Environment Bay of Plenty
REGIONAL COUNCIL

Rotorua Geothermal Regional Plan Review

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1 Executive Summary

A review of the efficiency and effectiveness of the provisions of the Rotorua Geothermal Regional Plan ("the Plan" or "RGRP") has been carried out under sections 35(2)(a) and 79 of the Resource Management Act 1991.

This review identifies that the plan has worked well in achieving its goals for restoring the Rotorua geothermal system to an equilibrium state that supports the surface features.

The review is in two parts, the main report being a view of the plan as a whole; how successful it had been at efficiently and effectively achieving its goals. The annex to the report takes a line by line look, within each chapter, to assess the value of each provision.

The review also advises that now that the Rotorua geothermal system is in equilibrium condition, the recommended next step is to amend the plan provisions to provide for greater efficiency of allocation and use of the available resource. The suggested course of action is that these amended regulatory provisions would be incorporated into the Regional Water and Land Plan, and that consideration should be given to the development of a non-regulatory management plan for the Rotorua geothermal system to support the regulatory provisions.

2 Introduction

Bay of Plenty Regional Council must formally review the Rotorua Geothermal Regional Plan no later than 10 years from the date it became operative (Section 79 of the Resource Management Act 1991 (RMA)). The Plan became operative on 1 July 1999.

This report contributes to that review by discussing the efficiency and effectiveness of the Plan. It also advises of other issues that will be relevant to future plan development and implementation (e.g. legislative amendments to the purpose and principles of the RMA, and to regional[1] and local council's functions and responsibilities).

2.1 Report Purpose

This report is to:

1 Fulfil the requirements to review the Plan (RMA section 79), including advising if the plan requires change or replacement. Such change or replacement would be done in the manner set out in Schedule 1) (79(3)(a)).

2 Assist in monitoring the efficiency and effectiveness of policies and methods of the Plan (fulfilling the requirements of RMA section 35(2A) to compile and make available to the public a review of the results of that monitoring).

[1] Appendix 2 lists regional councils' additional functions and responsibilities.

3 Background to the Rotorua Geothermal Regional Plan

Prior to the plan coming into effect, the government had recognised that the Rotorua Geothermal system was under severe stress. To revere this stress it commenced a bore closure programme. The sequence for bore closure was; firstly the government closed all bores used for heating government buildings in Rotorua. When that didn't stop the faltering of the geysers, it sought further scientific advice which resulted in the 1.5 km zone being established and private bores therein being grouted shut, with the exception of the shallow DHX systems.

So the bores that were affecting the geysers were already closed when the plan went operative. The plan confirmed the reasons behind the governments bore closure programme (the main one being maintaining the aquifer water levels) by setting the Minimum Groundwater levels (MGAWL) and confirmed the already established 1.5 km MAEZ around Pohutu by developing it into plan policy (status quo). It built on the government's work by requiring reinjection of fluid from existing bores and blocked any further mass abstraction within the 1.5 km zone.

The pre-plan resource rental regime brought in by the Ministry of Energy affected the viability of using geothermal resource. That had a dramatic effect on domestic users in particular. The resource rental requirements possibly caused more (mainly smaller domestic) bores to be shut than the original bore closure programme. There was certainly a significant shift towards the commercial (hotels, motels and pools) use of geothermal resource, because they could recover costs.

3.1 Purpose of the Plan

The purpose of the Rotorua Geothermal Regional Plan purpose was to take the Rotorua system from a state of over-extraction to one of stable equilibrium. In the words of the plan it was: "to promote the integrated and sustainable management of the Rotorua geothermal resource with all the other resources in the Rotorua environment".

It achieved this by identifying a fluid and heat take limit, set at a level that allowed the surface features to function. There is a much tighter degree of control within a 1.5 km limit of the main surface features of great intrinsic value and tourist interest. All allocation is constrained to the limits of a fluid volume envelope which has been defined by monitoring and modelling the resource.

The main policies required:

- Retention of the 1.5 km radius mass abstraction exclusion zone around Pohutu Geyser to protect the outstanding geothermal features at Whakarewarewa;
- No net increase in fluid abstraction in from the field. This has been set at the mass extraction level for 1992 as the maximum permitted for the field (4,400 tonnes per day for the field);

- Reinjection of all abstracted fluid - additional tonnes of fluid have been able to be allocated through reinjection, while still allowing a recovery in water level;
- Setting of strategic water levels in the geothermal aquifer to sustain geothermal surface features and protect these resources into the future;
- Protection of surface features from physical destruction, restoration of outflows and the avoidance or mitigation of natural geothermal hazards.

4 Evaluation Process

The evaluation method used to monitor and review the Plan focuses heavily on an audit of the Plan by staff with responsibilities for implementing it. These include science, resource consent, and compliance staff. Information was also drawn from Bay of Plenty Regional Council publications, technical reports and state of the environment reports.

The report has not sought the views of those directly affected by the implementation of the plan. While that exercise would have added robustness to the assessment, it would have also been a costly exercise. If the success of the plan had been in doubt, it would have been valuable to have this contribution, to see how it further informed the outcome. In the case of this plan where the results are clear, it was considered that the effort will be better spent on the next phase of plan development rather than reconfirming the impact of this plan on different groups of people.

There are two comprehensive monitoring reports that explicitly show the monitoring results that confirm the effect of the plan provisions on the system recovery. These are:

- BOPRC (2001) Gordon, D. O'Shaughnessy, B. Rotorua Geothermal Field Management Monitoring. ISSN 1172 - 5850

- BOPRC (2005) Gordon, D. Scott, B J. Mroczek, EK. Rotorua Geothermal Field Management Monitoring Update: 2005. ISSN 1175 - 9372

The executive summary of the latter notes:

Geothermal aquifer monitor bores (M series) for the system have shown water level increases of 0.5 m between 1992-1999. This cannot be accounted for by variations in rainfall, but may possibly be caused by changes in usage, which occurred subsequent to the bore closures. From 1999 to 2004 water levels in monitor bores shows some short term variations but this is consistent with a stable pattern of geothermal aquifer pressures reaching equilibrium.

Temperature profile monitoring also shows no systematic change apart from the profile for M9, which shows general warming of about 5ºC since 1992. This would result in a water level change of about 0.1 m compared to the 1m of water level change that has been observed in this monitor bore from 1992 to 1998.

Surface feature monitoring has indicated that the recovery of surface features has been a lot slower than the immediate response of aquifer pressure after bore closure. The period from 1992 - 2001 displayed the greatest period of surface feature recovery, including the sudden reactivation of surface features in the northern system (Kuirau Park) in 1998. In the southern part of the system recovery has been mixed. Several features show positive changes, increased flows and temperatures. The primary geysers are erupting for longer periods, while some adjacent geysers have stopped erupting. The results of recent chemical sampling reflect similar variation of positive and negative changes.

As the system extraction/reinjection has been relatively steady since 2001, with a slight increase in reinjection it is likely that many of the surface features are now displaying aspects of their natural variability. Across the system there has been recovery, but this is not consistent. Features that responded quickly to the bore closures have not always remained hot or flowing. Many other features have been slow to show responses to the aquifer recovery. A possible explanation for the non-recovery of some features is that hydrothermal alteration processes may have damaged the feeder conduit systems.

Recent geochemical studies of selected surface features and bores shows that the fluids discharged in the northern area of the system at Kuirau Park now match those discharging in the early 1960s and it is likely that this part of the system is near full recovery. At Whakarewarewa, springs do not appear to be fed directly by a primary upflow and consequently the recovery has been mixed due to the influence of the hydrology between the upflow and the surface outlets.

The withdrawal of fluid from the shallow aquifers during the exploitation phase did not significantly change the composition or chemistry of the deep aquifer fluid. The shallow aquifer feeding the bores over the last decade shows relatively minor changes in reservoir chloride and small increases in heat (~16ºC). This indicates that no deleterious processes are affecting the system.

Usage patterns in the system have continued to remain stable. Total withdrawal and bore numbers have remained relatively static between 2001 and 2005. Non reinjection production now only represents 10% of the total withdrawal. This increase is a result of an increase in reinjection from 7,500 tonnes (estimated) in 2001 to approximately 8,730 tonnes in 2005. The percent of total withdrawal discharged to soakage is now only 4%.

Formal meetings seeking approval to review the Rotorua Geothermal Plan and commence a plan change suggesting the incorporation of the provisions into the Regional Water and Land Plan included:

- 23 April 2009 – Policy and Planning Committee meeting seeking approval to commence plan change and review for RGRP/RWLP.
- March 2009 – Paper to Triennial meeting re Environment Bay of Plenty alignment with Environment Waikato geothermal provisions.
- 28 April 2009 – Maori Policy Committee re review of the Rotorua Geothermal Regional Plan.

Meetings that discussed this evaluation included:

- 12 August 2009 – met with Rotorua District Council re plan and other aspects of geothermal management.
- October 2009 – Ministry of Economic Development meeting re geothermal policy in Rotorua.
- 14 October 2009 – met with geothermal geologists, chemists and geophysicists to discuss the effectiveness of the Plan as that relates to the monitoring results.
- 28 January 2010 – preliminary meeting with Te Arawa to identify future direction of the plan.

- Internal meetings with compliance, consents and science staff to discuss the effectiveness of the plan and to identify future direction of the plan.
- New Zealand Geothermal Association was also advised of the forthcoming plan review and their views sought informally.

4.1 Scope of Implementation Audit

The scope of this analysis was to assess the Bay of Plenty Regional Council and Rotorua District Council's performance in implementing the plan.

4.2 Report structure

Of the many ways that a plan can be evaluated for effectiveness, this report uses:

1 A high level assessment of:

- overall effectiveness
- plan appropriateness
- plan efficiency

2 A detailed assessment of:

- each anticipated environmental result (Appendix 1 - table)
- whether each chapter achieved its purpose (Appendix 1 - text)

The detailed assessment of how well each Anticipated Environmental Result (AER) has been achieved (Appendix 1 table), judges each AER within its chapter setting, in the context of the objectives, policies, rules and other methods.

The high level assessment draws heavily on the suggestions of "Evaluating Regional Policy Statements and Plans - A guide for regional councils and unitary authorities July 2008" Enfocus.

As a result of this assessment, the Plan provisions have been narrowed down to those that are still considered to be necessary for continued management of the Rotorua geothermal system.

It also identifies those that:

- still need to be given effect to (possibly with modification) to contribute to the ongoing effective and efficient management of the geothermal resources of the Rotorua system and
- have not been effective and need redesign to be effective.

5 Evaluation

5.1 Introduction

Policy design (was the design suitable to get the result sought), and policy delivery (did the objectives match up with outcomes on the ground) are both evaluated in this report.

Both aspects (design and delivery) are used to provide advice on what provisions continue to be useful for future Rotorua geothermal planning, and both aspects are used to assess the existing plan.

To assess effectiveness the report looks at whether the provision has been used and whether "on the ground" change has occurred as a result.

Appropriateness of:		**Assessed by:**
Policy design	Is it effective? Are its intentions concise and clear?	Analysing the policy design to see whether the issues are still relevant, whether the chapters group the issues and responses in a useful way and have objectives, policies and methods that are clearly linked, easily understood and will resolve the issue.
Intervention context	Are they still appropriate to current issues and priorities?	Analysing the provisions in the context of the achievements of the plan and therefore whether they have served their purpose. Do we need to continue with them, now that the system is in equilibrium?
Outputs	whether, and to what extent, commitments to do things have been delivered	Comparing council activities to the anticipated environmental results
Outcomes	whether, and to what extent, what is sought through objectives and/or environmental results expected, has been achieved	Measuring the outcomes against the objectives

5.2 Overall effectiveness

Effectiveness is an assessment of whether the outcome sought was achieved.

The overall outcome for the Plan is clearly defined – to return the geothermal system to equilibrium condition, and retain it there, so that the activity of the surface features is restored.

Has this outcome been achieved?

Yes, this overall outcome has been met. The Plan has been very effective in returning the system to a state whereby surface feature activity is restored. The major mechanisms used were to define the resource that could be allocated and then reduce allocation of fluid and energy (expressed in tonnes of fluid per day) to that limit. The tight controls on allocation and the requirement to reinject have restored the geothermal

aquifer fluid to the level required for healthy surface feature activity. [NB it appears that it is fluid level that is the critical parameter, not pressure].

We now have close to a decade of experience of the system being operated at equilibrium condition, and the surface features are again reliably active. The system can accommodate some fluid abstraction and energy use, and we have a much clearer idea of what the limits are before the surface features (that the Rotorua economy heavily relies on) start to be affected by this use.

There are a large number of scientific papers that identify the causes of the drop in system aquifer water level and pressure, its effect on the surface features, and the strong correlation between reduced draw-off and system recovery (see Allis in bibliography). This correlation is so strong that it is now possible to predict these effects based on fluid and energy extraction scenarios. The provisions of the plan are therefore not relying on subjective assessments; they are based on empirical information and supported by the system model. For the Plan it is possible to (literally) use a pressure and state relationship analysis to see how the plan provisions are working = the monitoring results of system fluid levels. It is readily scientifically defensible that the system use (measured as tonnes per day) of extracted fluid) had to be reduced, and then controlled to protect the system's ongoing viability. The available resource was then allocated among competing users.

The overall goal of the plan was met. The next question any review must pose is:

Was it due to the implementation of the plan and its interventions that this result was achieved? Or, in other words, how effective have the objectives, policies and methods been?

In general the objectives, policies and methods have worked successfully and coherently to achieve the overall outcome of sound system management. To judge their effectiveness on a chapter by chapter basis requires that the components of each chapter are assessed. These detailed outcomes and outputs are described in the anticipated environmental results (AER). Each AER has been assessed in its chapter context to find out whether and how they have contributed to reaching this overall goal. The results of this assessment are in Appendix 1 to this report. Each AER has been given a rating of "Met", "mainly met" or "not met" with a commentary that explains the reasons for this rating. The majority of AERs have been met.

A number of these AERs go further than what is expected of anticipated environmental results, in the sense that they do not just describe an environmental outcome; they also list out the way in which the objective of each chapter will be achieved. This means they are much more comprehensive in their assessment, not only of the results (outcomes), but also of the tasks to be done (outputs) that lead to those successful outcomes. For example, Chapter 13 The protection of geothermal surface features has the objective:

> *"The protection of geothermal surface features, the restoration of geothermal surface features outflow activity and the avoidance or mitigation of natural geothermal hazards".*

One of the seven anticipated environmental results is:

> *All natural geothermal surface features and associated ecologies within the Rotorua geothermal resource will be identified and catalogued.*

This step is necessary. To protect features, you have to know what they are and where they are. However, merely knowing this doesn't achieve the goal of protection, so this is an output – it is a task that must be completed before the goal of protection can be achieved. The assessment of this AER is:

Met. Geothermal surface features (1511 features) and surface activity are comprehensively catalogued in a GIS database that contains information on the type of geothermal surface feature (i.e. mud pool, spring or heated ground), grid references, any threats to it, and any known bibliography.

Geothermal ecologies were mapped in 1996 and resurveyed in 2005. The report covers site extent and vegetation descriptions and threats. It includes assessments of significance levels (international, national, regional, local) based on the RPS Appendix F (indigenous ecosystems) criteria. This information is also in a GIS based database.

There is an interim list of nationally (including international) and regionally significant geothermal wetlands based on existing information and the RPS Appendix F assessment criteria = on scenic, cultural, spiritual, scientific, intrinsic and ecological values.

The region's territorial authorities don't yet have direct access to these databases but the development of compatible databases information exchange software is underway. The databases are currently accessible to BOPRC staff (includes induction where requested).

5.2.1 Could there be alternative reasons the objective was reached?

The outcome has been achieved. The next test is; but was it because of the plan? Can we attribute the positive change to some other influence? Would the system have recovered without regulatory intervention? Would technological change or economic conditions have caused the system to recover? Could it have happened without the cohesive and forceful response of the plan?

Looking at the alternatives to regulation in turn:

- Economic conditions change
- Technology change
- Voluntary programme to change

Economic change to create a reduction in fluid take would occur by pricing access to fluid or pricing fluid itself "out of the market", thus making it unattractive to take.

1 **Pricing access to the resource**. This could happen by default if the system became so depleted that existing bores couldn't be used and new ones would have to be drilled at considerable expense (however at this level of use the surface features would not be active) or

2 **Pricing fluid**. Done by introducing a regime that set the value of the resource being extracted higher than other forms of heating. In 1986 the government introduced a rental regime for geothermal fluid, which did just that. A number of bore users ceased using their bores as a result, but this economic instrument alone was insufficient for on-going sound system management. While this reduced the amount taken, it did not address the need to increase reinjection - required to get the fluid levels back up to level needed for healthy surface feature function.

Neither the bore closures nor the resource rentals were consciously designed to shift geothermal resource between user sectors but it did have this consequence. In this regard, there was no actual selection process – it was self selection, but that just happened to favour the larger commercial users.

Economic instruments still play a part in the management of the Rotorua system. It is no longer the resource rental but the need to operate and maintain both production and reinjection bores, something only viable for the wealthy; those on community schemes who can distribute their costs, and the tourism/commercial users who can pass on their costs. Small users have also trended towards downhole heat exchangers. Future trends may see increased use of harvesting heat from warm ground using ground source heat pump technology.

There have been no significant technological advances in the time since the problem was first comprehensively assessed (early to mid 1908s) that would of themselves lead to the reduced exploitation of the geothermal fluid resource. There is hope that downhole heat exchangers would replace take and discharge of fluid, but uptake of this technology has not been high.

Was progress made at an acceptable rate?

Once the problem was identified (late 1970s), and data collected to support the theories of the cause of the problem (1982-85), the bore closures programme was initiated by central government (1986). Central government also introduced a resource rental that further reduced take. The role of the Plan was to continue and consolidate this progress by authorising the remaining bores, transferring the takes and discharges to the RMA resource consent framework and requiring reinjection. The system recovery was evident within a year of the major closure programme, and the system's continued improvement has been strongly correlated to the further management of the resource, as all takes were brought into the consents system (in the process identifying more for closure), and reinjection started. From problem identification to problem resolution took about 15 years. In resource management response timeframes, this is reasonably rapid progress.

Would the bore users of Rotorua have voluntarily relinquished sufficient resource to get this result? How degraded would the system have had to be before a voluntary collective response would have occurred?

Although some users understood the fragility of the resource and were prepared to act to benefit the health of the system as a whole, the process of reducing the fluid take in the system by closing bores (which mainly occurred prior to the plan being introduced) and requiring reinjection from the remaining bores was fought by some bore users. Resistance to the management limits imposed by the Plan, and resentment at bore closures in the late 1980s before the Plan led to the development of the Rotorua Bore Users Association, formed specifically to challenge aspects of the Plan to the Environment Court. Their appeal to the Environment Court was mainly on the 1.5 km MAEZ. Their theories about the Rotorua geothermal system and how it functioned were found to be unsubstantiated and pseudoscientific, thus the Environment Court found their case had little merit. The case was fought on the basis of not being necessary (the belief was that the resource was limitless), and fought by various factions of bore users on the basis that it should not be them who relinquish their bores, but someone else (i.e. between-user allocative arguments). This type of reaction to the imposition of a management regime, after many years of explanation as to why the resource was depleted (i.e. the information was available but not accepted), makes it extraordinarily unlikely that a sufficiently large core of bore users would act collectively and voluntarily to sustainably maintain the system.

In summary, it can be said that although the bore closure action by Central Government reversed the decline of the system, the actions of the Plan were required to complete the restoration of the system, i.e. the system didn't spontaneously and naturally grow in pressure, people didn't spontaneously decide to stop using geothermal energy for health or cost reasons.

The geothermal energy resource in the Rotorua system is not growing. People are always going to want to extract the fluid and/or energy for a variety of purposes, so there is always going to be a need for plan provisions to manage that allocation process. The crisis of system decline has been solved, but on-going management is needed.

5.3 Plan appropriateness

The plan appropriateness evaluation assesses the plan provisions as to whether:

1 The provisions of the plan continue to focus on the right issues and

2 The policy design and direction remains valid and relevant (given changes in the legislative and policy environment, case law, the understanding of good planning practice and social and economic changes since the plan became operative).

This detail of this section of the evaluation is at Appendix 1 in text, where a chapter by chapter commentary assesses which provisions are still required, why, and what additional areas need to be covered.

In summary:

1 A large proportion of the Plan dealt with transitional provisions in order to get users into a resource consent process, allow for multiple users to register, and require reinjection to be undertaken. The transition period is over. These provisions worked well, but are no longer required.

2 At the time the plan was proposed there were known gaps in information on system capacity (that would support allocation decisions) and on surface features (to allow for their protection). As a result the Plan was conservative (precautionary) and the necessity for approach as accepted by the Environment Court. In both these areas the base information is now more extensive, supporting a system model and providing guidance for feature protection. Ongoing provisions would focus on successful use of this information, keeping it up to date with the use of targeted monitoring, and using the system model as a predictive trend and effect tool.

3 There are two chapters on efficiency; avoiding wastage and on efficiency of use. These use a different angle to deal with the same subject, but both only look at efficiency in a narrow technical efficiency sense – the efficiency of the heat harvesting and transfer apparatus once fluid take has occurred. No judgement is made on the efficiency of the type of use. The only assessment of efficiency is a self selection on ability to pay – this still does not cover whether the equipment used to extract the resource is efficient, it merely indicates whether the user can pay for the equipment installation and upkeep - themselves or by passing the cost on. A consequence of this is that smaller private users have shut their bores, and commercial/tourism uses have retained theirs. This was not a direct objective of the plan.

4 Total allocation efficiency of the system (optimising use) is not discussed and there are no provisions that support it. Present rules merely support take to a specified limit. The new provisions may need to make a judgement on whether less efficient uses (e.g. electricity generation) should be required to have a cascade of further uses to increase efficiency of use, or a more efficient use (direct heat) be preferred for presently unallocated resource. A caveat on cascade use is that reinjected fluid usually needs to be 70ºC to avoid pressure quenching in the aquifer, so provision must be made for this.

5 The plan still needs provisions that protect surface features. Provisions are needed to protect geothermally dependent flora, fauna, habitats and ecologies. This can be achieved through the preservation of system fluid levels and pressure, but also through protection of the surroundings of these features. There are over 1,500 features, so some prioritisation would be useful, with the objective of ensuring that the best examples and those of cultural significance to tangata whenua are afforded high levels of protection.

6 The non-regulatory provisions of the plan have not been thoroughly implemented, particularly those covering working with other agencies and the community. It may be more productive to develop a suite of non-regulatory methods in more detail outside the statutory plan, using a Memoranda of Understanding to define the relationship with the other agencies and the community and implement them using annual action plans to manage tasks.

5.4 Efficiency

Efficiency is a measure of the benefit of a policy relative to its cost. The higher this ratio is, the more efficient the intervention, so assessment of this parameter needs to answer:

- *Have we achieved that outcome at reasonable cost?*
- *Using these plan provisions could we have achieved the desired outcome more cheaply?*

Prior to the Plan, at the time of the bore closures programme (1985 and 1992) the number of wells dropped from 376 to 141, a reduction of 235. The fluid withdrawal reduced from 29,000 tonnes to 9,500 tonnes, a reduction of 19,500 tonnes. All those users either switched to an alternative supply of heating/fluid use, or did without. However, the costs involved were in some cases negative. While the perception was that geothermal was ”free” energy, a cost benefit analysis of cost of bore construction and maintenance depreciated over the life of the bore showed it was often more expensive than gas or electricity. (Baverstock K). No compensation was paid to those who lost access to the resource.

The Plan added further cost to the remaining users by requiring reinjection, so the plan did cause further sacrifice by private users for public benefit (in terms of the costs of reinjecting).

Evaluating efficiency for RMA Section 35 purposes assesses whether the cost or benefit is as the plan expected. It does not assess whether alternative policy options could have achieved the outcome more cheaply (this exercise should have been done at the plan development stage – section 32 analysis). If the cost is found to be very different from what was anticipated, that should trigger a review of those provisions, to consider whether there are alternative policy options.

This report is restricted to qualitative observations of cost – where the major costs fell and why. It makes a qualitative assessment of whether the costs are considered reasonable, given the benefit they provide. It does not assess efficiency using fully monetarised costs (full dollar value assessment of all interventions using full cost accounting), nor does it provide quantitative descriptions of costs.

It does consider whether the regulation of effects was efficient. In this sense it looks at whether the provisions that have been used in the plan to manage effects provided flexibility for resource users as to how requirements are met.

More questions on whether policy has been efficient are:

- *Did the Plan potentially reduce allocation efficiency because it prescribes via activities rather than effects?*

  No. It identifies effects on the outstanding surface features about Whakarewarewa, created an exclusion zone of 1.5 km around Pohutu Geyser to manage those effects. It sets other controls on fluid and energy extraction outside of the exclusion zone. These are effects based as they promote greater efficiency of resource use and require the reinjecting of fluid to create fluid level and pressure support for the system.

- *Did it use prescriptive provisions to attempt to predict resource use and demand?*

  No. It capped the resource use and endeavoured to allow for trading within that cap by including provisions that created a potential trading environment.

- *Did the provisions lock up resources and not allow use to change over time or transfer easily between parties?*

  No. although the Plan caps resource use to provide for intrinsic values of the outflow features such as geysers, it does contain provisions that allowed for change of use over time – encouraging more efficient uses such as downhole heat exchangers; requiring more efficient use through consent conditions, and providing the capability to transfer the resource between users. Is such trading or transferring occurring? The plan suggests not many, although there were plenty of provisions in the plan to allow such transfer. Further work can be done on identifying why trading is not occurring to see whether it is because the resource was allocated efficiently or there is some other barrier to such as lack of information on potential traders to allow such trade to occur.

- *How successful was the plan in providing certainty and clarity, e.g. what investment timeframe is provided for (what is the term of consents)?*

  The Plan is clear about where takes can occur and what quantity is available for use. It is also clear about the aquifer water levels needed to sustain the Rotorua geothermal system. The capped use of resource does favour existing users because although the consent term is relatively short (ten years) there is no real opportunity for potential users to displace those seeking to obtain new consent to replace their old ones. Despite this, the geothermal resource use has moved away from domestic-scale heating and towards the high return tourist infrastructure users (hot pools and heating in spa complexes, hotels, motels, backpackers etc). The Plan purposely set moderate duration consents, with provision for review within consents, to provide Council with the ability to react to system events relatively quickly.

To keep the scale of the efficiency evaluation manageable this analysis is done at overview level, identifying the beneficiaries and the losers caused by the policy direction taken by the plan. The evaluation does examine

some specific rules where they have the potential to cause significant costs and benefits.

The following questions rate the cost of policy in the terms of policy design, rather than an "on the ground" full analysis.

Analysing efficiency involves:

- Identifying the various environmental costs and benefits of the policy/methods.
- Identifying the various social and economic costs and benefits of the policy/methods.
- Identifying who/what will face the cost, or experience the benefit of the policy/methods.
- Assessing the relative size of the costs and benefits of the policy/methods.
- Identifying all assumptions and uncertainties clearly. (If there is uncertainty, state how critical it is, what has caused it, and what further information might reduce it.)

Costs and benefits of the policy/methods	**Identified as:**
Environmental	Benefit – restored the outstanding natural surface features of the filed, restored associated significant vegetation. Cost – none.
Social and economic	Benefit – stabilised Rotorua's internationally renowned geothermal features, prime attraction for international, national and local tourism industry; generating jobs and providing economic multipliers. Cost – a large proportion of individual and commercial uses were shut down (prior to the plan becoming operative), with associated costs of shifting to other heating sources.
Who/what will face the cost, or experience the benefit	Benefit – intrinsic values of the surface features and outflow features, both also having significant cultural use dimensions, supporting use by remaining users for public use (aquatic centre, hospitals) commercial use (tourism businesses marketing geothermal spa or heating) and private uses. Commercial benefit to tourism operators running Te Puia, Whakarewarewa, and thermal pools and many multipliers off tourism - locally to Rotorua, in the wider region, and nationally. Cost - mainly to private householders who had used geothermal fluid for space heating and pools within the 1.5 km Mass Abstraction Exclusion Zone.
Relative size of the costs and benefits	In 1988/89 tourism to Rotorua returned between $192 – 321 million (depending on multipliers used). This information is not broken down further to attempt to figure out what proportion of that tourism was due to interest in geothermal however, but given that geothermal is the main sales pitch, it would be a significant proportion. Karen Baverstock 1998 paper on costs and benefits of retaining 1.5 km mass extraction exclusion zone around Pohutu geyser. Main conclusions were that there was private cost to households for bore closure. This varied between users and was difficult to measure as they include non-utility benefits – e.g. enjoyment of soaking in a hot pool, but also that geothermal heating had been ascribed greater utility value than it possessed as such costs as bore depreciation costs were not accurately valued by most bore users. O'Shaughnessy 1999 paper discusses the use of punitive and incentive based economic instruments to effect change in geothermal use patterns, but does not assess the relative costs and benefits, noting that the social impacts of the use of economic instruments is hard to evaluate.

5.4.1 Costs

Costs are considered in the categories of administration, compliance and broader economic cost:

Administration costs – the administration of the policies and methods (notably rules). It includes costs to develop and defend plan provisions, non recoverable costs of considering and issuing resource consents and defending decisions (at the Environment Court) and monitoring and enforcement.

Costs in plan development and early introduction were high. Running the plan in its later years, administration costs have been relatively low. Was there a way of reducing these costs? As discussed in section 3.2.1 the plan was hotly contested by those with a large direct economic stake = the Rotorua Bore Users Association. Their challenge (an appeal on 6 points) was taken to the Environment Court, thus the plan provisions had to be very robust to succeed in the face of that challenge. Was this cost avoidable? Probably not. The Plan did cause a transfer of benefit. And these people were always going to lose their resource access in order to restore resource function elsewhere. The bore users considered the Plan to be overly constraining on the taking of resource and did not agree with the protective policies the Plan gave to outflow features. Under those circumstances of self interest, and the need to urgently address the system overuse, regulation was required. Administration costs to effect that result were relatively high. Now that the system is in equilibrium, and there is a resource consent regime to manage the allocation within the fixed system cap, the administration costs are low.

Compliance costs - regulatory methods. These are faced by:

(a) Resource users, and include all costs associated with complying with rules including the gaining of consent, and compliance with conditions of that consent (or plan provision). This includes costs that might flow from actions and physical works or equipment usage, including bore maintenance, and capital costs required to comply with consent conditions.

(b) Councils, for:

  (i) Non-regulatory methods such as commitments to engage in advocacy or education programmes or to provide funding support for particular initiatives.

  (ii) Developing regional or district plans or specific provisions in such plans.

Costs to resource users varied. In the 1980's a significant number of direct users suffered the cost of being shut out of the resource – which in some cases also caused the loss of their business, in others loss of cost of infrastructure investment for home heating (bores, radiators systems). Others lost access to culturally significant uses. Constraints on fluid take still limits economic use. Some are now exposed to the costs of complying with resource consent conditions – which also varied. Large costs were involved in complying with reinjection requirements which involved the installation of a separate reinjection bore, moderate costs were involved in improving technical efficiency and monitoring take. Those who relied on the

intrinsic value of the resource, mainly in the tourist industry, were significant beneficiaries, as they were not subject to any resource consents, but the value of the resource was considerable enhanced (or more accurately - restored).

Costs to Bay of Plenty Regional Council are moderate, and include continued requirements to model and monitor the resource to support the contention that system use must be constrained for the health of the whole resource, in the face of greater demand than supply. There have been ongoing costs associated with detecting and processing unauthorised abstractions, use and discharge of resource; however these have diminished over time. Costs to council should have been greater than they were, as a number of the non-regulatory methods were not implemented. In this regard the regional plan process is sound for ensuring that regional rules are successfully administered, but it is not successful in ensuring that complementary non-regulatory methods are carried out. If retained, these need to be more thoroughly built into the Local Government Act ten year plan process with KPI's or dealt with through another separate process whereby those carrying out the actions have some other funding and accountability regimes to ensure they are carried out.

Broader economic costs - resulting from regulation.

These could involve:

- Constrained production e.g. limits on scale, discharge, input or output limit imposed as a result of a plan provisions or consent condition; or
- Sub-optimal allocation, such that resources are locked into low value uses, meaning value from potentially higher value uses is foregone; or
- Reduced innovation as a result of prescriptive controls (e.g. prescribing certain technologies) that do not provide for innovation and change in the way users exact value from resources or manage environmental effects of their activities.

Considerable direct economic costs due to constrained production were incurred as noted above, but this cost must be played off against the considerable benefits accruing to the wider Rotorua community as a result of the geothermal features creating a significant international and national tourist draw card.

Is allocation optimal under the plan? This cannot be assessed using a simple cost accounting trade off between costs and benefits, as there are a large number of factors that are beyond the scope of simple cost benefit analysis. Intrinsic value, traditional cultural use value, health values are all difficult to cost as no single standard value exists. Economics has a number of models for these with different weightings and values. For some, even the thought of trying to monetarise these values is offensive. The number of multipliers for the initial tourism attraction, and how they spin off into other parts of the Rotorua and wider regional and national economies are also difficult to pin down.

The plan concentrated on managing one aspect of technical efficiency, that being: *"once the resource is extracted, is it being used with technical efficiency to avoid further heat loss before reaching is ultimate use?"* (Although it did endeavour to associate the size of the take to the need of the use in rule 17.3.3(b)(i) *An allocation … shall be limited to an amount sufficient for the efficient use of resource relative to the activity proposed).*

It doesn't address either of the questions:

- *"Is the use being sought an efficient use of geothermal heat or fluid",* or
- *"Does the use add the most value (in dollar terms) for using the geothermal resource"?*

The Plan provides avenues to encourage resource transfer between users, but this series of provisions has not been used to any significant extent, although just after the plan was made operative a number of businesses acquired extra resource, by paying to have the same amount of another users take reinjected. This was encouraged as it allowed people (usually domestic users) to comply with Plan's reinjection requirements at no cost and both industry and the system benefited. Feedback from compliance staff at both district and regional councils is that limited use is made of cascade uses, whereby heat/energy is extracted by a series of uses before the fluid is discharged/reinjected. This would be a more efficient way of using extracted resource, and that there is still considerable scope for more technical efficiency of use, while noting the caveat on reinjection temperature requirements, or cascading where reinjection temperatures are not an issue such as in outflow features.

The Plan allocates resource on a 'first in first served' basis for future uses, but can only accommodate uses that fit under the threshold of total allowable allocation of resource. Within a 1.5 km radius of the key surface features at Whakarewarewa the plan prohibits extractive use and has a moratorium on DHE heat taking.

The broad aims of the plan have been comprehensively met, and it has therefore been effective. The Plan did not venture into the subject of within-resource allocation in any detail, thus the subject of equity between resource users or most efficient allocation was not broached.

The prime function now is to maintain the hard-won equilibrium in the system aquifer; look for efficiencies to better utilise what is available and use monitoring and the system model to test whether further small increments of allocation can be made.

6 Conclusions and Recommendations

The Plan has performed well in achieving the overall outcome of restoring the function of the internationally renowned surface features of the Rotorua system. Although the costs and benefits in managing this type of resource will always be subjective, the plan succeeds in managing the Rotorua geothermal resource as a 'have your cake and eat it' proposal; with both thermal harvesting and sufficient resource retained within the system to support the surface features and their intrinsic and tourism value.

The Plan's performance on policy and management issues regarding allocation has created an equilibrium condition.

The Plan does not attempt to address the complexities involved in balancing the competing interests for the available geothermal fluid and heat resource. It has a conservative allocation regime limited to first come first served. It has no ability to increase allocative efficiency either in a best dollar sense (greatest dollar value proposition for geothermal fluid or heat use) or a technical sense (most efficient enthalpy capture). Whether the regional council should try to pick winners in either an economic or technical sense is something that needs discussion in the plan review. Predicting the direction of the market and setting allocation policy based on derived best benefit is an area fraught with difficulty, especially over the time scale that most plans operate.

The Plan has performed well in ensuring allocation does not exceed resource available, in monitoring the geothermal system health and in enforcing consents relating to geothermal use and discharge.

Recommendations

1 Provisions to be carried forward are those that focus on:

(a) Maintaining the equilibrium of the system (consolidate and simplify provisions).

(b) Allocation, within the cap recommended by the model (expand to consider allocation in its wider sense, particularly allocative efficiency and prioritise access to encourage higher yielding uses and reduce the amount locked up in low value uses).

(c) Efficient use (refine and strengthen).

(d) Protection of surface features (expand to include ecologies).

2 Provisions that are not carried forward include:

(a) The elements of the Plan that dealt with the transition between previous management regimes and the RMA requirements,

(b) Much of the historic and explanatory text.

3 Additional provisions are required that cover:

(a) Effects on the resource from other uses (protection of these at both regional and district levels.)

(b) Monitoring the condition of the surface features and geothermal ecologies

(c) Changes to the RMA (Appendix 2) especially including those that require that regard be had to the benefits to be derived from the use and development of renewable energy (s7j)).

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Appendix 1 – Chapter by Chapter Plan Analysis

This advises on a chapter by chapter basis:

- What will happen to the content of each of the Rotorua Geothermal Regional Plan chapters in the next plan
- How successful the chapter was in achieving its objective
- Provides text of each chapter - issues, objectives, policies and methods
- Advises whether and how each Anticipated Environmental Result has been achieved

11 Understanding the resource - What happens to this chapter?

Current plan design and content means that although the work involved would continue to be done, these provisions would not be included in a RMA regulatory plan. It would instead be covered and referred to in the Natural Environmental Monitoring Network (NERMN) and the ten year plan, to ensure it was funded.

11 Understanding the resource What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) Best practicable understanding of field dynamics, resulting in a greater precision in setting environmental protection measures on resource consents.	**Met.** A Geothermal system model has been developed (1994), showing geothermal fluid and pressure budget. This was reviewed and revised in 2004. The model provides the capacity to predict the effects of use of geothermal fluid and reinjection on the resource and surface activity. A suite of scenarios was run in 2006 which further refined knowledge on what effects would be felt in which part of the system for a variety of use scenarios. It also identifies what "head-room" there is in the resource to allocate, thus providing considerable precision to allocation decisions.
(b) Enhancement of field precision and confidence giving more targeted environmental protection.	**Met (as far as is technically possible).** Electrical resistivity surveying has been used to delineate the extent of the system but as resistivity surveying involves uncertainty in interpretation of data the shape and aerial extent of the system is tentative.
(c) Best practicable understanding of cause and effect relationships across the field resulting in an ability to better assess the environmental effects of activities that may alter field parameters.	**Met.** As above. At this stage no individual Rotorua consent had any modelling and research data relating to system potential, attributes and qualities; the Rotorua model has been used on aggregate takes and discharges. The model is recalibrated from time to time using measured data from system monitoring.
(d) Open provision of information so that developers and Environment Bay of Plenty can better predict the environmental impacts that a development proposal may have, and means to avoid, remedy or mitigate unacceptable effects.	**Partially met.** The Rotorua system model output information is publicly available, but it is unlikely that particular scenarios run under that model for proposed activities would be, because the expense of running a scenario through the model would not be seen as having commercial value to any applicant. The model itself exists as an array of mathematical algorithms run on software owned and copyrighted by IGNS, and not openly available to the public. Its results require expert interpretation. Surface and bore measured i information would be available to Environment Bay of Plenty for modelling and management purposes, but may not be publicly available. The plan has as a rule (11.5.2(e)) 'To provide system model information, at cost, to any interested party'.

11 Understanding the resource – What the chapter said.			
Issues	**Objective**	**Policies**	**Methods**
The information available to BOPRC may not be of sufficient quality to enable effective management of the field. Fix by: To ensure, with testing and ongoing relationship evaluation, that the information available on field characteristics is of a quality sufficient to enable effective management of the Rotorua geothermal field. **That without a current model of the Rotorua geothermal field, BOPRC's ability to protect, cause and effect relationships will be limited and uncertain.** Fix by: To continue, as resources permit and research and monitoring data becomes available, evolving and developing a quality field management model, tested by peer review. **There may be specific types of information that should be researched further in order to enhance the confidence and precision with which the regional plan can operate.** Fix by: That BOPRC will target resources for the gathering of information about the Rotorua geothermal resource that will enhance precision and confidence in the field model and the RGRP.	**Best practicable cost effective management of data and information precision and confidence.**	a. To obtain best practicable quality field data and information. b. To achieve best practicable field management precision and confidence. c. To keep management expenditure to a practicable minimum. d. To ensure measured data used in field management is of the highest practicable quality. e. To provide field model information, at cost, to any interested party. f. To exercise caution with regards the use of historical data and information for field management purposes	<u>Research</u> (i) Continue field monitoring and research, and make resources available in accordance with the requirements of the RMA (section 35). (ii) Upgrade, as appropriate, the current field model of the Rotorua geothermal resource. (iii) Ensure that data input to the field model is of a defined high quality. (iv) Design, establish, calibrate and maintain a dynamic mathematical model of the Rotorua geothermal resource. (v) Direct monitoring resources, as appropriate, towards calibrating and testing the field model. (vi) Ensure that research and model information is to be made available, at cost, to any interested party. <u>Review</u> (i) Seek to enhance current field management and field monitoring techniques. (ii) Annually review the Rotorua geothermal field monitoring and expenditure programme.

12 Sustaining the Resource - What happens to this chapter?

These provisions would be retained for Rotorua Geothermal System Management, although any abstraction restriction provisions will be simplified.

12 Sustaining the Resource - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
The Rotorua geothermal field water level (and pressure) will be stabilised at a strategic equilibrium, above a defined minimum geothermal aquifer water level.	**Met.** The Rotorua system has been operating at a stable equilibrium for a number of years, above the defined minimum geothermal aquifer water level.
(b)The features, values and potentials of the Rotorua geothermal resource will be protected.	**Met.** The controls placed on take and discharge of fluid has protected the system outflow features, values and potentials of the resource. NB although the system is protected, the individual surface features are dynamic, and will (and do) change of their own accord.
(c)Any activity that may or would compromise the established strategic equilibrium, and thereby the field environment, will be tested by the resource consent application process.	**Mainly met.** Resource consent requirements for takes of fluid and discharges and reinjection are comprehensively covered, but the status of down-hole heat exchangers, re the resource consent process, is less clear. Requiring re-injection at all sites within three years of the Plan becoming operative (unless an extension of up to five years is granted on the grounds of financial hardship) has resulted in the Rotorua Geothermal system returning to a healthy condition. (See Brett W. O'Shaughnessy, May 1999, Use of economic instruments in management of Rotorua geothermal system, New Zealand, Geothermics 29 539 – 555). Consents are also granted for sites where it is not technically feasible to reinject. On rare occasions, sites where a five year 'fix' the system (install a reinjection bore) are granted consents, even though technically the grace period for this was part of the transitional provisions has expired. This is to address the few instances where extensions had been granted but no final date for completion had been included.
(d)The field environment will be better protected because existing and new resource consents can be adjusted to sustain the established strategic equilibrium.	**Met.** Policy 12.3.3(b)(ii) of the Rotorua Geothermal Regional Plan provides for an elaborate staged approach to manage the system if the aquifer water levels fall below specified levels. This provision has never been activated, but the capacity to activate it remains. Resource consents for the Rotorua system have had a term of no more than ten years and conditions normally include review clauses. Both of these provide the capability to alter the permitted quantity of geothermal fluid/energy to retain the strategic equilibrium.

12 Sustaining the Resource			
Issues	**Objective 12.5.1**	**Policies 12.5.2**	**Methods**
The Rotorua geothermal resource is vulnerable to irreversible destruction, this must be prevented to sustain its values and potentials. Fix by: To sustain field water levels by ensuring that the strategic equilibrium is restored to a level that reflects optimal reinjection, protects geothermal surface features from the adverse effects of abstraction and development, yet provides for the limited and controlled net abstraction of heat from the field reservoir.	A strategic equilibrium designed to sustain the features, values and potentials of the Rotorua geothermal resource into the future.	(a)To restore and maintain the Rotorua geothermal field at an optimal strategic equilibrium. (b)To restore the features, potentials, and values of the Rotorua geothermal resource for present and future generations.	12.3.3(a)Strategic Equilibrium (i) Establish MGAWL measured in calibrated system monitor bores to avoid or remedy adverse effects on fluid outflow from geothermal surface features. (ii). Monitor the minimum geothermal aquifer water levels for the system relative to system data and model scenarios to provide an ongoing information base relating the minimum geothermal aquifer water levels and the natural outflow from geothermal surface features. (iii). Use the system model to measure the effects any proposed resource use activity may have on the strategic equilibrium and the minimum geothermal aquifer water level. (iv). Initiate a plan change to vary the minimum geothermal aquifer water levels at any time that field data and system model information provides evidence that the current minimum geothermal aquifer water level is no longer accurate relative to the requirement to sustain the established strategic equilibrium, or protect natural surface features. <u>Rules and Conditions</u> MGAWL is (a) M6 of 280.174 m (b) M12 of 283.995 m, or (c) M16 of 295.873 metres relative to Moturiki Datum. EBOP may at any time specify ancillary or replacement Monitor Bores which shall be calibrated relative to the MGAWL ensure accurate continuity. Every new and existing resource consent granted to authorise the abstraction of geothermal water, heat or energy from the Rotorua geothermal system shall be subject to the following condition: ABSTRACTION RESTRICTIONS

13 Protecting Surface Activities and Features - What happens to this chapter?

The initial cataloguing of surface features and ecologies has been done. Current plan design and content means that repeat surveys of surface features and ecologies would not be included in a RMA regulatory plan, although the work involved would continue to be done. This work would instead be covered and referred to in the Natural Environmental Monitoring Network (NERMN) and the ten year plan, to ensure it was funded.
Future provisions would concentrate on continued protection of the groundwater levels, and on management of activities around surface features to better protect them, using both regional and district plan provisions to achieve this.

There is scope to use non-statutory measures to add to the protection of surface features using a "care group" approach, already successful in the coast and estuaries of the region.

13 Protecting Surface Activities and Features - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
All natural geothermal surface features and associated ecologies within the Rotorua geothermal resource will be identified and catalogued.	**Met.** Geothermal surface features (1511 features) and surface activity are comprehensively catalogued in a GIS database that contains information on the type of geothermal surface feature (i.e. mud pool, spring or heated ground), grid references, and any threats to it and any known bibliography. Geothermal ecologies were mapped in 1996 and resurveyed in 2005. The report [Beadel et al. Geothermal vegetation in the Bay of Plenty region 1996] covers site extent, vegetation descriptions and threats. It includes assessments of significance levels (international, national, regional, local) based on the RPS Appendix F (indigenous ecosystems) criteria. This information is also in a GIS based database. There is an interim list of nationally (including international) and regionally significant geothermal wetlands based on existing information and the RPS Appendix F assessment criteria = on scenic, cultural, spiritual, scientific, intrinsic and ecological values. The region's territorial authorities don't yet have direct access to these databases but the development of compatible databases information exchange software is underway. The databases are currently accessible to Environment Bay of Plenty staff (includes induction where requested).

(b) Outstanding natural geothermal surface activities, features and associated ecologies of Whakarewarewa geyserland area will be effectively protected.	**Met.** The geothermal heat and fluid required to keep the surface outflow features active has been protected. N.B. the dynamic nature of geothermal surface features means that there will always be fluctuations in individual features.
(c) Geothermal taonga will be protected and respected.	**Mainly met.** The stabilisation of the system has made a considerable difference to the preservation of many surface features that are geothermal taonga. Work is required to establish a robust heritage resources monitoring framework. Monitoring is also required to examine the extent of and actual pressures on heritage places. Stronger cultural heritage protection provisions are required, as these sites are not highlighted for these values in the surface features database. If resource consent conditions are not set to protect cultural heritage, compliance monitoring may not record any adverse effects. More use could be made of the information held by iwi authorities, particularly those with iwi management plans, on culturally significant places. Te Arawa has extensive cultural information about features, some of which is culturally sensitive. Progress is being made toward promoting easier access to Council's heritage information through the development, maintenance and review of databases.
(d) The natural character of geothermal wetlands within the Rotorua geothermal resource area will be preserved.	**Mainly met.** The natural character of geothermal wetlands is mapped, but preservation relies heavily on education of those carrying out activities near the wetlands (e.g. parks and reserves staff, Iwi owners, golf course green keepers) on their value. Problems also can arise if consideration is not built into land use and subdivision applications administered by the Rotorua District Council. While Environment Bay of Plenty specialist ecological and heritage staff are representatives on joint agency groups (e.g. Bay of Plenty Wetlands Group and the Bay of Plenty Biodiversity Group) broadly responsible for promoting and implementing regional biodiversity protection and enhancement initiatives/projects, there is no such group or process for geothermal wetlands. Decisions on consents that may affect wetlands are causing a few issues. They can only be considered as a discretionary activity, and it is a difficult task to prove that the disturbance of a geothermal surface feature will have sufficiently significant effects to the surface feature that the consent should be refused, rather than avoid, remedy or mitigate the effects.
(e) The intrinsic, ecological and tourist values of the surface features of the Rotorua geothermal resource will be protected and possibly enhanced.	**Met.** Implemented though provisions in the Rotorua District Plan which specifically protects surface features (including geothermal). *[although Rotorua District Council could withdraw this provision from their district plan)*

(f)All outstanding surface features and associated ecologies within the Rotorua geothermal resource will be defined and actively protected.	**Mainly met.** All outstanding surface features have been identified in a GIS based database, as have all geothermal ecologies. However, active protection mainly occurs when the resource consent process is triggered and conditions are set. Where such features are in areas such as reserves where there will be no consents, active protection relies on actions by Rotorua District Council to protect them from vandalism, lack of recognition of the value of geothermal vegetation. Implemented primarily through the assessments of resource consent applications. Environment Bay of Plenty staff provide comments on district consent applications on matters concerning natural character, landscape and ecological values. [in the revised plan all outstanding natural features should be categorically listed to avoid any misinterpretation of their status.] The application of the outstanding natural features of Change 1 to the Regional Policy Statement by a landscape architect failed to pick up all the geothermal outstanding natural features (Kuirau Park was not identified). There is a mismatch between the "outstanding" level required by the RPS and the protection of all surface features identified in the plan. No second tier of recognition nor any policies or rules that support features that are not regarded as outstanding but may still be significant. Appendix F Set 1 natural character (Heritage Criteria) promotes consistent criteria for assessing section 6(a) matters to ensure better recognition and provision for matters of national importance in resource management processes. Indigenous vegetation or habitat of indigenous fauna should be regarded as significant where it meets one or more of the Appendix F Set 3 criteria. Geothermal mapping undertaken in 1996 has been compared with RDAM geothermal mapping undertaken in 2003. Because the 1996 mapping was of poorer quality, changes in extent and condition cannot be accurately assessed for some sites. Most sites appeared to have similar extent and composition as that recorded in 1996. Human disturbance that continues to affect surface feature sites include tourism (access tracking in particular), recreation, rubbish dumping, geothermal wetland infilling and drainage. Good monitoring relies on regular repeats of ecological and features assessment. This needs to be built into NERMN on five yearly intervals for both features and ecology.
(g)Rotorua geothermal geysers and springs will exhibit healthy displays and outflows.	**Met.** The system has returned to equilibrium state. The features have responded by exhibiting healthy displays and outflows. Some of these have been unexpectedly healthy – in Kuirau Park there have been two large hydrothermal eruptions as the system regained equilibrium; however there have been no eruptions since 2007.

No specific AER on hazard mitigation	Altering and interfering with geothermal phenomena can cause risk from geothermal hazard, ranging from the re-emergence of fumaroles and gas emission to hydrothermal eruption. Interference with geothermal surface features takes these main forms: 1. inappropriate structures and 2. site development adjacent to features, and interference and damage to the natural hydrology and deposition of features particularly geysers, springs and hot lakes. Geothermal hazards associated with geothermal bores are controlled by Rotorua District Council Health and Safety bylaws. Previously regulation was under the Geothermal Energy Regulations 1961 and the Health and Safety in Employment Act 1992. Commercial and public geothermal developments mostly include adequate warnings of geothermal hazards associated. However, there are some geothermal features frequented by the public and tourists which have inadequate warnings of the hazards associated with them. Historically people have fallen into surface hot pools and been killed.

13 Protecting Surface Activities and Features – What the chapter said			
Issues	**Objective**	**Policies**	**Methods**
The geothermal surface features of the Rotorua geothermal resource have not been adequately assessed for qualities requiring protection. The Whakarewarewa thermal area is not adequately protected. That in the absence of a definitive assessment of those field qualities and values requiring protection, protection will be given to all geothermal surface features. The geothermal surface activities, features and associated ecologies of the Whakarewarewa area are	The protection of geothermal surface features, the restoration of geothermal surface features outflow activity and the avoidance or mitigation of natural geothermal hazards.	To identify, protect and, where practicable, enhance the intrinsic, ecological and tourist values of the geothermal surface features of the Rotorua geothermal resource. To protect the intrinsic, ecological and tourist values of the geothermal surface features of the Rotorua geothermal resource by advocating the establishment of policy in relevant planning documents that would require formal resource consent assessments and tests be applied on the effects of each development on geothermal surface features present in the development area. To avoid, remedy or mitigate natural hazard caused by interference with geothermal activity or geothermal surface features, formal resource consent assessments and tests are to be applied on the effects of development on geothermal surface features present in a	<u>Protection of Surface Features</u> Environment Bay of Plenty will, in liaison with Rotorua District Council, advocate that Rotorua District Council: Provide in the Rotorua District Plan for the protection of future options relating to all geothermal surface features and associated ecologies within the Rotorua geothermal resource. Provide in the Rotorua District Plan for the formal assessment of the effects on the intrinsic, ecological and tourist values of the geothermal surface features that may occur as a result of subdivision and land development. Environment Bay of Plenty and the Rotorua District Council will, in consultation with agencies and interest groups, including the Department of Conservation and the tangata whenua having local geothermal rangitiratanga, establish and maintain a register of all natural geothermal surface taonga features and associated natural ecologies within the boundaries of the Rotorua geothermal resource.

acknowledged as outstanding natural features, consequently requiring protection. To achieve this, the established 1.5 kilometre radius mass abstraction exclusion zone around Pohutu Geyser will be retained. **Geothermal aquifer water levels will need to be managed to ensure healthy geothermal activity continues so that geothermal surface features are protected.** To manage the water level in the field aquifer at a level that ensures the restoration of geothermal surface feature outflow activity.		development area, with particular regard to the effects of development on geothermal hazard risk. To require the provision of formal planning assessment of the effects of development on geothermal hazard risk in relevant planning documents. To define and protect outstanding natural geothermal activity and geothermal surface features of the Rotorua geothermal field. To ensure that geothermal taonga identified and named by tangata whenua are respected and afforded appropriate protection. To ensure that any use or development of the Whakarewarewa area is evaluated with particular regard to the protection of the outstanding natural features of the Whakarewarewa area. To require protection of geothermal adapted ecologies within the Rotorua geothermal resource. To retain a mass abstraction exclusion zone, measured as a 1.5 km radius from Pohutu Geyser. To ensure that any adjustment to the minimum geothermal aquifer water level pursuant to clause 12.3.3(a)(iv) of this plan provides for a level of outflow from surface features that meets the requirements for their protection.	The register will: (a) Identify, catalogue and describe each natural surface feature and its associations to groups of geothermal surface features, (b) Include natural ecologies associated to or dependent upon surface feature activity, (c) Name geothermal taonga identified by tangata whenua, (d)Include both active and inactive natural geothermal surface features, (e) Assess and describe the sensitivity of each natural surface feature to field pressure change and land development, and the protective measures needed to ensure the feature is sustained, (f) Include a description of any historic and cultural associations to each feature with respect to its heritage value, (g) Include, as practicable, quality scientific information of relevance to each feature in particular an assessment of outflow rates of geothermal fluid, (h) Include location maps and other information presentations to ensure that the register can provide "user friendly" quality information and be an effective planning device for developers and the public. Require the effective reinjection of bore abstracted geothermal water.

There is no control over the hazard risk or physical destruction of field features caused through development or inappropriate interference. Some natural surface features associated with the field have been, and continue to be, damaged by inappropriate activities and fluid abstraction To require a resource consent for any activity that would or may cause a potential geothermal hazard or have an effect on any natural surface feature, and to discourage development that would interfere with the scenic or amenity value of geothermal surface features, provided that it be made a prohibited activity to interfere with or cause destructive effects on any outstanding natural geothermal feature.		To require that the total quantity of heat extracted by authorised down hole heat exchangers within the abstraction exclusion zone about Pohutu Geyser is not increased. To promote the rehabilitation of the natural character and outflow activity of natural geothermal surface features and associated ecologies by encouraging the effective reinjection of bore abstracted geothermal water.	Rules The following activities shall be administered as activities that increase the risk of natural hazard, and have an adverse effect on the environment. They shall be regulated as discretionary activities requiring a land use consent: (a) Any interference with the natural geothermal fluid outflow from a geothermal surface feature, and; (b) Any interference with the physical structure of a geothermal surface feature, and; (c) Any destruction of a geothermal surface feature including excavation, and; (d) Any placement or deposition of any substance, including fill or waste material on, into or under any geothermal surface feature ; shall be considered as activities causing natural hazard requiring avoidance or mitigation, and as having an adverse effect on the environment, and shall be discretionary activities requiring a land use consent from Environment B·O·P. The bore abstraction of geothermal water within the geothermal mass abstraction exclusion zone, being that area circumscribed by a circle of 1.5 kilometre radius measured from the centre of Pohutu Geyser, shall be considered as having an adverse effect on the environment and is a prohibited activity. For section 14.3(c) RMA, the bore abstraction of geothermal water from the Rotorua geothermal field is deemed to have an adverse effect on the environment. The total quantity of heat extracted by authorised down hole heat exchangers within the geothermal water abstraction exclusion zone shall not be increased. Any minimum geothermal aquifer water level set by Environment Bay of Plenty under this regional plan shall be set with regard to the protection and preservation requirements of outstanding natural features, the natural character of geothermal wetlands and other natural features of the Rotorua geothermal resource including associated natural ecologies**.**

14 Quantifying Available Resource - What happens to this chapter?

The initial development of a model and associated monitoring has been completed. Current plan design and content means that the continued monitoring programme would not be included in a RMA regulatory plan, although the work involved in monitoring and calibrating the model would continue to be done. This work would instead be covered and referred to in the Natural Environmental Monitoring Network (NERMN) and the ten year plan, to ensure it was funded.

Future provisions would concentrate on efficient allocation within the fluid and heat caps recommended by the existing plan, which would remain at 4400 tonnes per day.

14 Quantifying Available Resource - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) A defined, maximum authorised amount of net geothermal water available for utility abstraction without reinjection is achieved.	**Met.** Modelling and monitoring has provided sufficient information that a maximum net take of both fluid and heat can be set. Monitoring of resource consents means that fairly accurate knowledge of the overall take and discharge patterns from the system is available.
(b) Utility users are provided with an incentive to improve the efficiency with which they take and use geothermal resource from the Rotorua geothermal resource, thereby conserving the field and limiting environmental impacts.	**Met.** This incentive is built into the consent conditions. Applications for new consents must justify the amount of resource (tonnes per day and/or kilowatts per day) being requested. Plan rules require that an allocation of geothermal resource granted by a resource consent shall be limited to an amount sufficient for the efficient use of resource relative to the activity proposed (17.3.3(b)(i))
(c) BOPRC will have a defined and regulated tool for reviewing the amount of geothermal water available for utility abstraction, leading to better control of environmental impacts.	**Met.** The model information is the tool used to assess the total system fluid mass available. The key environmental impacts of concern have been controlled, as the surface features have returned to a state similar to that prior to over-abstraction. The consents have been given a ten year term, allowing for review of the amount of abstraction at the renewal of consent. New consent being issues are also for a ten year term and contain review conditions. The sophistication of the assessment of take by each consent holder varies, which does give a small measure of uncertainty to the information feeding into the model. [In the plan the term abstraction is used rather than extraction. Although the terms have similar meanings in most dictionaries abstraction is the more accurate term as it covers the act of passively withdrawing the fluid (artesian under pressure) whereas extraction is more the active taking (such as pumping)].
(d)The potential to make further resource available as model information, efficiencies in resource use and reinjection frees up further geothermal water or energy.	**Mainly met.** To meet entirely requires greater sophistication of information on take, and annual variances of take. Greater efficiencies of use and of retaining heat prior to and during use are still possible.

(e)The potential to further restrict the amount of geothermal water available for utility abstraction should the policy requirements of this regional plan relating to: (i) BOPRC requirement for the maintenance of the strategic equilibrium, and (ii) BOPRC's requirement for the effective protection of natural geothermal surface features and ecologies, and (iii) BOPRC's requirement for efficient resource use, fail to be met.	**Met.** The provision exists to further restrict use, but has not had to be activated, as present levels of use have not created circumstances where the provision had to be applied. [in the current plan Rule 12.3.3(b)(ii) sets the 'abstraction restrictions' conditions on all consents. It has never been used.]

14 Quantifying Available Resource - What the chapter said			
Issues	**Objective**	**Policies**	**Methods**
There is a serious uncertainty about the actual amount of geothermal resource now available for utility abstraction, and whether there will be major increases or decreases in resource availability in the future. That a controlled moratorium on any further net mass abstraction from the Rotorua geothermal resource be established, provided that as quality information about the Rotorua geothermal resource becomes available, allowing better precision relating effects to location, net mass or energy available for abstraction across the field will be quantified accordingly. A relationship will be established linking net energy/mass abstraction from the field to the cumulative reinjection effort. As an interim control, the total net mass	A measure of available resource that relates to the maintenance of the strategic equilibrium, protection of natural geothermal surface features and ecologies, the cumulative effort for efficient resource use, and control of environmental effects.	To establish the net measure of available resource. To establish procedures for the review and variation of the net measure of available resource, with particular regard to: The maintenance of the strategic equilibrium, and; The protection of natural surface features and ecologies, and; The cumulative effort for efficient resource use, and; The control of environmental effects.	Establishing Available Resource - Environment B·O·P will: Establish an initial total net amount of geothermal water available for utility abstraction. Initiate a change to the plan to vary the total net amount of geothermal mass available for utility abstraction at any time that the review procedure of Section 14.3.3 (a)(iii) indicates that a variation is required. Establish a review procedure by which assessment of the total net amount of geothermal water available for utility abstraction will be made using quality information including: (a) Current analysis of trends in monitored information, (b) Information from the field model, (c) Environment Bay of Plenty's requirement for the maintenance of the strategic equilibrium, (d) Environment Bay of Plenty's requirement for the effective protection of natural geothermal surface features and ecologies, (e) Results of cumulative effort for efficient resource use and, (f) Environmental effects, including positive effects through the establishment of down hole heat exchangers.

abstraction from the field will not exceed 4,400 tonnes per day.			Define a relationship between mass abstraction activities and energy abstraction activities. Define the relationship between mass abstraction activities and energy abstraction activities in order to provide trends towards using more efficient geothermal utility systems, such as down hole heat exchanger systems. <u>Rule</u> The initial net amount of geothermal water (mass) available for utility abstraction shall not exceed an accumulated total of 4,400 tonnes per day.

15 Protecting Authorised Users - What happens to this chapter?

These provisions were to cover the transition to a resource consent regime. The transition period has now concluded so the provisions are obsolete.

15 Protecting Authorised Users - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) Existing authorised users who have given effective effort to using resource efficiently and minimising environmental effects will gain certainty of access to resource.	**Met in part.** Such users received resource consents. These consents have come up for renewal and as the system is in equilibrium they have been granted new consents. The current provisions for efficient use are not effective. For other consent types the incentive of longer terms can be used for better environmental examples, but as the plan restricts the term to 10 years there is little incentive for positive environmental behaviours, as all existing users have first right to the resource under 124A of the Resource Management Act 1991. Encouraging good environmental behaviour needs to be a core focus of the new plan provisions. Rule 17.3.3(b)(i) requires that an allocation of geothermal resource shall be limited to an amount sufficient for the efficient use of resource relative to the activity proposed and that efficient use of resource means that all practicable means have been or will be installed to ensure that wastage of geothermal resource, in particular heat and energy, is minimised. 'All practicable means' is not prescriptive but it does give scope for a consents officer to assess application details to see whether the intent of the rule is being met. The rule was meant to provide scope to turn down applications where an applicant blatantly failed to operate their system as efficiently as they should.
(b)All users on an interconnected multiple user system will have a measure of security of tenure, providing for the protection of rights and the enhancement of the "social environment".	**Met.** This provision is used, but only partially successfully, as the information has historically only being listed on the Officers Report, rather than on the Consent Conditions (the legal document, and the only document provided to the consent holder). Staff are currently trialling a new wording in the consent document to try and increase the protection of Category B (multiple access to single bore) users.

15 Protecting Authorised Users			
Issues	**Objective**	**Policies**	**Methods**
Environment Bay of Plenty will need to establish some certainty and protection for	**The use of geothermal energy by authorised users remains secure**	To recognise the commitments and investments of existing current authorised resource users while ensuring that	Process (i) To be considered under this section, the applicant is required to have a current authorisation, provided that Environment Bay of Plenty may, at its discretion, consider an application under this section if the applicant has had a valid

authorised users, particularly from unreasonable costs and over allocation. That Environment Bay of Plenty will seek to protect current authorised geothermal resource users, provided that the user complies with the policy requirements of the RGRP.	**and sustained.**	the geothermal resource is taken, used and discharged in accordance with the policies and rules of the RGRP. To encourage all users supplied by an interconnected multiple user system to form into a documented association to represent their individual and collective rights and interests.	authorisation within one year from the date of application. (ii)The applicant shall supply the following application information and evidence as appropriate when application is being sought for a replacement resource consent: (a) That the application is lodged with Environment Bay of Plenty no later than 6 months before the expiry of the original resource consent expires (section 124 of the RMA), and (b)That the application is for an amount of mass or energy not exceeding their existing authorisation, and (c) That the use of resource is efficient, and (d) That any fluid extracted is or will be reinjected, or a down hole heat exchanger is being used, and (e) That the bore installation has been maintained to standard, and (f) That the application complies with all other policies of this regional plan. (iii) In accordance with Section 418(2) and (4) of the RMA; (a) Any permission for the taking of geothermal energy from the Rotorua geothermal field for any purpose authorised (by licence or otherwise) under Section 9 (1)(b) of the Geothermal Energy Act 1951 is hereby revoked on the date six months following the date on which this regional plan becomes operative. (b) Any taking of heat or energy from geothermal water or from the material surrounding geothermal water in the Rotorua geothermal aquifer being lawfully taken or used, and such taking or use did not require any licence or other authorisation, shall cease to be permitted from the date six months following the date on which this regional plan becomes operative. (c) Any taking of heat or energy from geothermal water or from the material surrounding geothermal water in the Rotorua geothermal aquifer being taken pursuant to any general authorisation, including General Authorisation No 6 of the Environment Bay of Plenty Transitional Regional Plan, shall cease to be so authorised from the date six months following the date on which this regional plan becomes operative. (iv) Category B licence holders currently using geothermal water, heat or energy from interconnected multiple user systems are hereby recognised by Environment

			Bay of Plenty as having part interest together with Category A licence holders in any new or replacement resource consent to take and use a resource allocation for that system. (v) Any body of persons that have a documented association to represent their individual and collective rights and interests, and represent all users supplied by an interconnected multiple user system, will be recognised by E B·O·P. (vi)When considering an application for the replacement of a licence or resource consent for an interconnected multiple user system, regard shall be had to: (a) any current licence, resource consent or other documented permission advised by any user of the system, and (b)any claim of interest in the system, including the identity of individual users, the amount of resource they seek and their interest in the application, and (c) whether the application has been lodged and documented in a manner that protects any rights and interests established by a) or b) above

16 Managing Unauthorised Users - What happens to this chapter?

These provisions were to cover the transition to a resource consent regime. The transition period has now concluded so the provisions are obsolete.

Managing Unauthorised Users - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) Unauthorised bores currently operating on the geothermal field will either become authorised or will be shut down and sealed, decreasing draw-off from the geothermal aquifer.	**Mainly met.** Some bores that have not been appropriately shut down are still found, and require proper abandonment processes (grouting of bore) to be carried out. There are six consents for fluid take within the 1.5 km exclusion zone. The current plan prohibits Environment Bay of Plenty from accepting applications to replace these. There have been no forced bore closures under the Rotorua Geothermal Regional Plan.
(b) Field management costs will be more equitably distributed.	**Met.** System management costs are met through general rate and through recoveries on resource consents. As a considerable amount of the value of the system is in its intrinsic state, a mix of user charges (consents) and general value (rates) seems appropriate.
(c) Field management effort to reduce adverse environmental effects will be more effective.	**Met.** The system model has been used to determine the safe level of total take. This, together with the requirement to reinject, has led to a successful reduction in adverse environmental effect.
(d) Authorised bore operators and owners will be better protected.	**Met.** The resource consent regime for allocating fluid and heat has resulted in authorised users' resource being physically available to them without fear that the resource will be over-allocated.
(e) The preservation and protection of features and efficiency of resource use will be enhanced.	**Met.** The regular and consistent functioning of the system's outflow features has been restored. Technical efficiency of end use has been improved slightly, but there is considerable scope for further improvement as new consents are issued.

16 Managing Unauthorised Users – What the chapter said			
Issues	**Objective**	**Policies**	**Methods**
The effective management of the Rotorua geothermal resource can not be achieved while there are unauthorised users on the field. That Environment Bay of Plenty work together with people who have no formal	Unauthorised bore users are discouraged from committing offences under the Resource Management Act.	To identify and register authorised users of geothermal resource. (b) To actively pursue the decommissioning of any bore used without authorisation to take and use geothermal resource.	(a) Detection of Unauthorised Users Environment Bay of Plenty will: (a)(i) Establish a monitoring system designed to detect and register the location, owner and authorisation status of all bores on the Rotorua geothermal field whether in use or not. (a)(ii) Register, monitor and map known current authorisations for the taking or use of geothermal resource.

authorisation to take geothermal resource to determine the status of their resource use. If, as a result, people are found to have no valid authorisation, then they be given a period of three months in which to secure an allocation of geothermal resource and make a formal application for a resource consent. Any user subsequently discovered to be taking and/or using geothermal resource would, following due warning, be prosecuted. This process shall not apply to bores installed and used without resource consent on or after 1 October 1991.		(c)To revoke the right of existing users to take and use geothermal resource pursuant to Section 418(2) and (4) of the RMA. (d)To encourage unauthorised users to determine the authority by which they claim a right to take and use geothermal resource. (e)To provide a moratorium for a period of three months, for unauthorised users to secure an allocation of geothermal resource and apply for appropriate resource consent	(a)(iii) Work together with bore owners to ascertain whether individual bores that have no known current authorisation are authorised or not. (b) Prevention of Unauthorised Abstraction Environment Bay of Plenty will: (b)(i) When it has reasonable grounds to believe that a bore is being operated without authorisation, issue a written warning notice to the owner of the bore. The warning notice will include a summary of the grounds for E Bay of Plenty's concerns. (b)(ii) Require that after receiving a warning notice a bore owner shall, within 20 working days, provide to Environment Bay of Plenty information stating the authority under which the bore owner believes the bore to be operating. (b)(iii) Following assessment of any advice or information received, determine whether or not a bore is being used with or without authorisation and respond accordingly. (b)(iv) Ensure that any bore used to illegally access and take geothermal water, heat or energy from the Rotorua geothermal field is effectively decommissioned by any practical means. (b)(v) Following a moratorium period of 60 working days from the date on which an unauthorised taking and use of geothermal resource has been determined by Environment Bay of Plenty to have no authorisation, pursue, as appropriate, enforcement action. Rules (c)(i) The taking and use of geothermal heat or energy from geothermal water, or heat or energy from the material surrounding any geothermal water, pursuant to section 418(2) and (4) of the RMA, is hereby revoked on the date one year from the date on which this regional plan becomes operative.

17 Equating Allocation to Use - What happens to this chapter?

These provisions will be retained and added to, in order to increase efficiency of use of the resource.

There is also scope to use non-statutory measures to add to the efficient use purpose, by providing information and support to increase efficient use, thus enabling the available heat and fluid to be shared among a larger number of uses.

17 Equating Allocation to Use - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) Resource users will be restricted to amounts of resource that are relevant to the use they propose.	**Met.** The resource consent process identifies and assesses this.
(b) Resource users are restricted from installing inefficient or wasteful resource use systems.	**Met.** Resource consent conditions require this, and resource consent monitoring checks this for compliance.
(c) Resource users are restricted from unnecessarily holding amounts of available resource that could be made available to other users.	**Met.** Consent assessments include an efficiency test with trigger values for a range of uses. The trigger values are set scientifically.
(d) Resource users are restricted from capturing resource for speculative purposes.	**Mainly met.** Through standard five year lapse, although there is some "banking" to be resolved.
(e) Resource users are restricted from holding resource on the off chance that they may need a bit more at some future time.	**Met in part.** While allocation is usually based on bore potential rather than actual and accurate measurement, improving measurement techniques and the use of 'throttling diaphragms' have refined the amounts of resource able to be taken on some bores. However for other bores with older headworks this is still 'work in progress'.
(f) Resource users would only get enough resource to operate their proposed use efficiently, without waste.	**Met.** The resource consent process provides an opportunity for resource use to be assessed against amount requested.

17 Equating Allocation to Use - What the chapter said			
Issues	**Objective**	**Policies**	**Methods**
The amount of geothermal resource granted to a user should be related directly to their use requirement, and limited to prevent resource being wasted. That Environment Bay of Plenty will require, as part of the information supporting any new application, an assessment relating to the amount of mass or energy sought to the use of the resource sought and evidence of the efficiencies anticipated by the applicant. Environment Bay of Plenty will consider altering existing consents to meet the minimum geothermal aquifer water levels required by this regional plan.	Achieve efficient use practices and the prevention of the waste of available resource.	To ensure that the allocation of geothermal resource to an applicant is not excessive but equates to an amount that is reasonable, and will ensure the efficient use of resource for the activity proposed. (b) To discourage and prevent the waste of geothermal resource.	Application Requirements (i) Each new or replacement application for geothermal resource consent to provide, amongst other application details, evidence relating the amount of geothermal water, heat or energy sought to the particular resource use proposed. (ii) Any assessment presented by the applicant to accord with the policies for efficient use required by this regional plan. (iii) Will, in assessing and deciding on any application for a consent to take and/or use geothermal resource, give effect to the requirements for efficiency set by this regional plan. (iv) May, at its discretion, grant a consent for the amount sought by the application, or for a lesser amount subject to agreement with the applicant, or may decline the application. (v) All users of geothermal water, heat or energy from the Rotorua geothermal resource are required to avoid or remedy practices that result in the waste of geothermal resource. (vi) Each resource consent granted to take or use geothermal resource for a new activity shall be subject to the requirements of section 125 of the RMA provided that any extension granted on application under section 125(1)(b) of the RMA shall not exceed six months. (vii) Environment Bay of Plenty will investigate methods and means of achieving greater efficiencies in the use of geothermal resource. Information gathered shall be collated and made available at cost. (viii) All geothermal resource recovered as a result of the efficiency requirements of this regional plan shall be monitored and registered. 17.3.3(b) Rule 17.3.3(b)(i) An allocation of geothermal resource granted by a resource consent shall be limited to an amount sufficient for the efficient use of resource relative to the activity proposed. For the purposes of this rule, the efficient use of resource means that all practicable means have been or will be installed to ensure that wastage of geothermal resource, in particular heat and energy, is minimised.

18 Transfer of Allocations - What happens to this chapter?

These provisions will be retained for Rotorua Geothermal System Management to provide the capability to transfer resource for greater efficiency of use (presumption that transfer rights will result in resource moving from less to more efficient use). Provisions will be modified to improve their uptake.

Transfer of Allocations - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a) Mobility of resource use about the field.	**Met.** Rules in the plan provide for this to occur. They have not been activated in a coordinated manner between users, but as resource has been freed up in some places it becomes available for use by other potential users via the consent application process.
(b) Net shift of extractive effects away from Whakarewarewa.	**Met.** The 1.5 km exclusion zone ensured that extractive resource use shifted away from Whakarewarewa. If a transfer occurs, Rule 18.3.3(a)(iv)(b) requires regard to be had to whether the transfer would result in the shifting of the resource abstraction point to a distance further away from Pohutu Geyser.
(c) Enable allocated resource to shift to more efficient use.	**Met.** Although the system was set up, it was not consciously used by willing traders; it has only been put into effect by the attrition and replacement of resource consents. The only way allocation can be re-assigned to more efficient use is when consents are surrendered.
(d) Induce a shift to downhole heat exchangers and reinjection.	**Met.** Resource consents conditions have prompted a strong shift to reinjection. Downhole heat exchangers are still in a development phase, as technology that suits Rotorua conditions is still evolving. So while the policy provides for and encourages the chance, not a lot of action has occurred.
(e) Enable users choices.	**Met.** The plan provides the capacity to choose, even if this provision has not been used.

18 Transfer of Allocations - what the chapter said			
Issues	**Objective 13.5.1**	**Policies 13.5.2**	**Methods**
To achieve resource mobility, to provide for community resource use aspirations and to allow the holders of resource allocations a wider range of options, a mechanism for facilitating the transfer of geothermal resource should be provided. That Environment Bay of Plenty provide for the transferring of geothermal resource between authorised users that have recognised transferrable consents, but subject to controls to ensure that the objectives and policies of the RGRP are not compromised	**Provision for the transferring of geothermal resource allocations**	(a) To enable transferring to occur as efficiently as is practicable. (b) To facilitate transferring of resource provided that the objectives, policies and methods of this regional plan are not compromised. (c) To establish a register of transferrable consents. (d) To ensure that the transfer of any portion or allocation of geothermal resource related to an interconnected multiple user system recognises the interests of users that take or use geothermal water, heat or energy from the system.	Transfer Register and Procedure - E B·O·P will: (i) Establish and maintain a register of those resource consents and associated bore systems that qualify as transferable consents. (ii) Require that a transfer proposal be submitted to E B·O·P for assessment, under the signatures of all parties to the transfer. (iii) Consider a transfer proposal with reference to an assessment on environmental effects. (iv) Environment Bay of Plenty may have regard to the following criteria when considering a transfer proposal: Whether the transfer would result in the extracted resource being reinjected or heat resource being accessed by a downhole heat exchanger, (b) Whether the transfer would result in the shifting of the resource abstraction point to a distance further away from Pohutu Geyser. (c) Whether the transfer results in compliance with the objectives, policies and methods of this regional plan. (v) Advise the parties of its assessment of the proposal. (vi) Require, pursuant to section 136(2)(b)(ii) of the RMA, the completion of an appropriate resource consent transfer application, as prescribed by section 136(4) of that Act. (vii) Not accept liability or responsibility for compensation, commercial competition or subsequent availability of a transferred resource allocation. (b) Rule (b)(i) Transferring a geothermal resource is limited to originate from any resource consent that qualifies and is registered as a transferable consent identified on Environment Bay of Plenty's transferable consents register. (b)(ii) A transfer of geothermal resource shall not result in a net additional demand on the resource.

			(b)(iii) A transfer has not occurred until all relevant application requirements, policy criteria and rules have been complied with and new or replacement resource consents issued. (b)(iv) The transfer shall not result in any increased adverse effects on the surface features of the Rotorua geothermal resource. (b)(v) Any bore owner transferring the whole of their resource allocation shall have no further claim to that transferred allocation. (b)(vi)A ny bore owner transferring part of their resource allocation shall adjust their bore and use systems accordingly. (b)(vii) Environment Bay of Plenty shall not involve itself with any negotiation, transactions, between parties in relation to a transfer of geothermal resource. (b)(viii) The transfer of any portion or allocation of geothermal resource related to an interconnected multiple user system shall require the application for transfer to be made with the consent of all users connected into that system. Any application not complying with this provision shall be a notified discretionary activity.

19 Controlling Environmental Effects - What happens to this chapter?

Many of these provisions were to cover the transition to a resource consent regime. The transition period has now concluded so the provisions are obsolete.

Bore drilling and testing provisions are already in the Water and Land Plan, and these would be used instead of the rules below.

The remainder, covering the Mass Abstraction Exclusion rules, will be retained for Rotorua Geothermal System Management.

Controlling Environmental Effects- What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a)A shift towards minimal abstraction or the substantial reinjection of all extracted geothermal fluid within three years.	**Met.** In 2001, 77% of geothermal fluid in the Rotorua Geothermal system was reinjected. By 2005, the level of reinjection had reached 90%, consistent with the intended management objectives for the use and allocation of the Rotorua Geothermal system resource.
(b)A shift to the use of down hole heat exchangers and fluid reinjection will be encouraged for five years and required after that.	**Met.** As noted above, reinjection levels are 90%. As noted in previous chapter, down-hole heat exchangers are still in a development phase, as technology that suits Rotorua conditions (such as heat pump use) is still evolving.
(c)There will be control over unnatural discharges of geothermal fluid into surface drainage and shallow groundwater systems, culminating in a substantial prohibition on the surface and soakage discharge of bore extracted fluid after five years.	**Met.** Abatement and infringement notices have been issued to consent holders for not complying with consent conditions which have resulted in unnatural discharges of geothermal fluid, condensates and gases. Remedial action primarily involved discharging geothermal fluid into a re-injection bore, or alternatively converting production bores to down-hole heat exchanger (DHX) bores. Rotorua District Council and Bay of Plenty Regional Council staff cooperate strongly to continue to deal with the remaining users so that their geothermal fluid is appropriately discharged. There are still some surface (or shallow) discharges occurring in the Rotorua system, these are primarily centred around Ohinemutu where it has been shown to be potentially dangerous to reinject (being an outflow feature). There is also a small portion of shallow discharges occurring in an area of the 1.5 km MAEZ where the water is being abstracted from no more than 6 metres below ground level.
(d)The unnatural emission of geothermal gases into the air will be remedied.	**Met.** Resource consent conditions require emission management. Consent compliance checks confirm this.
(e)The hazard of uncontrolled gas emissions from bores and soak holes will be remedied.	**Met.** The few remaining problems of this nature are dealt with by the Rotorua District Council under their Rotorua District Council Geothermal Safety Bylaw 2008.

19 Controlling Environmental Effects – What the chapter said			
Issues	**Objective**	**Policies**	**Methods**
Effects caused by the placement of geothermal bores The inappropriate placement of geothermal bores could result in adverse environmental effects and hazards, and raises the possibility of a user being refused a resource consent. To require the construction or installation of any new or replacement bore to be a discretionary activity, subject to conditions as to location and the return of construction and testing information. Issue: effects caused by the withdrawal of geothermal water The withdrawal of geothermal water lowers field aquifer water levels and causes environmental effects. To require all users that extract geothermal fluid to install a reinjection or down hole heat exchanger system within three years, and to require that resource consents for any new bore system, or renewal of existing system, are limited to a term of 10 years with reinjection or a downhole heat exchanger, provided that: (a)The taking of limited amounts	19.6.1(a)Protected and enhanced geothermal field aquifer water levels and pressures. 19.6.1(b)Unnatural surface discharges of geothermal fluid are avoided or remedied. 19.6.1(c)Surface ecologies and water quality are protected from surface discharges of geothermal fluid. 19.6.1(d)The effects and hazards from the uncontrolled discharge of gases from bores are avoided or remedied.	To control the location and means of constructing and installing a geothermal bore. (b) To encourage and eventually require existing resource users to shift away from net mass abstraction and install effective reinjection systems or down hole heat exchangers over a three year period, or up to five years in special circumstances (c)To encourage and eventually require existing resource users to shift away from the discharge of geothermal fluid into surface drainage systems and shallow soakage systems over a five year period, except in special circumstances (d) To prohibit the hazardous uncontrolled discharge of geothermal gases from any bore. (e) To promote the controlled discharge of geothermal gases. (f) To limit the term of resource consents and	(a) Promote an education campaign to explain the new requirements. (b)Make available information on the location and extent of surface geothermal outflows and encourage the use of outflow resource provided the use does not cause damage to sensitive ecosystems. (c) Rules (i) From the date three years following the RGRP becomes an operative plan, the taking and using of geothermal water from a bore installed into the Rotorua geothermal field aquifer = a prohibited activity, unless reinjected at an appropriate temperature into the source, then discretionary (b) For an existing bore, an authorised user or consent holder may, within one year following the date on which Plan becomes operative apply for an extension re abstracted be reinjected within three years following the date on which the RGRP becomes operative. Environment Bay of Plenty may extend the reinjection compliance period to a date >3yrs not exceeding five years following the operative plan date. Such extension = discretionary activity until the date on which the extended period expires, and from then on a prohibited activity. c) A rule 13.5.3(b)(ii) prohibiting the taking and using of bore abstracted geothermal water within the 1.5 kilometre mass abstraction exclusion zone shall take precedence. (c)(ii) The taking of geothermal water, heat or energy for the purpose of testing = a Permitted Activity provided: (a) The discharge of geothermal water taken does not contaminate the environment, and (b) The taking of geothermal resource does not continue for longer than 48 hours, and (c) The taking and discharge of geothermal water remains controlled by appropriate headworks. (d) Discretionary Activities (Restricted) (d)(i)The construction or installation of any bore discretionary activity

of geothermal fluid for medicinal and therapeutic facilities may be granted if waste fluid is subsequently reinjected, and (b)Under special circumstances, particularly where reinjection is not practicable, E B·O·P may waive or defer the reinjection requirement. In such circumstances E B·O·P may consider other options to limit mass abstraction effects. Issue: effects caused by the discharge of fluid to the E Surface and soakage discharges of bore abstracted geothermal fluid are destructive, hazardous and have unnecessary effects on the environment. That following a three year transition period, and apart from defined special circumstances, Environment B·O·P would prohibit the discharge of geothermal fluid into any environment other than the source from which it came and will only grant consent to withdraw geothermal water on the condition that all fluid would be returned to the source from which it came. Issue: effects resulting from the discharge of geothermal gases. The venting of gas, particularly from unused bores, poses an avoidable threat to the environment, and an unnecessary		establish eventual prohibitions to achieve the above policies. (g) To encourage the use of surface geothermal resource outflow as an alternative to bore abstraction, subject to the protection of surface ecologies.	requiring a land use consent. (d)(ii) Application details for the construction or installation of any bore shall be in the prescribed form + information on the proposed bore (8 matters): (a) Bore. (d)(iii) When considering an application for the construction or installation of any bore, restrict the exercise of its discretion to (7 matters) (d)(iv) Each resource consent granted for the construction or installation of any bore shall comply with conditions, standards and terms on Bore Test Information & Provision For Control And Measuring Devices. (e)(i) Subject to the provisions of rule (c)(i), the taking, using or diverting of geothermal water with or without reinjection, and the taking, using or diversion of energy, including heat from a down hole heat abstraction system are deemed to be activities that have an adverse effect on the environment and shall be discretionary activities requiring a water permit, provided that rule 13.5.3(b)(ii) prohibiting the taking and using of geothermal water within the 1.5 kilometre mass abstraction exclusion zone shall take precedence. (e)(ii) An application for a water permit to take and use geothermal resource without reinjection shall not be granted unless accompanied by an application for a discharge permit to cover the discharge of fluid following use. (e)(iii) The discharge by reinjection of geothermal fluid or gas back into the geothermal surface source or aquifer from which the fluid or gas was extracted shall be a discretionary activity. (e)(iv) The discharging of geothermal fluid into any part of the environment other than by direct return or reinjection back into the geothermal surface source or aquifer from which the fluid or gas was extracted shall be a discretionary activity requiring a discharge permit. (e)(v) The continuous, controlled and safe discharge of geothermal gases from any bore or soakage hole into the air or surface environment outside the fluid source reservoir shall be a discretionary activity requiring a discharge permit. (e)(vi) The taking and discharging of geothermal water or geothermal energy, including heat from or into any surface geothermal resource,

hazard risk to the community. That Environment B·O·P requires the sealing of all unused geothermal bores and ensures that any operational bore, including production, reinjection and soak bores are made safe from gas discharge.			flowing naturally from the Rotorua geothermal field shall be a discretionary activity. (f) Prohibited Activities (f)(i) Commencing the physical construction or installation of a bore to access geothermal resource without a current land use resource consent granted under this regional plan is a prohibited activity. (f)(ii) The discharge of bore extracted geothermal fluid outside the geothermal aquifer from which the fluid was extracted shall be a prohibited activity from the date five years following the date on which the RGRP became an operative regional plan, provided that where the applicant demonstrates to the satisfaction of Environment Bay of Plenty that for a particular bore reinjection is not technically feasible or may be potentially dangerous, the discharge shall remain a discretionary activity. (f)(iii) The discharge of bore extracted geothermal fluid into the surface environment or to soakage shall become a prohibited activity from the date five years following the date on which the RGRP became an operative regional plan, provided that where the applicant demonstrates to the satisfaction of Environment Bay of Plenty that for a particular bore reinjection is not technically feasible or may be potentially dangerous, the discharge shall remain a discretionary activity. (f)(iv) The uncontrolled discharge of geothermal gases from any bore or soakage hole shall become a prohibited activity from the date one year following the day on which the Proposed RGRP became an operative regional plan. (g) Resource Consent Terms and Conditions (g)(i) consent limited to three years following RGRP or where fluid reinjection is not technically feasible limited to ten years. (g)(ii) consents to abstract geothermal water with effective reinjection discharge limited to ten years. (g)(iii) consent to extract geothermal energy, , from DHX ten years. (g)(iv) consent to taking and discharging of geothermal water, heat or energy from and into the same surface geothermal resource flowing naturally from the Rotorua geothermal field ten years. (g)(v) consent to discharge geothermal fluid to surface or soakage drainage systems = five years limit, except where reinjection not

			technically = ten yrs. (g)(vi) A resource consent granted for a discharge permit = 5 yr limit.

20 Efficiency in Resource Use - What happens to this chapter?

These provisions will be retained and added to, in order to increase efficiency of use of the resource.

There is also scope to use non-statutory measures to add to the efficient use purpose, by providing information and support to increase efficient use, thus enabling the available heat and fluid to be shared among a larger number of uses.

Efficiency in Resource Use - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
(a)Wastage of geothermal resource will stop.	**Mainly met.** Still scope for work to be done here, probably around increased education and eventually stronger conditions in regards use efficiencies.
(b)By requiring an assessment of efficiency of use to be considered by E B·O·P when a resource consent is sought, wasteful abstraction will be limited and the environment better protected.	**Met in part.** Efficiency only considers end use, not efficiency of original use or dollar value efficiency of use. Consent process looks at the efficiency of use and wasteful practices, checked via compliance, but focuses mainly on heat escape not efficiency of equipment (e.g. bore headworks and heat transfer apparatus)
(c)Resource consent holders will need to consider means and methods that they can use to remedy any adverse effects their resource use may have on the field. This will enhance resource conservation and protect the environment.	**Met in part.** There is still a need to build these more strongly into consent conditions. Not done routinely and further education work is needed.

20 Efficiency in Resource Use - What the chapter said			
Issues	**Objective 13.5.1**	**Policies 13.5.2**	**Methods**
Some users are wasting geothermal resource by taking more than they need or failing to insulate or control heat flows. That when assessing renewed and new resource consents, Environment Bay of Plenty will, amongst other considerations, evaluate whether the applicant proposes an efficient use of geothermal resource and whether the amount sought relates to the use proposed without waste. Environment Bay of Plenty may grant an application that does not meet efficiency standards, however the period of grant will be limited on the expectation that efficient resource use would be implemented prior to reapplication. The period of grant is proposed to be limited to two years in this situation.	Protection of available resource from inefficient and wasteful use practices	To require resource consent holders to control their taking and using of geothermal water or energy to minimise heat loss. (b) To require source consent holders to maintain their mass and heat abstraction and exchanger systems to minimise heat lo(c)To require resource consent holders to insulate their mass and heat abstraction and exchanger systems and associated pipework to minimise heat loss.	a) Information (a)(i) As practicable, Environment Bay of Plenty will investigate establishing geothermal resource efficiency standards on means and methods to protect available resource from inefficient and wasteful use practices. (a)(ii) Environment Bay of Plenty will compile and make available any information it has on means, methods and resource efficiency standards. (b) Application Criteria (b)(i) As appropriate, Environment Bay of Plenty may require the installation of control devices for bores that are over productive relative to the amount sought. (b)(ii) All resource applications to take or use geothermal resource are accompanied by an analysis of measures that the applicant has or will undertake to prevent waste of geothermal resource, in particular heat and energy. (c) Consent Terms and Conditions i) Any consent granted to take or use geothermal resource, including energy and heat, shall be made subject to a condition requiring that adequate control of heat transfer equipment has been installed, including any variable control or sealed orifice devices that Environment Bay of Plenty considers necessary to achieve minimum heat loss from the system proposed. ii) The amount of resource granted to an applicant shall, in terms of energy or heat (thermal) equivalents, not exceed an amount adequate to service the use sought. iii) On any subsequent application for a resource consent, an assessment of the applicants efficiency performance shall be made, relative to any consent conditions of the applicants previous consent, and to the policy requirements of this regional plan.

21 Administration - What happens to this chapter?

These provisions would be transferred to a non-statutory document, linked to action plans, rather than being transferred to the regulatory part of the next plan.

Administration What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
Best practicable operation of the Rotorua Geothermal Regional Plan with continued active community liaison and participation	**Not Met.** There has been very little community liaison with regards to the geothermal field. [The liaison group that was mooted in the plan never eventuated. There have been a few ad hoc meetings with Te Arawa iwi and Rotorua District Council, and some miscellaneous geothermal presentations, but no focussed effort on discussing geothermal issues with the Rotorua community.] There is great potential for an efficiency and protection campaign).

21 Administration What the chapter said			
Issues	**Objective**	**Policies**	**methods**
	The achievement of efficient and effective administration of this regional plan, while minimising costs.	To establish and convene regular meetings of a Rotorua Geothermal Liaison Group to discuss the operation of the RGRP. (b) To encourage a partnership management relationship with tangata whenua of the Whakarewarewa and Ohinemutu rohe. (c)To actively advocate that an integrated inspectorate and charging system be established for the Rotorua geothermal resource. (d) To remove redundant policy	Rotorua Geothermal Regional Plan Workshops Environment Bay of Plenty will: (i) Ensure that the Rotorua Geothermal Liaison Group is an informal group facilitated by Council to provide an open forum for interested parties including (without limitation) geothermal users, Tangata Whenua, the District Council, and representatives of the tourism industry and the Minister of Conservation to meet and discuss matters related to the regional plan, and arrange that a Liaison Group meeting be held not less than every twelve months from the date on which the proposed regional plan became operative. The Liaison Group is a consultative group. (ii) Keep a register of matters including any issues, problems and concerns raised about the regional plan, its operation or the Rotorua geothermal field. (iii) Act to remedy any urgent matter that arises, and bring other matters to the attention of the Rotorua Geothermal Liaison Group for discussion and solution. Responsibilities of Tangata Whenua

		and to promote more effective policy.	(i) Environment Bay of Plenty will seek to establish a partnership of management relationship with tangata whenua. This will be primarily for the geothermal resource and the hot pools and springs and other geothermal surface manifestations within the Whakarewarewa and Ohinemutu areas of the field. The purpose of this partnership will be to oversee any partnership matters that the tangata whenua or Environment Bay of Plenty consider require attention including: (a)The registration and protection of geothermal taonga, and (b) The determination of who has the right to claim geothermal use rights under Section 14 (3)(c) of the Resource Management Act, and (c) Resolution of the concerns and matters of importance to tangata whenua noted at the Geothermal Meeting with Te Arawa Representatives on 15 July 1993, and (d) Any other partnership matters that the tangata whenua or Environment Bay of Plenty consider require attention. integrated Inspectorate (i) Environment Bay of Plenty and the Rotorua District Council will actively advocate to Government that an integrated inspectorial and charging system be established for the Rotorua geothermal resource. Rescinding Previous Policy (i) Authorisation to abstract geothermal water pursuant to General Authorisation No.6 of the Bay of Plenty Regional Council Transitional Regional Plan dated October 1991 is hereby cancelled.

22 Monitoring and review - What happens to this chapter?

This function is a requirement of the RMA, and would be presented in the subsequent plan in accordance with those requirements.

Monitoring and review - What did this chapter try to achieve? (Anticipated Environmental Results)	**Did it do it?**
The effectiveness of the environmental objectives and outcomes of the plan will be continuously monitored, and reviewed as appropriate.	**Met in Part.** Compliance with resource consents in the Rotorua Geothermal system is 80 - 85%. A sample of geothermal consents was assessed: 1. Use of geothermal water for domestic, spa and swimming pool heating. 2. Use of geothermal water to provide a source of heat for light commercial use. 3. Drilling and well testing of geothermal systems.

	Geothermal hazard risk assessments (including subsidence) are required for new activities or developments on land over or adjacent to geothermal resources, sites and features, as appropriate to the scale and significance of the potential effects.

22 Monitoring and review - What the chapter said			
Issues	**Objective**	**Policies**	**methods**
The amount of geothermal resource granted to a user should be related directly to their use requirement, and limited to prevent resource being wasted. That Environment Bay of Plenty will require, as part of the information supporting any new application, an assessment relating to the amount of mass or energy sought to the use of the resource sought and evidence of the efficiencies anticipated by the applicant. Environment Bay of Plenty will consider altering existing consents to meet the minimum geothermal aquifer water levels required by this regional plan.	**Continual monitoring and review of the effectiveness of the plan as a means of achieving its objectives and policies**	To ensure the Rotorua geothermal field monitoring programme is oriented to provide information that supports the objectives and policies of this regional plan. (b) To compile a register of matters that may require reconsideration in any subsequent review of the regional plan. (c) To initiate action to resolve any matter that may confuse or subvert the objectives or policies of this regional plan.	(a) Align the Rotorua geothermal field monitoring programme to the requirements of this regional plan. (b) Monitor the regional plan for structural and operational faults. (c) Initiate a review of the regional plan at any time that an unacceptable fault arises. (d) Initiate a full review of the regional plan after five years from the date on which this regional plan became operative.

Appendix 2 - Additional regional council functions and responsibilities

Changes to the Plan must be in accordance with changes to section 30 and Part 2. RMA Amendments since 1999 mean that the Bay of Plenty Regional Council must now also recognise and provide for:

- the protection of historic heritage from inappropriate subdivision, use and development [section 6 (f)];
- the protection of recognised customary activities [section 6 (g)];

and have particular regard to:

- the ethic of stewardship [section 7 (aa)];
- the efficiency of the end use of energy [section 7 (ba)];
- the effects of climate change [section 7 (i)]; and
- the benefits to be derived from the use and development of renewable energy [section 7 (j)].

Amendments to the functions of BOPRC section 30 are:

- the establishment of rules to allocate the taking of water (including heat) and the capacity of water to assimilate a discharge [section 30(1)(fa)and (fb)(i)];
- the establishment of objectives, policies and methods for the maintenance of indigenous biological diversity [section 30(1)(ga)]; and
- the strategic integration of infrastructure with land use through objectives, policies and methods [section 30(1)(gb)].

The Resource Management (Energy and Climate Change) Amendment Act 2004 (RMAA):

- Introduced a definition of renewable energy which includes geothermal energy and amended section 7 (other matters) by including (j) 'the benefits to be derived from the use and development of renewable energy' as a further matter to which local authorities must have particular regard. The intent of the amendment is to promote the use and development of renewable energy in order to help meet the central government's energy targets.
- Strengthened Council's ability to provide policy direction on renewable energy and the efficiency of the end use of energy. The RMA includes energy in the definition of natural and physical resources.

Council's role in energy related matters may increase given both the RMAA 2004 and the purpose of the Local Government Act 2002 providing councils with a mandate to be involved in broader sustainable development initiatives. Council may continue to pursue a strong advocacy role in energy matters to achieve integrated management of all forms of natural and physical resources.