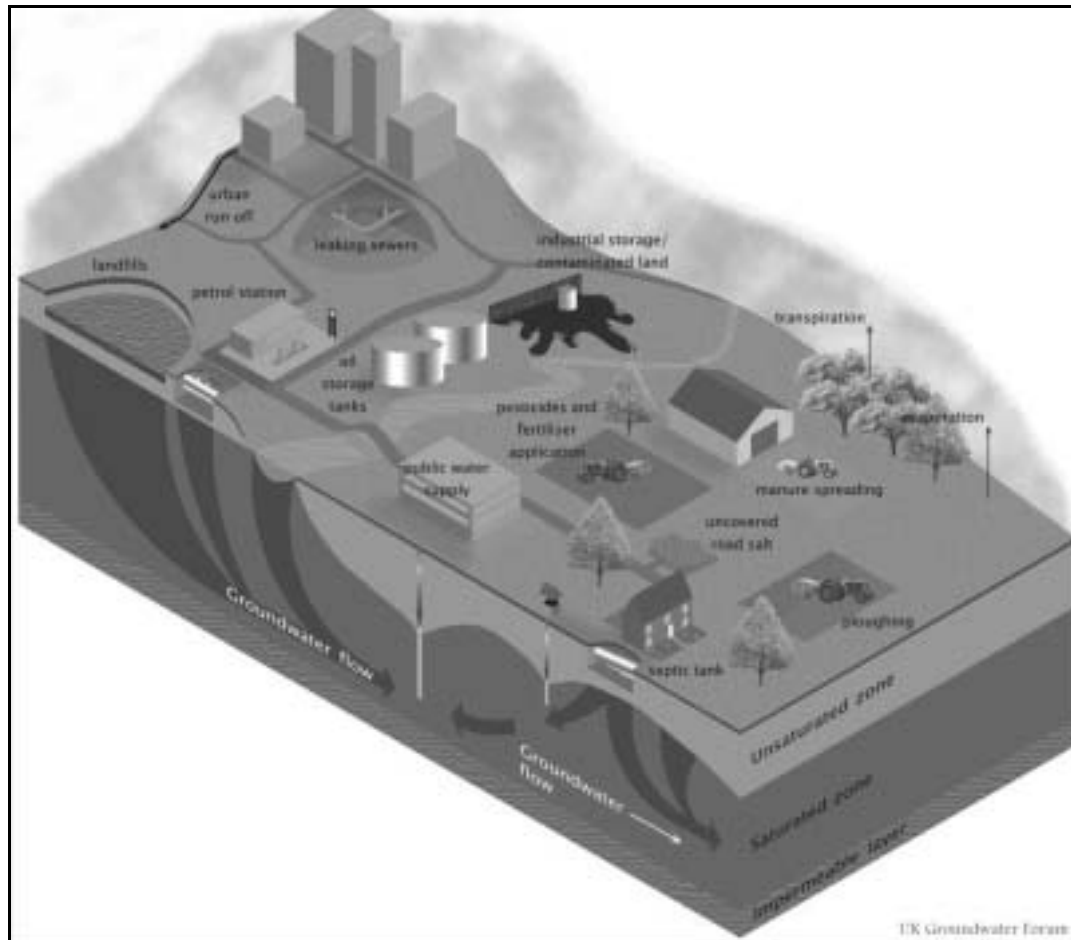


Groundwater Quality and Vulnerability

Groundwater is often safe to drink without treatment, making it particularly suitable for small-scale and cost effective development. However, sometimes groundwater can become contaminated, making it unsafe to drink.



Some hazards that threaten groundwater quality

Groundwater contaminants can be divided between micro-organisms (biological contaminants) and inorganic contaminants. Microorganisms include viruses and bacteria, and sometimes these can cause serious diseases such as cholera. Leaking sewers and latrines can allow harmful microorganisms to enter the groundwater. This is why latrines are normally situated down gradient from wells or boreholes.

All groundwater contains natural dissolved minerals derived from the soils and rocks. The total amount of dissolved solids in groundwater (total dissolved solids or TDS) can be estimated by measuring the electrical conductivity of the water, and this is often used as a rough indication of natural groundwater quality. The higher this measurement, the more brackish or salty the water will taste. The dissolved content of groundwater is normally harmless, although in some cases naturally occurring elements such as fluoride or arsenic may be present in groundwater in concentrations that can be harmful. Analysis of the water by a laboratory is needed to check for these elements.

Sometimes groundwater in its natural state is unfit to drink, such as the groundwater in parts of Tanzania that has high levels of fluoride. However, the most serious risk to groundwater quality is by pollution from human activities. This can include mining or industrial chemicals and effluents, which sink into the ground and dissolve into the groundwater, or agricultural chemicals such as pesticides and fertilizers that are spread on the ground. Groundwater usually moves very slowly, and has a great ability to filter or remove pollutants, but this depends on the properties of the aquifer and the type of pollutant. Fractured aquifers allow pollutants to travel more quickly.

A hydrogeologist needs to take into account many factors when assessing the risk of groundwater contamination. These include:

- The type of aquifer (e.g. fractured or intergranular).
- The depth to the water table.
- Potential sources of contamination.

An aquifer that has a high risk of contamination is said to be **vulnerable**. The risk of contamination is especially serious when many people or industries depend on the aquifer for their water.

Source: J Davies et al (2002) Development of a curriculum and training of supervision teams in borehole construction in Malawi. British Geological Survey Internal Report CR/02/219N