CHANGING RESOURCE MANAGEMENT OF SURFACE WATER ALLOCATION TO MEET DRILLING RIG DEMANDS

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ABSTRACT

Access to water, as managed under the Resource Management Act 1991 (RMA) is becoming increasingly constrained in New Zealand. Geothermal drilling operations require relatively large amounts of surface water albeit on a variable and infrequent basis to provide for drilling mud and circulation fluids. As fluids are "lost" during drilling to the deep underground formations, more fluids and water are required to provide for safe and successful drilling operations. This paper identifies key policy issues involved with surface water allocation and use, through the lens of geothermal drilling and identifying several methods to effectively manage the resource during a well programme. Investigations into current water provision within two Council regions are discussed, as well as observations of how water is to be managed in New Zealand.

1. CONTEXT

1.1 Management of Water Resource under the RMA

Fresh water is fundamental to the New Zealand economy, including the primary sector, tourism, hydro and geothermal power generation. Water in both good quantity and quality is a scarce resource and managing it effectively to meet competing expectations and values can be complex, confrontational and costly. Managment of these values have been a regional council responsibility under the Resource Management Act 1991 – legislation developed at a time where there was a relative abundance of water.

Supply of surface water exists on a "first-in, first-served basis" and often in catchments that are over-allocated. Any consent seeking further provision would need to enter at the back of a queue and be assessed once allocation exists. As a result, this process favours existing uses and consents, protecting established activities from changes to plan rules and standards designed to promote better environmental outcomes. In extending access to a resource for long periods, enhanced the ability to invest in long-lived capital equipment that can best use, or to bank, that resource. However, in an over-allocated catchment - the 'first-in, first-served' approach can prevent the end allocation of resources to uses which offer the greatest respective environmental, social, cultural or economic value.

Without any flexibility and limited access to information and data, little improvements to the system have been made. Note: At the time of writing, One scheme by Wairakei Pastoral Limited is known to be exercising some form of sharing in allocation with other users. Watercare have also been granted consent for 100 million litres of winter allocation and sharing 25 million litres with Hamilton.

1.2 Drivers of Change

While quantity and quality are not an issue across all New Zealand catchments, and not all of the time with seasonal fluctuation in water availability, the main consequence is increasing competition for water between different users and deteriorating water quality in some catchments. A more responsive system is needed to address cumulative environmental effects and pressures arising as a result of climate change. Any system also needs to recognise and provide for customary Māori rights and interests to water further to Waitangi Tribunal claim in Wai 2358.

The Land and Water Forum (2018) advice to Ministers identified many of the issues that must be resolved, but was unable to reach a consensus among participants on some important issues, including how to determine initial allocations and how best to reduce existing allocations. A reduction in existing freshwater "rights" is urgent in overallocated catchments, and where collaborative processes are not likely to succeed, a regulatory backstop is required. In addition, a more structured approach to the allocation of new rights, and for reallocating rights upon the expiry of existing consents, should be implemented where scarcity is reasonably foreseeable. Any future resource management system will need to have the mechanisms and processes to resolve these issues.

Overseas experiences have also generated some potential solutions to scarcity:

- systems that focus on achieving the most value from water,
- coordinating multiple discipline science based decision-making,
- developing water trading markets,
- being careful with allocations, and
- using policy design to achieve social, cultural and environmental goals.

1.3 Changes to Freshwater Policy & RMA

To date many drivers for change in freshwater allocation policy have been at the regional council level.

In 2012, Waikato Regional Council undertook a change to their planning framework with Variation 6 following an Environment Court decision. This established new rules for managing the allocation of water in the Waikato. The rule provided for an increase to the allocable amount of water from the Waikato River above Karāpiro. A recent similar Bay of Plenty Regional Council Water Allocation Plan Change has been abandoned.

The incoming National Policy Statement for Freshwater Management (NPS-FM) will likely bring about another review which may also bring some alignment with recent legislative changes. This will require that regional councils set environmental limits and ensure that plans state criteria

by which applications for approval of transfers of water take and use permits are to be decided, including to improve and maximise the efficient allocation of water.

Contrasting this NPS-FM with the National Policy Statement for Renewable Electricity Generation (NPS-REG) – currently the NPS-REG does not apply to the NPS-FM, so no additional protection under the NPS for geothermal generation.

Further to more recent developments in Resource Management Act Reform in 2020, including the proposal of repealing and replacing the RMA, it appears that water allocation and management will not only be a resource planning issue, but a key New Zealand election issue.

2. USE OF WATER IN GEOTHERMAL DRILLING

2.1 Drilling Operations and Demand Under Losses

The use of water for rig operations is essential for the drilling wells. Without water, wells would simply not be able to be drilled and a geothermal plant will lose ability to maintain both production and injection capacity and the benefits to be derived from the use and development of renewable geothermal energy.

The amount of water needed for drilling can be quite variable over the duration of a drill campaign, characterised by peaks and periods of little or no water use. As each well approaches certain geological formations, the need for water increases to provide for drilling mud and circulation fluids. If these fluids are "lost" to the deep underground formations, more fluids and water is required to provide for a safe and successful drilling operation.

Examples of rig water use for nine Mercury wells are shown below in Figure 1. Peaks correlate to formations where losses occurred. The highest recorded water usage while drilling a Mercury well with losses has been 7,407m^3/day, while average use over each well is 1,396 m^3/day. To account for the maximum needs of the rig and uncertainty of losses, it is recommended that up to 7,500 m^3/day is available and allocated.

Water allocation is monitored and reported to the regional council whose objectives are to review and demonstrate the most efficient use of the resource. As drilling is undertaken on the field every 2-3 years and for 2-3 months each programme, large amounts of consented allocation for drilling activities remain unused and could be considered a relatively inefficient use of the available water resource.

2.2 Existing License

Existing licenses for drilling water use have undergone consent change, transfer and renewal in the past to provide for operations and facilitate more flexibility around operations on multiple fields.

Rotokawa and Ngatamariki share water allocation between the two fields. A nominal amount of days are allowed for higher water demands so that in theory up to two drilling rigs can be in operation at once. Conditions to address environmental effects or restrictions in periods of low flows and availability have been added. Water recording and reporting need to be closely and actively managed.

At Kawerau, part of a water take consent allocation was transferred from another geothermal user to provide for a large majority of water use. The RMA provides for the transfer of consents to a new owner or occupier of the site on application by the consent holder. Consents can also be transferred to another site where the transfer is expressly allowed by a regional plan, or where the regional council specifically authorises the transfer having considered the environmental effects of the transfer and any relevant regional or national policy direction.

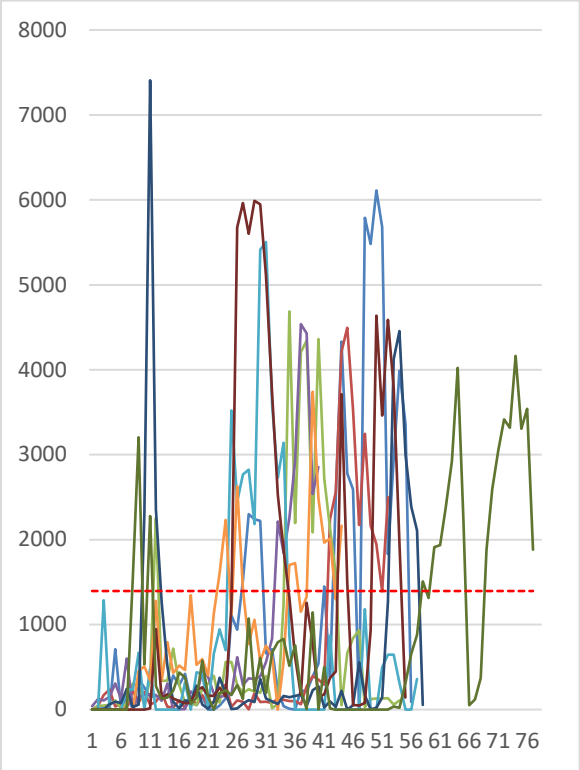

Figure 1: Water consumption in cubic metres (m^3) per day over nine (9) wells drilled. Average usage per well per day is 1,396 m^3/day and peak daily use was 7,407 m^3.

When applying for a resource consent, while there is no explicit guarantee of consent renewal in policy, common practice has seen existing consent holders have priority over new applications on expiry of a consent, although the consent authority must consider: the efficiency of the existing consent holder's use of the resource, the use of industry good practice by the existing consent holder, if the existing consent holder has been served with an enforcement order and the value of the investment of the existing consent holder.

2.3 Alternative Sources of Water

Other sources of water for drilling application have been investigated to supplement available surface water: Condensate from geothermal plant operations has been explored as a potential source of loss circulation fluid. However, the supply rate and temperatures delivered make it undesirable for use. Groundwater bores have potential in areas where surface water is overallocated to provide water. However, to draw enough water at up to 7,500 m^3/day, the size, cost and effects of a groundwater bore becomes prohibitive. Lined buffer ponds can store excess water in

reserve. However, to accommodate for a typical period of losses, significant reserves need to be held far in excess of the average rig use rate (e.g., such a pond will need to be one hectare in area and 2 metres deep).

3. FUTURE CHALLENGES FOR DRILLING WATER

For drilling operations to adapt to future challenges in the management of water allocation - three main areas need to be explored; more flexible regulatory permissions, developing administrative merit-based systems and better enabling the trading of permits within the current system. Each of these have specific challenges and opportunities for drilling water use.

3.1 Increasing Flexibility

Allocations can be designed to provide a responsive regime. Shorter durations allow more permits to be re-considered more often, if necessary. More frequent allocation opportunities mean councils can alter permits based on how successful they have been in meeting freshwater objectives. Consideration could also be given to the flexibility of the provisions for review of consent conditions, including the possibility of 'clawback' provisions that give councils the option to retain a certain percentage of the existing water use as part of the permit renewal process. Utilising the same expiry date for permits enables councils to make adjustments to water use based on a holistic and simultaneous assessment of different takes.

For drilling takes, defending unused allocation will remain the largest challenge resulting from more flexibility provisions. Shorter durations do not promote investment certainty for the billions invested in geothermal development and operations. The ability to effectively "reserve" this water will need to be protected within the planning process, rather than just on application at each consent expiry.

3.2 Community User Groups

One way to reduce the administration and decision-making costs of local authorities is to form collaborative water user groups. Here, shared water permits can be issued to an industry (i.e. geothermal), or sub-catchment water governance group to manage on behalf of its members. This effectively outsources some of the decision-making to a third party. In the case of drilling, rig availability generally prevents competing use for water, so allocation could be shared within those in the geothermal industry. However, as rig activities follow no seasonal cycle and can be required on ad hoc or emergency basis, this could come into conflict with primary industry demands over summer seasons. If drilling activities had the ability to be more aligned with winter months, water would be more easily secured. Water allocated for geothermal drilling will be an 'attractive' prospect for catchment groups to add to their portfolio because of the large periods of little use. Acceptance by the geothermal operator will need to be accompanied by rigorous planning of various water user group needs and some form of veto for well intervention activities.

3.3 Market-Based Approach

Moving to a market-based approach in enabling trading of permits within the current system or using auctions and tenders may be useful in some situations. Geothermal allocations retain large amounts that are left unused for large periods of time – so could be capitalized upon. However, there are limits to the extent to which market drivers can promote the efficient use of resources. Significant investment into technology and systems for accurate measurement, monitoring and management of takes will allow water to move to its highest and best use across a wider range of users, including newcomers. This will largely be at the immediate benefit of those who hold existing rights – a potential boon for geothermal operators.

4. CONCLUSION

There are significant challenges and changes anticipated in how freshwater is managed in New Zealand. For geothermal operators who use large amounts of surface water for intermittent application on drilling activities, there are some threats to existing water rights, but also some market-based opportunities in sharing unused allocation. Through effective planning process and regulatory review, the interests of the geothermal industry should be to advance provision of water for drilling and well intervention as a critical resource to supporting nationally significant electricity generation infrastructure.

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