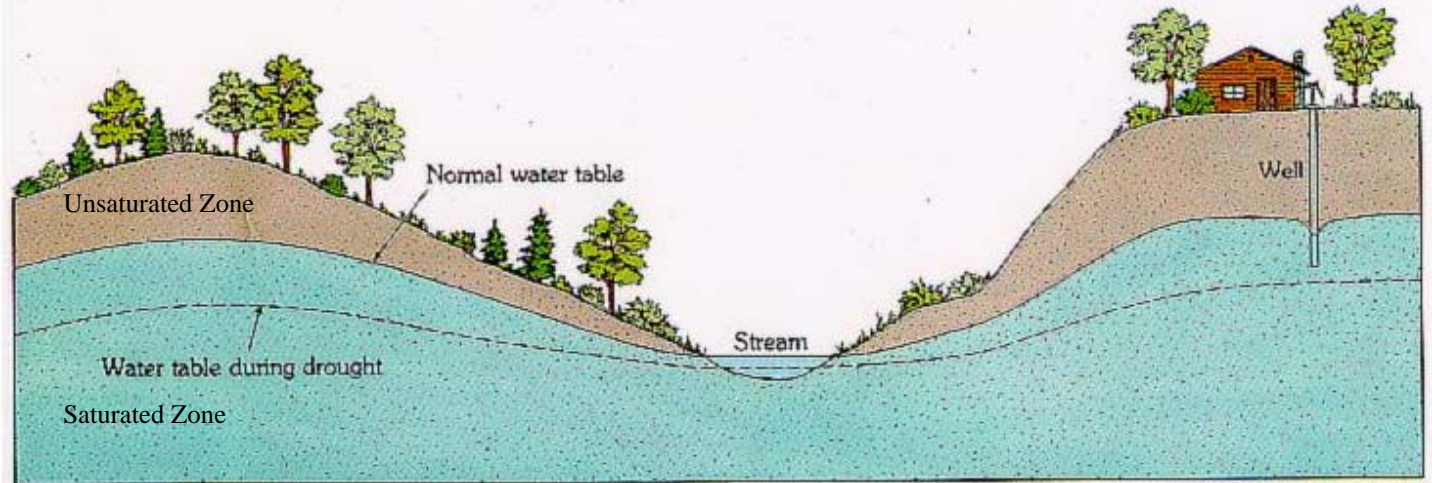


# UNDERGROUND WATER



Underground water is stored in the tiny open spaces between rock, sand, soil, and gravel under the land's surface. Water under the surface of ground is called **groundwater**. Groundwater is found in two zones.

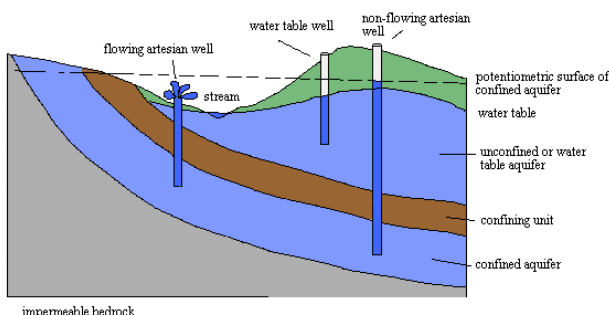
- The **unsaturated zone** is immediately below the land surface and contains both water and air in the open spaces.
- The **saturated zone**, under the unsaturated zone, contains water in all the open spaces.

## WATER TABLE

The **water table** is on top of the saturated zone. The water table is not flat. It often follows the shape of the land. When the water table meets the ground's surface it forms springs, lakes, swamps, or rivers. The amount of water in the table varies.

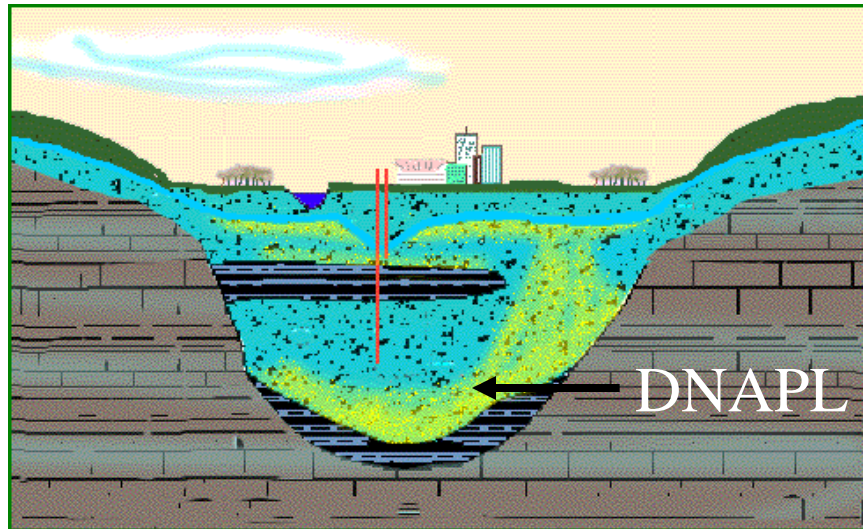
## AQUIFER

An **aquifer** is a layer of soil and rock under the ground's surface that allows water to pass through easily. Water can be pumped from an aquifer by wells to the earth's surface for household use.



# DENSE NON-AQUEOUS PHASE LIQUIDS

DNAPLs are compounds made mostly of carbon and hydrogen. DNAPLs are heavier than water.



The major types of DNAPLs are

- chlorinated solvents such as:
  - trichloroethylene (TCE)
  - perchloroethylene (PCE or "Perc")
  - carbon tetrachloride
  - methylene chloride
- coal tar
- creosote
- PCB oils

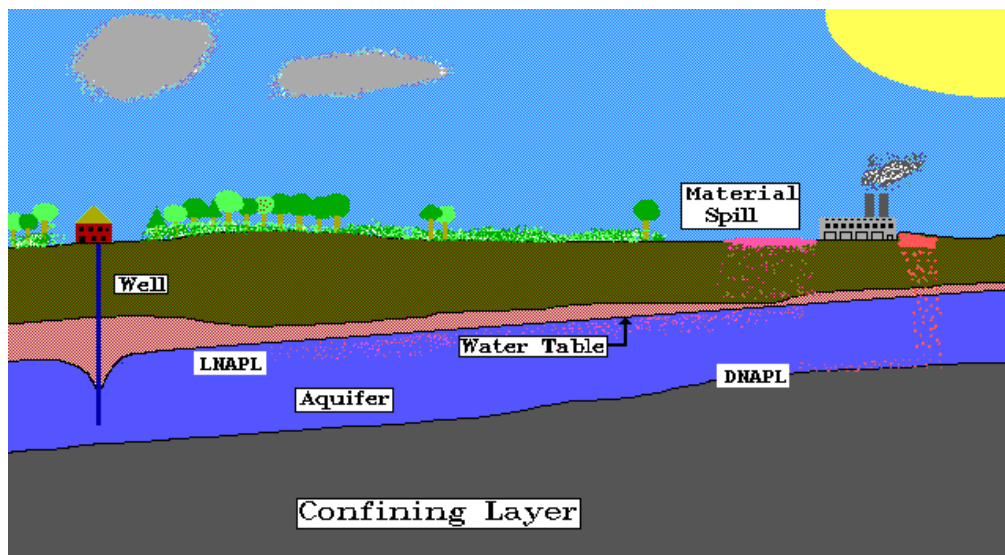
DNAPLS move downward through soils and groundwater. When they reach a solid layer where they collect and/or move laterally. DNAPLs are hard to find and remove from groundwater. They dissolve slowly providing a long term source for low level contamination of groundwater.

# NON-AQUEOUS PHASE LIQUIDS

Some substances do not dissolve easily in water. Liquids that do not dissolve in or mix with water are called **Non-Aqueous Phase Liquids** or **NAPLs**. When NAPLs are spilled onto the surface of the ground they spread, often reaching the groundwater. How fast a NAPL reaches groundwater depends on the soil conditions where the spill occurred and the chemical properties of the substance itself.

## TWO TYPES OF NAPLs

- Light non-aqueous phase liquids or LNAPLs
- Dense non-aqueous phase liquids or DNAPLs



- Light non-aqueous phase liquids or LNAPL's are substances lighter than water. LNAPLs "float" near the surface of the aquifer (water table). Petroleum is a LNAPL.
- Dense non-aqueous phase liquids or DNAPLs are substances heavier than water. DNAPLs sink to the bottom of the aquifer. They stop sinking only when they reach a solid surface, such as rock or clay. Dry cleaning fluid is an example of a DNAPL.