greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

MEMO

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DATE	14 April 2015
FILE NUMBER	ENV/05/08/12-v1

FOR YOUR INFORMATION

Selection of default supplementary allocation criteria for the proposed Natural Resources Plan

This memo summarises the process by which criteria relating to supplementary allocation were derived for inclusion in the Proposed Natural Resources Plan (PNRP).

Background

The current Regional Freshwater Plan (WRC 1999) identifies mid-range flow thresholds for some rivers above which supplementary allocations are available. It is difficult to trace the exact basis for the numbers. Only the Mangatarere Stream threshold has explicit reasoning – to maintain optimum brown trout habitat. The other numbers are largely arbitrary and vary from river to river – some supplementary flow allocation levels are only marginally above minimum flow levels whilst others are more genuine mid-range flow thresholds.

In 2010, a review of the Wellington regional plan began. This review was guided by the Regional Policy Statement which directs the regional plan to manage the quantity of water in all rivers in the region for aquatic ecosystem health and other identified purposes. This is achieved in part by setting limits for when (ie, flow rate) and how much water can be abstracted.

At the same time as the review of the regional plan got underway, water storage scheme options were also being considered. In 2011, the Wairarapa Water Use Project (WWUP) sought advice from GWRC about what new supplementary allocation thresholds were likely to be put forward in the PNRP.

It is within the context of both the regional plan review (culminating in the proposed Natural Resources Plan) and the need to provide WWUP with more certainty around mid-range flow harvesting that GWRC have reviewed the criteria relating to supplementary allocation.

What do other councils do?

Approaches to supplementary allocation differ between regions. Enviornment Southland makes supplementary allocation available without limit above the natural mean flow. Otago Regional Council provides for a supplementary allocation of 50% of flow at the catchment main stem (minus actual primary allocation takes). Otago also provide a further unlimited supplementary allocation of flow above the mean flow. Horizons provide for supplementary allocation in circumstances when the river flow is greater than the median flow and the total amount of water taken by way of a supplementary allocation does not exceed 10% of the natural actual flow in the river at the time of abstraction. Horizons also require no increase in the frequency or duration of low flows or any significant departure from the natural flow regime, including the magnitude of the median flow and the frequency of flushing flows.

Canterbury Regional Council refers to A, B and C "block" allocations in their regional plans. A block has the lowest minimum flow and is the most reliable water. B block water has a higher minimum flow and is less reliable. C block has the highest minimum flow and is least reliable. In Canterbury the B and C block thresholds and allocations differ across rivers in the region. A recent example is the proposed Hurunui and Waiau River Regional Plan that was notified in October 2011. A policy in the proposed plan specified that flows of between 1.5 and 3 times the median be maintained on the basis that this magnitude of flow flushes periphyton, turns over larger gravel boulders and resets the main stem bed. Marlborough District Council also employs an A, B and C block approach and the C Block allocation is associated with flows above that which is exceeded 80% of the time. There is no upper limit on Class C permits. They may only be drawn to supply a storage reservoir, or recharge groundwater or generate electricity.

Hay and Kitson (2013) provide a much fuller review of council approaches in New Zealand to supplementary allocation policy. To summarise, they found that, where such a policy exists, median flow is the most common threshold.

Defining supplementary allocation criteria for Wellington

There is insufficient scientific understanding to precisely quantify the likely ecological responses of a river or stream to given reductions in flow (Hay and Kitson 2013). Nevertheless there are components of the natural flow regime that are well known and provide a starting point for at least generating default rule-of-thumb management controls for allocation.

GWRC chose to examine components of the mid to high flow regime and guiding principles for allocating this water by assembling a small group of technical experts. A meeting was held in Wellington on 17 November 2011 and in attendance (in addition to GWRC staff) were Mike Harkness (Hydrologist – Opus), Ton Snelder (Principle Freshwater Scientist - NIWA) and Joe Hay (Freshwater Ecologist – Cawthron Institute).

The following parts of this memo summarise the main discussion points and advice resulting from the meeting and follow up correspondence. Discussion focused on rivers in the Wairarapa, primarily because it is within this part of the region that the use of supplementary allocation is more likely to

occur the future. However, it is expected that the guiding principles and logic/methods for setting supplementary allocation limits on rivers in the Wairarapa will apply more broadly.

Guiding principles and assumptions

Median flow – an ecologically relevant threshold.

Research in New Zealand indicates that median flow is an ecologically relevant flow statistic relating to trout carrying capacity and stream productivity. Jowett (1990, 1992) found that invertebrate food-producing habitat at the median flow was strongly associated with trout abundance. Many large rivers in the region are recognised (eg, in the Regional Policy Statement, GWRC (2013)) for offering important trout habitat and having regionally significant recreational values for their trout fisheries. It is therefore suggested that there is a biological rationale for adopted, as a general rule, median flow as a supplementary flow threshold for valued trout rivers. In the absence of comparable information with which to nominate a biologically relevant flow threshold for other fish species, a region-wide rule of thumb based on median flow is favoured.

Periphyton is a key indicator.

Periphyton (algae) growths and blooms occur in many Wellington region rivers, particularly after long periods of stable base flow. While warm weather promotes algae growth it is important to note that blooms can also occur in winter conditions if flows are stable for long enough. Periphyton blooms are unsightly, sometimes pose a nuisance to swimmers and other recreationists and can result in habitat degradation for aquatic species (mainly due to oxygen depletion). Benthic cyanobacteria can be toxic and is known to proliferate on occasion in Wellington rivers. Given the range of values affected and relatively well understood relationship between periphyton and flow (see flushing flows next), periphyton is seen as the key indicator for consideration when setting supplementary flow thresholds and limits.

Flushing flow preservation is important.

Flushing flows ensure fine sediment, periphyton and other aquatic vegetation does not accumulate at a site with adverse effects on aquatic ecosystem health and other values. New Zealand research has demonstrated that flows of about three times the median are likely to provide suitable flushing flows in most rivers. It is therefore important to preserve the frequency with which these flushing flows occur. The annual frequency of flows exceeding three times the median flow is commonly referred to as FRE3.

Options for allocation criteria

On considering the guiding principles put forward by the expert group, a range of supplementary flow threshold options were identified. These were established using the Waingawa River as a specific example to illustrate the threshold values, although the options were conceived to be broadly applicable across the region. The expert group felt that the range of options identified represented a resonable balance between what we do and do not know about river response to mid-range flow alteration.

Table 1. Possible alternative approaches to defining a supplementary allocation rule-of-thumb. Based on the Waingawa River.

Primary objective	Scenario	Comment
Option 1 Maintain the status quo	Flow threshold: 66th percentile flow (3,500 L/s) Allocation limit: unlimited take	This option is from the current Regional Freshwater Plan. Allocation above the threshold is unlimited and not likely to find ongoing acceptance
Option 2 Preserve frequency of flushing events	Flow threshold option 2(a): 66th percentile flow (3,500 L/s) Flow threshold option 2(b): median flow (5,100 L/s) Allocation limit: 2 times median flow so long as no change to existing frequency of 3xmedian flushing flows (FRE3)	This option provides an allocation limit and recognises the importance of minimising effects on periphyton accrual patterns by preserving the frequency of flushing events.
Option 3 Reduce abstraction impact during times of vulnerability to periphyton accrual	Flow threshold option 3(a): 66th percentile flow (3,500 L/s) Flow threshold option 3(b): median flow (5,100 L/s) Allocation limit: unlimited take except when a flushing flow of at least 3x median has not occurred in the previous 30 days	This option is based on the premise that once periphyton accrual times exceed 30 days it is much more likely that nuisance growth will occur.
Option 4 Cap and step allocation to manage total flow removal	Flow threshold option 4(a): 66th percentile flow (3,500 L/s) Allocation limit option 4(a): up to 500 L/s above 3,500 L/s, an additional 500 L/s allocation above 5000 L/s, a further additional 500 L/s allocation above 6500 L/s Flow threshold option 4(b): median flow (5,100 L/s) Allocation limit option 4(b): up to 1,000 L/s above 5,100 L/s, an additional 500 L/s allocation above 7,000 L/s	This option provides for blocks of water at different flow levels up to a maximum of 1500 L/s (If more allocation is required, additional stepped allocation could be modelled at higher flow levels). Broadly designed to ensure that no more than half of the natural flow is removed when supplementary allocation is added to core allocation
Option 5 Cap and proportional step allocation to manage total flow removal	Flow threshold option 5(a): 66th percentile flow (3,500 L/s) Flow threshold option 5(b): median flow (5,100 L/s) Allocation limit: 50% proportional flow sharing	This option requires that allocation is progressively increased on a 50/50 basis above the chosen flow threshold e.g. if flow threshold is median flow, then at 6,100 L/s up to 500 L/s can be taken, at 10,100 L/s up to 2500 L/s can be taken.
Option 6 Make criteria sensitive to seasonal flow changes	Flow threshold option 6(a): 66th percentile flow (3,500 L/s) Flow threshold option 6(b): median flow (5,100 L/s) Allocation limit: unlimited take in the winter period (May-Oct inclusive)	This option recognises that flow alteration in the winter may be of less consequence than the summer when many instream values and demand are highest

The options were refined to a single recommendation for a region-wide default. In selecting a single option, preference was given to taking a precautionary appoach and adopting criteria that had some precendence within water management policy elsewhere in New Zealand. Consideration was also given, in a conceptual sense at least, to how the option might enable or constrain water users.

To summarise, the following points were considered and conclusions reached:

- unlimited allocation above the supplementary threshold is not desirable because it has the potential to result in significant flow alteration, including flat lining of the river flow regime. Therefore Option 1 was ruled out.

- in the absence of river/catchment specific analysis, there is a clearer rationale for selecting median flow as a supplementary threshold than any other flow index. Options involving flow indices other than median flow were ruled out.

- reference to maintenance of specific flushing flows is desirable (eg, Option 2) as these are considered to be one of the most important features of the mid to high flow regime.

- cap and step allocation regimes (Options 4 and 5) have some merit but could be complex to adminster and introduce when 'block' allocation has not been a feature of GWRC water management in the past

While it became clear that some form of allocation cap is needed (once the supplementary flow threshold (ie, median flow) has been exceeded), no meaningful criteria were identified by the expert group for establishing what this amount of water should be. Ultimately it was concluded that, in the absence of such criteria, up to 50% of flow removal should be permitted, thereby providing equal 'share' for water users and for maintenance of instream values.

Recommended option

None of the initial options in Table 1 entirely satsified the points raised in the previous section and a hybrid of Options 2 and 5 was developed. This became the final recommendation and basis for the default provision in the PNRP. It states that:

*Supplementary allocation only be available (in addition to core allocation) when natural river flows exceed **median flow**. Furthermore water is only available providing that:*

- *the frequency of flushing flows that exceed three times the **median flow** of the river is not changed, and*

- *50% of the river flow above the **median flow** remains in the river.*

This recommendation is intended to apply region-wide by default. However, discretion could be applied to activities operating outside of the default criteria, providing that an appropriate catchment-specific assessment of effects is submitted.

Summary

This memo summarises the approach taken by GWRC to derive supplementary allocation provisions for the proposed Natural Resources Plan.

Technical staff are mindful that judgements are hampered to some extent by a lack of definitive information in the domain of mid to high-flow limit setting. Notwithstanding this reality, the recommended default rules are considered to represent a reasonable balance between maintaining ecological values and enabling water use. It is noted that a recent review of regional council policies on mid-range flow management (Hay and Kitson 2013) stated general support for the approach being put forward here by GWRC; ie, the use of median flow and a flow sharing arrangement above that which includes preservation of flushing flow characteristics.

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