**Laser-Induced Fluorescence (LIF) Primer**

**Background**

Laser-induced fluorescence (LIF) is a method used to detect and map petroleum NAPL in the subsurface. LIF is based on the principle that certain organic compounds, when exposed to laser light, emit characteristic fluorescent light. This light can then be used to map the distribution of NAPL, which is useful in remediation planning and site characterization.

**Methodology**

LIF involves the use of a laser to excite the NAPL, and the emitted fluorescent light is captured by a detector. The detector records the intensity of the emitted light as a function of depth, allowing for the creation of a LIF log.

**Advantages**

- LIF detects NAPL equally well in both the vadose and saturated zones.
- LIF is logged continuously with depth (2 cm/second) without data gaps or partial recovery.
- LIF is compatible with both cone penetration test (CPT) and percussion based direct push drilling technologies.
- LIF is used in conjunction with cone penetration test (CPT) and direct push drilling for high-resolution NAPL delineation.

**Limitations**

- Laser-induced fluorescence does not detect all NAPL components, such as light non-petroleum hydrocarbons (LNAPL).
- LIF is not effective for detecting NAPL with low PAH content or low fluorescence.
- LIF technology is expensive and requires specialized equipment.

**Practical Applications**

- LIF is used in the remediation of fuel-contaminated sites, where it provides valuable information about the nature and extent of NAPL contamination.
- LIF data can be used to guide remediation efforts, such as the selection of remediation technologies and the design of remedial systems.

**Conclusion**

Laser-induced fluorescence is a powerful tool for mapping NAPL in the subsurface, providing valuable information for remediation planning. However, it is important to consider the limitations of LIF technology when deciding whether it is the appropriate method for a particular site.