Using Ultraviolet-Induced Fluorescence to Enhance an LNAPL Conceptual Site Model

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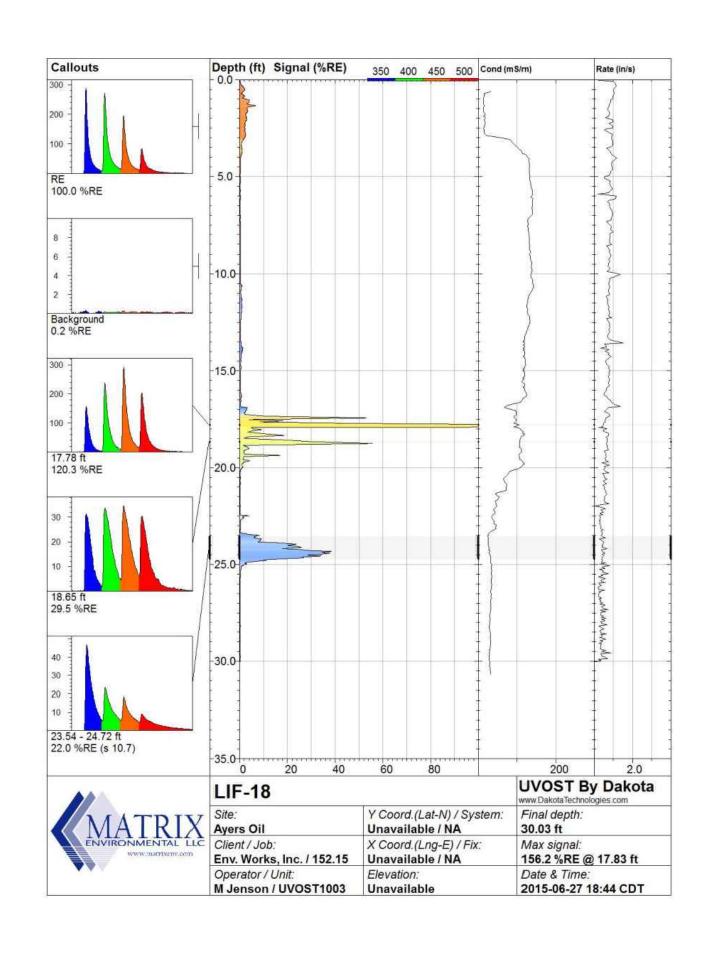
RATIONALE AND RESULTS

Following the discovery of gasoline constituents in soil and groundwater at two petroleum retail facilities in northeast Missouri, extensive characterization efforts were conducted. Subsequent cleanup activities included recovery of LNAPL by monthly and biweekly hand-bailing, bioslurping, active recovery and full-time skimming systems.

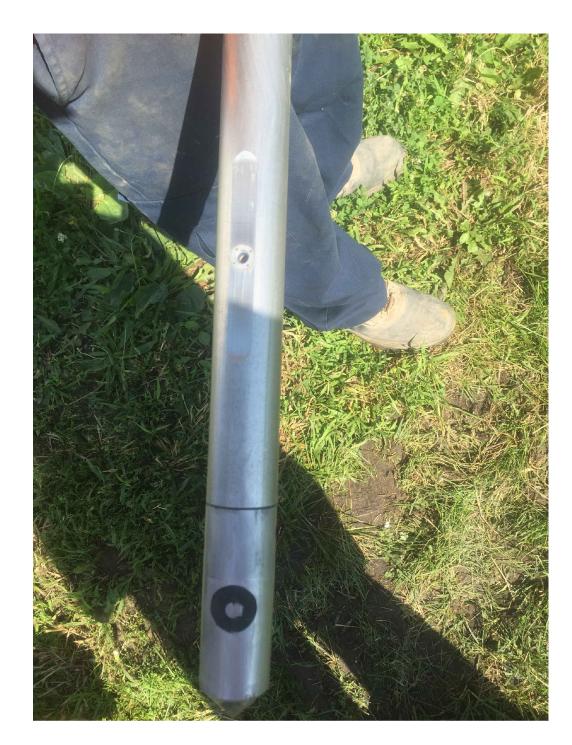
Prior to evaluating the need for additional characterization or LNAPL recovery efforts, ultraviolet (UV)-induced fluorescence logging was performed.

The data collected at each site confirmed delineation of petroleum impacts by previous soil and groundwater sampling. The work also confirmed that no previously unidentified sources of petroleum hydrocarbons were present in the subsurface. These results were used to inform the next steps toward closure of each site.

(sand)

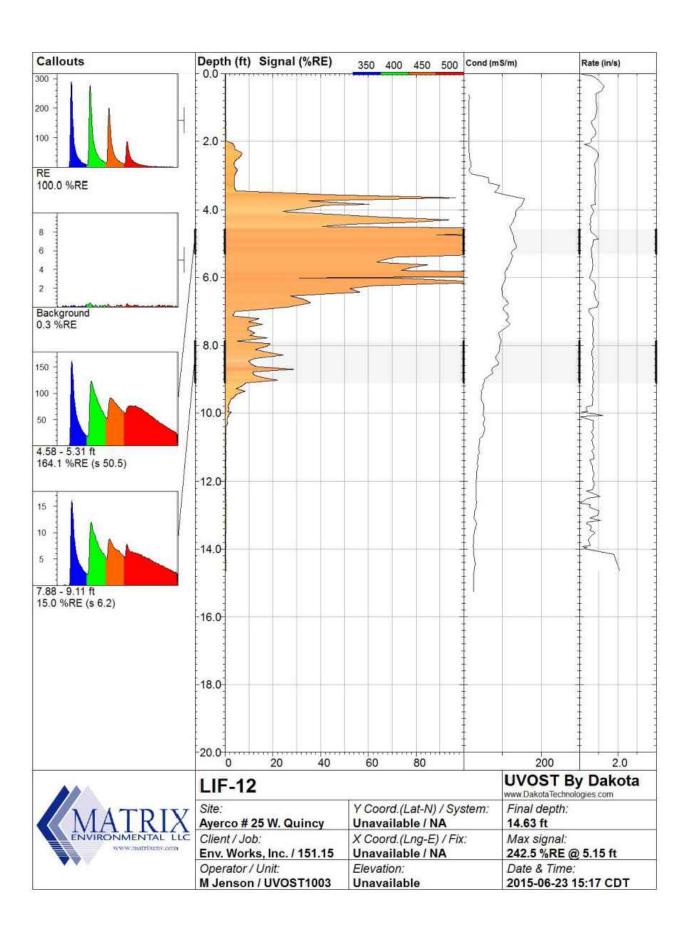


TECHNOLOGY





The technology includes a probe which houses a fiber optic cable that transmits light through a sapphire window in the side of the probe, exposing the soil to UV light. The UV light stimulates the emission of photons from polycyclic aromatic hydrocarbons (PAHs) present in petroleum hydrocarbons. The emitted waveform is then divided into four wavelengths which roughly correspond to product types.



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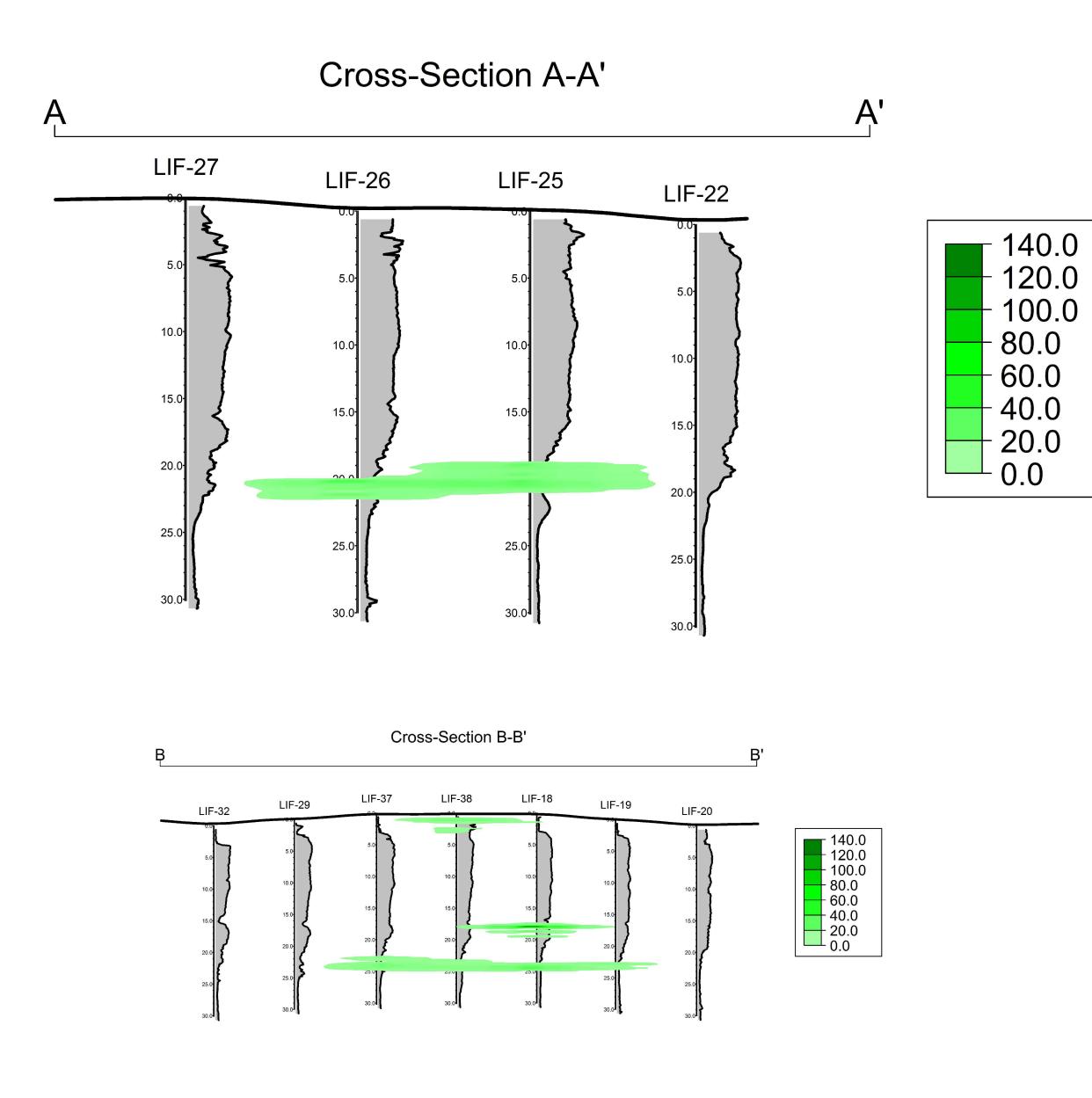
The probe is also designed to collect electrical conductivity data from the surrounding soil. Areas with a higher conductivity indicate relatively fine-grained material (clay), while areas with a lower conductivity indicate more coarse-grained material

SITE 1

The site consists of a former petroleum retail/auto repair facility with a closed diner located to the west. When in operation, four ASTs were located on the northeast area of the site. The ASTs and the three dispenser islands located in front of the building were removed subsequent to the release in 2005.

UV-induced fluorescence, also called laser-induced fluorescence (LIF), was used to survey the Site by advancing 40 borings over the property.

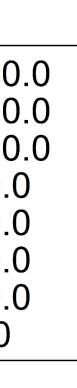
A higher percentage of reference emission (%RE - shown as darker green) indicates a greater saturation of petroleum hydrocarbons near the southeast corner of the Site, downgradient of the former dispensers.

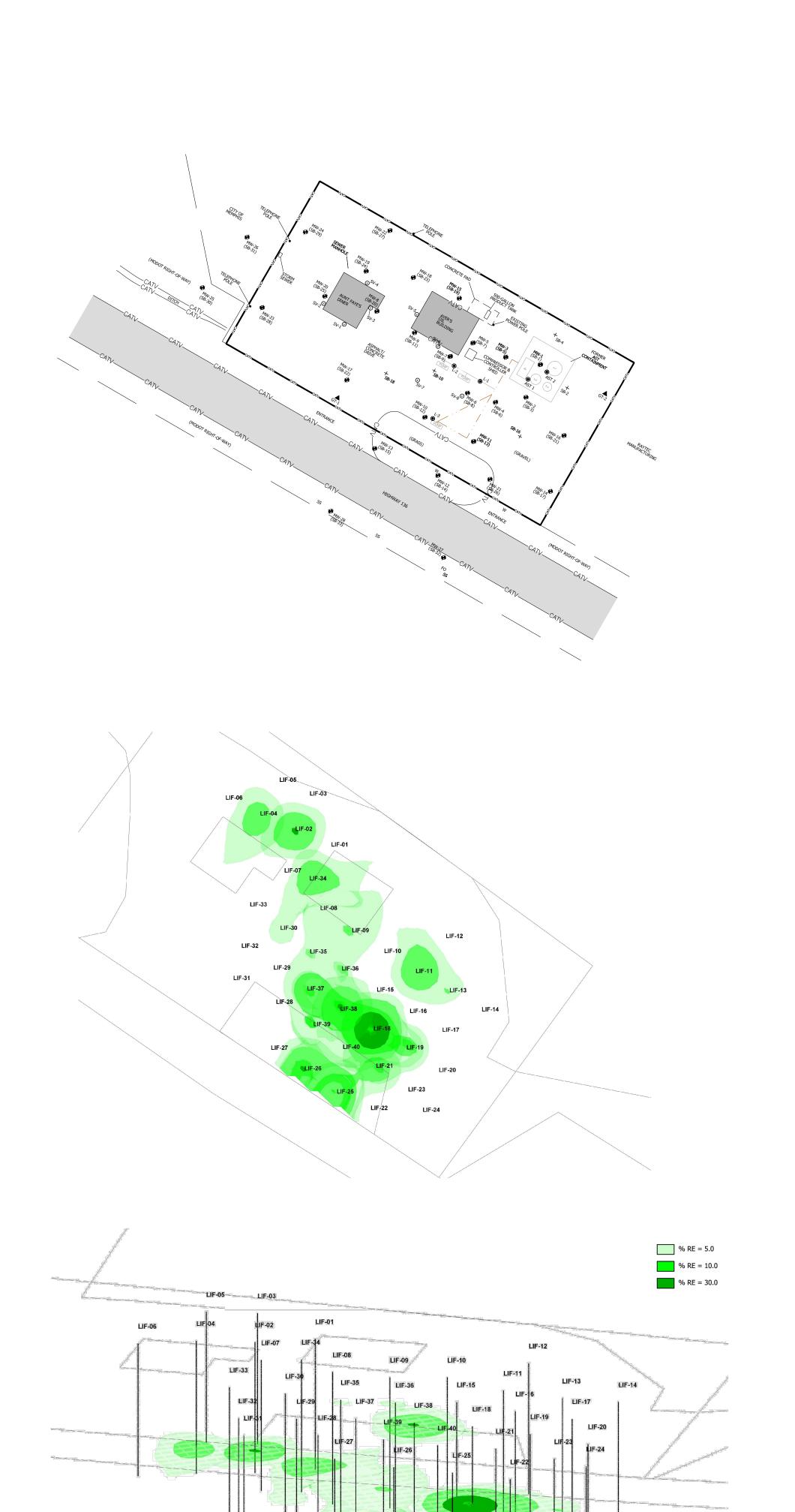


Electrical conductivity logs show that subsurface soils consist of silty clay which grades to fine-grained sand at a depth of 20-25 feet below grade, with intermittent sand lenses generally at 16-17 feet below grade.





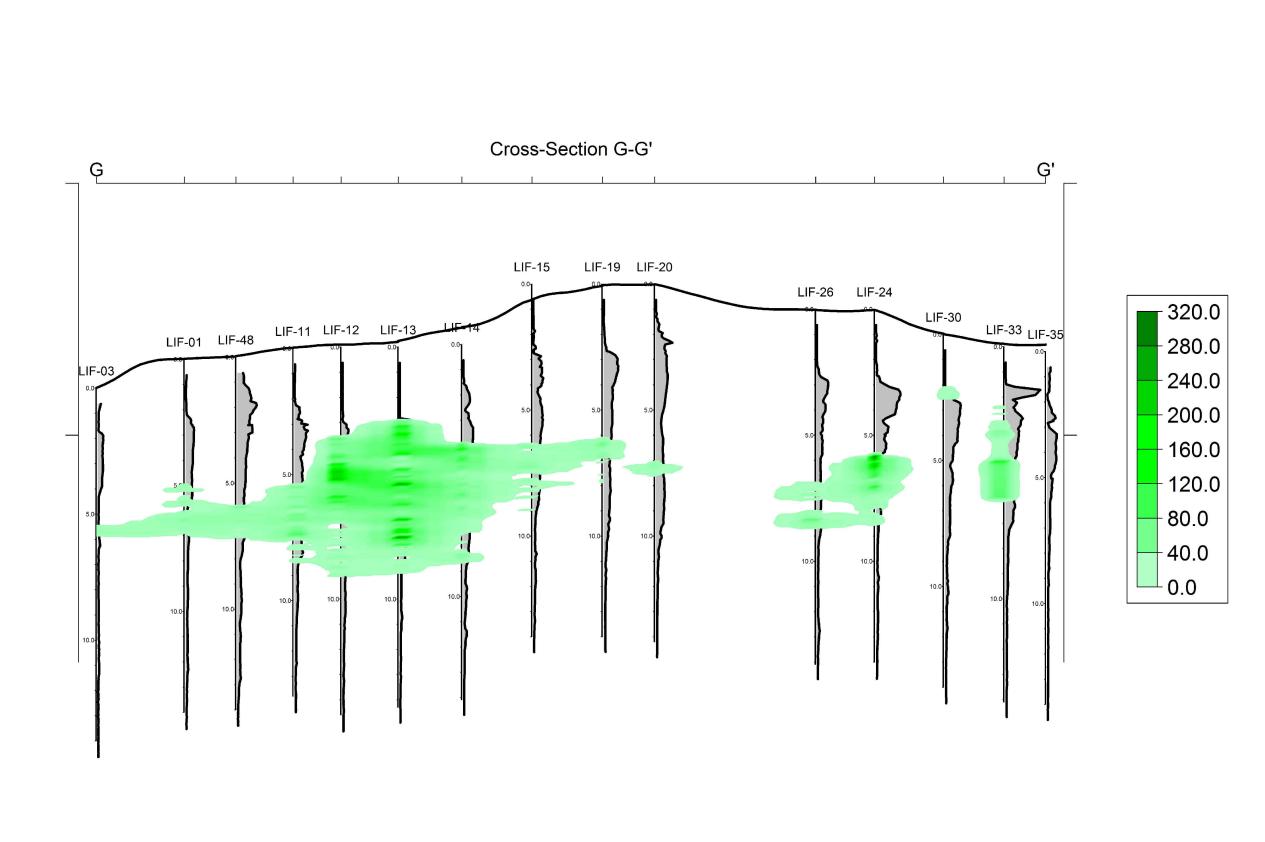


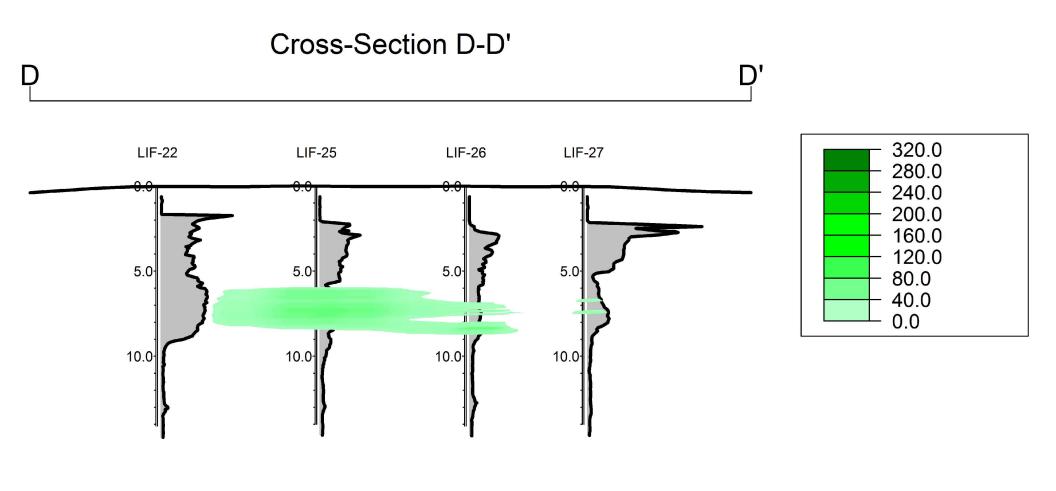


SITE 2

The Site is located on two acres and has historically been utilized for petroleum retail purposes since at least the 1960s. The current station and AST system were installed after the 1993 Mississippi River flood which destroyed the old station. The Site currently utilizes four ASTs located at the north edge of the paved lot.

A total of 51 borings were advanced during the LIF survey. The higher %RE noted in the plan and isometric views corresponds to the presence of PAHs in diesel-impacted soil on the north side of the convenience store, near the diesel dispensers.





As indicated by the electrical conductivity curves in the cross sections, subsurface soil at the Site is comprised of interlayered alluvial deposits, with silt and silty clay above fine to coarse sand generally encountered near 8-10 feet below grade.

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