

# In Situ Chemical Reduction on Metallurgical Industry Impacted by Hexavalent Chromium (Sao Paulo, Brazil)

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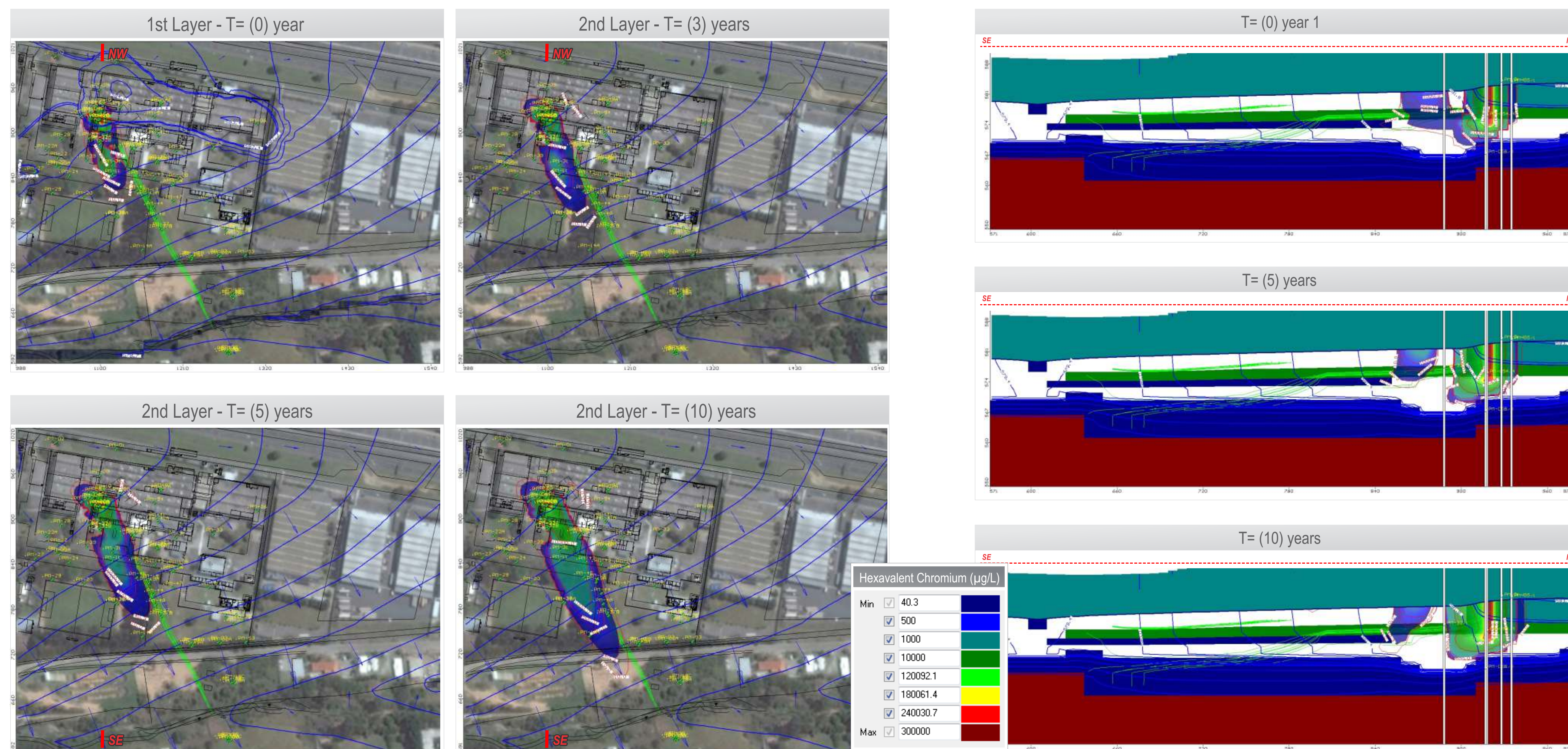
## Background / Objectives

In a metallurgical industry of automotive parts, **two distinct plumes of total and hexavalent chromium** were mapped, one of the plumes being associated with **past leakage of liquid effluents from the chrome plating machines**, and another associated with the **former waste disposal**, of smaller proportion. The objective of the remediation was **to reach the established goal for the dermal contact of construction workers**, with no exposed sensitive receptors.

The plume with the greatest coverage was approximately **100 meters long** and concentrated in the hot spot between 10,000 and 50,000 ppb of hexavalent chromium (March/2019).

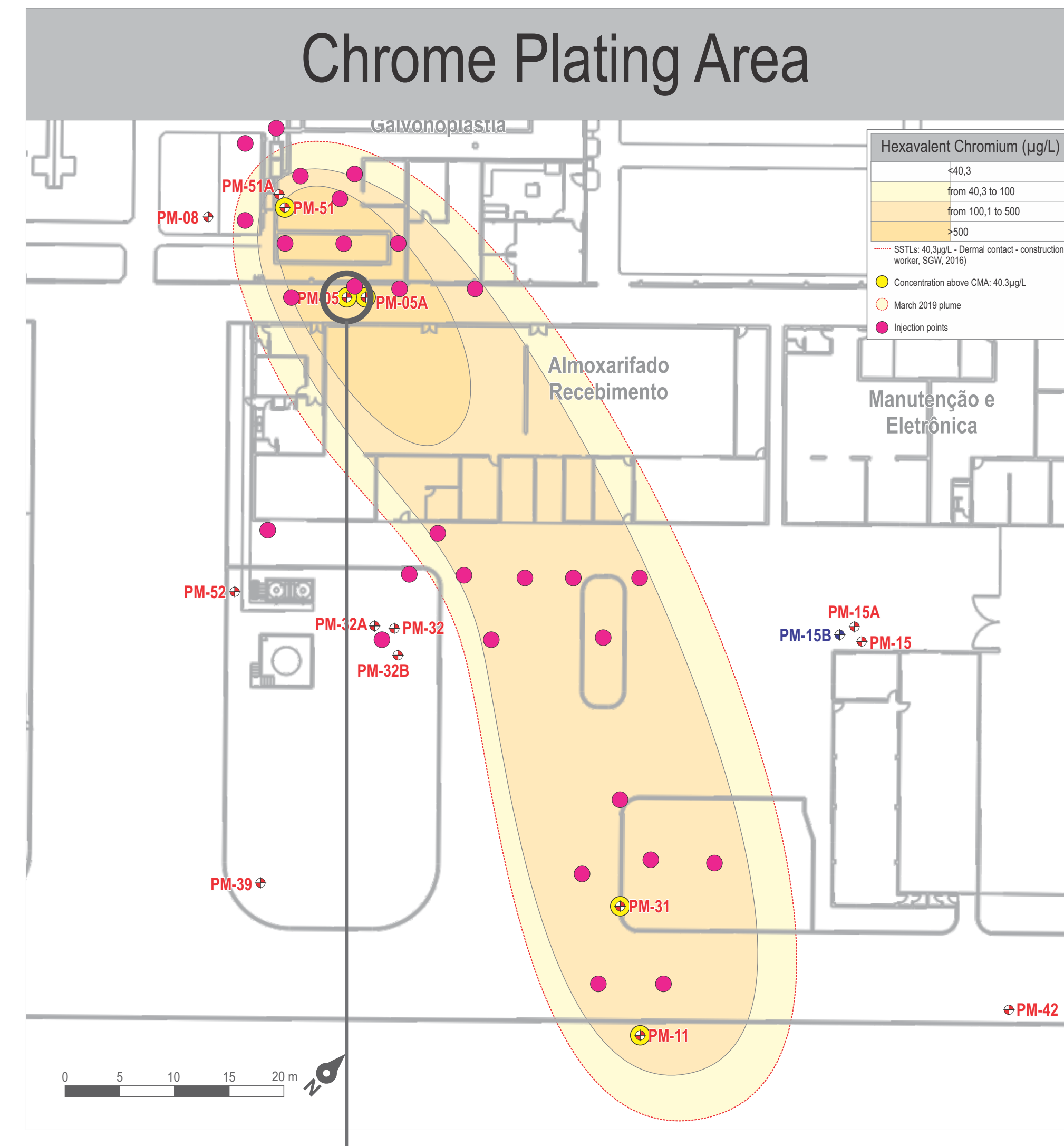
The smallest plume resided near a former waste disposal (excavated and removed in 2012), with **20 m downgradient** of the source and with an average concentration of **300 ppb**.

## Mathematical Model - Transport Simulation Without Intervention



## Approach / Activities

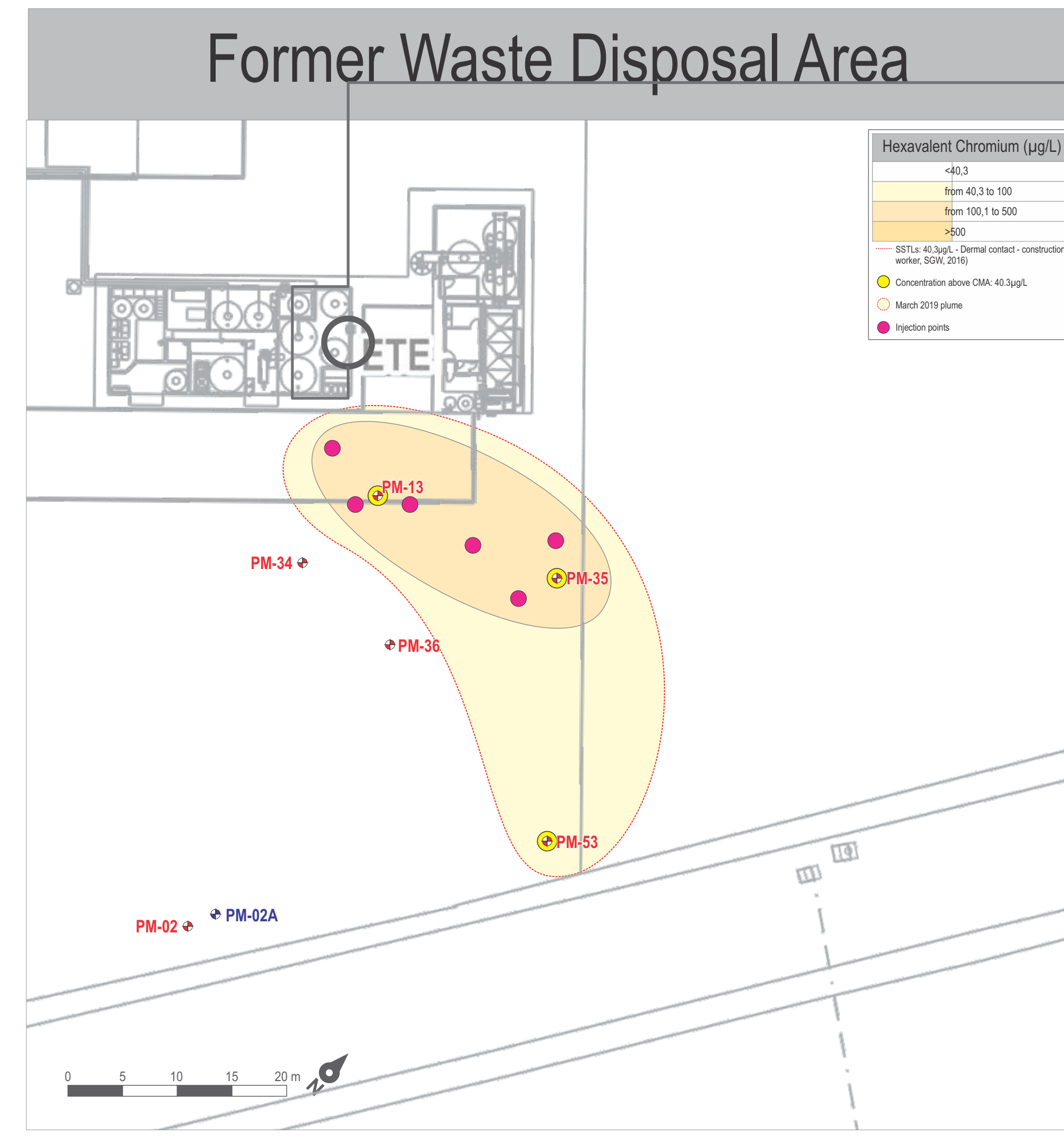
To reach the objective, the **in situ chemical reduction (ISCR)** technique was used, **previously successfully tested** in the area.



Due to the **slightly acidic conditions** of the aquifer to be treated, it was also decided to use a **buffering agent**, in order to favor the **hexavalent chromium co-precipitation reaction**. Due to the



Between September and November 2019, **35 injection points** were performed, **29 in the longest plume** and **6 in the smallest plume**.

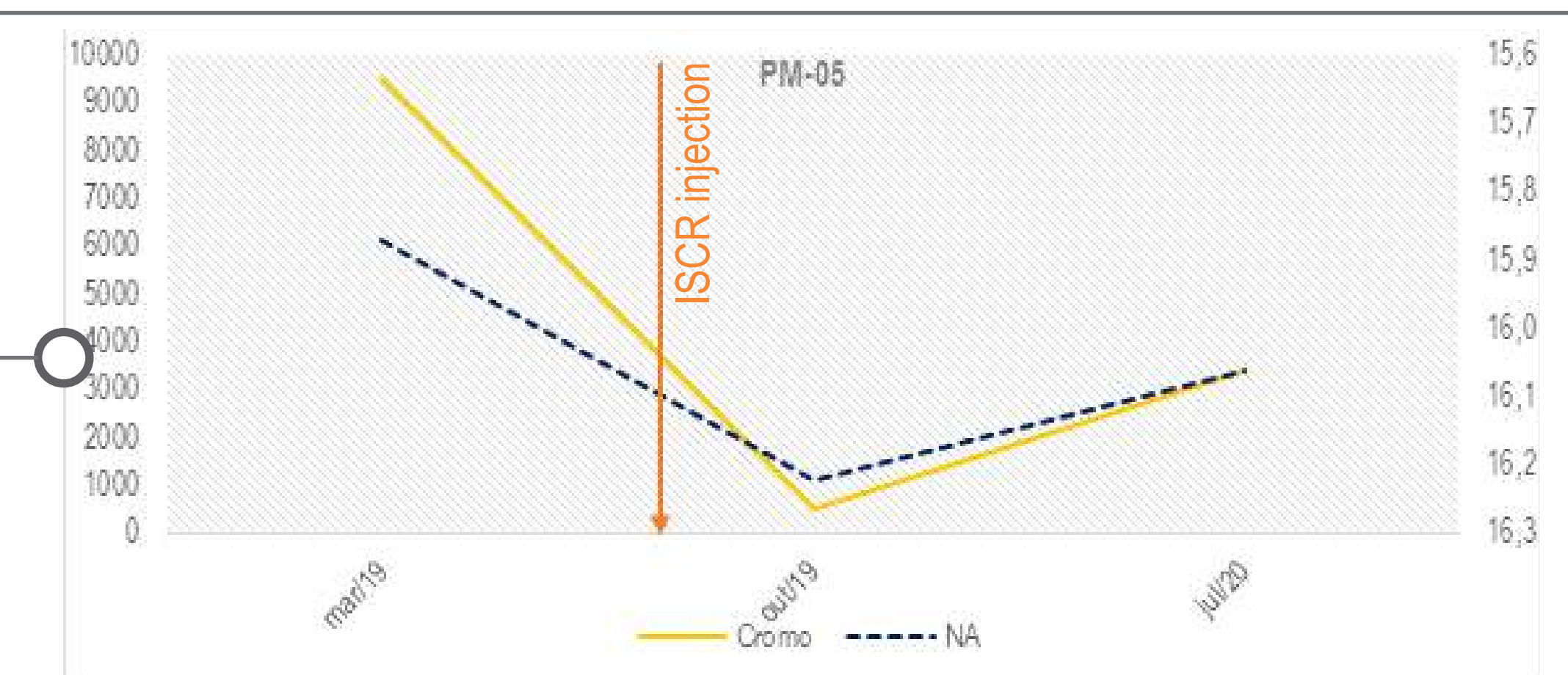


extensive **variation in the capillary fringe**, the injection between **14.4 m** and **19.0 m** was prioritized for the largest plume, while in the smallest the injection depths were between **11.5 m** and **15.6 m**.



## Results / Lessons Learned

In the area of the largest plume, about **6 months after the injections**, the results indicated reductions in **hexavalent chromium** concentrations **between 50 and 99%**.

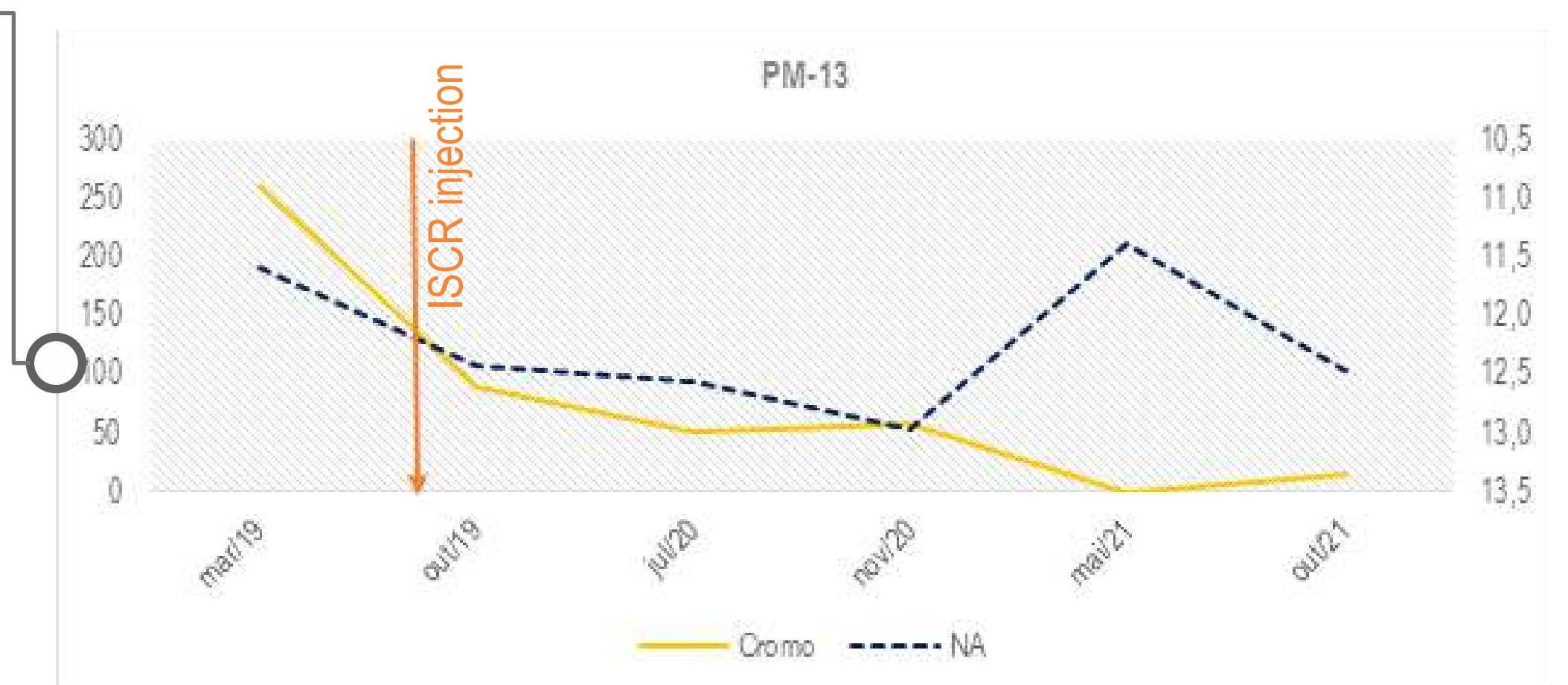


However, **one year after injection** in November 2020 campaign, it was observed an **orange coloration in hot spot wells**, indicating that new leak occurred in chrome plating area.



An **excavation** was carried out and the new leak was confirmed from the lift station area of chrome plating process. Currently, further actions are in discussion to contain the plume migration (pump & treat) and after, **a new ISCR injections will be necessary**.

In the area of the smallest plume, since the ISCR injection, concentrations of **hexavalent chromium** above the target **are no longer observed** in the monitoring campaigns.



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