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Case Study:

GTR and TCH Multi-Phase Extraction and Treatment of Benzenes and DNAPL

Suzhou, China

Project Overview

Location:
Suzhou, China

Partner:
DDBS

Duration:
33 days

Geology:
Clay, Groudwater
1.5 m bgs

Contaminant:
Benzene, Chloroben-
zene, DNAPL, TPH-g
& TPH-d

Target Temperature:
100°C

Remediation Results:
>99% Mass Removal

Site History

In partnership with JSDDBS, GEO was contracted in a groundbreaking initiative to perform the first-ever thermal remediation in Chinese history. The treatment zone, located in Suzhou, China, required In Situ Thermal Remediation to

remove benzene, chlorobenzene, and TPH. GEO's Gas Thermal Remediation (GTRTM), using Thermal Conductive Heating (TCH), raised the temperature of the soils in the treatment zone to 100°C to achieve the remedial objective.



Site History (cont.)

The target treatment area (TTA) was 100m² and ranged from surface to 18m bgs. The soil type consisted of clay and silt, with heterogenous hydrogeology. Groundwater level was about 1.5m bgs with groundwater velocities between 10⁻⁵ to 5x10⁻⁴ cm/s.

The GTRTM design included 22 heating wells. Additionally, a total of 17 multiphase extraction (MPE) wells were applied to maintain hydraulic control and NAPL extraction. Extracted vapors were treated with a cooling and GAC system before being released to the atmosphere. Water produced from condensation and MPE extraction was treated with neutralization settling tanks.

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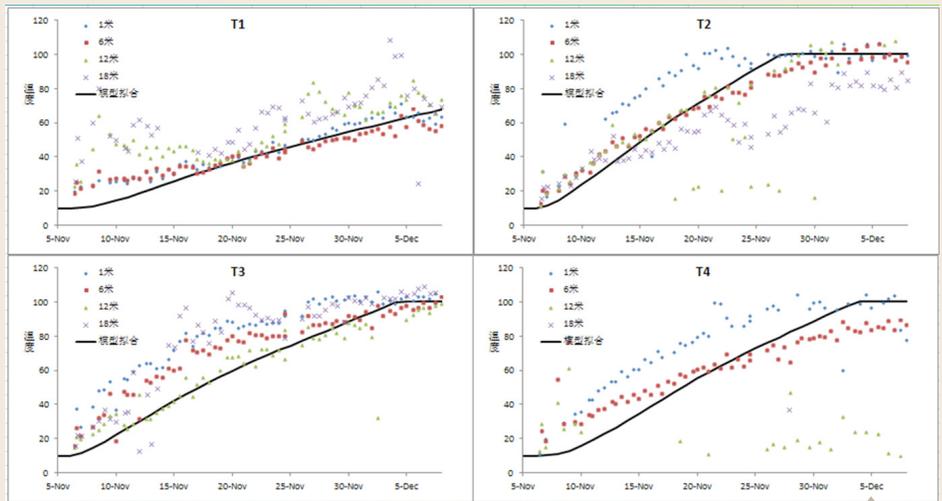
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Results

The full remediation effort, including installation, heating time, and demobilization, was achieved in under 60 days, marking a record achievement. Four graphs are shown below depicting temperature thermocouple responses vs.time and comparing the results to our predicted model. The before and after photos of the remediated soils reveal complete removal of contaminants, water, and much of the organic matter, as indicated by the clearer soil with light brown coloration.

The pilot test confirmed the proof of concept requirement set out by the Chinese government for ISTCH applicability, and specifically demonstrated the efficacy of ISTCH for sites with high pollution, low permeability, and more than 16m of groundwater within the target treatment zone.



Soil Before

Soil After

Water Before

Water After

Above:

Each chart corresponds to a different thermocouple. Black line represents GEO thermal prediction, data points represent sampled temperatures taken at various depths.