

7 Geothermal Module

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7.1 Clarification of the Relationship between the Water and Geothermal Modules

a. Objectives and Policies

The RMA definition of 'water' encompasses all water, including 'geothermal water' (both terms are defined in s2(1) of the RMA). The Geothermal Module of this Plan identifies and discusses resource management issues that specifically concern geothermal water and sets out objectives and policies applying to geothermal water and the effects of the take, use, and discharge of geothermal energy and water on other resources, including fresh water.

Objectives and policies applying to other activities relating to fresh water are contained within Module 3 of this Plan.

b. Rules

This Module contains rules addressing the taking, use, and associated discharge of geothermal water. However, some of the rules within Module 3 address the taking, use or associated discharge of small amounts of both geothermal water and fresh water. Where this is the case, it is specifically stated in the rule. Module 3 rules that specifically state that they include geothermal water are as follows

- i. Rule 3.3.4.15, which applies to the taking of water for well or aquifer testing purposes.
- ii. The rules within Section 3.5.8, which apply to discharges from well or aquifer testing.
- iii. The rules within Chapter 3.8, which apply to drilling activities.

The Geothermal Module also includes Rules 7.6.6.1 to 7.6.6.3, which address other activities in the vicinity of Significant Geothermal Features. Where activities in the vicinity of Significant Geothermal Features are regulated by Rules 7.6.6.1 to 7.6.6.3 of this Module, they are not also covered by rules elsewhere in the Plan.

7.2 Geothermal Module

7.2.1 Background and Explanation

The Waikato Region contains most of New Zealand's geothermal areas. The Regional Geothermal Resource can be divided naturally into management units known as geothermal systems and this Plan is based on this distinction. A geothermal system is an individual body of geothermal energy (including geothermal water) not believed to be hydrologically connected to any other in the upper few kilometres of the Earth's crust. There may be more than one heat upflow contributing to a geothermal system. A geothermal system may be indicated by geothermal surface features such as an isolated hot spring or set of hot springs, or a much larger set of features. Alternatively, there may be no visible expression at the surface.

The main geothermal systems in the Waikato Region are identified in Figure 7.1

Further background information on the geothermal resource within the Waikato Region, including the uses and values associated with the resource, can be found in the Waikato RPS and other documents produced by Waikato Regional Council (Waikato Regional Council). This Plan should be read in conjunction with the RPS.

The legend of Ngatotoirangi describes how geothermal energy arrived in New Zealand and gives a basis for understanding the relationship tangata whenua in geothermal areas have with the resource. The concept of kaitiakitanga requires tangata whenua to respect the environment and to ensure resources are available for future generations. Kaitiakitanga is an important concept in decision making that involves the notion of guardianship as well as tapu, mana, mauri and ahi kaa. It places an obligation on tangata whenua as Kaitiaki to ensure that geothermal resources are maintained and handed to future generations in a healthy condition. Tangata whenua with particular interest in geothermal energy are people from Waikato-Tainui, Te Arawa, Ngati Tuwharetoa, Ngati Tahu, Ngati Raukawa, Maniapoto and Hauraki.

Therefore, in the management of the Regional Geothermal Resource, there is a need to recognise the importance of protecting the variety, and as much as is practicable, extent of the characteristics and values that are associated with the resource, as well as recognising its development potential. The management framework put forward in this Plan seeks to meet these two directions while avoiding degradation of the Regional Geothermal Resource.

This is achieved by identifying the geothermal systems in the Region for different management regimes. There is a clear distinction between the Region's large and small geothermal systems. The large systems are all found in the Taupo Volcanic Zone, the triangular-shaped active volcanic zone stretching from an apex at Mt Ruapehu out to White Island (Whakaari) and beyond. These systems each cover an area of several square kilometres at least, and contain large volumes of heated rock and geothermal fluid with temperatures of up to 350 °C. The small geothermal systems are scattered throughout the region, including the Taupo Volcanic Zone. They generally produce water of less than 100 °C, and are small in area and volume of water discharged.

Each of the 15 known large geothermal systems within the Region is substantially different from the others in terms of its extent and volume, local geology, reservoir dynamics, and surface outflows.

Horohoro is a waning system, with few existing surface outflows but large areas of ancient sinter, indicating that it has been substantially more active than it is today.

Mangakino is the western-most large system in the Taupo Volcanic Zone. It also has few surface features, most of which are now under Lake Maraetai. However, it does not appear to be waning in the same way as Horohoro.

Mokai has its main upflow near the Mokai settlement, with a subsurface outflow flowing eleven kilometres north to the Waikato River. It has few surface features and few natural and physical resources that would be substantially adversely affected by subsidence, should it occur as a result of system development. Mokai supports a power station and a glass-house complex providing employment for many local people.

Ngatamariki was postulated to have a hydrological connection to Orakeikorako; however resistivity measurement and other data have effectively ruled that out. It has unusual travertine sinters, but none of the springs vigorously deposit sinter.

Ohaaki was developed in the 1970s, but cold water drawdown near production wells has cooled the production aquifer and electricity output is decreasing. Before production commenced there were several geysers and sinter-depositing springs, including the spectacular Ohaaki Ngawha, which is considered a taonga by Ngati Tahu. The flow to these springs was destroyed by development, and now the Ngawha is kept full by the input of bore water. Production has also increased the surface expression of steam, and an urupa has become the site of new fumaroles. The site of the main Ngati Tahu marae, situated by the Waikato River, is expected to be inundated as a result of subsidence. As well as a geothermal power station, there is a geothermally-heated timber-drying plant at Ohaaki.

Rotokawa supports a power station that has plans for expansion. An extensive area of altered ground has been the site of a sulphur-mining operation, and substantial sulphur deposits remain. It has a few sinter-depositing springs, and a large area of geothermal vegetation. The geothermally-influenced Lake Rotokawa provides habitat for a unique species of leech, that is adapted to live in the highly acidic water, which has a pH of 2.

Wairakei-Tauhara once supported two large geyser fields, but the flow to these was destroyed by the geothermal development for the Wairakei Power Station and by works in the bed of the Waikato River associated with the installation of the Taupo Control Gates for hydroelectric developments. The Wairakei Power Station has been operating for nearly 50 years, and was the second geothermal power station ever built in the world. Part of the Wairakei field has experienced subsidence of up to 15 metres as a result of the geothermal development. Taupo urban area is built over part of the Tauhara geothermal field, and there are many geothermally-heated homes, motels, and swimming pool complexes.

Atiamuri has two large sinter pools in a Department of Conservation reserve. There are several other sinter-depositing springs in nearby farmland, and some that were submerged by the creation of Lake Ohakuri.

Tokaanu-Waihi-Hipaua has several geysers and sinter-depositing springs at Tokaanu, most of which are in a Department of Conservation reserve. Waihi village also has hot springs at the edge of Lake Taupo, and directly above Waihi there is a large expanse of steaming ground on a steep hillside at Hipaua. This has been the site of several fatal landslides, as chemicals in the geothermal steam destroy the structure of the soil, causing it to slip away and fall onto the village. There are many small uses of geothermal fluid at Tokaanu, including homes, public baths, and accommodation establishments.

Reporoa shares a boundary with the Waikite-Waiotapu-Waimangu system, and may be hydrologically linked to it. Many of the sinter-depositing springs at Reporoa are adversely affected by drainage of the surrounding land for farming purposes.

Te Kopia shares a boundary with the Orakeikorako system, and may be hydrologically linked. It has a relatively pristine area of geothermal vegetation extending from the base of the Paeroa Scarp to its top, all within a Department of Conservation Reserve and surrounded by mature forest. It has a rare mud geyser and many other pools at the base of the scarp, and several super-heated fumaroles pumping out large volumes of steam at the top of the scarp.

Orakeikorako has New Zealand's largest concentration of geysers and sinter-depositing springs, and supports a tourism operation. There are now approximately 35 geysers within the tourist area, but before the creation of Lake Ohakuri drowned a large part of the geyser field, there were approximately 120 geysers.

Horomatangi lies under Lake Taupo which is the caldera of an active volcano. Investigation with a submarine has revealed sinter spires and fumaroles on the bed of the lake.

Tongariro on Mt Tongariro is New Zealand's only high-altitude geothermal system. There are outflows at Ketetahi, Te Maari, and the Tongariro summit. Ketetahi Springs is a taonga of Tuwharetoa and is on private property with access denied, surrounded by the Tongariro National Park. Within Ketetahi Springs there are unusual acid geysers, and the geothermal area supports a high-altitude thermophilic midge that is not known to live anywhere else. Tongariro geothermal system extends into the Manawatu-Wanganui Region.

Waikite-Waiotapu-Waimangu system has many geysers, sinter-depositing springs, mud pools and other features, including the spectacular Champagne Pool at Waiotapu. There is a large tourist operation on the Waiotapu field, and one of the world's largest bee-keeping operations uses geothermal heat for warming hives and processing honey. Most of the Waimangu field is in the Bay of Plenty Region. Waimangu is the youngest geothermal field in the world, having been created in the 1886 eruption of Mt Tarawera. It also has a large tourism operation.

In accordance with the policies and methods in the Regional Policy Statement, large geothermal systems are identified as Development, Limited Development, Research, or Protected Geothermal Systems. The Research category includes undiscovered large systems.

All other geothermal systems are treated as Small Geothermal Systems. The policy reflects the primary uses or values associated with those Small Geothermal Systems, while ensuring that the variety, and as much as is practicable, extent, of the regional geothermal resource is maintained.

Key aspects of managing the Regional Geothermal Resource are ensuring that use of the resource is efficient and that the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations is not compromised. This is addressed by:

- Identifying some Protected Geothermal Systems, where the natural characteristics of the system will be protected;
- Requiring a System Management Plan for each Development Geothermal System which will promote the efficient management of takes uses and discharges in accordance with the objectives and policies in the Regional Policy Statement and this Plan;
- Ensuring that, in all other systems, use of the geothermal resource conserves geothermal energy and water as much as practicable;
- Recognising that future generations may have more and better choices than present generations as to how to meet their energy requirements, and therefore

allowing controlled depletion in some geothermal systems while not compromising the ability of future generations to meet their reasonably foreseeable needs.

Another important aspect of the management of the Regional Geothermal Resource is avoiding, remedying, or mitigating adverse environmental effects. This includes not only the actual and potential effects associated with the use of the Regional Geothermal Resource, but also the effects of other activities on the Regional Geothermal Resource.

The following sections of this Module are intended to expand upon the issues, objectives, and policies of the Regional Policy Statement and provide clear direction in terms of regional council functions for addressing those resource management issues. This has been achieved by providing more detail in relation to the nature of the resource management issues associated with geothermal resources and providing specific objectives, policies, and methods that are intended to address those issues.

Figure 7-1: Map of the Geothermal Resources of the Waikato Region



7.3 Issues and Objectives

Issue 1:

Inefficient take, use and discharge can unnecessarily accelerate the rate of depletion of the Regional Geothermal Resource.

Issue 2:

Take, use and discharge of geothermal energy and water can adversely affect Significant Geothermal Features.

Issue 3:

Some land and water use practices in the vicinity of Significant Geothermal Features can cause significant adverse effects on the features.

Issue 4:

Large takes of geothermal energy and water from any geothermal system may cause adverse effects on other natural and physical resources including overlying structures (the built environment), such as those resulting from subsidence and land instability.

Issue 5:

The discharge of geothermal energy and water can contaminate fresh water to an extent that reduces its suitability for other uses and may significantly adversely affect the health and intrinsic value of fresh water ecologies generally.

Issue 6:

A lack of information and knowledge about the Regional Geothermal Resource and effects of its use can create uncertainty for management of the resource.

Objective 1

Where geothermal energy and water is taken, it shall be used and managed efficiently.

Objective 2

In Development Geothermal Systems, significant adverse effects on Significant Geothermal Features arising from the take of geothermal energy and water to be remedied or mitigated within the Regional Geothermal Resource

Objective 3

In all Limited Development, Research, Protected, and Small Geothermal Systems, significant adverse effects on Significant Geothermal Features arising from the take of geothermal energy and fluid are to be avoided.

Objective 4

Significant adverse effects on Significant Geothermal Features arising from land use and the take, use and discharge of non-geothermal water to be avoided.

Objective 5

In Development Geothermal Systems, adverse effects on other natural and physical resources including overlying structures (the built environment), such as those resulting from subsidence and land instability, arising from the take, use, and discharge of geothermal energy or water to be avoided, remedied or mitigated.

Objective 6

In Limited Development Geothermal Systems, significant adverse effects on other natural and physical resources including overlying structures (the built environment) such as those resulting from subsidence and land instability, arising from the take, use, and discharge of geothermal energy or water to be avoided, remedied or mitigated.

Objective 7

Significant adverse effects on fresh water and land arising from the discharge of geothermal energy and water avoided.

Objective 8

Increased knowledge about the Regional Geothermal Resource, and better understanding of the effects of using the resource and effects of other activities on the resource.

Principal Reasons for Adopting the Objectives**Objective 1**

In order to provide for the energy needs of current generations and the reasonably foreseeable needs of future generations, it is necessary to ensure that all the readily accessible geothermal energy is not wasted on inefficient and inappropriate uses, and that future generations have equitable access to the resource. Particular regard should be given to using the resource efficiently, otherwise more resources will be demanded, and additional environmental costs may occur. Once used in a primary process such as electricity generation, a geothermal resource may be of value to secondary uses, such as commercial, industrial and/or domestic processes. Such a cascaded use of the resource may contribute to the efficient use and development of that resource. Rejection of used geothermal energy and water, where practicable, may also assist in ensuring that the remaining energy and water are not lost from the system and that reservoir pressures are sustained.

Objectives 2 and 3

Objectives 2 and 3 recognise that the take, use, and discharge of geothermal energy and water can have a significant adverse effect on Significant Geothermal Features. Distinctly different management approaches are required for those geothermal systems that are subject to development and those that are to be protected.

Objective 2 recognises that large-scale use of Development Systems may result in significant adverse effects on Significant Geothermal Features and requires remediation or mitigation of those effects. Remediation and mitigation can be undertaken on the Significant Geothermal Feature affected or on another geothermal feature of the same type in any geothermal system.

Objective 3 focuses on protection of the Significant Geothermal Features of Limited Development, Research, Protected, and Small Geothermal Systems. In order to maintain the extent and variety of the valued regional geothermal characteristics, it is appropriate to protect Significant Geothermal Features in Limited Development, Protected, and Small Geothermal Systems from significant adverse effects arising from the extraction of energy and water from these systems. In Research Systems, a precautionary approach must be applied to protect known and unknown features within each system and within any Protected System that may later prove to be hydrologically connected to it.

Objective 4

Objective 4 recognises that land uses and uses of non-geothermal water can have a significant adverse effect on Significant Geothermal Features, and seeks to avoid these effects. Historically, for example, the establishment of the Waikato River hydroelectric system artificially submerged a range of Geothermal Features such as most of the geysers at Orakeikorako, which are now under water as a result of the creation of the hydroelectric lake Ohakuri. Whilst the hydroelectric system has significant regional and national benefits, such effects on Significant Geothermal Features should be avoided for any future activities. For instance, some land uses have adverse effects on characteristics of the geothermal resource. For example, at Reporoa, land drainage for farming has caused some sinter-depositing springs to cease discharging. Forestry in

geothermal areas can lead to geothermal features being damaged by trees falling into them and harvesting machinery destroying delicate sinter terraces. Allowing livestock or vehicles access to geothermal features, or using geothermal features as rubbish dumps can lead to a range of adverse effects including the crushing of fragile sinters and rare native plants, animals and micro-organisms.

In most cases, surface features that are part of a tourism venture are better cared for than those found in land that has other uses such as forestry and farming. Tourism can also increase appreciation of the resource and awareness of its fragility and rarity. However, extensive tourist use can lead to vandalism, wearing away of paths, and contamination of sinter by gravel and rubbish. Draining a feature or diverting its flow to protect paths can cause destruction of the feature and its ecosystem.

Objectives 5 and 6

Objectives 5 and 6 recognise that the take, use, and discharge of geothermal energy and water can have adverse effects on overlying structures (the built environment) and other natural and physical resources. These objectives achieve integration between the Geothermal and other Modules of this Plan and are implemented through policies and methods throughout the Plan.

In Development and Limited Development Systems it is important to ensure that adverse effects arising from the take, use, and discharge of geothermal resources are avoided, remedied, or mitigated, and that the cost of these actions falls on those who cause the adverse effects.

Objective 7

Objective 7 recognises that discharges of geothermal energy and water can have an adverse effect on fresh water resources from a water quality and ecological perspective. This objective achieves integration between the Geothermal and Water Modules of this Plan. It is consistent with the Water Module Section 3.2.3 Policy 3. Discharges to freshwater or land are not inconsistent with this objective if they are sufficiently remedied or mitigated so as to avoid significant adverse effects on the receiving environment.

Objective 8

Objective 8 recognises that where surface features exist, they provide only a very small indication of the extent of the resource and its hydrodynamic characteristics. Geophysical and geochemical techniques, as well as an understanding of the local geology, must be applied to enable understanding of the resource. Sustainable management of geothermal systems requires inputs from these disciplines, reservoir modelling and other disciplines to provide a useful model of system dynamics.

It is important that information be made available to support regional decision-making and policy direction, and to ensure that significant adverse effects on valued geothermal system characteristics are avoided, remedied or mitigated as appropriate.

7.4 Policies

Policy 1: Identification of Geothermal Systems

Promote the sustainable management of the Regional Geothermal Resource by identifying Geothermal Systems for different uses in accordance with the categories in Section 3.7.2, Policy Three of the Regional Policy Statement, as follows:

- A) **Development Geothermal Systems**, where the take, use and discharge of geothermal energy and water will be allowed while:
- remedying or mitigating significant adverse effects on Significant Geothermal Features; and
 - avoiding, remedying or mitigating adverse effects on other natural and physical resources including overlying structures (the built environment).

Development Geothermal Systems are identified in Table 7-1 and mapped in Section 7.9.1.

Table 7-1: Development Geothermal Systems

System	Reason
Horohoro	Few surface outflows vigorously depositing sinter. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Mangakino	Few surface outflows vigorously depositing sinter. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Mokai	The system is already subject to large scale energy use and development. No surface outflows vigorously depositing sinter. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Ngatamariki	No surface outflows vigorously depositing sinter. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Ohaaki	The system is already subject to large scale energy use and development. Existing surface features significantly impaired by legally established large takes. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Rotokawa	The system is already subject to large scale energy use and development. Few surface outflows vigorously depositing sinter. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.
Wairakei-Tauhara	The system is already subject to large scale energy use and development. Existing surface features significantly impaired by legally established large takes. No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.

- B. **Limited Development Geothermal Systems**, where some uses may be allowed that will not cause significant adverse effects on the characteristics of the geothermal system, including Significant Geothermal Features. Significant adverse effects on other natural and physical resources are to be avoided, remedied or mitigated. Limited Development Geothermal Systems are identified in Table 7-2 and mapped in Section 7.9.2:

Table 7-2: Limited Development Geothermal Systems

System	Reason
Atiamuri	Several surface outflows vigorously depositing sinter, and other moderately to highly vulnerable features, that would be adversely affected by large takes, but which are unlikely to be adversely affected by small to medium-sized, suitably located takes.
Tokaanu-Waihi-Hipaua	Many geysers, sinter-depositing springs, geothermal habitats, mud pools, and other vulnerable surface features, that do not appear to be significantly adversely affected by the many small to medium existing extractions. Limited new extractions may be accommodated without adverse effects on the Significant Geothermal Features but larger extractive uses would be likely to have significant adverse effects.

- C. **Research Geothermal Systems**, where limited takes and discharges for the purposes of research are provided for, as are small-scale takes and discharges for other purposes. To protect the characteristics of the system, and other natural and physical resources, large takes are prohibited. Research Geothermal Systems are identified in Table 7-3 and mapped in Section 7.9.3.

Table 7-3: Research Geothermal Systems

System	Reason
Reporoa	Several surface outflows vigorously depositing sinter. May be hydrologically linked to Waikite-Waiotapu-Waimangu Geothermal System.
Large Systems undiscovered as at 23 August 2003	

- D. **Protected Geothermal Systems**, where the heat and fluid flows and geothermal features will be protected. Only existing and small-scale new uses including scientific investigation and remediation or mitigation of past adverse effects, are provided for within these systems. Protected Geothermal Systems are identified in Table 7-4 and mapped in Section 7.9.4.

Table 7-4: Protected Geothermal Systems

System	Reason
Horomatangi	Sinter-depositing springs on the bed of Lake Taupo, sinter tubes and associated specialised ecosystems.
Orakeikorako	New Zealand's largest concentration of geysers, sinter-depositing springs and other moderately to highly vulnerable geothermal features. Significant populations of <i>Cyclosorus interruptus</i> , <i>Schizaea dichotoma</i> , <i>Christella dentata</i> , and <i>Nephrolepis cordifolia</i> .
Te Kopia	Rare mud geyser (which may be a chloride geyser), several mud pools and super-heated fumaroles, large area of geothermal vegetation that represents the best quality example of a relatively intact area of geothermal vegetation which is part of a high quality ecological sequence. Contains the at-risk geothermal plant species <i>Dicranopteris linearis</i> , <i>Calochilus paludosus</i> , and <i>C. robertsonii</i> . May be hydrologically linked to Orakeikorako Geothermal System.
Tongariro	Is mostly within Tongariro National Park, a World Heritage Area.
Waikite-Waiotapu-Waimangu	Many geysers, sinter-depositing springs and other moderately to highly vulnerable geothermal features. Significant populations of <i>Cyclosorus interruptus</i> , <i>Christella dentata</i> , <i>Dicranopteris linearis</i> , and <i>Nephrolepis cordifolia</i> .

- E. **Small Geothermal Systems:** In Small Geothermal Systems a low rate of fluid extraction is unlikely to cause unacceptable adverse effects but new large takes may cause unacceptable effects. Limited take and use of geothermal energy and water are provided for while avoiding or remedying adverse effects on the geothermal system, including Significant Geothermal Features.

Policy 2: Requesting a Change to a Geothermal System Identification

Provide for the reclassification of any Geothermal System, excluding those identified as Protected Geothermal Systems, where it can be shown that the Geothermal System more appropriately falls within another classification specified in Policy 1 above and having regard to Section 3.7.2 Policy Three of the RPS.

Implementation Methods for Policy 2:

- 1) Any party may request a change to the identification of a Development, Limited Development, Research or Small System through a change to the Regional Plan, on the presentation of new information supporting such a request. In order to support such a request an applicant would be required to:
 - a) collect, collate, and present information to address the matters in RPS 3.7.2 Policy Three Method 1 including information about the
 - System Size;
 - Vulnerability of Significant Geothermal Features to extractive uses;
 - Existing Use; and
 - Potential connection to any other Geothermal System; and
 - b) prepare the supporting RMA s32 analysis for such a change.
- 2) Protected Geothermal Systems are identified in the Regional Policy Statement, and a request for a change to a Regional Policy Statement may only be made by a Minister of the Crown or a territorial authority within the region.

Policy 3: Management of Use and Development in Development Geothermal Systems

Control the depletion of energy in Development Geothermal Systems through stepped production based on reservoir modelling that:

- considers the capacity of the system as a whole; and
- considers the reasonably foreseeable needs of present and future generations; and
- promotes efficient management and use of the system.

Policy 4: Integrated System Management of Development Geothermal Systems

Each Development Geothermal System shall have an up to date approved System Management Plan that defines the objectives to be achieved in relation to the System having regard to the relevant policies in the RPS.

Implementation Methods for Policies 3 & 4:

1. Require resource consent applicants for large takes to provide a draft of the System Management Plan. The plan shall include, but not be limited to:
 - i. Description of the Geothermal System before the exercise of resource consents;
 - ii. Description of the resource consents and conditions to which the System Management Plan relates;
 - iii. Description of the proposed development, including:
 - provision for stepped development;
 - reservoir management (including modelling);
 - where appropriate, requirements for multiple uses and users;
 - identifying sources of high enthalpy fluid and how these may be accessed and used;
 - a Discharge Strategy in accordance with Section 3.7.2.1, Policies Two and Three, of the Regional Policy Statement;
 - identifying actions to remedy and mitigate any significant adverse effects on Significant Geothermal Features;
 - identifying actions to avoid, remedy and mitigate any other significant adverse effects on the Geothermal System and other natural and physical resources including overlying structures (the built environment) ;
 - identifying how adverse effects will be managed to ensure that the burden of any adverse effects falls on those who cause them.
 - iv. Monitoring and reporting processes, including:
 - trigger points for initiation of actions to avoid, remedy or mitigate adverse effects; and
 - subsidence monitoring, particularly in the built environment.
 - v. Procedures for review of the System Management Plan;
 - vi. Peer Review Panel responsibilities;
 - vii. An Information Management Protocol outlining processes for information collection, review and dissemination. The protocol should clearly identify types of information that may be classified as commercially and/or culturally sensitive, necessitating specific consideration as part of any request for information received by the Waikato Regional Council (Waikato Regional Council).
2. Require drafting of and submission for approval of a System Management Plan in accordance with the conditions of resource consent for large takes.
3. Establish a process for peer review and updating of the System Management Plan.
4. Provide, where appropriate, for the review of specific conditions of any resource consent to address the effects arising from the exercise of that consent.

Policy 5: Multiple Operators

Ensure mechanisms (multiple operator agreements such as steamfield management agreements and field operation protocols) are in place where more than one consent holder for large takes is to exist within a system. Any such mechanism shall address the following matters to the satisfaction of the Waikato Regional Council (Waikato Regional Council):

- i. coordination and cooperation between consent holders
- ii. processes and procedures for assignment of responsibility and/or liability between consent holders for adverse environmental effects
- iii. identification of potential interference effects between consent holders
- iv. processes and procedures for avoiding, remedying or mitigating significant adverse environmental effects related to ii) and iii) above
- v. amendment of the System Management Plan
- vi. processes and procedures for dispute resolution of technical and consent related matters
- vii. processes and procedures for changes to the mechanisms, such as changes incorporating consent durations and transfers to new parties
- viii. siting of wells to avoid interference effects and to achieve efficient use and appropriate reinjection/production
- ix. monitoring, information and data access arrangements, including the apportioning of costs
- x. compliance with consent conditions, including joint reporting.

There is a strong preference for formal agreement(s) between consent holders but an applicant may demonstrate achievement of this policy by other mechanisms.

Implementation Methods for Policy 5

1. Presentation of an agreement and / or mechanisms shall form part of the consent application.
2. Mechanisms prepared in accordance with Policy 5 must be in place prior to the exercise of consents by the subsequent consent holder.

Policy 6: Significant Geothermal Features in Development Geothermal Systems

Where significant adverse effects on Significant Geothermal Features in Development Geothermal Systems are to be remedied or mitigated, the remediation and mitigation may include:

- the take and return of geothermal water being managed to remedy or mitigate significant adverse effects on those Significant Geothermal Features affected, or
- adverse effects on features of the same or similar type (defined in the glossary) being remedied or mitigated to an extent commensurate with the adverse effect being caused ('like for like' mitigation).

Implementation Method for Policy 6:

Identification of Significant Geothermal Features in Development Systems: In accordance with Section 3.7.2, Policy Two of the Regional Policy Statement, Significant Geothermal Features in Development Geothermal Systems are identified in Table 7-5. The boundary of each Significant Geothermal Feature in Development Geothermal Systems is shown in Section 7.10: Significant Geothermal Features Maps.

Table 7-5: Significant Geothermal Features in Development Geothermal Systems

Development Geothermal System	Location of Significant Geothermal Feature	Significant Geothermal Feature types present (see maps in Section 7.10 for named features and numbered feature areas)
Horohoro	Horohoro	Culturally significant feature (5) Geothermally-influenced aquatic habitat (5, 6) Geothermally-influenced water body (5) Heated ground habitat (5) Hydrothermal eruption craters (1, 2, 4) Recent sinter (5)
Mokai	Paerata Rd	Heated ground habitat Mud geyser Mud pools
	Tirohanga Rd	Heated ground habitat (1 – 9) Mud pools (1 – 9)
	Waipapa Stream	Geothermally-induced atmospheric microclimate Geothermally-influenced water body (Waipapa Stream)
Ngatamariki	Orakonui Springs	Geothermally-influenced aquatic habitat (1) Geothermally-induced atmospheric microclimate (2, 3) Geothermally-influenced water body (pools (6, 7)) Heated ground habitat (2 - 7) Hydrothermal eruption crater (7)
	Waikato River Springs	Geothermally-influenced aquatic habitat (1, 3, 4) Geothermally-induced atmospheric microclimate (1) Geothermally-influenced water body (wetlands (1, 3, 4))
Ohaaki	Ohaaki Steamfield East	Heated ground habitat
	Ohaaki Steamfield West	Culturally significant feature (Ohaaki Ngawha (3)) Heated ground habitat (1 – 4) Recent sinter (Ohaaki Ngawha (3))
Rotokawa	Lake Rotokawa	Geothermally-influenced aquatic habitat (Lake Rotokawa and Parariki Stream) Geothermally-influenced water body (Lake Rotokawa and Parariki Stream) Heated ground habitat Hydrothermal eruption craters Springs vigorously depositing sinter (lake-edge springs)

Development Geothermal System	Location of Significant Geothermal Feature	Significant Geothermal Feature types present (see maps in Section 7.10 for named features and numbered feature areas)
	Rotokawa North	Geothermally-influenced aquatic habitat (Parariki Stream) Geothermally-influenced water body (Parariki Stream) Heated Ground Habitat Hydrothermal eruption craters
	Parariki Stream	Geothermally-influenced aquatic habitat (Parariki Stream) Geothermally-influenced water body (Parariki Stream)
Wairakei-Tauhara	Broadlands Rd Reserve	Heated ground habitat Hydrothermal eruption craters (1) Mud pools (1)
	Craters of the Moon	Geothermally-induced atmospheric microclimate Heated ground habitat Hydrothermal eruption craters Mud pools
	Crown Rd and Crown Park Reserve	Heated ground habitat
	Hall of Fame Stream	Geothermally-induced atmospheric microclimate
	Karapiti Forest	Heated ground habitat
	Otumuheke Stream and Spa Park	Geothermally-induced atmospheric microclimate (Otumuheke Stream (1)) Geothermally-influenced aquatic habitat (Otumuheke Stream (1)) Geothermally-influenced water body (Otumuheke Stream (1)) Heated Ground Habitat (3) Recent Sinter (2)
	Te Kiri O Hine Kai Stream and Waiora Lakes	Geothermally-influenced water bodies (Te Kiri O Hine Kai Stream and Alum Lake) Heated ground habitat Hydrothermal eruption craters
	Te Rautehuia	Heated ground habitat
	Te Rautehuia Stream	Heated ground habitat Mud pools

Development Geothermal System	Location of Significant Geothermal Feature	Significant Geothermal Feature types present (see maps in Section 7.10 for named features and numbered feature areas)
	Upper Wairakei Stream (Geyser Valley)	Geothermally-induced atmospheric microclimate (4, 6) Heated ground habitat (3, 6) Mud pools (3, 6) Recent sinter (1, 6)
	Waipahihi Valley (Onekeneke Stream)	Geothermally-influenced aquatic habitat (Onekeneke Stream) Geothermally-influenced water body (Onekeneke Stream) Heated ground habitat Recent sinter
	Waipouwerawera	Heated Ground Habitat

Policy 7: Significant Geothermal Features in all other Geothermal Systems

Ensure that take, use, and discharge of geothermal energy and water avoid significant adverse effects on Significant Geothermal Features in Limited Development, Research, Protected and Small Geothermal Systems.

In Limited Development Systems, should unintended significant adverse effects occur to Significant Geothermal Features as a result of the exercise of any consent, require the consent holder to remedy or mitigate those effects.

Implementation Methods for Policy 7:

- 1) Identification of Significant Geothermal Features in Limited Development Systems: In accordance with Section 3.7.2, Policy Two of the Regional Policy Statement, Significant Geothermal Features in Limited Development Geothermal Systems are identified in Table 7-6. The boundary of each Significant Geothermal Feature in Limited Development Geothermal Systems is shown in Section 7.10: Significant Geothermal Features Maps.

Table 7-6: Significant Geothermal Features in Limited Development Geothermal Systems

Limited Development Geothermal System	Location of Significant Geothermal Feature	Significant Geothermal Feature types (see maps in Section 7.10 for named features and numbered feature areas)
Atiamuri	Whangapoa Springs	Geothermally-induced atmospheric microclimate (2) Geothermally-influenced water body (2, 3) Heated ground habitat (3) Spring vigorously depositing sinter (3)
Tokaanu -Waihi - Hipaua	Hipaua Steaming Cliffs	Heated Ground Habitat Mud pools
	Maunganamu	Geothermally-influenced aquatic habitat
	Tokaanu Domain	Geothermally-induced atmospheric microclimate Geothermally-influenced water body (Atakororeke Stream and several pools)

Limited Development Geothermal System	Location of Significant Geothermal Feature	Significant Geothermal Feature types (see maps in Section 7.10 for named features and numbered feature areas)
		Heated ground habitat Mud pools Recent Sinter Springs vigorously depositing sinter

- 2) For Research Protected and Small Systems – Significant Geothermal Features are not mapped and are those that meet one or more of the descriptions of Significant Geothermal Feature Types which are defined in the Glossary.
- 3) Waikato Regional Council (Waikato Regional Council) will continue to investigate and monitor geothermal features in all geothermal systems, particularly those in Research, Protected, and Small Geothermal Systems, in order to increase knowledge and understanding of the characteristics of geothermal features.
- 4) Waikato Regional Council (Waikato Regional Council) will introduce a variation to correct/update the maps in section 7.10 of this plan for Significant Geothermal features as a consequence of new information obtained since notification. The variation will also delete this method. *[NB: Maps in Section 7.10 were updated by Variation No. 7 – Minor Variations and Geothermal Maps which became operative in December 2010. Those updated Maps are incorporated in this REPRINTED Version of the Plan.]*

Policy 8: Geothermal Features in Protected Geothermal Systems

Recognise Geothermal Features in Protected Geothermal Systems where they are valued for amenity, cultural or scientific reasons.

Implementation Method for Policy 8:

When assessing resource consent applications, where appropriate, have regard to the value of Geothermal Features and provide for their protection.

Policy 9: Relative Significance of Significant Geothermal Features to be Considered

When assessing applications for activities that will significantly adversely affect a Significant Geothermal Feature, the matters that Waikato Regional Council (Waikato Regional Council) considers will include:

- the significance of the feature compared to other examples of that type of feature within the Region;
- the classification of the Geothermal System that the feature lies within; and
- the benefits of the activity that may cause the adverse effect on a Significant Geothermal Feature, when deciding whether and by how much the effects are to be avoided, remedied or mitigated, as directed by the objectives and policies for each type of Geothermal System in the Regional Policy Statement.

Implementation Method for Policy 9:

The following factors should be taken into account when determining the relative significance of a Significant Geothermal Feature and the measures to be taken to avoid, remedy, or mitigate adverse effects on it, (as directed by the objectives and policies for each type of Geothermal System):

- i) current uses and management of the feature and the area immediately surrounding it;
- ii) the relative rarity, resilience and viability of the specific feature compared to other features of the same type;
- iii) cultural, social, economic, scientific, and intrinsic values of the feature;

- iv) previous modifications to the feature; and
- v) effects of the activity on the significant characteristics of the feature including dependent ecosystems.

Policy 10: Adverse Effects of Land Use and Take, Use and Discharge of Water on Significant Geothermal Features

Ensure that land use and the take, use and discharge of non-geothermal water avoid significant adverse effects on Significant Geothermal Features.

Policy 11: Effects of Geothermal Resource Use on Other Natural and Physical Resources, including Overlying Structures (the Built Environment)

When taking, using, or discharging geothermal energy and water in Development Geothermal Systems, avoid, remedy or mitigate the adverse effects on non-geothermal natural and physical resources, including overlying structures (the built environment).

Where there is scientific uncertainty and a threat of serious or irreversible adverse effects on natural and physical resources including overlying structures (the built environment) adopt a precautionary approach.

Implementation Method for Policy 11:

When assessing applications for activities that may have adverse effects on other natural and physical resources including overlying structures (the built environment) the characteristics of the system, the nature of the use and the sensitivity of the built environment to adverse effects will be considered. In addition, the best method(s) for avoiding, remedying or mitigating adverse effects on the built environment will be required and in that respect the factors to be taken into account include:

- The severity of impact of the adverse effects on other natural and physical resources including overlying structures (the built environment);
- Relevant national and international best practice in geothermal system management;
- The known body of information and experience of the particular Geothermal System, including data, information, research, monitoring and survey results and experience;
- The identification of suitable sites for reinjection/injection as part of a Discharge Strategy;
- The costs of avoiding, remedying or mitigating adverse effects should fall on those who cause them; and
- The availability and appropriateness of bonds as a condition.

Policy 12: Discharges of Geothermal Energy and Water onto Land and into Fresh Water

Ensure that discharges of geothermal energy and water onto land and into fresh water after efficient and appropriate use are limited such that the adverse effects are no more than minor.

Policy 13: Discharge Strategy for Large Discharges of Geothermal Energy and Water in Development Geothermal Systems

For large discharges of geothermal energy and water, reinjection / injection is to be undertaken in accordance with a Discharge Strategy prepared for each Development Geothermal System.

Policy 14: Information Gathering

Ensure that environmental monitoring is undertaken and information provided about the characteristics of the Regional Geothermal Resource. Ensure that high-quality data,

research, and monitoring of the Regional Geothermal Resource and of the effects of its use, commensurate with the scale of any activity, are, where appropriate, independently peer reviewed and made publicly available having regard to commercial and cultural sensitivity.

Additional Implementation Methods for Policies 1 to 14:

1. Assessment Criteria and Information:

Where applications are made to undertake activities that may adversely affect:

- The characteristics of the Regional Geothermal Resource;
- Significant Geothermal Features;
- Other natural and physical resources including overlying structures (the built environment),

ensure that adequate information is provided to assess those applications and provide assessment criteria within the Rules for the assessment of such effects.

2. Establishment and Review of Geothermal System Land Boundaries: Waikato Regional Council (Waikato Regional Council) will periodically review the system boundaries for Development, Limited Development, Research, and Protected Geothermal Systems, while ensuring that the precautionary approach is applied to the boundaries of the Protected Geothermal Systems. Waikato Regional Council (Waikato Regional Council) undertakes to review these boundaries on the establishment or receipt of new information, or within ten years of the plan becoming operative.

3. Supporting Investigation and Information Sharing: Waikato Regional Council (Waikato Regional Council) will continue to support and encourage collection of high-quality data, research, and monitoring into the characteristics and features of Geothermal Systems with the possible intention of changing their classification through a plan change, or introducing specific management strategies. Waikato Regional Council (Waikato Regional Council) will continue to act as a repository and disseminator of information about the Regional Geothermal Resource and matters relating to sustainable management and efficient use of geothermal resources including applicability and use of new technologies.

4. Monitoring of Permitted Activities in Geothermal Systems: Waikato Regional Council (Waikato Regional Council) will monitor the cumulative environmental effects of geothermal takes and discharges within Geothermal Systems that do not require resource consent. Where there are significant adverse effects occurring, the relevant permitted activity rules will be reviewed.

5. Peer Review Panels: In association with its geothermal management responsibilities, Waikato Regional Council (Waikato Regional Council) will establish peer review panels to assist it, particularly in relation to monitoring resource consents and Geothermal Systems that are subject to large-scale development.

Explanation and Principal Reasons for Adopting the Policies and Methods

These policies and methods build upon those for the management of the Regional Geothermal Resource in Section 3.7 of the Waikato RPS.

Policy 1 supports WRP 7.3 Objective 1 and specifically identifies Geothermal Systems that are to be managed for development purposes and others that are to be protected, according to the criteria specified in RPS 3.7.2 Policy Three. Policy 1 also sets out the management regime for each type of system in terms of whether and how significant adverse effects on the Geothermal System and its characteristics including surface features, and other natural and physical resources, are to be avoided, remedied, or mitigated.

Policy 2 supports WRP 7.3 Objective 1 by providing the opportunity for a system, other than a Protected Geothermal System, to be re-classified through a plan change upon the receipt of information that demonstrates that it is more appropriately classified for a different purpose.

Policy 3 supports WRP Objective 1 by providing for use and controlled depletion of energy in Development Geothermal Systems so that the needs of current and future generations can be met.

Policy 4 supports WRP 7.3 Objective 1 and seeks to achieve integrated system management through the preparation, approval and implementation of a System Management Plan that defines the objectives for the use and management of each Development Geothermal System.

Policy 5 supports WRP Objective 1 and ensures that, where there is more than one operator in a Development Geothermal System, all large takes and discharges are managed in an integrated manner through the use of a range of mechanisms to co-ordinate activities. Mechanisms must be in place prior to exercise of consents by a subsequent operator.

Policy 6 supports WRP 7.3 Objective 2 by requiring significant adverse effects on Significant Geothermal Features in Development Geothermal Systems to be remedied or mitigated within the Regional Geothermal Resource.

Policy 7 supports WRP 7.3 Objective 3 and requires that significant adverse effects on Significant Geothermal Features in Limited Development, Research, Protected, and Small Geothermal Systems are to be avoided. Method 1 allows for identification of Significant Geothermal Features in Limited Development Geothermal Systems in order that they may be protected from any significant adverse effects of system development. Method 2 recognises that in Research, Protected, and Small Systems, in the absence of a large-scale developer required to monitor effects of surface features, it is the role of the regional council to monitor the effects of permitted uses and to increase understanding of the Regional Geothermal Resource.

Policy 8 supports WRP Objectives 3 and 4 and provides a basis for protecting Geothermal Features in Protected Geothermal Systems that are valued for amenity, cultural and scientific reasons. The policy does not require mandatory protection but allows an assessment to be made through the resource consent process.

Policy 9 supports WRP 7.3 Objective 2 provides criteria for assessing applications for activities that will adversely affect Significant Geothermal Features, listed under Policy 6, which deals with the effect of extractive uses in Development Geothermal Systems. Other activities that may affect Significant Geothermal Features include uses of land and non-geothermal water, and extractive activities in other geothermal system types. Policy 9 also provides criteria for assessing the relative significance of Significant Geothermal Features that are to be affected. It allows analysis of Geothermal Features to ensure that the Region's most significant features are protected while allowing some flexibility in the use of less significant features.

Policy 10 supports WRP 7.3 Objective 4 by requiring that significant adverse effects on Significant Geothermal Features arising from land use and the use of non-geothermal water be avoided.

Policy 11 supports WRP 7.3 Objective 5 by recognising adverse effects on other natural and physical resources from take, use, and discharge of geothermal energy and fluid, and by adopting a precautionary approach. It provides for the burden of adverse effects on overlying structures (the built environment) and other natural and physical

resources to fall on those who cause them. The higher the impact, the heavier the burden. However, it acknowledges that the Regional Geothermal Resource is a significant geothermal energy source for electricity generation in the Waikato Region, and that the best practicable option should be applied where existing power plants need to be completed or extended, or new plants established, in order to accommodate increased demand for electricity yet prevent or minimise adverse effects to overlying structures and other natural and physical resources.

In situations of scientific uncertainty, where there is a need to prevent adverse effects of high potential impact to overlying structures and other natural and physical resources, a precautionary approach will be taken. Method 1 recognises that relevant best practice standards should also be applied for avoiding, remedying or mitigating adverse effects.

Policy 12 supports WRP 7.3 Objective 7 by ensuring discharges of geothermal energy and water onto land and into fresh water, after efficient and appropriate use, are limited so as to have no more than minor adverse effects. In some cases it is appropriate to allow the discharge of geothermal water to land or freshwater after use, including for the following reasons:

- i. There are no adverse effects to the geothermal system or the receiving environment;
- ii. The water discharged has become unsuitable for reinjection as a result of efficient use;
- iii. The water is discharged to a Geothermal Feature, mitigating significant adverse effects on natural or cultural characteristics of that feature.

Policy 13 supports WRP 7.3 Objectives 1, 5, and 7 requires a Discharge Strategy to be prepared as part of the System Management Plan for each Development Geothermal System. The final form of a Discharge Strategy, including provisions for reinjection / injection, will be determined by any consent granted and the conditions imposed.

Policy 14 supports WRP 7.3 Objective 8, which promotes information collection and monitoring. It recognises that information is required not only on the Regional Geothermal Resource, but also on the effects of its use. The concepts of independence, peer review and research are important. The release of information to the public needs to be balanced against the confidentiality of information that is commercially or culturally sensitive.

Additional Implementation Methods for Policies 1 to 14

Method 1 recognises the value of assessment criteria in providing guidance in the consideration of resource consent applications, and provides for the use of these in the Rules.

Methods 2 and 3 relate to the identification of Geothermal Systems in Policy 1, acknowledging that there is a need to continue research and information gathering to enable Geothermal Systems to be appropriately mapped and managed. Method 2 also recognises the need to apply a precautionary approach to matters relating to managing boundaries.

The Waikite-Waiotapu-Waimangu Geothermal System lies across the boundary between Waikato Region and Bay of Plenty Region. Waikato Regional Council (Waikato Regional Council) has established a co-ordinated resource management approach with Bay of Plenty Regional Council for the protection of the system.

Method 4 recognises that it is necessary to ascertain through monitoring whether resource uses allowed as permitted activities are likely to result in significant cumulative effects. Method 4 recognises that consent holders also play an important role in undertaking monitoring as a result of their resource consent conditions.

Method 5 identifies the role of peer review panels for geothermal issues and in particular large resource consents, in order to ensure that the necessary knowledge and skills are available for auditing the management of geothermal systems subject to development. The expected outcome of Method 5 is the adequate sourcing and efficient provision of the necessary skills. The provision of information to the Peer Review Panel shall not constitute a waiver of any confidentiality attaching to that information.

7.5 General Non-Regulatory Implementation Methods

7.5.1 Geothermal Characteristics Valued by Tangata Whenua

Waikato Regional Council (Waikato Regional Council) will encourage and assist tangata whenua as Kaitiaki to identify particular geothermal surface features and specific geothermal resource management matters of traditional and contemporary cultural value.

7.5.2 Environmental Education

Waikato Regional Council (Waikato Regional Council) will use environmental education programmes to increase public understanding and awareness of the regional geothermal resource and the effects of resource use activities, especially land use activities, on Significant Geothermal Features. Significant Geothermal Feature Types are listed in the Regional Policy Statement Appendix 5, and Significant Geothermal Features in Development Geothermal Systems and Limited Development Geothermal Systems are listed in Tables 7.5 and 7-6 and mapped in section 7.10 of this Module.

7.5.3 Integrated Management

Waikato Regional Council (Waikato Regional Council) will maintain a close liaison with constituent and/or neighbouring territorial and regional councils that have geothermal resources in their areas, to promote integrated management and address cross-resource and cross-boundary effects.

7.5.4 Consistency of District Plans

Waikato Regional Council (Waikato Regional Council) will take an active role in the local government partnership for managing geothermal resources by identifying any inconsistencies between regional objectives and relevant provisions in district plans and advocating for plan changes to remove these.

7.5.5 Geothermal Features in Protected Systems

Waikato Regional Council (Waikato Regional Council) will advocate or assist with the protection or remediation of Geothermal Features in Protected Geothermal Systems where appropriate

7.5.6 Guidelines for Applicants

In addition to the Information Requirements contained in Module 8 (8.1.6) of this Plan, the Waikato Regional Council (Waikato Regional Council) will develop a guideline for the drafting of System Management Plans and the preparation of applications for large takes and discharges of geothermal energy and water.

Explanation and Principal Reasons for Adopting Non-Regulatory Methods 7.5.1 to 7.5.6

The methods in this Plan must be read in conjunction with the methods in the Waikato RPS.

These methods are intended to be self-explanatory. **Method 7.5.1** recognises that, before the relationship of tangata whenua who are Kaitiaki with geothermal resources can be recognised and provided for, there must be a positive, specific identification by

them of sites and resource management matters of significance to them. The process for this identification of sites and resource management matters is set out in Module 2 of this Plan. **Method 7.5.2** identifies the role of environmental education in raising awareness of general activities relating to the regional geothermal resource (including tourism and other positive benefits) as well as activities that may destroy or damage Significant Geothermal Features.

Methods 7.5.3 and **7.5.4** address integrated management between district and regional councils and between adjoining regional councils. Some geothermal systems extend into adjoining regions, and land use activities, which may adversely affect Significant Geothermal Features, are primarily managed by territorial authorities through district plans. Therefore it is necessary to ensure that these geothermal systems and their features are consistently managed by the councils concerned.

Method 7.5.5 recognises the policy guidance in the Regional Policy Statement Geothermal Section 3.7.3 which encourages the protection of Geothermal Features in Protected Geothermal Systems.

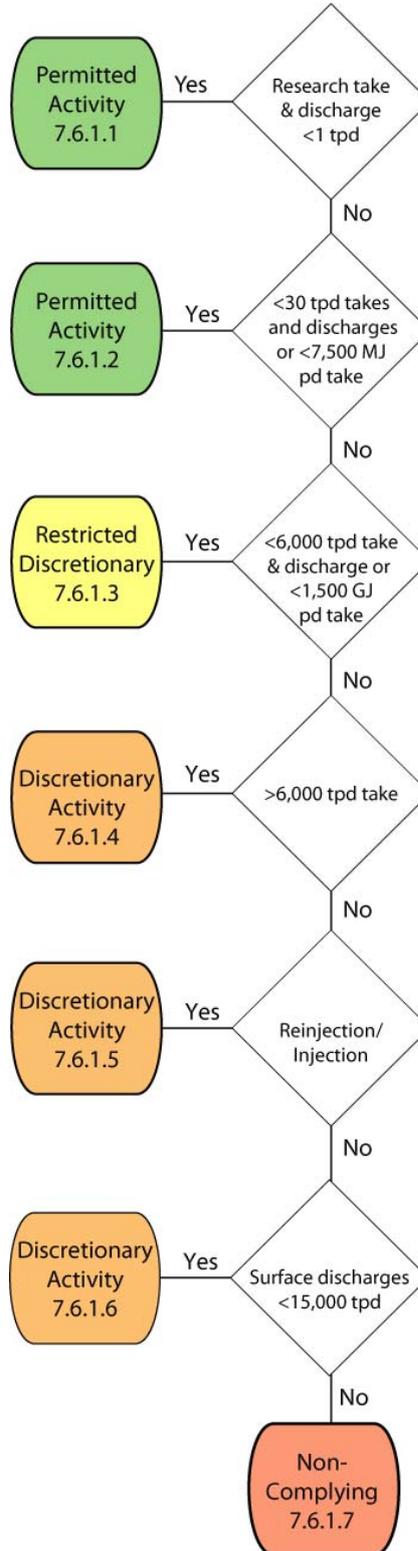
Method 7.5.6 is intended to provide a “checklist” of matters to be addressed in a draft System Management Plan (including amendment to an approved System Management Plan), which is to be submitted with any resource consent application for large takes and/or discharges of geothermal energy and water in Development Geothermal Systems. This method will also guide the information to be submitted with any resource consent application for large takes and/or discharges of geothermal energy and water in Limited Development and Research Geothermal Systems.

7.6 Regional Rules

7.6.1 Takes and Discharges in Development Systems

Summary of Rules For Takes And Discharges In Development Geothermal Systems:

Horohoro, Mangakino, Mokai, Ngatamariki, Ohaaki, Rotokawa, Wairakei-Tauhara



7.6.1.1 Permitted Activity Rule – Small Takes and Associated Discharges of Geothermal Water and Energy from Development Geothermal Systems for Scientific Investigation or Enhancement Purposes

Any:

1. Take or use of geothermal energy or water within a Development Geothermal System or from geothermal water that has been shown to be strongly hydrologically connected to a Development Geothermal System, or
2. Discharge of geothermal water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Development Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **permitted activity** subject to the following condition:

- a) The maximum rate at which water can be taken or discharged shall not exceed 1 tonne per day.

7.6.1.2 Permitted Activity Rule – Small Takes and Associated Discharges of Geothermal Water and Energy from Development Geothermal Systems

Any:

1. Take or use of geothermal energy or water within a Development Geothermal System or from geothermal water that has been shown to be strongly hydrologically connected to a Development Geothermal System, or
2. Discharge of geothermal water and associated contaminants into geothermal water, or onto or into land, arising from the taking of geothermal energy or water from within a Development Geothermal System;

is a **permitted activity** subject to the following conditions:

- a) The maximum rate at which surface water can be taken shall not exceed 15 tonnes per day.
- b) The maximum rate at which heat from surface water can be taken without taking water shall not exceed 3,750 megajoules per day.
- c) The maximum rate at which ground water can be taken shall not exceed 30 tonnes per day.
- d) The maximum rate at which heat from ground water can be taken without taking water shall not exceed 7,500 megajoules per day.
- e) Any take established after 23 August 2003 shall not be located within 100 metres of a Significant Geothermal Feature except for those features that are Recent Sinter or Hydrothermal Eruption Craters containing no geothermal pools or discharging geothermal features in which case the take shall not be located within 20 metres of the feature.
- f) Any discharge established after 23 August 2003 shall not be located within 20 metres of a Significant Geothermal Feature.
- g) Any well constructed after 23 August 2003 for the purposes of taking geothermal ground water shall be at least 20 metres from any other well that exists at the time of construction.
- h) The maximum rate at which water and contaminants can be discharged shall not exceed 45 tonnes per day.
- i) The method of discharge shall be by soakage or reinjection.
- j) There shall be no discharge into any fresh surface water body.
- k) There shall be no discharge of geothermal water into any fresh groundwater body.
- l) Waikato Regional Council (Waikato Regional Council) shall be notified in writing of the activity within one month of the start of the activity or within three months of this rule becoming operative.

7.6.1.3 Restricted Discretionary Activity Rule – Medium-sized Takes and Associated Discharges of Geothermal Water and Energy from Development Geothermal Systems

Except as permitted or regulated by Rules 7.6.1.1, 7.6.1.2, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take or use of geothermal water or energy from a Development Geothermal System or from geothermal water that has been shown to be strongly hydrologically connected to a Development Geothermal System, or
2. Discharge of geothermal water and associated contaminants into geothermal water, or onto or into land, arising from the taking of any geothermal water from within a Development Geothermal System;

is a **restricted discretionary activity** (requiring resource consent) subject to the following standards and terms:

- a) The maximum rate at which surface water can be taken or discharged shall not exceed 3,000 tonnes per day.
- b) The maximum rate at which ground water can be taken or discharged shall not exceed 6,000 tonnes per day.
- c) The maximum rate at which heat can be taken from surface water without taking water shall not exceed 750 gigajoules per day.
- d) The maximum rate at which heat can be taken from ground water without taking water shall not exceed 1,500 gigajoules per day.
- e) Any take established after 23 August 2003 shall not be located within 100 metres of a Significant Geothermal Feature except for those features that are Recent Sinter or Hydrothermal Eruption Craters containing no geothermal pools or discharging geothermal features in which case the take shall not be located within 20 metres of the feature.
- f) Any discharge established after 23 August 2003 shall not be located within 20 metres of a Significant Geothermal Feature.
- g) Any well constructed after 23 August 2003 for the purposes of taking geothermal ground water shall be at least 20 metres from any other well that existed at the time of construction.
- h) There shall be no discharge of geothermal water into any fresh water body.

Waikato Regional Council (Waikato Regional Council) restricts its discretion to the following matters:

- i. Effects on ground water resources
- ii. Effects on the geothermal system, including the location, depth, and volume, rate and temperature of takes and discharges
- iii. Effects on geothermal surface features
- iv. Effects of subsidence
- v. The risk of hydrothermal eruptions.

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.2.1 and 8.1.2.2 of this Plan.

7.6.1.4 Discretionary Activity Rule – Large and Other Takes of Geothermal Ground Water and Energy from Development Geothermal Systems

Except as permitted or regulated by Rules 7.6.1.1, 7.6.1.2, 7.6.1.3, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any take or use of geothermal ground water and energy, within a Development Geothermal System or from geothermal water that has been shown to be strongly hydrologically connected to a Development Geothermal System is a **discretionary activity** (requiring resource consent), subject to the following standard:

- a) For takes exceeding 6,000 tonnes per day, a draft System Management Plan being prepared and provided to Waikato Regional Council (Waikato Regional Council) as part of the documentation supporting a Resource Consent application in accordance with the Policies and other Methods of this Geothermal Module.

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which the draft System Management Plan addresses the Policies and other Methods of this Geothermal Module;
- ii. The extent to which the System Management Plan and Mechanisms (Multiple Operator Agreements such as Steamfield Management Agreements and Field Operation Protocols) will promote coordination and cooperation between consent holders and achieve integrated system management;
- iii. The extent to which significant adverse effects on Significant Geothermal Features will be, remedied or mitigated and how this will be achieved;
- iv. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- v. The extent to which legal access to land is available to optimise resource use and sustainable management of the system;
- vi. The extent to which there is appropriate provision of:
 - reservoir modelling and subsidence modelling
 - data to support the initial extraction rate and production levels
- vii. The adequacy of the monitoring programme;
- viii. The adequacy of the means by which connection to the system's hydrological boundary has been determined;
- ix. The extent to which the proposed development affects the capacity of the system as a whole and its ability to provide for the reasonably foreseeable needs of present and future generations;
- x. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- xi. The extent to which system development maximises the potential of the resource, and does not exclude more efficient uses;
- xii. The extent to which distribution of geothermal water or energy to subsequent uses and users is accommodated where appropriate and provision is made within the System Management Plan for potential future uses, especially those that have high efficiency and provide a community benefit;
- xiii. The adequacy of measures to avoid, remedy or mitigate adverse effects on natural and physical resources including overlying structures (the built environment) Including the extent to which the following factors have been taken into account:
 - the severity of impact of the potential adverse effects on overlying structures (the built environment) and other natural and physical resources.
 - relevant national and international best practice;
 - the known body of information and experience of the particular Geothermal System, including data, information, research, monitoring and survey results and experience;
 - the use of bonds;
 - the practicality and costs of alternative locations or methodologies and the benefits that each option provides
 - the use of a precautionary approach.

Advisory Notes:

- The assessment criteria listed above are to be read in conjunction with the information requirements to enable the assessment of any application under this rule set out in Section 8.1.6.1 of this Plan.
- Waikato Regional Council (Waikato Regional Council) may amend the System Management Plan on the recommendation of the System Peer Review Panel.

- Discharge of geothermal ground water and associated contaminants taken under this rule is covered under Rules 7.6.1.5, 7.6.1.6 and 7.6.1.7.

7.6.1.5 Discretionary Activity Rule – Reinjection / Injection from Development Geothermal Systems

Except as permitted or regulated by Rules 7.6.1.1, 7.6.1.2, 7.6.1.3, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. discharge of geothermal water and associated contaminants, into land, or geothermal ground water by reinjection / injection, or
2. discharge of water including contaminants, into geothermal ground water by injection:

is a **discretionary activity** (requiring resource consent) subject to the following standard:

- a. For discharges exceeding 6,000 tonnes per day, a draft Discharge Strategy, forming part of a draft System Management Plan, being prepared and provided to Waikato Regional Council (Waikato Regional Council) as part of the documentation supporting a Resource Consent application in accordance with the Policies and other Methods of this Geothermal Module.

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. For discharges exceeding 6,000 tonnes per day, the adequacy of the Discharge Strategy to address matters detailed in Section 3.7.2.1 Policy Three of the Regional Policy Statement;
- ii. For discharges of less than 6,000 tonnes per day, measures to avoid, remedy or mitigate adverse effects arising from a failure to comply with the standards, terms and conditions in Rule 7.6.1.1 to 7.6.1.3.

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.6.1 of this Plan.

7.6.1.6 Discretionary Activity Rule – Surface Discharges from Development Geothermal Systems

Except as permitted or regulated by Rules 7.6.1.1, 7.6.1.2, 7.6.1.3, 3.3.4.11 and Rules within sections 3.5.8 and 3.8, any discharge of geothermal water, not exceeding 15,000 tonnes per day and not exceeding 2.5 million tonnes per annum, and associated contaminants, onto land or surface waters is a **discretionary activity** (requiring a resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- ii. The effect on the sustainability of the geothermal system from loss of the energy and fluid contained in the discharge;
- iii. The extent to which the discharge reflects natural discharge prior to development;
- iv. The extent to which the discharge mitigates pre-existing adverse effects on a natural geothermal feature;
- v. The extent to which remediation of significant adverse effects is achievable;

- vi. The extent to which provision has been made for downstream users of the discharge;
- vii. The expected duration of the activity;
- viii. Whether the discharge is the best practicable option;
- ix. The extent to which the discharge strategy addresses any relevant provisions, including objectives and policies in Chapters 3.4 and 3.7 of the Regional Policy Statement, the Water Module and the Geothermal Module of the Waikato Regional Plan.

7.6.1.7 Non-Complying Activity Rule – Other Takes and Discharges of Geothermal Water from Development Geothermal Systems.

Except as permitted or regulated by Rules 7.6.1.1 to 7.6.1.6, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any take or discharge of geothermal water and associated contaminants from a Development Geothermal System or from geothermal water that has been shown to be strongly hydrologically connected to a Development Geothermal System, is a **non-complying activity** (requiring resource consent).

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.6.1 of this Plan.

Explanation and Principal Reasons for Adopting Rules 7.6.1.1 to 7.6.1.7

The regulatory regime for Development Systems recognises the provisions of RPS Section 3.7, which allows for sustainable development in these systems, while avoiding, remedying, or mitigating adverse effects on the geothermal system, the regional geothermal resource, overlying structures (the built environment), and other natural and physical resources. Both existing and new small-scale activities are permitted under **Rule 7.6.1.1** and **7.6.1.2**, subject to limits on the scale of development. **Rule 7.6.1.2** allows takes of up to 15 tonnes per day of surface water and 30 tonnes per day of ground water from Development Systems, together with associated discharges. Activities of this scale generally have much smaller adverse effects than very large-scale development of most of these systems for electricity generation purposes.

As well as restricting the scale of existing uses, **Rule 7.6.1.2** requires in condition i) that discharges are by soakage or reinjection. In condition h), this rule allows for a daily discharge greater than the take to enable some flexibility of stored fluid. Condition j) ensures that natural surface water is not contaminated by the discharge and that discharge does not occur to geothermal surface features. Condition k) ensures protection of fresh ground water.

The restricted discretionary activity classification for **Rule 7.6.1.3** enables a case by case assessment of whether the requirements of the RMA and the provisions of RPS Section 3.7.2.1 are met by proposed activities of a larger scale, such as direct heat applications including swimming pools, glass-houses, timber drying, and remedying or mitigating adverse effects on Significant Geothermal Features.

Rules 7.6.1.1, 7.6.1.2 and **7.6.1.3** address both the take and discharge of geothermal water so that in most cases users do not have to apply for separate consents for take and discharge of the same geothermal water. Also in these rules, the use of down-hole heat exchangers is promoted because it results in no loss of geothermal water, and less loss of heat, than the taking of geothermal water and subsequent discharge into the environment.

Discretionary Activity **Rule 7.6.1.4** for large takes enables appropriate assessment of adverse effects and imposition of conditions.

In contrast to **Rules 7.6.1.1, 7.6.1.2 and 7.6.1.3, Rule 7.6.1.4** is for takes only, while **Rules 7.6.1.5 and 7.6.1.6** are for discharge only. This enables a hierarchy of rules for takes and discharges.

Rules 7.6.1.4 and 7.6.1.5 allow for ground water takes and discharges by reinjection / injection to be carried out in areas hydrologically connected to the Geothermal System, including outside the defined boundaries of the system as mapped in Section 7.9.1 of this Plan.

Discretionary Activity **Rule 7.6.1.6** allows for surface discharges of up to 15,000 tonnes per day and not exceeding 2.5 million tonnes per annum. This rule provides for a range of activities that may:

- render the geothermal water unsuitable for reinjection / injection; or
- be for short term operational activities such as well drilling and testing; or
- include remediation or mitigation of adverse effects on Significant Geothermal Features; or
- have no significant adverse effects on the receiving environment.

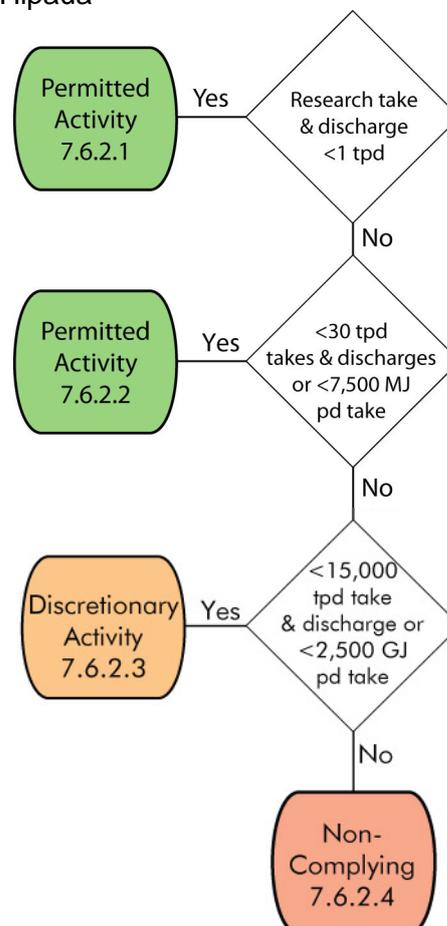
Any other take or discharge is non-complying under **Rule 7.6.1.7**.

7.6.2 Takes and Discharges in Limited Development Systems

All the rules in this section shall apply to a Limited Development Geothermal System as mapped in section 7.9 of this plan and to geothermal water that has been shown to be strongly hydrologically connected to that mapped Limited Development Geothermal System.

Summary of Rules for Takes and Discharges in Limited Development Systems:

- Atiamuri, Tokaanu-Waihi-Hipaua



7.6.2.1 Permitted Activity Rule – Small Takes and Associated Discharges of Geothermal Water and Energy in Limited Development Geothermal Systems for Scientific Investigation or Enhancement Purposes

Any:

1. Take or use of geothermal energy or water within a Limited Development Geothermal System, or
2. Discharge of water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Limited Development Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **permitted activity** subject to the following condition:

- a) The maximum rate at which water can be taken or discharged shall not exceed 1 tonne per day.

7.6.2.2 Permitted Activity Rule – Small Takes of Geothermal Water and Energy and Associated Discharges in Limited Development Geothermal Systems

Any:

1. Take or use of geothermal energy or water within a Limited Development Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal energy or water from within a Limited Development Geothermal System;

is a **permitted activity** subject to the following conditions:

- a) The maximum rate at which surface water can be taken shall not exceed 15 tonnes per day.
- b) The maximum rate at which heat from surface water can be taken without taking water shall not exceed 3,750 megajoules per day.
- c) The maximum rate at which ground water can be taken shall not exceed 30 tonnes per day.
- d) The maximum rate at which heat from ground water can be taken without taking water shall not exceed 7,500 megajoules per day.
- e) Any take established after 23 August 2003 shall not be located within 100 metres of a Significant Geothermal Feature.
- f) Any discharge established after 23 August 2003 shall not be located within 20 metres of a Significant Geothermal Feature.
- g) Any well constructed after 23 August 2003 for the purposes of taking geothermal ground water shall be at least 20 metres from any other well that existed at the time of construction.
- h) The maximum rate at which water and contaminants can be discharged shall not exceed 45 tonnes per day.
- i) The method of discharge shall be by soakage or reinjection.
- j) There shall be no discharge into any natural surface water body.
- k) There shall be no discharge of geothermal water into any natural fresh water body.

7.6.2.3 Discretionary Activity Rule – Larger Takes of Geothermal Water and Energy and Associated Discharges in Limited Development Geothermal Systems

Except as permitted or regulated by Rules 7.6.2.1, 7.6.2.2, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take or use of geothermal water or energy from a Limited Development Geothermal System, or

2. Discharge of geothermal water and associated contaminants within a Limited Development Geothermal System:

is a **discretionary activity** (requiring resource consent) subject to the following standards and terms:

- a) The maximum rate at which surface water can be taken or discharged shall not exceed 3,000 tonnes per day.
- b) The maximum rate at which ground water can be taken or discharged shall not exceed 15,000 tonnes per day.
- c) The maximum rate at which heat can be taken from surface water without taking water shall not exceed 750 gigajoules per day.
- d) The maximum rate at which heat can be taken from ground water without taking water shall not exceed 2,500 gigajoules per day.
- e) The application shall include a proposed comprehensive programme monitoring the effects of the proposed operation on the hydrodynamics of the geothermal system and in particular on the characteristics of Significant Geothermal Features.

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- ii. The extent to which significant adverse effects on Significant Geothermal Features are avoided, remedied or mitigated;
- iii. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- iv. The extent to which the applicant's proposed monitoring programme is adequate in ensuring that effects of the operation on the hydrodynamics of the geothermal system, particularly the characteristics of Significant Geothermal Features, are detected.
- v. The extent to which the use of geothermal energy and water is efficient;
- vi. The extent to which distribution of geothermal water or energy to secondary uses and users is accommodated where appropriate and provision is made for potential future uses, especially those that have high productive efficiency and provide a community benefit;
- vii. The extent to which the following factors are taken into account:
 - the severity of impact of the adverse effects on overlying structures (the built environment) and other natural and physical resources.
 - relevant international best practice
 - the use of bonds
 - the practicality and costs of alternative locations or methodologies and the benefits that each option provides
 - the use of a precautionary approach.
- viii. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- ix. The effect on the sustainability of the Geothermal System from loss of the energy and fluid contained in the discharge;
- x. The extent to which remediation of significant adverse effects is achievable;
- xi. The extent to which provision has been made for downstream users of the discharge;
- xii. The expected duration of the activity;
- xiii. Whether the discharge is the best practicable option.

7.6.2.4 Non-Complying Activity Rule – Other Takes and Discharges of Geothermal Water in Limited Development Geothermal Systems.

Except as permitted or regulated by Rules 7.6.2.1, 7.6.2.2, 7.6.2.3, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any take or discharge of geothermal water and associated contaminants in a Limited Development Geothermal system, is a **non-complying activity** (requiring resource consent).

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.2.1 and 8.1.2.2 of this Plan.

Explanation and Principal Reasons for Adopting Rules 7.6.2.1 to 7.6.2.4

Rules 7.6.2.1 to 7.6.2.4 establish the regulatory regime for takes and associated discharges from Limited Development Geothermal Systems. These rules stem from the Policies in Section 3.7 of the RPS and Section 7.4 of this Plan.

Each rule addresses both the take and discharge of geothermal energy and water so that in most cases users do not have to apply for separate consents for take and discharge of the same water.

Both existing and new small-scale activities are permitted under **Rules 7.6.2.1 and 7.6.2.2**, subject to limits on the allowable scale of activity. **Rule 7.6.2.2** allows takes of up to 15 tonnes per day of surface water and 30 tonnes per day of ground water from Limited Development Systems, together with associated discharges. Activities of this scale generally have much smaller adverse effects than larger developments.

As well as restricting the scale of existing uses, **Rule 7.6.2.2** requires in condition i) that discharges are by soakage or reinjection. Condition j) ensures that natural surface water is not contaminated by the discharge and that discharge does not occur to geothermal surface features. Condition k) ensures protection of fresh ground water. These conditions are considered necessary to ensure that the viability of Limited Development Systems and their associated significant surface features are sustained (as required by RPS Section 3.7.2.2). In condition h), this rule allows for a daily discharge greater than the take to enable some flexibility of stored fluid.

Existing and new uses that cannot comply with **Rules 7.6.2.1 and 7.6.2.2** are regulated as discretionary activities under **Rule 7.6.2.3**, on the basis that a case by case assessment is required of whether these activities should be allowed to continue.

Through **Rules 7.6.2.2 and 7.6.2.3** the use of down-hole heat exchangers is promoted because it results in no loss of water, and less loss of heat, than the taking of water and subsequent discharge into the environment.

Rule 7.6.2.3 allows for ground water takes and discharges by reinjection / injection to be carried out in areas hydrologically connected to the geothermal system, including outside the defined boundaries of the system as mapped in Section 7.9.2 of this Plan.

The thresholds set as standards and terms are based upon the limited existing knowledge of the two Limited Development Systems. Where an applicant can demonstrate on the basis of further research that some higher level of abstraction can occur without conflicting with the objective and policies applicable to Limited Development Systems, such proposals may be considered favourably as a non-complying activity in accordance with the Resource Management Act.

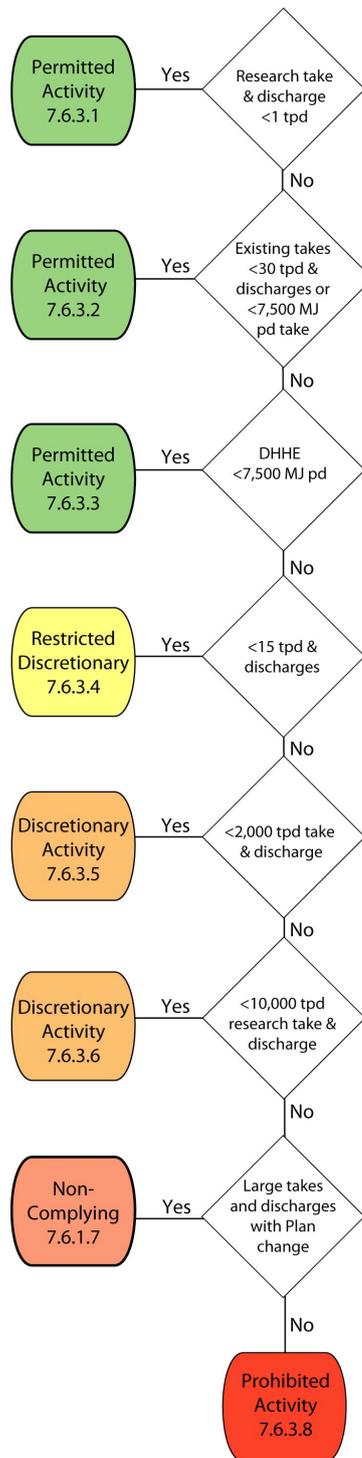
Any other take or discharge is non-complying under **Rule 7.6.2.4**.

7.6.3 Takes and Discharges in Research Systems

All the rules in this section shall apply to a Research Geothermal System as mapped in section 7.9 of this plan and to geothermal water that has been shown to be strongly hydrologically connected to a mapped Research Geothermal System.

Summary of Rules For Takes and Discharges In Research Systems

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7.6.3.1 Permitted Activity Rule – Small Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems for Scientific Investigation or Enhancement Purposes

Any:

1. Take or use of geothermal energy or water within a Research Geothermal System, or
2. Discharge of water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **permitted activity** subject to the following condition:

- a) The maximum rate at which water can be taken or discharged shall not exceed 1 tonne per day.

7.6.3.2 Permitted Activity Rule – Existing Small Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems

Any:

1. Take or use of geothermal energy or water within a Research Geothermal System; or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

that was lawfully established or authorised prior to 23 August 2003 is a **permitted activity** subject to the following conditions:

- a) Except as limited by other conditions of this rule, the amount, rate and location of the activity shall not change from that which was lawfully established or authorised.
- b) The maximum rate at which surface water can be taken shall not exceed 15 tonnes per day.
- c) The maximum rate at which ground water can be taken shall not exceed 30 tonnes per day.
- d) The maximum rate at which heat from ground water can be taken without taking water shall not exceed 7,500 megajoules per day.
- e) The maximum rate at which water and contaminants can be discharged shall not exceed 30 tonnes per day.
- f) The method of any discharge shall be soakage or reinjection.
- g) There shall be no discharge into any natural surface water body.
- h) There shall be no discharge of geothermal water into any natural fresh water body.

7.6.3.3 Permitted Activity Rule – Use of Down-Hole Heat Exchangers in Research Geothermal Systems

Any take of heat from geothermal ground water without taking water within a Research Geothermal System is a **permitted activity** subject to the following conditions:

- a) The maximum rate at which heat can be taken shall not exceed 7,500 megajoules per day.
- b) Any take that is established after 23 August 2003 shall be located no less than 100 metres from a Significant Geothermal Feature.
- c) Waikato Regional Council (Waikato Regional Council) shall be notified in writing of the activity within one month of the start of the activity.

Advisory Note:

- This rule includes increases in existing takes of energy from Research Geothermal Systems provided they comply with the conditions specified in the rule.

7.6.3.4 Restricted Discretionary Activity Rule – Small Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal

Except as permitted or regulated by Rules 7.6.3.1 to 7.6.3.3, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take or use of geothermal energy or water within a Research Geothermal System; or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

is a **restricted discretionary activity** (requiring resource consent) subject to the following standards and terms:

- a) The maximum rate at which water can be taken shall not exceed 15 tonnes per day.
- b) The maximum rate at which water and contaminants can be discharged shall not exceed 30 tonnes per day.

Waikato Regional Council (Waikato Regional Council) restricts its discretion to the following matters:

- i. Effects on ground water resources
- ii. Effects on the geothermal system, including the location, depth, and volume, rate and temperature of takes and discharges
- iii. Effects on geothermal surface features, including cumulative effects.

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.2.1 and 8.1.2.2 of this Plan.

7.6.3.5 Discretionary Activity Rule – Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems

Except as permitted or regulated by Rules 7.6.3.1 to 7.6.3.4, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of up to 2,000 tonnes per day of geothermal energy or water from within a Research Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

is a **discretionary activity** (requiring resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which adverse effects on Significant Geothermal Features will be avoided or remedied;
- ii. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;

- iii. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- iv. The provision of productive efficiency analyses for the proposed uses of the geothermal fluid and energy and the extent to which optimum productive efficiency can be achieved;
- v. The extent to which distribution of geothermal fluid or energy to secondary uses and users is accommodated where appropriate and provision is made for potential future uses, especially those that have high productive efficiency and provide a community benefit;
- vi. The extent to which associated infrastructure such as structures, pipelines and wells will be designed, constructed and placed to avoid, remedy or mitigate adverse effects on biodiversity, landscape and amenity values;
- vii. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account;
- viii. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- ix. The extent to which remediation of significant adverse effects is achievable;
- x. Whether the discharge is the best practicable option.

7.6.3.6 Discretionary Activity Rule – Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems for Scientific Investigation or Enhancement Purposes

Except as permitted or regulated by Rules 7.6.3.1 to 7.6.3.5, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

- 1. Take of geothermal energy or water from a Research Geothermal System of up to 10,000 tonnes per day or
- 2. Discharge of water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **discretionary activity** (requiring resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which adverse effects on Significant Geothermal Features will be avoided or remedied;
- ii. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- iii. Provision for the identification of the system's hydrological boundary to be researched and reviewed;
- iv. Provision for research into the system's possible hydrological connection with another large system;
- v. Provision for research into the characteristics of the geothermal system, including surface features;
- vi. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- vii. The extent to which the precautionary approach in situations of scientific uncertainty is taken into account;
- viii. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account.

- ix. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- x. The effect on the sustainability of the geothermal system from loss of the energy and fluid contained in the discharge;
- xi. The extent to which remediation of significant adverse effects is achievable;
- xii. The extent to which the duration of the activity is limited to that necessary for scientific or enhancement purposes;
- xiii. Whether the discharge is the best practicable option.

7.6.3.7 **Non-Complying Rule – Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems**

Except as permitted or regulated by rules 7.6.3.1 to 7.6.3.6, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of geothermal energy or water from a Research Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

Is a **non-complying activity**, only if it is accompanied by a request for a Plan Change to change the classification of that System together with the information required by this Plan for such a change.

Any resource consent granted pursuant to this rule shall not commence unless and until such time as the accompanying Plan Change reclassifying the System becomes operative.

7.6.3.8 **Prohibited Activity Rule –Takes of Geothermal Water and Energy and Associated Discharges in Research Geothermal Systems**

Except as permitted or regulated by rules 7.6.3.1 to 7.6.3.7, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of geothermal energy or water from a Research Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Research Geothermal System;

is a **prohibited activity** for which no resource consent shall be granted.

Explanation and Principal Reasons for Adopting Rules 7.6.3.1 to 7.6.3.8

Rules 7.6.3.1 to 7.6.3.8 establish the regulatory regime for takes and associated discharges from Research Geothermal Systems. These rules stem from the Policies in Section 3.7 of the RPS and Section 7.4 of this Plan.

Each rule, except for **Rule 7.6.3.3**, addresses both the take and discharge of geothermal water and energy so that in most cases users do not have to apply for separate consents for take and discharge of the same water. **Rule 7.6.3.3** addresses the use of down-hole heat exchangers, from which no discharge is necessary. The use of down-hole heat exchangers is promoted because it results in no loss of geothermal water, and less loss of heat, than the taking of fluid and subsequent discharge into the environment.

Small existing uses of Research Systems are permitted under **Rule 7.6.3.2** subject to conditions, on the basis that the level of effects is minor. This rule allows existing takes of up to 15 tonnes per day of surface water and 30 tonnes per day of ground water from Research Systems, together with associated discharges. As well as restricting the scale of existing uses, **Rule 7.6.3.2** requires in condition f) that discharges are by soakage or reinjection. Condition g) ensures that natural surface water is not contaminated by the discharge and that discharge does not occur to geothermal surface features. Condition h) ensures protection of fresh ground water. These conditions are considered necessary to ensure that the viability of Research Systems and their associated significant surface features are sustained (as required by Regional Policy Statement, Section 3.7.2.3). In condition e), for surface takes this rule allows for a daily discharge greater than the take to enable some flexibility of stored fluid.

Existing small uses that cannot comply with **Rules 7.6.3.2** or **7.6.3.3** are regulated as discretionary activities under **Rule 7.6.3.4**, on the basis that a case by case assessment is required of whether these activities should be allowed to continue. This rule also covers new small extractive uses. Larger takes, of a scale not likely to have significant adverse effects on the system or any other, given suitable conditions, are a discretionary activity under **Rule 7.6.3.5**.

Takes and discharges undertaken for scientific investigation or enhancement purposes, are allowed for in **Rules 7.6.3.1** and **7.6.3.6**, as such activities may well be of benefit to the sustainable management of Research Systems. Very small takes are permitted under **Rule 7.6.3.1**, and larger activities are discretionary under **Rule 7.6.3.6**, recognising that they should not proceed unless the effects are minor. The discharge of tracers for scientific investigation is covered under **Rule 3.5.9.1**.

In this context, acceptable research includes investigations to:

- determine whether or not the system is connected to another
- delineate the resistivity, hydrological and other boundaries of the system
- determine other characteristics of the system such as heat and mass outflow, and gas and water chemistry
- identify, map, or describe geothermal features and their characteristics within the system

It excludes any investigations that would be likely to have significant adverse effects on the characteristics of the system, Significant Geothermal Features and flowing geothermal features, and other natural and physical resources. Any takes of geothermal fluid for research purposes are expected to be of limited duration, for example, days or weeks rather than years.

The purpose of **Rule 7.6.3.7** is to enable the promoter of a plan change to seek resource consents to take, use and discharge geothermal energy and water contemporaneously with the plan change request. Any resource consent granted under this rule will be subject to conditions ensuring that the consent cannot be exercised unless and until the relevant plan change is operative, having regard to the provisions applicable to the proposed system classification.

Any other take or discharge is prohibited under **Rule 7.6.3.8**. This recognises the lack of knowledge about these systems about the likelihood of large extractive uses causing significant adverse effects to the characteristics of the system or another system. The rule implements the precautionary approach required by RPS 3.7.2 Policy Four.

Those seeking to establish a large take on a Research Geothermal System first need to apply for a plan change to re-identify the System as a Development or Limited Development Geothermal System. The information required for a plan change is described in Clause 22 of RMA First Schedule, and in this case would include, but not be limited to, compelling evidence that the system is not linked to a Protected

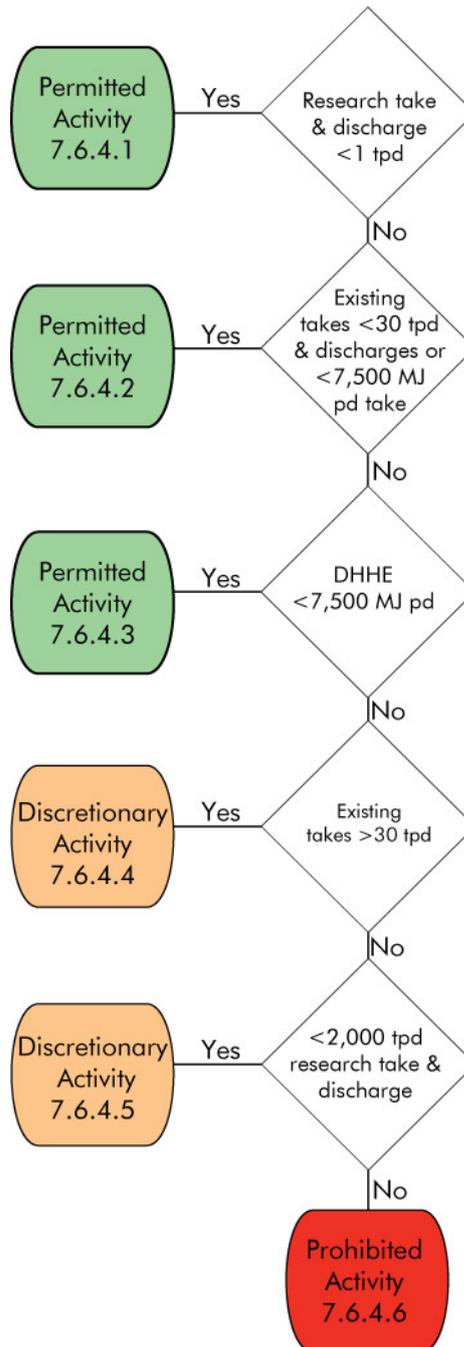
Geothermal System, and that the system does not otherwise meet the criteria for a Protected Geothermal System.

7.6.4 Takes and Discharges in Protected Systems

All the rules in this section shall apply to a Protected Geothermal System as mapped in section 7.9 of this plan and to geothermal water that has been shown to be strongly hydrologically connected to a mapped Protected Geothermal System.

Summary of Rules for takes and discharges in Protected Systems

Horomatangi, Orakeikorako, Te Kopia, Tongariro and Waikite-Waiotapu-Waimangu



7.6.4.1 Permitted Activity Rule – Small Takes of Geothermal Water and Energy and Associated Discharges in Protected Geothermal Systems for Scientific Investigation or Enhancement Purposes

Any:

1. Take or use of geothermal energy or water within a Protected Geothermal System, or
2. Discharge of water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Protected Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **permitted activity** subject to the following condition:

- a. The maximum rate at which water can be taken or discharged shall not exceed 1 tonne per day.

7.6.4.2 Permitted Activity Rule – Existing Small Takes of Geothermal Water and Energy and Associated Discharges in Protected Geothermal Systems

Any:

1. Take or use of geothermal energy or water within a Protected Geothermal System; or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Protected Geothermal System;

that was lawfully established or authorised prior to 23 August 2003 is a **permitted activity** subject to the following conditions:

- a) Except as limited by other conditions of this rule, the amount, rate and location of the activity shall not change from that which was lawfully established or authorised.
- b) The maximum rate at which surface water can be taken shall not exceed 15 tonnes per day.
- c) The maximum rate at which ground water can be taken shall not exceed 30 tonnes per day.
- d) The maximum rate at which heat from ground water can be taken without taking water shall not exceed 7,500 megajoules per day.
- e) The maximum rate at which water and contaminants can be discharged shall not exceed 30 tonnes per day.
- f) The method of any discharge shall be soakage or reinjection.
- g) There shall be no discharge into any natural surface water body.
- h) There shall be no discharge of geothermal water into any natural fresh water body.

7.6.4.3 Permitted Activity Rule – Use of Down-Hole Heat Exchangers in Protected Geothermal Systems

Any take of heat from geothermal ground water without taking water within a Protected Geothermal System is a **permitted activity** subject to the following conditions:

- a) The maximum rate at which heat can be taken shall not exceed 7,500 megajoules per day.
- b) Any take that is established after 23 August 2003 shall be located no less than 100 metres from a Significant Geothermal Feature.
- c) Waikato Regional Council (Waikato Regional Council) shall be notified in writing of the activity within one month of the start of the activity.

Advisory Notes:

- This rule includes increases in existing takes of energy from Protected Geothermal Systems provided they comply with the conditions specified in the rule.
- Refer to Drilling rules in section 3.8 of this plan

7.6.4.4 Discretionary Activity Rule – Existing Large Takes of Geothermal Water and Energy and Associated Discharges in Protected Geothermal Systems

Except as permitted or regulated by Rules 7.6.4.1 to 7.6.4.3, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take or use of geothermal energy or water from within a Protected Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Protected Geothermal System;

that was lawfully established or authorised prior to 23 August 2003 is a **discretionary activity** (requiring resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which adverse effects on Significant Geothermal Features will be avoided or remedied;
- ii. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- iii. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- iv. The provision of productive efficiency analyses for the proposed uses of the geothermal fluid and energy and the extent to which optimum productive efficiency can be achieved;
- v. The extent to which distribution of geothermal fluid or energy to secondary uses and users is accommodated where appropriate and provision is made for potential future uses, especially those that have high productive efficiency and provide a community benefit;
- vi. The extent to which associated infrastructure such as structures, pipelines and wells will be designed, constructed and placed to avoid, remedy or mitigate adverse effects on biodiversity, landscape and amenity values;
- vii. The extent to which the following factors are taken into account:
 - current international best practice
 - the practicality and costs of alternative locations or methodologies and the benefits that each option provides
 - the use of a precautionary approach in situations of scientific uncertainty;
- viii. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account.
- ix. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- x. The extent to which remediation of significant adverse effects is achievable;
- xi. Whether the discharge is the best practicable option.

7.6.4.5 Discretionary Activity Rule – Takes of Geothermal Water and Energy and Associated Discharges in Protected Geothermal Systems for Scientific Investigation or Enhancement Purposes

Except as permitted or regulated by Rules 7.6.4.1 to 7.6.4.4, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of up to 2,000 tonnes per day of geothermal energy or water from a Protected Geothermal System, or
2. Discharge of water and associated naturally occurring contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Protected Geothermal System;

that is undertaken for the purpose of scientific investigation or enhancement of the geothermal system or associated surface features is a **discretionary activity** (requiring resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which adverse effects on Significant Geothermal Features will be avoided or remedied;
- ii. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- iii. Provision for the identification of the system's hydrological boundary to be researched and reviewed;
- iv. Provision for research into the system's possible hydrological connection with another large system;
- v. Provision for research into the characteristics of the geothermal system, including surface features;
- vi. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- vii. The extent to which the precautionary approach in situations of scientific uncertainty is taken into account;
- viii. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account.
- ix. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- x. The extent to which remediation of significant adverse effects is achievable;
- xi. The extent to which the duration of the activity is limited to that necessary for scientific or enhancement purposes;
- xii. Whether the discharge is the best practicable option.

7.6.4.6 Prohibited Activity Rule – New Takes of Geothermal Water and Energy and Associated Discharges in Protected Geothermal Systems

Except as permitted or regulated by Rules 7.6.4.1 to 7.6.4.5, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of geothermal energy or water from a Protected Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Protected Geothermal System;

that was not lawfully established or authorised prior to 23 August 2003 is a **prohibited activity** for which no resource consent shall be granted.

Explanation and Principal Reasons for Adopting Rules 7.6.4.1 to 7.6.4.6

Rules 7.6.4.1 to 7.6.4.6 establish the regulatory regime for takes and associated discharges from Protected Geothermal Systems. These rules stem from the Policies in Section 3.7 of the Regional Policy Statement and Section 7.4 of this Plan.

Each rule, except for **Rule 7.6.4.3**, addresses both the take and discharge of geothermal energy and water so that in most cases users do not have to apply for separate consents for take and discharge of the same water. **Rule 7.6.4.3** addresses the use of down-hole heat exchangers, from which no discharge is necessary. The use of down-hole heat exchangers is promoted because it results in no loss of geothermal water, and less loss of heat, than the taking of geothermal water and subsequent discharge into the environment.

Small existing uses of Protected Geothermal Systems are permitted under **Rule 7.6.4.2** subject to conditions, on the basis that the level of effects is minor. This rule allows existing takes of up to 15 tonnes per day of surface water and 30 tonnes per day of ground water from Protected Geothermal Systems, together with associated discharges. As well as restricting the scale of existing uses, **Rule 7.6.4.2** requires in condition f) that discharges are by soakage or reinjection. Condition g) ensures that natural surface water is not contaminated by the discharge and that discharge does not occur to geothermal surface features. Condition h) ensures protection of fresh ground water. These conditions are considered necessary to ensure that the viability of Protected Geothermal Systems and their associated significant surface features are sustained (as required by Regional Policy Statement Section 3.7.2.4). In condition e), for surface takes the rule allows for a daily discharge greater than the take to enable some flexibility of stored fluid.

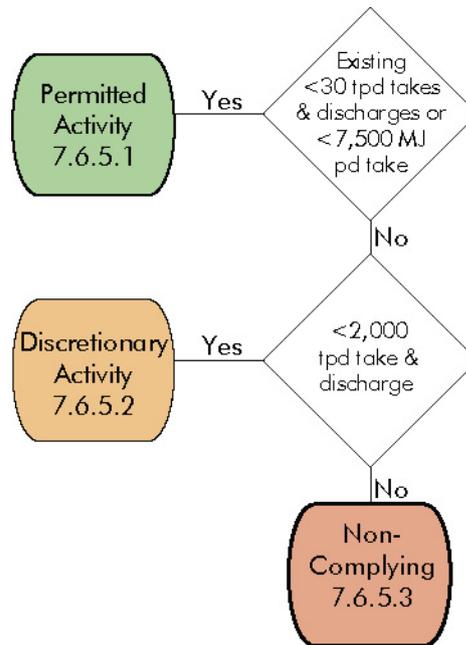
Existing small uses that cannot comply with **Rules 7.6.4.2** or **7.6.4.3** are regulated as discretionary activities under **Rule 7.6.3.4**, on the basis that a case by case assessment is required of whether these activities should be allowed to continue.

However, exceptions are made for takes and discharges undertaken for scientific investigation or enhancement purposes are allowed for in **Rules 7.6.3.1** and **7.6.3.6**, as such activities may well be of benefit to the sustainable management of Protected Geothermal Systems. Very small takes are permitted under **Rule 7.6.4.1**, and larger activities are discretionary under **Rule 7.6.4.7**, recognising that they should not proceed unless the effects are minor. The discharge of tracers for scientific investigation is covered under **Rule 3.5.9.1**.

Other than takes of energy by means of down-hole heat exchangers, and takes and discharges for research purposes, all new takes and discharges of geothermal energy and water are prohibited under **Rule 7.6.4.6**. This recognises the significant values associated with these systems, and their vulnerability to serious or irreversible damage. Waikato Regional Council (Waikato Regional Council) considers that new developments are likely to result in adverse effects that are so significant that they cannot be adequately avoided, remedied, or mitigated under any circumstances.

7.6.5 Takes and Discharges in Small Systems

Summary of Rules For Takes and Discharges In Small Systems



7.6.5.1 Permitted Activity Rule –Small Takes of Geothermal Water and Energy and Associated Discharges in Small Geothermal Systems

Any:

1. Take or use of geothermal energy or water within a Small Geothermal System; or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Small Geothermal System;

is a **permitted activity** subject to the following conditions:

- a) The maximum rate at which water can be taken shall not exceed 30 tonnes per day.
- b) The maximum rate at which heat can be taken without taking water shall not exceed 7,500 megajoules per day.
- c) Any take that is established after 23 August 2003 shall not be located within 100 metres of a Significant Geothermal Feature.
- d) Any discharge established after 23 August 2003 shall not be located within 20 metres of a Significant Geothermal Feature.
- e) Any well constructed after 23 August 2003 for the purposes of taking geothermal ground water shall be at least 20 metres from any other well that existed at the time of construction.
- f) The maximum rate at which water and contaminants can be discharged shall not exceed 30 tonnes per day.
- g) The method of any discharge shall be soakage or reinjection.
- h) There shall be no discharge into any natural surface water body.
- i) There shall be no discharge of geothermal water into any natural fresh water body.
- j) Waikato Regional Council (Waikato Regional Council) shall be notified in writing of the activity within one month of the start of the activity.

Advisory Notes:

- Refer to Drilling rules in section 3.8 of this plan

7.6.5.2 Discretionary Activity Rule –Takes of Geothermal Water and Energy and Associated Discharges in Small Geothermal Systems

Except as permitted or regulated by Rules 7.6.5.1, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take or use of up to 2,000 tonnes per day of geothermal energy or water within a Small Geothermal System; or
2. Discharge of up to 2,000 tonnes per day of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Small Geothermal System;

is a **discretionary activity** (requiring resource consent).

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which adverse effects on Significant Geothermal Features will be avoided or remedied;
- ii. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- iii. Provision for the identification of the system's hydrological boundary to be researched and reviewed;
- iv. Provision for research into the characteristics of the geothermal system, including its productive capacity;
- v. The extent to which the rate and volume of take will be controlled so as to manage the adverse effects on the geothermal system and overlying environment over the long term and achieve sustainable management of the resource;
- vi. The provision of productive efficiency analyses for the proposed uses of the geothermal fluid and energy and the extent to which optimum productive efficiency can be achieved;
- vii. The extent to which system development maximises the potential of the resource, and may exclude more efficient uses;
- viii. The extent to which distribution of geothermal fluid or energy to secondary uses and users is accommodated where appropriate and provision is made for potential future uses, especially those that have high productive efficiency and provide a community benefit;
- ix. The extent to which the following factors are taken into account:
 - current international best practice
 - the practicality and costs of alternative locations or methodologies and the benefits that each option provides
 - the use of a precautionary approach in situations of scientific uncertainty;
- x. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account.
- xi. The extent to which heat and contaminant loads, and relative water volume and flow characteristics of the discharge will affect the receiving environment in terms of other uses, its intrinsic and cultural value and its ecological health;
- xii. The effect on the sustainability of the geothermal system from loss of the energy and fluid contained in the discharge;
- xiii. Whether the discharge is the best practicable option.

7.6.5.3 Non-Complying Activity Rule –Takes of Geothermal Water and Energy and Associated Discharges in Small Geothermal Systems

Except as permitted or regulated by Rules 7.6.5.1, 7.6.5.2, 3.3.4.11, and Rules within sections 3.5.8 and 3.8, any:

1. Take of geothermal energy or water from a Small Geothermal System, or
2. Discharge of water and associated contaminants into water, or onto or into land, arising from the taking of geothermal water from within a Small Geothermal System;

is a **non-complying activity** (requiring resource consent).

Advisory Note:

- Information requirements to enable the assessment of any application under this rule are set out in Section 8.1.2.1 and 8.1.2.2 of this Plan.

Explanation and Principal Reasons for Adopting Rules 7.6.5.1 to 7.6.5.3

Rules **7.6.5.1 to 7.6.5.3** establish the regulatory regime for takes and associated discharges from Small Geothermal Systems. These rules stem from the Policies in Section 3.7 of the Regional Policy Statement and Section 7.4 of this Plan.

Each rule addresses both the take and discharge of geothermal energy and water so that in most cases users do not have to apply for separate consents for take and discharge of the same water.

Both existing and new small-scale activities are permitted under **Rule 7.6.5.1**, subject to limits on the allowable scale of development. It allows takes of up to 15 tonnes per day of surface water and 30 tonnes per day of ground water from Small Systems, together with associated discharges. Activities of this scale generally have much smaller adverse effects than larger developments.

As well as restricting the scale of existing uses, **Rule 7.6.5.1** requires in condition g) that discharges are by soakage or reinjection. Condition h) ensures that natural surface water is not contaminated by the discharge and that discharge does not occur to geothermal surface features. Condition i) ensures protection of fresh ground water. These conditions are considered necessary to ensure that the viability of Small Systems and any associated significant surface features are sustained (as required by Regional Policy Statement, Section 3.7.2.5). In condition f), this rule allows for a daily discharge greater than the take to enable some flexibility of stored geothermal water.

Existing and new medium-sized uses that cannot comply with **Rule 7.6.5.1** are regulated as discretionary activities under **Rule 7.6.5.2**, on the basis that a case by case assessment is required of whether these activities should be allowed to continue.

Through **Rules 7.6.5.1 and 7.6.5.2** the use of down-hole heat exchangers is promoted because it results in no loss of geothermal water, and less loss of heat, than the taking of geothermal water and subsequent discharge into the environment.

Any other take or discharge is non-complying under **Rule 7.6.5.3**. This recognises that Small Geothermal Systems have limited capacity for development, and ensures that the systems' resources are retained for traditional and small to medium-scale permitted and consented activities.

7.6.6 Surface Activities Affecting Significant Geothermal Features

7.6.6.1 Permitted Activity Rule – Existing Activities in the Vicinity of Significant Geothermal Features

The on-going use, operation, replacement and/or maintenance (including associated soil disturbance and vegetation clearance) of any of the following land use activities and associated structures lawfully established as at 23 August 2003, in or within 20 metres of, any Significant Geothermal Feature:

1. Traditional cultural activities in accordance with Tikanga Maori
2. The Urupa at Ohaaki Steamfield West;
3. The cap of the asbestos repository in the Wairakei borefield; and
4. Roads, tracks (including boardwalks), wells, drilling ponds (including drilling ponds used in the past which may be used in the future for maintenance drilling operations), pipelines, power lines and associated supporting structures, steamfield infrastructure;

is a **permitted activity** subject to the following conditions:

- a) There shall not be:
 - i). Any clearance of vegetation; or;
 - ii). Any direct deposition of a contaminant (including herbicide), clean fill, solid waste, soil, sediment or vegetation (other than of native species for the purpose of ecosystem restoration);
beyond two metres from the activity or structure.
- b) Best management practices shall be adopted to avoid indirect deposition of any contaminant (including herbicide), clean fill, solid waste, soil, sediment or vegetation beyond two metres from the activity or structure.
- c) Any activity permitted under this rule shall not alter the scale, size, extent or location of a lawfully established structure, or create a new structure.

7.6.6.2 Permitted Activity Rule – New Activities in the Vicinity of Significant Geothermal Features

Exception

These Standards do not apply to:

Plantation forestry activities as from 1 May 2018 these activities are regulated under the National Environmental Standards for Plantation Forestry Regulations 2017.

The following activities in or within 20 metres of a Significant Geothermal Feature:

1. Vegetation clearance of invasive exotic plants
2. Traditional cultural activities in accordance with Tikanga Maori;
3. Soil disturbance associated with fencing to protect the feature;

are **permitted activities** subject to the following conditions:

- a) There shall not be any direct deposition of a contaminant (including herbicide), clean fill, solid waste, soil, sediment or vegetation (other than of native species for the purpose of ecosystem restoration) beyond two metres of the activity or any structure.
- b) There shall not be any clearance of vegetation (other than invasive exotic plants) beyond two metres from any structure.
- c) No new structures, other than fencing to protect the feature, will be erected.

- d) Best management practices shall be adopted to minimise damage to indigenous plants and avoid indirect deposition of any contaminant (including herbicide), clean fill, solid waste, soil, sediment or vegetation (other than of native species for the purpose of ecosystem restoration) beyond two metres from the activity or structure.
- e) Waikato Regional Council (Waikato Regional Council) shall be notified in writing of the activity within one month of the commencement of the activity.

7.6.6.3 Discretionary Activity Rule - Activities in the Vicinity of Significant Geothermal Features

[This Rule still applies to plantation forestry activities and prevails over the National Environmental Standards for Plantation Forestry Regulations 2017 which came into effect on 1 May 2018.](#)

Except as provided for in rule 7.6.6.1 and 7.6.6.2 any:

1. Vegetation clearance or soil disturbance, in or within 20 metres of a Significant Geothermal Feature; or
2. Discharge of contaminants into or onto land in or within 20 metres of a Significant Geothermal Feature, except for discharges that are regulated by other rules in this Module; or
3. Damming or diversion of geothermal water that affects a Significant Geothermal Feature; or
4. Activity specified in s13(1) of the RMA carried out in, on, over or under that portion of the bed of a water body which is a Significant Geothermal Feature; or
5. Livestock access to a Significant Geothermal Feature;

is a **discretionary activity** (requiring resource consent).

For the avoidance of doubt, this rule does not apply to the operation of the Waikato River system for hydroelectric generation as authorised by resource consents commencing 12 April 2006.

Assessment Criteria:

The matters that Waikato Regional Council (Waikato Regional Council) considers in the assessment of a discretionary activity under this rule will include, but not be limited to:

- i. The extent to which the cultural values of tangata whenua are recognised including their kaitiaki role with the geothermal resource;
- ii. The extent to which consultation with key stakeholders including tangata whenua has been undertaken and the recognition of concerns has been taken into account.
- iii. The extent to which adverse effects on Significant Geothermal Features will be avoided, remedied or mitigated and if mitigated how this will be achieved, for example 'like for like' enhancement;
- iv. The extent to which the activity mitigates pre-existing adverse effects on a natural geothermal feature;
- v. The extent to which associated infrastructure such as structures, pipelines and wells will be designed, constructed and placed to avoid, remedy or mitigate adverse effects on biodiversity, landscape and amenity values;
- vi. The extent to which the following factors are taken into account:
 - the practicality and costs of alternative locations or methodologies and the benefits that each option provides
 - the use of a precautionary approach in situations of scientific uncertainty;
- vii. The expected duration of the activity;
- viii. Whether the activity is the best practicable option.

Explanation and Principal Reasons for Adopting Rules 7.6.6.1 to 7.6.6.3

Rules 7.6.6.1, 7.6.6.2 and 7.6.6.3 regulate certain activities in and within the vicinity of Significant Geothermal Features, irrespective of the type of Geothermal System. **Rules 7.6.6.1, 7.6.6.2 and 7.6.6.3** seek to ensure that the effects of these activities, where they occur in and within the vicinity of Significant Geothermal Features, are adequately avoided, remedied or mitigated. This is achieved by classifying most new activities (those not lawfully existing at 23 August 2003) as discretionary, thereby giving the Council discretion to grant or decline consent, and to impose appropriate conditions on any consents that are granted. **Rules 7.6.6.1, 7.6.6.2 and 7.6.6.3** give effect to Regional Policy Statement Section 3.7.3, which ensures protection for Significant Geothermal Features from inappropriate uses of land and non-geothermal water.

7.7 Environmental Results Anticipated

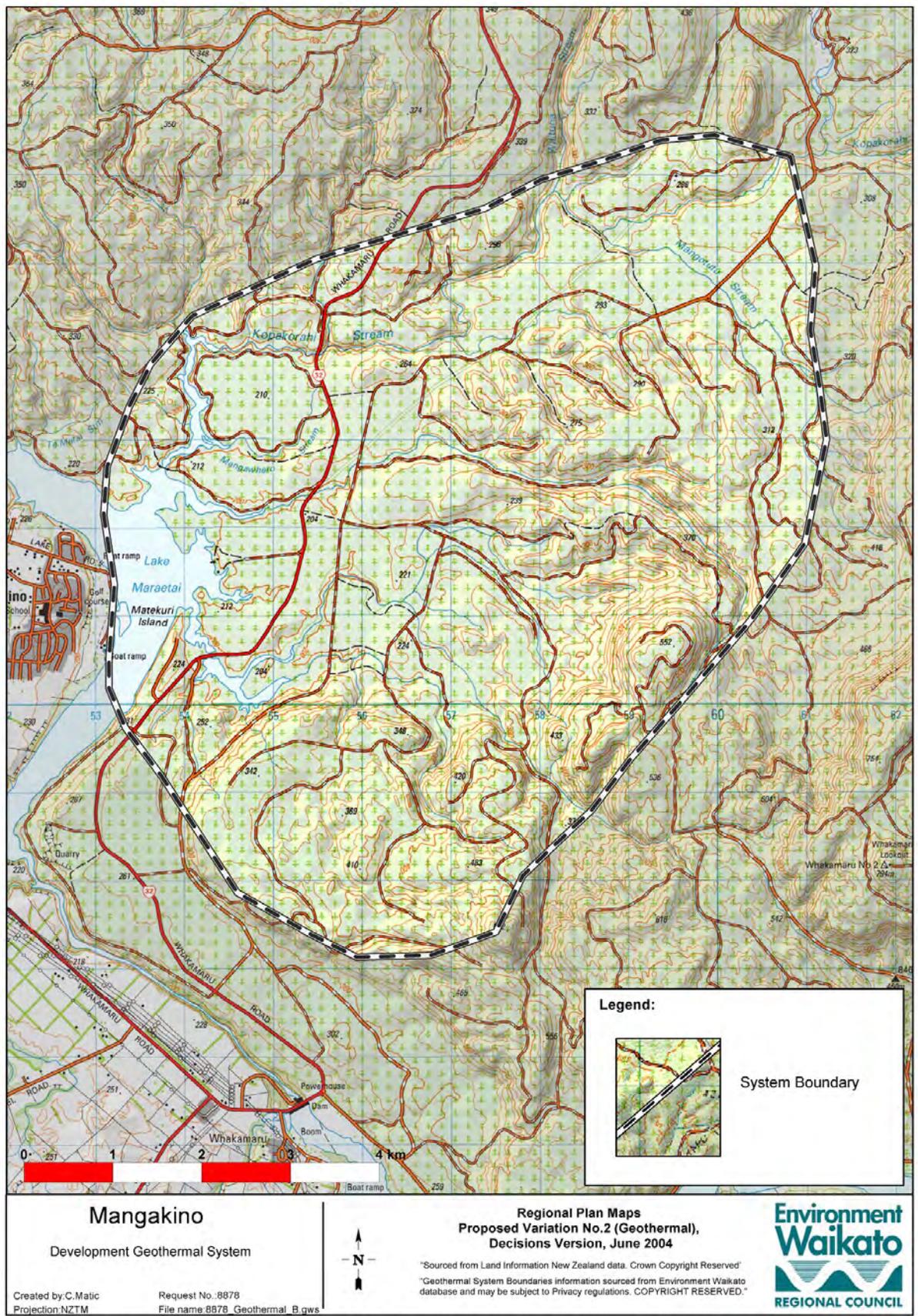
1. The sustainable management of the Regional Geothermal Resource
2. People and communities being able to provide for their social, economic and cultural wellbeing through the appropriate use, development and protection of the Regional Geothermal Resource.
3. Geothermal surface features and resource management matters of significance to tangata whenua identified, and recognised and provided for.
4. Efficient use of the Regional Geothermal Resource including the use of alternative technologies such as down-hole heat exchangers.
5. Significant adverse effects on Significant Geothermal Features in Development Geothermal Systems arising from the take, use, and discharge of geothermal energy and water remedied or mitigated in any Geothermal System.
6. No significant adverse effects on Significant Geothermal Features in Limited Development, Research, Protected, and Small Geothermal Systems as a result of human activity.
7. No significant adverse effects on Significant Geothermal Features as a result of land use and the use of non-geothermal water.
8. No reduction in the life-supporting capacity and biodiversity or overall sustainability of Research and Protected Geothermal Systems as a result of human activity.
9. Adverse effects on other natural and physical resources including overlying structures (the built environment) avoided, remedied, or mitigated.

7.8 Monitoring Options

Objective	Indicators/ Measurement	Types of Monitoring	Information Source
Where geothermal energy and water is taken, it shall be used and managed efficiently.	Trends in the total amount of geothermal energy and water extracted, converted and injected, reinjected or discharged, in and from geothermal systems.	Resource use monitoring, compliance and effects monitoring, reservoir modelling.	Surveys and compliance monitoring database. National energy use surveys. Resource consent reservoir modelling.
In Development Geothermal Systems, significant adverse effects on Significant Geothermal Features arising from the take of geothermal energy and water to be remedied or mitigated within the Regional Geothermal Resource	The trend in the number and condition of the various geothermal features and characteristics.	Regional monitoring of and regular reporting on the state of and threats to different geothermal features and characteristics.	Geothermal database and resource consent database.
In all Limited Development, Research, Protected, and Small Geothermal Systems, significant adverse effects on Significant Geothermal Features arising from the take of geothermal energy and fluid are to be avoided.	The trend in the number and condition of the various geothermal features and characteristics.	Regional monitoring of and regular reporting on the state of and threats to different geothermal features and characteristics.	Geothermal database and resource consent database.
Significant adverse effects on Significant Geothermal Features arising from land use and the take, use and discharge of non-geothermal water to be avoided.	GIS comparisons of mapped extent of Significant Geothermal Features	Aerial mapping, supported by ground survey and site inspections	District Council Consent applications and databases Five yearly aerial photography
In Development Geothermal Systems, adverse effects on other natural and physical resources including overlying structures (the built environment), such as those resulting from subsidence and land instability, arising from the take, use, and discharge of geothermal energy or water to be avoided, remedied or mitigated	Subsidence rate in excess of natural rate.	Ground level surveys	Subsidence monitoring by developers linked to consent conditions

Objective	Indicators/ Measurement	Types of Monitoring	Information Source
<p>In Limited Development Geothermal Systems, significant adverse effects on other natural and physical resources including overlying structures (the built environment) such as those resulting from subsidence and land instability, arising from the take, use, and discharge of geothermal energy or water to be avoided, remedied or mitigated.</p>	<p>Subsidence rate in excess of natural rate.</p>	<p>Ground level surveys</p>	<p>Subsidence monitoring by developers linked to consent conditions</p>
<p>Significant adverse effects on fresh water and land arising from the discharge of geothermal energy and water avoided.</p>	<p>See Section 3.1.4.</p>	<p>See Section 3.1.4.</p>	<p>See Section 3.1.4</p>
<p>Increased knowledge about the Regional Geothermal Resource, and better understanding of the effects of using the resource and effects of other activities on the resource.</p>	<p>All of the above indicators</p>	<p>As above</p>	<p>All of the above sources</p>

7.9.1.2 Mangakino



Mangakino
 Development Geothermal System

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 Projection NZTM File name: 8878_Geothermal_B.gws

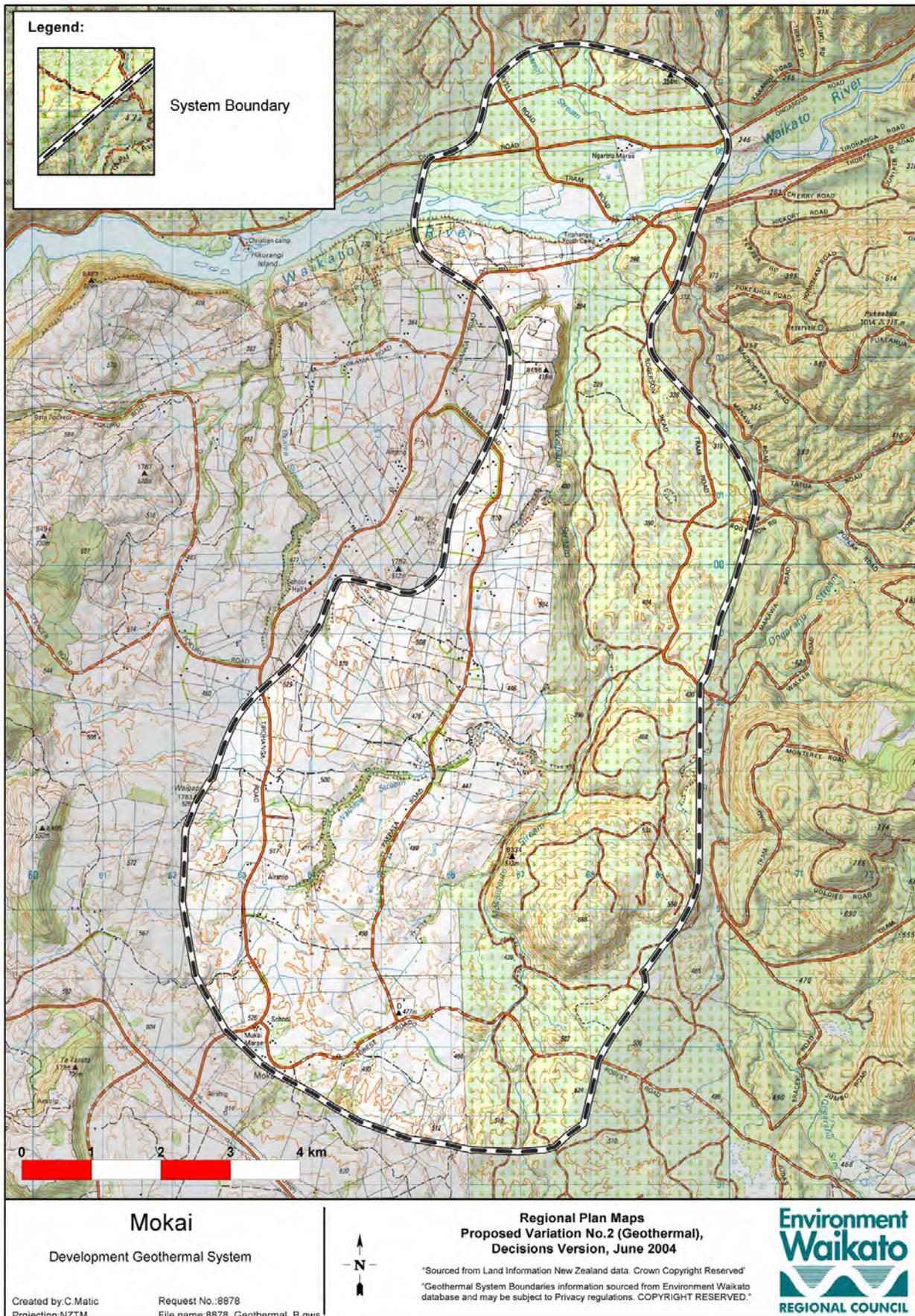
Regional Plan Maps
 Proposed Variation No.2 (Geothermal),
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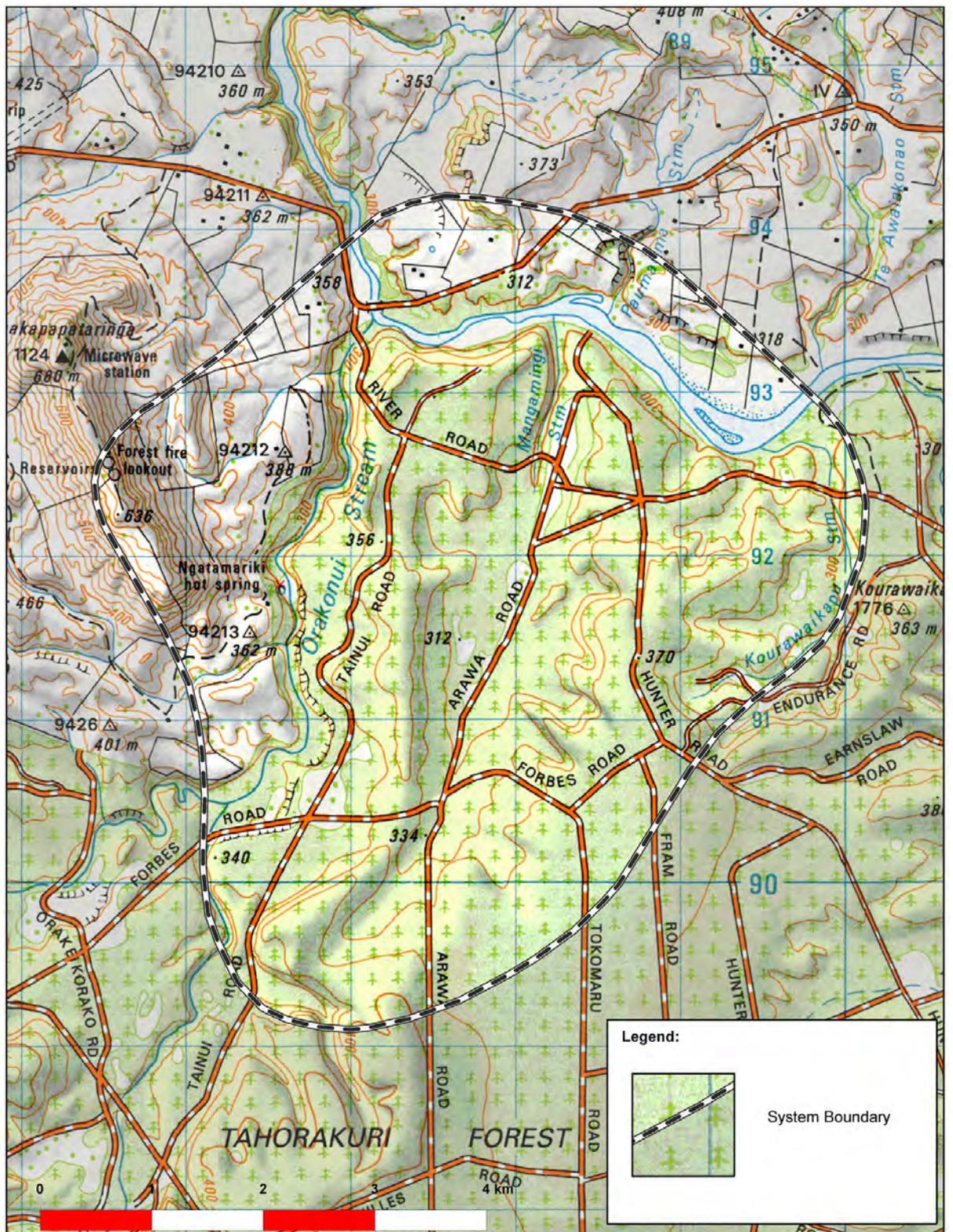


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7.9.1.3 Mokai



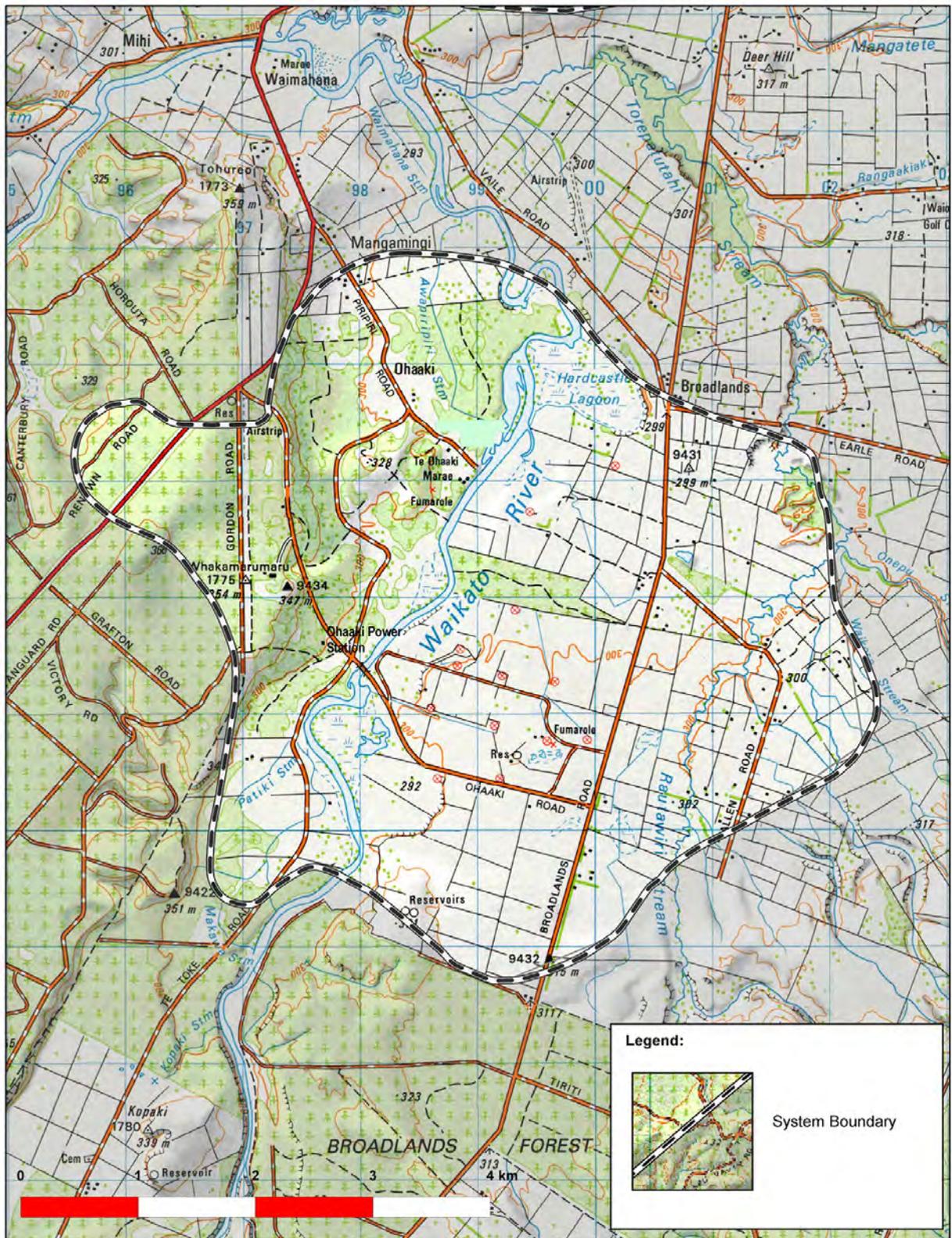
7.9.1.4 Ngatamariki



<p>Ngatamariki Development Geothermal System</p> <p>Created by: C.Matic Projection: NZTM</p> <p>Request No.: 8878 File name: 8878_Geothermal_B.gws</p>	<p>↑ N ↓</p>	<p>Regional Plan Maps Proposed Variation No.2 (Geothermal), Decisions Version, June 2004</p> <p><small>*Sourced from Land Information New Zealand data. Crown Copyright Reserved*</small> <small>*Geothermal System Boundaries information sourced from Environment Waikato database and may be subject to Privacy regulations. COPYRIGHT RESERVED.*</small></p>	
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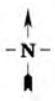
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7.9.1.5 Ohaaki



Ohaaki
Development Geothermal System

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Regional Plan Maps
Proposed Variation No.2 (Geothermal),
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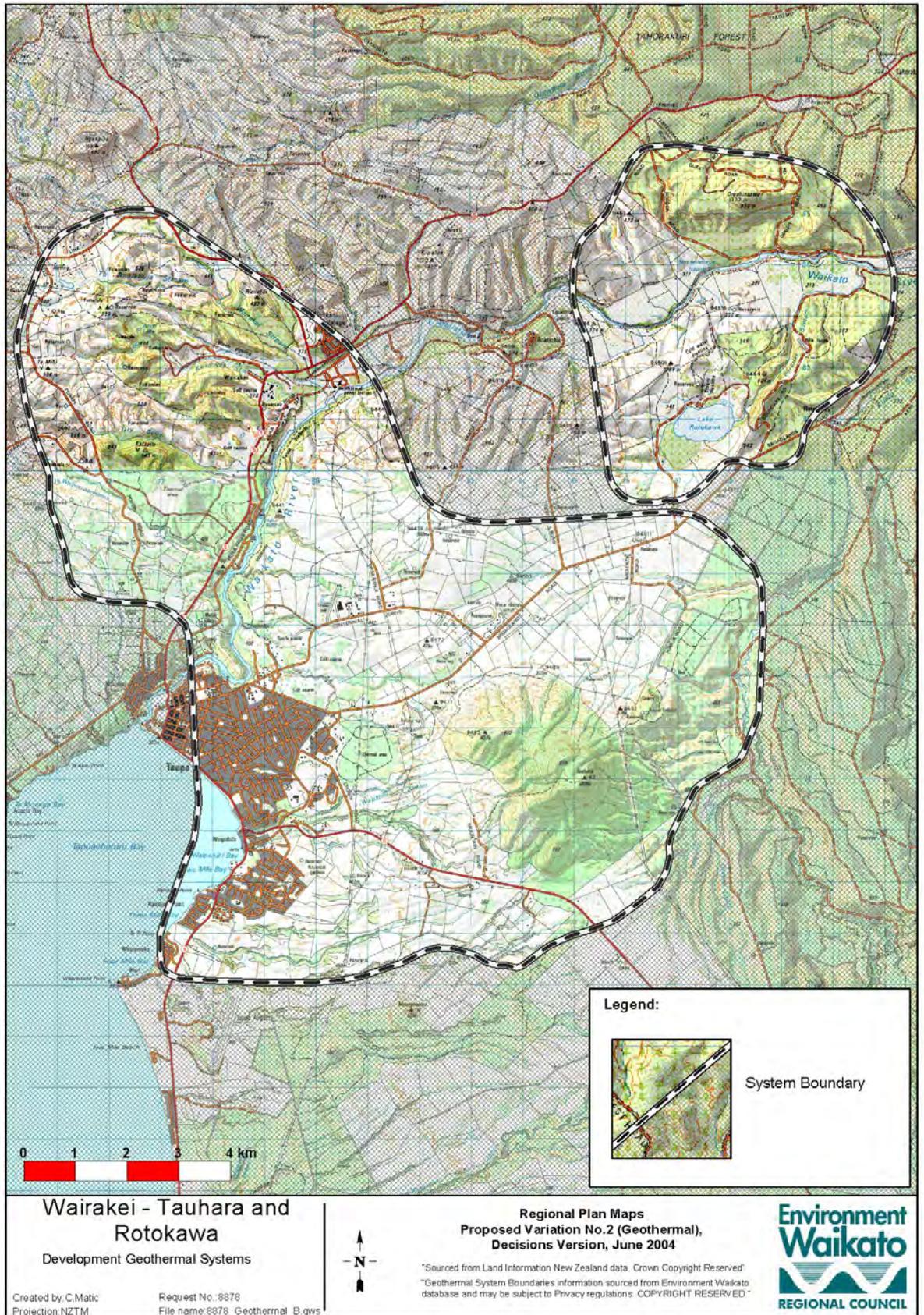
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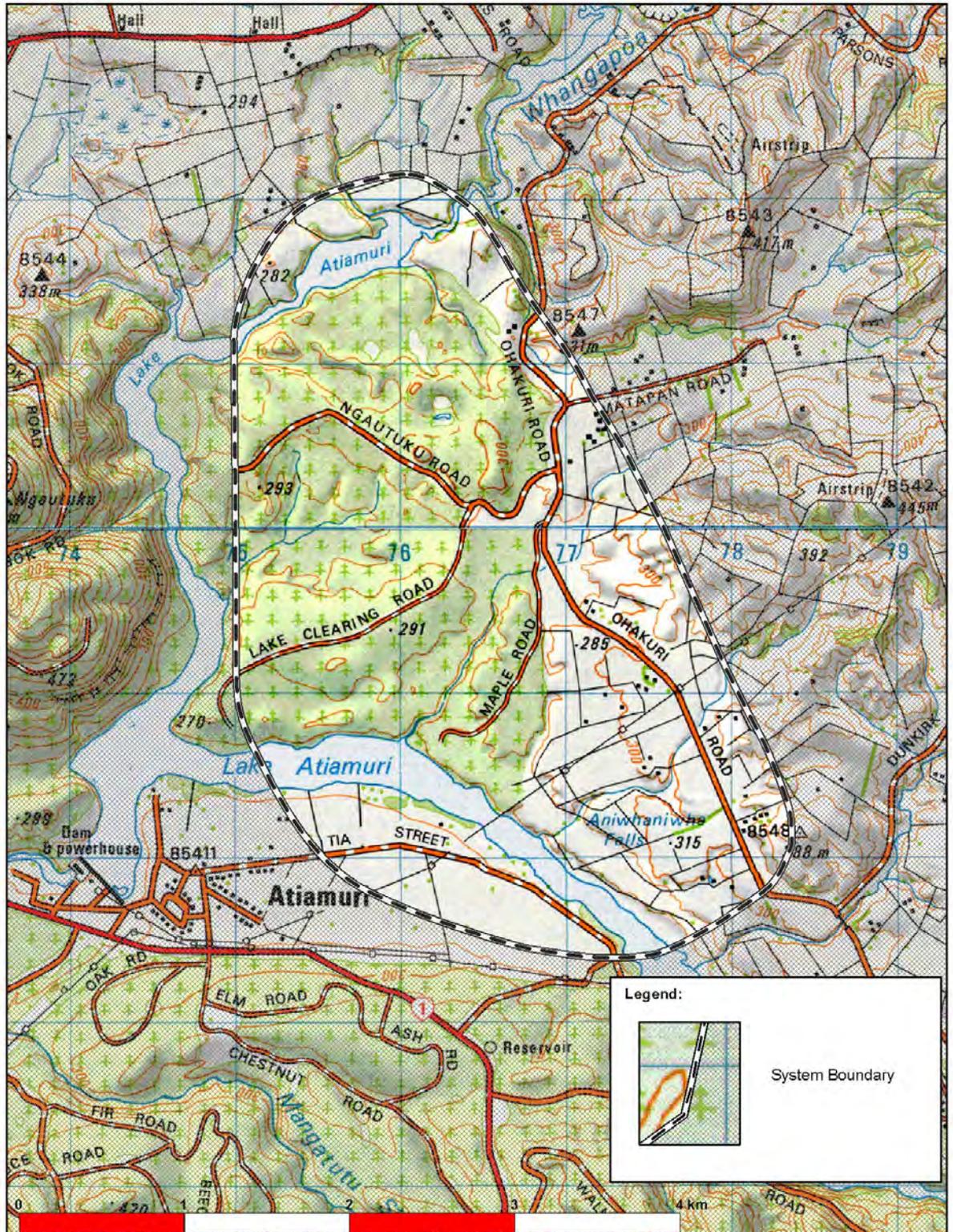
7.9.1.6 Rotokawa

7.9.1.7 Wairakei-Tauhara



7.9.2 Limited Development Geothermal Systems

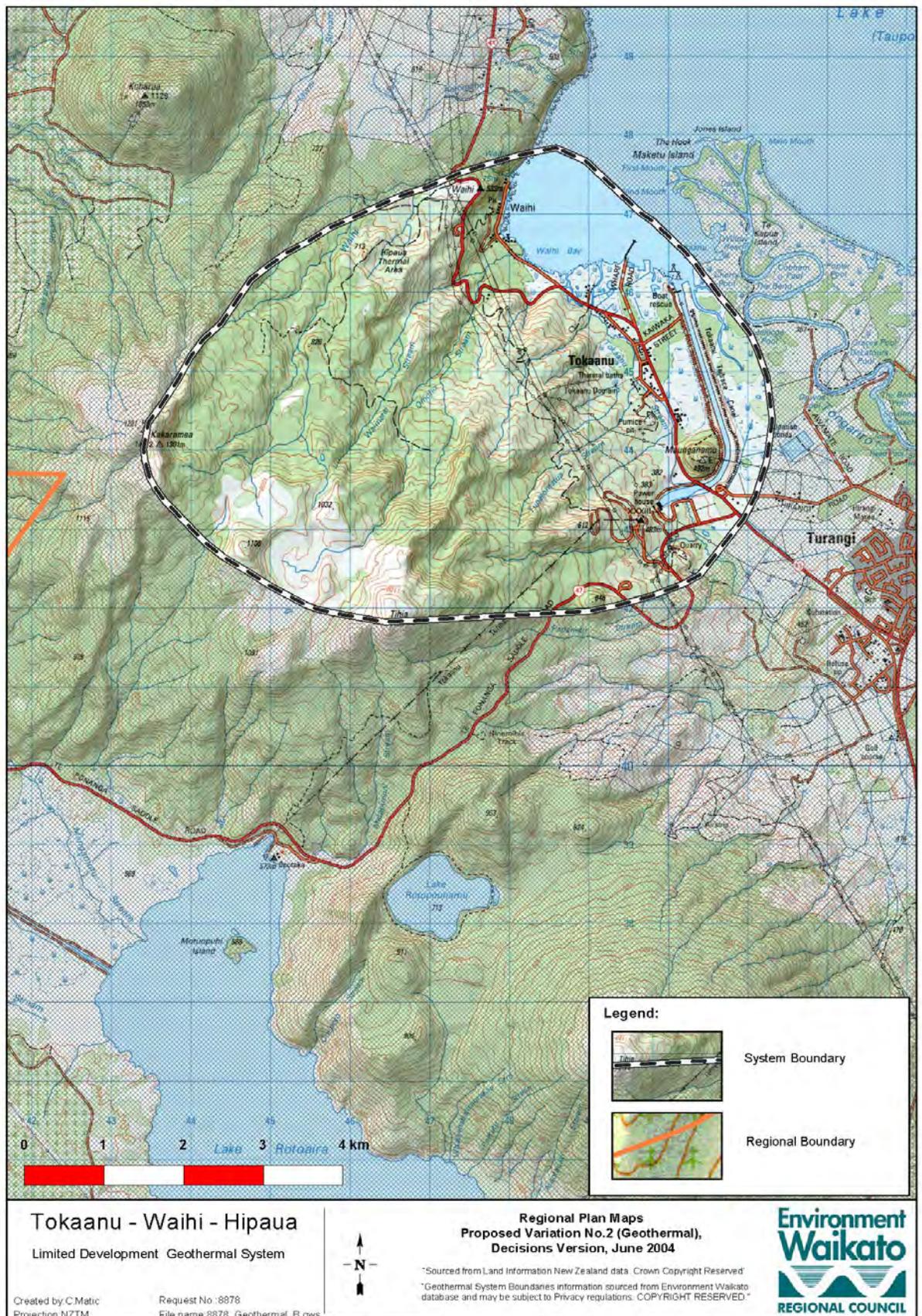
7.9.2.1 Atiamuri



<p style="text-align: center;">Atiamuri Limited Development Geothermal System</p> <p>Created by C. Matic Request No. 8878 Projection NZTM File name 8878_Geothermal_B.gws</p>	<p style="text-align: center;">Regional Plan Maps Proposed Variation No.2 (Geothermal), Decisions Version, June 2004</p> <p><small>*Sourced from Land Information New Zealand data. Crown Copyright Reserved *Geothermal System Boundaries information sourced from Environment Waikato database and may be subject to Privacy regulations. COPYRIGHT RESERVED*</small></p>	
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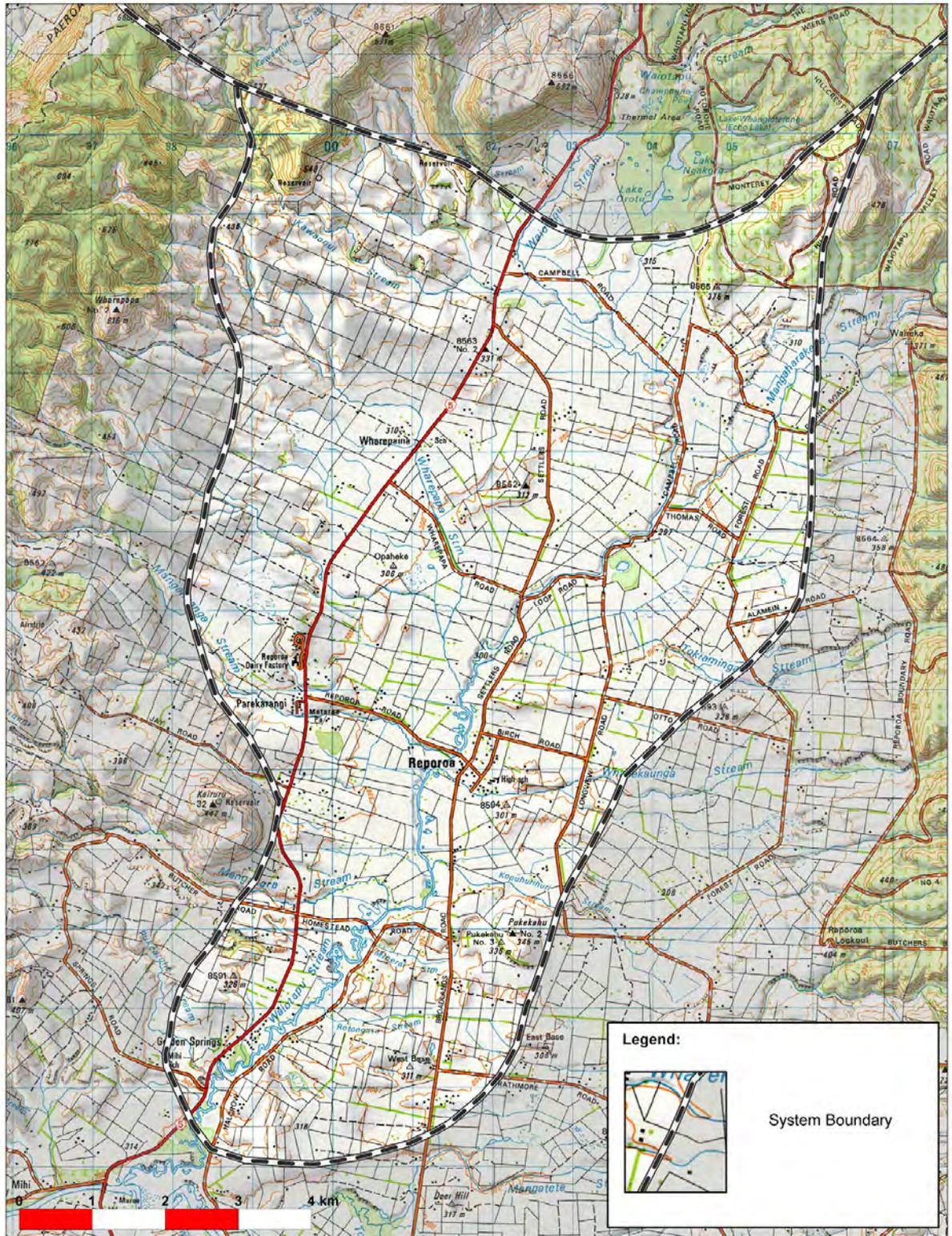
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7.9.2.2 Tokaanu – Waihi – Hipaua



7.9.3 Research Geothermal Systems

7.9.3.1 Reporoa



<h3>Reporoa</h3> <p>Research Geothermal System</p>		<p>Regional Plan Maps Proposed Variation No.2 (Geothermal), Decisions Version, June 2004</p> <p><small>*Sourced from Land Information New Zealand data. Crown Copyright Reserved *Geothermal System Boundaries information sourced from Environment Waikato database and may be subject to Privacy regulations. COPYRIGHT RESERVED.*</small></p>	
<p>Created by C.Matic Request No: 8878 Projection NZTM File name 8878 Geothermal B.qws</p>			

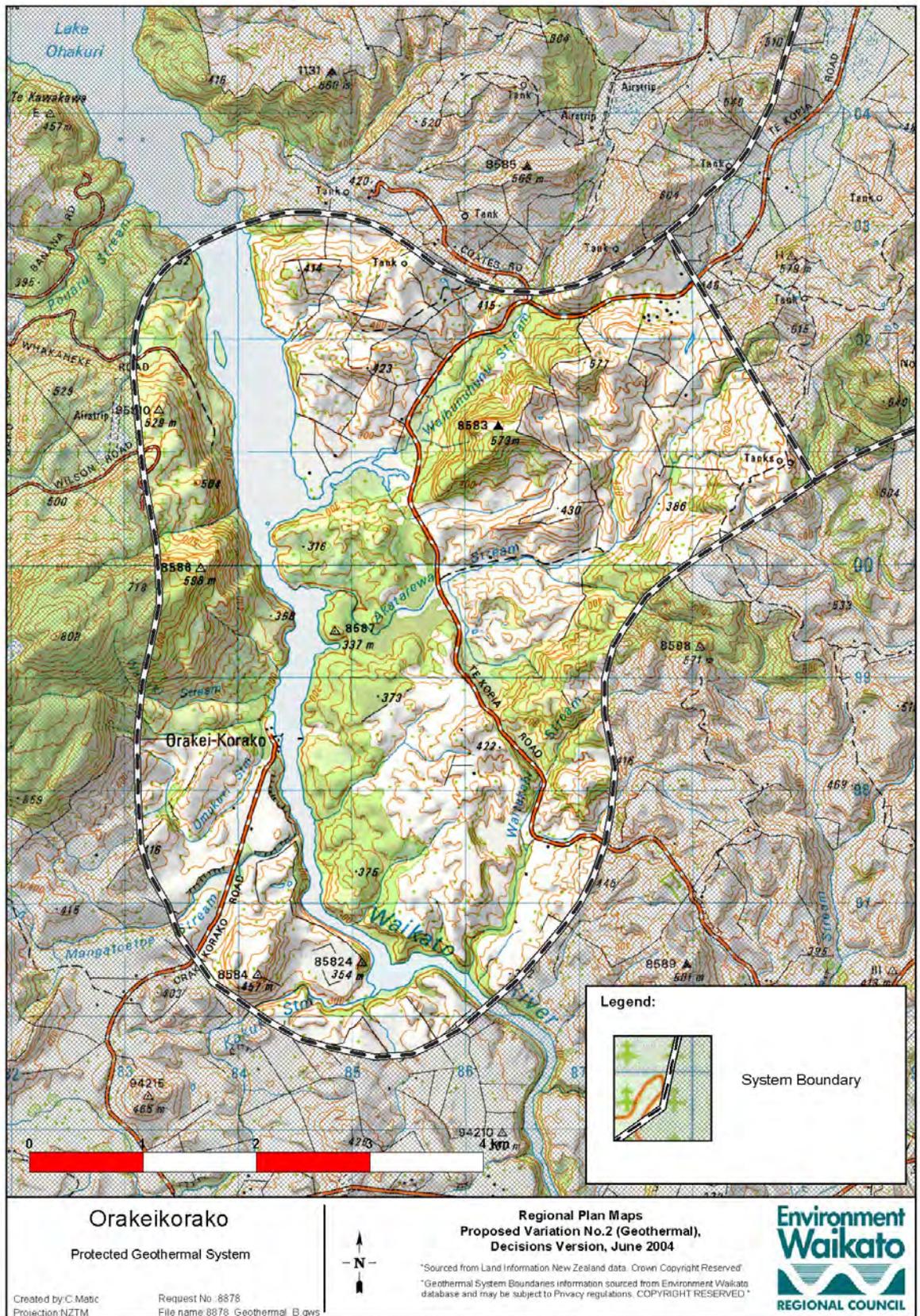
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7.9.4 Protected Geothermal Systems

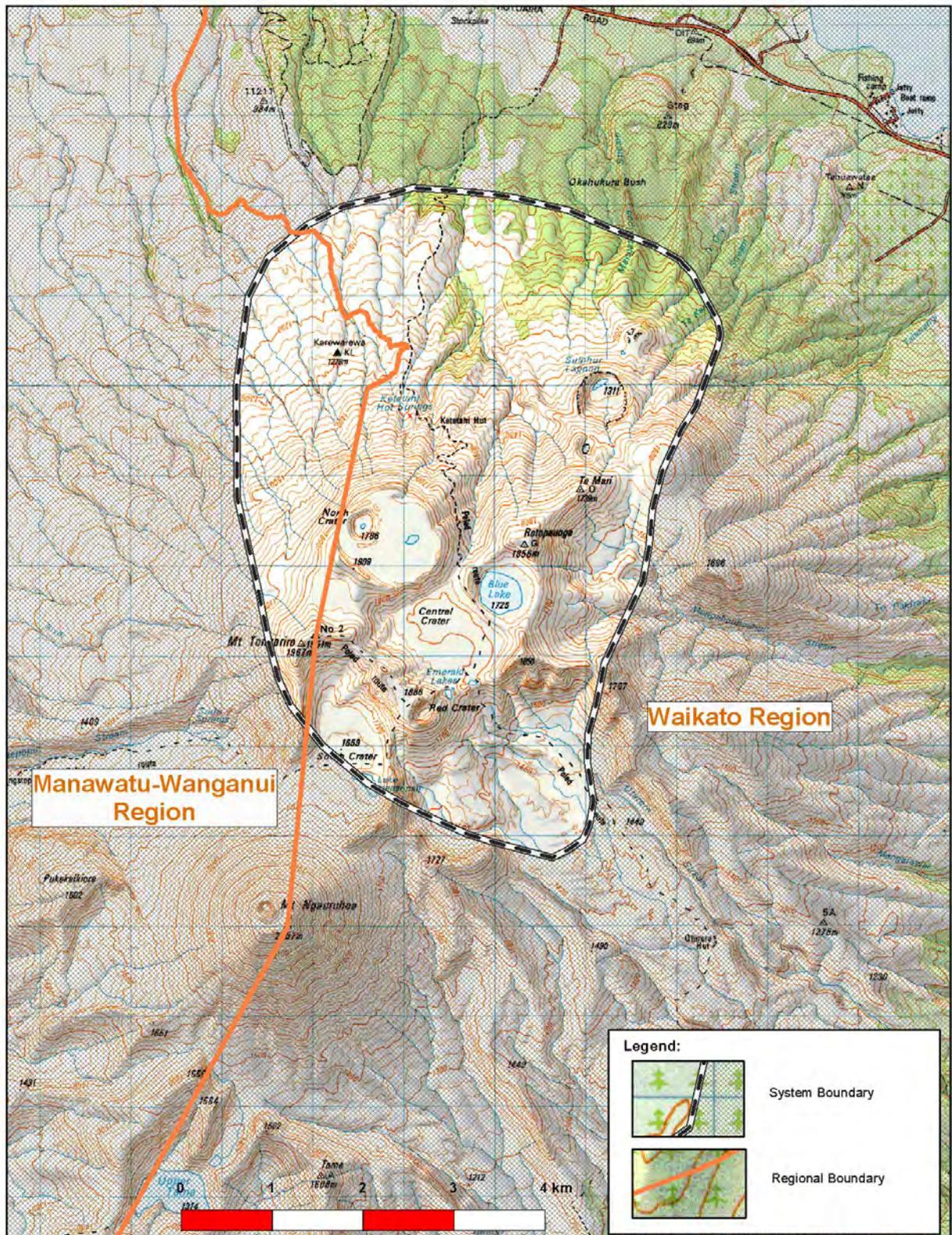
7.9.4.1 Horomatangi



7.9.4.2 Orakeikorako



7.9.4.4 Tongariro



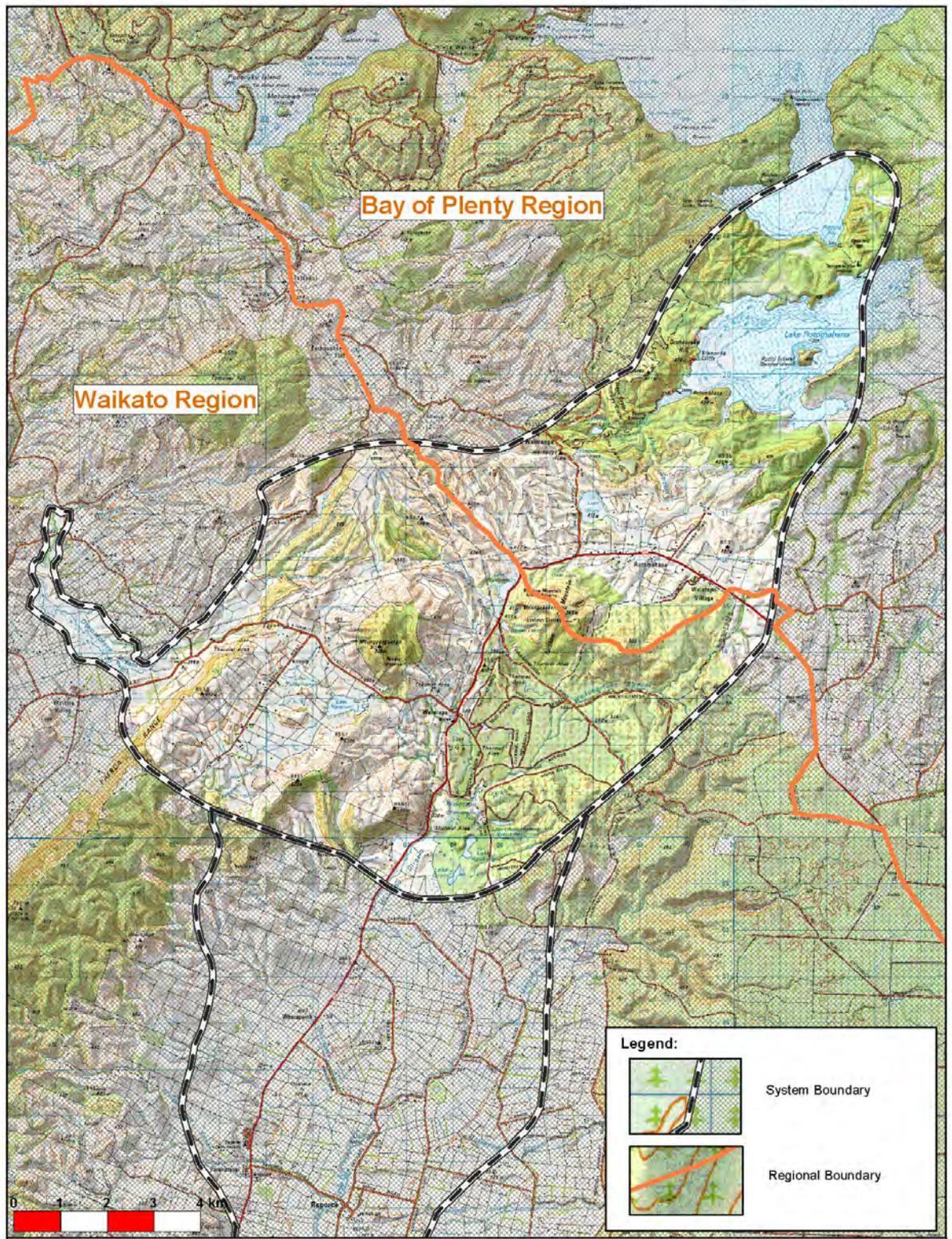
Tongariro
Protected Geothermal System

Created by C.Matic Request No. 8878
Projection NZTM File name 8878_Geothermal_B.gws

Regional Plan Maps
Proposed Variation No.2 (Geothermal),
Decisions Version, June 2004

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7.9.4.5 Waikite – Waiotapu – Waimangu



Waikite - Waiotapu - Waimangu
 Protected Geothermal System

Created by C.Matic Request No: 8878
 Projection NZTM File name 8878_Geothermal_B.gws

**Regional Plan Maps
 Proposed Variation No.2 (Geothermal),
 Decisions Version, June 2004**


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 "Digital boundaries derived from Statistics New Zealand's Digital Meshblock Database (DMDB). Crown Copyright Reserved, DQSI and Statistics 1994. License Number DQ008"



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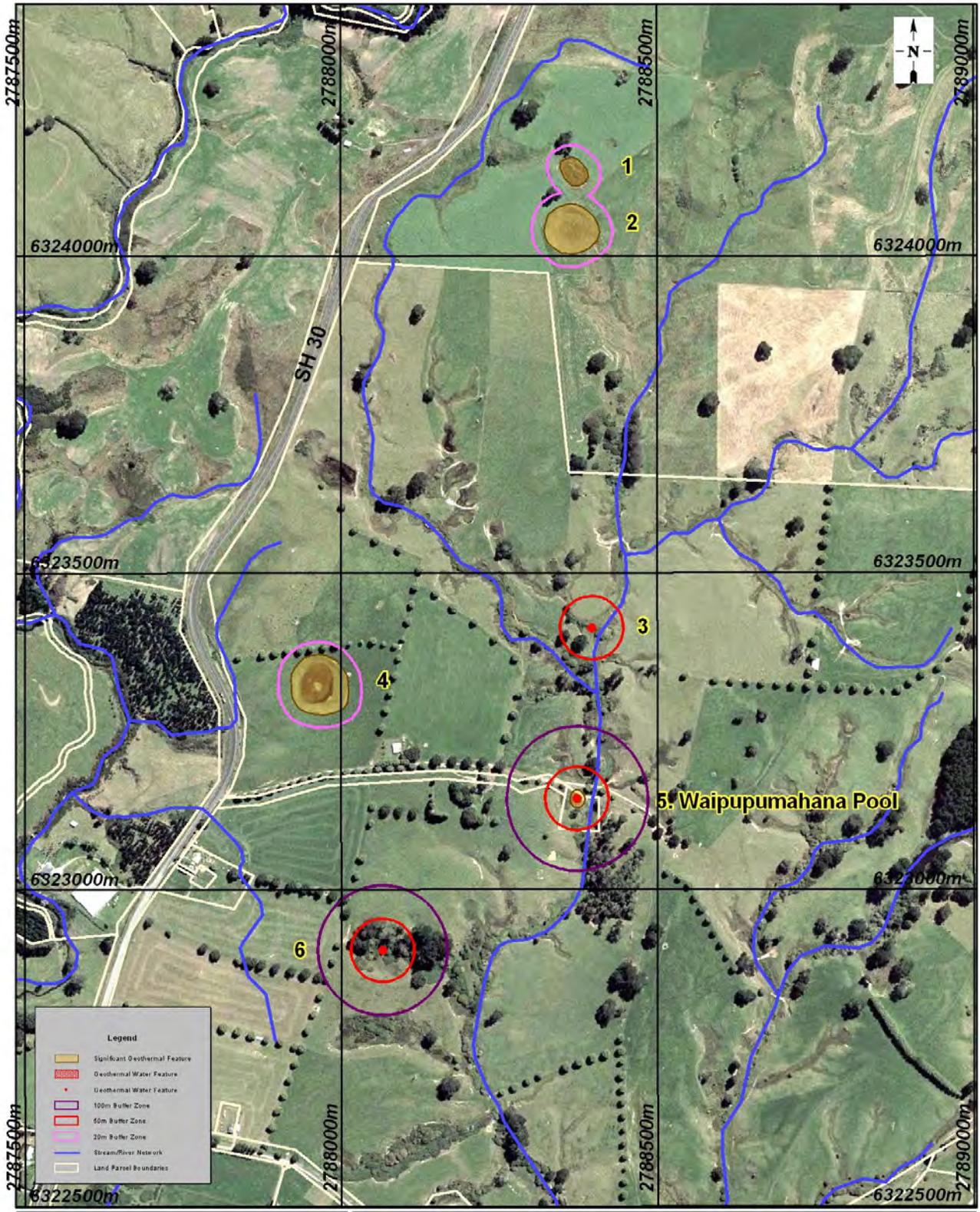
7.10 Maps of Significant Geothermal Features and Geothermal Water Features

7.10.1 Significant Geothermal Features and Geothermal Water Features in Development Geothermal Systems

List of Maps

Development Geothermal System	Location and identifiers (where applicable) of Significant Geothermal Features	Identifiers (where applicable) of Geothermal Water Features
Horohoro	Horohoro (1, 2, 4, 5, 6)	3, 5, and 6
Mokai	Paerata Rd	No GWFs
	Tirohanga Rd	No GWFs
	Waipapa Stream	See Map
Ngatamariki	Orakonui Springs (1 – 7)	A – J
	Waikato River Springs (1, 3, 4)	1 – 4
Ohaaki	Ohaaki Steamfield East (1 - 3)	No GWFs
	Ohaaki Steamfield West (1 – 4)	No GWFs
Rotokawa	Lake Rotokawa	See map
	Rotokawa North	See map
	Parariki Stream	See map
Wairakei-Tauhara	Broadlands Rd Reserve	No GWFs
	Craters of the Moon	No GWFs
	Crown Rd and Crown Park Reserve	No GWFs
	Hall of Fame Stream	See Map
	Karapiti Forest	No GWFs
	Lower Wairakei Stream	No GWFs
	Otumuheke Stream and Spa Park (1, 3, 4)	Otumuheke and Kathleen Springs
	Te Kiriohinekai Stream and Waiora Lakes	Alum Lake
	Te Rautehuia (1, 2)	No GWFs
	Te Rautehuia Stream	No GWFs
	Upper Wairakei Stream (Geyser Valley) (1 – 6)	No GWFs
	Waipahihi Valley (Onekeneke Stream)	See Map
	Waipouwerawera	No GWFs

7.10.1.1 Horohoro – Horohoro



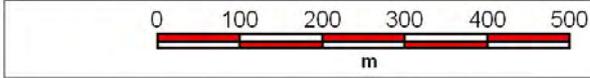
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Horohoro
 Horohoro Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
 File name: S:GIS_Jobsl.....



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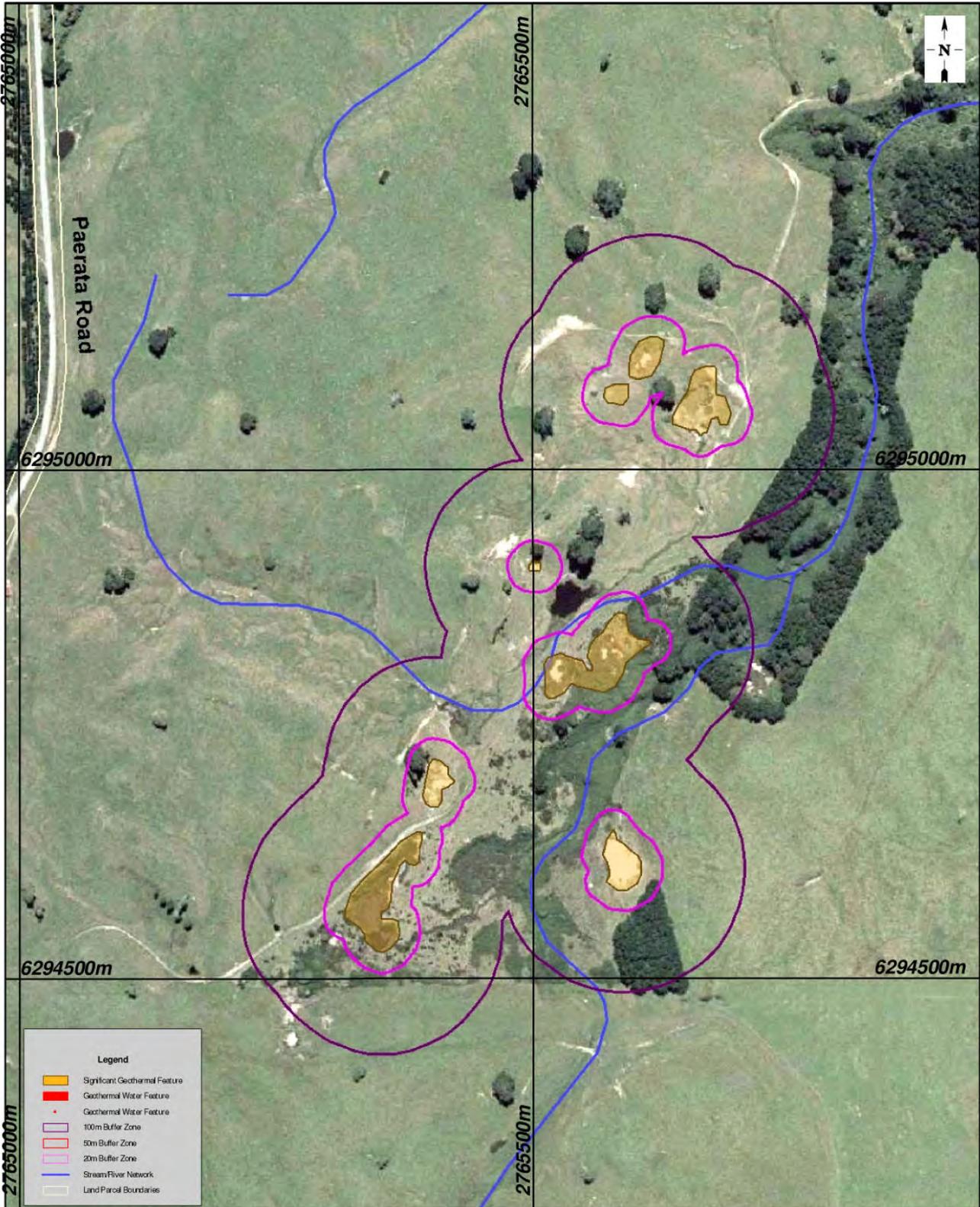
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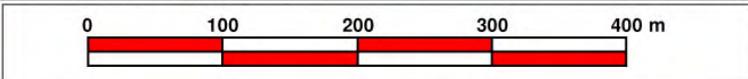
Mokai - Paerata Rd



Paerata Road
 Mokai Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
 File name: S:GIS_Jobs\.....



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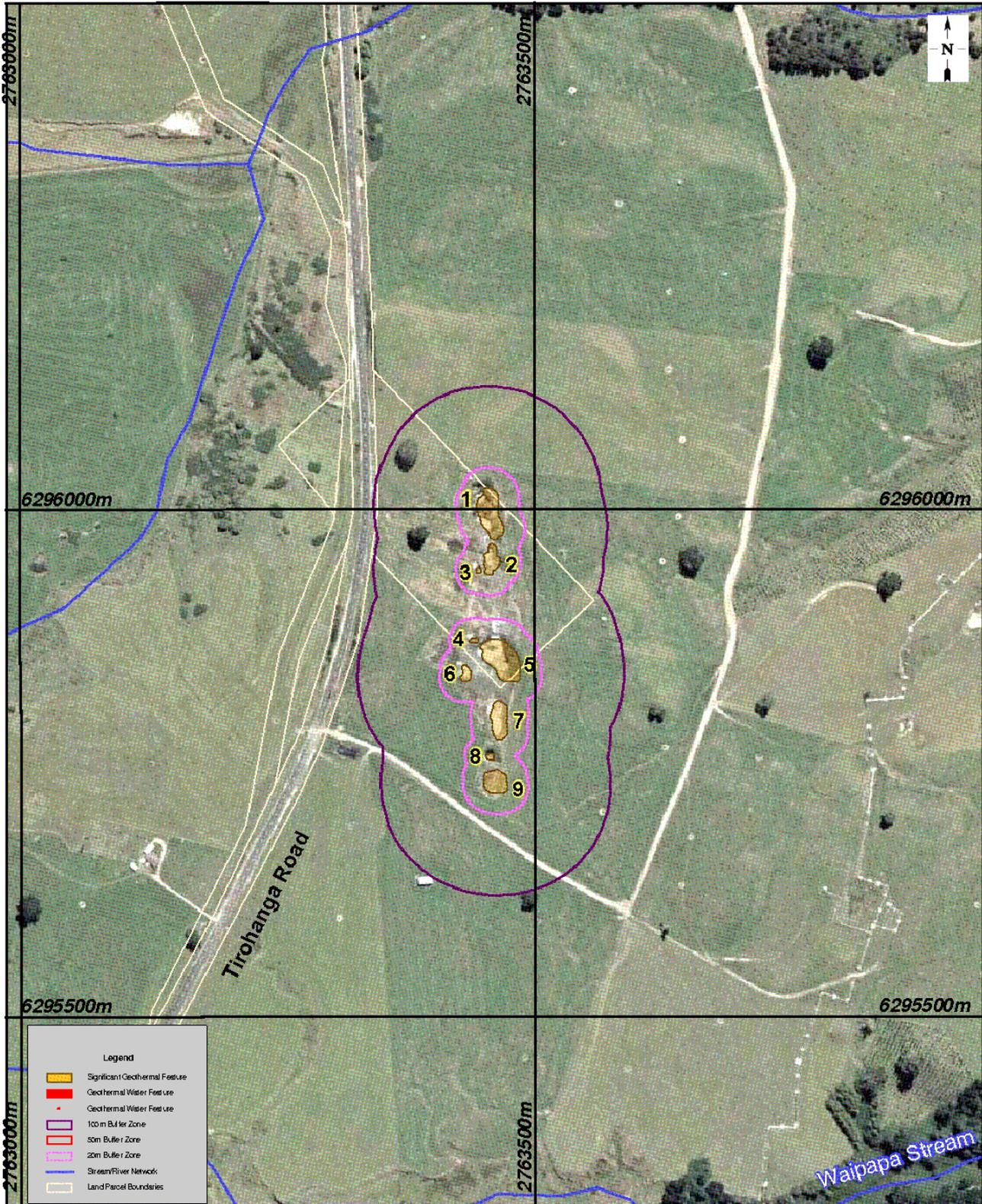
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Mokai -Tirohanga Rd

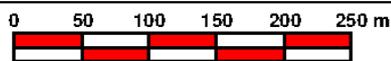
6296500m



Tirohanga Road

Mokai Geothermal System

Regional Plan Maps
Proposed Variation No. 7, May 2007



A4

Created by: HCE
Projection: NZMG
Date: March 2007

Request No.: 14990
File name: S:GIS_Jobs\.....

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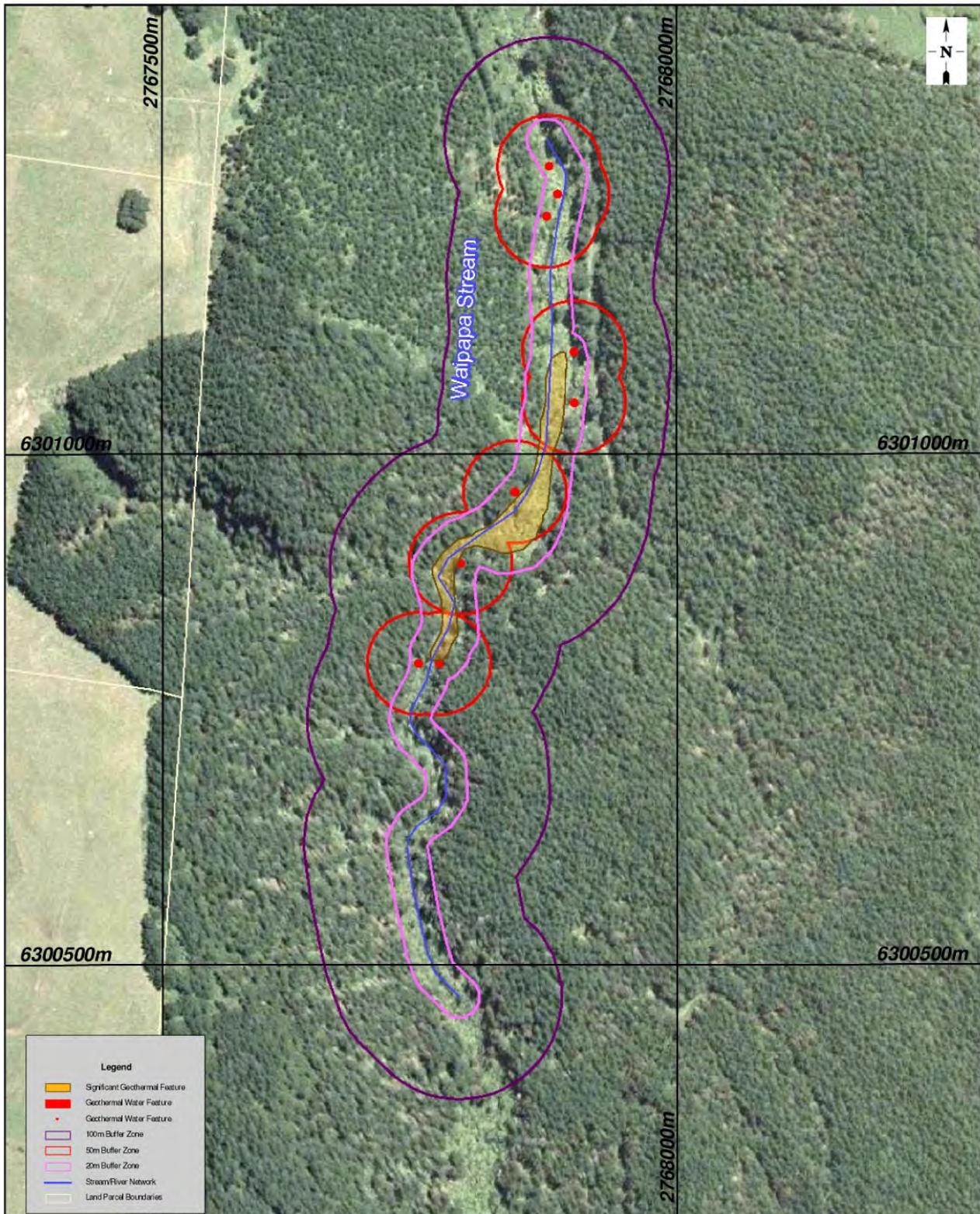
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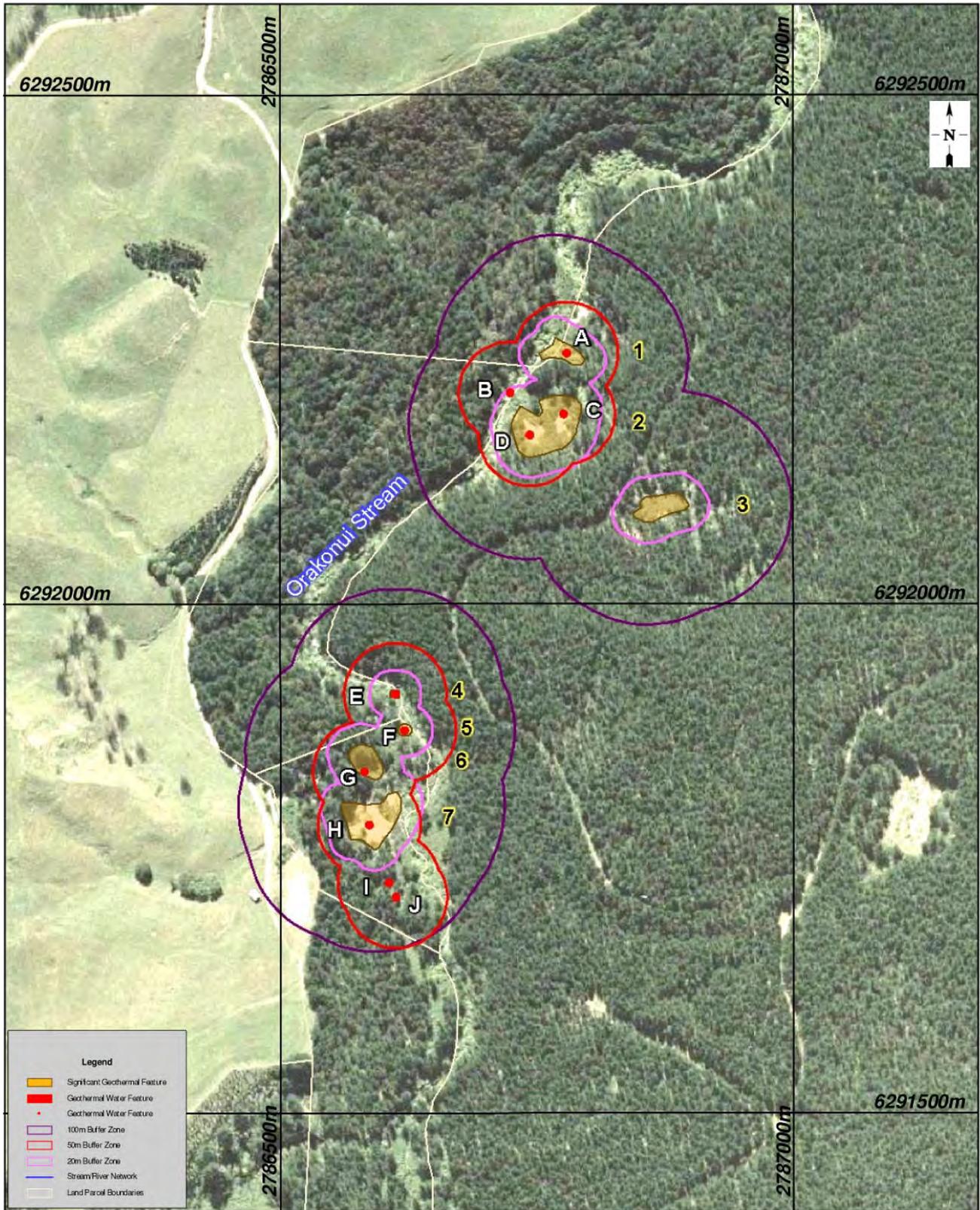
Mokai -Waipapa Stream



<p style="text-align: center;">Waipapa Stream Mokai Geothermal System Regional Plan Maps Proposed Variation No. 7, May 2007</p> <p>Created by: HCE Projection: NZMG Date: March 2007</p> <p>Request No.: 14990 File name: S:GIS_Jobs\.....</p>	<p>0 50 100 150 200 250 m</p>	A4
<p>Cadastral information derived from Land Information New Zealand's Landonline Cadastral Database. CROWN COPYRIGHT RESERVED.</p> <p>Geothermal Features information Sourced from Environment Waikato database and may be subject to Privacy regulations. COPYRIGHT RESERVED.</p> <p>Digital photographic imagery Sourced From Terralink International Limited, 2002. COPYRIGHT RESERVED.</p> <p>1:50,000 Hydrological data Sourced from NZTopo Database, Crown Copyright Reserved</p>		

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Ngatamariki - Orakonui Springs



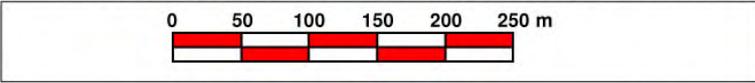
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Orakonui Springs
 Ngatamariki Geothermal System
Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
 File name: S:GIS_Jobs\.....



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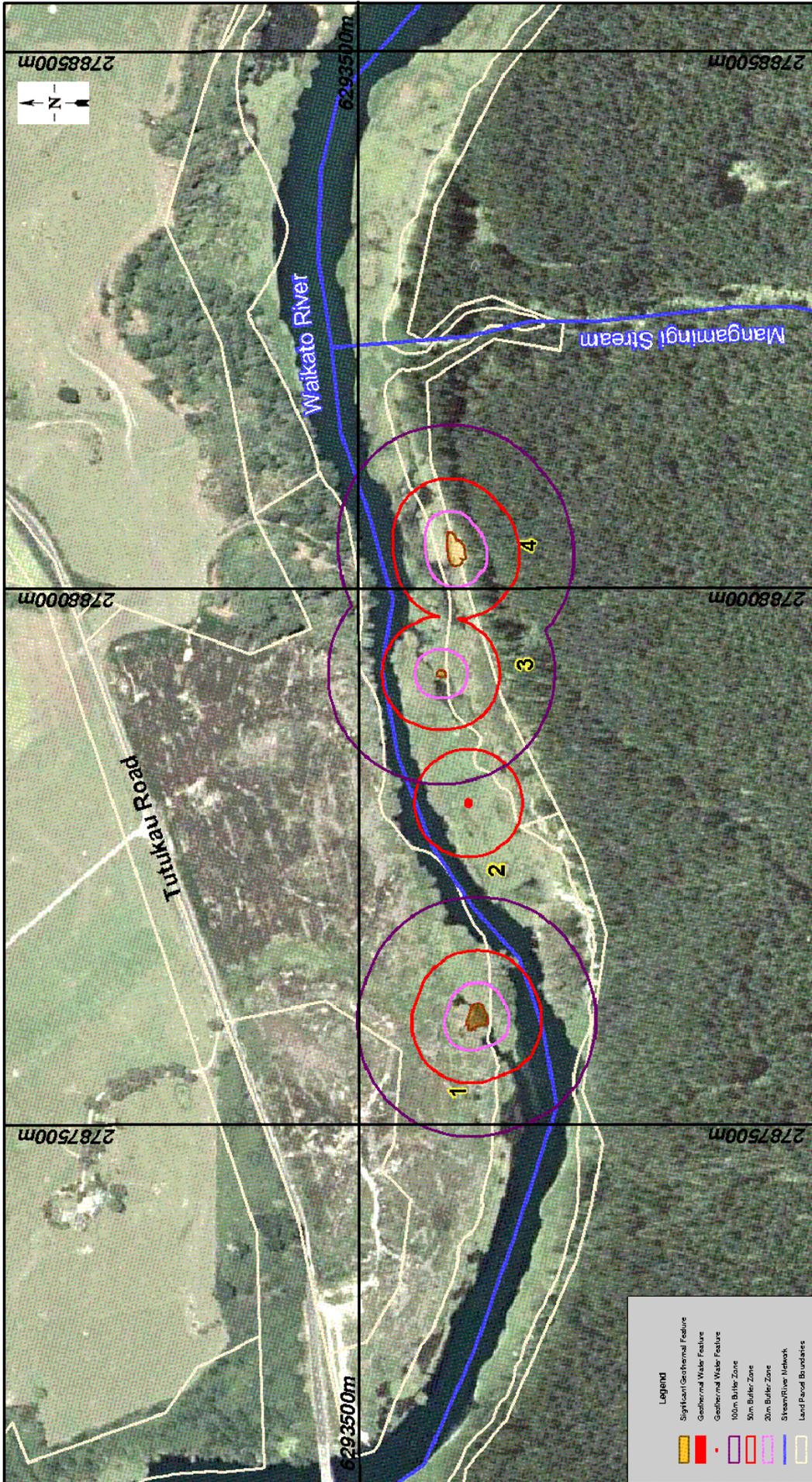
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Ngatamariki - Waikato River Springs



Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Waikato River Springs
 Ngatamariki Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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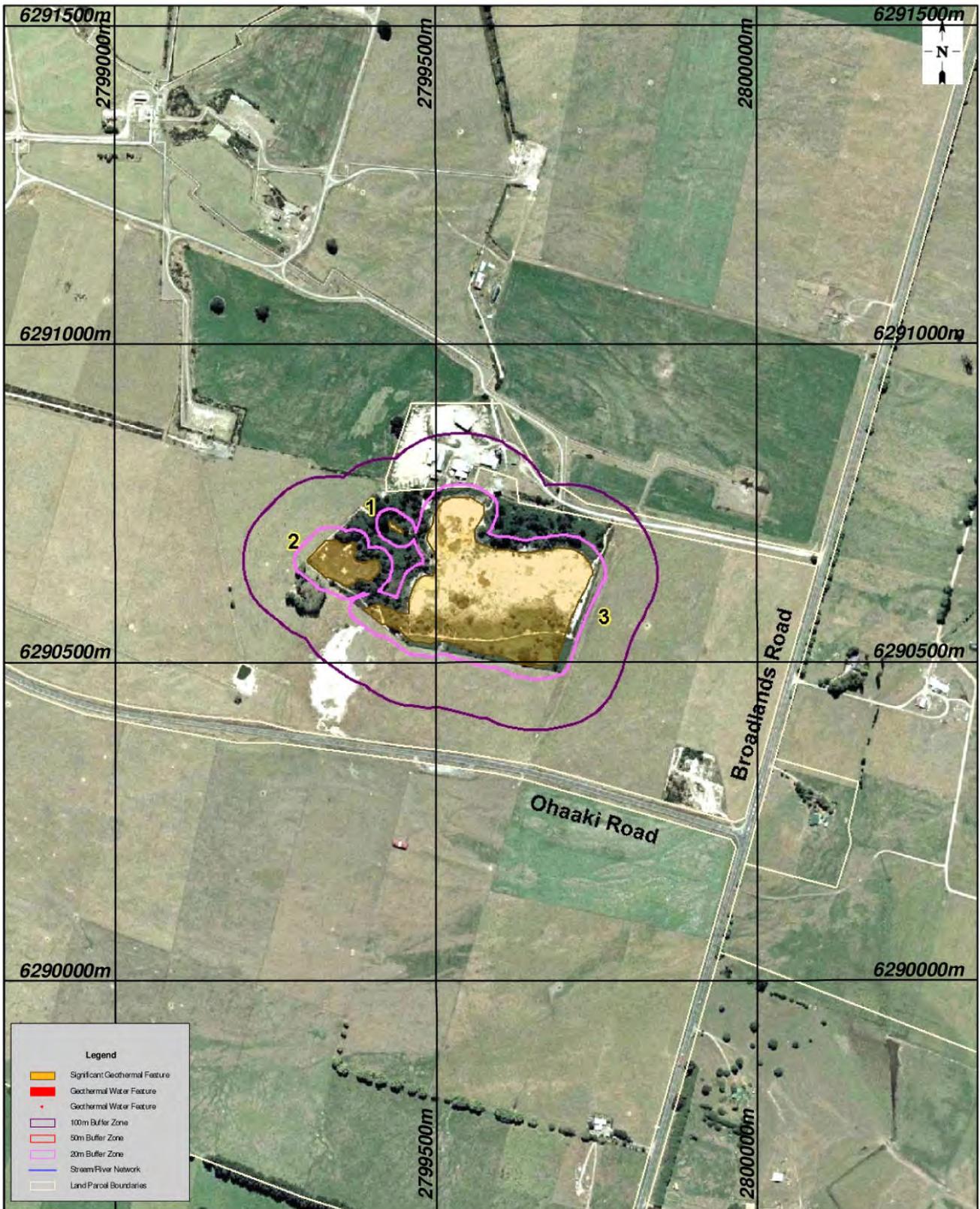
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Ohaaki - Ohaaki Steamfield East

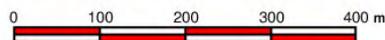


Ohaaki Steamfield East

Ohaaki Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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Ohaaki - Ohaaki Steamfield West

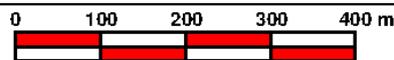


Ohaaki Steamfield West

Ohaaki Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
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Request No.: 14990
 File name: S:GIS_Jobst.....



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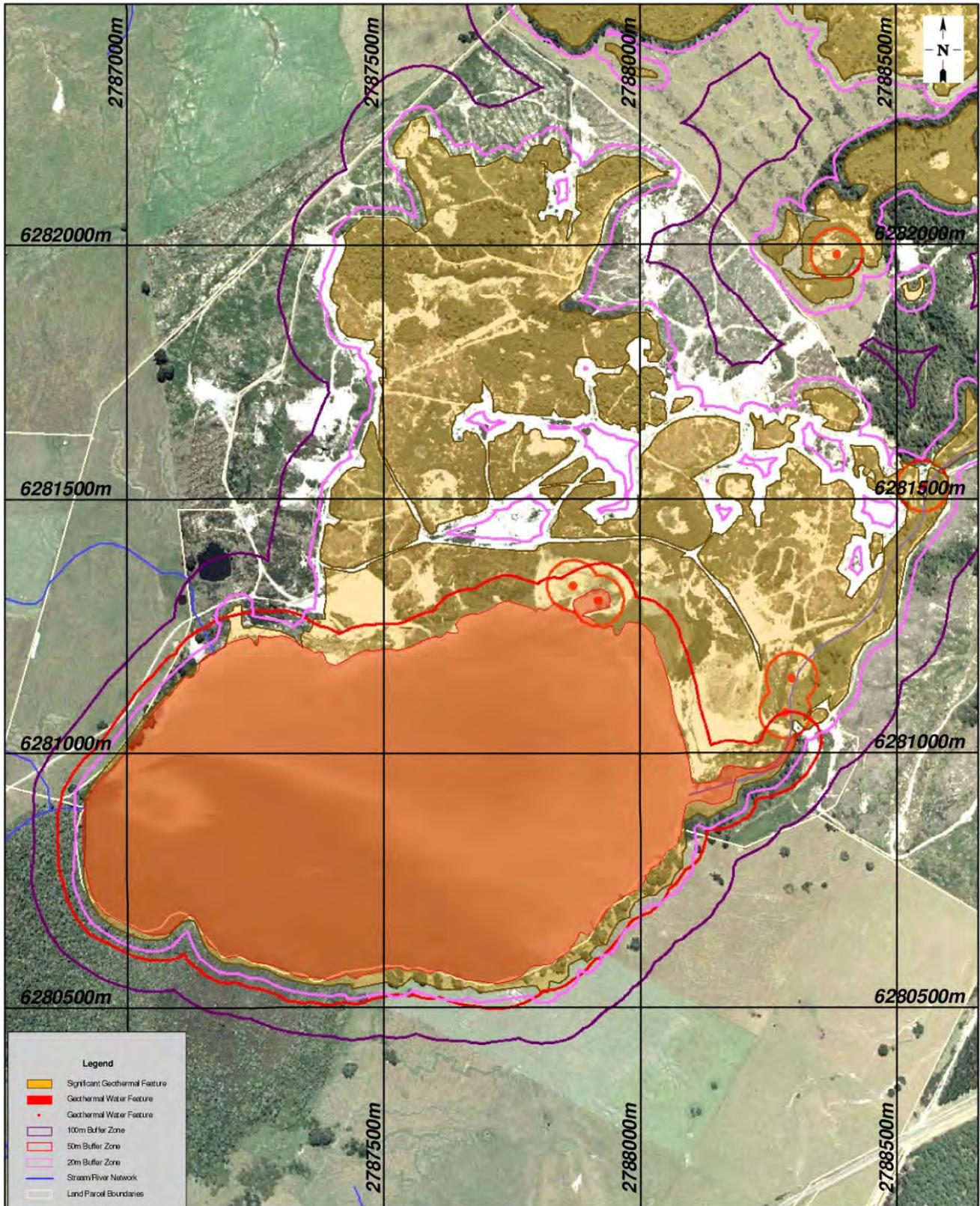
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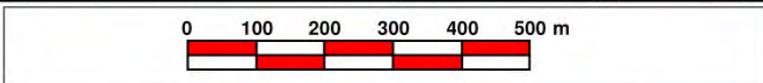
Rotokawa - Lake Rotokawa



Lake Rotokawa
 Lake Rotokawa Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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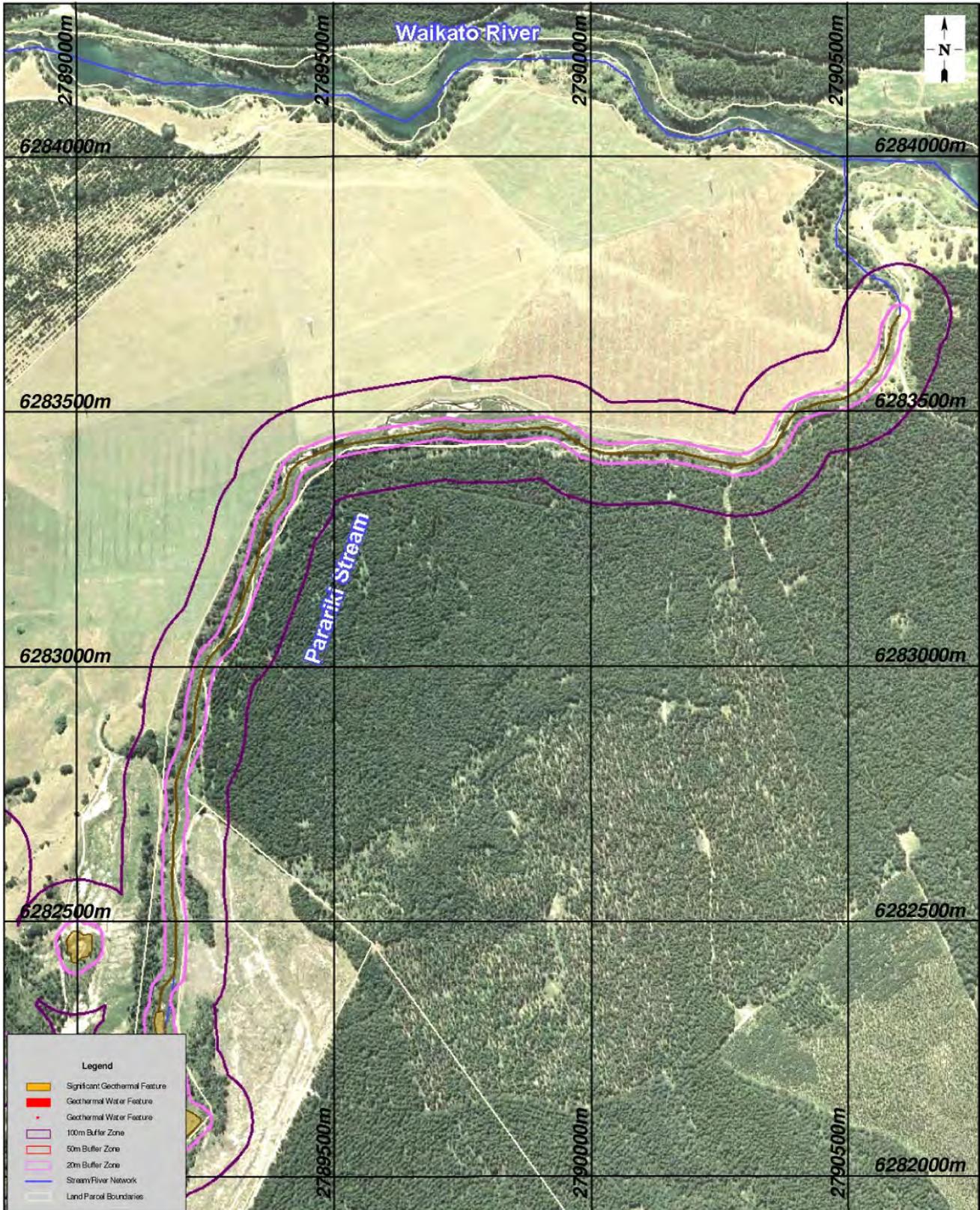
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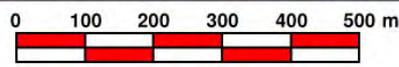


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Rotokawa - Parariki Stream



Parariki Stream
 Lake Rotokawa Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007



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 Projection: NZMG
 Date: March 2007

Request No.: 14990
 File name: S:GIS_Jobs\.....

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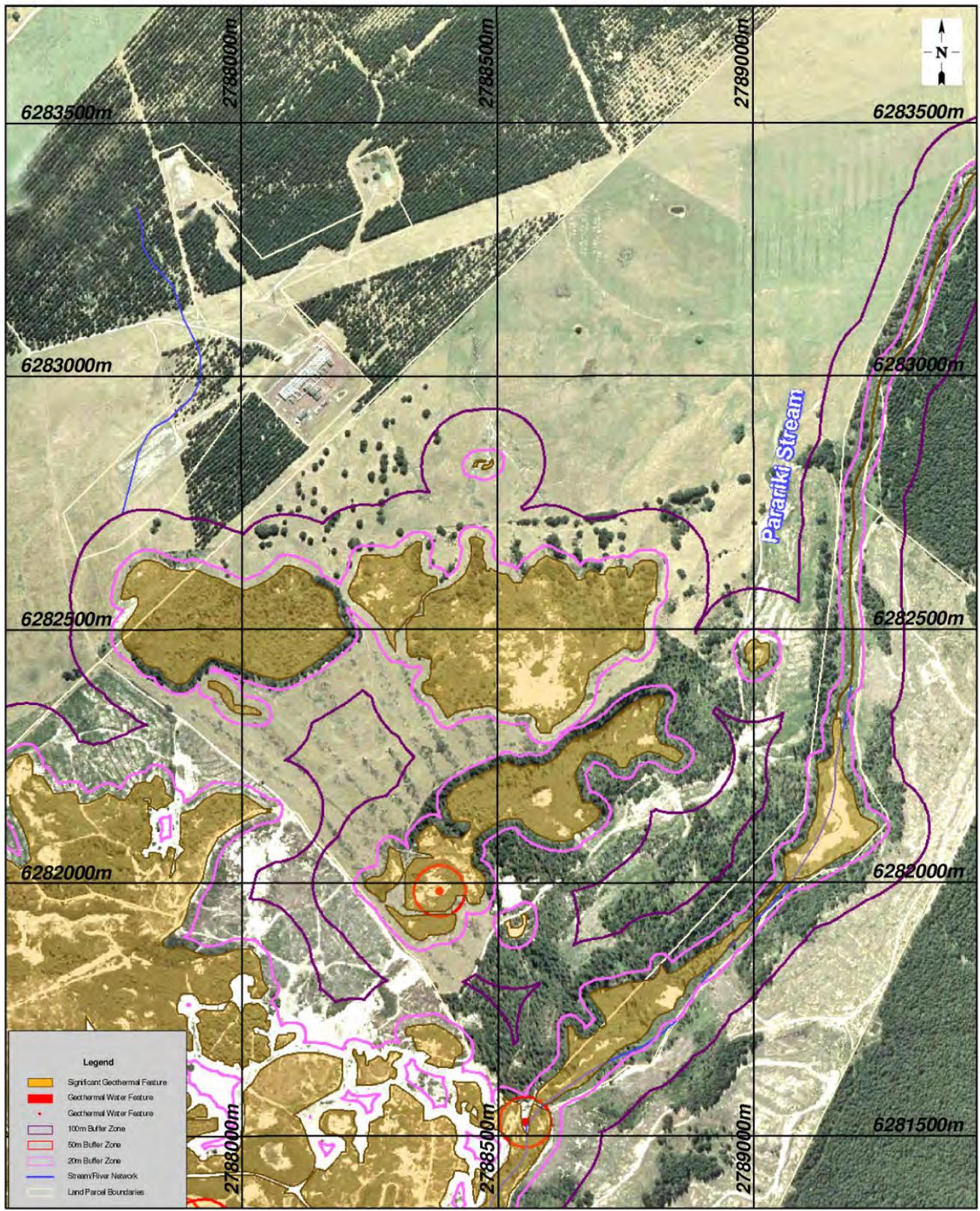
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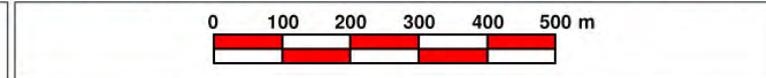
Rotokawa - Rotokawa North



Rotokawa North
 Lake Rotokawa Geothermal System
Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
 File name: S:GIS_Jobs\.....



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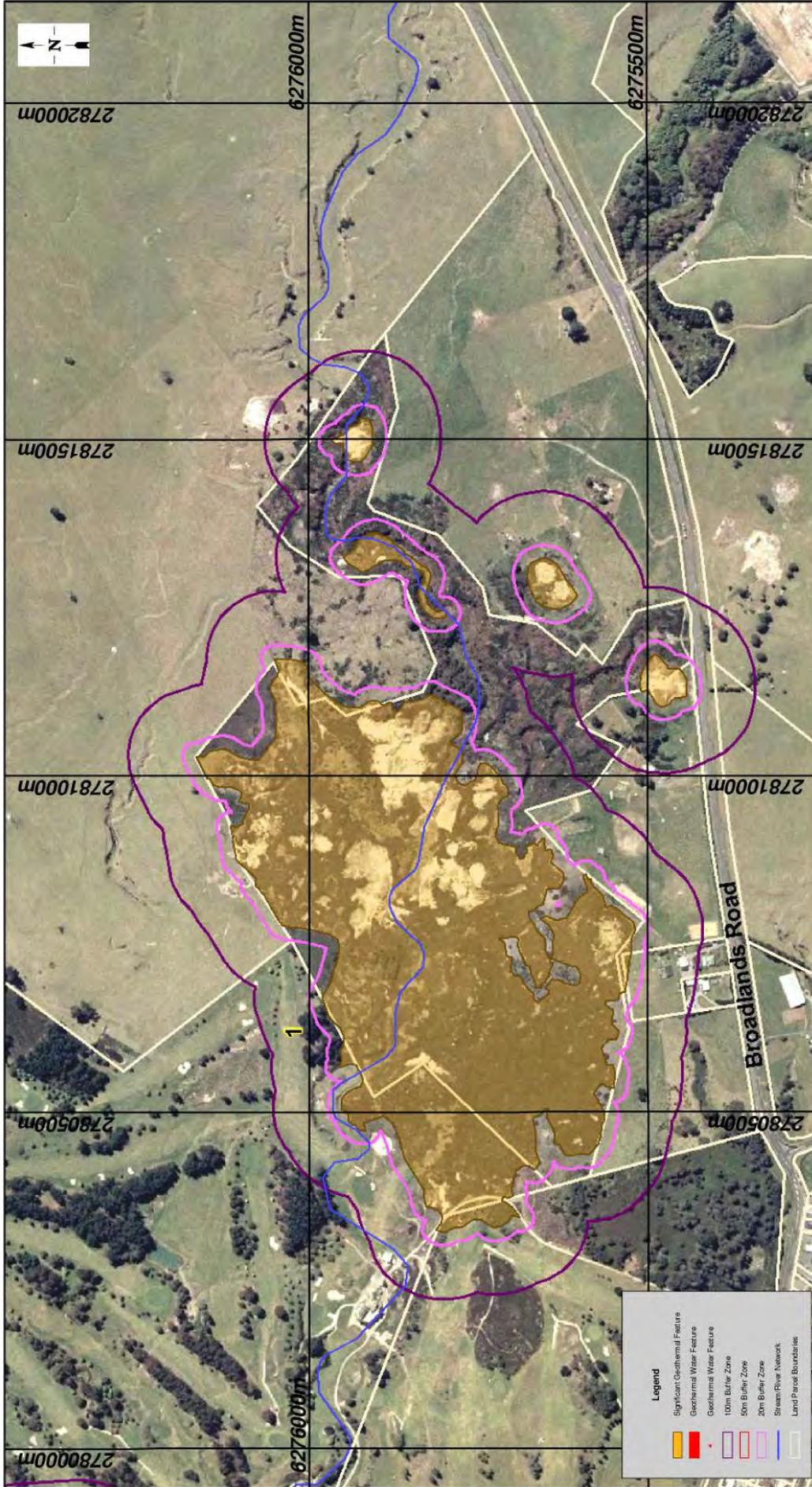
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Wairakei-Tauhara - Broadlands Rd



Broadlands Road Reserve
Wairakei - Tauhara Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

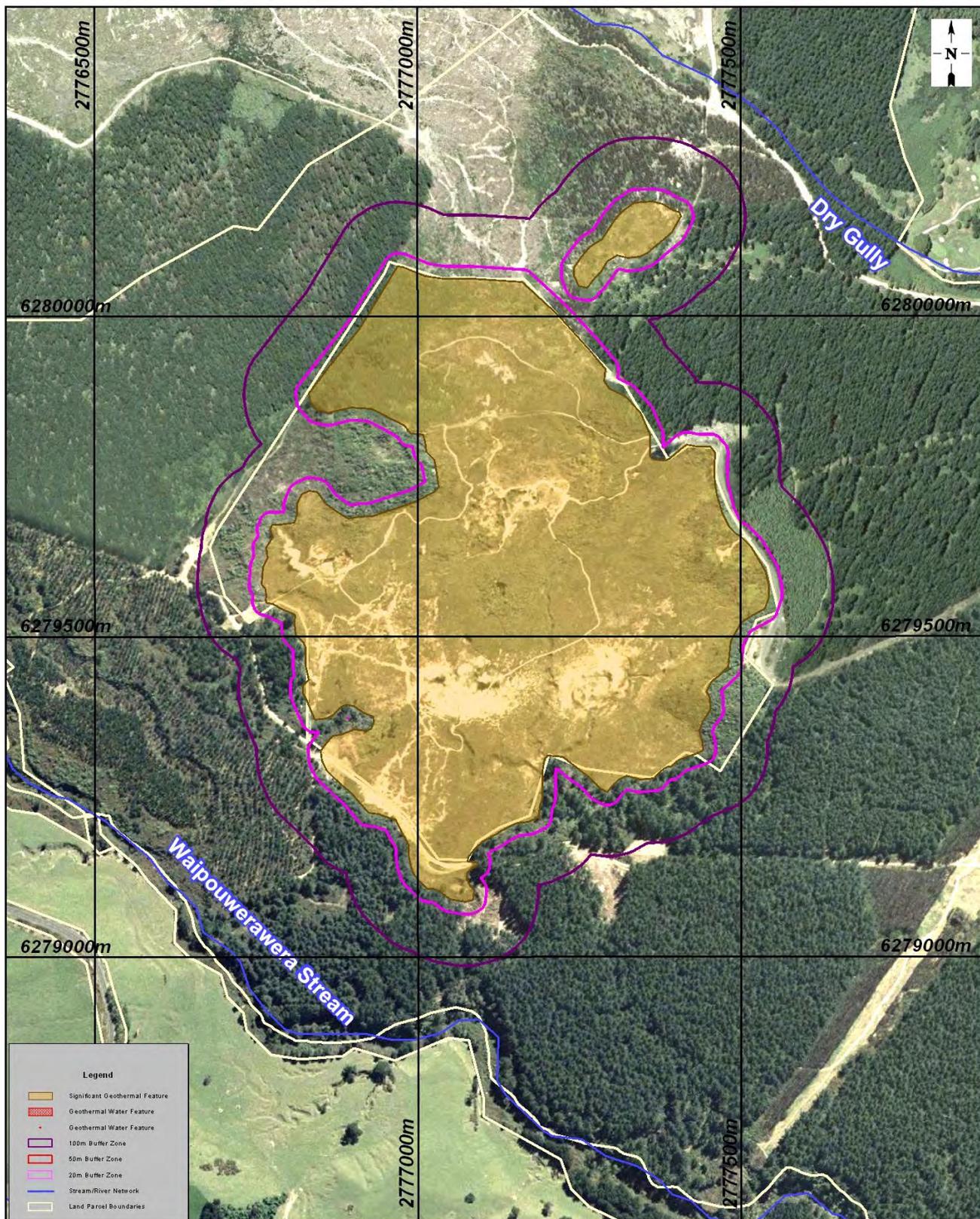
A4

0 100 200 300 400 m

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Projection: NZMG
Date: March 2007

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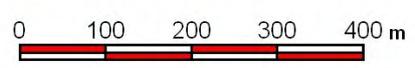
Wairakei-Tauhara - Craters of the Moon



Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Craters of the Moon
 Wairakei - Tauhara Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, March 2009



A4

Created by: HCE
 Projection: NZMG
 Date: March 2009

Request No.: 14990
 File name: S:GIS_Jobs\.....

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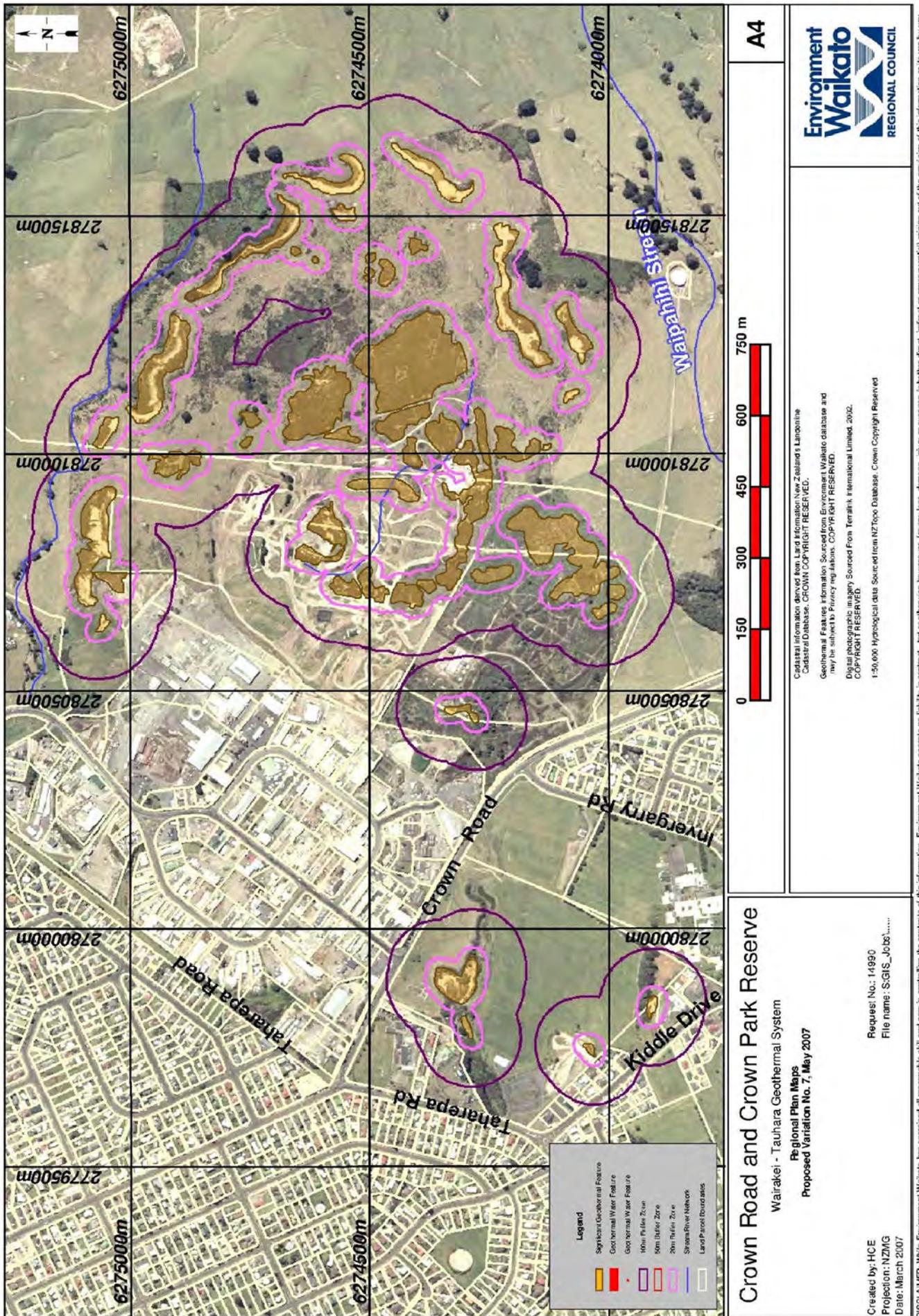
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Wairakei-Tauhara - Crown Rd and Crown Park Reserve



Crown Road and Crown Park Reserve
 Wairakei - Tauhara Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Request No.: 14990
 File name: SGIS_J06b.....

Created by: HCE
 Projection: NZMG
 Date: March 2007

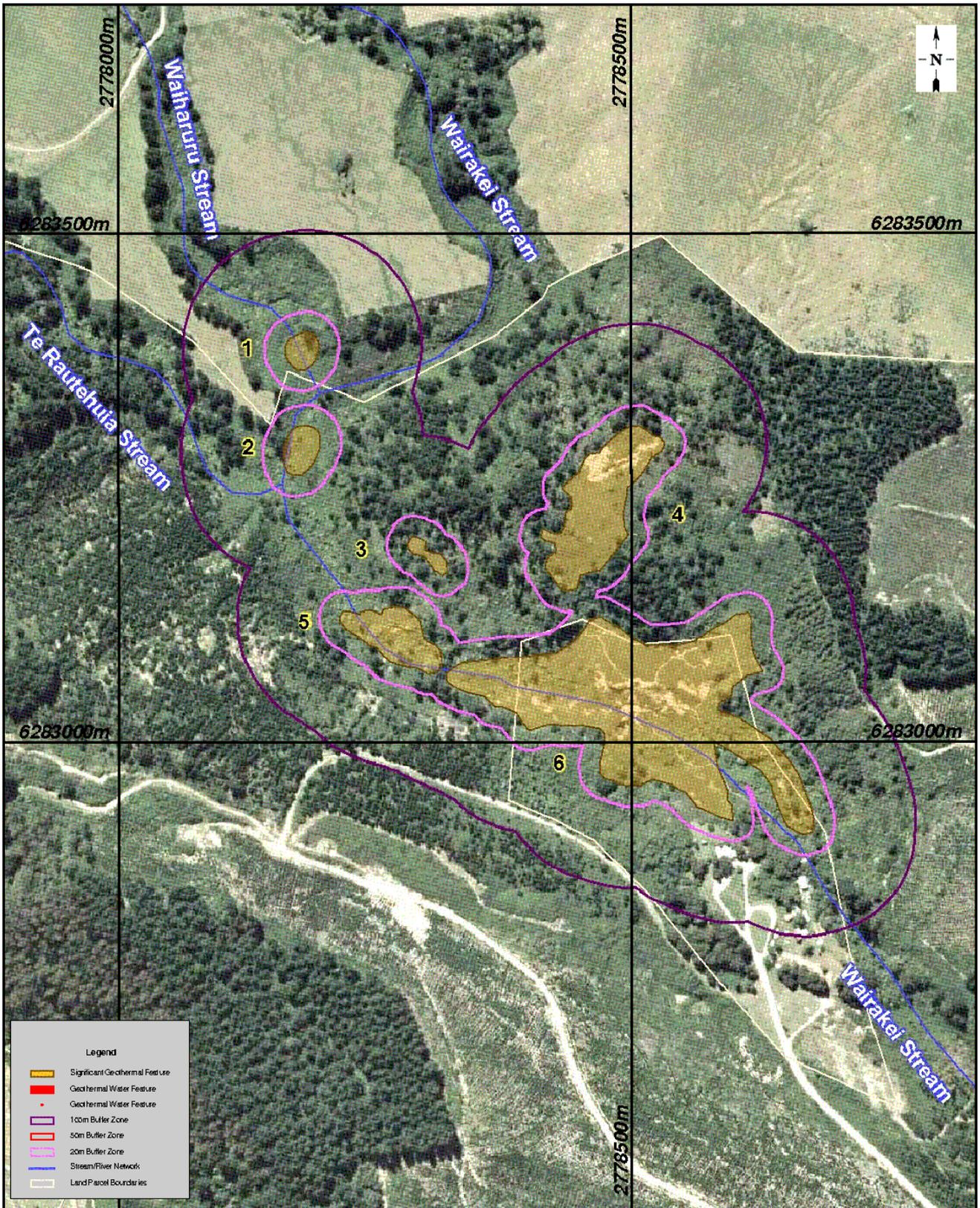


0 150 300 450 600 750 m

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Wairakei-Tauhara - Geysir Valley



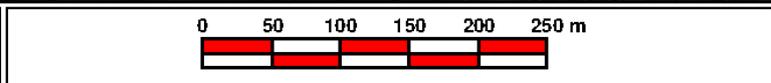
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Geyser Valley
Wairakei - Tauhara Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

Created by: HCE
Projection: NZMG
Date: March 2007

Request No.: 14990
File name: S:GIS_Jobs\.....



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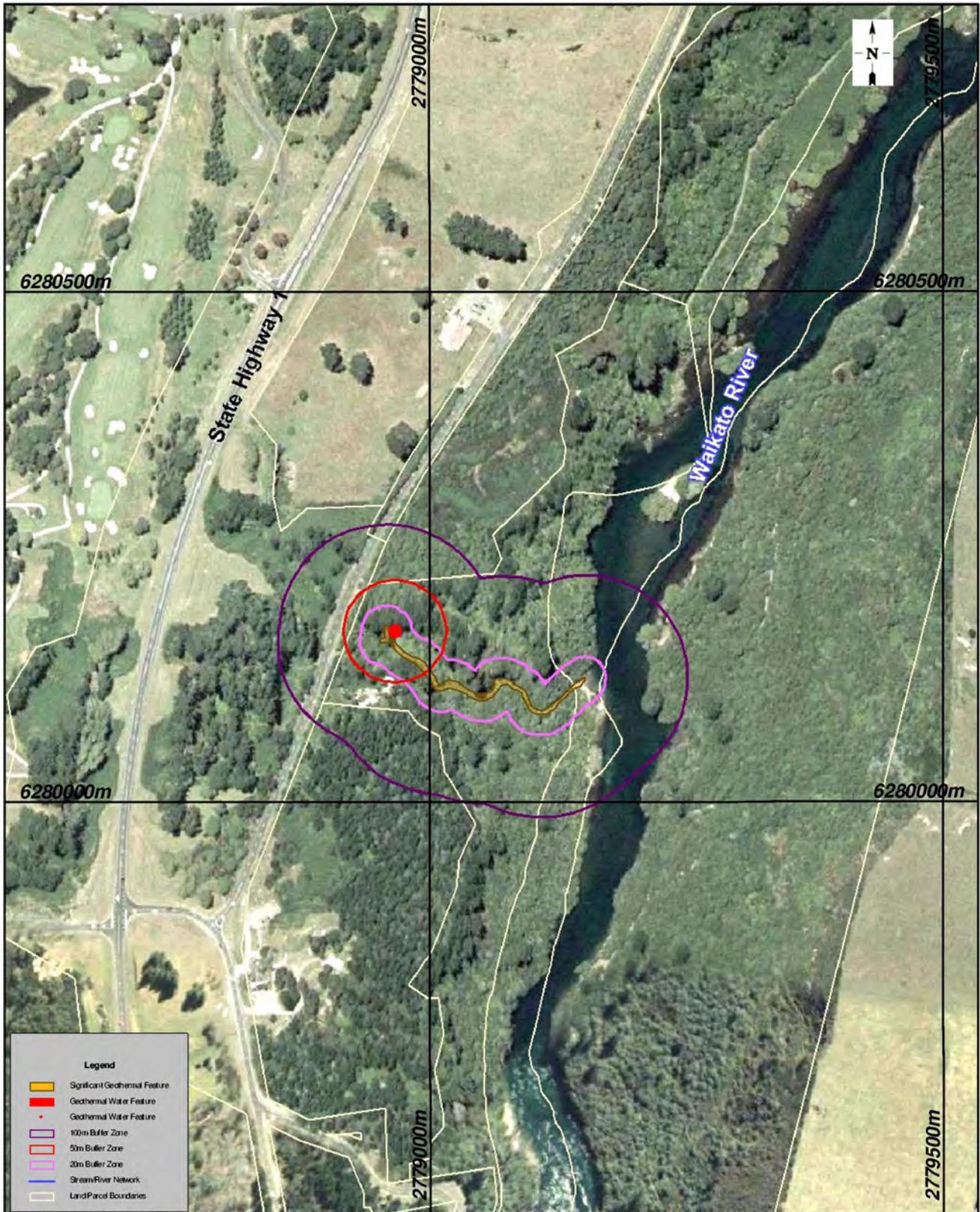
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Wairakei-Tauhara - Hall of Fame Stream



Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

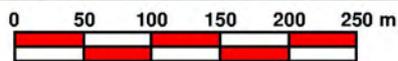
Hall of Fame Stream

Wairakei - Tauhara Geothermal System

Regional Plan Maps
Proposed Variation No. 7, May 2007

Created by: HCE
Projection: NZMG
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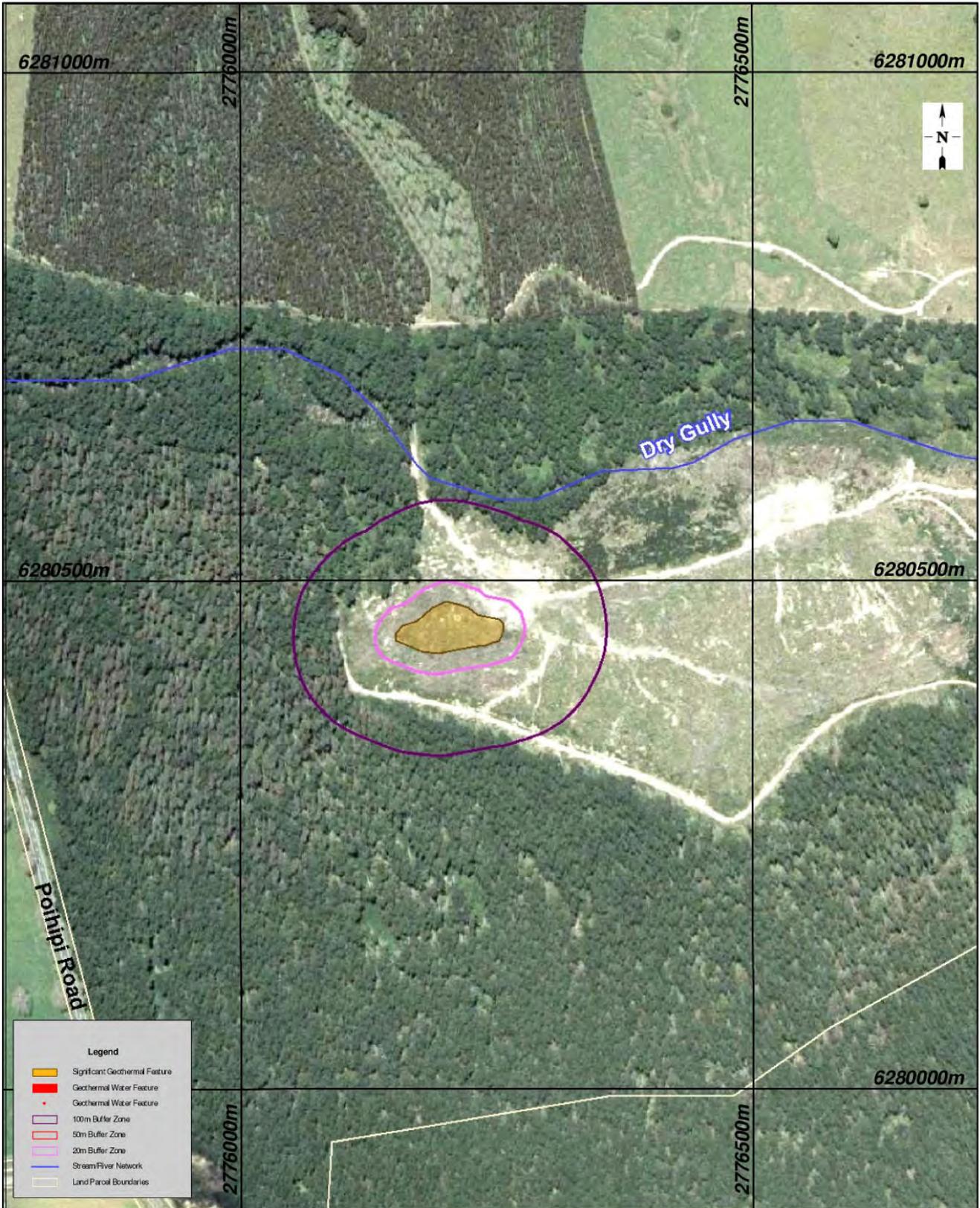
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Wairakei-Tauhara - Karapiti Forest



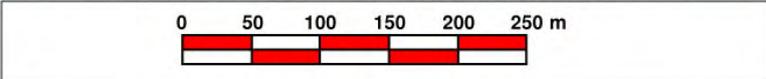
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Karapiti Forest
 Wairakei - Tauhara Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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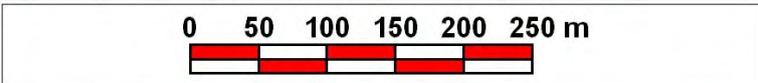
Wairakei-Tauhara - Lower Wairakei Stream



Lower Wairakei Stream
 Wairakei - Tauhara Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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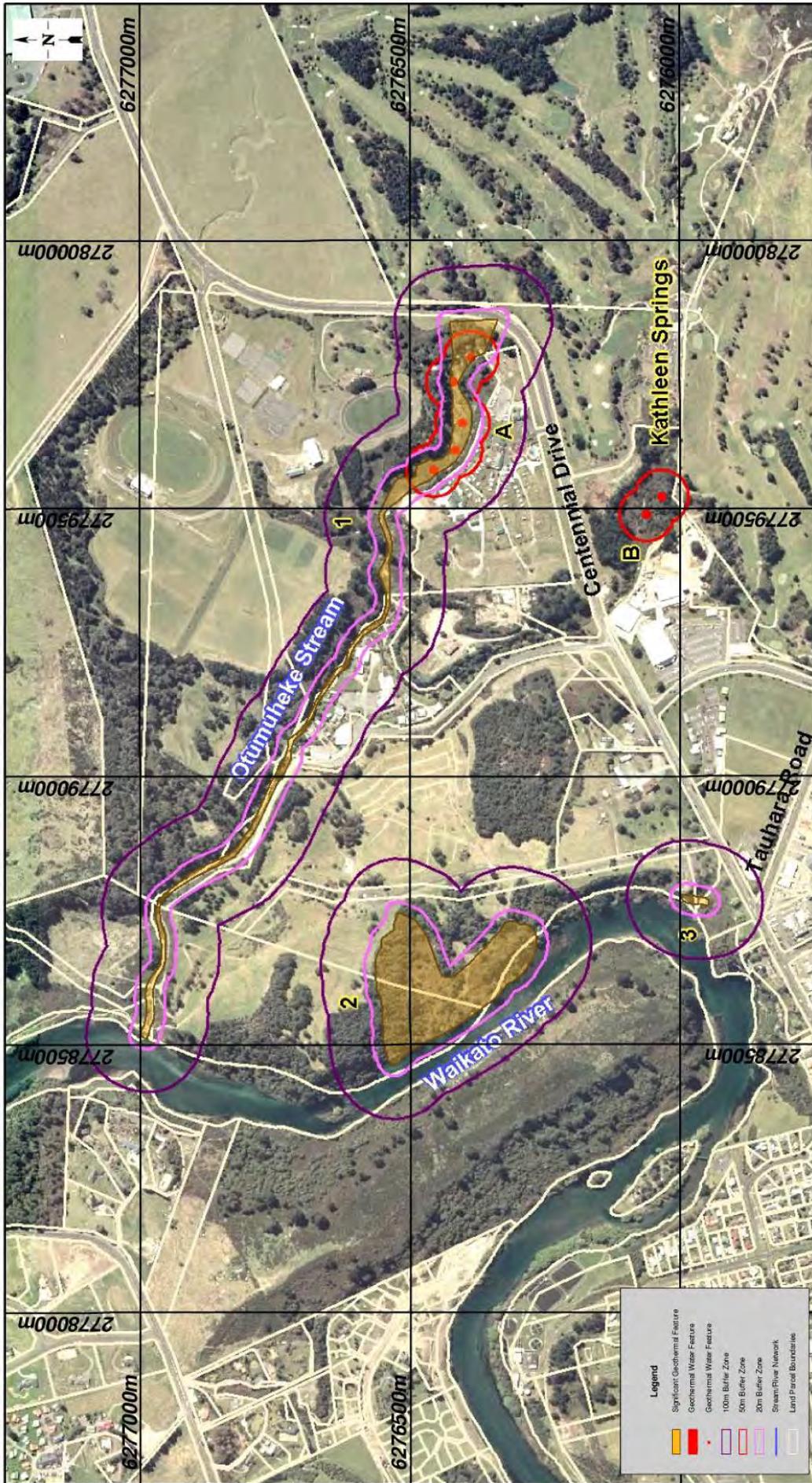
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Wairakei-Tauhara - Otumuheke Stream and Spa Park



Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Environment Waikato
REGIONAL COUNCIL

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Wairakei - Tauhara Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

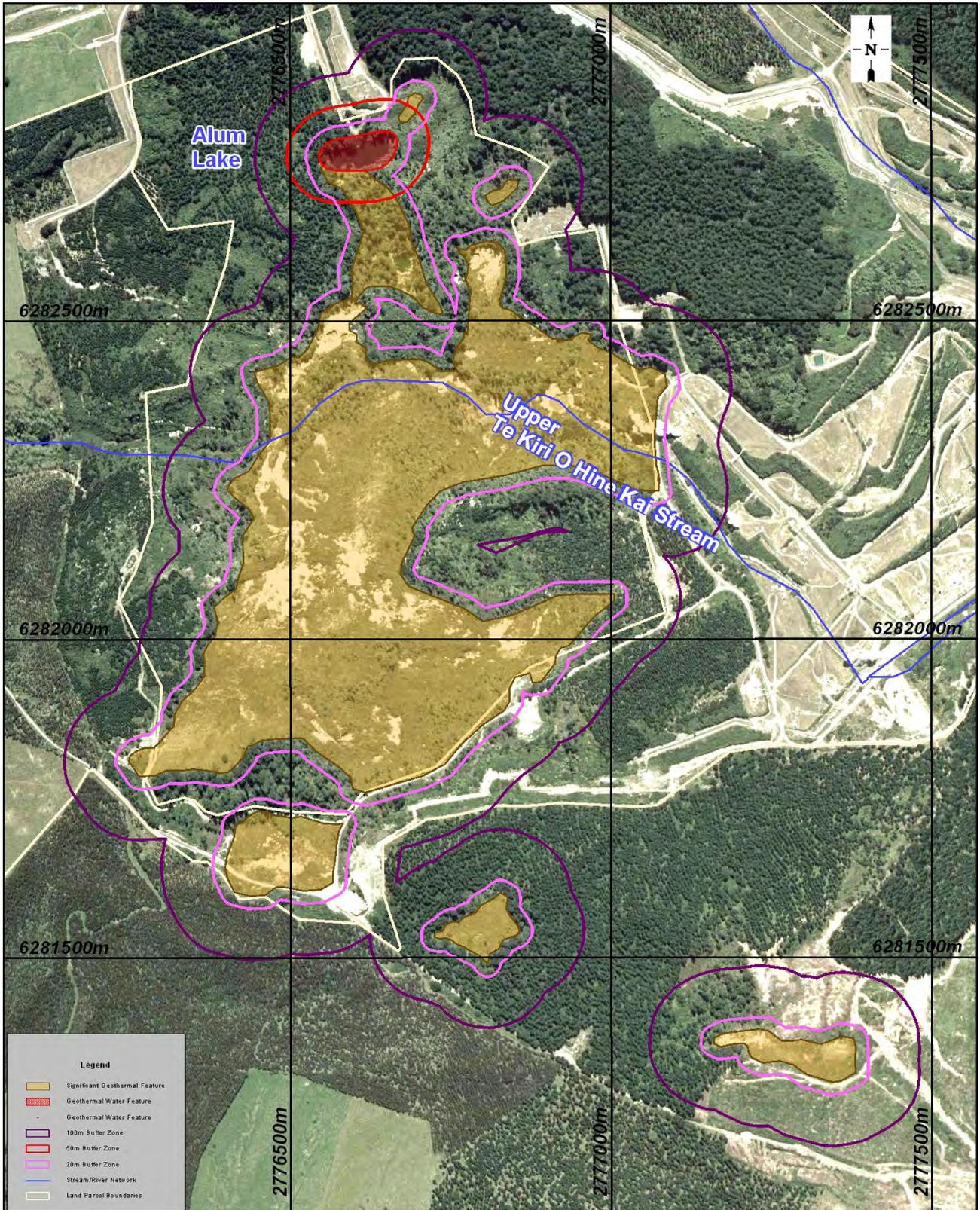
Request No.: 14990
File name: S.GIS_Jobs\.....

Otumuheke Stream and Spa Park

Created by: HCE
Projection: NZMG
Date: March 2007

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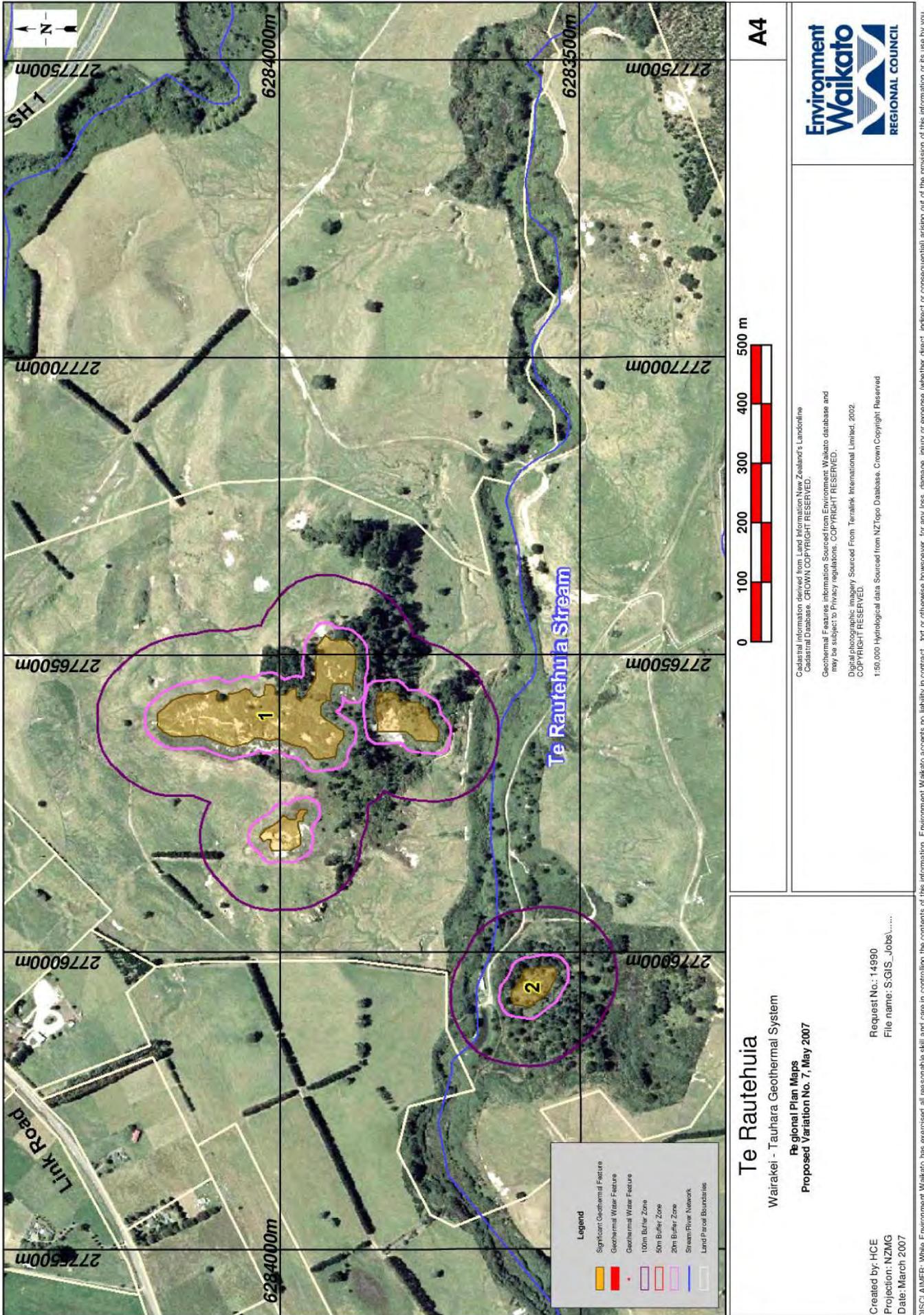
Wairakei-Tauhara - Te Kiriohinekai Stream and Waiora Lakes



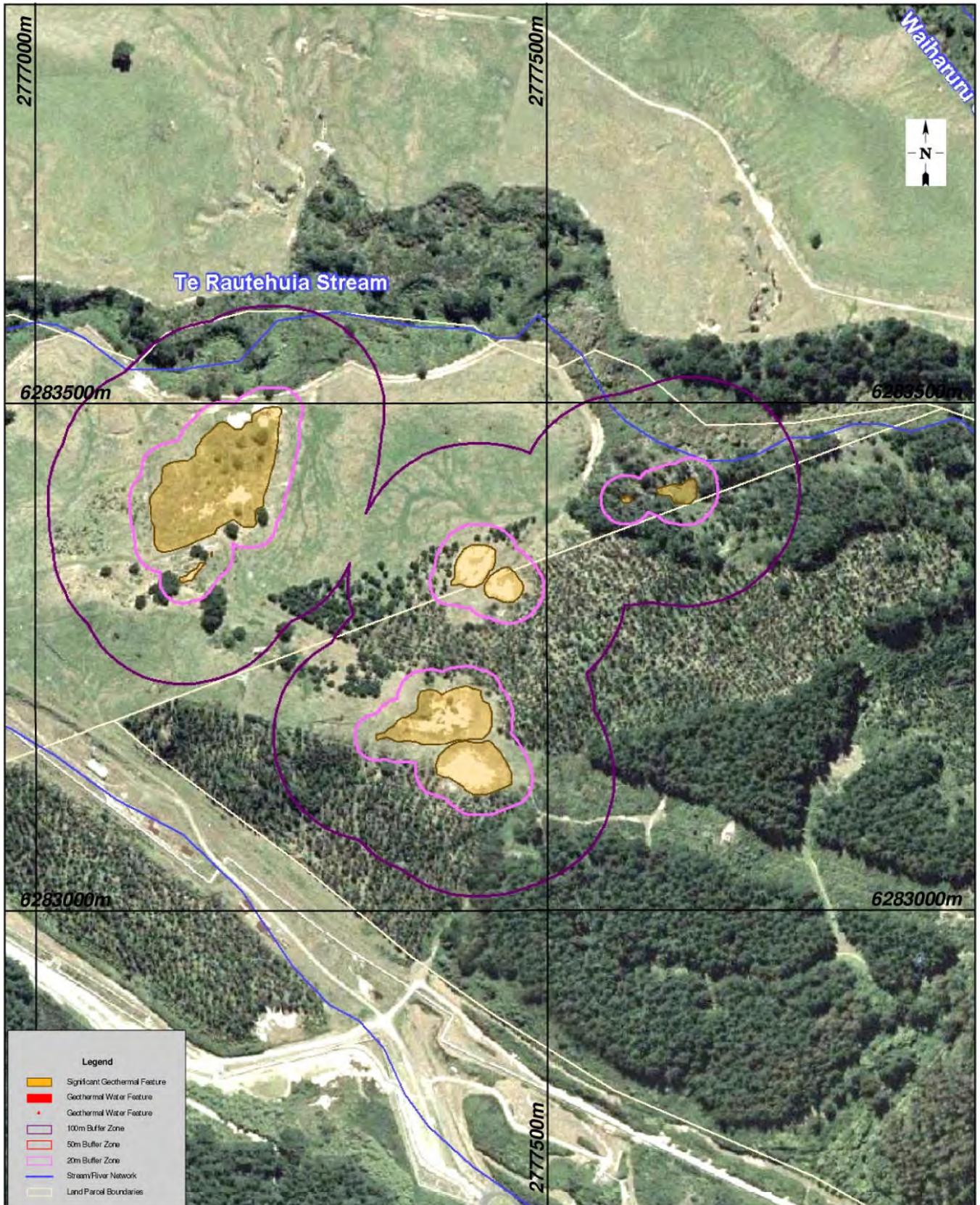
<p>Te Kiri O Hine Kai Stream and Waiora Lakes</p> <p>Wairakei - Tauhara Geothermal System</p> <p>Regional Plan Maps Proposed Variation No. 7, March 2009</p> <p>Created by: HCE Projection: NZMG Date: March 2009</p> <p>Request No.: 14990 File name: S:GIS_Jobst.....</p>	<p>0 100 200 300 400 500 m</p>	<p>A4</p>
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Wairakei-Tauhara - Te Rautehuia



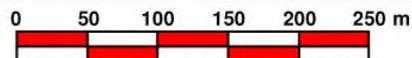
Wairakei-Tauhara - Te Rautehuia Stream



Te Rautehuia Stream

Wairakei - Tauhara Geothermal System

Regional Plan Maps
Proposed Variation No. 7, May 2007



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Created by: HCE
Projection: NZMG
Date: March 2007

Request No.: 14990
File name: S:GIS_Jobs\.....

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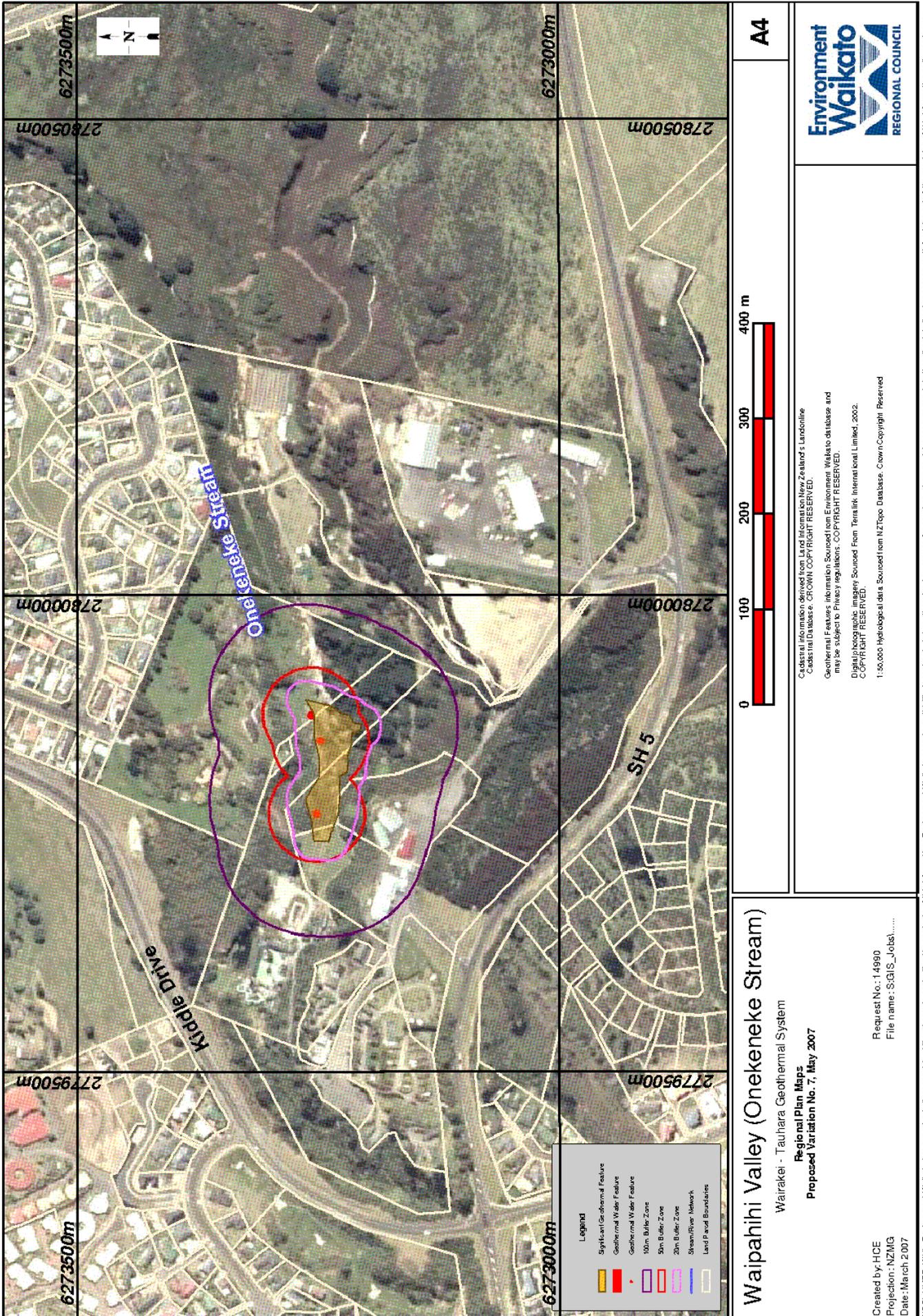
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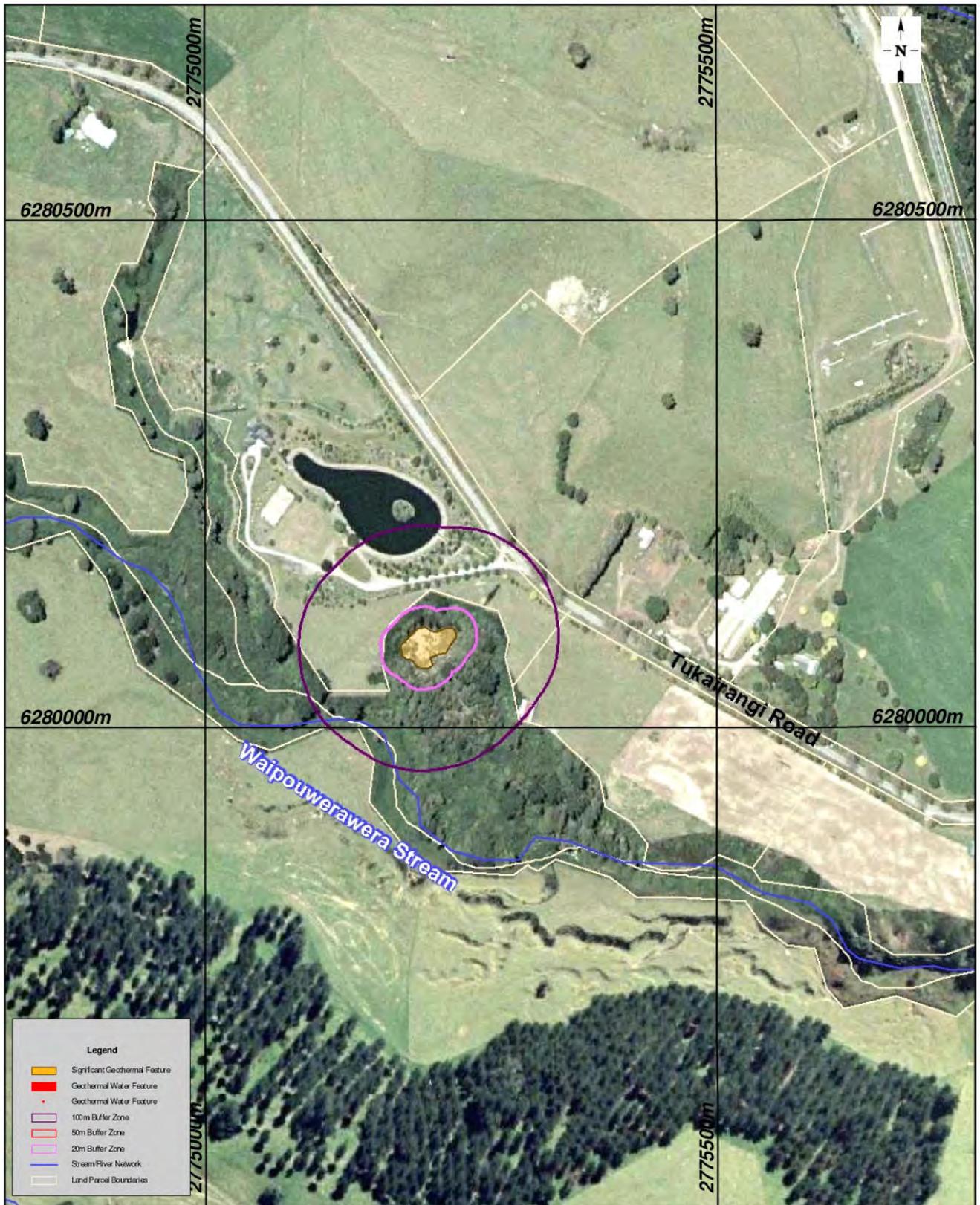
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Wairakei-Tauhara - Waipahihi



Wairakei-Tauhara - Waipouwerawera



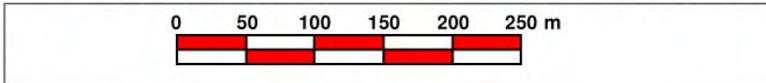
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Waipouwerawera (Tukairangi)
 Wairakei - Tauhara Geothermal System
 Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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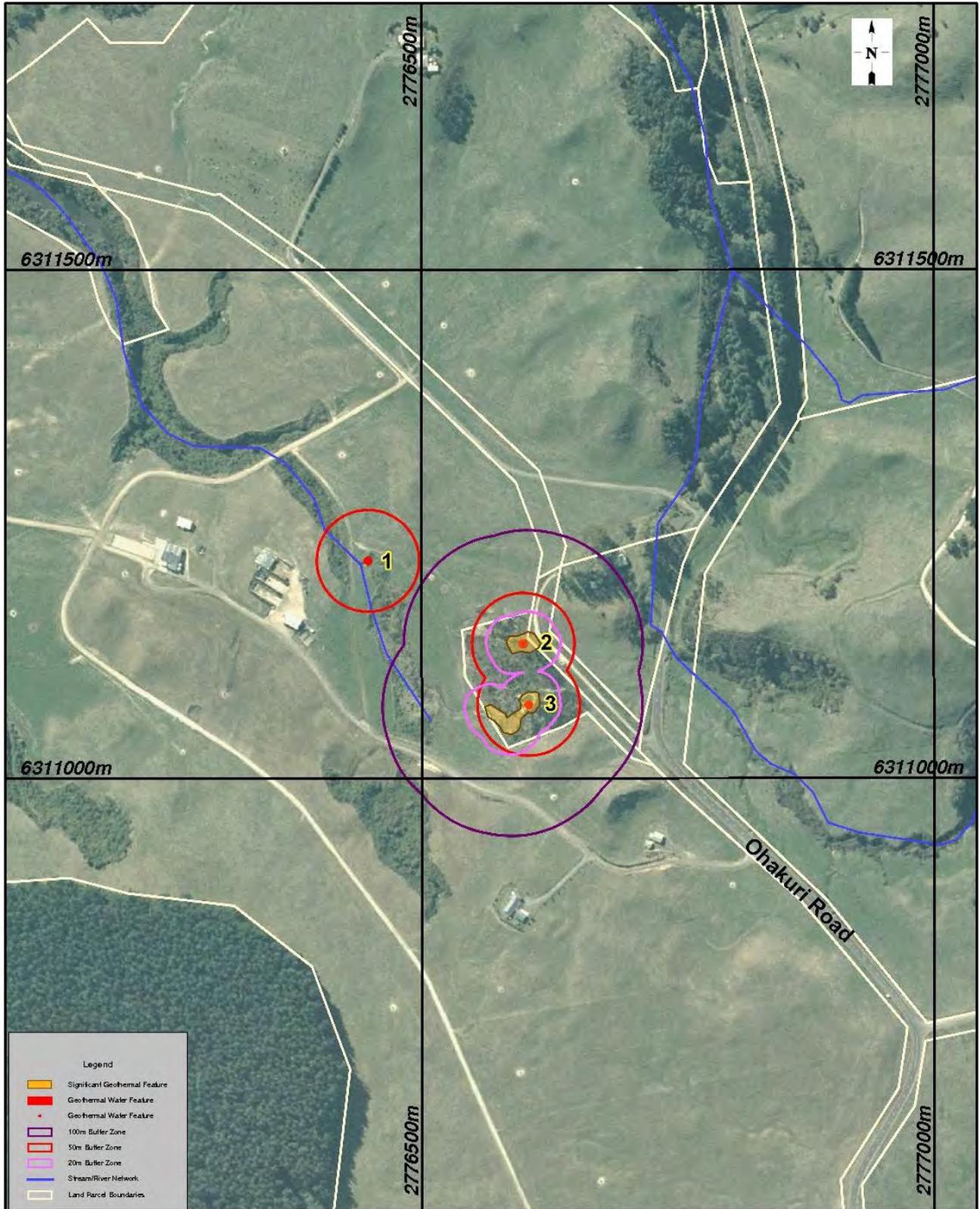
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7.10.2 Significant Geothermal Features and Geothermal Water Features in Limited Development Geothermal Systems

List of Maps

Limited Development Geothermal System	Location and identifiers (where applicable) of Significant Geothermal Features	Identifiers (where applicable) of Geothermal Water Features
Atiamuri	Whangapoa Springs (1 – 3)	1 – 3
Tokaanu-Waihi-Hipaua	Maunganamu	No GWFs
	Tokaanu Domain	1 - 16
	Hipaua Steaming Cliffs	No GWFs

Atiamuri - Whangapoa Springs



Legend

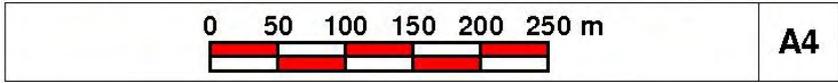
- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Whangapoa Springs
Atiamuri Geothermal System

Regional Plan Maps
Proposed Variation No. 7, May 2007

Created by: HCE
Updated by: IK
Projection: NZMG
Date: June 2009

Request No.: 14990
File name: S:GIS_Jobs\.....



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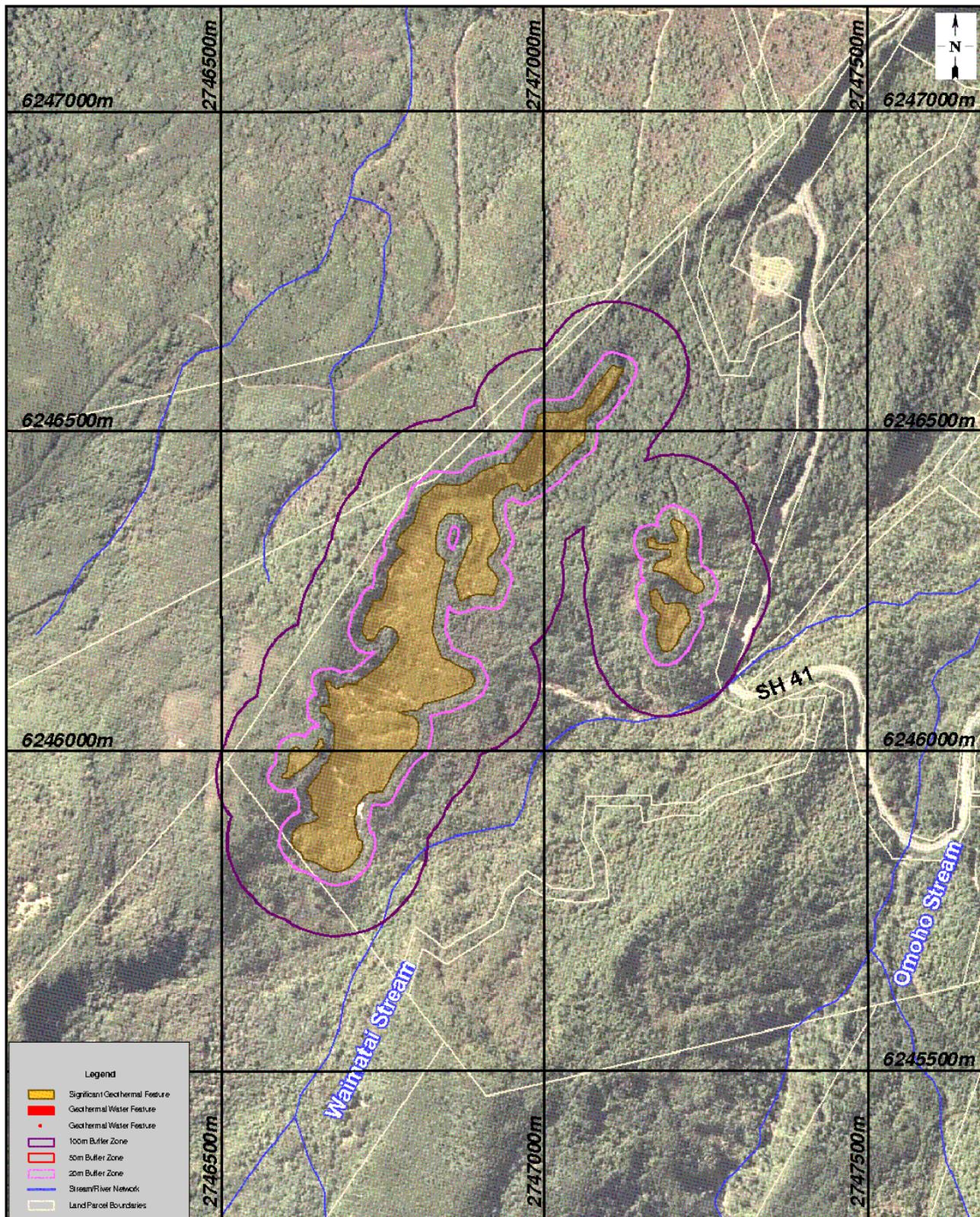
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Tokaanu – Waihi – Hipaua – Hipaua Steaming Cliffs



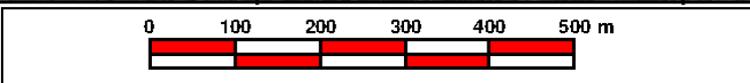
Legend

- Significant Geothermal Feature
- Geothermal Water Feature
- Geothermal Water Feature
- 100m Buffer Zone
- 50m Buffer Zone
- 20m Buffer Zone
- Stream/River Network
- Land Parcel Boundaries

Hipaua Steaming Cliffs
 Tokaanu - Waihi - Hipaua Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

Created by: HCE
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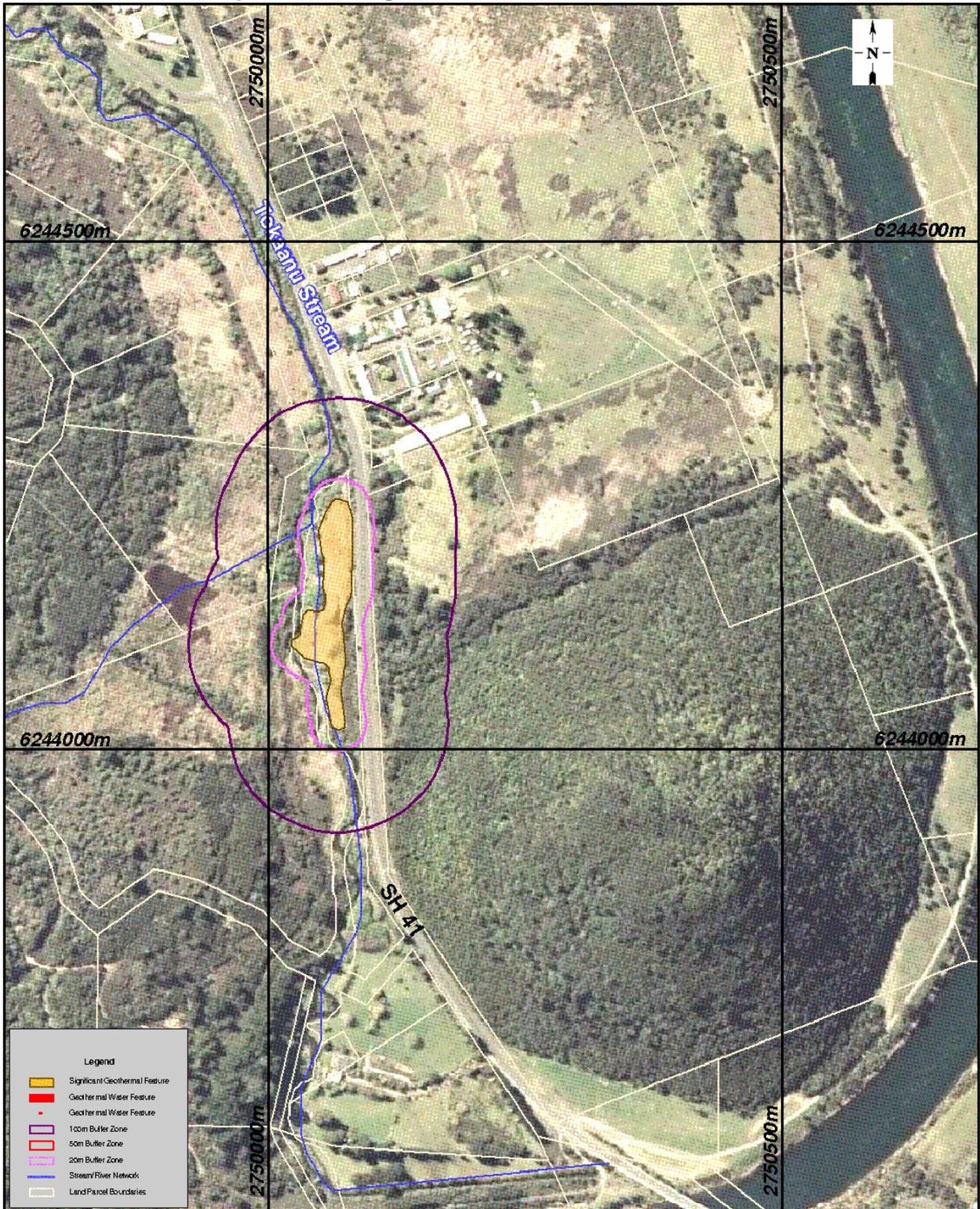
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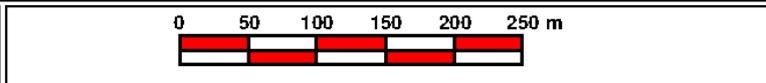
Tokaanu – Waihi – Hipaua – Maunganamu



Maunganamu
 Tokaanu - Waihi - Hipaua Geothermal System
Regional Plan Maps
 Proposed Variation No. 7, May 2007

Created by: HCE
 Projection: NZMG
 Date: March 2007

Request No.: 14990
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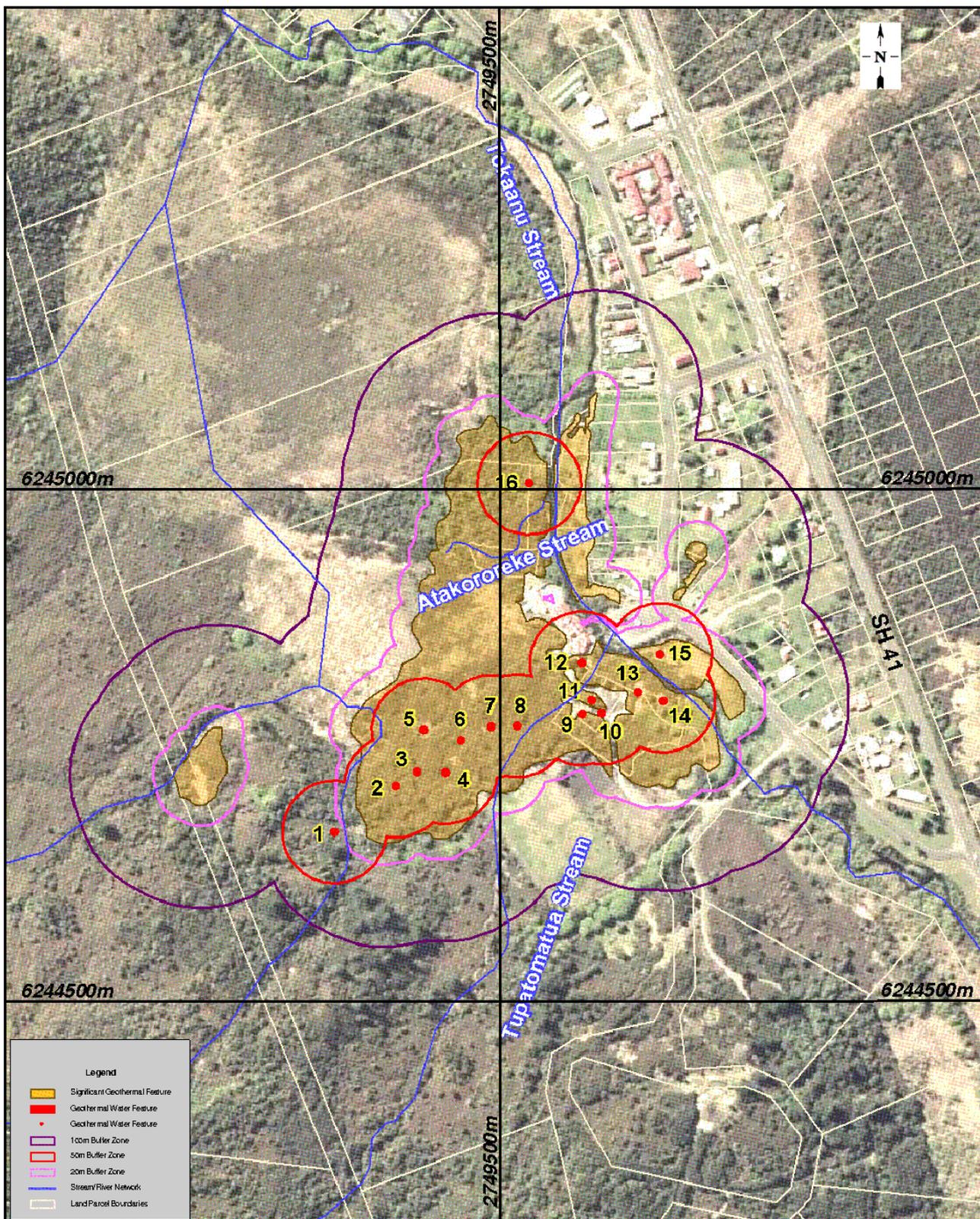
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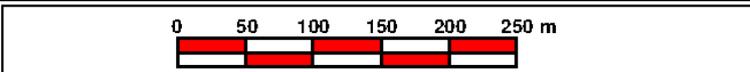
Tokaanu – Waihi – Hipaua – Tokaanu Domain



Tokaanu Domain
 Tokaanu - Waihi - Hipaua Geothermal System
Regional Plan Maps
Proposed Variation No. 7, May 2007

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