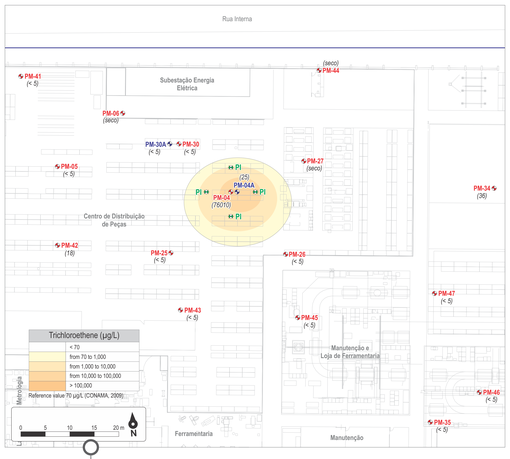
Vapor Intrusion Potential Control combined with ISCR Pilot Test at Industrial Site Impacted by Chlorinated Compounds (Rio Grande do Sul, Brazil)

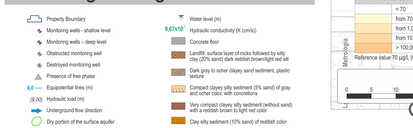
Authors: Sidney Aluani (saluani@sgw.com.br), Fabíola Tomiatti, Cristina Spilborghs, Eduardo Pujol, Natália Nascimento (SGW Services, São Paulo, SP, Brazil), Jim Mueller (Provectus Environmental Products, - Freeport, IL, USA)

Background / Objectives

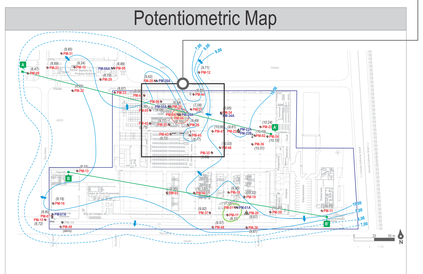
Industrial plant located in Rio Grande do Sul, Brazil, which operated for **over 50 years** manufacturing **tractors and diesel engines**.

Occurrence of a **TCE plume** was observed in the order of **150,000 ppb**, with **100m² in area** and **8m depth**, originated from the operation of a degreasing machine.

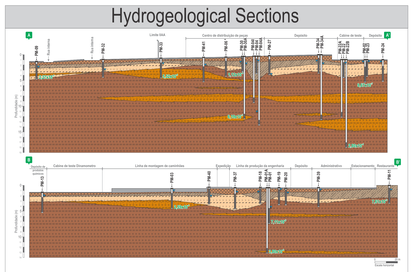




Potentiometric Map



Hydrogeological Sections

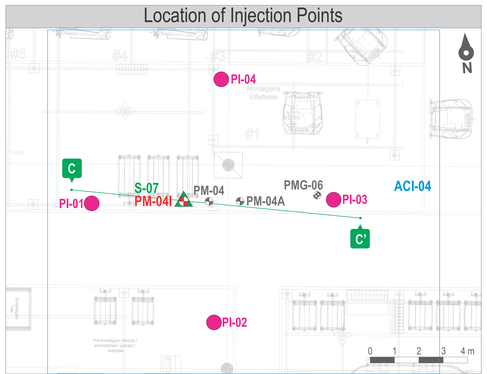


With **shallow groundwater table (~1 m)** the site has complex geology consisting of consolidated and unconsolidated sediments with predominance of **silty texture**, with **great variation** in the degree of compaction and confining characteristics in some portions of the site.

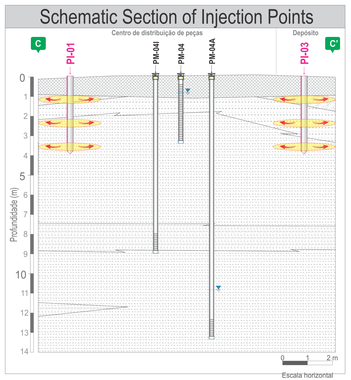
The **objective of the pilot test** was to evaluate the effectiveness of **ISCR** technology application to **reduce TCE** concentrations and, subsequently, a **vapor extraction system was installed** in order to minimize the potential of vapor intrusion due to the **remediation process**.

Approach / Activities

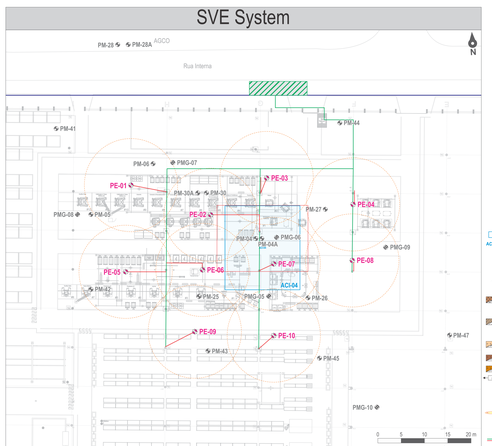
Location of Injection Points



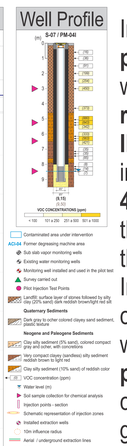
Schematic Section of Injection Points



SVE System



Well Profile



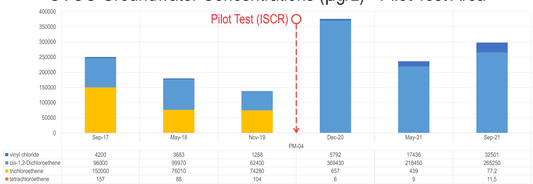
In October 2020, an **ISCR pilot test** was conducted with injection of **2 ton of remedial agent (Provect-IR)** through **4 points**. The injection interval was **1 to 4 m deep** and prioritized the **shallow aquifer** and the **plume's hotspot**. In this region, high concentrations of **TCE** were found in the **vapor phase** due to the high concentrations in groundwater.

In order to **minimize the potential of vapor intrusion** and **avoid additional vapor mass** resulting from the injection, **a vapor extraction system (SVE) was installed** 2 months after the pilot test injections.

Results / Lessons Learned

It was observed in the months following the pilot test injections that the **concentration of trichloroethene in groundwater was significantly reduced** (reduction of 99%).

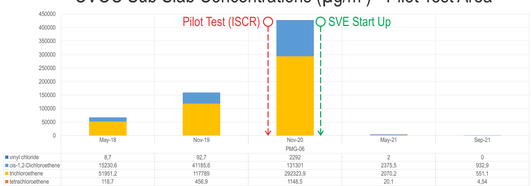
CVOC Groundwater Concentrations (µg/L) - Pilot Test Area



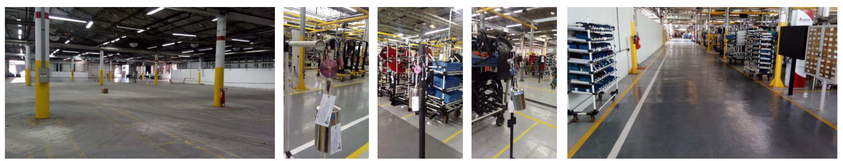
	Sep-17	May-18	Nov-19	Dec-20	May-21	Sep-21
vinyl chloride	4200	3683	1258	5792	17436	32501
cis-1,2-Dichloroethene	98000	99970	62400	369430	218450	265250
trichloroethene	150000	76010	74280	657	439	77.2
tetrachloroethene	157	66	104	6	9	11.5

Sub slab vapor results shows a clear effect of the **remediation** action through the **increase of the chlorinated compounds concentrations** (TCE and daughter-products) in **the vapor phase** in the first month.

CVOC Sub Slab Concentrations (µg/m³) - Pilot Test Area



	May-18	Nov-19	Nov-20	May-21	Sep-21
vinyl chloride	8.7	92.7	2292	2	0
cis-1,2-Dichloroethene	15230.6	41180.6	131307	2375.5	932.9
trichloroethene	51951.2	117789	292323.9	2070.2	551.1
tetrachloroethene	118.7	406.9	1148.5	20.1	4.54



Despite the **existence of concentrations above the reference**, the **potential risks to human health were controlled** by the action of the **SVE system**, whose preliminary results **after 6 months** of operation indicated a **significant reduction in vapor**, besides the fact that the SVE operation itself **prevents vapor intrusion**.