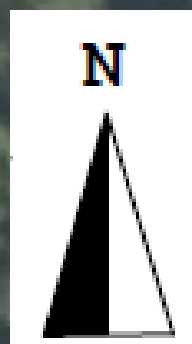




In-Situ Remediation of DNAPL Source and Plume at an Active Industrial Facility with Innovative Enhanced Reductive Dichlorination Technology

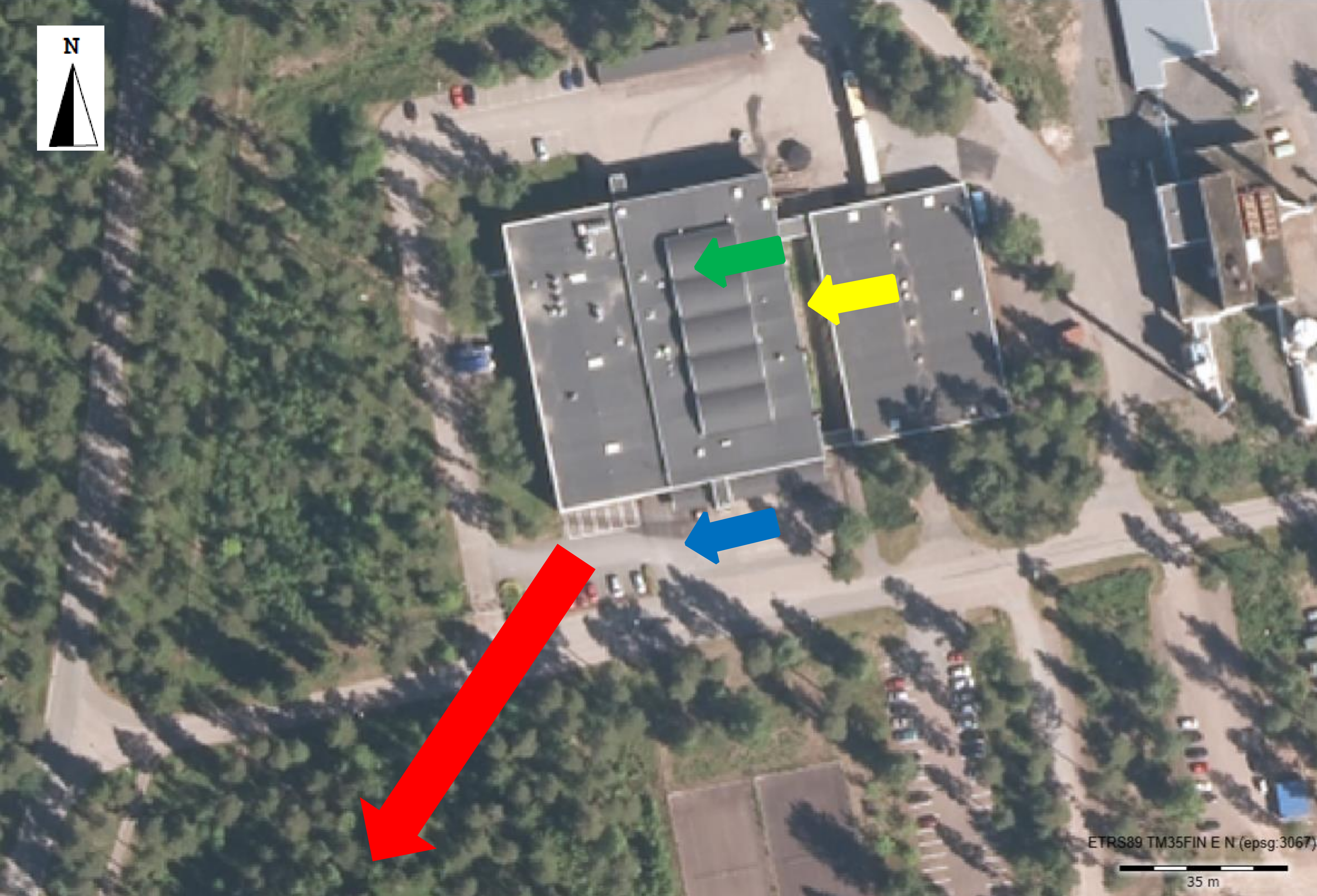


*Gabriele Giorgio Ceriani
In-Situ Remediation Services Team Leader
Ejlskov A/S*



Site History

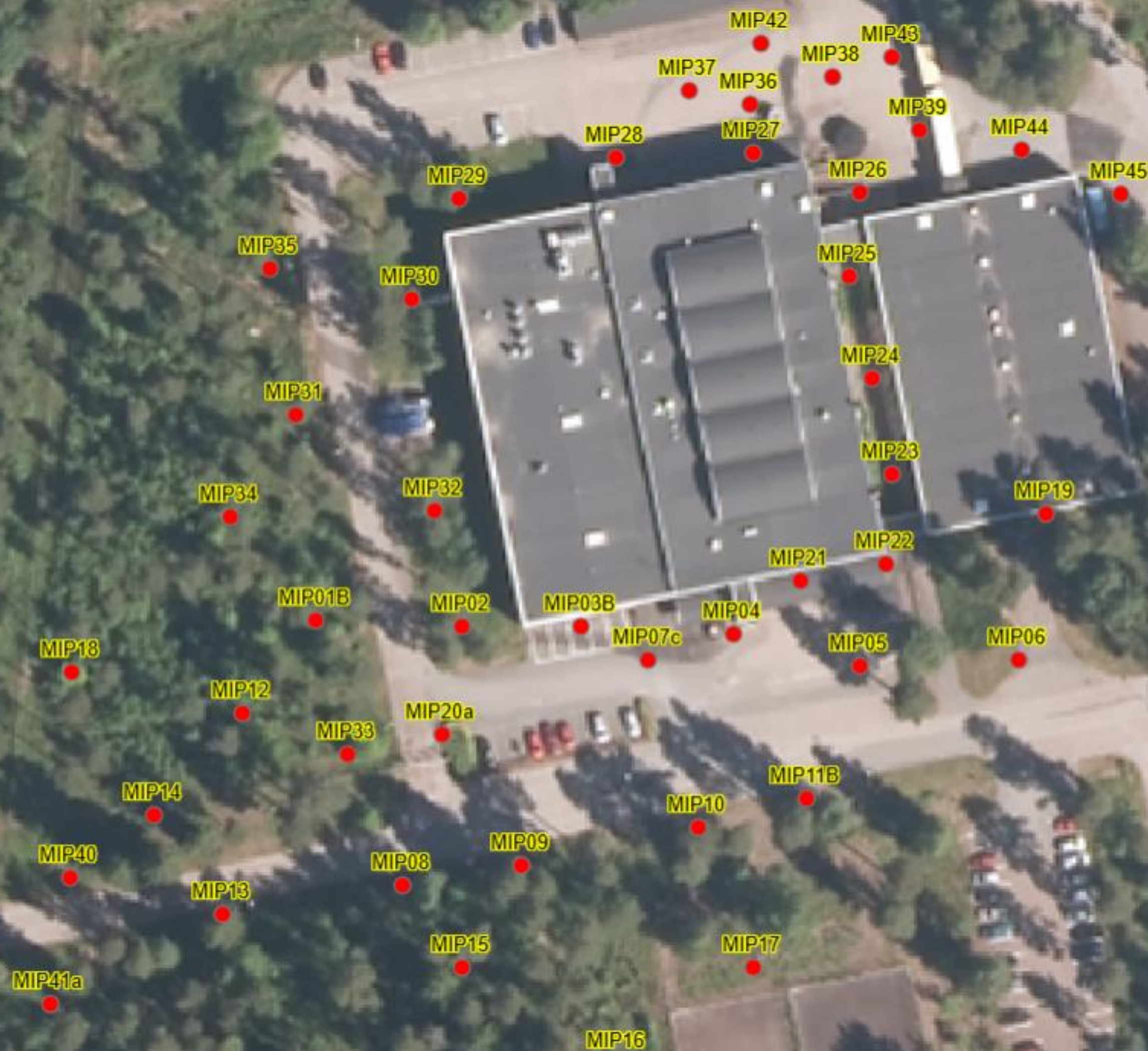
- Dry Cleaning / Repair Shop site active since the 1960s
- Excavation remediation in 2003 / 2004
- Pump & Treat active for 5 years
- Air/Bio Sparging active for few years post excavation works, then discontinued
- PCE plume forcing private house owners 2 km downgradient to discontinue pumping wells in their gardens





MIP Investigation

- Regular and Low Level MIP used to assess lateral and vertical extent of contamination
- MIP screening allowed to identify source zone located in area totally unknown to client and secondary off-site minor source zone
- Follow up soil sampling and GW wells installation based on MIP profile – TARGETED EFFORT



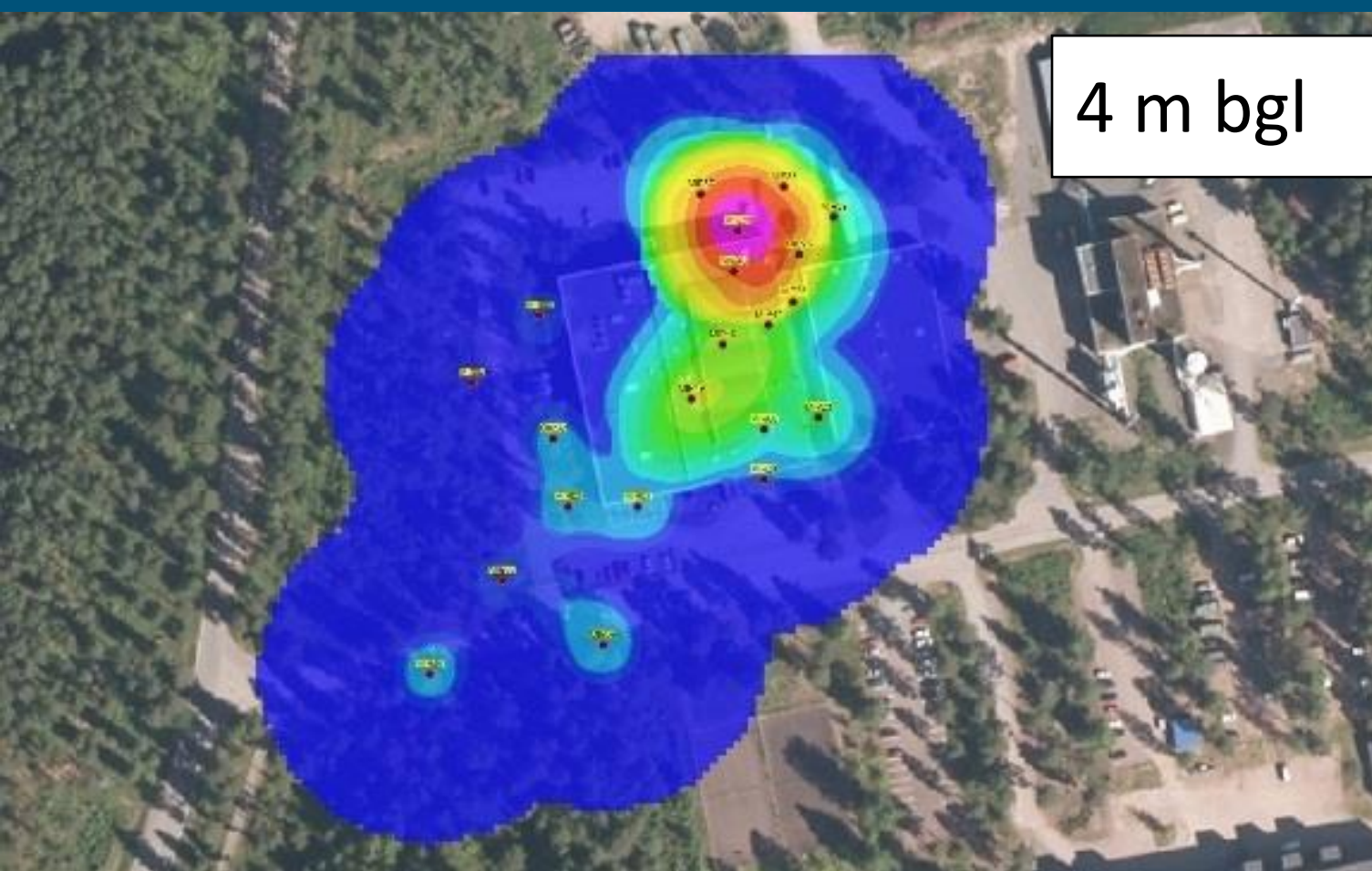
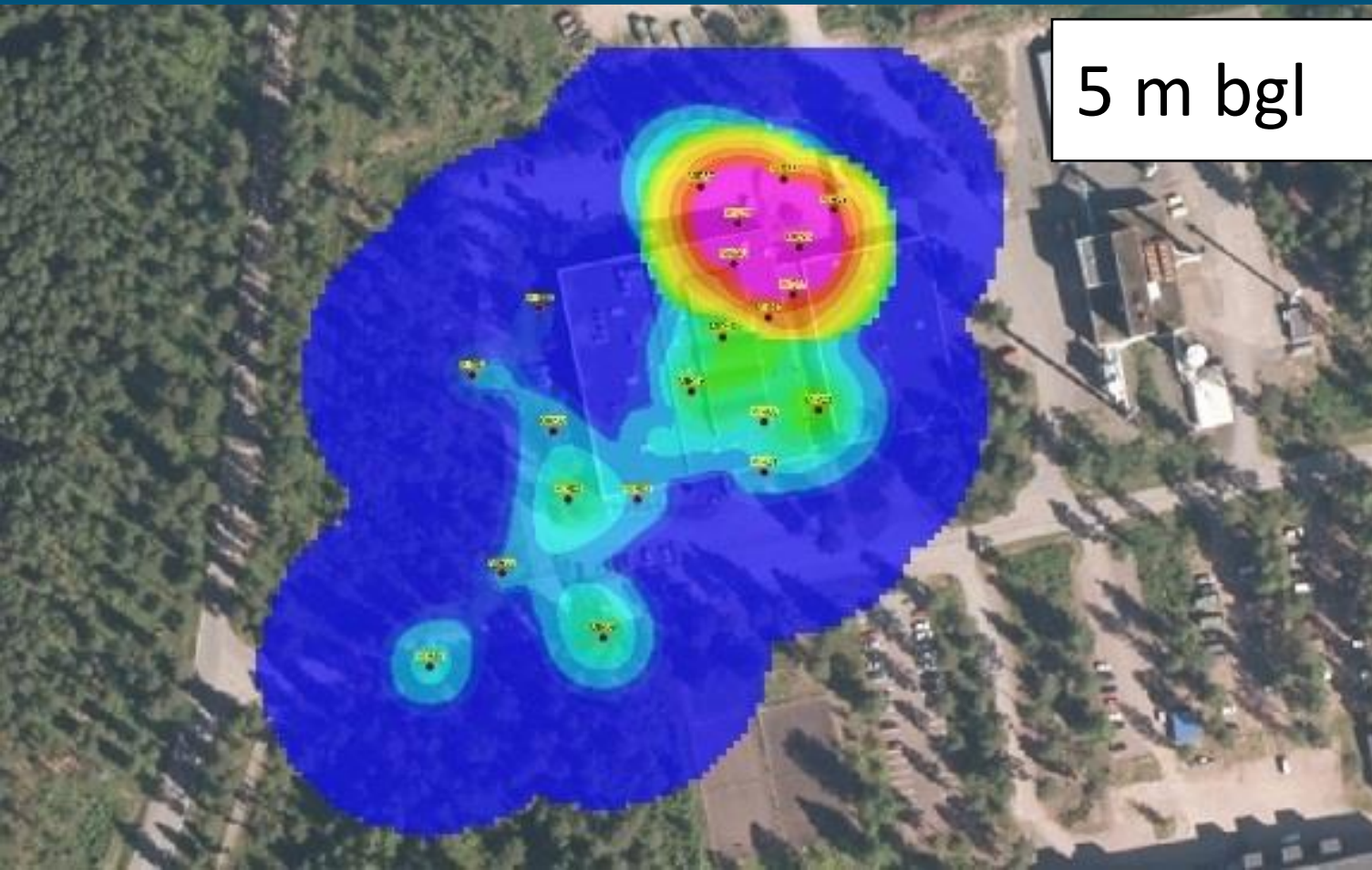
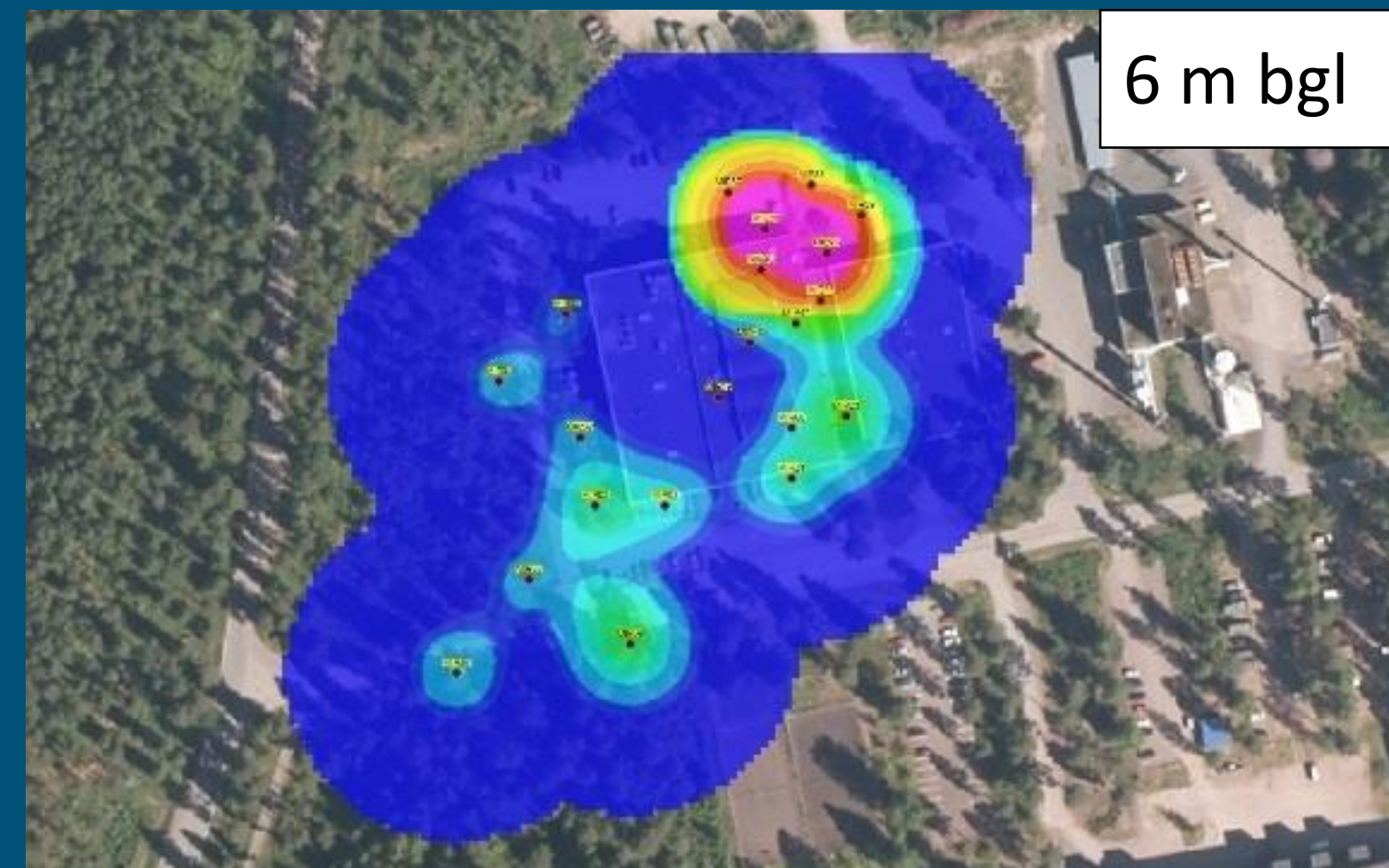
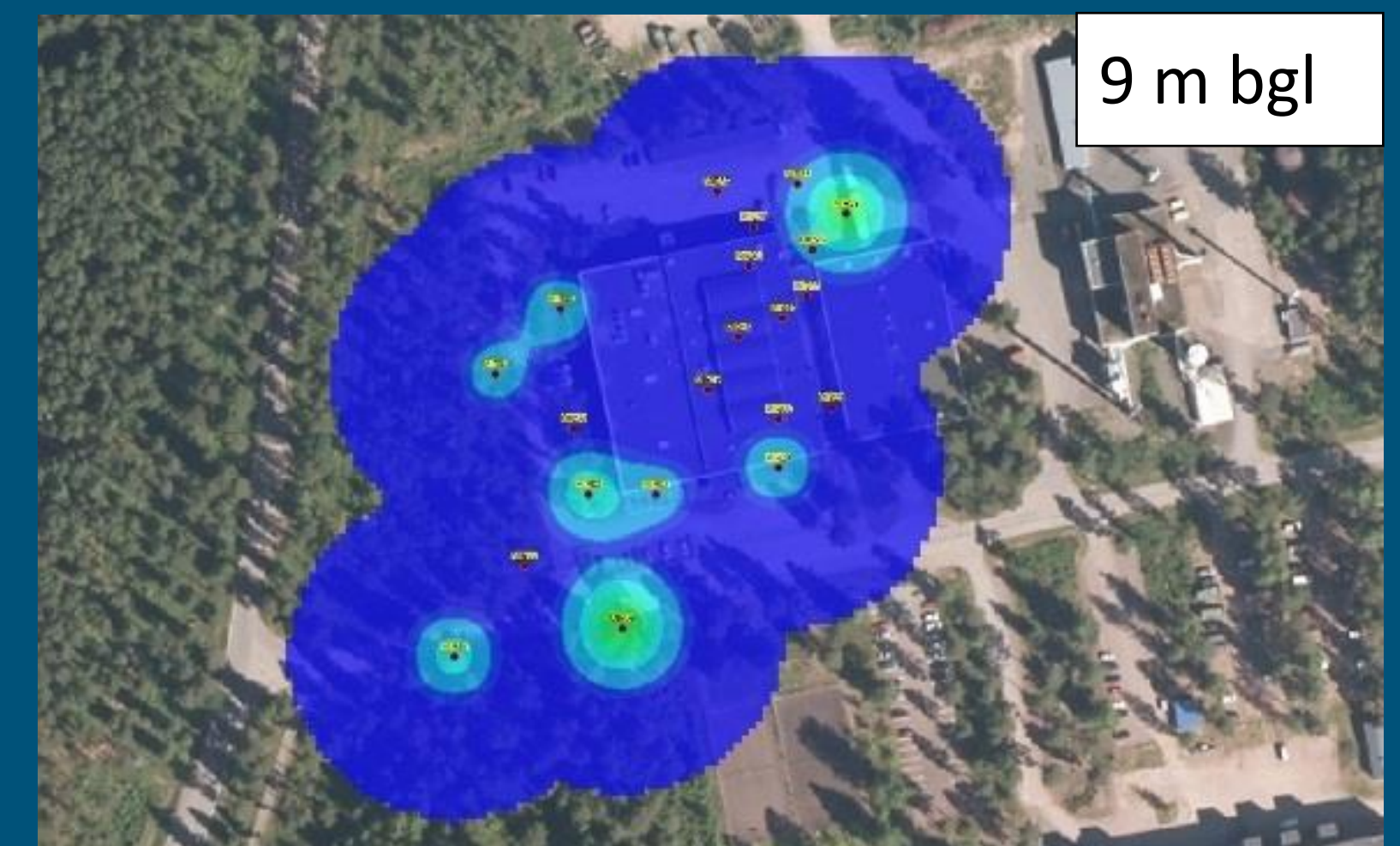
ETRS89 TM35FIN E N (epsg:3067)

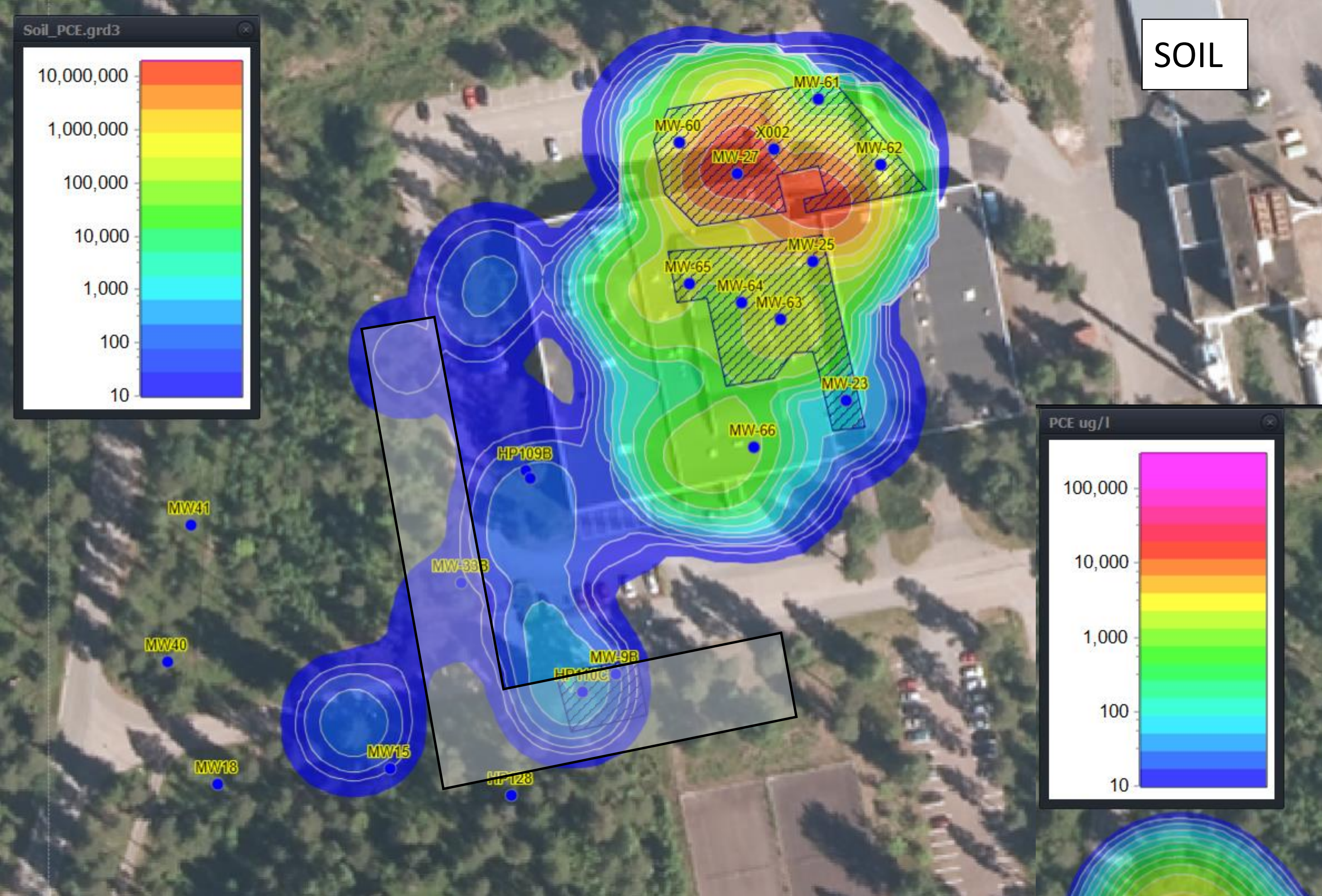
35 m

PCE Soil and MIP Data Interpolation

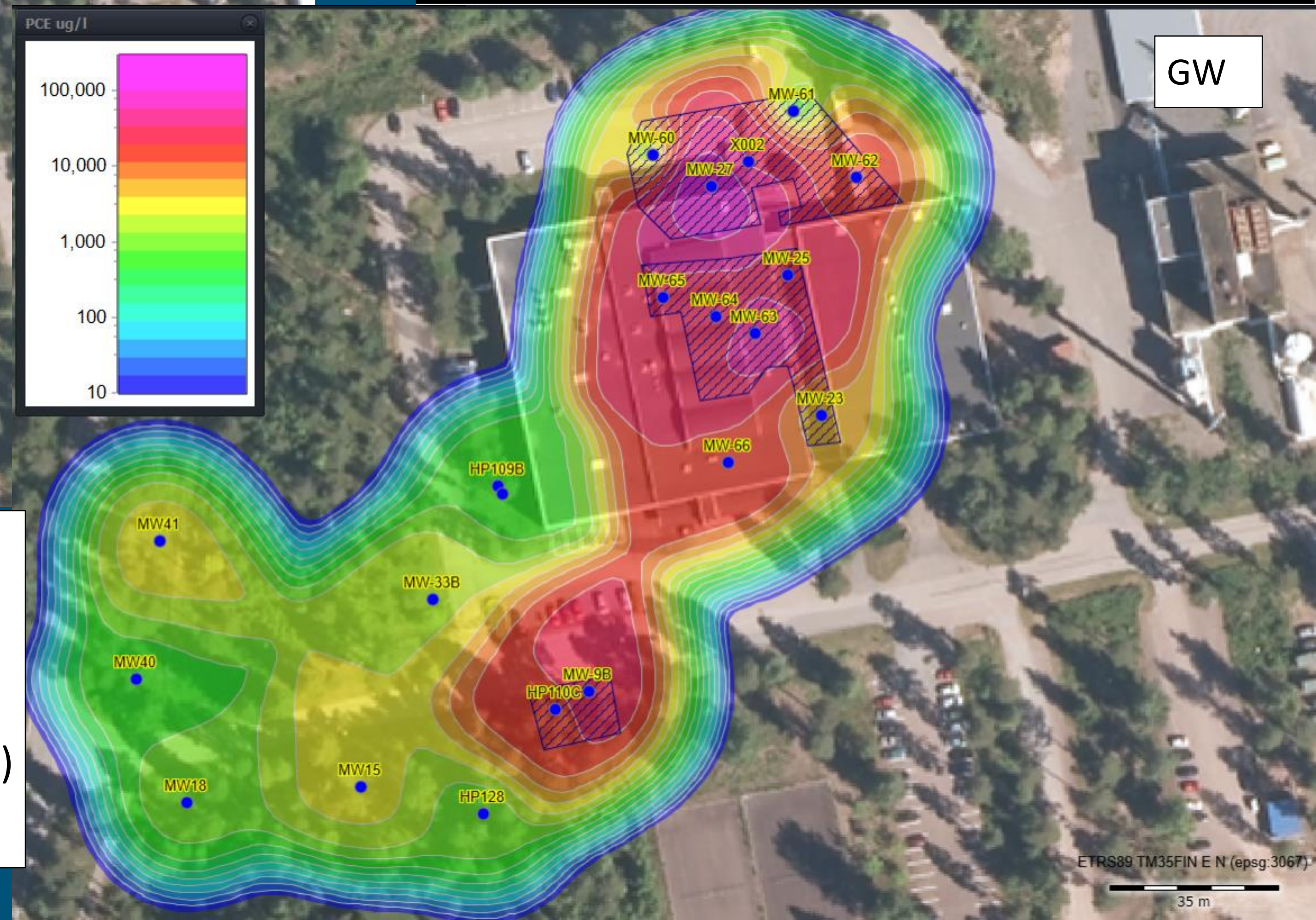
Total of ~300 soil samples collected across 25 soil cores

EJLSKOV
Cleaning up the earth





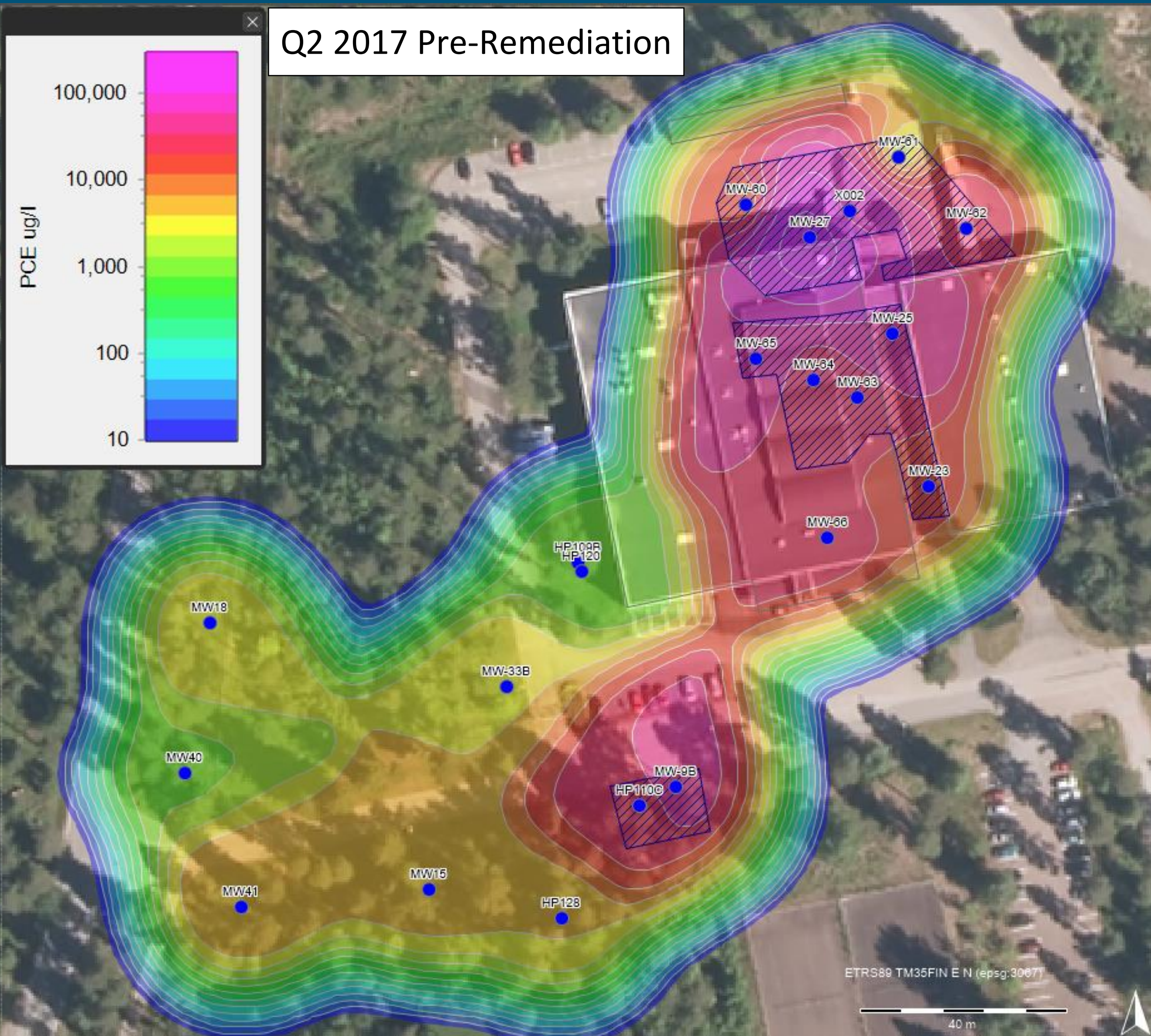
<i>SUBAREA ID</i>	<i>AREAL EXTENT (m2)</i>	<i>PCE MASS (kg)</i>
AREA A	350	16,000
AREA B	500	250
AREA C	250	150
AREA D	800	1,000
AREA E	250	50



Injection works completed between April and August 2017. A total of 702 injection points were completed across subareas A through E.

Approx. 52,000 Kg of CAT100 (incl. 3,800 kg of BOS100®) were installed

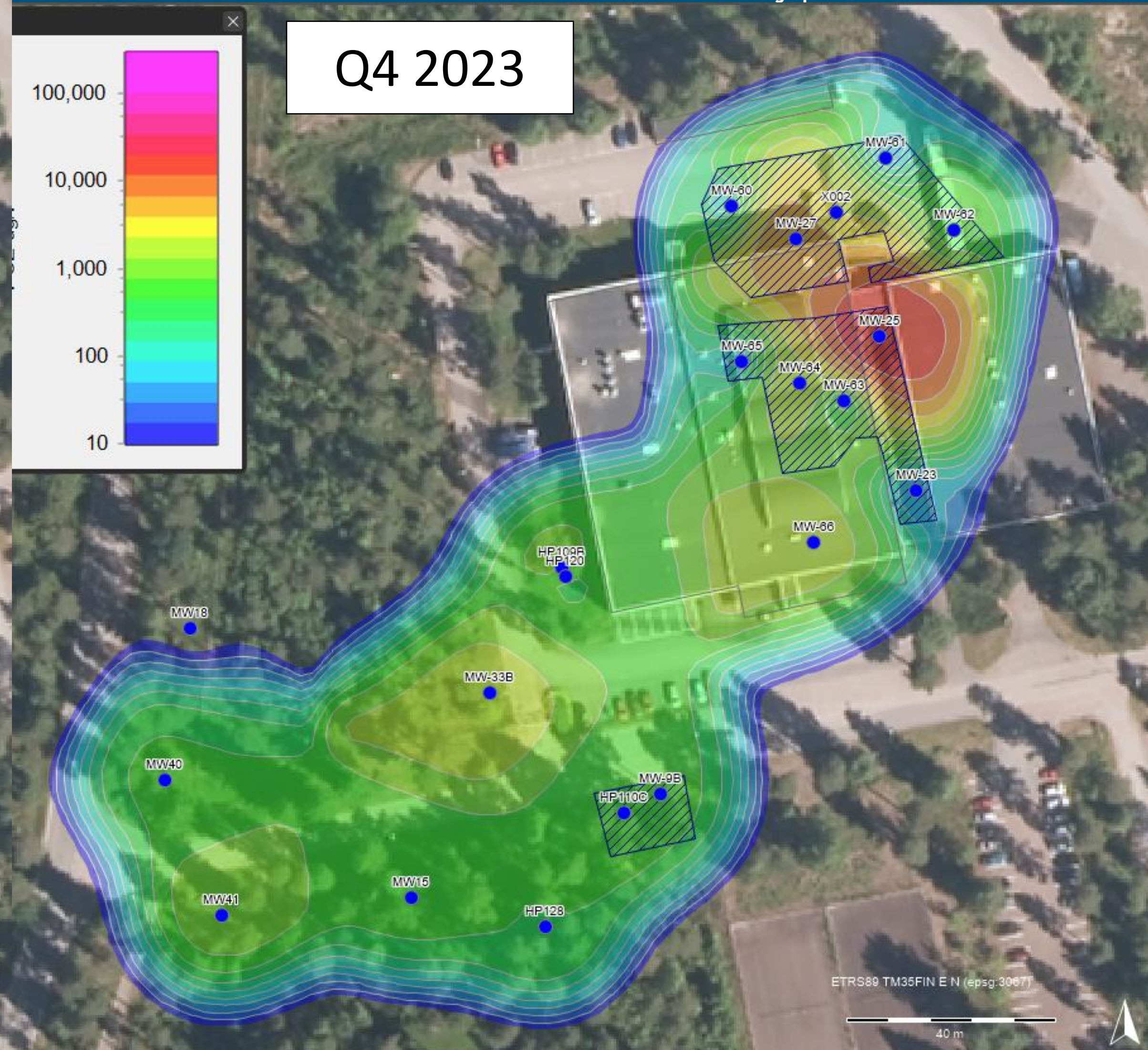
Q2 2017 Pre-Remediation



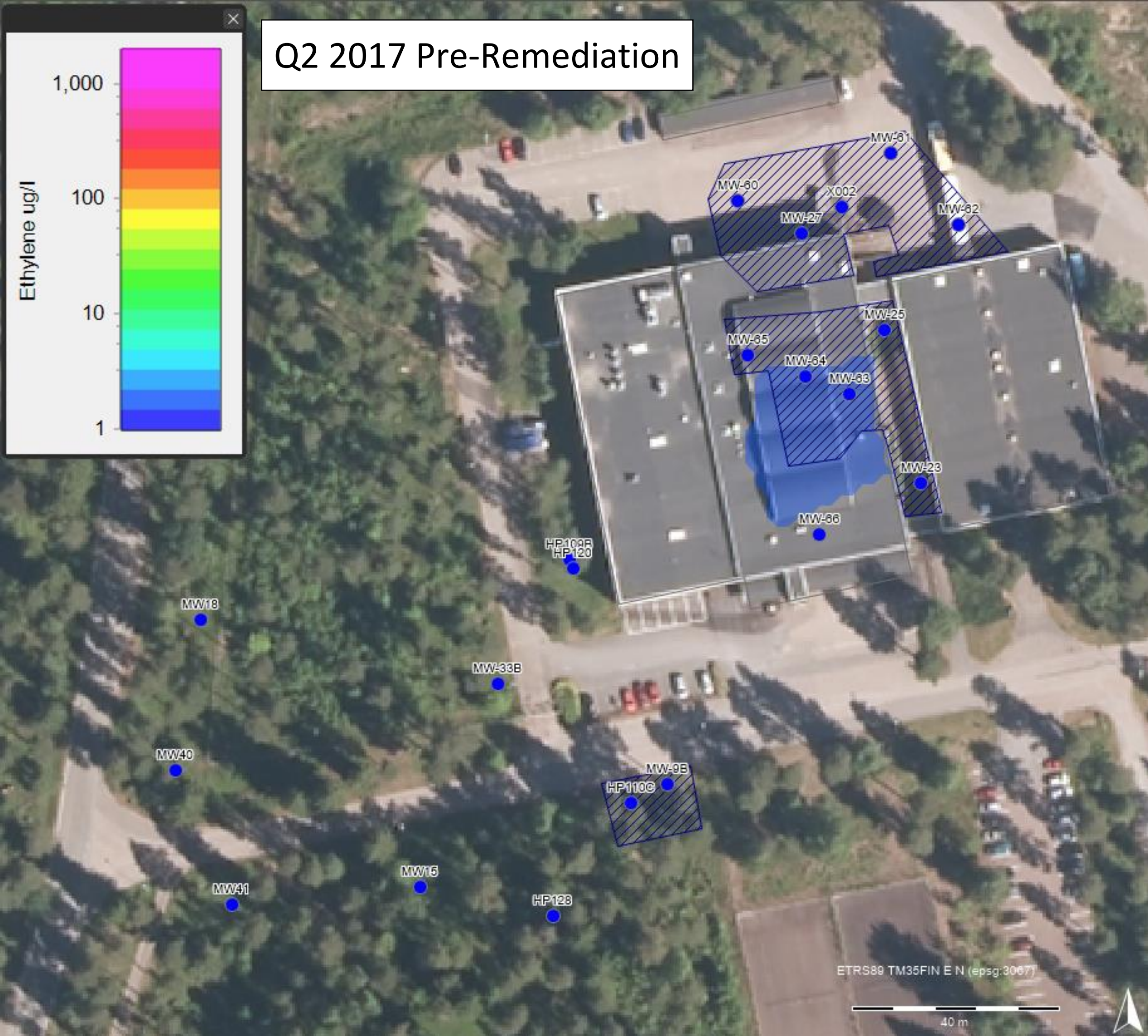
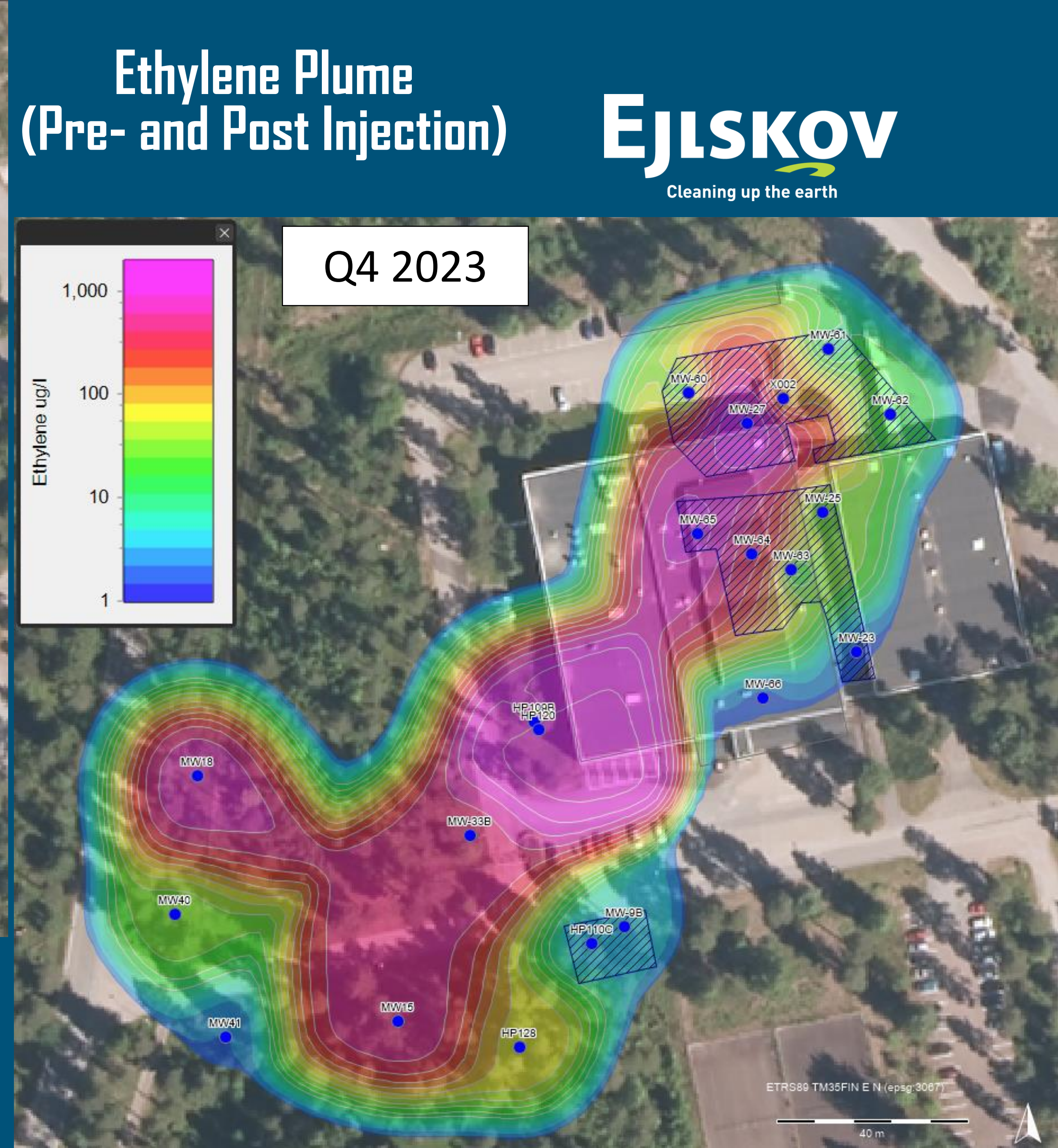
PCE Plume (Pre- and Post Injection)

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Cleaning up the earth

Q4 2023

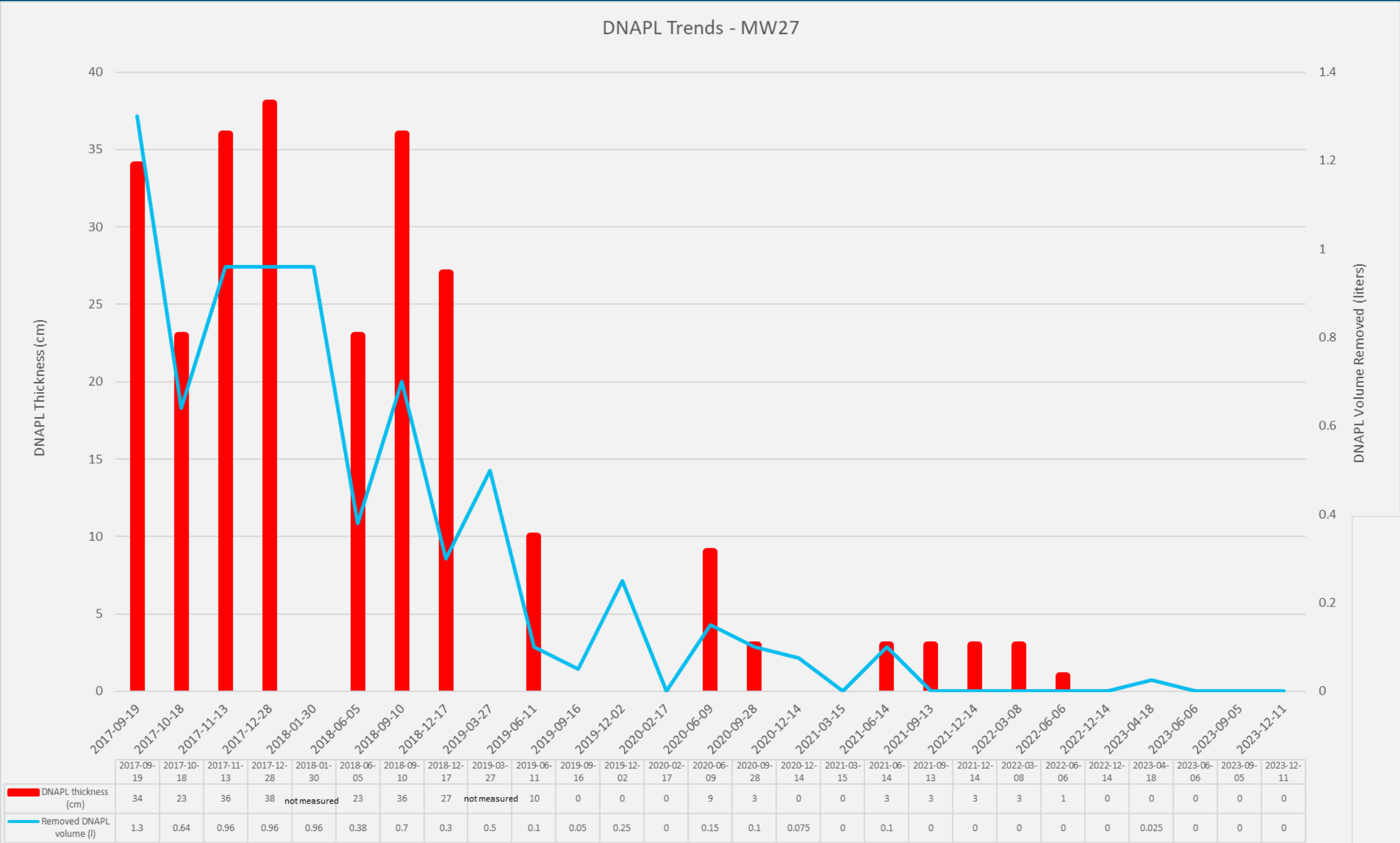


- GW control program running on quarterly basis (approx. 500 GW samples analysed free of charge by RPI ~75,000 € cost saving)
- Interim target: PCE values at site boundary around 10 $\mu\text{g/l}$



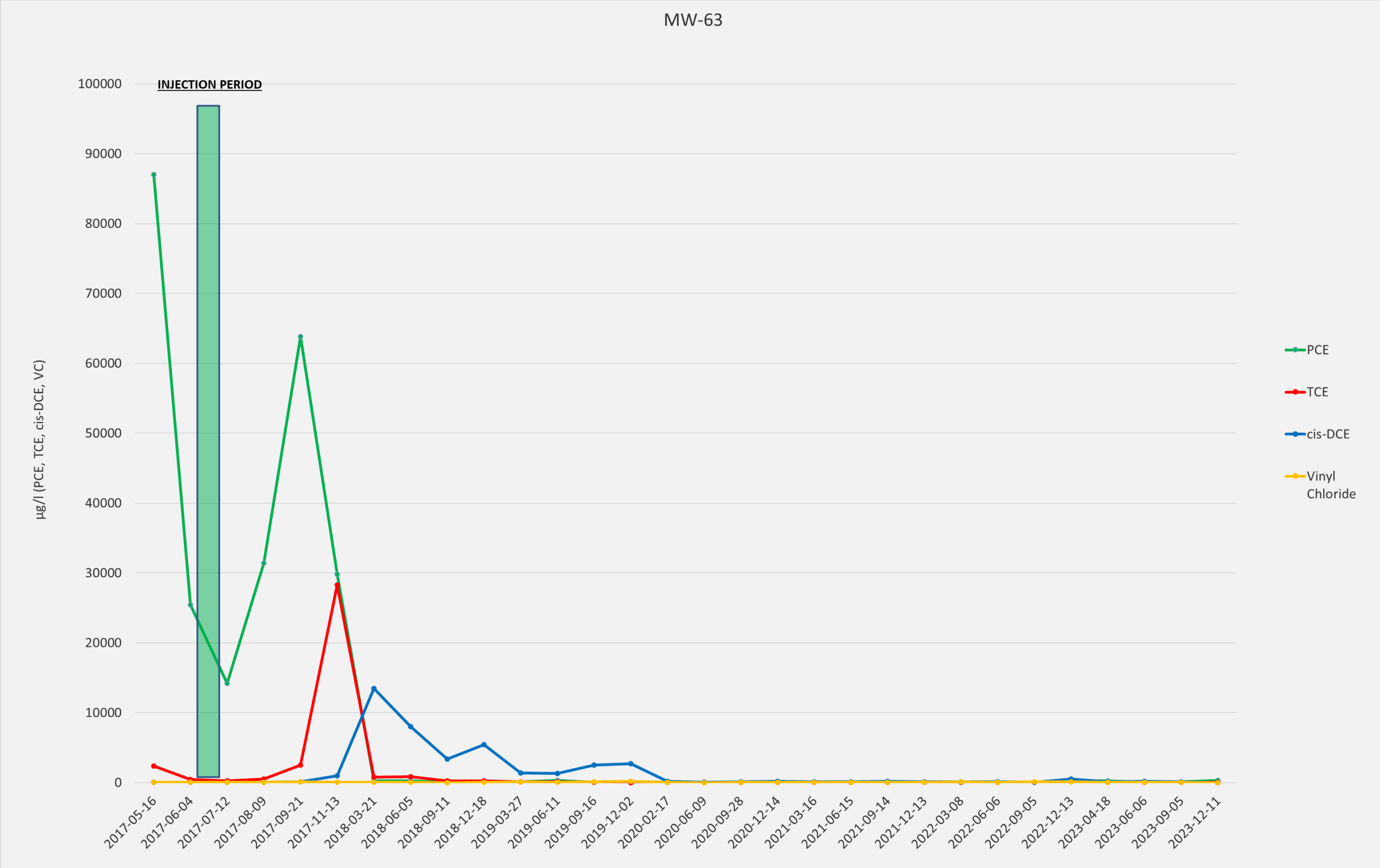
- CAT100 Injection zones (shaded areas), acting as electron donors slow release zones
- Full PCE conversion observed approx. 12 months post injection in the untreated areas downstream

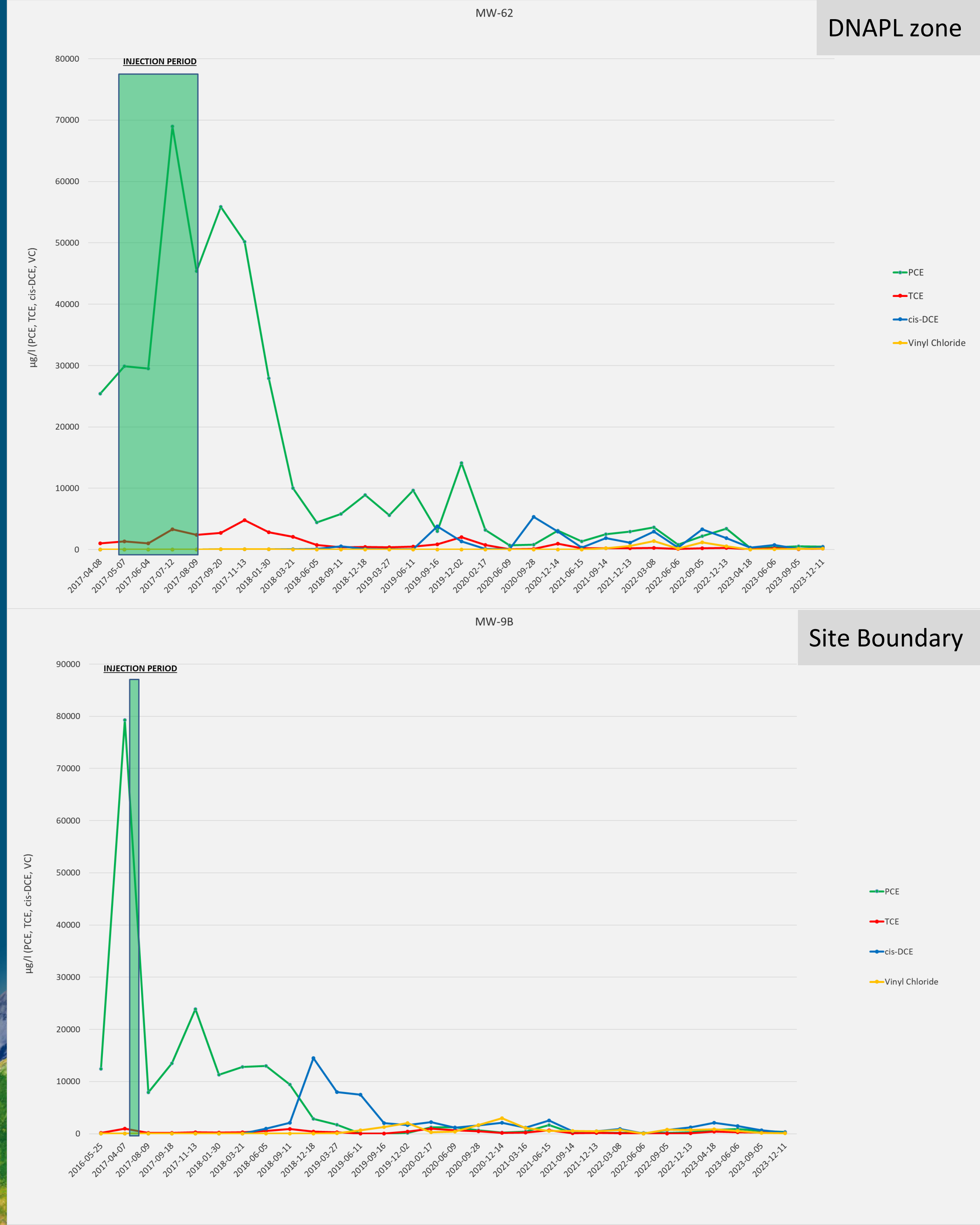
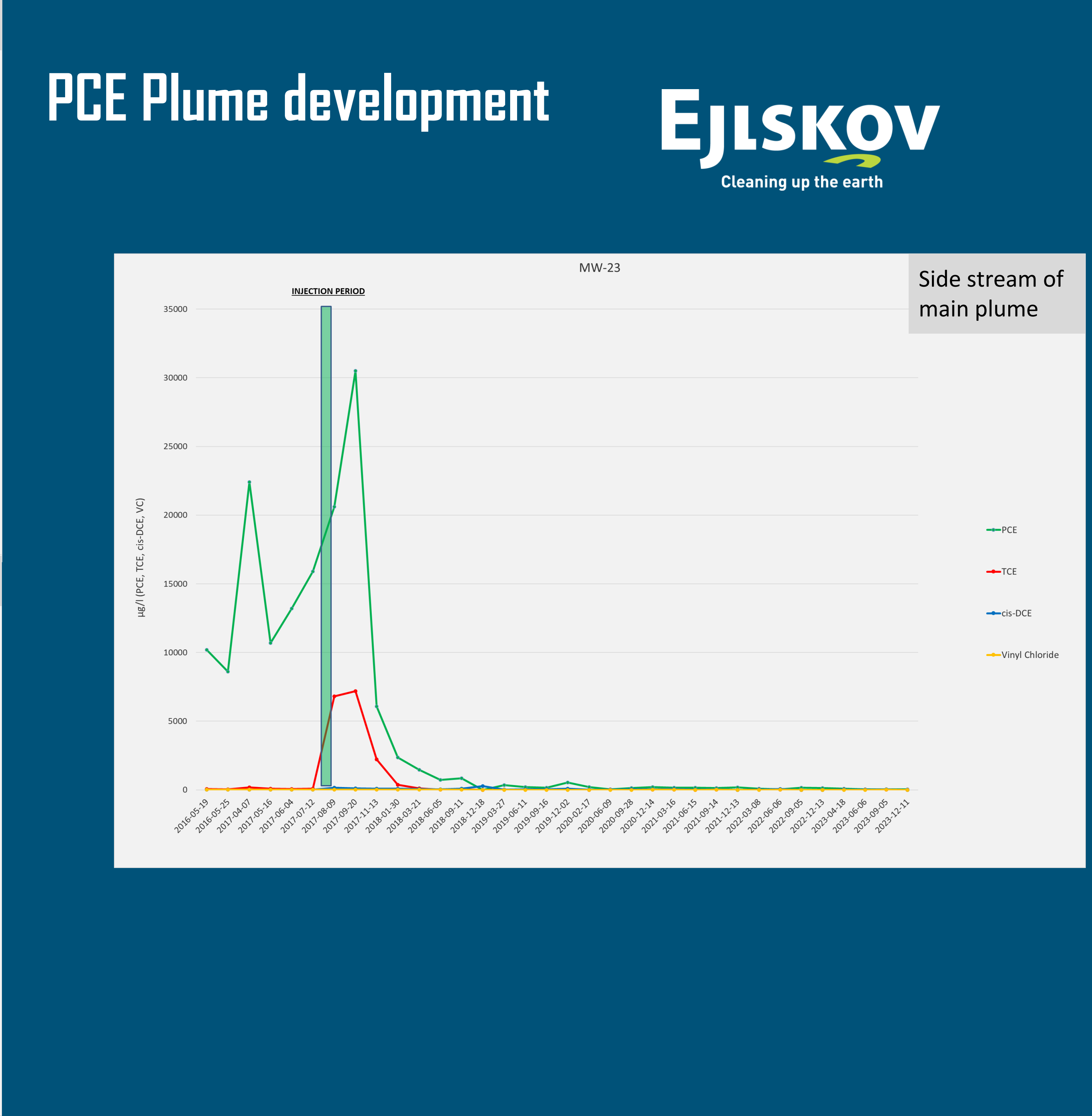
Source and Plume Treatment – DNAPL Site Treated with CAT100



DNAPL evidence
MW27 soil core

- PCE Concentrations in soil found at 50-60,000 mg/kg Remedial Design Phase (16,000 kg of PCE in soil estimated in source area)
- Soil Validation event in Q1 2022 showed based on 1:1 comparison soil samples an estimated PCE soil mass reduction between 40 and 50% compared to pre-remediation conditions
- DNAPL no longer observed in MW27
- An extra GW well was installed close to the original MW27 showing 98% less dissolved PCE than pre-remediation level
- MW63 located directly downstream of DNAPL source area







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