

Soil Contamination & Groundwater Migration



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Introduction



⌘ Types of contamination.

⌘ Common sources:

For soil and groundwater impacts.

⌘ Remediation strategies:

The challenges, reasoning, expense.

⌘ OHM Dry Cleaner – Bridge Project.

What types of contaminants impact the environment?

- ⌘ Petroleum Hydrocarbon (DRO, GRO, PAH).
- ⌘ Volatile Organic Compounds (VOCs).
Benzene, PCE, TCE
- ⌘ Metals: Lead, Arsenic



What are the most common sources?



- ⌘ Leaking Tanks – both underground (LUST) and above ground (AST).
- ⌘ Surface Spills.
- ⌘ Manufacturing Operations.
 - Dry Cleaners
 - Machine Shops (degreasers)
 - Foundry & Metal Plating
- ⌘ Historic Fill sites (PAHs).

Leaking Underground Storage Tank – LUST Site



Surface Spills



Manufacturing Operations



Figure 18. Still Bottoms Discharges. Note the still bottoms spilled onto the floor and splattered on wall behind drycleaning machines.

Petroleum Hydrocarbon Migration

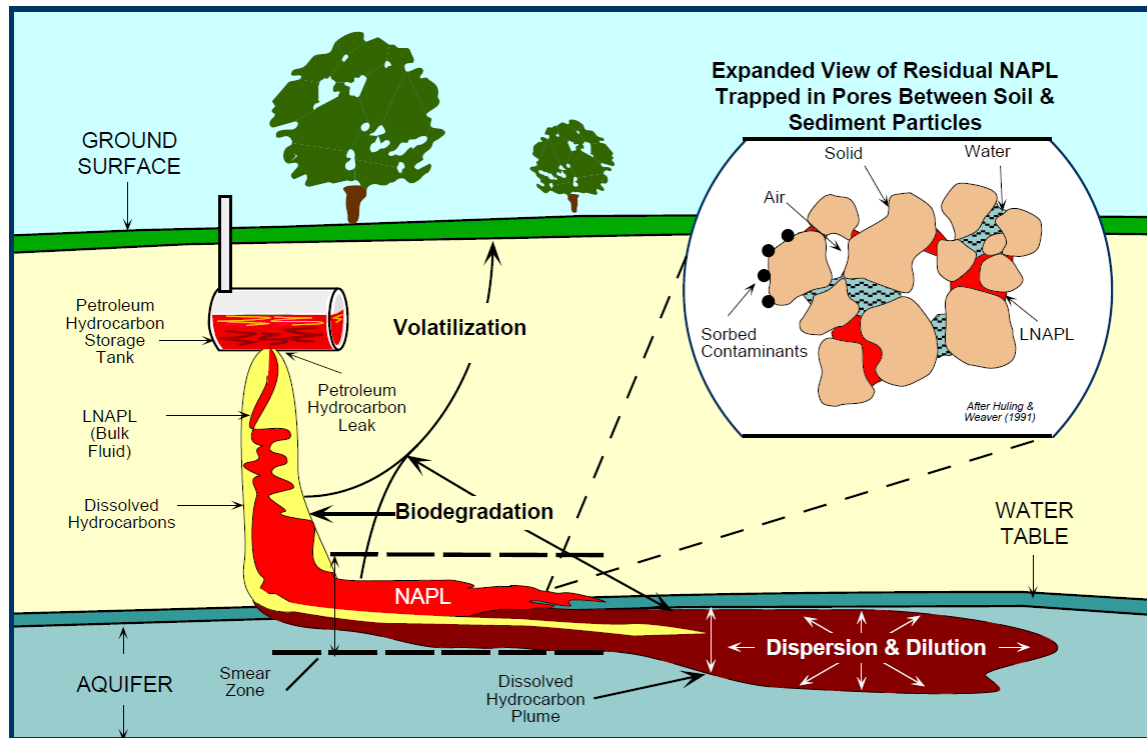


Figure 2. As the bulk hydrocarbon moves through the subsurface, some of the liquid may be trapped in the soil or sediment pores (residual saturation); some may evaporate (volatilization); some may become sorbed to the surface of the soil particles (sorption) and some may dissolve in the ground water (dissolved plume). Since bulk petroleum hydrocarbon liquids are less dense than water, the liquid may float on top of the ground water table, rising and falling as the water table rises and falls through the seasons. This process can create a smear zone of residual saturation. As the dissolved plume moves, the concentration of the dissolved hydrocarbons is lowered by dispersion and dilution effects. Microorganisms may degrade hydrocarbons that are dissolved, volatilized or sorbed.

Chlorinated Solvent Migration

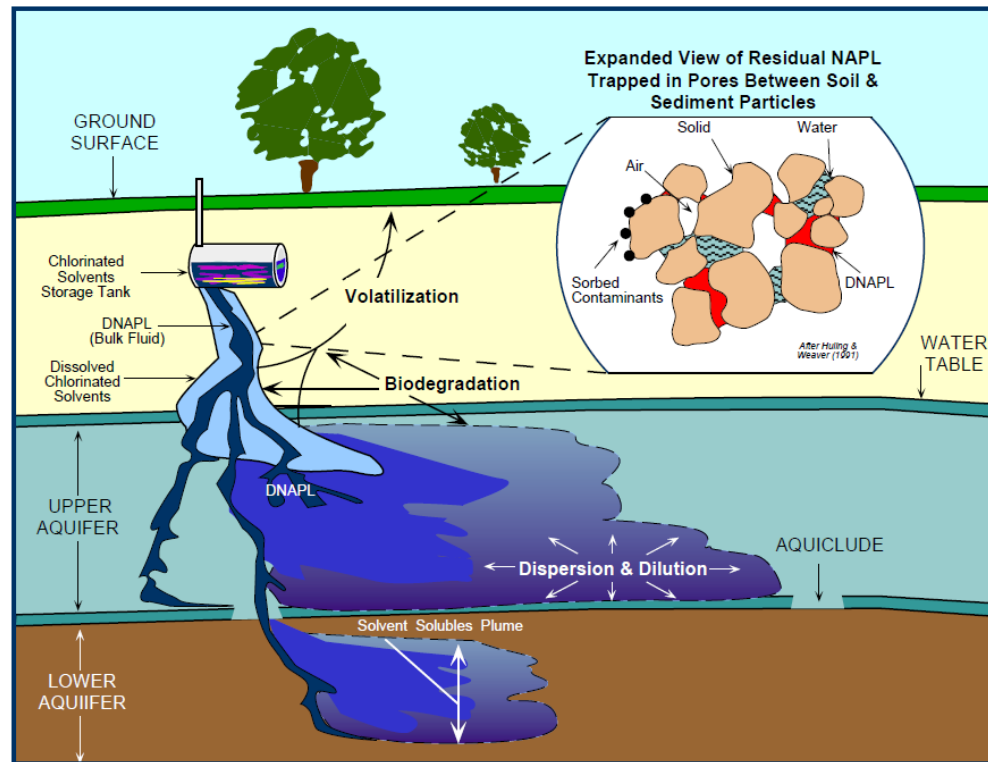


Figure 2. As the bulk chlorinated solvent moves through the subsurface, some of the liquid may be trapped in the soil or sediment pores (residual saturation); some may evaporate (volatilization); some may become sorbed to the surface of the soil particles (sorption) and some may dissolve in the ground water (dissolved plume). Since bulk chlorinated solvents are more dense than water, the liquid tends to move down below the water table. As the dissolved plume moves, the concentration of the dissolved solvents is lowered by dispersion and dilution effects. Microorganisms may degrade hydrocarbons that are dissolved, volatilized or sorbed.

Remediation for Soil



⌘ Landfill (Dig & Dump).

Hazardous or solid waste.

⌘ Soil Vapor Extraction (sandy soil).

⌘ Soil Roasting (incineration).

⌘ Natural Attenuation:

Extent defined and not a direct contact threat.

Remediation for Soil



Remediation for Soil



Remediation for Groundwater



- ⌘ Pump and Treat.
- ⌘ Injection (Peroxide, molasses).
- ⌘ Biosparging.
- ⌘ Natural Attenuation:
 - Needs to have degree and extent defined and establish a stable or receding plume.

OHM – Elm Grove Dry Cleaner Site



OHM – Elm Grove Dry Cleaner Site



- ⌘ Chlorinated PCE and TCE impacts in both soil and groundwater.
- ⌘ Extent has been defined. Impacts extend out into Watertown Plank Road.
- ⌘ BP gas station across the tracks is a documented LUST site.
 - Site Investigation complete.

Summary



- ⌘ Petroleum Hydrocarbons, Volatile Organics Compounds & Metals are the most common impacts.
- ⌘ Common sources are leaking tanks, surface spills and manufacturing operations.
- ⌘ Historic fill sites (PAHs) are a major problem for property transactions.

Summary



- ⌘ Chlorinated solvent (TCE, PCE) sink deeper into the groundwater.
- ⌘ Landfilling and natural attenuation are common methods to address soil impacts.
- ⌘ Natural attenuation is a common groundwater remedy if the plume is defined, stable or receding.

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Questions??

