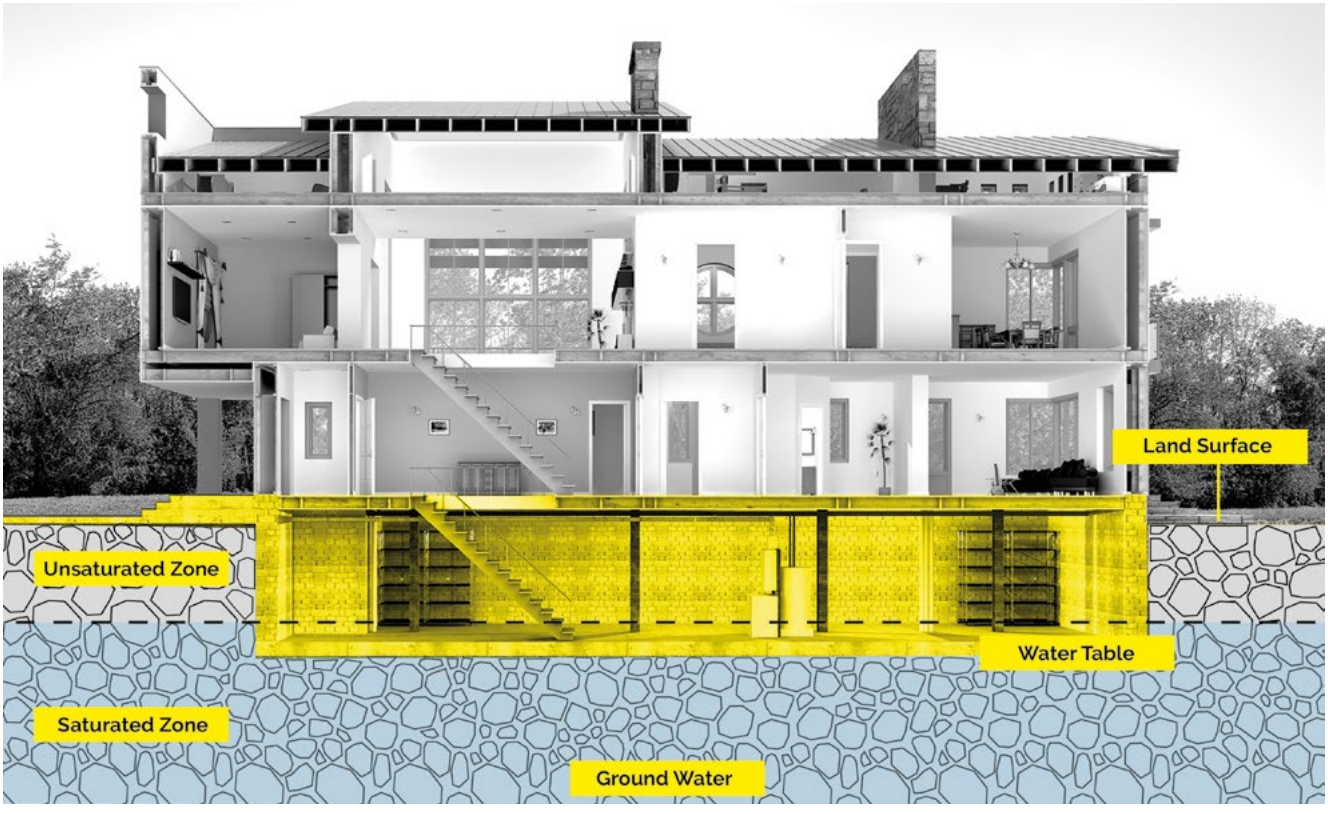
Problems with Groundwater Resources

If the rate of abstraction of groundwater from an aquifer is too high, and exceeds the amount of water recharged from rainfall, the water level in the aquifer will fall. This not only increases costs of pumping water, but also at the same time reduces the yield from individual boreholes. It can further affect the flow of rivers and streams which are supported by groundwater. When high rates of abstraction are put together with a dry summer, rivers and lakes may begin to dry, which will have consequent impacts on wildlife and amenity. It should be acknowledged, that not all low flows in rivers are due to groundwater abstraction, river flow is also affected by changes in climate, and by changes in land use. Modern abstraction schemes are often designed to put back as much treated wastewater into the river as would have naturally flowed in from groundwater.

Too much groundwater can also cause problems. In wet winters, rising groundwater levels can cause localized flooding in low-lying land. Groundwater tends to react slowly, so this type of flood problem can be long lasting. Unfortunately, groundwater flooding problems are often due to human activities by building on land that is naturally prone to flooding.

A particular problem often noted in areas, is where past over-abstraction has lowered groundwater levels, added with reductions in pumping, results in groundwater levels rising. London provides a great example. In the 19th century heavy pumping of groundwater lowered water levels within the Capital, much of London's infrastructure was built whilst groundwater levels were low, this includes parts of the London Underground network and the deep foundations of tall buildings. In the 1960s, changes in water usage meant that pumping rates were drastically reduced, and water started to rise back towards its natural levels, causing problems for London's tube lines and around building foundations. Recently we have seen pumping resuming in London which has started to control the rise of excessive groundwater. Although, similar problems occur in other cities, and in old mining districts.

Building and infrastructure damage occurs where differential movements within groundwater exceed the thresholds that the buildings or infrastructure can sustain. Too much groundwater can affect buildings with basements and cellars which having been converted into living spaces with furnishings and fittings. Where the structure was originally constructed with lower groundwater levels, the structure was able to sustain the levels of groundwater without damage. When groundwater levels increase the structure is no longer about to sustain without damage, resulting in a flooded basement or cellar.



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Like any water resource there is a risk from pollution. Pollutants on the lands surface can be flushed through the soil and rock into groundwater. Pollution occurs from diffuse sources, when pollutants are spread over wide areas, for instance when pesticides or fertilizers are used on agricultural land, and from point sources, for instance chemicals leaking from a storage tank or landfill. Once a pollutant reaches an aquifer, its impact will depend on its chemistry; the nature of the aquifer; and on the distance between the source of pollution and the point at which groundwater reaches the surface again (either in a river or by being pumped). Some pollutants will naturally degrade or will be filtered out of the water as it flows through the aquifer. Others will be persistent and need to be removed before the water can be used. Whilst preventing groundwater pollution is best, it is not always possible.

Rising groundwater can bring quality problems to the surface. In cities, pollution that has soaked into the ground from industrial spills can be 'trapped' in unsaturated rocks above the water table for decades - rising groundwater levels can flush out this pollution into local rivers. In mining areas, groundwater levels were historically kept low by pumping to stop the mines flooding. When the mines closed, and the pumping stopped, groundwater gradually flooded the mines, and dissolves minerals from the walls. This polluted groundwater may then discharge into local rivers.

It should always be noted, that it is difficult to establish groundwater levels of the future, given the uncertainty of current climate change scenarios and whether an area has had long term low water levels due to pumping. There should be an awareness that buildings built now will still be in use in 50-100 years time and that groundwater levels may change during the structures life cycle.