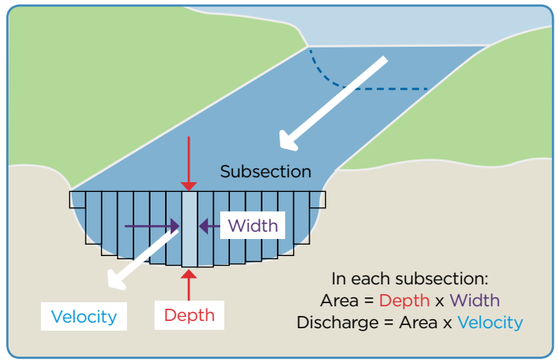
## Case study – measuring stream flow

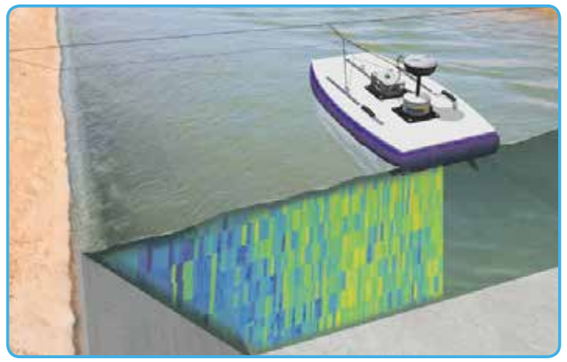
**There are four steps to measure stream flow:**

1. Monitoring the height of the river. This can be done with equipment that monitors the height of the water surface, such as floats, pressure transducers or radar type sensors.

2. Measuring actual flow by manually measuring river width, depth and water velocity which then give a flow rate at a point in time. Technology has made this easier by using acoustic instruments (such as an ADCP) that detect the doppler effect of sound waves to measure the bed of the river and water velocity with more detail.



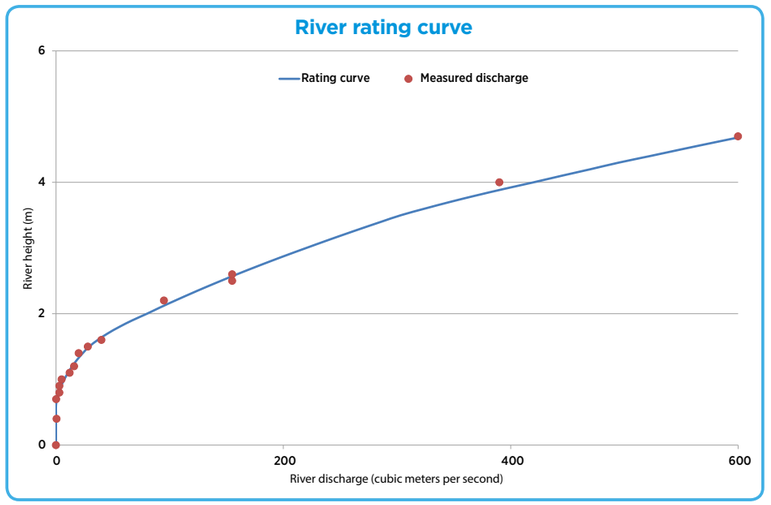

*Parameters used in measuring river flow.*



*An acoustic profiler (ADCP) measuring parameters for determining stream flow.*

3. Relating river heights to actual flow measurements at a point in time to construct a 'rating'. The rating shows how much water is flowing in the river when it is at a specific height. Natural changes in river shape, roughness or slope mean these ratings need to be checked and maintained to give accurate flows.

4: Combining measured stream height with the rating enables us to easily derive measured flow in the river at all stream heights.




GD154465

**For more information**

**Visit** www.boprc.govt.nz/kaitunamaketu
**Phone** 0800 884 880
**Email** info@boprc.govt.nz

*Freshwater is essential to life; it sustains the things we value*

BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

# Surface water and groundwater quantity in the Kaituna/Maketū and Pongakawa/Waitahanui catchments

## Water availability and use

In the Kaituna/Maketū and Pongakawa/Waitahanui catchments there is:

- 1.94 billion $m^3$ per year of rainfall - that's nearly two and a half times the volume of Lake Rotorua.
- 1.6 billion $m^3$ of runoff to the sea per year.

**2,194 km of waterways**

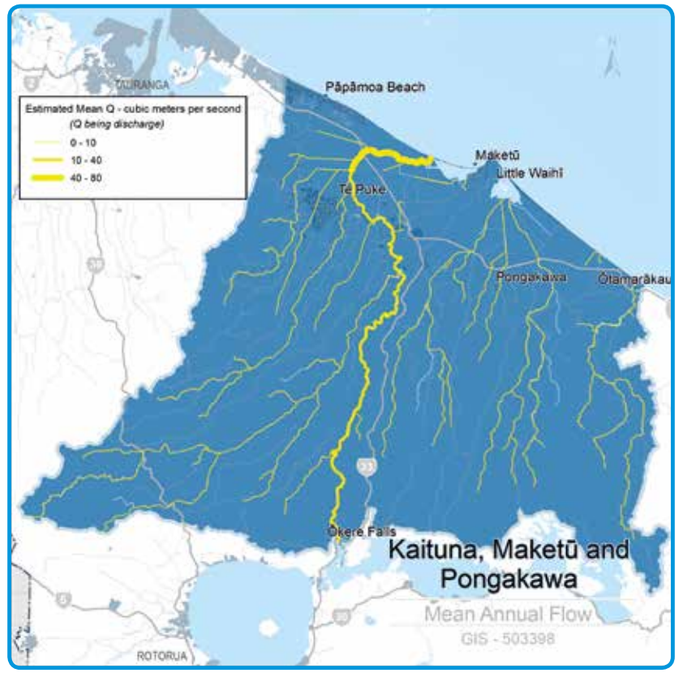
**1197km** in Kaituna/Maketū catchment including Kaituna River and 24 streams

**997 km** in Pongakawa/Waitahanui catchment including 8 primary streams

**314 resource consents**
to take and use water

**Major industry includes**

Te Puke township | 167 dairy farms | 1000+ kiwifruit blocks | One meat works | Exotic forestry




*The rivers and streams in the Kaituna/Maketū and Pongakawa/Waitahanui catchments have different amounts of water flowing through them. The map (above) shows the modelled mean (average) discharge from the different rivers and streams in the catchment.*

## Lake Rotorua

The Kaituna River headwaters flow from Lakes Rotorua and Rotoiti.

Control gates at Okere are used to manage lake levels and regulate the flow from Lake Rotoiti into the headwaters of the Kaituna River. The Okere gates are used to release floodwater from Lake Rotoiti when required, and to reduce outflows during periods of low rainfall so that desirable lake levels can be maintained.

While the Okere gates mitigate flood peaks in the Lower Kaituna to some degree, uncontrolled flows from the Mangorewa River are the main cause of downstream flood peaks. Average flow down the Kaituna River at Okere Gates is approximately 17 cubic metres per second.

*Okere control gates*

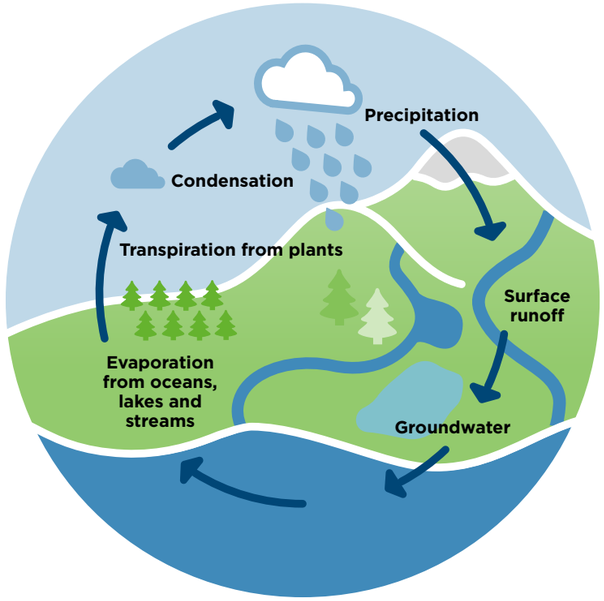
## The water cycle

The water cycle explains how water moves around in the environment.

Water on the surface of the earth (surface water) such as from lakes, rivers and the ocean, evaporates into the air where it cools down and then falls as rain.

Rain either soaks into the ground and becomes groundwater or flows over the land into lakes, rivers and streams. Most surface water and groundwater then ultimately flows back out into the ocean where it will evaporate again.

As water moves around the land surface and through the ground, it transports contaminants like bacteria, sediment and nutrients.




*Water cycle*

## Groundwater

In 2009 GNS Science provided a geological model of the groundwater systems beneath these catchments as shown in Figure 1 (right). This helps us visualise the local groundwater systems.

The Kaituna/Maketū and Pongakawa/Waitahanui catchments are divided into 11 groundwater catchments: Lower Kaituna, Mangorewa, Kaikokopu-Pokopoko-Wharere, Pongakawa, Waitahanui and six other smaller coastal catchments. See Figure 2 map (below) for catchment locations.

The geological model (right) shows that groundwater catchments are connected to surface waters (such as drains, streams and rivers), so abstraction from groundwater could affect surface water flow.

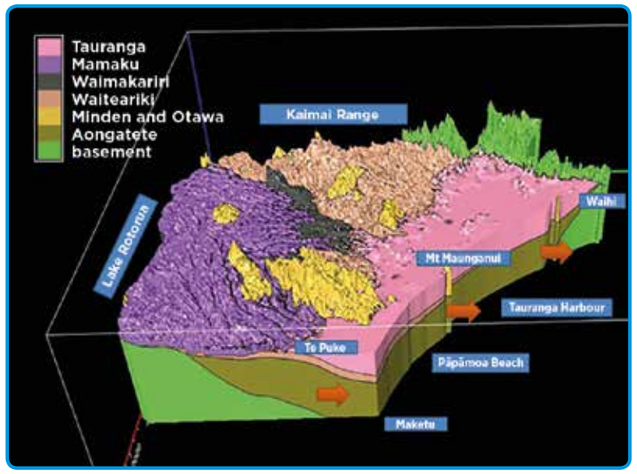
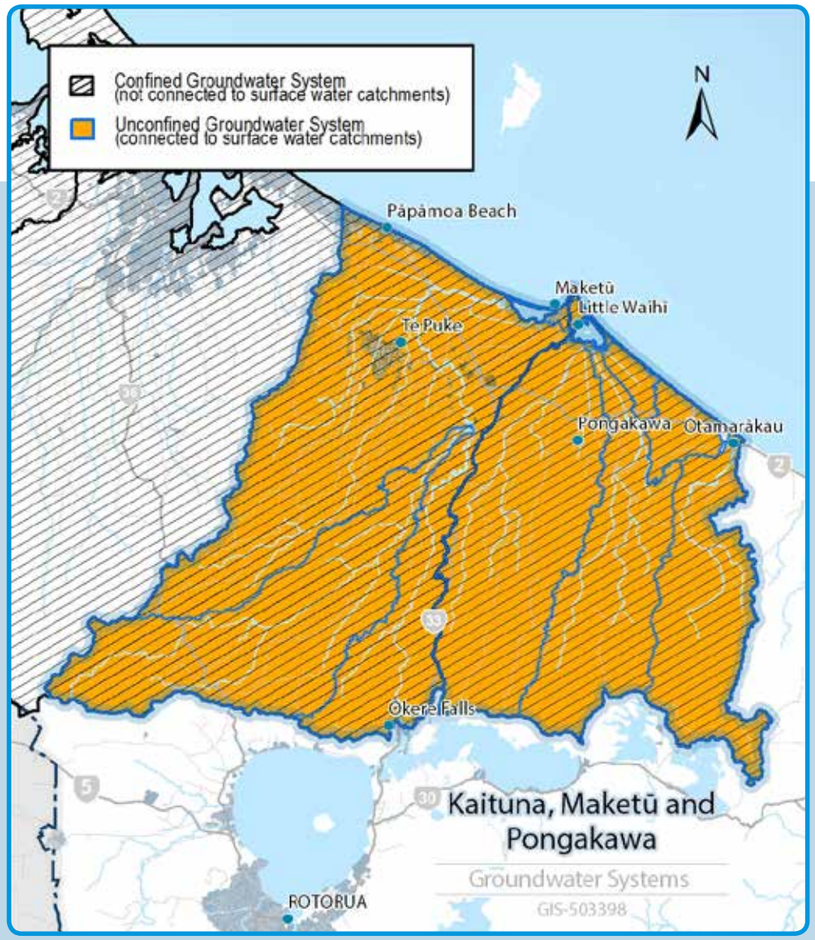



*Figure 1: Geological model of Kaituna/Maketū and Pongakawa/Waitahanui groundwater catchments.*

*Figure 2: Kaituna/Maketū and Pongakawa/Waitahanui groundwater systems.*




## Research

Water is a limited resource. To be able to make the best use of what we have, we need to fully understand what affects water availability.

To help us improve our knowledge of local water resources, the Regional Council is gathering information on:

- The interaction between groundwater and surface water.
- The importance and uniqueness of springs.
- How much water is currently taken from our rivers, streams, lakes and groundwater eg. through unconsented permitted and illegal takes.
- Groundwater flow and availability.

## Glossary

**Groundwater –** all the water that is contained in the void spaces within rocks.

**Surface water –** means freshwater in a river, lake, stream, pond or wetland, that is not located within the coastal marine area.

**Flow (or discharge) -** refers to the volume of water in a river flowing past a single point in one second. It is measured in cubic metres of water per second.

A cubic metre per second can be written as m3/s, or cumecs, and equals 1000 litres per second. To give you an idea about how much water that is; 0.7 m3/s would fill an Olympic swimming pool in an hour. A flow of 42m3/s would fill the same pool in a minute.

**ADCP -** stands for an Acoustic Doppler Current Profiler. This is a special instrument that uses changes in sound waves to measure the cross-section area of a river, and water speed, which are then combined to measure river flow.