



Ngā Wai Ariki o Tauranga Moana He Mahere Whakahaere Pūnaha

Draft Tauranga Geothermal System Management Plan



Mihi / Foreword

The Tauranga Geothermal System, Ngā Wai Ariki o Tauranga Moana, is a low temperature geothermal system, and is the warm parts of the interconnected groundwater system. Although the system is less well-known than the hot geothermal systems of the Bay of Plenty region, it is used and valued in many ways.

We are continuing to build our knowledge of the system, and this Draft Tauranga Geothermal System Management Plan (SMP) reflects our current understanding, and our early thinking on how it can be managed sustainably.

The draft SMP still needs direction and guidance from tāngata whenua, as well as from resource consent holders, key stakeholders, and the wider community. The draft provides some suggestions for the community to think about, but there may be gaps. We are seeking feedback so that the SMP reflects the views shared by the community.

Ngā tangata whenua

The relationship of tangata whenua with Ngā Wai Ariki o Tauranga Moana, cultural values, and partnership approaches in management of the system is an important part of this SMP. Initial engagement with tangata whenua tells us that while there are few geothermal surface features in Tauranga Moana, warm springs were used for bathing, healing and weaving, so Kotahitanga through use of ngā wai ariki was strong.

Over time some of the springs that were used by tangata whenua have been changed or degraded. Some springs stopped flowing due to increased use of water from groundwater aquifers. In Maketū, springs that were used for bathing were degraded through drainage, and land use practices. Opportunities for maintaining whakapapa with geothermal, and for tangata whenua to share their **mātauranga** (knowledge) on the **mauri** (life force, energy) and **wairua** (spirit) of geothermal should be a focus of future management.

The hapū of Ngāti Whakaue ki Maketu describe geothermal water, heat and energy from the Tauranga Geothermal System as precious gifts provided by the gods (taonga tuku iho). Their ancestors used and valued the resource, and this is acknowledged in their pātere (chant) which was written to retain knowledge of the place names that are significant to Ngāti Whakaue. The excerpt from their pātere below gives reference to the thermal springs at Maketū.

*“Mawhiti atu au ki te waiariki koropupū
ana i te Rau-o-te-Huia...”*

*“I leap to the hot springs bubbling at
Te Rau o te Huia...”*

Rārangi kaupapa

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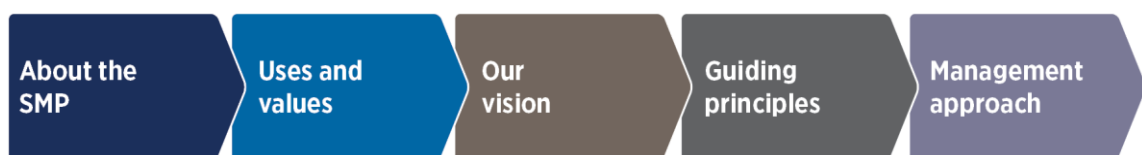
Part 1:

Kōrero Whakataki

Introduction

1.1 Te Aronga/Purpose

The purpose of this SMP is to ensure that the Tauranga Geothermal System is managed in an integrated and sustainable way. It describes how we intend to manage the system, the values to be protected, and builds knowledge about the system. Our aim is that the final SMP also reflects the relationship of tāngata whenua with this taonga and lays out how Bay of Plenty Regional Council (BOPRC) will work with tāngata whenua in its management.



1.2 He aha ngā wāhi e aratohungia ana ki tēnei mahere whakahaere? What area does this plan guide?

Bay of Plenty Regional Council has developed this SMP for the Tauranga Geothermal System or Ngā Wai Ariki o Tauranga Moana. The system stretches over 60 km from Katikati to Waihi Beach in the northwest, to Te Puke-Maketū in the east, with the primary heat source situated near Tauranga city. It is within the boundary of Tauranga City and the Western Bay of Plenty District Council. The system is interconnected with the groundwater resource, so defining its boundary is difficult. We have used the known presence of geothermal water to show an indicative boundary and the area covered by this SMP.

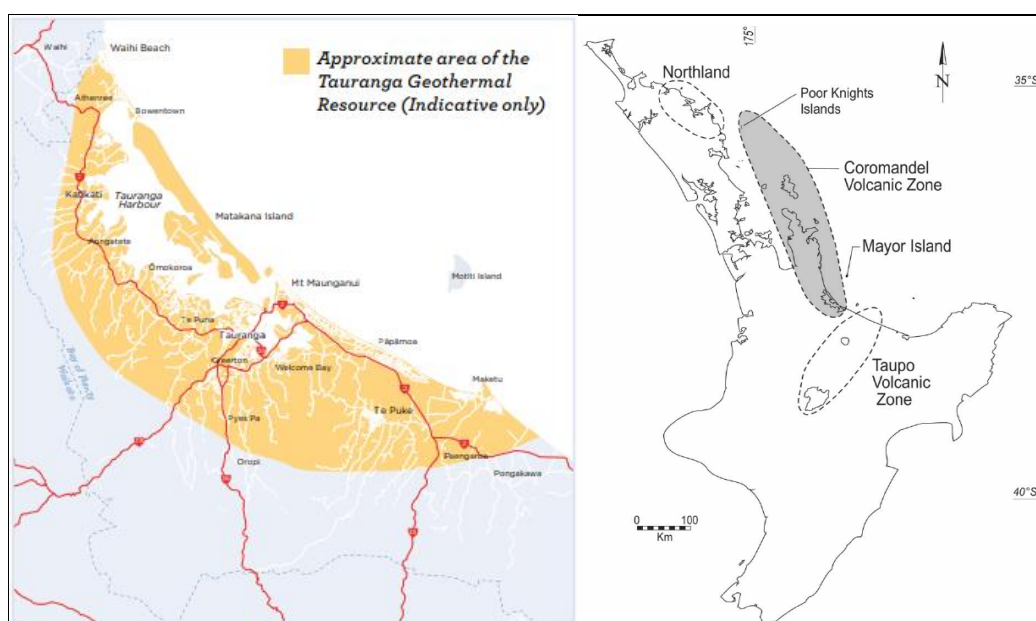


Figure 1 and 2 The Tauranga Geothermal System and the Coromandel Volcanic Zone

1.3 **Te Whakahaere i Ngā Wai Ariki o Tauranga Moana/Managing Ngā Wai Ariki o Tauranga Moana**

The Bay of Plenty Regional Council currently has the responsibility for the sustainable management of geothermal under the Resource Management Act 1991 (RMA). This includes the allocation of geothermal water, energy and heat (s.14), and geothermal discharges to land, air and water (s.15) through regional plans and resource consents.

Council must also recognise and provide for the relationship of Māori, their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga (s.6 (e)), have regard to kaitiakitanga (s.7 (a)) and take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) (s.8).

These functions and responsibilities (s.30) are given effect to through the Bay of Plenty Regional Policy Statement (RPS), which sets out the overall framework for managing geothermal. It outlines the management purpose for the Tauranga Geothermal System as a low temperature system and provides for use, where the adverse effects of activities can be avoided, remedied or mitigated.

The Bay of Plenty Regional Natural Resources Plan (RNRP) includes policies and rules under which resource consents are granted.

1.4 **Te Tiriti o Waitangi/Treaty of Waitangi**

For tangata whenua, iwi and hapū, resource planning documents recognised by an Iwi Authority and lodged with Council signal interests to be considered in Council decision-making. Under the RMA (s.66(2A)) Council must take into account these plans (see section 2.4).

It is acknowledged that there are outstanding (and potentially new) Treaty claims which are yet to be heard and/or resolved. Any recommendations from the Waitangi Tribunal and/or any legislative change arising from those claims will need to be addressed and implemented at that time, and this SMP may then need to be reviewed. To avoid any doubt, it is not the role of this SMP to impact on, affect or influence the process or outcome of any Treaty claim.

Ngā Wai Ariki o Tauranga Moana Tauranga Geothermal System

Tauranga geothermal water is **groundwater heated by warm rocks** from ancient volcanism



Temperature of the geothermal water in the system ranges from **30°C - 77°C**

There are **few geothermal surface features**, but there are a small number of warm seeps and geothermal springs.



Geothermal water chemistry is similar to non-geothermal groundwater.

Geothermal takes:



76% use the geothermal heat.
24% are for non-geothermal uses.

There are about **130 resource consents to take geothermal water, heat and energy from the geothermal system**, with 9.5 million cm³ of geothermal water consented to be taken.

Part 2:

Mō te Pūnaha o Ngā Wai Ariki o Tauranga Moana

About the Tauranga Geothermal System

2.1 Pūnaha o Ngā Waiariki o Tauranga Moana/Tauranga Geothermal System

The Tauranga Geothermal System is one of 12 geothermal systems that are managed by BOPRC. It is a low temperature system i.e. systems with temperatures below 150°C. The BOPRC website includes more information about the different geothermal systems in the Bay of Plenty.

In Tauranga the groundwater aquifer system consists of multiple hydrologically connected parts, with groundwater temperatures generally ranging from 15°C (ambient) to 70°C, with a temperature of nearly 77°C recently recorded near Te Puke.

The geothermal system is the parts of ground water aquifer where the water temperature is over 30°C, the temperature at which water is considered 'geothermal' under the RMA. Groundwater with elevated temperatures (but below 30°C), is referred to as geothermally influenced groundwater.

2.2 Ngā pūmeka e pā ana ki te Pūnaha o Ngā Wai Ariki o Tauranga Moana/Quick facts about Tauranga Geothermal System

- Tauranga geothermal water is groundwater heated by warm rocks from ancient volcanism.
- Temperature of the geothermal water in the system ranges from 30°C - 77°C.
- There are few geothermal surface features, but there are a small number of warm seeps and geothermal springs.
- Chemistry of the geothermal water is similar to non-geothermal groundwater.
- There are about 130 resource consents to take geothermal water, heat and energy from the geothermal system, with 9.5 million cm³ of geothermal water consented to be taken.
- 76% of geothermal takes use the geothermal heat, 24% are for non-geothermal uses.

2.3 Ngā Tūāhua o te Pūnaha o Ngā Wai Ariki o Tauranga Moana/Characteristics of Tauranga Geothermal System

The Tauranga Geothermal system originates from volcanic activity in the Coromandel Volcanic Zone, which is now thought to be extinct. There is still residual heat in the rocks and as groundwater flows through these heated rocks, it gradually heats up or cools

down, depending on the temperature of the rocks along its pathway. This heat transfer occurs mainly through conduction, like warming your hands with a cup of tea, where heat is transferred through touch.

The mineral content of the geothermal water is much lower than in high-temperature systems, like Rotorua or Kawerau, and the water can be used for irrigation, stock water and human drinking water, although in some locations it can have higher levels of minerals like mercury, arsenic or boron.

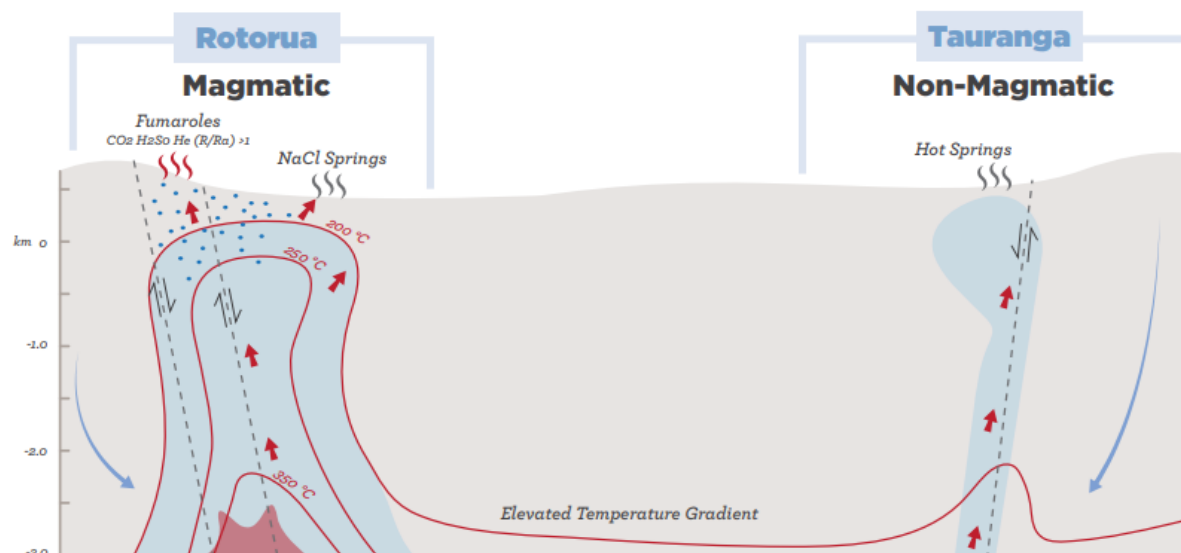


Figure 3 Simplified conceptual model of magmatic and non-magmatic geothermal.

A description of the geothermal system is available in the report *Tauranga Geothermal System Science Summary Report Te Rīpoata Whakarāpopoto Putaiao o te Waiariki ki Tauranga Moana*.

2.4 Ngā Hononga o te Tangata Whenua/Relationship of Tangata Whenua

Iwi and hapu management plans provide guidance about the way the geothermal system should be managed. There are several plans that relate to the Tauranga Geothermal System:

- Ngāti Whakaue ki Maketu Hapu Management Plan 2018 – 2028
- Tauranga Moana Iwi Management Plan 2016 – 2026
- Tapuika Environmental Management Plan 2014 – 2024
- Ngā Pōtiki Environmental Plan 2019 - 2029

There are also other iwi or hapu documents that are concerned about water quality of the shallow groundwater resource and the coastal environment.

These documents are also relevant to geothermal resource consent applications (s104(1)(c) of the RMA). Some of the issues raised in these plans are shown in Table 1.

Table 1 Some of the issues raised by tangata whenua in iwi management plans.

Proactive integrated management	Potential loss of culturally significant geothermal taonga, highlighting the need for proactive, integrated preservation efforts.
Sustainability	A heightened risk of continued degradation of geothermal taonga, and urgent need for effective management strategies to mitigate further damage.
Managing effects of discharges	- Avoidance of adverse effects of geothermal discharges on the mauri of Tauranga Moana are avoided. - Minimizing environmental impacts.
Protecting the of mauri of the geothermal taonga	- Preservation, enhancement of the mauri of geothermal resources - Robust measures to safeguard the resource for future generations.
Involvement of iwi and hapū	- Involvement of iwi and hapū in the management of the Tauranga Geothermal Resource, including plan development process, research and decision making. - Recognition of the inherent rights and responsibilities of tangata whenua as kaitiaki. - Effective management of effects of geothermal discharges to preserve ecological balance and cultural integrity. - Integrated management approaches that consider the interconnectedness of freshwater, groundwater and geothermal ensuring holistic resource management.

The issues raised by tangata whenua show the importance of collaborative, culturally sensitive approaches to geothermal management. Through shared decision-making processes, we can work towards sustainable and equitable outcomes.

2.5 Ngā Whakamahinga o Ngā Wai Ariki o Tauranga Moana/Uses of Ngā Wai Ariki o Tauranga Moana

There are currently about 130 consented takes for geothermal water and/or heat from the geothermally influenced parts of the groundwater system. The current consented volume of geothermal water is 9.5 million m³.

About 76% of the takes use the thermal energy, while 24% use the water for non-geothermal uses such as bottling, irrigation, frost protection and dust suppression. Water is also used for bathing, and water and/or space heating is the single biggest use (e.g. retirement villages, private homes, greenhouses).

Heating for community facilities (e.g. Bay Wave and The Mount Hot Pools) account for nearly half of the consented volume of direct use. About 29% is allocated to businesses, including retirement villages, greenhouses and tourism (e.g. mineral pools). About 23% is allocated to non-commercial uses, such as home heating, private swimming pools, and spas.

Distribution of the geothermal and non-geothermal consented takes in the Tauranga Geothermal System are shown in Figure 4.

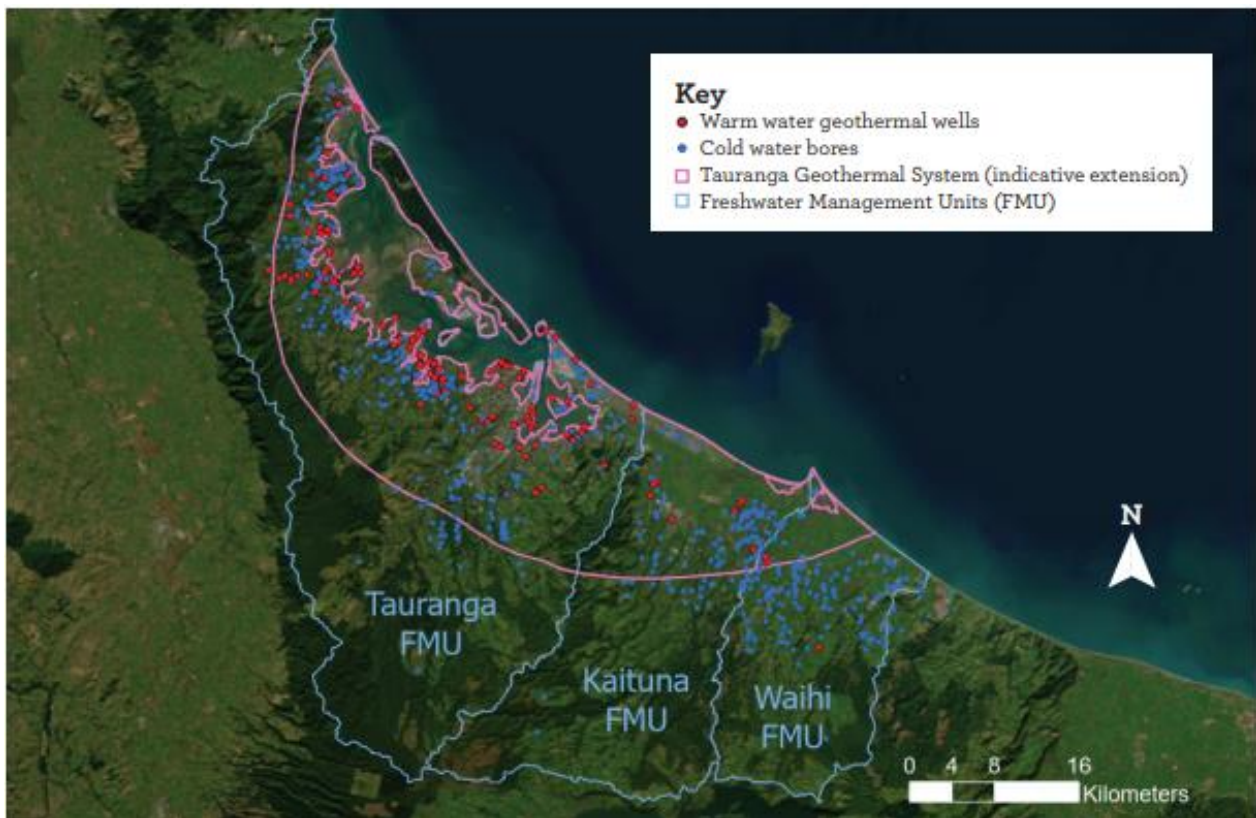


Figure 4 Distribution of the geothermal and non-geothermal consented takes in the Tauranga Geothermal System.

2.6 Ngā Uara o te Pūnaha o Ngā Wai Ariki o Tauranga Moana/Values of the Tauranga Geothermal System

2.6.1 Cultural values

It is not for BOPRC to describe the relationship of tangata whenua with Ngā Wai Ariki o Tauranga Moana or explain the intergenerational values and uses. This mātauranga or knowledge is held by tangata whenua. We hope that these values can be embedded in this SMP.

However, we do know that where geothermally influenced springs were present, these were used by tangata whenua for generations. For example, Ngāti Whakaue ki Maketū have stated in their Iwi Management Plan that they have a strong physical and spiritual connection to the geothermal spring at Maketū, which was used for bathing.

A number of these springs have been impacted by groundwater use, and springs that were previously artesian now need to be accessed by wells. In the case of Maketū springs, drainage changed the water table, and surrounding land uses have also impacted the spring.

Understanding how tangata whenua measure the health of Ngā Wai Ariki o Tauranga Moana, the mauri and wairua, is an important step in the development of the SMP.

2.6.2 Socio-economic values

The Tauranga Geothermal System is valued both as a source of groundwater, as well as heat and contributes substantially to the economic wellbeing of the Bay of Plenty region.

For example, at least six tourist accommodation businesses in the Tauranga and Western Bay of Plenty take and use geothermal water for space and/or water heating, and mineral pools. Benefits include lower operating costs and/or a greater ability to attract more guests.

Community facilities (i.e. public pools, schools) are the biggest single use geothermal water. While pool users may not know about, or place value on the geothermal heating of these facilities, it provides access to year-round swimming, comfortable pool temperatures, lower electricity costs, and a low emissions heating option.

Geothermal water takes that do not utilise the heat but are used for irrigation and horticulture also contribute to economic wellbeing. Horticulture contributes 5.4% and 9.2% of regional GDP and employment respectively. Access to groundwater, regardless of its temperature, is essential for many rural industries.

The economic value of low temperature geothermal use in Tauranga is summarised in the report ***Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty 2022***.

2.6.3 Geoheat potential

Low temperature geothermal generally can't be used for electricity generation but can be used for geoheat applications. The heat can be used directly when the water is warm enough to meet the demand of the end use (e.g. 35°C - 40°C for bathing). Indirect use includes heat pump technology to raise the temperature of groundwater or geothermal water to meet end use demand.

For example, ambient temperature groundwater could be used to heat or cool a building by using a Ground Source Heat Pump (GSHP). Geothermal water of 50°C could be increased by using a high temperature GSHP e.g., to generate steam for commercial or for an industrial process.

Heating (and cooling) is a growing driver for energy demand, both in buildings and in industrial processes. The lack of fragile surface features such as geysers in Tauranga, means that heat from this system (and potentially cool from the groundwater system) can be used more readily. If managed sustainably, it could contribute to a shift towards decarbonisation and renewable energy, while still supporting the sustainable growth of the region.

The geoheat potential of the Tauranga Geothermal System is summarised in the report.

[Geoheat Potential of the Tauranga Geothermal System 2024](#)

Part 3:

Hauora o te pūnaha wai ariki

Health of the geothermal system

3.1 Ngā aroturuki me ngā tauratanga/Monitoring and modelling

The Tauranga Geothermal System is managed very differently to the Rotorua System, where use is limited to avoid cooling and maintain pressure to protect significant surface features, such as geysers. In Tauranga our focus is on enabling use of the groundwater and geothermal resource for people's social and economic wellbeing, while maintaining the heat resource for future generations.

To do that we need to understand the interconnected nature of the groundwater and geothermal resource, where takes from one part of the aquifer can affect another, and the cumulative effects of use.

3.2 Tā mātou e mārama nei/Our current understanding

State of the Environment Monitoring (groundwater and geothermal) and consent monitoring can help tell us about system wide trends. The Council has also developed a geothermal reservoir model to predict potential changes in the system through changes in use.

Our most recent modelling tells us that by keeping all groundwater takes (geothermal and non-geothermal) within modelled sustainable groundwater allocation limits for each groundwater management unit, we should not expect to see system wide cooling.

There is however, potential for localised cooling, in some circumstances, either from geothermal or non-geothermal takes causing cool draw down, or saltwater intrusion, or through reinjection of cooler water. These effects are best managed on a case-by-case basis through the consent process. However cumulative effects of many small takes also need to be considered.

Part 4:

Te Mahere Pūnaha Whakahaere

The System Management Plan

4.1 Te Whakamahi i te Mahere Pūnaha Whakahaere/Using the System Management Plan

This document has been prepared to give effect to the RPS, which requires a SMP for the integrated management of geothermal systems.

The SMP does not carry the legal weight of a regional plan, but its principles will be taken into account in implementation of the geothermal provisions of Regional Natural Resources Plan.

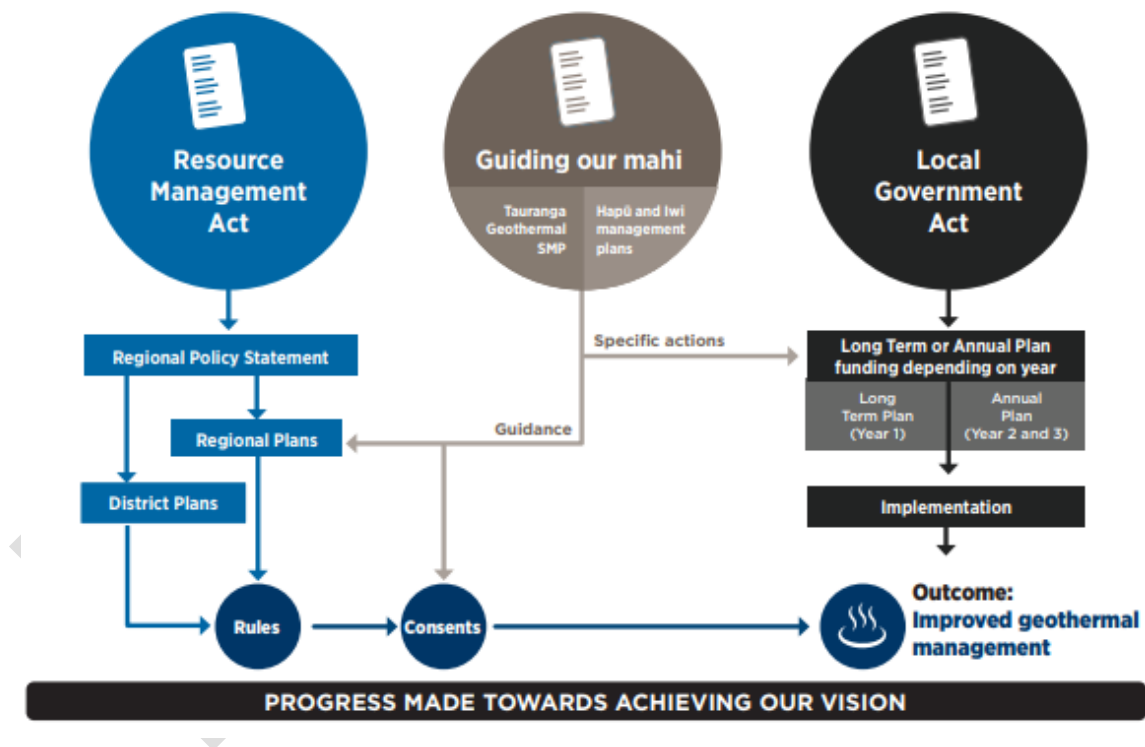


Figure 5 Relationship to other planning documents.

The SMP will be considered in assessing consent applications, but it does not pre-empt or limit BOPRC's statutory discretion. If in doubt the provisions of the Regional Policy Statement or Regional Plan take precedence.

The SMP also sets out how we work operationally, through specific actions and guidance documents. These operational documents and practices can be updated as we improve our processes, data management, reporting, research, and monitoring.

4.2 **Te whakawhanake i te Mahere Pūnaha Whakahaere/How the System Management Plan was developed**

This draft SMP has been guided by our current knowledge and understanding of the Tauranga Geothermal System and people's interactions with it. There are gaps in our knowledge, and we have started to fill these through technical reports and specialist knowledge.

Where possible we have drawn on iwi management documents, and feedback from tangata whenua. Te Ao Māori perspectives on the system and how it should be managed, including partnership approaches, is still a big gap.

We also want to hear the views of the community, and key stakeholders, such as resource consent holders and the Tauranga City and Western Bay District Councils. This input will guide the structure, vision, principles, and the overall management approach in the SMP.

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Part 5:

Tā mātou aronga anamata

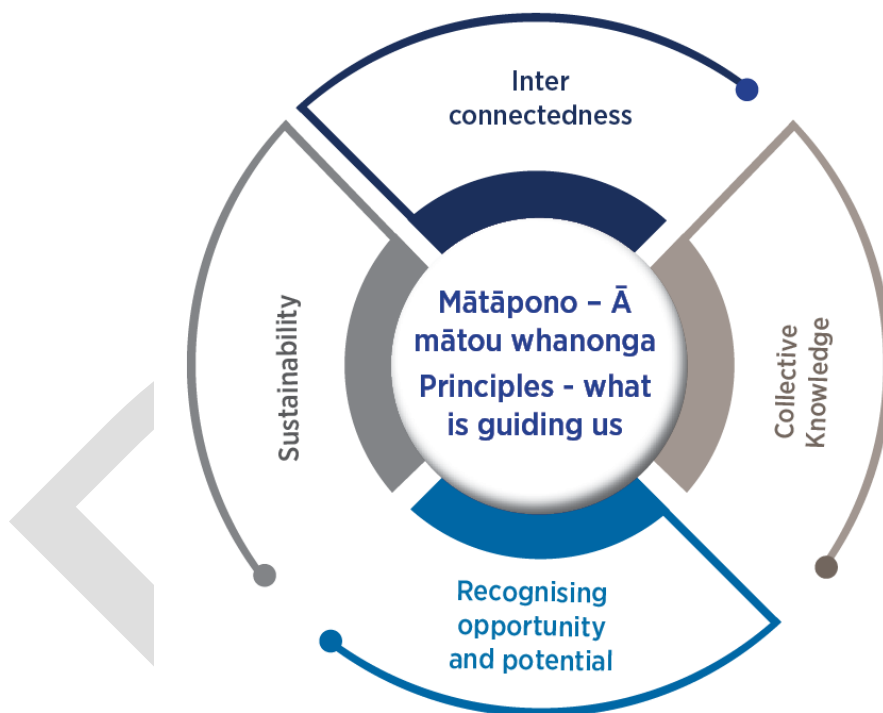
Our future focus

5.1 Whakakitenga/Vision

Long term sustainable use of the low temperature geothermal system for both geothermal and non-geothermal uses, while:

- *staying within sustainable groundwater allocation limits,*
- *avoiding local or system wide cooling, and*
- *carefully managing the effects of this use on the receiving environment.*

5.2 Ngā Mātāpono – ka pēhea ō mātou whanonga/Principles – how we will behave



Interconnectedness

This principle recognises that in Tauranga, geothermal and non-geothermal groundwater takes are from interconnected aquifers. This SMP will provide a whole system approach and sets a pathway for integrated and sustainable management of the Tauranga Geothermal System.

Recognising opportunity and potential

Use of the Tauranga Geothermal System contributes to economic and social wellbeing. The system does not have the same fragility as systems like Rotorua, so enabling sustainable use and exploring use of low-temperature geothermal as a source of renewable energy is an important driver of the SMP.

Collective knowledge

Management should draw on different knowledge and world views, be adaptive and responsive to new information. While science explores physical processes of the geothermal system, mātauranga Māori is a living, interactive knowledge gained from connection with the environment. Resource users, stakeholders, and consent holders also have unique experience and knowledge. We don't value one type of knowledge more than another.

Sustainability

Sustainability means using the geothermal system in a way that meets present needs without compromising the ability of future generations to meet their own needs. It requires a careful balance between use and protection, ensuring that both the thermal and water properties of the groundwater system are maintained.

Your feedback

- *How do you value the geothermal system? What values should we be thinking about in management of the system?*
- *Do you agree with the draft vision for the SMP?*
- *What does long-term sustainability of the geothermal system mean to you (e.g. should we protect the heat value in the system and if so, for how long?*
- *How well do you think the principles of the Tauranga Geothermal System Management Plan align with our goals?*
- *We currently name the system Tauranga Geothermal System or Ngā Wai Ariki o Tauranga Moana. Is this the correct or best name for the system?*

5.3 Huarahi whakahaere/Management approach

This section outlines the steps that will be taken to achieve the vision, with more detail in supporting documents. An action plan will also be developed when the SMP is approved, to support its implementation.

5.3.1 Integrated management

The Tauranga groundwater and geothermal aquifers are interconnected. The use of one affects the other, and vice versa. An integrated approach means that we also need to consider the impacts of geothermal use on the environment, including on surface water bodies, the non geothermal groundwater resources, and the coastal environment.

A key element of groundwater and geothermal management, is groundwater allocation limits, which geothermal takes must also comply with, as these takes are from the same aquifer. Groundwater Management Units (GMUs) are spatial units for which quantitative limits are set, and within which water allocation is effectively accounted. Surface water limits, and water protection areas may also apply. For more information on allocation limits in these units, see the [Freshwater Management Units Draft](#) web page.

Our Approach	How we will do it
Integrated planning	- A coordinated programme of work through the Geothermal Programme - Integrated groundwater and geothermal provisions in the Natural Resources Regional Plan.
Integrated modelling	Work towards integrated geothermal and groundwater reservoir models/s
Impact of geothermal takes and discharges on groundwater	- Geothermal takes will stay within groundwater allocation limits. - Geothermal takes will be avoided in proximity to Freshwater Management Protection Areas. - Assessment of the risks of saline intrusion for geothermal consent applications for takes located in proximity to the Coastal Marine Area (CMA). - Best practice management of geothermal discharges through use of Discharge Guidelines.
Impacts of geothermal takes and discharges on surface environment	- Geothermal discharges will meet water quality standards of receiving water body. - Consider filtration of bathed in water before discharges to surface water. - Chemistry analysis of water prior to discharge to land for irrigation, in accordance with Discharge Guidelines
Impacts of groundwater takes on geothermal	- All new groundwater and geothermal takes to assess impacts on adjacent wells following standard groundwater assessment procedures (pump tests/well bore model). - Groundwater takes to assess potential impact on neighbouring heat users and to provide setbacks where there is a risk of local cooling.
Best practice drilling	- A risk management approach to low temperature drilling, by requiring NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock for takes up to 70°C. - Use The Shallow Geothermal Well Guidelines or the NZ Deep Geothermal Drilling Code of Practice (NZS2403:2015)¹ in cases of elevated risk (i.e., temperatures over 70°C/artesian flow). - Always ensure drill rig access to well heads, and avoid buildings being constructed close to well heads.

Your feedback

- Do you agree with the approach to integrate the management of groundwater and geothermal? Why/why not?*

¹ NZS2403:2015 specifically applies to drilling deep geothermal wells that:

- Reach, or may reasonably be expected to reach, a depth exceeding 250 m and contain predominantly water or steam at temperatures exceeding the boiling point of water for the mean ambient conditions at the surface of the well site; or
- Reach, or may reasonably be expected to reach, a depth of between 150 m and 250 m, and that:
 - Contain steam or hot water that may reasonably be expected to exert a shut-in pressure at the wellhead of 0.5 MPa or greater, or
 - Have expected or actual downhole temperatures within 20°C of the boiling point-for-depth (BPD) temperature as measured from the local water level.

- *How do you feel about allowing geothermal groundwater to be used for non-geothermal purposes, as long as it remains within sustainable groundwater allocation limits? i.e. irrigation*

5.3.2 Tangata whenua

Tangata whenua have a unique relationship with the environment and have rights and interests in water and geothermal. Some iwi and hapū have laid out their values and aspirations for geothermal in their management plans, including integrated management and sustainability. Tangata whenua also have a right to exercise their role as kaitiaki, with active and meaningful involvement in management decisions, including resource consent processes, plan development, research and monitoring. Tangata whenua are the best people to decide how that should happen.

Our Approach	How we will do it
Ensure the mauri (health) of the Tauranga Geothermal System and the community's relationship with this taonga is maintained.	• Manage the groundwater system in an integrated way, reflective of a Te Ao Māori approach. • Support tangata whenua to use mātauranga Māori to monitor health of the system (e.g. tohu or indicators) • Protect culturally significant geothermal or geothermally influenced springs (i.e. springs over 23°C) • Support tangata whenua to enhance significant geothermal or geothermally influenced (e.g. by reinstating natural drainage patterns, mitigating surface contamination, planting etc.)
Mana whenua are recognised, kaitiakitanga is enabled	• Align the SMP with the vision and aspirations of Tauranga Moana Iwi as much as possible. • Work with tangata whenua to agree a process for meaningful input into resource consenting, consistent with scale of effects. • Share knowledge on the system with tangata whenua to build capability and capacity. • Support resource consent applicants by providing guidance about how to engage with tangata whenua. • Work with tangata whenua to provide consistent guidance to consent holders on how to assess cultural effects of geothermal takes.

Your feedback

- *How can we better align the SMP with the vision and aspirations of Tauranga Moana Iwi?*
- *Are the processes for tangata whenua involvement in resource consenting for geothermal working? Why/why not?*

5.3.3 Monitoring

A picture of system health is built by monitoring system attributes, through State of the Environment Monitoring. This can detect unexpected or sudden changes or long-term trends. An integrated monitoring approach is needed, drawing on information from the 25 groundwater quality monitoring wells within the Tauranga Geothermal System area, seven of which are geothermal monitoring wells. Attributes monitored include aquifer water levels, down hole (or discharge) temperatures and chemistry. Data is also obtained intermittently from privately owned wells (e.g. during well maintenance shuts), and springs, including a surface feature at Maketū.

The Council also monitors consented use of the system. Historically, there was little metering of groundwater use, but the Resource Management Regulations 2010 (Measurement and Reporting of Water Takes) require metering for freshwater taken at a rate of 5 litres/second or more.

The regulations do not apply to geothermal, but we are working towards improved monitoring (e.g. metering) to align with non-geothermal groundwater takes, without imposing unreasonable costs.

Our Approach	How we will do it
State of the Environment Monitoring	• Integrated geothermal and groundwater monitoring. • Monitor identified key attributes with at least eight dedicated geothermal monitoring wells, including water level, temperature and chemistry testing. • Seek opportunities to extend State of Environment Monitoring through use of privately owned wells. • Focussed monitoring of significant springs and or seeps to monitor changes in temperature and flow. • Regular monitoring and reporting on the health of the system to the community.
Consent and compliance monitoring	• Develop best practice Low Temperature Monitoring Guidelines that reflect scale of take and reasonable costs and are integrated with groundwater monitoring (e.g. for pump testing, chemistry sampling, downhole measures, surface temperature readings). • Continuous telemetered metering for all consented geothermal takes (i.e. total water take) or regular temperature records (measured at the production and reinjection well head), at least twice during the lifetime of the consent. • New wells to have sampling points to allow testing, or infra-red monitoring where a sampling point is not reasonably accessible. • A pump or yield test to identify likely size of take for all consented takes (or as a permitted activity standard if permitted activity status is developed for small geothermal takes through a regional plan change). • Chemistry sampling for all geothermal resource consents applications at least once during lifetime of consent, with ongoing chemistry sampling where there is a risk of saline intrusion or elevated levels of minerals such as boron, mercury or arsenic (the frequency of investigations to be determined on a case-by-case basis). • Soil profile investigations where geothermal water with elevated levels of minerals is used for irrigation (the frequency of investigations to be determined on a case-by-case basis). • Monitoring of water quality for point source discharges in sensitive receiving environments. • For permitted groundwater takes between 25-29^o C, or where permitted groundwater takes are known to be in close proximity geothermal takes, ensure that temperature measurements are provided to confirm permitted activity status.

Your feedback

- *Do you think the monitoring requirements for resource consent holders are reasonable?*

5.3.4 Information and knowledge

We are continuously building our collective knowledge about the Tauranga Geothermal System and this knowledge can be used to try new ways of doing things. The Council is trying to find better ways to share information about the system with the community, including through the BOPRC website and the environmental portal.

Mātauranga Māori is also precious knowledge. It is not for Council to hold this mātauranga, but we need to work together to find ways to use it more in decision making. Equitable use of both indigenous and Western knowledge systems will help us develop solutions and empower communities.

Have you seen the geothermal page on our website [Geothermal at BOPRC](#) and taken a look at the current [Geothermal Consents](#) on our website?

Our Approach	How we will do it
Informed consent decisions	• Provide consent applicants and holders information on consenting and compliance requirements, including through pre application advice, consent advice notes, and best practice Monitoring Guidelines • Minimum information requirements for consents²
Easy access to information about the geothermal reservoir	• Easily accessible information about the geothermal system through Council's website and on social media. • Regular reporting on the state of the geothermal system to the community • Educational material on low temperature geothermal, including geoheat opportunities.
Building understanding of the Tauranga System	• Maintain connections with science providers and lead or provide appropriate financial and/or in-kind support for low temperature geothermal projects, including system characterisation, and low temperature technology.
Mātauranga Māori	• Support tangata whenua to develop an approach to reflect Te Ao Māori perspectives and mātauranga Māori in management of Tauranga Geothermal System • Develop a structure and process for annual reports on the mauri health of the system for the Tauranga Geothermal Management Group
Adaptive management	• Accommodate the newly acquired knowledge in consenting decisions (i.e. best knowledge available). • Ensure consents have appropriate review clauses. • Maintain an updated geothermal reservoir model (or integrated geothermal and groundwater model) to predict potential changes to the reservoir resulting from production and discharge strategies, with a minimum of 10 yearly model review.

² The list below describes the minimum level of following information that will need to be provided Bore log and bore permit number.

- 1 Rate of proposed take (average daily take) measured in tonnes/day.
- 2 The annual expected volume of geothermal fluid required.
- 3 The frequency of take (average number of days per week), including seasonal variations.
- 4 Temperature of the fluid (measured at the top of the well head).
- 5 Temperature profile with depth.
- 6 24 Hour pump test data.
- 7 Proposed method of discharge including location (e.g. injection, surface discharge etc).
 - a. Include alternate methods and locations of discharge that has been considered.
- 8 Fluid Chemistry Data – Chloride, boron, arsenic...

Your feedback

- *Do you have any other ideas to help build information and knowledge about the system?*
- *What do you most want to learn about for the Tauranga Geothermal System?*

5.3.5 Sustainable management of heat values

All geothermal takes and discharges have some impact on aquifer water levels and temperature because they all remove water and/or heat. Taking too much geothermal water or groundwater out of the aquifer too quickly could lead to cold water infiltration and cooling of the aquifer, and/or in nearby geothermal wells. Cooling can happen quickly, and small changes can have significant impacts i.e. the available heat may no longer be enough for the end use.

Modelling can indicate where too much draw down could lead to system wide cooling, and recent modelling shows that current groundwater take is sustainable. However, modelling is not suitable to predict local effects or effects in isolated locations.

In many cases neighbouring production and injection wells will be owned by the same consent holder, so often this is self-limiting. But boundary and cumulative effects need to be managed, including how we take geothermal water (the production system we use), where we take it from (location and depth, distance from other wells), and the end use.

While some groundwater takes could lead to local cooling, it is not appropriate to limit groundwater takes across the whole system to maintain geothermal heat. However, there may be areas where heat is widely used or highly valued, or where we want to protect the ongoing or future use of this heat resource. Sensitive areas could include high value/use wells such as those located in the central Tauranga area. Sensitive geothermally influenced springs, such as in Maketu, may have significant cultural values, and protecting the heat, and the groundwater aquifer in these areas may be necessary.

Our Approach	How we will do it
Avoiding system wide cooling	• Geothermal takes to stay within sustainable groundwater allocation limits within the Regional Natural Resources Plan (under development) • Reservoir modelling at least every 5 years to predict system wide impacts of groundwater takes on the geothermal heat resource. • Application of Discharge Guidelines
The heat value of the resource is retained and protected in areas where is it currently most valued	• Enable and protect/enhance customary practices of geothermally influenced springs. • Identify areas where geothermal heat is most valued or has future potential and protection for these uses from unsustainable or competing use. • Sustain the aquifer levels in areas of high heat value (e.g., greater consideration of impacts of heat through the consent process, limiting groundwater takes, and requiring setbacks, and managing rate of take and method of discharge. • Ensure that new takes (warm and cold water takes) consider the impact on existing takes and the heat resource.
Enabling use	• Enabling policies and rules for sustainable use of geoheat in the Regional Natural Resources Plan. • Education, information about the Tauranga Geothermal System and low temperature geoheat applications and technology.

	• Workshops and collaboration with industry, local councils, economic development agencies to jointly promote low temperature geoheat. • Building on spatial planning opportunities to identify greenfield areas where geoheat heating and cooling is feasible, including the development of case studies.
Efficiency	• Encourage through education and advice, applicants for geothermal groundwater takes that do not utilise the heat resource (i.e. irrigation) to investigate alternative ways to use the heat (i.e. for space and water heating). • Regular auditing of resource consents on efficiency measures in high value heat areas or where takes are >5cm³ day. • Require water efficiency assessments for all geothermal consent applications, and heat efficiency assessments for geothermal takes in urban areas (i.e. high value heat areas) • Develop Low Temperature Geothermal Efficiency Guidelines

Your feedback

- *Do you think that geothermal users should have to be efficient with the use of heat? What is reasonable to require of consent holders?*
- *How can we encourage the efficient use of geothermal heat in non-geothermal applications, such as cascading uses, and what incentives or guidelines would be most effective?*
- *Do you think we should map high value geothermal sites? Are there you think should be identified? E.g. geothermally influenced springs, historic springs.*

5.3.6 Managing discharges

Geothermal discharges include land soakage, surface water (rivers, streams and/or the Tauranga Harbour), stormwater, wastewater, or reinjection to the groundwater aquifer. Resource consents are required for geothermal discharges, except for where the discharge is to land for irrigation. See the [Tauranga Geothermal System Science Summary Report](#) for more information on types of discharges.

Only 16.4% of geothermal takes are reinjected back into the groundwater aquifer, usually into the shallower overlaying Tauranga sediments. These takes are non-consumptive i.e., no net loss of water from the groundwater aquifer. However, reinjection is not always appropriate, as it can lead to cooling or contamination of the receiving aquifer and may be difficult to justify when most other groundwater takes are consumptive takes (i.e. water is used for irrigation etc).

Discharge to surface water is sometimes a preferred option where the discharge can be easily assimilated. But this can lead to downstream flooding, erosion caused by higher flows and impacts on water quality due to increased heat load and contaminants (i.e. pathogens from bathing water). Discharges to land through soakage facilities (trenches, soak holes or irrigation) are cost effective and are generally for smaller uses, but for larger takes, there is potential for effects on surface water or local flooding.

Approximately 24.6% of consented geothermal take is for irrigation, frost protection and dust suppression. Where there are higher levels of certain minerals, surface discharges need to be managed to avoid risks to human health or the environment.

In urban areas discharge of geothermal water may be to stormwater or the wastewater system. These discharges may require approval from the local authority (Tauranga City Council or Western Bay of Plenty District Council) which have comprehensive stormwater consents for discharge of clean stormwater.

The approach adopted will be dependent on the type of take, the location of discharge, the size and rate of take and discharge, the quality of the water being discharged, and the sensitivity of the receiving environment.

The broad approach adopted in this SMP is outlined below:

Our Approach	How we will do it
Best practice discharge methods	The discharge method and strategy for each user will be assessed at the time of consenting following best practice Discharge Guidelines.
Managing surface effects	- Geothermal discharges to be within receiving environment water quality standards, contained in the Regional Natural Resources Plan. - No new discharges to the stormwater or wastewater network unless approval has been obtained by the local authority. - Resource consent applications to demonstrate that the most appropriate method of discharge has been selected including that reinjection of geothermal water has been considered as an alternate method of water disposal. - Avoid surface discharges in highly sensitive receiving environments or where there are significant cultural effects. - Use land soakage or surface discharge only when this can occur without risk of flooding, subsidence, erosion or contamination of receiving environment. - Require appropriate treatment (e.g., filtration for bathed in water). - For larger discharges consider natural filtration options i.e. wetlands.
Managing groundwater effects	- Where geothermal water is reinjected into the same or shallow aquifer, this will be considered a non-consumptive take. - Require reinjection for geothermal heat takes in groundwater management units that are fully, or nearly fully allocated or where there is a risk of saline intrusion. - If the shallow aquifer is used for potable supply, minimum separation distances, and minimum water quality standards should be imposed for shallow reinjection if deep reinjection not possible.
Managing effects on geothermal heat values	Manage reinjection depths and temperatures to prevent local cooling of the productive part of the aquifer, or thermal contamination of the shallow part of the aquifer.

Your feedback

- What do you think are the key issues from geothermal discharges?*
- What concerns, if any, do you have about discharging bathed-in water into waterways, and how do you think we can address them effectively?*

5.3.7 Managing competing uses

The Tauranga Geothermal System is currently managed as a shared groundwater resource. The groundwater resource is used for municipal uses, irrigation, frost protection etc. Often the value for the user is in the groundwater, and not the heat value. Heat extraction is a much smaller, but potentially growing demand.

Because the temperature of the aquifer varies greatly, users can not always target ideal temperatures for their end use e.g., someone drilling for water for irrigation may find elevated temperatures, and vice versa.

The use of geothermal water for 'non geothermal uses' could be considered a wasteful use of the valuable heat resource, so to prevent depletion of the heat resource, we want to encourage efficiency. But we also do not want to unreasonably limit geothermal water use where it is needed for economic wellbeing. Modelling has shown that at current levels of groundwater abstraction (including geothermal water), system wide temperature trends in the geothermal system are likely sustainable. This means we do not need to further limit groundwater or geothermal takes to protect the geothermal system overall.

Our Approach	How we will do it
Enabling use	• If a geothermal take is within sustainable groundwater allocation limits, geothermal groundwater may be used for non-geothermal uses. • Any take of geothermal water for non-geothermal use should demonstrate that the location and rate of take does not create any local cooling of other existing heat uses. • Take an enabling approach for the establishment of low temperature geoheat applications, including ground source heat pumps. • Consider permitted activity standards for small geothermal takes to be consistent with non-geothermal groundwater takes.
Efficient use	• Any take of geothermal water for non-geothermal use should be encouraged to find alternative efficient use for that heat (e.g., cascading uses). • Develop guidelines and provide information on the utilisation of surplus heat.
Monitoring	• Monitoring and modelling to assess cumulative impacts of groundwater takes (see also 5.3.3 above).

Your feedback

- *Do you agree that we should manage groundwater takes to avoid local cooling?*
- *What are your views on permitted activity status (in the Regional Natural Resources Plan) for small geothermal takes? Would this be adequate to protect the geothermal resource?*
- *What do you think is more important - the use of groundwater or the use of geothermal heat?*
- *Do you think cooling of the geothermal system over time is something we should care about?*

Part 6:

Aronga anamata

Future focus

6.1 Mahi pūrongo/Reporting

An integrated report on the state of the Tauranga Geothermal System will be prepared Bay of Plenty Regional Council staff every two years, including:

- any significant trends in monitoring data over the monitoring period (e.g., chemistry and temperature),
- consenting activity,
- monitoring of cultural indicators,
- modelling carried out,
- any recommended policy changes, and

A summary of the report will be made available on BOPRC's website.

6.2 Te Whakamohoa i te Mahere Pūnaha Whakahaere/Updating the System Management Plan

Management of the Tauranga System will be guided by the best knowledge we have available. As knowledge is gained, particularly through partnerships, research, further monitoring, and use of geothermal, the SMP will need to be adapted to accommodate the newly acquired knowledge.

To enable this, the SMP will be reviewed by BOPRC:

- Internal review five yearly.
- Formal review every ten years, aligned with regional plan changes.
- Following changes to any relevant National or Regional Policy Statements.

Your feedback

- *Do you have any other feedback you would like to give us or comments you would like to make on the Draft Tauranga Geothermal System Management Plan?*

Appendix 1:

Te tautoko i ngā tuhinga

Supporting documents

- The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty Region (2022)
- Bay of Plenty Geothermal Systems: The Science Story
- Tauranga Geothermal System: Science Summary Report
- Geothermal Plan Review: Review of Iwi and Hapū Management Plans
- Geo-heat potential of the Tauranga Geothermal System
- Tauranga Geothermal System Reservoir Modelling reports
- Monitoring information (e.g. monitoring wells)

Draft

Kupu taka

Glossary

Terms in italics are as defined in the Resource Management Act 1991

Aquifer: A geological formation capable of supplying an economic quality of water or energy. In this document it is used to refer to the intermediate geothermal aquifer associated with young ignimbrites, rhyolites and the Rotorua basin sediments.

Discharge: To emit, deposit, and allow to escape. For geothermal this usually relates to discharge of water or gas

Downhole heat exchanger: A device installed down a bore to remove heat from a geothermal field without removing geothermal water, using fresh water circulated through a heat exchanger at depth (from the Regional Natural Resources Plan).

Efficiency: For the purposes of measuring efficiency of geothermal resource use (section 7 RMA) efficiency has several dimensions. Efficiency includes the comparison of the overall benefit to society (economic efficiency) of competing uses (allocative efficiency), productive efficiency, and the ability of productive efficiency to increase over time through technology improvements and better understanding of the resource (dynamic or innovative efficiency) (from RPS).

Freshwater Management Unit: The term freshwater management unit (FMU) was introduced to the National Policy Statement for Freshwater Management (NPS-FM) in the 2014 amendments. An FMU is defined in the NPS-FM 2014 as: A water body, multiple water bodies or any part of a water body determined by the regional council as the appropriate spatial scale for setting freshwater objectives and limits and for freshwater accounting and management.

Geothermal aquifer: A permeable geological formation, group of formations, or part of a formation, beneath the ground, capable of receiving, storing, transmitting and yielding geothermal water. Groundwater is heated at depth by surrounding heated rocks and may also receive input from magmatic fluids. Geothermal heat and hot water is transported within and between different hydrogeological units by convection, advection and/or conduction.

Geothermal energy: *Energy derived or derivable from and produced within the earth by natural heat phenomena; and includes all geothermal water.*

Geothermal feature: Includes natural and relic features, and as defined in Annex A of the Bay of Plenty Regional Policy Statement (from RPS).

quantity of geothermal water being used.

Geothermal system (sometimes also referred to as a geothermal field): A system defined by scientific investigation comprising geothermal energy stored as geothermal water or steam and the rocks confining them and associated water, steam and gas emissions and the geothermal surface features resulting from these emissions and is believed to have no hydrological connection to another system (from RPS).

Geothermal water: *Water heated within the earth by natural phenomena to a temperature of 30 degrees Celsius or more; and includes all steam, water, and water vapour, and every mixture of all or any of them that has been heated by natural phenomena.*

Geothermal well: A geothermal bore (hole) drilled into the geothermal aquifer, intended to take or reinject geothermal water, steam and/or energy, or to investigate or monitor the geothermal resource. When used in the context of 'bore' the meaning remains the same.

For the purposes of this SMP, does not include hand dug wells less than 2 m deep.

Groundwater: Subsurface water contained in pores and fissures in rock beneath soil, most of which is beneath the water table.

Kaitiaki/ kaitiakitanga: *Means the exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources; and includes the ethic of stewardship.*

Mauri: The essential life force, energy or principle that tangata whenua believe exists in all things in the natural world, including people. Tangata whenua believe it is the vital essence or life force by which all things cohere in nature. When mauri is absent there is no life. When mauri is degraded, or absent, tangata whenua believe this can mean that they have been remiss in their kaitiakitanga responsibilities, and this affects their relationship with the atua (Māori gods). Mauri can also be imbued within manmade or physical objects (RPS).

Mātauranga Māori: Māori customary knowledge, traditional knowledge or intergenerational knowledge (from the New Zealand Coastal Policy Statement).

Pressure The force exerted by the water across the areas of the geothermal aquifer. Pressure depends on the amount of water and its temperature, but pressure response is influenced by recharge, and the replacement of water as it is abstracted.

Reinjection The return of geothermal **water** into the geothermal aquifer from which it was taken (from the RPS).

Reservoir in this document refers to a geothermal aquifer that contains hot or warm water that is available to be used for economic benefit.

System Management Plan: A plan that manages the geothermal resource on a whole system basis, to ensure integrated management of the system which responds to changes caused by its use.

Taonga: Treasure, property; taonga are prized and protected as sacred possessions of the tribe. The term carries a deep spiritual meaning and taonga may be things that cannot be seen or touched. Included for example are te reo Māori (Māori language), Wāhi Tapu, waterways, fishing grounds and mountains. (from the RPS)

Wāhi tapu: Sacred place, sacred site - a place subject to long-term ritual restrictions on access or use, e.g. a burial ground, a battle site or a place where tapu objects were placed. (from Te Aka Māori Dictionary)

Wairua: Spirit (from the RPS)

Water:

- (a) means water in all its physical forms whether flowing or not and whether over or under the ground*
- (b) includes fresh water, coastal water, and geothermal water*
- (c) does not include water in any form while in any pipe, tank, or cistern*

Waterbody: *fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within in the coastal marine area.*