SUBMISSION ON

Draft Plan Change 11 and Tauranga Geothermal System Management Plan

30 January 2025

To: Bay of Plenty Regional Council
Name of Submitter: Horticulture New Zealand
Supported by: NZ Avocado, NZ Kiwifruit Growers Inc., Tomatoes NZ, Vegetables NZ Inc.

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Horticulture™ New Zealand
Ahumāra Kai Aotearoa

OVERVIEW

Submission structure

1. **Part 1:** HortNZ's Role
2. **Part 2:** Executive Summary
3. **Part 3:** Background on horticultural use of geothermal resources
4. **Part 4:** Direct feedback on the Tauranga System Management Plan and PC 11

Our submission

Horticulture New Zealand (HortNZ) thanks Bay of Plenty Regional Council for the opportunity to submit on the Geothermal Plan Change 11 and welcomes any opportunity to continue to work with Bay of Plenty Regional Council and to discuss our submission.

HortNZ could not gain an advantage in trade competition through this submission.

HortNZ wishes to be heard in support of our submission and would be prepared to consider presenting our submission in a joint case with others making a similar submission at any hearing.

The details of HortNZ's submission and decisions we are seeking are set out in our submission below.

PART 1

HortNZ's Role

Background to HortNZ

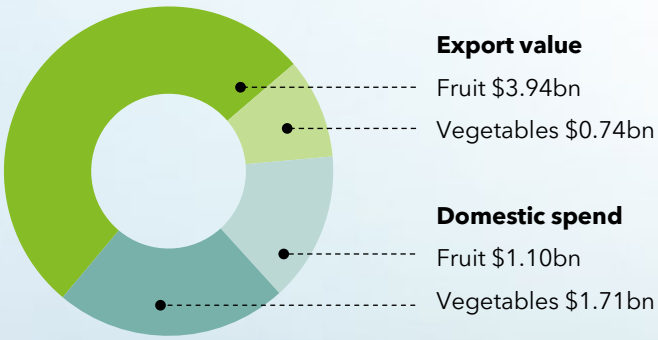
HortNZ represents the interests of approximately 4,200 commercial fruit and vegetable growers in New Zealand who grow around 100 different fruits and vegetables. The horticultural sector provides over 40,000 jobs.

There are approximately 80,000 hectares of land in New Zealand producing fruit and vegetables for domestic consumers and supplying our global trading partners with high quality food.

It is not just the direct economic benefits associated with horticultural production that are important. Horticulture production provides a platform for long term prosperity for communities, supports the growth of knowledge-intensive agri-tech and suppliers along the supply chain, and plays a key role in helping to achieve New Zealand's climate change objectives.

The horticulture sector plays an important role in food security for New Zealanders. Over 80% of vegetables grown are for the domestic market and many varieties of fruits are grown to serve the domestic market.

HortNZ's purpose is to create an enduring environment where growers prosper. This is done through enabling, promoting and advocating for growers in New Zealand.



Industry value $7.48bn

Total exports $4.67bn

Total domestic $2.81bn

Source: Stats NZ and MPI

HortNZ's Resource Management Act 1991 Involvement

On behalf of its grower members HortNZ takes a detailed involvement in resource management planning processes around New Zealand. HortNZ works to raise growers' awareness of the Resource Management Act 1991 (RMA) to ensure effective grower involvement under the Act.

PART 2

Executive Summary

Horticulture and geothermal water use

Bay of Plenty is a major horticultural region and powerhouse of fruit exports. Horticulture is a low emissions land use and efficient water user which provides healthy food for high value exports and domestic food supply.

Geothermal water is used by the horticulture industry for irrigation, frost protection and heating greenhouses to grow vegetables. These uses are not competing and can all help achieve regional economic and food supply values for the Bay of Plenty Region.

In the Tauranga Geothermal System, in particular, warm water is used for irrigation and frost protection on orchards. This use of water is essential for the kiwifruit and avocado growing sectors to continue to bring great economic benefits to the region. Kiwifruit alone contributes over 8% of regional GDP.

Growing food is a highly efficient use of the geothermal resource because of its benefits for GDP, employment, the transition to a low emissions economy and domestic and global food supply.

The Council's science has shown that the water quantity will run out before heat in the Tauranga system, so volume is the limiting factor rather than heat resource. Given that this is the case, non-geothermal uses of warm water such as irrigation should not be restricted on the basis of retaining the heat resource. Consent conditions or permitted activity standards placed on geothermal takes should be reasonable and proportional to the risk of environmental effects, being mindful of cumulative compliance costs on users.

There is significant potential for low-temperature geothermal water to be used with ground source heat pumps for zero-carbon greenhouse growing of vegetables. Greenhouses provide a highly efficient growing system in terms of land, water and minimal contaminant discharge. These uses should be supported and enabled under the Tauranga System Management Plan. HortNZ and vegetable product groups would welcome the opportunity to collaborate with the Regional Council on advancing opportunities for the greenhouse sector.

PART 3

Background Information

1. Horticulture in Bay of Plenty

Bay of Plenty is a prominent horticultural region and powerhouse of fruit exports, home to 37% of New Zealand's total fruit growing land by area.[1] Horticulture plays a major role in the regional economy. Kiwifruit and avocados are the key crops in the region, as shown in the tables below.

Table 1: Area of fruit growing in Bay of Plenty, Year ended 30 June 2022
(area planted, ha; 'S' indicates that Statistics NZ have suppressed date, so likely an underestimate)[2]

Crop	Apples	Kiwifruit	Summerfruit	Avocados	Citrus	Berryfruit	Other Subtropical	Other fruits
Area	120	11,290	11+**S**	2,120	38	76	57	59

Table 2: Area of vegetable growing in Bay of Plenty, Year ended 30 June 2022
(area planted, ha; 'S' indicates that Statistics NZ have suppressed date, so likely an underestimate)[3]

Crop	Asparagus	Broccoli, Cabbage & Cauliflowers	Carrots, Onions & Potatoes	Peas & Beans	Lettuces	Sweet Corn	Other veg	Indoor crops
Area	5	37	**S**	3	180	20	34+**S**	8+**S**

Kiwifruit represents 56% of New Zealand's total fruit and vegetable exports from 2023-24.[4] The crop is expected to break $3 billion in export value in 2025 after a record 2024 crop.[5] In 2022, there were 11,290 ha of planted kiwifruit orchards in the Bay of Plenty region, contributing $1.82 billion to the region's economy and thousands of jobs.[6] This means that kiwifruit alone contributes 8.4% of Bay of Plenty's regional GDP (more than the estimate for all of horticulture included in the Draft Tauranga System Management Plan).[7]

[1] United Fresh. Fresh Facts 2024.
[2] United Fresh. Fresh Facts 2024.
[3] United Fresh. Fresh Facts 2024.
[4] United Fresh. Fresh Facts 2024.
[5] MPI. Situation and Outlook for Primary Industries. December 2024.
[6] Bateson, Sonya. "Kiwifruit, housing contributes to rising Bay of Plenty economic ranking: ASB scorecard". *NZ Herald*. 16 December 2024.
[7] Using GDP of $21.666 billion from Stats NZ. Regional gross domestic product: Year ended March 2022.

Growth in planted area is limited to licenses released by Zespri each year, not all of which will be planted in the Bay of Plenty region. Kiwifruit yields are improving due to research and orchard management practices, with production per hectare increasing 83% between 2013 and 2023.[8]

Overall, the New Zealand avocado industry is expecting $91 million in export revenue forecast for the year ending 30 June 2025,[9] with approximately half of production and value located in the Bay of Plenty.[10] Unfavourable weather conditions over the past two years from the La Niña weather pattern have created challenges for the industry.[11] In 2023/24, there were 1,826 ha of planted avocado orchards in the Bay of Plenty.[12]

2. Horticulture as a low emissions land use

Horticulture is a low emissions land use, contributing only 1.1% of New Zealand's greenhouse gas emissions.[13] The sector's limited greenhouse gas emissions come from the use of fuel for farm equipment, processing, cool storage and freight. Horticulture also produces nitrous oxide emissions from fertiliser, although horticulture's share of nitrous oxide emissions is only 1% of New Zealand agriculture's total.[14]

Despite already being a low emissions land use, the horticulture industry is further decarbonising. The kiwifruit industry reduced its carbon footprint by over 20% from 2009 to 2017.[15]

The greenhouse vegetable growing industry is also moving toward renewable energy sources. Many greenhouse businesses use heating sources powered by fossil fuels in colder months and rely on the CO_2 captured when burning natural gas to pump into the greenhouses to boost plant productivity. Geothermal energy is one promising alternative energy source, particularly when CO_2 can be captured for use in the greenhouse.

3. Horticulture and freshwater

Growing fruit is an efficient use of water. Water is one of the key ingredients needed for plants to grow. Trees and vines need enough soil moisture to ensure balanced growth and fruit quality. Too much water can have a negative impact on fruit quality and size, increase the risk of root rot or plant death, or cause nutrient leaching into the environment. Too little water inflicts stress on the plant, or even death. For all of these reasons, growers seek to use just the right amount of water to a high degree of precision.[16]

All nutrients in an orchard system need to be balanced and supplied at optimal levels at the right time to support production goals. The horticulture industry encourages and monitors good and best management practices to manage environmental effects through industry

[8] MPI. Situation and Outlook for Primary Industries. June 2024. (p. 45)
[9] MPI. Situation and Outlook for Primary Industries. December 2024.
[10] NZ Avocado
[11] MPI. Situation and Outlook for Primary Industries. June 2024. (p. 103)
[12] United Fresh. Fresh Facts 2024.
[13] StatsNZ. Greenhouse gas emissions (industry and household): Year ended 2022
[14] StatsNZ. Greenhouse gas emissions (industry and household): Year ended 2022
[15] Zespri. The Carbon Footprint of Our Kiwifruit. Accessed 11/12/24.
[16] HortNZ. Fresh fruit from freshwater. Accessed 29/01/25.

assurance programmes like New Zealand Good Agricultural Practice (NZGAP) and Zespri GAP.

Greenhouses are efficient users of water compared to other forms of primary production, in terms of both quality and quantity. Greenhouse-grown tomatoes require as little as six litres of water to produce one kilogramme of fruit, saving approximately 200 litres per kilo compared to traditional outdoor growing methods. This astonishing degree of water saved is because many greenhouses recycle water within their operations. Many businesses collect and use their own rainwater for irrigation as well.

4. Use of geothermal water for orcharding

Geothermal water is used by the horticulture industry for irrigation, frost protection and heating greenhouses to grow vegetables. These uses are not competing and can all help achieve regional economic and food supply values for the Bay of Plenty Region. They are described in the following sections.

4.1. Irrigation

In the area of the Tauranga Geothermal System, orchardists use heated and non-heated groundwater for irrigation and frost protection. The amount of water required depends on the size, age and health of the plant and environmental factors. The financial returns growers get for their fruit are strongly influenced by fruit size. If water stress results in smaller fruit or a decline in plant health, continued production is less viable.[17]

One grower told HortNZ, "We have a deep well bore and the water is warm when it comes to the surface…We use it for frost protection and irrigation. All computerised." The grower said that the water is also used for domestic use, and the uptake is all on telemetry.

4.2. Frost protection

Frosts can destroy fruit tree blossoms, growing fruit, leaves and shoots, so growers do what they can to protect their trees from these events. If cold temperatures cause water in plant cells to freeze and expand, the cells burst, causing damage that reduces surface area available for photosynthesis.

Water sprinklers are an effective method of frost protection. When plants are sprayed with water during freezing temperatures, the water droplets form a thin layer of ice on the plants' surface, which insulates them from the freezing air. Having water available to manage frost events is essential to protect trees and vines.

4.3. Connection to geothermal policy

Provisions for the use of heated groundwater by growers will be managed through the Tauranga Geothermal System Management Plan and a future freshwater plan change from the Regional Council. As stated in PC11, "Take, use, damming, diversion, discharge, and

[17] HortNZ. Fresh fruit from freshwater. 17 June 2024.

drilling in Geothermal Management Group 5 (including the Tauranga Geothermal System) will be addressed through a future freshwater plan change, not the Geothermal Chapter."

4.4. Quantifying horticultural use

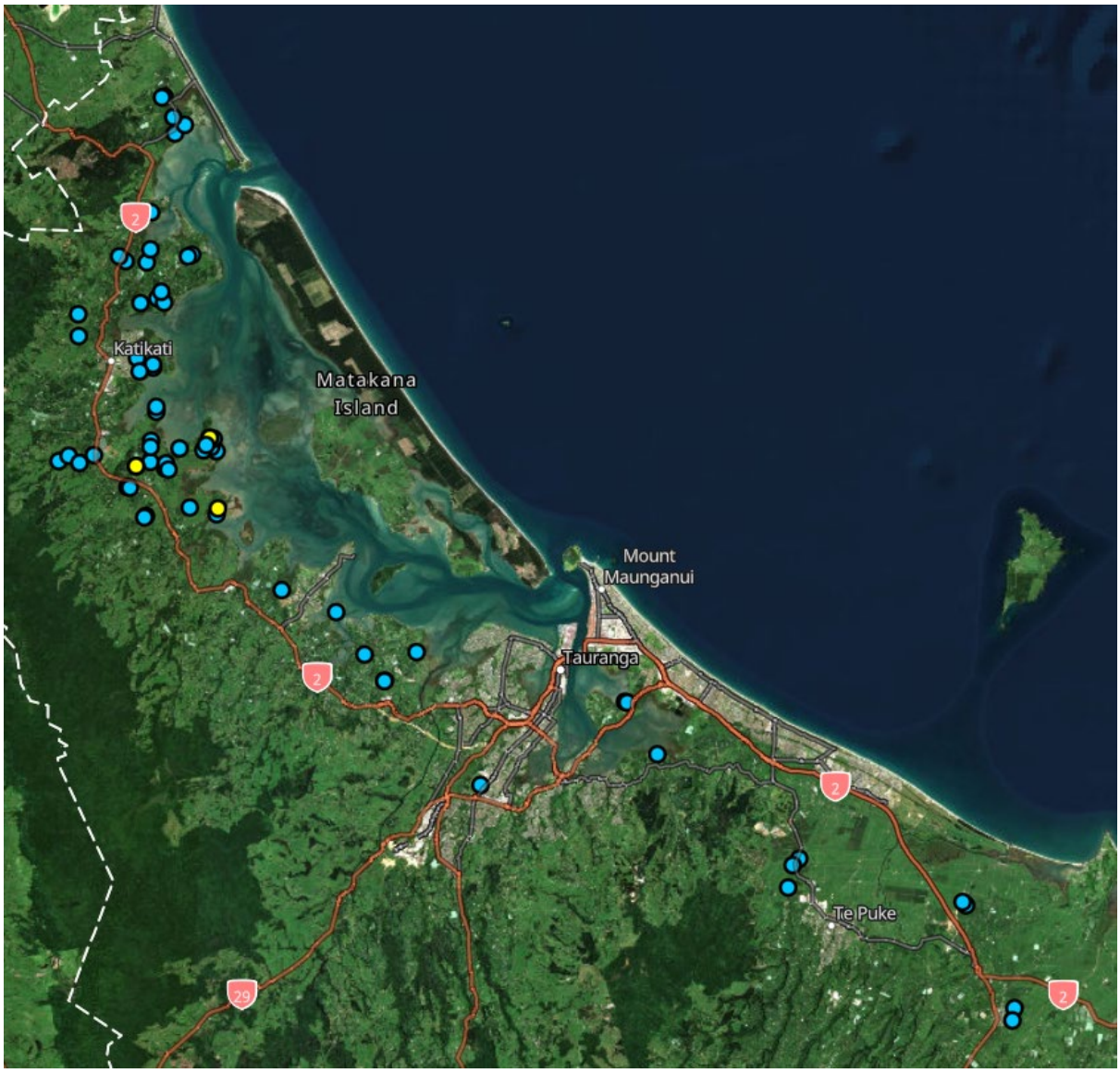
27-29% of overall use of geothermal water in the Tauranga Geothermal System is for horticultural use, making up 96% of geothermal water allocated to non-geothermal activities.[18] Horticultural use for non-geothermal activities is taken to mean irrigation and frost protection. The quantity of water used for different uses is estimated in Table 3 using data from the draft Tauranga System Management Plan.

Table 3: Geothermal water use in the Tauranga Geothermal Management System[19]	
Total consented volume	9.5M tonnes or an average of 26,000 tonnes per day
'True geothermal uses' (relying on thermal energy in water)	76% (~7.22M tonnes)
Non-geothermal uses	24% (~2.28M tonnes)
Horticulture use of all geothermal water	27% (~1.95M tonnes)
Private/Horticulture use of all geothermal water	2% (~0.19M tonnes)

Figure 1 shows a screenshot of the Regional Council's map of geothermal consents, filtered by the word "irrigation". It is likely that there are a number of other consented takes which do not list the word "irrigation" in their purpose on the map, so this image is only indicative of general location and scale of use.

[18] Bay of Plenty Regional Council. The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty region. February 2022. (p. 21)
[19] Bay of Plenty Regional Council. The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty region. February 2022. (p. 19)

Figure 1: Consents for geothermal takes with the word "irrigation"[20]



5. Use of geothermal water for greenhouses

5.1. Greenhouses are needed to adapt our food system

Growing indoors, also known as covered cropping, is what allows New Zealanders to buy tomatoes, cucumbers, capsicum, courgettes, eggplants, leafy greens and herbs year-round. Covered crop growers even out the supply of fresh produce, extending the availability of seasonal crops when outdoor cropping is challenging. Consumers expect access to these crops, which drives production.

An increase in covered cropping will be essential to adapt the food production system to the variable weather that comes with a changing climate while still producing enough food for New Zealand's population. Indoor growing systems are less vulnerable to environmental

[20] Resource Consents | BayMaps

conditions and pressures such as significant weather events. During Cyclone Gabrielle, 80% of the tomatoes grown outdoors for processing were destroyed, whereas the supply of indoor grown greenhouse tomatoes was relatively unaffected.[21]

Greenhouses do not contribute to the degradation of freshwater quality because they are closed systems. Greenhouse growers are precise about exactly how much of a nutrient input they use. Because greenhouses are controlled systems, it is easy to know exactly how much of different nutrients like nitrogen and phosphorus plants need to reach the correct size for market requirements at the right time. As efficient land and resource users, greenhouses will be an essential growing system for the ongoing resilience of New Zealand's food supply.

5.2. The need to decarbonise greenhouses

61% of known greenhouse growers (covering 80% of greenhouses by area) use heating sources powered by fossil fuels in colder months.[22] Greenhouse growers pay into the Emissions Trading Scheme (ETS).

Energy-switching is prohibitively expensive, particularly for small and medium-sized growers. The covered cropping sector needs support for decarbonisation. The cost for a greenhouse grower to decarbonise is roughly $500,000-$1 million per hectare, depending on the fuel type.[23] Geothermal is a promising future alternative energy source because of its low ongoing costs after the upfront capital expenditure to connect to the energy source.

5.3. Existing use of geothermal for greenhouses

In the Tauranga Geothermal System, between 4-7%[24] of geothermal water takes are for horticultural energy use. This share of takes is presumed to be for greenhouse heating.

Based on the Bay of Plenty Regional Council map of resource consents, there are at least three consents for take of warm water for greenhouses, but two were consented in the 1980's and may or may not still be in operation.[25] Other consents used for greenhouses may not be labelled as such on the map.

New Zealand Gourmet is the only vegetable growing business known to HortNZ in New Zealand using geothermal energy at scale to heat their glasshouses, but they are not located in the Bay of Plenty region. It is possible that other glasshouse businesses are growing flowers, seedlings or medicinal plants using geothermal heating.

Case Study: New Zealand Gourmet

New Zealand Gourmet uses geothermal heat exchange for greenhouse heating at their Gourmet Mokai site, which is northwest of Taupō in the Waikato region.[26] While not located in the Bay of Plenty, Gourmet Mokai provides a case study for possible future use of geothermal resources.

[21] Tomatoes NZ, personal communication
[22] Vegetables NZ, Inc.
[23] Vegetables NZ, Inc. estimate
[24] This is 6-9% of the 76% used for 'true geothermal use' according to p.19-20 of the Council's economic report.
[25] Resource Consents | BayMaps
[26] New Zealand Gourmet. Gourmet Mokai Ltd. Accessed 11/12/24.

Gourmet Mokai employs 100 staff, growing 4,275 tonnes of tomatoes and 900 tonnes of capsicums per annum for domestic and export markets.[27]

Gourmet Mokai uses high-temperature geothermal with one heat exchanger. The system works by running a pipe from the valve on a well from the geothermal reservoir. Geothermal water comes from the well at 50 bar and 250°C and is fed through a heat exchanger where the water from the greenhouse heating system is heated up to 90°C. These two water systems are kept completely separate and never mix, meaning that all of the bacteria, minerals and potentially corrosive elements of the geothermal water do not enter the greenhouse heating system. Geothermal water can also be acidic. In the case of the Mokai well, the pH can go as low as pH 4, which affects the pipes of the heating system.

The geothermal water is then discharged back into the reservoir, at a cooler temperature. Gourmet Mokai takes the water out of the reservoir at approximately 250°C and returns it at 90°C.

The heating pipes now full of clean, hot water run along the floor of the glasshouse. The heat from the pipes is then radiated to the air, heating the whole glasshouse and keeping the plants warm. Different systems could be used on other greenhouse sites.

While Gourmet Mokai uses high-temperature geothermal energy, low-temperature geothermal is a less expensive and highly promising alternative energy source for future glasshouse development.

5.4. Future use of geothermal for greenhouses

Ground source heat pumps are one renewable energy system with sector interest and a high return on investment. Growers are concerned that the electrical grid will not be able to handle the vast load of all industries trying to electrify and decarbonise at once, so an alternative heat source is attractive. Ground source heat pumps can use geothermal resources from 10-100°C, [28] so they are well-suited to low temperature geothermal systems like the Tauranga system. They are already in use in New Zealand at locations like the Christchurch Airport and ECAN Council buildings.[29] It is important to note that not all ground source heat pump designs need to extract the geothermal water from the aquifer.

Industry groups and GNS are developing a new web-based tool to help greenhouse growers switch to geothermal heating.[30] Industry groups, including HortNZ, Vegetables NZ and Tomatoes NZ are keen to work with Council to get the settings right to enable access to geothermal energy.

[27] New Zealand Geothermal Association. "Action Plan 2024-2025: Geoheat Strategy for Aotearoa NZ".
[28] GNS. Geothermal heat. Accessed 13/12/24.
[29] GNS. Geothermal heat. Accessed 13/12/24.
[30] Grower2Grower. "Web based tool to help growers switch to geothermal heating". 15 January 2025.

Case Study: Ground Source Heat for a Whakatane (or Tauranga) Greenhouse

The Energy Efficiency and Conservation Authority (EECA) is running a Regional Energy Transition Accelerator (RETA) programme to develop decarbonisation roadmaps for each region.[31] Their Bay of Plenty (BOP) workstream has modelled the use of ground source heat pumps for a 3.2ha Whakatane greenhouse.[32] The modelling showed that drawing 15°C groundwater, the heat pump could heat water to 65°C to heat the greenhouse. With 30°C groundwater temperature, the capital cost to install the technology would decrease 40% and annual energy savings would decrease 15%, which shows the potential cost savings of establishing over a low temperature geothermal system like Tauranga.[33] Ground source heat pumps are more efficient than air source heat pumps, especially when accessing geothermally enhanced groundwater.[34]

The EECA RETA BOP report recommended including ground source heat pumps in the regional economic and energy strategies for Tauranga.[35] The report noted, "The low temperature geothermal resource in and around Tauranga represents an opportunity that has not been fully realised…energy efficiency opportunities could further attract economic investment to the region, especially for sectors such as the covered crop growers."[36]

Using low-temperature heat for greenhouses is a highly efficient use of the geothermal resource because:

- Greenhouse crops are valuable on the domestic and export markets, and growing creates jobs, providing economic benefits,
- Growing vegetables benefits the region by providing healthy, nutritious food to New Zealanders and
- The technology is energy efficient and can become even more efficient with technological advancement.

[31] Carey, et al. Regional energy transition accelerator – Bay of Plenty – Geothermal Energy Assessment. GNS Science. 2024.
[32] New Zealand Geothermal Association. "Action Plan 2024-2025: Geoheat Strategy for Aotearoa NZ".
[33] Carey, et al. Regional energy transition accelerator – Bay of Plenty – Geothermal Energy Assessment. GNS Science. 2024.
[34] New Zealand Geothermal Association. "Action Plan 2024-2025: Geoheat Strategy for Aotearoa NZ".
[35] Carey, et al. Regional energy transition accelerator – Bay of Plenty – Geothermal Energy Assessment. GNS Science. 2024.
[36] Carey, et al. Regional energy transition accelerator – Bay of Plenty – Geothermal Energy Assessment. GNS Science. 2024. (p. 50)

PART 4

Submission

6. Proposed Tauranga Geothermal System Management Plan

The Tauranga Geothermal Management System is a low-temperature geothermal system, meaning it is "basically heated groundwater".[37] Groundwater over 30°C is considered geothermal under the RMA, but groundwater temperatures in the system range from 15-70°C, reaching nearly 77°C at a maximum.[38] Unlike higher temperature systems in the Bay of Plenty, the water is mostly suitable for irrigation, stock water and human drinking water.[39] The geothermal water chemistry and mineral content in the system is similar to non-geothermal groundwater.[40]

Draft Plan Change 11 to the Regional Natural Resources Plan directs that the Tauranga System Management Plan is taken into account for applications for the take, use, damming, diversion, discharge and drilling in the Tauranga-Mount Manganui (Mauao)–Pāpāmoa-Maketū system.[41] As such, the Tauranga System Management Plan has a direct impact on consent applications. In addition, the Tauranga System Management Plan forecasts policy likely to come through a future freshwater plan change to the Natural Resources Plan.

The following sections of this submission provide HortNZ's feedback on specific sections of the System Management Plan.

6.1. Part 1: Introduction

No comments on this section.

6.2. Part 2: About the Tauranga Geothermal System

HortNZ supports that the non-geothermal uses of water from the Tauranga system are identified, including irrigation and frost protection, as well as the use of thermal energy for greenhouses (p. 9, s.2.5).

HortNZ supports the recognition of the socio-economic benefits of non-geothermal use of the water for irrigation and horticulture, including the GDP and employment contributions of the sector (p. 11, s.2.6.2).

HortNZ supports the recognition of the use of heat pump technology (p. 11, s2.6.3). This section could specifically mention the possible use of ground source heat pumps to generate energy for greenhouse heating to grow vegetables. This supports the decarbonisation of the greenhouse industry, as described in Section 5 of this submission.

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[37] Bay of Plenty Regional Council. The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty region. February 2022. (p. 19)
[38] Exposure Draft Tauranga System Management Plan (p. 6-7)
[39] Bay of Plenty Regional Council. The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty region. February 2022. (p. 19)
[40] Exposure Draft Tauranga System Management Plan (p. 6-8)
[41] GEO-P1, GEO-Table 1: Geothermal management group framework

The Geoexchange NZ Ltd. Report for Bay of Plenty Regional Council on the Geoheat Potential of the Tauranga Geothermal System notes that there is excellent potential for covered crop growing in the western Bay of Plenty. The report notes, "There is an opportunity for the western Bay of Plenty public agencies to work with covered crop industry bodies to strategize how they can support new ventures in the region", recognising the employment and food security opportunities.[42]

Outcome sought: HortNZ and vegetable product groups welcome the opportunity to collaborate with the Regional Council on advancing opportunities for the greenhouse sector.

6.3. Part 3: Health of the geothermal system

HortNZ supports that the focus in Tauranga 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" (p. 12, s3.1).

Outcome sought: S3.2 of the Plan should be specific that "science has shown that the water quantity will run out before the heat, so volume is the limiting factor rather than heat resource", as specifically mentioned in GEO-Table 1 (5) of PC11.

6.4. Part 4: The System Management Plan

No comments on this section.

6.5. Part 5: Our Future Focus

Discussion question	Do you agree with the draft vision for the SMP? (copied below) *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.*

AGREE

HortNZ supports this vision, although it could include reference to the social and economic benefits of using the low temperature geothermal system.

Discussion question	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?

The Council's groundwater modelling found that, "induced cooling is not an issue across any specific area or the wider geothermal system at the current areas of use" and that large drawdowns of volume are a greater risk than loss of heat.[43] Given that the Regional Council's science shows that protecting the heat value in the system is less of a concern for the Tauranga Geothermal System, this low level of concern should be reflected in the System

[42] GeoExchange NZ Ltd. Preliminary Scoping Study: Geoheat Potential of the Tauranga Geothermal System. 22 July 2024. (p. 62)
[43] Bay of Plenty Regional Council. Tauranga Geothermal System Science summary report. December 2023. (p. 25)

Management Plan. Non-geothermal uses of the groundwater for horticulture have enormous regional economic and social benefits and should be enabled.

Discussion question	How well do you think the principles of the Tauranga Geothermal System Management Plan align with our goals?

HortNZ supports the principles of interconnectedness, recognising opportunity and potential, collective knowledge, and sustainability. (p. 15-16, s.5.2) The principle of recognising opportunity and potential could be better reflected in the overarching vision.

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

AGREE

HortNZ agrees with an integrated management approach for the use of groundwater and geothermal. Given the interconnectedness of the geothermal and non-geothermal groundwater resource, it is sensible to manage both with allocation limits. HortNZ's positions on the specific policy proposals are included in Table 4, with key points highlighted in green.

Table 4: Integrated management (p. 17)

Council Approach	**How the Council will do it**	**HortNZ comments**
Integrated planning	A coordinated programme of work through the Geothermal Programme	Support
	Integrated groundwater and geothermal provisions in the Natural Resources Regional Plan.	Support
Integrated modelling	Work towards integrated geothermal and groundwater reservoir models/s	Support
Impact of geothermal takes and discharges on groundwater	Geothermal takes will stay within groundwater allocation limits.	Support
	Geothermal takes will be avoided in proximity to **Freshwater Management Protection Areas**.	More information is required, so that we can provide direct feedback.
	Assessment of the risks of saline intrusion for geothermal consent applications for takes located in proximity to the Coastal Marine Area (CMA).	Support
	Best practice management of geothermal discharges	Support the use of guidelines

	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.	This management approach appears to treat geothermal discharges as point source discharges. HortNZ supports this approach if diffuse discharges (like those from irrigation) are assessed cumulatively for their affect on receiving waters as opposed to at the point of discharge. Management should occur at the catchment or sub-catchment scale to meet the overall load requirements. We suggest that this policy is broken into two as follows: **Point source** geothermal discharges will meet water quality standards of receiving water body. **Diffuse** geothermal discharges will cumulatively meet water quality standards at the catchment or sub-catchment scale.
	Consider filtration of bathed in water before discharges to surface water.	No comment
	Chemistry analysis of water prior to discharge to land for irrigation, in accordance with **Discharge Guidelines**	HortNZ seeks to know more about what cost and compliance burden this would impose on growers and to manage what effects. Additional costs should not be imposed for minor effects.
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).	HortNZ seeks to know more about what cost and compliance burden this would impose on growers. The overall cost and compliance burden of all policies should be considered together.
	Groundwater takes to assess potential impact on neighbouring heat users and to provide setbacks where there is a risk of local cooling.	While HortNZ supports protections for existing users of heat to avoid local cooling, the cost and compliance burden should be minimised and proportional to the potential effects, which HortNZ understands are minor.

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 70oC.	Support the use of codes of practice and New Zealand Standards
	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 70oC/artesian flow).	Support the use of codes of practice and New Zealand Standards
	Always ensure drill rig access to well heads, and avoid buildings being constructed close to well heads.	No comment

Discussion question	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

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It is essential that geothermal groundwater can continue to be used for non-geothermal purposes within sustainable groundwater allocation limits. Irrigation and frost protection provide significant economic benefits to the Bay of Plenty region, supporting the $2.878 billion kiwifruit export industry and $37 million avocado export industry.[44] These sectors produce healthy, nutritious, low-emissions food to feed New Zealanders and the world. Their water use should be prioritised and supported for their national and regional benefits.

The Draft System Management Plan itself says, "it is not appropriate to limit groundwater takes across the whole system to maintain geothermal heat" (p. 21).

Discussion question	Do you think the monitoring requirements for resource consent holders are reasonable?

HortNZ's positions on the specific policy proposals are included in Table 5, with key points highlighted in green.

[44] MPI. Situation and Outlook for Primary Industries December 2024

Table 5: Monitoring (p. 19)

Council Approach	**How the Council will do it**	**HortNZ comments**
State of the Environment Monitoring	Integrated geothermal and groundwater monitoring…	Support, so long as additional costs are not passed on to land users.
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).	Support guidelines for best practice that try to control costs. Using a few good indicators rather than measuring everything is a more effective approach.
	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.	Telemetering and temperature records measure two different variables – water volume and temperature. Telemetering for geothermal water is not required under the Essential Freshwater regulations but supported given the integrated nature of the geothermal and non-geothermal resource. Temperature records twice during the lifetime of the consent is a reasonable and proportionate requirement given the low risk of cooling stated in the Council's science report, but any increased frequency could add a compliance burden.
	New wells to have sampling points to allow testing, or infra-red monitoring where a sampling point is not reasonably accessible.	No comment
	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	HortNZ seeks to know more about what cost and compliance burden this would impose on growers. The overall cost and

	takes through a regional plan change).	compliance burden of all policies should be considered together.
	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).	Chemistry sampling once during the lifetime of the consent is reasonable, but further sampling has the potential to be burdensome on the user. The frequency of investigations should be proportionate to the risk, which is understood to be minimal in the Tauranga System.
	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).	The frequency of investigations should be proportionate to the risk and only occur when there are elevated levels of minerals. The System Management Plan identifies that the Tauranga System has low levels of minerals in general when compared to high-temperature systems (p. 8)
	Monitoring of water quality for point source discharges in sensitive receiving environments.	No comment
	For permitted groundwater takes between 25-290 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.	A frequency must be provided for this requirement. The temperature measurements should only be required once before the take is instigated because the temperature would only get cooler over time, if at all.

Discussion question	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?

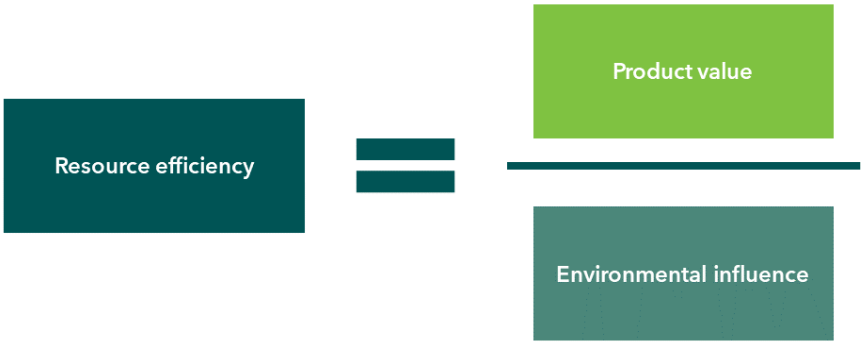
The Council should do more feasibility analysis, in partnership with horticultural industry groups, to understand how to realise the potential of geothermally heated greenhouse growing in the Bay of Plenty Region.

Discussion question	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?

Orcharding is an efficient use of water. As mentioned elsewhere in this submission and the consultation document, there is little risk of the heat resource being depleted in the Tauranga System. Given that minimal risk and that horticulture uses the water effectively by multiple metrics described below, irrigators should not be required to use the heat from their water in any particular way.

Orcharding performs well across multiple metrics of efficiency. Using precision irrigation methods and static infrastructure, orcharding has high water application efficiency. The 2010 Ministry for the Environment "Framework for Determining Resource Efficiency",[45] defines efficiency with the ratio shown in Figure 3.

Figure 3: Resource Efficiency[46]



In this case, productive output could be measured in economic benefit, export value or quantity of food produced. Environmental influence could take into account freshwater use, greenhouse gas emissions, nutrient discharge or impact on biodiversity. Orcharding

[45] Boffa Miskell. Resource Efficiency in New Zealand: Framework for Determining Resource Efficiency. June 2010. Prepared for Ministry for the Environment.
[46] HortNZ. Fresh fruit from freshwater. 17 June 2024.

performs well across all of these metrics. Orchards produce more economic benefit with each unit of water than other land uses. This is known as technical efficiency.

HortNZ's positions on the specific policy proposals are included in Table 6, with key points highlighted in green.

Table 6: Sustainable management of heat values (p. 21-22)

Council approach	**How the Council will do it**	**HortNZ comments**
Avoiding system wide cooling	Geothermal takes to stay within sustainable groundwater allocation limits within the Regional Natural Resources Plan (under development)	Support
	Reservoir modelling at least every 5 years to predict system wide impacts of groundwater takes on the geothermal heat resource.	Support
	Application of Discharge Guidelines	Support
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.	Support
	Identify areas where geothermal heat is most valued or has future potential and protection for these uses from unsustainable or competing use.	Support in part. While HortNZ supports identifying areas with potential for use of geoheat, warm groundwater should still be available for irrigation or frost protection use, especially when geoheat use has not yet been realised.
	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.	Oppose. The Council's own science discussed how volume is more likely to decrease before cooling occurs. Given the high economic value and regional benefits of horticulture, irrigation and frost protection should not be restricted beyond general volume allocation considerations.
	Ensure that new takes (warm and cold water takes) consider the impact on existing takes and the heat resource.	Oppose in part. Horticulture requires reliability in water supply, so ensuring new takes consider the impact on existing irrigators is

Council approach	How the Council will do it	HortNZ comments
		supported. However, the requirement to consider the impact on the heat resource is onerous and will have minimal benefits, given the high economic benefits of irrigation and frost protection compared to the minimal risk of cooling.
Enabling use	Enabling policies and rules for sustainable use of geoheat in the Regional Natural Resources Plan.	Support, especially with potential use for greenhouse heating.
	Education, information about the Tauranga Geothermal System and low temperature geoheat applications and technology.	Support
	Workshops and collaboration with industry, local councils, economic development agencies to jointly promote low temperature geoheat.	Support. We welcome opportunity to work with Council on this.
	Building on spatial planning opportunities to identify greenfield areas where geoheat heating and cooling is feasible, including the development of case studies.	Support. We welcome opportunity to work with Council on this.
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).	This could be useful in the case where irrigators can receive information about how to use the heat from the water to, say, power a heat pump for their home, while still being able to use the water for irrigation. It should be noted, however, that many orchards do not have residences or other buildings on their properties. This would not be useful if the intended message of the education is to steer users away from irrigating.

Council approach	How the Council will do it	HortNZ comments
	Regular auditing of resource consents on efficiency measures in high value heat areas or where takes are >5cm3 day.	It is unclear what would be audited, since users of geothermal water are not required to use the heat.
	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)	In theory, HortNZ supports efficient use of water and notes that irrigation and frost protection are highly efficient uses of water. We are concerned that growers already have high levels of monitoring and compliance required of them and more proposed in this System Management Plan. The Council needs to be mindful of the compliance burden in cost, time, and mental faculties they are requiring of users. Growers want to be efficient and are compared to other water users. If there was clear guidance and criteria about what counts as efficiency, that might be appropriate. These requirements should not necessitate thousands of dollars of consultant time to achieve.
	Develop Low Temperature Geothermal Efficiency Guidelines	Support. Guidelines need to be specific, clear and practical around what is required and what constitutes efficient use, recognising that cooling is not a significant concern in the Tauranga system.

Discussion question	What do you think are the key issues from geothermal discharges?

Reinjection is appropriate when low-temperature geothermal is used for greenhouse heating.

Discussion question	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?

HortNZ strongly disagrees with the statement that "The use of geothermal water for 'non geothermal uses' could be considered a wasteful use of the valuable heat resource" (p. 24, s5.3.7). There is no basis for this statement, and it is dismissive of the massive productivity and positive socio-economic benefits of the use of geothermal water for irrigation and frost protection. This is especially true, given the following sentence, which says, "Modelling has shown that at current levels of groundwater abstraction (including geothermal water), system wide temperature trends in the geothermal system are likely sustainable" (p. 24, s5.3.7).

HortNZ's positions on the specific policy proposals are included in Table 7, with key points highlighted in green.

Table 7: Managing competing uses (p. 24)

Council approach	**How the Council will do it**	**HortNZ comments**
Enabling use	If a geothermal take is within sustainable groundwater allocation limits, geothermal groundwater may be used for non-geothermal uses.	Strongly support
	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.	Oppose. This is onerous on consent applicants. It is much more efficient for the Council to work out how much water can be taken before cooling occurs. There will be a monitoring regime to check this. Individuals do not have the resource to do the science work this would require.
	Take an enabling approach for the establishment of low temperature geoheat applications, including ground source heat pumps.	Strongly support. Benefits for greenhouse heating.
	Consider permitted activity standards for small geothermal takes to be	Support, so long as the Council accounts for the overall impact of permitted takes.

Council approach	How the Council will do it	HortNZ comments
	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).	While we support education to encourage multiple uses for the geothermal water, using the heat should not be a requirement.
	Develop guidelines and provide information on the utilisation of surplus heat.	Support
Monitoring	Monitoring and modelling to assess cumulative impacts of groundwater takes	Support as a Council responsibility.

6.6. Part 6: Future Focus

No comments on this section.

6.7. Other Comments

The System Management Plan should be explicit about enabling the use of geothermal groundwater for use with ground source heat pumps. The upcoming Freshwater Plan Change should enable the use of non-geothermal water for ground source heat pumps as well, given that water as cool at 10°C can be used. This is assessed in the EECA RETA BOP report.[47]

7. Proposed Plan Change 11

Proposed Plan Change 11 adds a Geothermal chapter to the Bay of Plenty Natural Resources Plan (NRP).

7.1. Tauranga Geothermal System is excluded

Proposed Plan Change 11 indicates that "The take, use, damming, diversion, discharge, and drilling in Geothermal Management Group 5 (where groundwater can be heated by geothermal means to between 30°C and 70°C, therefore becoming defined as geothermal water) is addressed under the provisions in the [Draft Freshwater chapter]* of this plan." Management Group 5 includes the Tauranga system.

Because the Draft Freshwater chapter was not released for public consultation in 2024/early 2025, it is uncertain how the use of water from Geothermal Management Group 5 will be

[47] Carey, et al. Regional energy transition accelerator – Bay of Plenty – Geothermal Energy Assessment. GNS Science. 2024.

managed into the future. Most horticultural use of geothermal water comes from the Tauranga Geothermal System for irrigation and frost protection, and future use of low-temperature geothermal for greenhouse heating will likely occur in the Tauranga Geothermal System as well.

As such, HortNZ seeks that the public has the opportunity to submit on any direction for the take, use, damming, diversion, discharge, and drilling in Geothermal Management Group 5 that is redirected to the Tauranga Geotherm System Management Plan.

7.2. How PC11 will affect horticulture

Outside of the Tauranga Geothermal Management System, approximately 1% of geothermal water takes from the Rotorua System are for horticulture.[48] There is potential, however, for geothermal energy outside of Tauranga to be used for greenhouse heating.

HortNZ's comments on specific provisions of PC 11 are included in the following table.

[48] Bay of Plenty Regional Council. The Economic Impacts and Benefits and Costs of Geothermal Resources in the Bay of Plenty region. February 2022. (p. 22)

Submission on Geothermal Plan Change 11

Without limiting the generality of the above, HortNZ seeks the following decisions on the plan change, as set out below, or alternative amendments to address the substance of the concerns raised in this submission and any consequential amendments required to address the concerns raised in this submission.

Additions are indicated by bolded underline, and deletions by strikethrough text.

Provision	Support/ oppose	Reason	Decision sought
GEO-O1	Support	HortNZ supports the efficient use of geothermal water, heat, and energy, to make the best use of the available resource. HortNZ also supports that adverse effects from the development and use of geothermal water, heat, and energy can be mitigated or remedied.	Retain GEO-O1 as drafted.
GEO-Table 1: Geothermal management group framework	Support	The framing text for provisions for Group 5 is important to be clear that managing water quantity is the chief concern, rather than retaining heat.	Retain clause stating, "science has shown that the water quantity will run out before the heat, so volume is the limiting factor rather than heat resource" in 5(a).
GEO-P9	Support	HortNZ supports the use of Standards and Codes of Practice.	Retain GEO-P9(1) as drafted.
GEO-R4	Support in part	HortNZ supports consideration of the positive effects of the end use of geothermal water, heat, and energy as a matter of discretion. The use of	Retain GEO-R4 matter of discretion (g) as drafted.

Provision	Support/ oppose	Reason	Decision sought
		geothermal energy for heating greenhouses will provide healthy, nutritious food to the domestic market, potential export value and employment opportunities.	
GEO-ROT-P4	Support in part	This sets out an allocation hierarchy. HortNZ seeks another allocation priority layer for efficient and sustainable uses.	Values based allocation – Ngā uara tuaritanga Only provide for new or increased take and use of geothermal water, heat, and energy within the allocation limits specified in GEO-ROT-Table 1 in the following order of priority: (1) first, communal use that directly benefits the health and wellbeing of tangata whenua, including for marae use such as cooking and heating, communal bathing and papakāinga; then (2) second, takes for mineral bathing and wellness therapies; then **(3) third, efficient and sustainable uses of geothermal, water, and energy consistent with GEO-P1, GEO-ROT-P1 and GEO-ROT-P3; then** ~~(3) third,~~ **(4) fourth,** any other use of geothermal water, heat, and energy…

Provision	Support/ oppose	Reason	Decision sought
Definition of Efficiency	Support	HortNZ supports the consideration of economic efficiency (meaning the benefit to society), allocative efficiency and productive efficiency. The use of geothermal energy for heating greenhouses has high economy efficiency because it helps produce healthy, nutritious food for New Zealand's population. It also provides employment benefits and helps the sector decarbonise.	Retain definition of efficiency.