



Rotokawa-Mokoia Geothermal System

Science, monitoring and use

What is the Rotokawa-Mokoia Geothermal System?

The Rotokawa-Mokoia Geothermal System is a by-product of the volcanism associated with the Rotorua Caldera of the Taupō Volcanic Zone (TVZ). Volcanism started with the massive eruption about 240 thousand years ago (ka) and lasted at least until ~158 ka, with the formation of the Mokoia Island lava dome. This intense, relatively recent volcanism means that there are still very hot rocks at depth driving the Rotokawa-Mokoia Geothermal System.

For more information on this system, check out the 'Rotokawa-Mokoia Geothermal System - science, monitoring and use summary report' (located under Environmental publications on our website: www.boprc.govt.nz/publications)

What is the extent of the system?

GEOLOGY

Geothermal systems in the TVZ are driven by deep magma bodies that provide heat to one or more geothermal systems. The Rotokawa-Mokoia and the Rotorua city systems are driven by the same magma at ~5-8km depth. This connection is also reflected by Te Arawa's understanding of how these systems were formed and the legend of Ngātoroirangi.

HYDROGEOLOGY

For managing the geothermal systems in the Bay of Plenty region, Bay of Plenty Regional Council's focus is around the hydrological extent and connections of the geothermal aquifers, which are the aquifers in the top 3km. The geothermal aquifers of the Rotokawa-Mokoia and the Rotorua city systems are not hydrologically connected, therefore extraction from the Rotorua city system will not affect the Rotokawa-Mokoia Geothermal System and vice-versa.



For more information on the extent of the geothermal systems of the Bay of Plenty region, visit www.boprc.govt.nz

SOME QUICK FACTS ABOUT THE SYSTEM

LOCATION

About 8km northeast of Rotorua city.

EXTENT

From the eastern shore of Mokoia Island through to Lake Rotokawa to southeast, including the Lake Rotorua lakebed between the Rotorua Airport and the island.

GEOHERMAL SYSTEM TYPE

Hot water geothermal system of intermediate temperature, not believed to be boiling at depth.

GEOHERMAL AQUIFER TEMPERATURE

Mostly 60-80 °C in the first ~100m, but up to 115 °C in one well. Chemistry indicates higher temperatures in deeper aquifers, 500m deep or more, closer to 200 °C.

SIZE

Relatively small. ~11 km² of area and at least 500m deep. This is smaller than most geothermal systems of the TVZ.



What are geothermal surface features?

Geothermal surface features, or ngāwhā, are natural discharges of the geothermal water, steam and gas from the geothermal aquifer at surface. Sometimes the fluid or steam interacts with groundwater or soil to form mixed springs or muddy features. When there is little interaction, this water discharges as primary springs. Geothermal surface features are complex and vulnerable to development, depending on many factors.



Visit www.boprc.govt.nz to learn more about them.

Are there surface features in the system and what are they?

There are several springs and seeps along the eastern shore of Mokoia Island. They are reasonably hot (50-60 °C) and of diluted primary chemical composition. In Rotokawa, the springs are cooler (40-45 °C), and of mixed water nature. While surface features in the two areas are different in composition and temperature, they are fed by the same geothermal aquifer at depth. Geothermal activity also exists at the Lake Rotorua lakebed, probably consisting of gas and/or hot water discharges from small vents. The geothermally influenced Lake Rotokawa is the dominant surface feature in the Rotokawa area due to its size. The Waikimihia Spring (Hinemoa Pool) and other springs on Mokoia Island are highly significant to Māori.

What monitoring does Regional Council do and what are the results telling us?

Currently, Regional Council only monitors the key environmental factors that control the activity of the geothermal system, such as rainfall and lake level. Regional Council does not currently carry out any monitoring of the geothermal aquifer or of surface features, so has limited understanding of its current state and changes over time. Regional Council has some data on geothermal use, but data limitations mean that trends or changes in use over time are unknown, which makes it difficult to understand the effects of use on the system.

How much geothermal water and energy is currently extracted from the system?

The level of extractive use from this system is very small. Only about 81 tonnes per day is extracted from the system by three consent holders. All of them use shallow (< 100m deep) geothermal wells to produce hot water. About 40% of the water extracted is returned (reinjecting) back to the geothermal aquifer after heat extraction, and the other ~60% is discharged to Lake Rotokawa or to the ground via soakholes. This water does not return to the geothermal aquifer. It is estimated that around 6.4 megawatts-hour per day of geothermal energy is extracted from the geothermal system over winter, which is peak season.

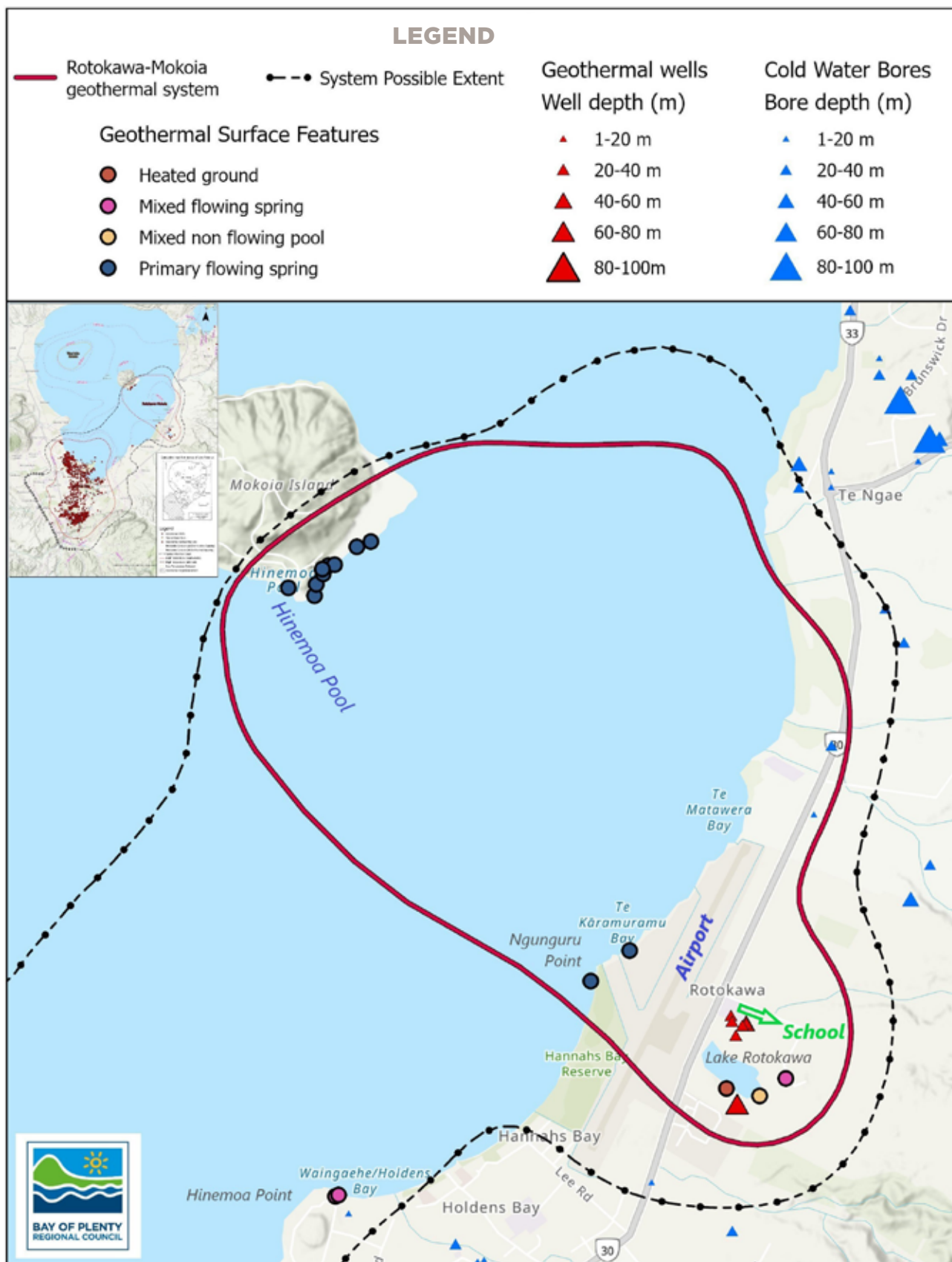
What is the geothermal water and energy used for in the system?

Geothermal water and heat are a taonga, and have been used for hundreds of years by tangata whenua for cooking, bathing, healing and other practices. Currently, the geothermal takes in the system are for space and water heating, cooking and bathing. Two of the three consented takes on the system are for domestic use. The third use is municipal, to heat water and the buildings of Rotokawa School. There is no extractive use in Mokoia Island.

Does taking geothermal water or heat affect the geothermal system?

Taking geothermal heat and water, especially via wells, will always affect the geothermal aquifer to some degree, from negligible to major. The level of effect depends on many factors, such as the depth, rate of take and discharge strategy as well as the natural capacity of the geothermal system to replenish itself. For the Rotokawa-Mokoia Geothermal System, the current level of take, individually and cumulatively, is quite small, so it is unlikely to be having a significant adverse effect on the system (although the natural capacity of the system has not been quantified so far).

FIGURE 1: Rotokawa-Mokoia Geothermal System extent. Geothermal surface features (dots) sorted by type. Geothermal and cold wells (triangles) sorted by depth.





For more information visit boprc.govt.nz/geothermal