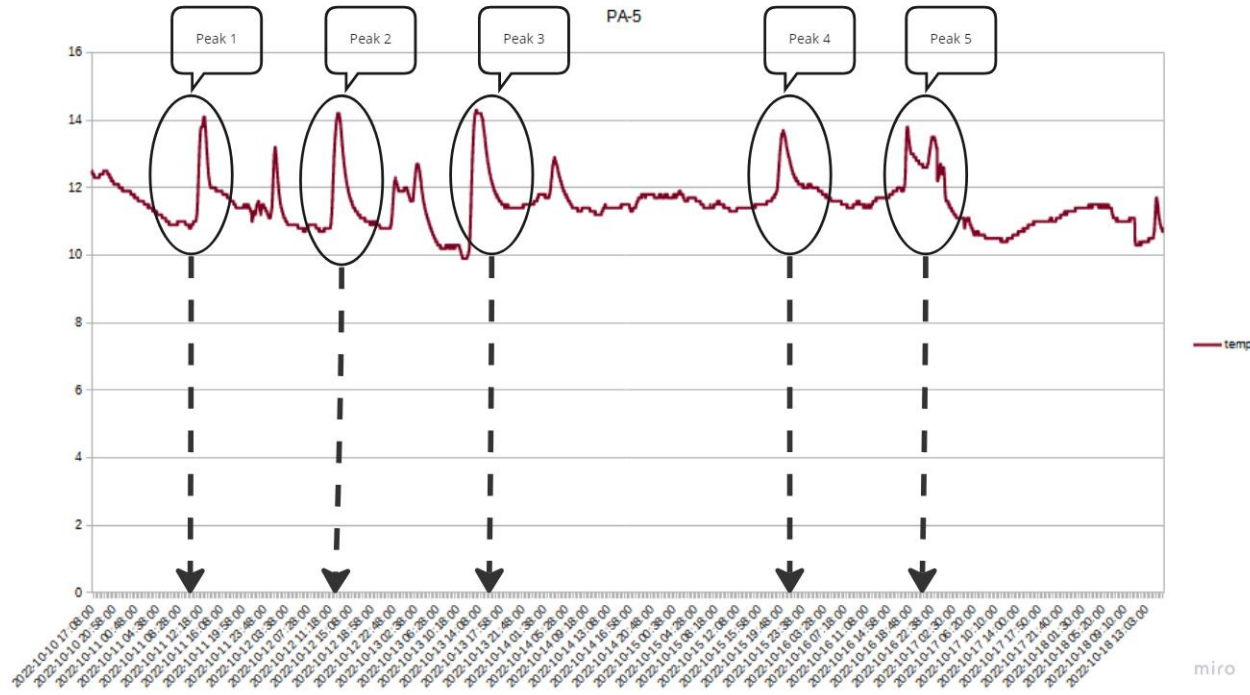
- EC
- TSS
- Turbidity
- pH/ORP
- Dissolved oxygen
- TOC
- Ions (HCO₃, Cl, SO₄, Ca, Mg, Na, K)
- Nutrients (TP, TN)
- Metals (Cd, As, Al, Cr, Pb, Zn, Cu, Fe, Ni)
- Pathogens (E.coli, enterococci)
- Water level, flow velocity, flow rate



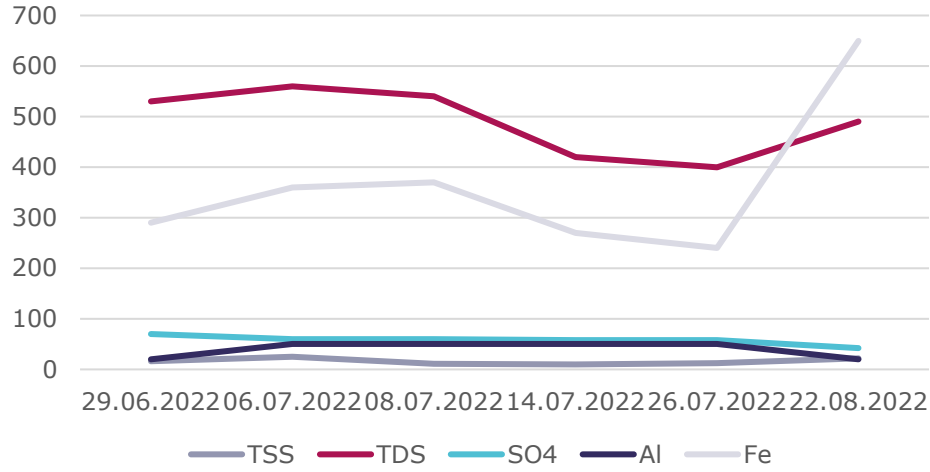
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OVERVIEW OF MEASUREMENTS (MIN, MAX, AVERAGE)

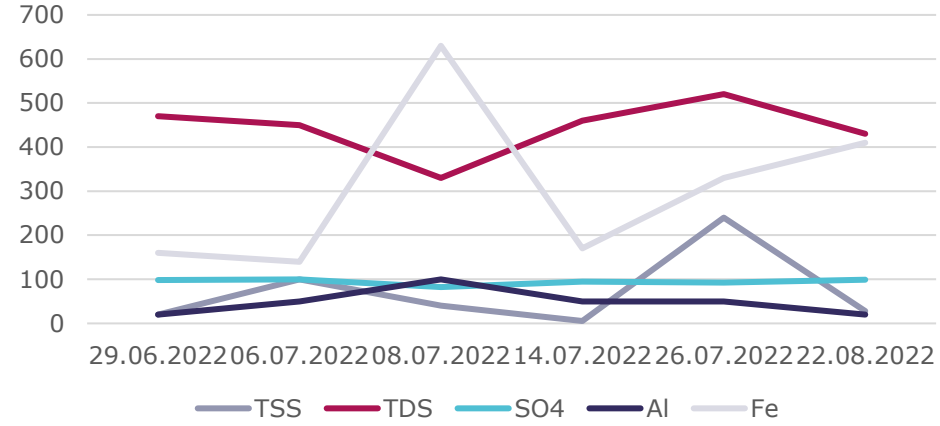
- Sampling showed microbiological contamination in the catchment.
- Occasional peaks of Al, Fe, Cl, SO₄, temperature were noted (e-monitoring shall give further input to locate the sources).



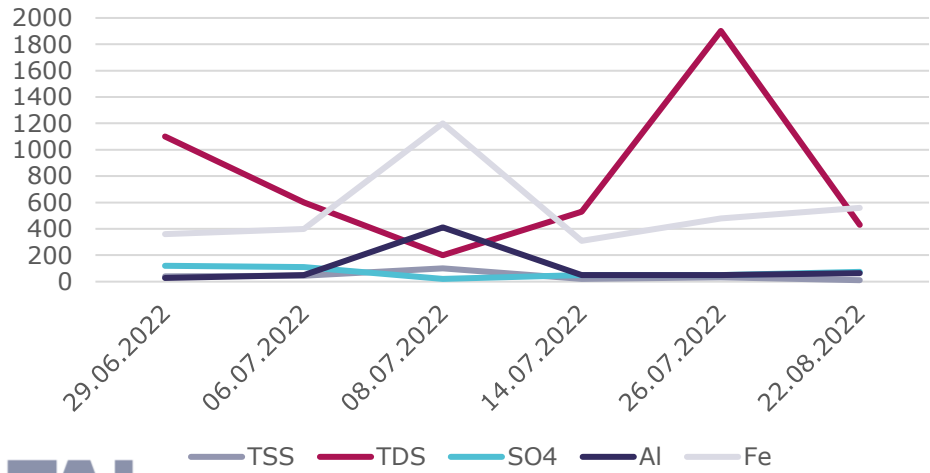
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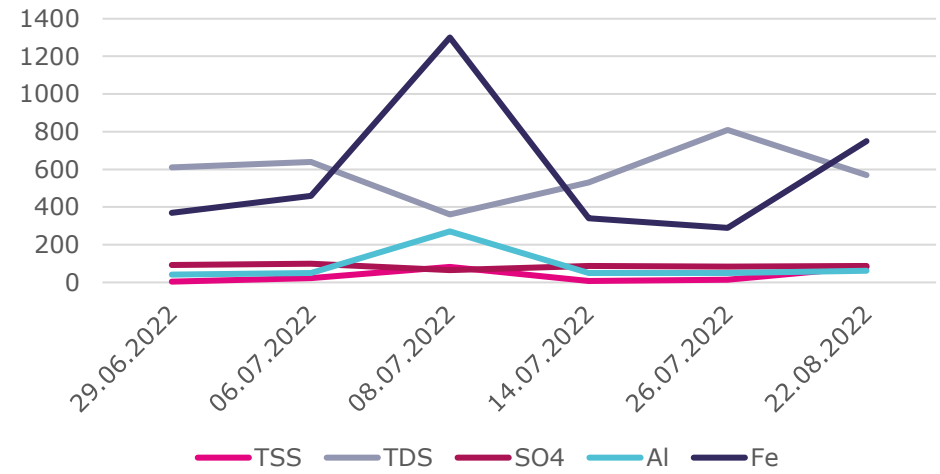
Ditch 1



Ditch 2



Outfall



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

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