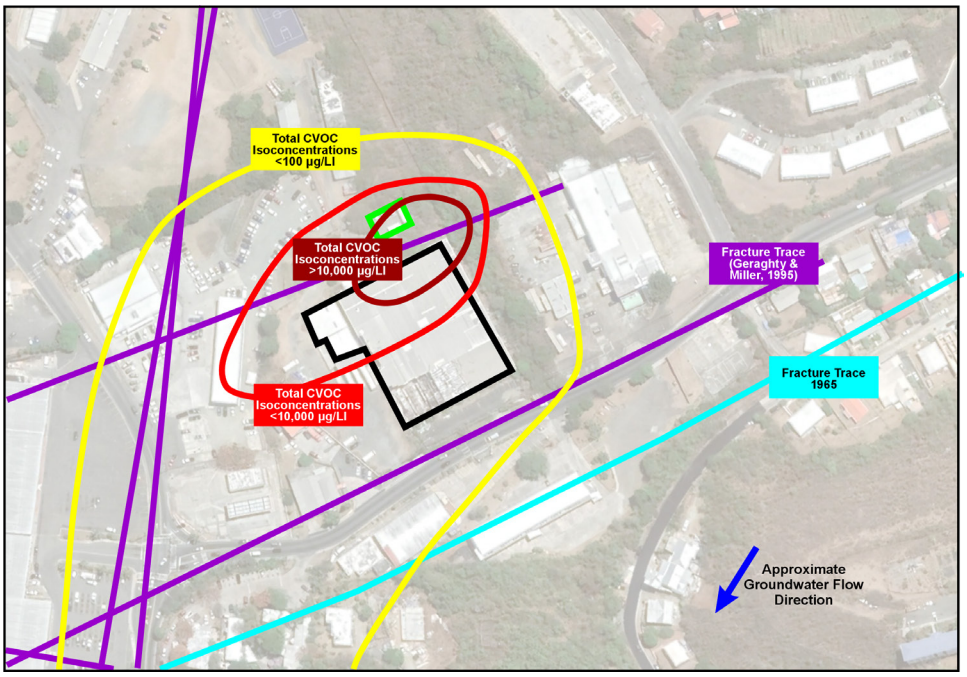
Case Study

Successful RDC at Tutu Wellfield Superfund Site

Operable Unit 2 (Site) of the Tutu Wellfield Superfund Site in St. Thomas, U.S. Virgin Islands (USVI) had a groundwater plume impacted with chlorinated volatile organic compound (CVOC) concentrations greater than 200 mg/L in some locations that threatened nearby municipal water supply wells. HDR, one of the leading engineering firms in the world, was tasked with cost-effectively designing remediation to meet environmental clean-up standards and protect the community from harm.

The Problem:

Remediation of chlorinated volatile organic compound (CVOC) sites is challenging, particularly in complex geology involving fractured and faulted volcanic bedrock. Fractures and faults provide flowpaths for dense non-aqueous phase liquid (DNAPL) and related dissolved-phase contaminants to migrate vertically and laterally in groundwater. Locating and characterizing flowpaths is critical to remedial design since the bulk of contaminated groundwater is likely to be found in these hydraulically active areas. Successful remedial design/remedial action requires robust remedial design characterization to develop a data-rich and accurate CSM, which is not possible using untargeted drilling data alone.



Approach:

HDR deployed Aestus' electrical hydrogeology scanning technology and 5-step CSM update process to locate DNAPL and aqueous phase CVOCs in groundwater and identify high-flux flowpaths. Aestus collected continuous 2D electrical images and integrated historical site data (i.e., geology, groundwater concentrations, etc.) into 2D figures and a 3D visualization model (Rockworks). Aestus and HDR worked collaboratively to leverage these integrated data sets and select targeted confirmation drilling locations to target electrical anomalies and understand how these related to faults, fractures, and preferential flowpaths, as well as CVOC-related contaminant distribution.

Results

- ☑ Located two, intersecting faults (confirmed via targeted drilling to be a high-permeability zone)
- ☑ Identified location of free-phase DNAPL for the first time in site history based on image guided drilling targets
- ☑ Mapped top of competent bedrock surface (contaminant flowpaths guided by bedrock)

HDR's collaboration with Aestus resulted in an updated CSM, which provided drilling and remediation system targets in high-flux zones and increased HDR's confidence in its remedial design for the site.

See Below. Succeed Above.

Our client needed more certainty in their subsurface data. We integrated existing site data, our GeoTrax Survey™ electrical images, and targeted confirmation drilling data to yield a more complete understanding of the subsurface. This allowed them to:

- ☑ Make better technical/business decisions
- ☑ Have clear roadmap for next steps
- ☑ Achieve project goals faster and cheaper

Aestus

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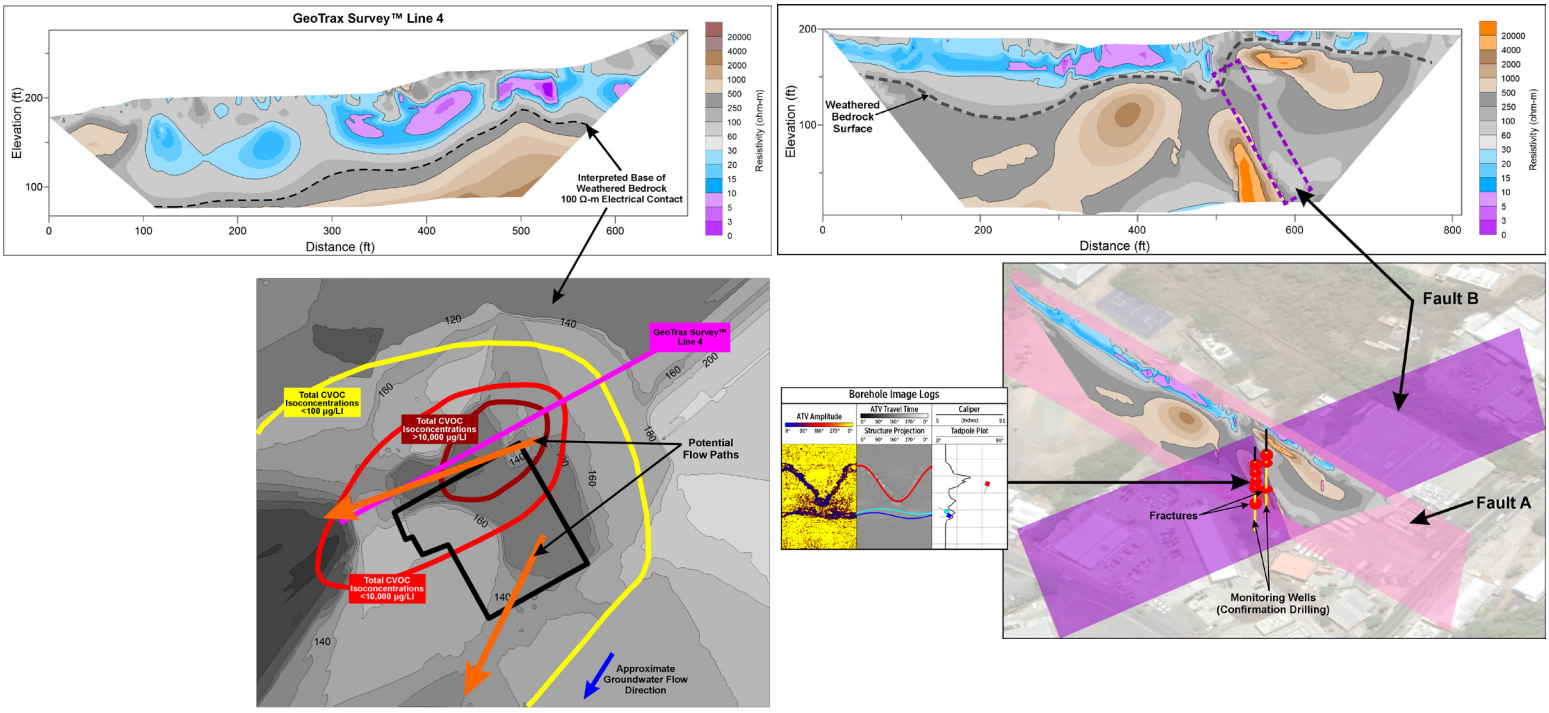
Outcome:

Aestus was able to assist HDR with developing a data-rich CSM for the site that allowed HDR to focus remedial design/remedial action on high-flux subsurface pathways for more technical and cost-effective remediation. To further assist with remedial design, Aestus suggested additional drilling locations for HDR's consideration as potential extraction and injection wells based on the updated CSM and electrical imagery.



HDR completed remedial design within three months of Aestus' final report submission to keep the project moving forward quickly and in a very focused manner. HDR submitted the remedial design document in December 2023, and "Final Remediation Action" is expected to start during the winter 2025 (EPA).

The evolution of this project demonstrated that the use of untargeted vertical borings and monitoring wells was not sufficient to locate and evaluate discrete faults and high-flux flowpaths. Aestus' imaging technology and CSM update process allowed HDR and the EPA to save time and resources allocated to cleanup of Site by increasing certainty of the CSM and subsequent remedial design.

Specific CSM updates of significance included the following data and conclusions:

1. Confirmation drilling targeting GeoTrax Survey image anomalous zone identified location of free-phase DNAPL for the first time in project history; allows focused remediation of source material at this location (see graphic)
2. Interpreted two, intersecting faults (i.e., Fault A and B) shown in 3D by the pink and purple planes (see graphic)
3. Targeted drilling confirmed highly fractured zones (red disks in the 3D image) present in rock cores at the intersection of Fault A and B (see graphic)
4. Step tests in monitoring wells proximal to the intersection of faults mapped by Aestus had a high specific capacity/yield rendering them as optimal remediation well targeted locations
5. Mapped top of competent bedrock surface (dark gray to light gray surface in the graphic)
6. Identified potential flowpaths along depressions in the top of weathered andesite (orange arrows in the graphic)

You Deserve More Certainty in your Subsurface Data

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