DSCR

DLA's Lead Center For Aviation Support

ENVIRONMENTAL RESTORATION PROGRAM

How Contaminants Are Introduced to the Environment

A DSCR Restoration Advisory Board (RAB) Technical Training Session

Presented by
Mitretek Systems

November 14, 2005

Briefing Overview

- What types of substances are site-related contaminants at DSCR?
- Where are they?
- How did they get there?
- Previews of coming attractions --

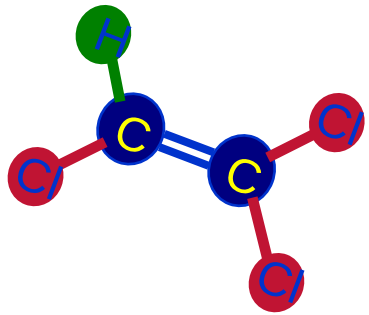
What is a Contaminant?

A contaminant is a substance that renders an environmental medium (soil, water, air) …

"impure or unclean by contact or mixture."

A contaminant is "*site-related*" if activities on the site introduced the substance to the environment.

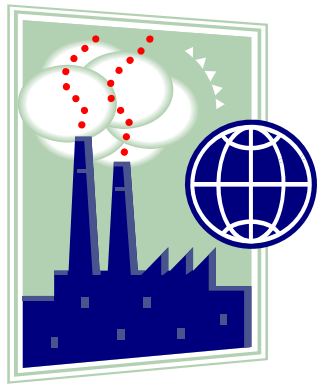
Site-Related Contaminants at DSCR



- **Industrial Chemicals**
  - **Chlorinated solvents (e.g, PCE, TCE)**
  - **Refrigerants (e.g., Freons)**
- **Refined Petroleum Products**
  - **Petroleum fuels (e.g., diesel, heating oil)**
  - **Petroleum solvents (e.g., Stoddard, xylenes)**
- **Pesticides (e.g., 4,4’-DDT, chlordane)**
- **Metals (e.g., arsenic, iron)**

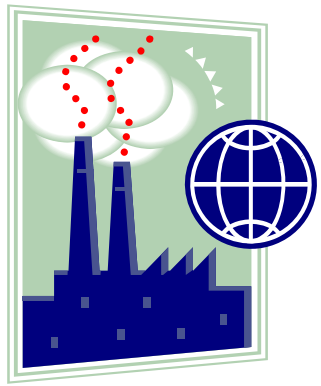
Where Do They Come From?

- **Chlorinated solvents (CVOCs) are commonly used as:**
  - Industrial degreasers
  - Dry-cleaning agents
  - Septic system cleaners
  - Solvents to dissolve other substances (glue, paint)
  - Pesticide ingredients
  - In common household products (drain cleaners, printing inks, spot cleaners, stain repellents, shoe polishes, glues, and aerosol sprays)
- **Refrigerants can be found in:**
  - Air conditioners
  - Fire extinguishers
  - Aerosol propellants

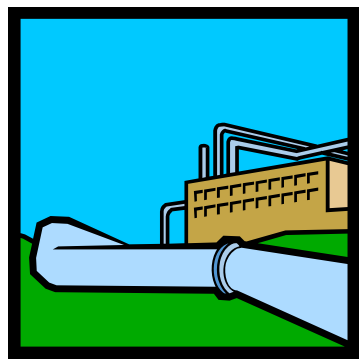


Where Do They Come From? (cont.)

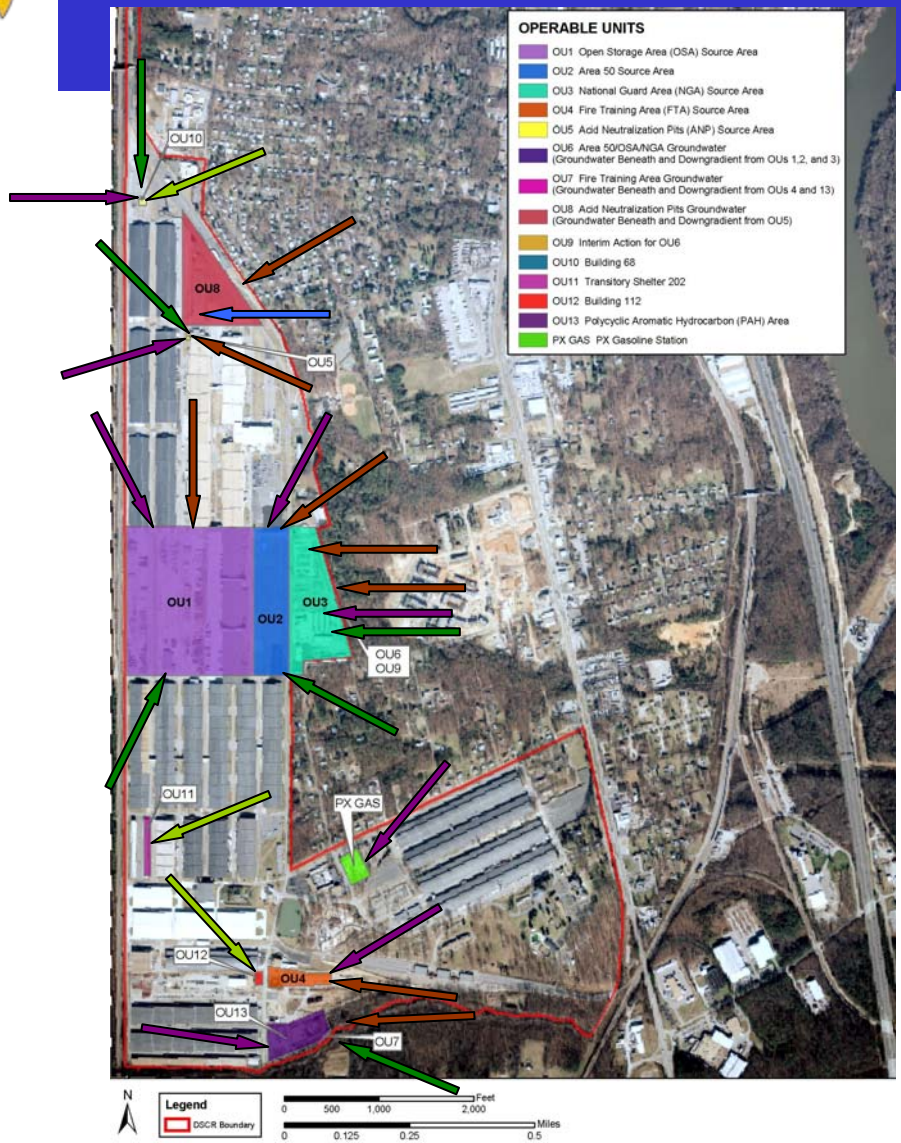
- **Refined petroleum products are found in:**
  - Petroleum fuels in storage (tanks)
  - Petroleum fuels (in vehicles)
  - Solvents to dissolve other substances (glue, paint)



- **Pesticides are found in:**
  - Bulk storage
  - Used in normal applications on DSCR
- **Metals occur as:**
  - Debris
  - Mobilized natural constituents



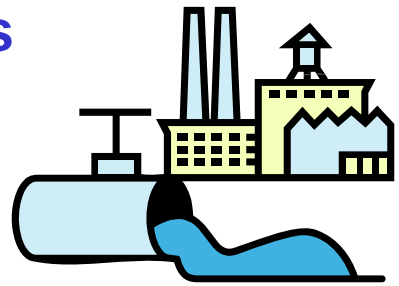
Where are They Found?



Legend

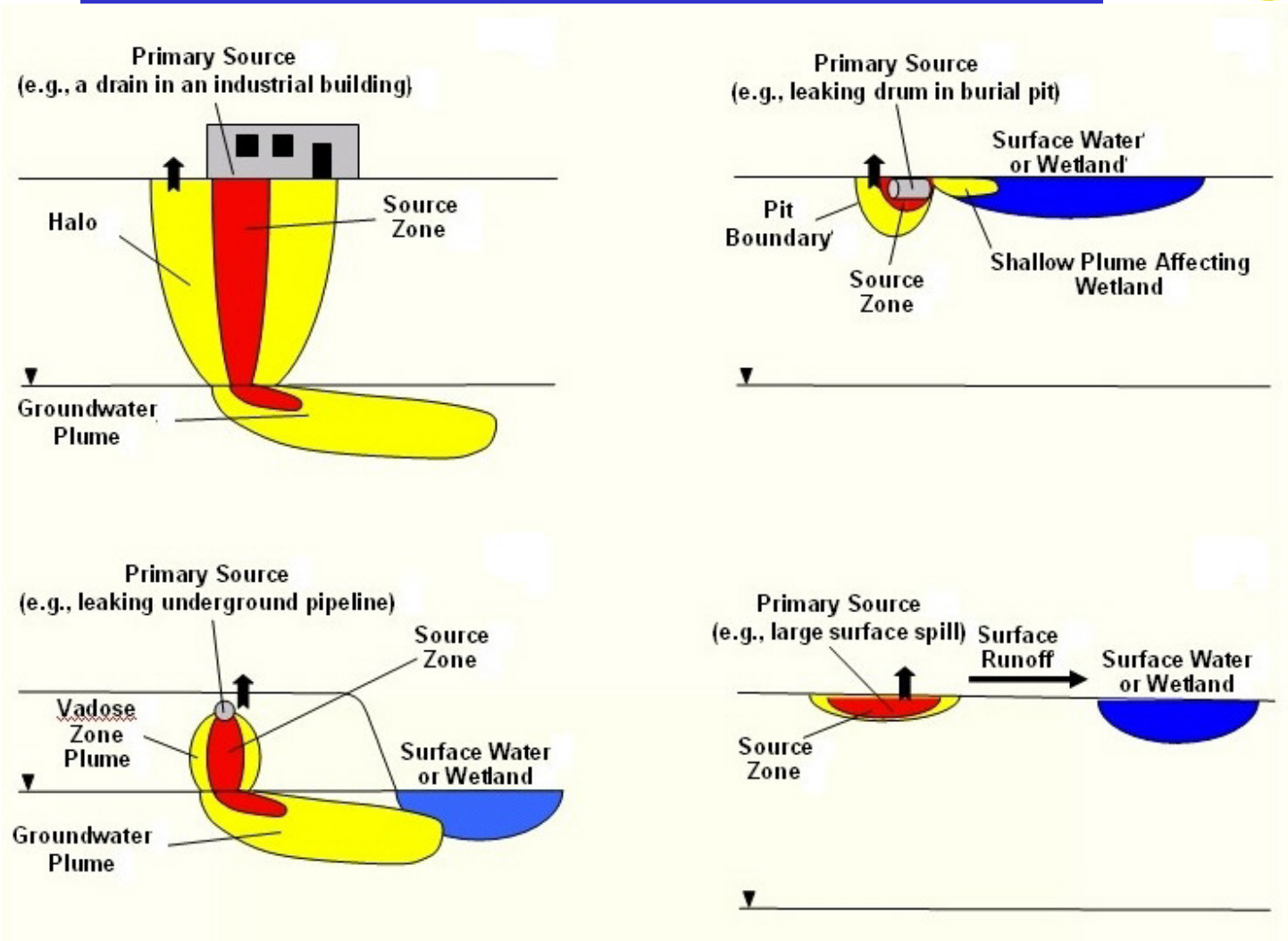
- Solvents
- Refrigerants
- Petroleum
- Pesticides
- Metals

How They Got into the Environment



- Solvents, petroleum fuels, pesticides, metals were not regulated as hazardous substances until the late 1970s
- Historically, solvents and fuels commonly were disposed of on the ground surface or in unlined waste disposal pits/landfills
- Petroleum fuels and solvents may have been lost while in storage
- Solvents and fuels also were used in fire-training exercises
- Pesticides may have been disposed of, lost while in storage, or applied for their intended use
- Metals may be anthropogenic, or may be “natural” constituents that have been mobilized

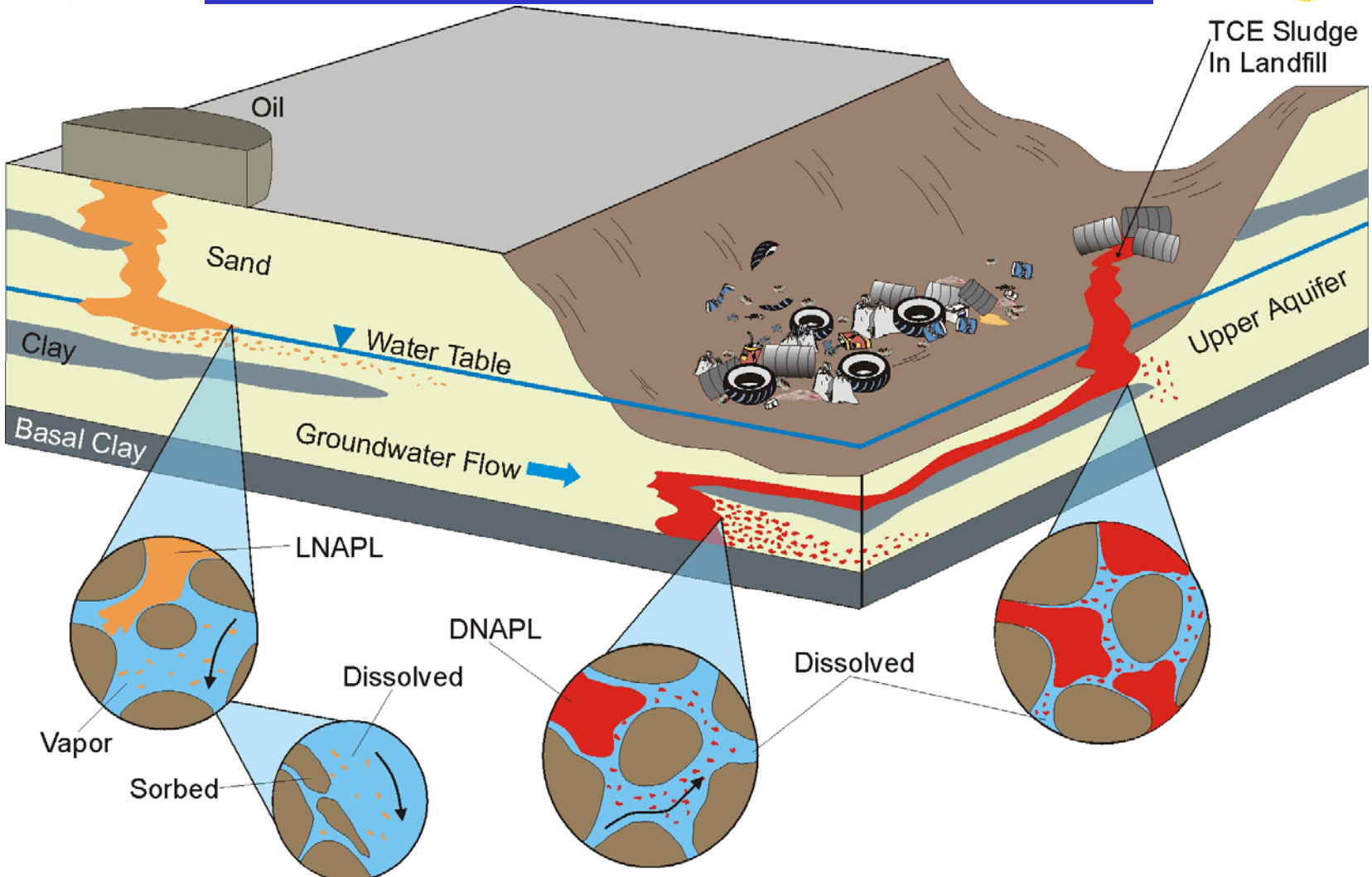
Contaminant Source Zones



Types of Contaminant Source Zones

- Dense, Non-Aqueous Phase Liquids (DNAPLs)
  - Most chlorinated solvents
  - Most refrigerants
- Light, Non-Aqueous Phase Liquids (LNAPLs)
  - All petroleum-based fuels
  - Most other refined petroleum products
- Other ("Diffuse") Sources
  - Most pesticides
  - Most metals

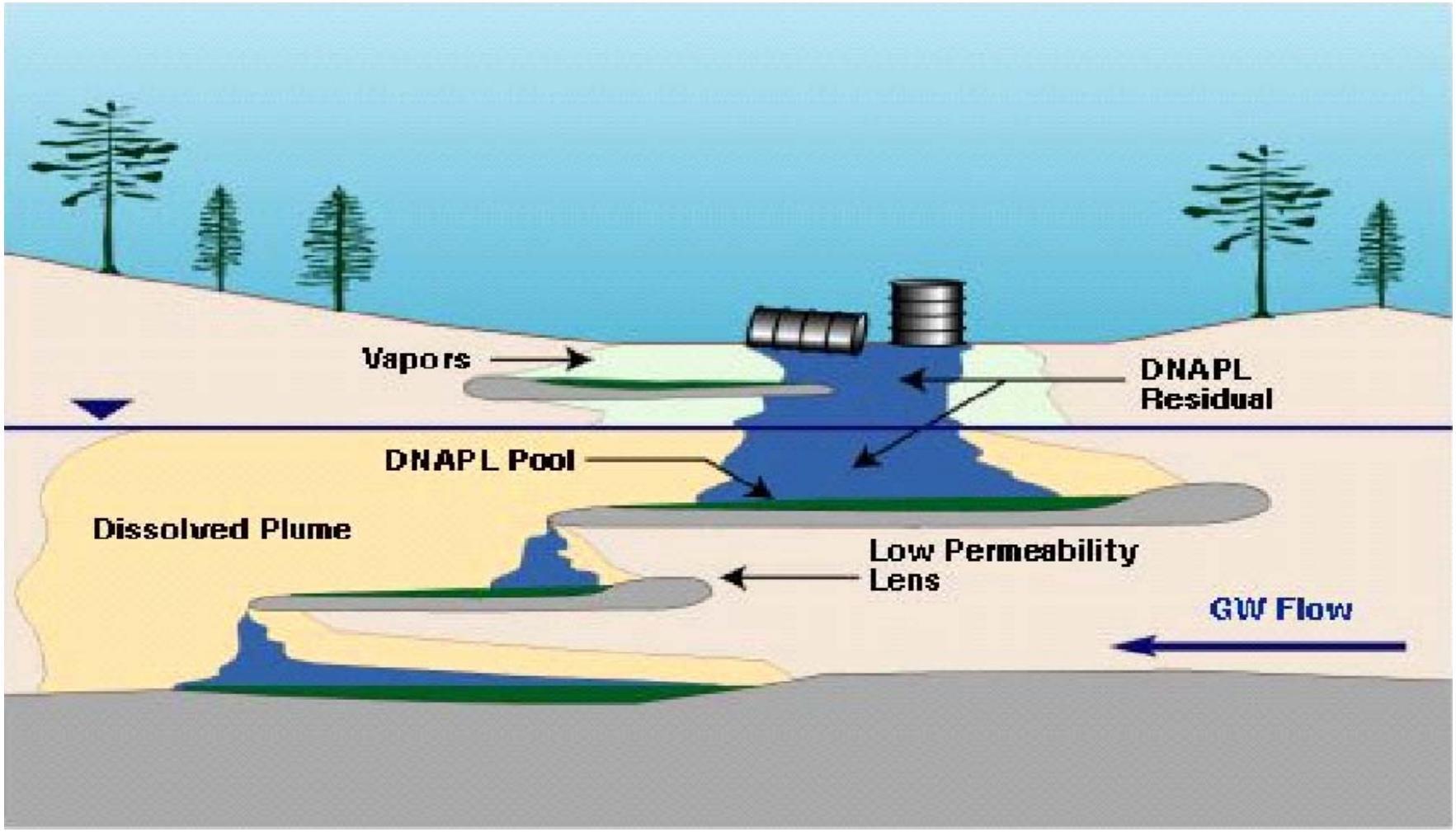
DNAPL and LNAPL in the Subsurface



Characteristics of DNAPL Contaminants

- DNAPLs (most chlorinated solvents):
  - Are heavier than water (“sink”)
  - Can move as separate liquid phase below groundwater table
  - Move with gravity rather than with groundwater flow
  - Bind to soil particles
  - Dissolve very slowly into groundwater
  - Volatilize as vapors
  - Low groundwater cleanup criteria

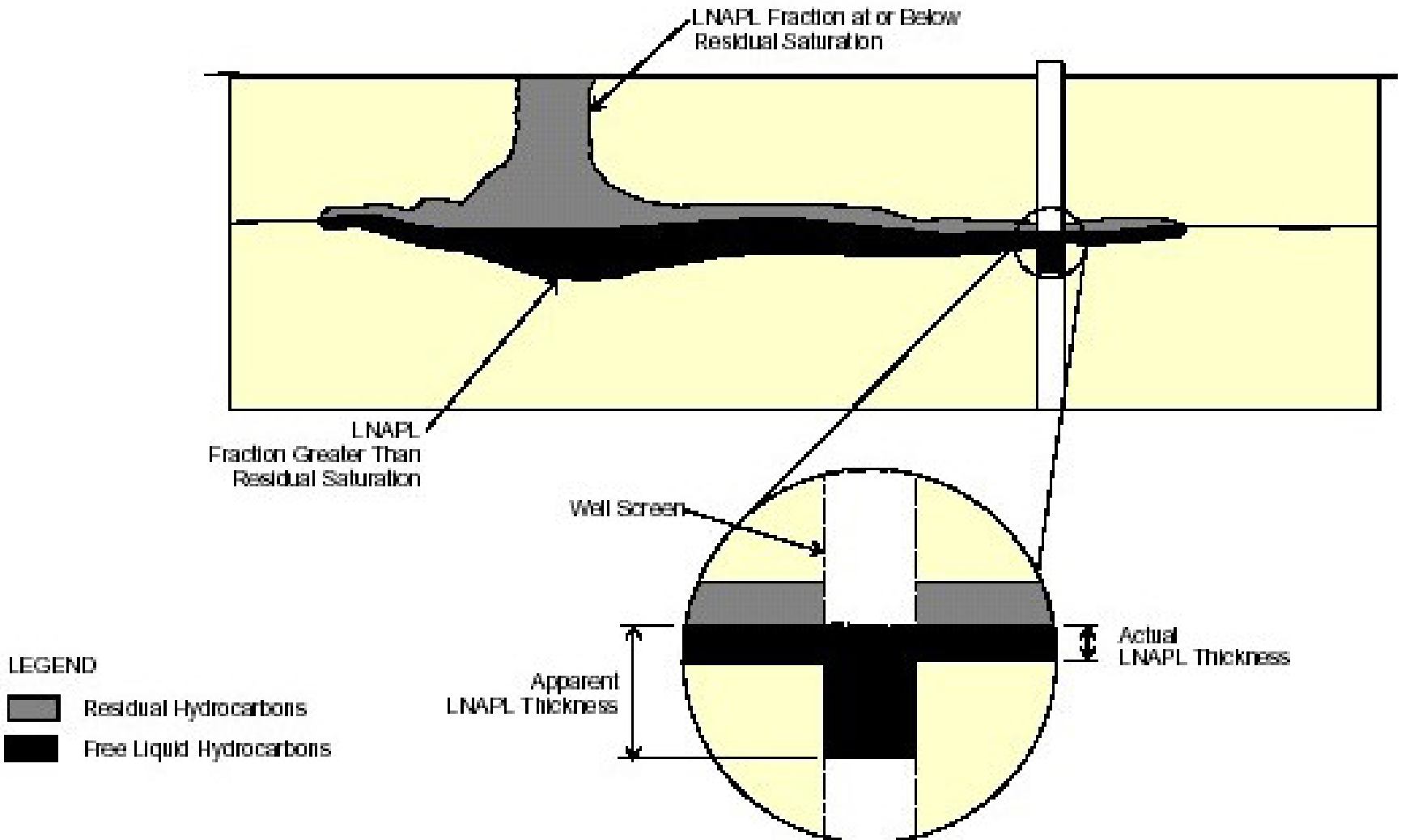
Conceptual DNAPL Site Model



Characteristics of LNAPL Contaminants

- LNAPLs (most petroleum products):
  - Are lighter than water (“float”)
  - Can remain as separate liquid phase above groundwater table
  - May move with groundwater flow
  - Bind to soil particles
  - Dissolve very slowly into groundwater
  - Volatilize as vapors
  - Usually low groundwater cleanup criteria

Conceptual LNAPL Site Model



Characteristics of "Diffuse" Sources

- "Diffuse" Sources (most pesticides and metals):
  - Usually dispersed in soil at low concentrations ("diffuse")
  - Limited solubility (don't dissolve in water)
  - Bind strongly to soil particles
  - Do not volatilize as vapors
  - Nearly immobile in the environment

Coming Attractions

- How contaminants are introduced to the environment
- How contaminants move through the soil column (above the water table) and in groundwater (below the water table)
- Fate of contaminants in the environment

Wrap Up

Questions?

Thank you for your attention!