



OPTICAL IMAGE PROFILER OVERVIEW

OPTICAL IMAGE PROFILER (OIP)

The Optical Image Profiler (OIP) is a high resolution site characterization (HRSC) tool that efficiently delineates non-aqueous phase liquid (NAPL, or free product) hydrocarbon fuels in the subsurface. The OIP is advanced via direct push drill rig, generating multiple data sets simultaneously. This system provides real-time information which allows the investigation team to make changes to the program while mobilized to target the locations and depths that will provide the most value. Combining the vertical profiles from multiple locations enables the development of more complex visual representations of NAPL distribution, such as transects, three-dimensional models, and interactive maps. Ultimately, these data enable better decision making. Whether the next step is a risk assessment, additional characterization, or remediation, this tool will reduce uncertainty - saving time and money.

OIP SYSTEM OVERVIEW

The OIP system was developed by Geoprobe for the detection of NAPL hydrocarbon fuels, oils, and tars present in the soil. NAPL may be detected as layers, ganglia, blebs or droplets of product in the formation matrix. Compounds in the NAPL will fluoresce when exposed to certain types of light. The tool operates by focusing a light source through a sapphire window and then capturing the resulting fluorescence with a camera 30 times per second as the tool is pushed downward. Back at the technician's station above ground, a software filter is applied to measure the amount of fluorescence in each image and a vertical log is generated in real time.

In addition to the NAPL fluorescence measurement, the tool includes an integrated electrical conductivity (EC) array and a Hydraulic Profiling Tool (HPT). The EC array measures bulk formation conductivity which can be used to make inferences about the soil type encountered. The HPT measures back pressure and flow rate of an injected water to generate an estimated soil transmissivity value. Together, these tools provide a powerful collaborative data set for understanding hydrostratigraphy. Cascade deploys both of the light sources available from Geoprobe: the OIP-UV and OIP-G.

OIP-UV Probe - The OIP-UV probe uses an UV LED and visible light camera and is suitable for delineation of fuels such as gasoline, diesel, etc. In addition to the software-filtered images showing percent areal fluorescence, the OIP-UV also provides the client with full color images of the soils outside the probe window.

OIP-G Probe - The OIP-G probe uses a green laser diode and an infrared camera, ideal for delineating coal tars, creosote and heavy fuels or oils. Since this system uses an infrared camera to filter out the green light, the visible light images returned by this probe are in black and white.



TECHNICAL SERVICES | OIP OVERVIEW

DATA COLLECTION

Data is collected and viewed in real time on a computer, visible to the entire field team. In addition to the boring logs, an electronic data deliverable (spreadsheet based) is created that is suitable for incorporation into common database tools (e.g., EQUiS) and for use in three-dimensional modeling software, such as EVS. Cascade also offers near-real time data transfer via online mapping tools such as ArcGIS, and can assist you in interpreting HRSC data.

BENEFITS OF OIP

- **Real-time data acquisition** - allows for “on-the-fly” decision making and selection of the next borehole location, leading to more efficient and successful investigation programs
- **Visible images of in situ soils** - provide an additional line of evidence for soil characterization. Qualitative assessments of grain size and soil color can be made to improve the site conceptual model
- **Adaptability** - Cascade’s OIP team arrives on site with Membrane Interface Probe (MIP) tool capability and can easily switch to that system to delineate dissolved phase impacts. Our full suite of HRSC tools can be mobilized to help you solve complex site investigation problems
- **Simplicity** - Cascade can seamlessly switch over to more conventional investigation tools such as soil borings and groundwater screen point samplers as desired to collect confirmatory data.
- **No IDW** - true in situ information without investigation derived waste, carryover, or handling and storage of samples
- **Fast** - production rates of 200 to 400 feet per day (typical direct push conditions)

OIP Log Generated by Cascade HRSC Team

This log shows the multiple data sets created during advancement of the OIP tool in the subsurface, including:

- Electrical conductivity (A);
- Percent areal fluorescence (NAPL detection) (B);
- Estimated hydraulic conductivity (C);
- UV light and software filtered images from a selected depth, in this case 6.8 feet below ground surface (D); and,
- Visible light images from selected depths (E).

