



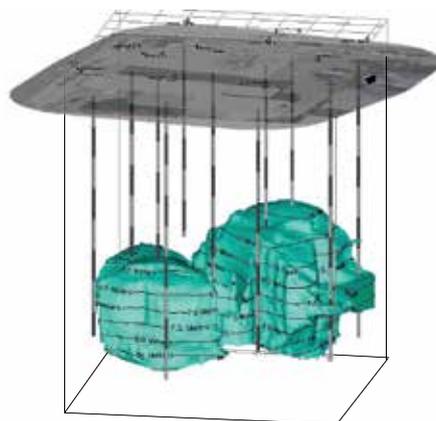
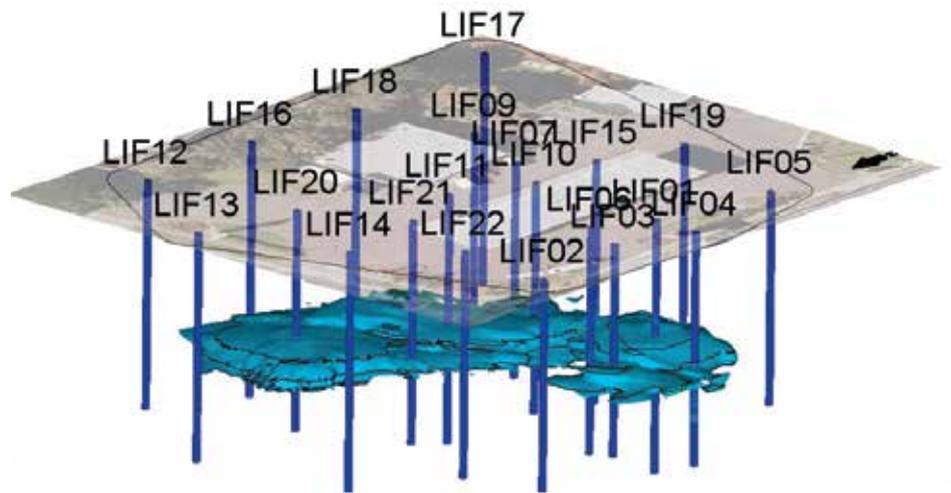
High Resolution Vertical Profiling (HRVP)

- *Membrane Interface Probe (MIP)*
- *Ultraviolet Optical Screening Tool (UVOST®)*
- *Hydraulic Profiling Tool (HPT)*

Numac is the leading service provider of High Resolution Vertical Profiling tools for mapping of subsurface contamination, as well as hydrogeologic conditions of unconsolidated formations.

These technologies enable rapid, real-time vertical and horizontal delineation of VOC contamination ranging from low levels of dissolved phase VOCs to NAPL. Subsurface data is collected in-situ and continuously throughout the vertical profile.

The MIP tool is used for analysing a range of VOCs, while the UVOST® is used to detect most types of NAPL. Hydraulic and lithologic data is provided by the HPT. These tools effectively provide highly accurate and complete conceptual site models.

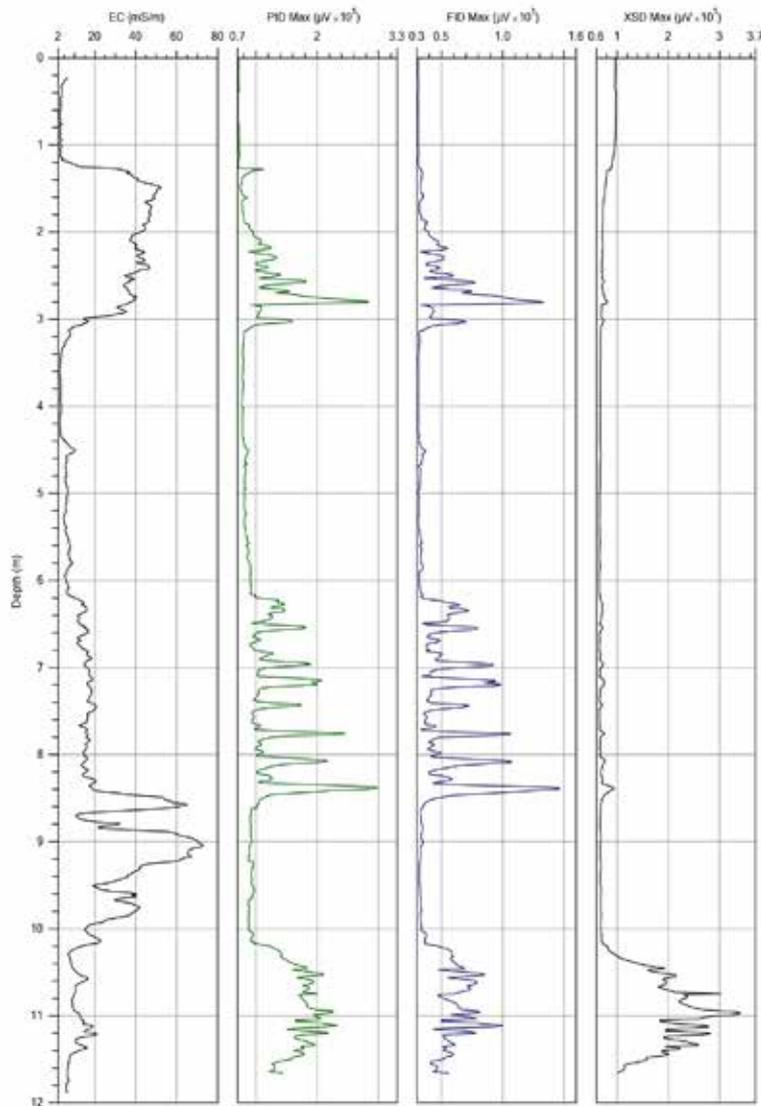


MEMBRANE INTERFACE PROBE (MIP)

The Membrane Interface Probe (MIP) is used for rapid assessment of sites contaminated with volatile organic compounds (VOCs).

As a continuous sampling system which heats the soil, water, and vapour matrix as it is driven into the subsurface, the MIP maps contaminants within the groundwater and the surrounding soil.

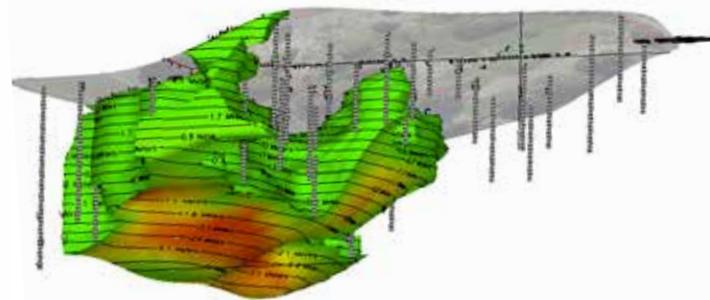
The VOC mass, which is extracted across a semi-permeable membrane, is carried to the surface by an inert purge gas via small diameter inert tubing. Analysis is by a suite of three laboratory grade detectors; namely a photo-ionisation detector, a flame ionisation detector and a halogen specific detector. The system also incorporates an electrical conductivity sensor to determine soil lithology.



Company	Number	Operator	Healer	File
Project ID	Client	Class	Location	Date
	Soiltest Site		ACME Consulting	3/03/2012

Major Benefits of MIP

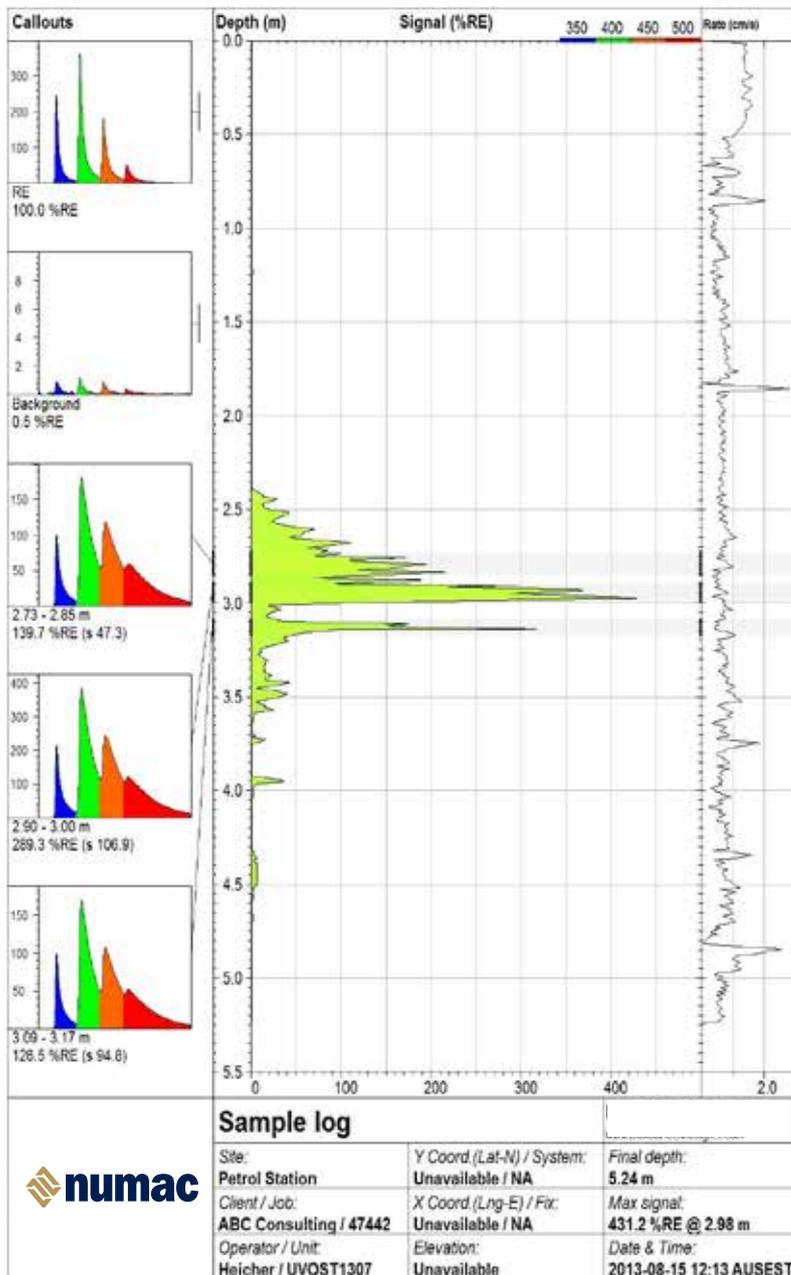
- Data is collected in real time and high resolution
- 65 readings per vertical metre
- Typical detection limits range from 200ppb to 2ppm
- Operates effectively in any matrix – vadose zone or groundwater
- Fast – advancement rate of 0.3m/minute, with daily production up to 70 - 80m per day
- Multiple data stream collection during the vertical push – MIP utilises three laboratory grade detectors for VOC analysis
- Soil Electrical Conductivity data provides indicative lithological properties (soil types)
- MIP data can be used to generate real time modelling for accurate conceptual site models



ULTRAVIOLET OPTICAL SCREENING TOOL (UVOST®)

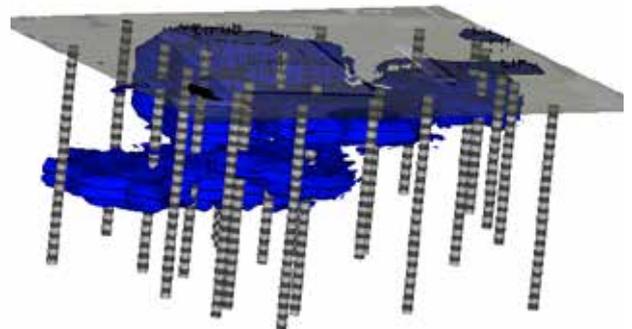
The Ultraviolet Optical Screening Tool (UVOST®) utilises Laser Induced Fluorescence (LIF) to detect Light Non-Aqueous Phase Liquid (LNAPL). Petroleum hydrocarbons contain significant amounts of naturally fluorescent polynuclear aromatic hydrocarbons (PAHs). Ultraviolet light from the LIF system causes the PAHs to fluoresce.

As the direct push probe is advanced into the soil, the LIF system uses a sapphire window to measure front-face petroleum LNAPL fluorescence. PAH fluorescence is directed back to the surface where it is analysed.



Major Benefits of UVOST®

- Data is collected in real time and high resolution
- 65 readings per vertical metre
- Typical detection limits range from 10ppm to 500ppm
- Operates effectively above, through and below the saturated zone
- Fast – probe advances at ~20 mm/sec without pause
- Typical daily productivity of 60 - 80 metres, across 10 - 20 locations
- High Resolution data density coupled with near instantaneous response, provides continuous detailed log of product distribution & heterogeneity
- Colour-coded logs for the ultimate in qualitative information “at-a-glance”
- CPT and percussion (Geoprobe / PowerProbe) deliverable – if direct push sampling gets there, UVOST® can get there

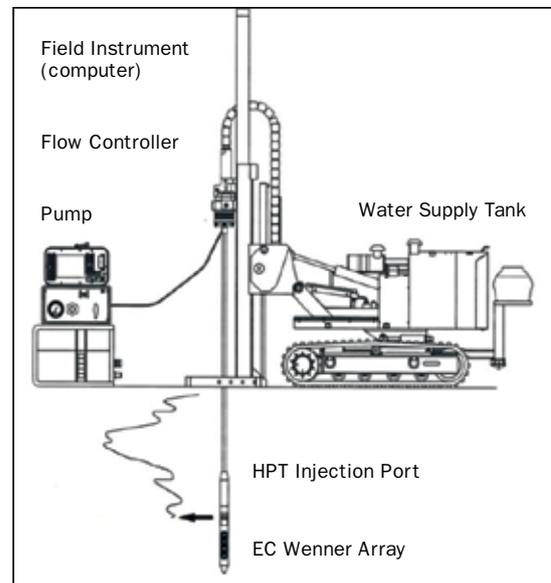


HYDRAULIC PROFILING TOOL (HPT)

The Hydraulic Profiling Tool (HPT) is used to determine hydraulic and lithological properties of the subsurface. The HPT is a logging tool that measures the pressure required to inject a flow of water into the soil, as the probe is advanced.

This injection pressure log is an excellent indicator of formation permeability. The HPT can also be used to measure hydrostatic pressure under zero flow condition. This allows the development of a hydrostatic pressure graph to calculate hydraulic conductivity values and water table elevations.

HPT data can be used to identify preferential contaminant pathways, remedial injection zones, and monitoring/recovery well screen intervals.



CASE STUDIES

The Site: Former Industrial Facility – Kalgoorlie, WA

Contaminants of Concern: LNAPL Petroleum and Chlorinated Compounds

The Issues: Former drum reconditioning facility with minimal environmental site investigation. Reportedly, drums were washed out & contents drained to an open pit.

The Work: Numac undertook a High Resolution Vertical Profiling investigation to assess subsurface LNAPL petroleum plumes, as well as to determine the presence of chlorinated hydrocarbons. A total of 29 LIF and 10 MIP locations were advanced to depths up to 9mbg, across the entire site.

The Benefits: In just three days of siteworks, vertical and horizontal delineation of petroleum impacted soil was obtained. MIP investigation revealed the possible presence of chlorinated compounds at depth.

The Site: Operating Industrial Facility – Newcastle, NSW

Contaminants of Concern: Petroleum Hydrocarbons (LNAPL)

The Issues: A currently operating petroleum blending facility with numerous aboveground tanks, floor drains and sumps, and historic underground storage tanks.

The Work: Numac conducted a LIF investigation to delineate petroleum hydrocarbon impact in soil and groundwater and determine if contamination was migrating offsite. Works were undertaken inside and outside the facility, and overnight so as to not interfere with plant operations.

The Benefits: Numac advanced 38 LIF locations to 4.3mbg, compared to the original scope of 17 LIF locations to 3mbg; all within the same time onsite. LNAPL contamination was encountered across the eastern portion of the site, with the suspected source being underground sump and floor drains.

The Site: Large Landfill – Melbourne, Victoria

Contaminant of Concern: Methane Gas

The Issues: Large Industrial landfill.

The Work: A MIP investigation to assess methane gas migration along the property boundary.

The Benefits: High Resolution Vertical Profiling revealed the presence of methane gas in the shallow sediments in all 5 locations advanced at the site, indicating that methane is migrating offsite.