# THINK TANK NEWSLETTER

Issue 9 - Meeting 28 27 April 2017

Meeting 28 again focussed on groundwater modelling results and making decisions about how much more scenario development and modelling is needed.

## Climate Change

HBRC's Jeff Smith, Hydrology Principal Scientist, gave an overview of how climate change may affect water availability and demand during this planning cycle. Jeff examined the effects of a relatively precautionary 'Representative Concentration Pathway' RCP6.0, that assumes $CO_2$ concentrations will increase to 670 parts per million by year 2100 – and stabilise in the 22nd century. Of 16 global climate models available for the RCP6.0 scenario, NIWA has downscaled six for New Zealand. The six models chosen by NIWA are broadly representative of all models. Projections for rainfall and evaporation in Hawke's Bay under the various climate change models show little difference for the next 26 years. Modelled data is very similar to climate records of the last 26 years.

Better models currently under development for NZ will not provide data in this planning cycle.

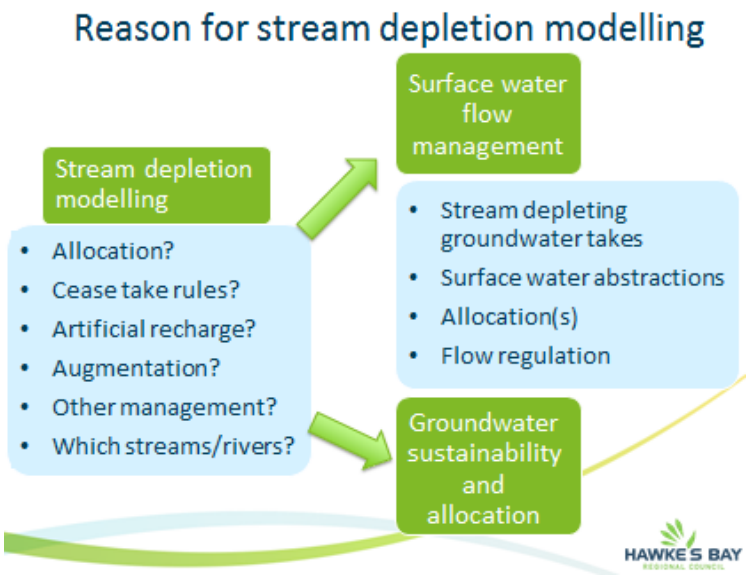
Climate Change effects are expected to show after 2050, so Jeff Smith recommended using the last 26 years of data to model effects of different water management scenarios for the current TANK Plan Change. Group members agreed this was a suitable approach.

The TANK Group was also anxious to ensure that climate change effects get proper attention. They requested that more information - as it becomes available - is used to review plan provisions, and agreed to consider possible climate change policy options for this plan change.

## Water Takes that reduce Stream Flows

At Meeting 27 the Group learnt that aquifers under Heretaunga Plains were very connected. This has big implications for how groundwater takes, including those with a stream-depleting effect, are to be managed. These groundwater takes impact spring-fed stream flows, the Ngaruroro River flow and the overall level of groundwater; all of which need to be accounted for.

Because of interconnection between groundwater takes and spring discharges across the entire plains,



the Group was asked to consider different management approaches to protect spring-fed stream flows. This includes maintaining flows artificially with augmentation from groundwater abstraction and managed aquifer recharge. The model will be used to predict what happens to groundwater levels, spring flows and the Ngaruroro River if these management approaches were adopted.

HBRC's Jeff Smith and Senior Resource Modeller Pawel Rakowski presented more information on the stream depletion modelling – the effects of groundwater takes on surface flows.

Their modelling has looked at the effects of different management options on stream flows for the groundwater takes: pumping bans, managed aquifer recharge and stream augmentation.

- Managed Aquifer recharge (MAR) = water taken from Ngaruroro River at times of higher flow, to recharge the aquifer
- Augmentation = taking water from the aquifer or above-ground storage to boost a stream flow in summer low flow periods
- Augment (by storage) = the taking and storage of water during high flow to increase flows in a stream during low flows

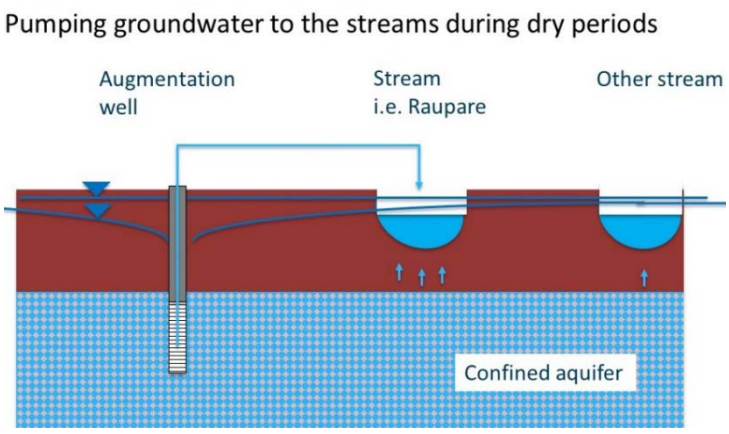
**Conclusions**

- Artificial recharge (MAR) has a limited effect on aquifer levels - benefits to spring-fed streams quickly dissipate
- Groundwater ban scenario shows some recovery over a 30-day period on Karamū Stream, but less on Ngaruroro flows – it takes a long time for a stream to recover after a ban, which would have to be applied to all plains water takes
- The model showed a spring-fed stream flow, such as Raupare stream, could not be managed with targeted management of groundwater takes in any sub-zone, due to high connectivity throughout the Heretaunga plains aquifers
- Augmentation from groundwater delivers water immediately to streams, making timing a key benefit, but likely to be impractical for large rivers due to the volume required.

Lowland stream ecosystem requirements have to be considered differently than the Ngaruroro and Tutaekuri rivers, i.e. oxygen is more important for aquatic life for Karamū and Raupare than the area of wetted usable habitat; the reverse for rivers.

The Raupare Stream typically loses flow in a dry summer and Pawel was able to show that stream augmentation of 150 litres per second pumped into the Raupare over 30 days has a small reducing effect on flows in the Karamū and Ngaruroro of about 8 and 35 l/sec over 30 days respectively. This could maintain a 300 l/ sec flow in the Raupare during an extremely dry summer.

A positive idea also came out of this testing and modelling. With a little work, these results could be automated to a website as an allocation tool and to show public the effect of pumping. This could help broaden public understanding of total water use across the plains - including residential and industry - and assist water conservation campaigns at times of stress.



## Ideas for Extra Modelling

The Group suggested other options to model, so HBRC scientists will consider the list and come back to the TANK Group with possibilities from ideas including:

- An augmentation scheme to supplement the Ngaruroro River from storage
- Augmentation flow schemes for the Raupare and Karamū streams from groundwater
- Flooding river flats at Maraekakaho/ Roys Hill, for recharge and to turn it into a wetland
- How to make urban (municipal) and industrial water use more efficient
- Consider how to manage water takes that are not fully used.

There was more discussion about managing the cumulative effects of groundwater takes on household wells, especially with issues reported for some wells last summer, as at Ruahapia Marae and Wellesley Road.

The Group particularly asked for more information on long-term aquifer levels and annual recharge.

## Recap - Benefits to a River of Restricting Groundwater Takes

Thomas Wilding of HBRC spoke about benefits of restricting groundwater takes, i.e. theoretically, what would happen to the rivers and streams if water was shut off to people across the plains?

Turning off all water takes - including industrial and municipal supplies - would result in little short-to-medium term (7-30 days) recovery of flows in the Ngaruroro River. A spring-dominated stream like the Raupare experiences proportionally greater flow recovery from a total ban, though the total amount of water is less (in litres per second).

More modelling is needed to predict the impact of management options on streams over the total eco-system, especially to understand the impact of flow management on oxygen levels in streams. The Group is looking at the streams where low oxygen could be a problem and will consider a combination of flow management with possible riparian land management to improve habitat in those streams.

## Twyford Irrigation Group

Jerf van Beek explained how the Twyford Irrigation Group works and what they are finding out about stream flows in the Raupare. The Twyford Irrigation Group is a company that manages the global consent to take water, where individual consent holders still own their water consent. The global company covers 1,500 hectares in total.

The consent holders in the group have groundwater bores and a surface water take from the Raupare and other streams, and is working to avoid all surface takes. The streams are spring-fed with water from the Ngaruroro and the aquifer.

Back in 2012-13 when an irrigation ban was placed on the Raupare, those taking water had no idea what effect the ban was having. Now the whole group has an accurate picture of water use. Forty-six wells use a WaterSense web tool. This collates the individual water-take telemetry data from HBRC's Water Information Service and shows the total water used by the group's global consent each day. The group undertakes to maintain a specified flow in the Raupare Stream, by managing their own collective take and pumping groundwater into the stream if flow in the stream falls below a specified flow.

Everyone in the Twyford Group benefits from not having a ban and pays a per hectare levy of $50. This is used for general consent work and a proportion is put towards pump costs that augment the stream flow. A network of small drains, creeks and springs flow into the Raupare, and the group uses

four augmentation points with water pumped from bores. They are also looking into a permanent community well at the top end of the catchment.

*Raupare Stream at Pākōwhai Regional Park.*

The daily mean flow from HBRC's website is used as a trigger for augmentation. This returns useful information, such as identifying where regular pumping from a well near the spring has sudden effects on the stream flow. During the recent summer, the highest water use was during January and the group was augmenting flows until 17 February. WaterSense showed total use per 28 days peaked at 59.5% of total allocated water. The total for the 12 months was 45%. The system also helps identify the location of losses in the system, such as broken pipes underground, and shows individual high use.

According to Jerf, as land values increase in the area, land and water use is changing. Cropping is less viable so land is going into stone and pipfruit crops.

*Jerf Van Beek works for Horticulture New Zealand and is a foundation member of the Twyford Water User Group.*

Through this process, the Twyford Group is educated and well informed about water use. They can therefore respond quickly to calls to reduce pumping. Even a small decrease at each pump can mean a significant group reduction in water volume.

Jerf says, "If we can demonstrate that we are using water effectively and looking after the environment then I don't have a problem reducing our consented water take. As long as we are able to provide security and quantity of supply to continue to grow the quality crops Hawke's Bay is well known for. Some growers would have no water at all without the Twyford Irrigators Group's Global consent, since available water was fully allocated."

The Group will work with HBRC on the unconfined zone global consent, and the effect of each individual well on levels. The way water takes from confined and unconfined areas are managed is likely to change however, given the findings of the model about the level of inter-connectivity.

There was a discussion about whether the Group approach has feasibility in other areas. There was some talk that it would be a good approach, but that management of the Group is clearly a commitment.

**AgFirst**

The AgFirst team gave some initial information about how they were going to model the impacts of different water management regimes on farm economics.

AgFirst have collected extensive data about what is grown on the plains and the hill country areas of TANK's catchments and combined this into a number of 'model farms' that represent the majority of land use in the TANK footprint.

This will help to consider water management option impacts as well as management responses for nutrient (Nitrogen and Phosphorus) uptake and losses, and sediment loss to waterways.

AgFirst are still finalising their base data with various industry groups. Irrigation management scenarios will be reported on and a range of situations for security of supply will be modelled. Impacts of sediment and scenarios to moderate nutrient loss are also yet to be modelled.

The final outputs will show EBIT (Earnings before Income and Tax) to assess and understand on-farm economic impacts. Other modelling will use this information to calculate the regional impacts of different management options.



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