

Canterbury groundwater

Where does groundwater occur?

Over thousands of years the rivers have carried sediment from the mountains, forming the alluvial fans we know as the Canterbury Plains. These fans consist of layers of gravel, sand, silt and clay sediments that can be hundreds of metres deep.

The layers of coarse-grained sand and gravel that have been deposited can hold large volumes of water. These are the water-bearing layers or aquifers. There are a multitude of these buried permeable, meandering channels carrying water toward the sea.

The fine-grained sands, silts and clay can only release small amounts of water.

What is an unconfined aquifer?

It is one with no upper confining layer so the system is not under pressure, and its water table levels fluctuate both seasonally and from year to year.

What is a confined aquifer?

It is an aquifer under pressure because a confining layer of impermeable clay and silt acts as a 'lid.' Because the water is under pressure, the water in a well drilled into a confined aquifer will rise up the well, and may even flow at the ground surface. The levels also fluctuate seasonally.

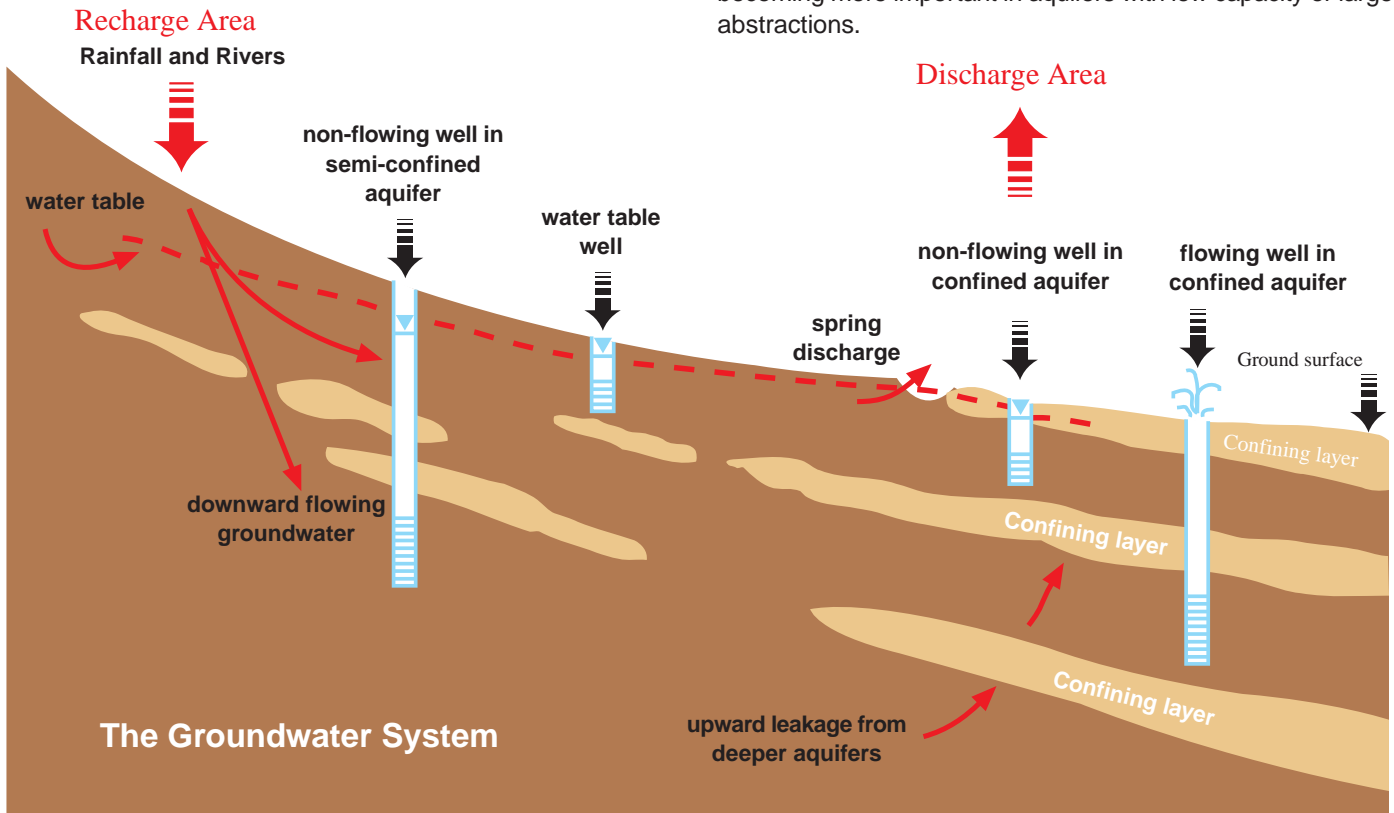
Why do springs arise?

Springs act as relief valves for the groundwater system. They occur where the groundwater comes to the surface, commonly near the coast. Springs and spring flows vary with groundwater levels.

Because springs are supplied from groundwater they can be affected by water being removed from nearby wells, or by the cumulative effect of many abstractions on the aquifer.

What affects groundwater levels?

Recharge is the main factor, but abstraction (pumping) is becoming more important in aquifers with low capacity or large abstractions.





Dual rotary drilling rig in action.

How does groundwater recharge?

Rainfall in the hills and the plains, the rivers flowing across the plains, and water from irrigation and stock water schemes all recharge the groundwater.

River recharge

In some areas water seeps from the rivers that flow across the plains. Even the smaller foothill rivers can have very significant effects on the groundwater in their vicinity.

Rainfall recharge

Once the soils of the plains are saturated, water will drain through the soil profile to the water table. Due to high summer evapotranspiration rates and low rainfall, this normally only occurs during the winter months. A series of dry winters will result in low groundwater levels.

Saltwater Intrusion

The aquifers discharge into the sea. There is potential for the saltwater/freshwater interface to be modified, allowing seawater to flow inland. The greatest risk of this happening is from excessive abstraction.

How much water can we abstract?

For a groundwater system to be sustainable over time, the rate of abstraction, and other discharges (springs and flow to sea) must not exceed the rate of recharge of the system.

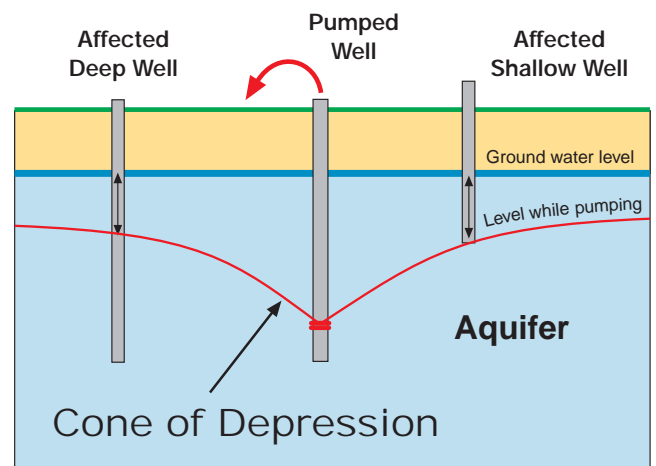
What are the effects of abstraction?

- The cumulative effect of all the wells abstracting from an aquifer lowers groundwater levels.

This affects everyone drawing from the aquifer, and may also affect spring fed streams, and potentially the saltwater / freshwater interface at the coast. In aquifers with large abstractions, the levels can decline faster, and reach lower levels, depending on how "good" the aquifer is.

- Localised interference

Drawdown from a well creates a cone-shaped depression in the groundwater levels which can affect your neighbour's wells. This effect will depend on the distance between wells, the abstraction rate, the physical aquifer characteristics (e.g. transmissivity – the rate water can move through an aquifer), and the regional groundwater levels.



What is hydraulic connection?

This is when surface water and groundwater are directly linked. When you pump water from a well that is connected to a nearby stream, it reduces the flow in the stream. This may be because the groundwater supplies water to the stream, and abstraction lowers the supply; or because the stream supplies water to the groundwater, and the abstraction lowers the groundwater and increases the losses from the stream.