Regional plans review – topic summary

Water quantity

How can we improve the management of water quantity in our regional plans? This is a summary of our initial ideas.

What is water quantity?

Water quantity means the amount of water that is present in a river, lake, wetland or aquifer at a particular point in time. Water quantity varies naturally in water bodies due to climate, land cover, and underlying geology. Natural variability in water flows and levels is important for the health of aquatic ecosystems and many of the services that they provide (for example, fisheries).

However, water quantity is also influenced by human activities, such as water takes, diversions, dams, bores and some uses of land. These activities, which are covered in this report, need to be balanced against the need to ensure ecological flows and water levels are suitable to safeguard the health and mauri (life force, or essence) of aquatic ecosystems.

Simply put, water quantity management involves defining the amount of water that is required to remain in a water body to provide for ecosystem health and other in-stream values, and the available water that can be used. It also involves effectively and efficiently managing activities that affect water quantity.

Overview of regional plans review

This is one of 10 summary reports for the review of Northland's regional plans.

Northland has three regional plans:

- Regional Air Quality
- Regional Coastal Plan
- Regional Water and Soil Plan

(For more information about the plans visit www.nrc.govt.nz/newregionalplan)

We are required to review the regional plans every 10 years.

The review is the first step in developing a new regional plan and is a stocktake of:

- What we know about our resources and their use;
- Lessons learnt from administering the regional plans;
- Current legal and policy drivers; and
- Feedback from key stakeholders and tangata whenua

The review concludes with recommendations or options for the new regional plans.

Rather than reviewing them separately, we will review all the plans at the same time. We've split the review up into 10 topics:

- Water quality
- Water quantity
- Marine ecosystems and biodiversity
- Coastal water space
- Air quality
- Significant natural heritage values
- Māori participation in resource management
- Natural hazards
- Infrastructure and mineral extraction
- Hazardous substances

Contents

Key terms:

"Water quantity objective" = the desired environmental outcome to be achieved by managing activities that affect water quantity.

"Attribute" = physical, chemical and biological characteristic of water.

"Water quantity limit" = an upper or lower level beyond which an activity is unlawful or subject to additional restrictions.

"Environmental flows and levels" = a type of limit which describes the amount of water in a water body required to meet water quantity objectives.

1 What are the issues with Northland's water quantity?

Monitoring and research has identified the following significant issues with Northland's water quantity:

1.1 High levels of allocation in some catchments

While rainfall can be high and water is generally abundant in most areas of Northland, a number of catchments are assessed as potentially having high levels of allocation for consumptive uses[1], this being water takes that are permitted[2], consented and/or unauthorised[3] (e.g. drinking water supplies, irrigation, stock drinking and dairy shed uses). During dry periods and in catchments with low flows, this may put pressure on aquatic ecosystems and reduce reliability of supply for consumptive water users. We need to improve our understanding of authorised and unauthorised takes and what effects on the environment they may be having.

1.2 Climate change

The most recent predictions on the effects of climate change include a rise in temperature and a decrease in annual rainfall, but an increase in extreme rainfall events and more frequent droughts. This will likely put additional pressures on aquatic ecosystems and the reliability of water supply[4].

1.3 Water storage and security of supply

Primary production is the back bone of Northland's economy. The sector is dependent on access to and the use of water, which means that security of supply is very important. An increased frequency of droughts and less annual rainfall is likely to drive water storage. While dams can have significant negative effects, they can also have considerable positive effects and we need to weigh these up in any future management proposals for water storage options. Greater security of supply will allow for more future planning and investments, which in turn will lead to increased productivity. It is important that any future management options carefully balance economic values with environmental, social and cultural values such that Northland may still thrive and grow without undue restrictions.

1.4 Wetlands

As a result of historic activities, the vast majority of Northlands wetlands have been lost, therefore those remaining are of significant value. Despite strong regional plan controls on drainage and diversion, wetlands continue to be modified and lost. In addition, the current rules around indigenous wetlands can be counterproductive and current definitions are problematic and confusing and we need to clarify these. There is opportunity to better encourage beneficial activities, such as creating, maintaining and restoring wetlands and we need to balance the protection of wetlands while not inhibiting these beneficial activities.

[1] Based on regional council estimates.
[2] For the purpose of this report, permitted takes means both those permitted under s14(3)(b) of the RMA and by rules in the Regional Water and Soil Plan.
[3] Estimated water takes based on 70 litres per cow per day ($0.07m^3$) for dairy shed wash down. During times of the year, the maximum permitted volume is $10m^3$ per day, therefore any dairy operation with a heard of 143 cows or more would breach this.
[4] Predictions are taken from the 5th report from the Intergovernmental Panel on Climate Change and although they have not been refined specifically for Northland, they are the best information we currently have for future planning. The report does however refer specially to New Zealand and general areas within New Zealand.

2 What are the issues with the management of Northland's water quantity?

The Regional Water and Soil Plan contains policies and rules for managing activities that affect fresh water quantity in Northland. The plan was drafted in the second half of the 1990's and was made operative in 2004. Some aspects of the rules for managing water quantity were amended in 2007. Overall, the Regional Water and Soil Plan is a reasonably sound regulatory framework for managing freshwater quantity. However through our review we have identified four key issues with the management of Northland's water quantity:

- The Regional Water and Soil Plan does not adequately address the significant issues with Northland's water quantity;
- Some shortcomings with the way that the Regional Water and Soil Plan is currently administered;
- The Regional Water and Soil Plan does not fully give effect to recent national and regional policy direction; and
- Gaps and uncertainties in our information about the values associated with water quantity and the activities that affect it.

These issues and the options to address them are described in the remainder of this report.

2.1 Water quantity and the Resource Management Act (RMA) – an overview

The RMA is the principle statute governing the management of New Zealand's water resources. Under the RMA, regional councils are tasked with managing water quantity. This is done through regional plans, which contain water quantity objectives, and policies and rules that control activities affecting water quantity.

The RMA provides regional councils with a number of functions for regulating activities that affect water quantity, including controlling the taking, use, damming and diversion of water and the use of land.

Under the RMA, water quantity is normally allocated on a 'first-in-first-served' basis. However, regional councils also have the ability to allocate water to different uses. But this is seldom done because it means that councils are required to make judgement calls about the appropriate (most effective and efficient) use of water, which is challenging.

Central government can promulgate national policy statements that direct the RMA functions of regional councils. They state objectives and policies that regional councils must give effect to through their plans and have regard to when considering applications for resource consents. Currently, there is only one national policy statement that directs the management of water quantity.

The National Policy Statement for Freshwater Management 2014 (freshwater policy statement) sets out a nationally consistent approach to managing freshwater quantity (and quality). The approach involves:

1. Defining freshwater quantity management units, for example, grouping freshwater bodies by type such as ecological sensitivity;
2. Identifying the values of water quantity in each management unit, for example, healthy aquatic ecosystems, drinking water supplies, irrigation;

3. Identifying the important attributes of each value, for example, native fish species, security of water supplies;
4. Determining an acceptable state for each attribute, for example, good quality of habitat for native fish, and high reliability of supply for users (expressed as the likelihood that water will be available for extraction at a point in time);
5. Establishing water quantity objectives, which are numeric and/ or narrative statements of desired environmental outcomes, that reference the selected attribute states;
6. Setting associated water quantity limits, which are comprised of minimum flows (for rivers) or water level (for lakes and groundwater) and an allocation limit (the amount of water that can be extracted above the minimum flow); and
7. Establishing methods (including rules) to avoid and phase out over-allocation[5].

Water quantity objectives, limits and rules must be included in regional plans for all freshwater quantity management units in a region. The freshwater policy statement also requires that the significant values of outstanding freshwater bodies and wetlands are protected.

The regional council has a Proposed Regional Policy Statement that also provides direction on water quantity management in regional plans. It reinforces the aims of the freshwater policy statement and provides additional direction on managing the efficient allocation and use of water and avoiding and phasing out over-allocation. It also recognises and promotes the benefits of water harvesting, storage and conservation methods.

2.2 Water quantity management units

The first step in implementing the National Policy Statement for Freshwater Management (freshwater policy statement) is establishing water quantity management units. These units enable a diverse region to be divided up so common water quantity objectives and limits can be applied to each unit. Management units can be a water body, multiple water bodies, or any part of a water body. The management unit approach is essential because Northland has thousands of freshwater bodies and developing specific water quantity objectives and water quantity limits would be a huge undertaking. It is also unnecessarily because in many cases it is more practical to group water bodies by type and manage them accordingly.

2.2.1 Issues with the current management units

The Regional Water and Soil Plan currently groups Northland's rivers into three water quantity management units:[6]

- Outstanding water bodies (water flows and levels to be preserved and protected in natural state);
- Flow sensitive rivers of high ecological value (minimum flows not to be reduced below mean annual low flow); and
- Other rivers (minimum flows not to be reduced below the seven day, one in five year return interval, which generally corresponds to between 70-84% of the mean annual low flow, depending on the size of the river).

The region's wetlands and lakes are all managed as single management units, although the Regional Water and Soil Plan rules afford a higher level of protection (through non-

[5] The situation where a water quantity objective is not being met or where water has been allocated through existing rules and consents to users beyond a limit.
[6] Rivers are managed under one water quantity objective but there are three different minimum flow (limits) regimes.

complying activity rules) for significant indigenous wetlands and a number of listed dune lakes.

Similarly, aquifers are managed under one water quantity objective and a set of narrative minimum water levels. The plan gives higher level protection through the rules to aquifers with high actual or potential demand, aquifers at risk of seawater intrusion, and geothermal aquifers. Many of these aquifers are mapped.

We think that the management units in the Regional Water and Soil Plan are generally appropriate but could be refined to better reflect the environmental variability between water bodies and their sensitivity to hydrological modification.

2.2.2 Possible changes to the regional plan

We are considering defining freshwater quantity management units for lakes, rivers, aquifers and wetlands based on ecological sensitivity as this is a fundamental requirement of the freshwater policy statement. Our current ideas about future water quantity management units are set out at the end of this section of the report.

It is important to note that we are currently undertaking collaborative catchment management in five catchments. Collaborative stakeholder groups are likely to make recommendations to the council on water quantity objectives, limits and rules relating to these catchments.

2.3 Water quantity objectives

Water quantity objectives state desired environmental outcomes that are to be achieved by managing activities that affect water quantity.

Water quantity objectives can be expressed in a number of ways, including in broad narrative, tight narrative, or numeric terms. Broad narrative water quantity objectives express desired environmental outcomes in abstract and non-quantified terms, for example, “water quantity safeguards the life-supporting capacity and is available for use”. Such objectives are open to wide interpretation. Tight narrative objectives state desired environmental outcomes in more specific terms but remain difficult to quantify, for example, “flows in rivers provide suitable habitat for native fish and invertebrate species and help prevent the growth of nuisance plant and algal.”

Numeric water quantity objectives on the other hand express the intended outcome (environmental state) in numeric terms, for example, “water flows in river X are managed so that there is no more than a 10% reduction or increase in longfin eel habitat and there is a 90% reliability of water supply for users during summer.”

The National Policy Statement for Freshwater Management (freshwater policy statement) requires the council to follow the following process when setting water quantity objectives and limits:

1. Identify the values that the water quantity management unit should be managed for. Only one value (ecosystem health) is compulsory under the national policy statement. However, the use of water for consumptive and non-consumptive purposes is also a fundamental value.
2. Identify the attributes of the values. Fish habitat is usually the best attribute for ecosystem health. Security of supply is normally used for consumptive uses.

3. Select the desired state for each attribute, for example, no more than 5 % loss of in-stream habitat (flow and depth) for longfin eels or banded kōkopu, and 95% reliability of supply for water users; and
4. Set water quantity objectives in regional plans for the water management unit in numeric terms where practicable, otherwise in narrative terms, by reference to the selected attribute state (examples are provided later).

The Proposed Regional Policy Statement for Northland provides additional direction on the nature of new water quantity objectives by requiring that the following is provided for:

> *Maintain flows, flow variability and water levels necessary to safeguard the life-supporting capacity, ecosystem processes, indigenous species and the associated ecosystems of freshwater.*

2.3.1 Issues with the current objectives

The Regional Water and Soil Plan currently contains broad narrative water quantity objectives that apply generally to all freshwater quantity management units. These are set out below for context.

Surface water:[7]

> *The maintenance and enhancement of water flows and levels in rivers, lakes and indigenous wetlands that are sufficient to provide for the preservation of their natural character, safeguard the life-supporting capacity, and has particular regard to protecting their intrinsic ecosystem, amenity and cultural values.*

Groundwater:[8]

> *The sustainable use and development of Northland's groundwater resources while avoiding, remedying and mitigating actual and potential adverse effects on groundwater quantity and quality.*

It is unlikely that many people would disagree with the outcomes that these objectives seek. However, they lack specificity and therefore certainty. They are expressed in such broad terms that it is difficult for the council, or indeed resource users, to measure or assess whether the outcomes are being, or can be, achieved.

2.3.2 Possible changes to the regional plan

Generally we think that by managing flows and levels for aquatic ecosystem health (as required by the national policy statement), other in-stream values will be provided for, such as natural character, mahinga kai (traditional food gathering places) and fishing. This is because these values are very closely related to ecological health. The protection of these will be dependant on the level of ecosystem health that we manage to and we are yet to determine how we will go about establishing this, although fish habitat is a good indicator. Feedback from stakeholders suggested that we use the Macroinvertebrate Community Composition (MCI) as a means of establishing ecological health.

We recognise that this will not always be the case and in some instances there will be other values that will require higher water flows/levels than that required to protect ecosystem health. An example of this is recreation, where minimum flows/levels might need to be set higher in order to provide for activities such as swimming.

[7] Objective 9.4.1, Regional Water and Soil Plan
[8] Objective 10.4.1 Regional Water and Soil Plan

Use values of water, such as irrigation and food production, animal drinking water, water supplies, commercial and industrial uses, and hydro-electric power generation are a key consideration when setting allocation limits, that is, the volume of water available for allocation over and above the minimum flows/levels. While these use values are not directly relevant to the purpose of minimum flows/levels, they need to be considered as the water available for allocation will depend on how high or low the minimum flows/levels are set.

2.4 Water quantity limits

The freshwater policy statement directs the council to set environmental flows and levels (water quantity limits) for all water quantity management units in the region (except ponds and naturally ephemeral water bodies). Environmental flows and levels are a type of limit that describes the amount of water in a water body required to meet water quantity objectives. Environmental flows for rivers and streams must include an allocation limit and a minimum flow. Environmental levels for other water quantity management units (lakes, wetlands, aquifers) must include an allocation limit and a minimum water level (or other level/s). It is important that the impacts on water quality are considered when determining flows and levels.

As discussed above, minimum flows and levels are set to protect aquatic ecosystems but in some cases may need to be set higher to maintain other values. They are based on the assumption that the less water there is in a water body, the less habitat there is available for aquatic species, for example, plants, invertebrates, and fish, and the more stressed the ecosystem is.

Minimum flows and levels only maintain the quantity of water left in a water body. They do not regulate the natural fluctuations above the minimum flows and levels that are important for ecosystem health, for example, flushing out nuisance plant and algae growths and the special conditions required for the migration and breeding of native fish like white bait species.

Allocation limits are set to cap the amount of water that can be taken from a water body above a minimum flow or level. They provide two roles: they ensure that water bodies have natural fluctuations in flows and levels and they provide a degree of security of supply for water users. Generally speaking, the larger the allocation limit, the larger the amount of water available for extraction, but this reduces the reliability of the water supply (because more people are trying to take a finite amount) and increases the likelihood that a water body will be at a minimum flow or level. This is illustrated in Figure 1 below.

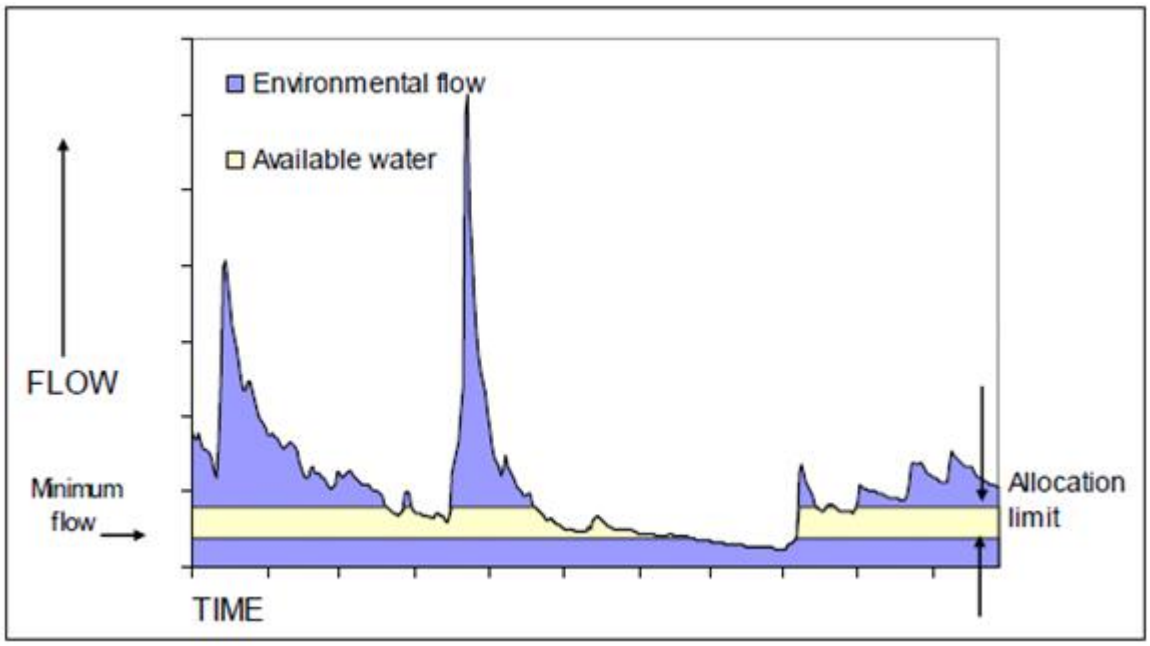

Figure 1 Illustration of a simple environmental flow for a river

The degree of rigour required in setting minimum flows/levels and allocation limits is proportionate to level of demand for water in a particular water body – where there is low demand for water (that is, low levels of allocation) a default or interim approach may be appropriate.

The Proposed National Environmental Standard on Ecological Flows and Water Levels 2008[9] contains default minimum flows and allocation limits for rivers, aquifers and wetlands. The intent of the proposed national standard is to establish a consistent approach to setting both minimum ecological flows/levels and allocation limits in the absence of catchment-specific data.

2.4.1 Rivers and streams

For rivers and streams, the proposed ecological flows and allocation limits are expressed as a percentage of the mean annual low flow of a river or stream. For rivers with mean flows of 5m^3 per second or less, the proposed national standard sets out a default minimum ecological flow of 90% of the mean annual low flow and an allocation limit of, whichever is the greater of:

- 30% of mean annual low flow, or
- the total allocation from the catchment on the date that the national environmental standard comes into force less any resource consents surrendered, lapsed, cancelled or not replaced.

For rivers and streams with mean flows greater than 5m^3 per second, the proposed national standard sets out a lower minimum flow of 80% mean annual low flow and an allocation limit or, whichever is the greater of:

- 50% of mean annual low flow, or
- The total allocation from the catchment on the date that the national environmental standard comes into force less any resource consents surrendered, lapsed, cancelled or not replaced.

[9] Proposed National Environmental Standard on Ecological Flows and Water Levels: Ministry for the Environment Discussion Document; March 2008.

Larger rivers have less stringent limits because their instream ecology is normally less sensitive to water takes.

We have assessed the levels of allocation in Northland's river catchments using the approach of the proposed national standard, in terms of the default 30% and 50% mean annual flow allocation limits. Levels of assessed allocation are shown in figure 2 below.

It is important to note that this map is a work in progress and it will change over time as we gather more information. The allocation calculations assume that all permitted activity takes are from surface water bodies and that the level of allocation is based on all users (being permitted, consented and unauthorised) taking water at the same time and taking to the maximum amount of water available (by conditions in rules or consents), which in reality is not the case. Additionally, the dam allocations assume that water users take inflows to the dams rather than using stored water.

Notwithstanding the above, on the basis of this map it is likely that we are able to use a default approach for the majority of rivers in Northland, i.e. where high allocation is not identified as being an issue. In the limited areas where high allocation is identified as an issue, we will likely look at setting specific flows/levels and limits.

It is further noted that we need to be sure we have the best information available to make these assumptions around allocation levels and ensure that moving into the future water is used more efficiently where it can be. Also the interaction between surface water and ground water has not yet been incorporated into the allocation calculations and this is something that we are currently working on as it is an integral part of setting minimum flows and levels.

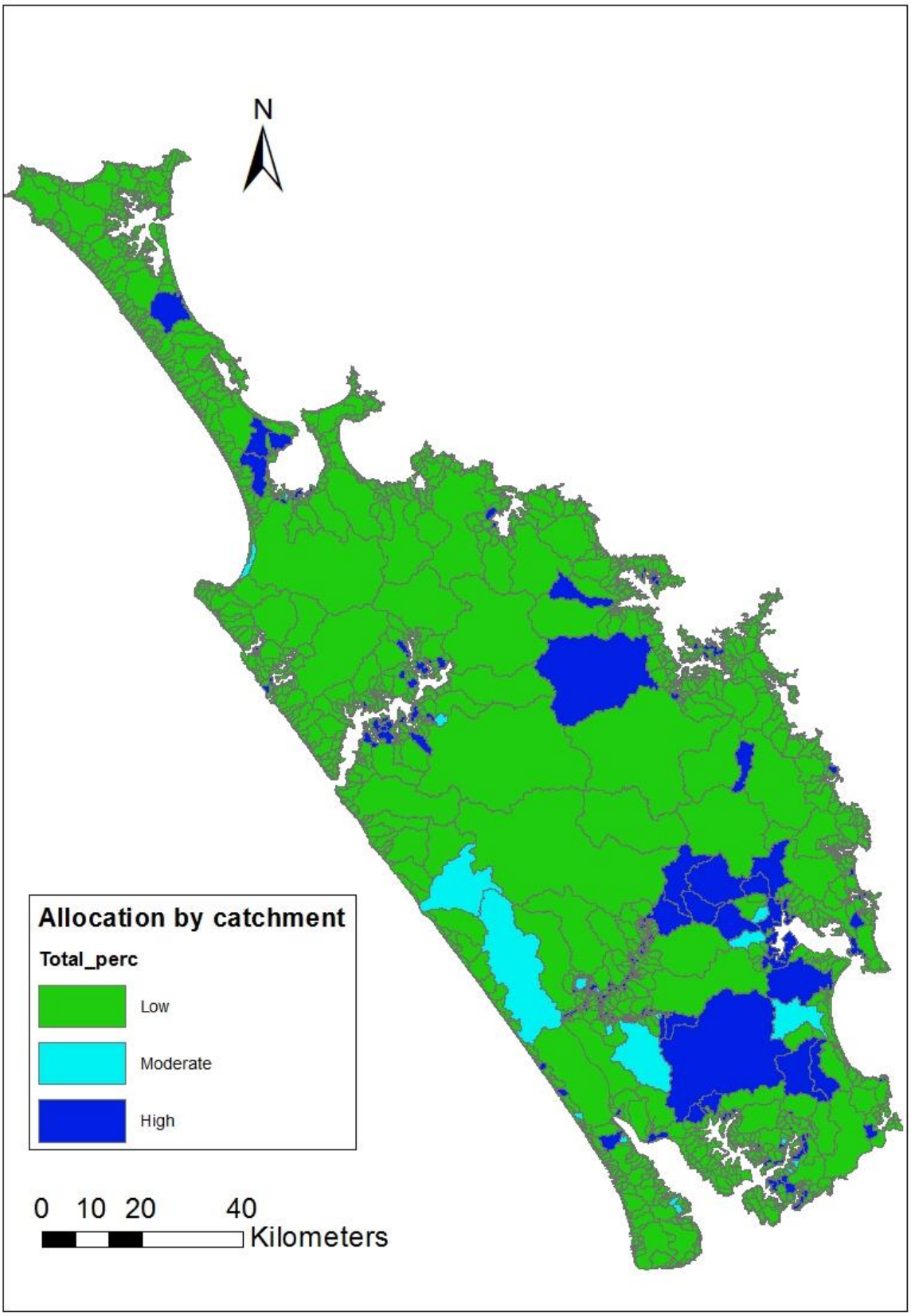

Figure 2: Levels of assessed water allocation for consumptive uses (permitted, consented and unauthorised) in surface water catchments based on default methodology in the Proposed National Environmental Standard on Ecological Flows and Water Levels. Note: Low Allocation = 0 to 75%; Moderate = 76 to 100% and High = >100%.

2.4.2 Lakes and wetlands

For most of Northland's lakes and wetlands, limits can only practicably be expressed in narrative terms due to environmental variability and a lack of good information on their natural levels.

The proposed national environmental standard contains default minimum levels and allocation limits for wetlands only, but not for lakes. With regard to wetlands, the default limit is: "No change in water levels, beyond the water level variation that has already been provided for by existing resource consents on the date that the Standard comes into force."

2.4.3 Aquifers

The proposed national standard contains default allocation limits for aquifers. For shallow, coastal aquifers (predominantly sand) the allocation limit is, whichever is the greater of:

- 15% of the average annual recharge as calculated by the regional council; or
- The total allocation from the groundwater resource on the date that the standard comes into force.

For all other aquifers the allocation limit is, whichever is the greater of:

- 35% of the average annual recharge as calculated by the regional council; or
- The total allocation from the groundwater resource on the date that the standard comes into force.

2.4.4 Issues with the current water quantity limits

The Regional Water and Soil Plan includes minimum flows for rivers: Minimum flow for flow-sensitive rivers is mean annual low flow, and for larger rivers over 300 litres per second the seven day, one in five year low flow is used (typically 70-84% of mean annual low flow). However, these are not absolute and policy allows exceptions to be made, which is likely to be inconsistent with the freshwater policy statement.

The Regional Water and Soil Plan also needs to be amended to give effect to the national policy statement because it does not contain:

- Minimum levels for lakes and wetlands;
- Minimum levels for some aquifers;
- Allocation limits for rivers, lakes, aquifers and wetlands; and
- Absolute minimum flows for rivers.

The absence of the above creates two problems:

1. The potential for the ecosystem health of water bodies to be adversely affected by water takes, drainage and diversions; and
2. The amount of water available for use is not clearly defined and this means there is no known security of supply for existing and future users.

2.4.5 Possible changes to the regional plan

Options for new water quantity limits are set out in the following sections of this report. It is acknowledged that water quality will need to be considered when setting water quantity flows/levels and limits.

2.5 Lakes

Northland has nationally and internationally important dune lakes, with many being outstanding for their ecological values. The region also has a number of other natural lakes. Northland's natural lakes do not appear to be a major water source for consumptive uses. However, monitoring suggests that water levels in some dune lakes are being impacted by surrounding land uses (for example, plantation forestry).

2.5.1 Possible changes to the regional plan

Based on our initial research, we think that Northland lakes could be divided into three water quantity management units for the purposes of applying water quantity objectives and limits.

Water Quantity Management Unit	Objectives	Limits
Outstanding lakes	Narrative of numeric objective that seeks to protect the significant values of outstanding lakes while allowing some water for consumptive and non-consumptive uses. Consumptive and non-consumptive uses.	Stringent narrative limits that allow some level of hydrological modification provided that the outstanding or significant values are protected.
Dune lakes (not outstanding or significant)	A narrative objective that seeks water levels are managed so that the ecological health of lakes is maintained or enhanced.	Narrative limits that allow water to be taken, used, and diverted, provided that the activities cause no more than minor changes to natural lake level fluctuations.
Other lakes	A narrative objective that seeks water levels are managed so that the ecological health of lakes is maintained.	Narrative limits that enable water to be taken, used and diverted, provided that the activities cause no significant changes to natural lake level fluctuations.

2.6 Rivers

We think that the best way to develop water quantity management units for rivers is by grouping water bodies by river size and risk of hydrological modification.

The risk of adverse effects on aquatic ecosystems from hydrological modification (water takes, dams and diversions) is typically highest in smaller streams close to the coast, where natural flows are generally low. We suggest these streams be treated as a separate management unit (high value rivers and rivers sensitive to changes in flows).

The National Policy Statement for Freshwater Management (freshwater policy statement) directs the council to protect the significant values of outstanding freshwater bodies. For this reason, we also think all of Northland's outstanding rivers could be managed as one unit, in other words, under one water quantity objective and set of associated limits.

2.6.1 Possible changes to the regional plan

Northland's rivers (including streams) are used for a variety of consumptive purposes. As discussed above, we have identified some catchments as likely being 'highly allocated'. That is, based on the current water allocation estimates, these rivers have high levels of allocation compared to the proposed default allocation limits in the proposed national environmental standard.

For highly allocated catchments, catchment-specific minimum flows and allocation limits may need to be set to reflect the values and uses within these catchments. This work includes:

- Assessing the actual takes, that is, conditions of consents, frequency of takes, security of supply requirements;
- Understanding the effects of takes on flow throughout the catchment;
- Identifying the values specific to these catchments;
- Assessing the sensitivity of the ecological values and the flow requirements within the catchments; and

Catchment-specific limits could then be established based on this work for our highly allocated catchments.

However in the interim, the most appropriate course of action may be to set an interim allocation limit for the highly allocated catchments based on existing use. This will involve capping at existing maximum allocation and includes permitted use (including stock drinking water) and the current consented takes. It will also include existing unauthorised activities (estimates based on land use). Future activities within these catchments that require a water supply, including expansion of existing activities reliant on increased water supplies, would likely become non-complying or prohibited activities at least in the interim.

Outside of highly allocated catchments we consider a default minimum flow and allocation limit can be applied given the low allocation levels. We suggest using the default limits in the proposed national environmental standard for such areas.

The exception to this could be where the regional council has established collaborative catchment groups (Waitangi, Whāngārei Harbour, Doubtless Bay, Mangere and Poutō) to assist in the development of water policy – in these areas a different approach may be justified given the more detailed assessment and another freshwater quantity management unit may be appropriate to distinguish such areas from the ‘default’ flow/allocation regime.

Based on our analysis we consider that Northland’s rivers could be divided into the following management units (these are similar to the current river water quantity management units in the Regional Water and Soil Plan):

Water quantity management unit	Objectives	Limits
Outstanding rivers	Narrative objective that seeks to protect the significant values of outstanding rivers while allowing some consumptive and non-consumptive uses.	High minimum flow (for example, 100% mean annual low flow). Small allocation limit (for example, 10% of mean annual low flow.
High value rivers and rivers sensitive to changes in flows	Numeric objective that seeks a level of protection for the habitat of important fish species (the attribute of ecosystem health) and a good security of supply for consumptive takes.	High minimum flow (for example, 90% mean annual low flow). Moderate allocation limit (for example, 30% mean annual low flow).
Other rivers	A numeric objective that seeks a moderate level of protection for the habitat of important fish species (the attribute of ecosystem health) and good security of supply for consumptive takes.	High to moderate minimum flow (for example, 80% mean annual low flow). Moderate allocation limit (for example, 30-40% of mean annual low flow). Based on defaults in the proposed national environmental standard.
Highly allocated catchments	To be developed.	Cap allocation at current level (where necessary incorporating lower levels set by consent) until the catchment is reviewed and specific objectives and limits set (policy sets out approach).

2.7 Wetlands

There are many remnant wetlands in Northland, including some relatively large inland wetlands, such as Hikurangi Swap and the Motatau Wetlands. A number of wetlands associated with dune and gumland areas and adjoining the coast are considered habitats of international significance. Similar to lakes, Northland's indigenous wetlands are not understood to be a major source of water for consumptive purposes (e.g. irrigation). However, the original area of wetlands has been greatly reduced due to drainage and conversion to agricultural uses. This is further discussed at the end of this report.

2.7.1 Possible changes to the regional plan

We think wetlands should be grouped into the following four water quantity management units for the purposes of setting water quantity objectives and limits. These management units will include different wetland types (for example, bogs, fens, marshes, swamps, etc.).

Water Quantity Management Unit	Objectives	Limits
Significant to outstanding indigenous wetlands	Narrative objective that seeks to protect the significant values of indigenous wetlands.	Stringent narrative water quantity limits that protect natural water levels.
Indigenous wetlands	Narrative objective that seeks to maintain aquatic ecosystem health.	Reasonably stringent limits that main water levels while allowing some degree of hydrological modification.
Non-indigenous, degraded and constructed wetlands	Enable management of water levels for treatment/storage, buffering or restoration.	Narrative water quantity limits that allow flexibility in the use of these wetlands.

2.8 Groundwater

Many of Northland's aquifers are important sources of water and in general, groundwater quality is high enough so as to allow the water to be consumed without treatment. The main aquifers are the Aupouri sands, Kaikohe basalts and Whangarei basalts. There are a number of smaller sand and gravel coastal aquifers, such as those located at Russell, Matapouri and Taipa, and less productive groundwater zones situated throughout the region in varying geology. In the areas where groundwater is in high demand, we have mapped the aquifers and have a fairly good understanding of the resource. However in other groundwater zones where there is little groundwater use, we have limited information on the groundwater resource.

2.8.1 Possible changes to the regional plan

Based on our research, we think that Northland's aquifers can be grouped into four water quantity management units for the purposes of setting water quantity objectives and limits:

Water quantity management unit	Objectives	Limits
Coastal aquifers (at risk of salt intrusion)	Narrative objective that seeks to enable the sustainable use of groundwater and provide good security of supply.	Allocation limit based on sustainable yield: Calculated via appropriate method based on available information. Where limited data, use appropriate proposed national environmental standard default allocation limit (15% of the average annual recharge). Where hydraulically linked to surface water, river minimum flows and allocation limits may also apply.
High demand and potential high demand (Ngāwhā geothermal aquifer will be managed separately)	Narrative objective that seeks to enable the sustainable use of groundwater and provide good security of supply.	Allocation limit based on sustainable limit: Calculated via appropriate method based on available information. Where limited data, adoption of appropriate proposed national environmental standard default limit (35% of the average annual recharge). Where hydraulically linked to surface water, river minimum flows and allocation limits may also apply.
Other mapped aquifers	Narrative objective that seeks to enable the sustainable use of groundwater and provide security of supply.	Sustainable yield allocation limit: Calculated via appropriate method based on available information. Where limited data, adoption of appropriate proposed national environmental standard default limit (35% of the average annual recharge). Where hydraulically linked to surface water, river minimum flows and allocation limits may also apply.
Other groundwater	Narrative objective that seeks to enable the sustainable use of groundwater and provide good security of supply.	35% of the receiving stream surface water base flows.

3 Managing activities that affect water quantity

The council has a legal obligation to identify a range of practicable options (policies, rules, and non-regulatory methods) for achieving water quantity objectives and meeting limits. The best options are those that are the most effective and efficient.

It is important to note that the council is not starting with a blank piece of paper. The operative Regional Water and Soil Plan contains policies and rules for managing a number of activities that affect water quantity. These are briefly evaluated below. As part of this, the main issues with the current rules and the way that they are implemented, are highlighted with possible alternative options identified.

The Regional Water and Soil Plan was drafted in the mid-to-late 1990s and was made operative in 2004. We now have more knowledge about the effects of activities on water quantity and the effectiveness of various management approaches. There are a number of areas where we think some adjustment is required to the operational aspects of the plan in order to better manage effects, or assist in meeting national/regional policy.

3.1 General

The council will need to amend some of the existing rules and potentially include new rules in the Regional Water and Soil Plan to ensure that water quantity objectives are achieved and limits met. Importantly, the National Policy Statement for Freshwater Management (freshwater policy statement) directs the council to avoid (prevent) future over-allocation and where necessary phase out existing over-allocation.

As with rules for managing water quality, the council will need to be confident that permitted activities can cumulatively occur while still ensuring that water quantity objectives will be achieved and limits met. Some types of activities may need to be non-complying or prohibited if they will likely compromise objectives or not meet limits. It is important to note that prohibiting activities is a last resort and we think in most cases a non-complying activity status is probably an appropriate 'backstop'. This will allow people who are proposing high-risk activities to demonstrate that while the activity might exceed an allocation limit it may not compromise a water quantity objective. This may be appropriate for water bodies that have default limits, but is less likely to be appropriate for water bodies that have specific (tailored) limits in place.

For other types of activities, resource consents will be required where a case-by-case assessment is needed to determine whether objectives and limits will be met.

3.2 Water takes

The Regional Water and Soil Plan regulates the taking of water from surface water and ground water. The plan permits most surface water takes subject to a number of conditions including maximum daily volumes and that water users provide the council with information on their water takes on request. However, it is important to note that the council has seldom asked for this information and our knowledge on actual permitted takes is limited.

Water takes that are not permitted are discretionary activities (require resource consent). Takes from dune lakes, significant indigenous wetlands, and water bodies with outstanding values are non-complying activities. The plan does not prohibit any water takes.

The rules for groundwater takes are similar to the surface water rules. Permitted activity rules for groundwater takes also contain conditions including maximum daily volumes and the requirement that water users must provide information on their takes to the council on

request. Like surface water, this has seldom been done and our understanding of permitted groundwater takes is limited.

The taking of groundwater which does not comply with permitted activity rules or is from aquifers that are under high demand, at risk of saltwater intrusion, or from a geothermal aquifer is a discretionary activity. Taking groundwater from significant indigenous wetlands is a non-complying activity. The plan does not contain any prohibited rules for groundwater takes.

The current provisions have generally worked well, but will need revision in some areas to reflect water quantity objectives and limits required by the National Policy Statement for Freshwater Management. We have also identified some other concerns:

- Section 14(3) of the RMA allows people to take fresh water for their reasonable domestic needs and the reasonable needs of their animals for drinking water as long as the take does not have an adverse effect on the environment. The Regional Water and Soil Plan does not contain any rules that regulate such takes given that they are 'as-of-right' provided that they have no adverse effects on the environment. It is important to note that the council has fairly limited data on the location, volume or impact of these takes;
- For other uses, the plan permits surface water takes of $10m^3$ per day during December – May and up to $30m^3$ and during June – November. Recent research indicates that the in-stream ecology of small coastal streams is sensitive to reduction in flows and as such the permitted $30m^3$ per day may not be appropriate;
- The $10m^3$ rule may also be inappropriate in areas of very high allocation or may be overly restrictive where water is shown to be plentiful (very low allocation levels);
- Metering of consented water takes is not always required (it is mandatory for takes of 5 litres per second or more), but it is important to ensure objectives and limits are met particularly where allocation levels are high;
- Consents for water takes expire and must be renewed periodically. Ideally all such consents would be considered catchment by catchment to ensure objectives and limits are met. While common expiry dates may not be practical, common review dates may well be.

Potential options to address these issues are discussed below.

3.2.1 Future management options

Taking of water for reasonable domestic needs and animal drinking water needs

Section 14(3) of the RMA allows people to take fresh water for their reasonable domestic needs and the reasonable needs of their animals for drinking water as long as the take does not have an adverse effect on the environment. Under the National Policy Statement for Freshwater Management, adverse effects are when a limit is exceeded and/or a water quantity objective is not being met.

The Regional Water and Soil Plan contains rules that regulate such takes in some scheduled aquifers. To help the council assess if section 14(3) takes are having adverse effects, the plan currently states that water users must provide information on their takes to the council on request. This has not happened to date.

The current permitted activity rules[10] require design minimum flows to be maintained, and set daily volume limits. During drought conditions it is likely that design minimum flows are not being maintained (and therefore the takes are not 'permitted').

In some of the catchments that are assessed to be highly allocated (mainly small coastal stream catchments), 'as-of-right' and permitted activity takes are thought to account for the majority of the allocation. However, it is important to point out that we have limited knowledge about actual permitted uses and rely on estimations based on land use (dairy and dry stock). These estimates indicate there is likely to be significant non-compliance with the permitted daily volumes and in some areas the design minimum flows are not being maintained.

In setting water quantity limits the council may have to establish a rule that sets out the maximum take per day for water use for reasonable needs, in some catchments, in order to prevent or phase out over-allocation and to protect the in-stream ecology. This is a significant change from the current approach.

While all water users for 'as-of-right' and permitted takes are required to provide the council with information on the location, volume and purpose of their takes on request, we thinking that this is something council needs to act more strongly on (see *metering* below for further information). This would enable us to meet the freshwater policy statement quantity accounting requirements.

Other permitted takes

As reported above, we do not have accurate information on whether users are meeting the requirements of permitted activity takes. In particular, we do not have a good understanding of water used in dairy sheds. Our assessment methodology for estimating is based on an annual average of 70 litres ($0.07m^3$) per cow per day for dairy shed use, in addition to 70 litres per cow per day for drinking water.

If this water use is accurate, it would mean that dairy farms with more than 143 cows (most dairy farms) would exceed the maximum permitted surface water take volume of $10m^3$ per day during December through to 31 May[11]. This means that most dairy farms require water permits if they are taking from one source during this period. Currently, only a very small number of dairy farms have water permits for dairy shed use.

It is important to acknowledge that the actual takes are likely to vary significantly across the range of conditions/farm operations. For example we know a herringbone system uses substantially less water than some modern rotary milking systems, meaning the figure per cow per day for dairy shed use could be at least halved (many herringbones manage 30-35 litres per cow per day) in some instances but increased in others. Additionally, we know that stock drinking increases with warmer, drier weather, and with the feeding of additional supplements such as palm kernel extract.

The plan permits surface water takes up to $30m^3$ in some areas provided specific criteria is met. Recent research indicates that the in-stream ecology of small coastal streams[12] is sensitive to reduction in flows and as such the permitted $30m^3$ per day may not be appropriate.

Based on levels of assessed allocation, most of the region's water bodies are unlikely to be under pressure (that is, have low to moderate levels of allocation). However, a small

[10] See permitted activity rules 24.1.1 and 25.1.1
[11] See permitted activity rules 24.1 and 25.1.
[12] For example: West Coast draining rivers and streams from Maunganui Bluff to Shipwreck Bay.

number of catchments appear to be highly allocated. Depending on the limits set for these catchments, we may need to revise the maximum permitted daily volumes (up or down) and add potential guidance/policy around the timing (staggering) and rate of takes as this will be critical. This would also need to be considered for flow sensitive rivers and rivers with high ecological values (a proposed water quantity management unit).

Finally, feedback from stakeholders suggested that the permitted activity rule for taking water is unclear about how to apply it, for example is it per take, per property, can these takes be aggregated etc.

Metering

We need to improve our information on the use of water in Northland so that the resource can be sustainably managed into the future.

Water takes can be accounted for in a catchment by way of direct measurements (water metering) or estimation through computer modelling. The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 requires that all takes of equal to or greater than five litres per second are metered. The Government has stated that it intends to provide guidance on accounting for water takes.[13]

The majority of Northland's rivers are small and takes less than 5 litres per second can abstract a large portion of flow and potentially result in significant adverse effects. We are therefore considering options for requiring water meters on smaller takes (less than five litres per second, potentially including permitted takes), which is a significant change from the current approach.

It is important to note that we are at the beginning of this process and have not come to any definitive solutions in terms of water metres. Any future management options will need to be well tested and be open to public debate. Many factors will need to be taken into consideration, including the practicalities and costs of metering, how many meters might be required per property (for multiple takes), how the data will be collected and what type of meters might be required, and how the data will be valuably used.

Efficient allocation and use of water

While the first-in first-served approach to managing water quantity will never be completely efficient it can be improved. Methods include:

- Requiring, through permitted activity rules and conditions of resource consent, that intended rate and quantity of water taken is reasonable and justified for the proposed use;
- Providing for the efficient transfer of water permits between water users; and
- Promoting water user groups within a catchment.

Currently, the permitted activity rules define a maximum volume that is deemed appropriate and require that reticulation systems and components are maintained in good working order to minimise leakage. For takes that require resource consent, applicants are required to demonstrate that, among other things, the amount of water applied for is justified for the proposed use, alternative sources have been considered, and measures will be used to avoid wastage. We think that these requirements are appropriate and do not need to be changed.

Levels of allocation can be high on paper, but generally only a proportion is used at any point in time. This means that while water may be available, new users can be excluded

[13] See: Ministry for the Environment. 2013. *Freshwater reform 2013 and beyond.* Wellington: Ministry for the Environment

from gaining access to it. Ensuring that water can be easily transferred between users through formal mechanisms (transferring water permits) and less formal means (water user groups) is a key way of addressing this issue. The council has a role to play in this by providing for water to be transferred with minimal administrative costs.

The freshwater policy statement directs the council to include criteria in the Regional Water and Soil Plan by which applications for water permit transfers can be assessed, including improving and maximising the efficient use of water. The operative Regional Water and Soil Plan currently contains criteria, however these will need to be reviewed to ensure consistency with the National Policy Statement. These criteria must also be consistent with section 136 of the RMA[14].

Feedback from stakeholders suggested concern over the way transferring of water permits would be handled and to avoid the potential for a user being able to make a capital gain, i.e. a user being able to sell a portion their water rights either to another user or back to council. An example raised was that of an inefficient user becoming efficient and then selling their excess water on to another user. Another example raised was that of a user 'banking' water, i.e. applying for more than necessary and banking/storing this water so that they can sell the excess on at a later date. It is noted that currently, and in any future regime, any application to use water must justify the amount they have applied for being necessary for the proposed use.

Consent duration

Determining consent durations is currently done on a case-by-case basis. We consider that this approach is appropriate and is consistent with other councils and the recommendations of the Land and Water Forum[15] and the Government.[16] For this reason we do not think that the Regional Water and Soil Plan needs to be amended to specify shorter timeframes.

Reviewing conditions of water permits

To ensure objectives and limits can be met the council may need to put in place common review dates for consents. Common review dates can enable concurrent consent processing and review of conditions for comprehensive and integrated assessment of water quantity issues in catchments and/or aquifer systems, and potentially reduce administrative costs.

Section 128(1)(a) of the RMA provides the council with the ability to review conditions of water permits to deal with any adverse effect on the environment which may arise from the exercise of the consent. Specifying common consent review dates on water permits in catchments that are assessed as highly allocated could be a way to address the cumulative effects of multiple takes.

Section 128(1)(b) of the RMA allows the council to review conditions of water permits when a regional plan has been amended to include water quantity limits and the council believes that it is appropriate to review conditions of water permits to ensure minimum flows/levels and allocation limits are met.

3.3 Dams

The collection and storage of water in dams can both provide valuable security of supply for water users and reduce water takes from rivers during low flow conditions. Other benefits of

[14] s.136 Transferability of water permits.
[15] Land and Water Forum, 2012. *Third Report of the Land and Water Forum: Managing Water Quality and Allocating Water.*
[16] Ministry for the Environment. 2013. *Freshwater reform 2013 and beyond.* Wellington: Ministry for the Environment.

dams include easing peak storm flows, improving low flows, sediment capture, groundwater recharge and increased aquatic habitat. Feedback from stakeholders suggested water storage as a significant issue, which will inevitably increase into the future with farming intensification and predicted climate change effects. Conversely, there are known issues with dams such as:

- In-stream dams can prevent fish passage;
- Dams and storage reservoirs that recharge at any time from rivers or overland flow can extend low flow conditions in streams and reduce supply for downstream water users. The cumulative effects of these dams on in-stream ecology are potentially significant;
- The existing rules relating to dams could be more straight forward; and
- The size-trigger for dams needing a building consent has changed.

3.3.1 Future management options

Longer drought periods and reduced annual rainfall predicted with climate change, intensification of pastoral/horticultural farming and demand for greater security of supply are likely to increase demand for new water storage options and dams in the future.

Regional plan provisions for dams aim to avoid significant adverse effects on the flows and aquatic ecology (including indigenous wetlands and allowance for fish passage). The effects of the largest dams are generally well understood and managed, however the regional council only has information on around 300 dams and there are likely to be 10 to 20 times that number in total. Currently there is no requirement to notify council when constructing permitted dams. We do not have good information on the degree to which smaller dams are affecting flows and ecology, however, for most catchments with low allocation, there does not appear to be a problem.

Dams that intercept rainfall runoff that would naturally flow into streams during dry periods can prolong drought conditions and adversely affect stream ecology at a time when it is most vulnerable. To address this, most large-scale in-stream dams provide what is known as continuation flow. This is not the case for some smaller in-stream dams or off-stream storage dams.

The council is currently commissioning work to better understand the cumulative effects of such dams. The National Institute for Water and Atmospheric Research has also developed a model[17] that can be used to simulate changes in flows within a catchment, taking the effects of dams into account. These effects are likely to be of most significance in catchments that are highly allocated, flow sensitive, or where there are high numbers of dams. This work may result in the review of the permitted thresholds for dams.

Other future options could include:

- Allowing permitted takes to fill storage dams during periods of medium to high flows;
- Notification to council when constructing permitted dams;
- Encouraging damming of intermittently flowing watercourses where there is: ecological benefit (such as wetland creation) and maintenance or enhanced stream flow during extended low flow periods;

  And particularly in highly allocated and flow sensitive catchments:

- Review permitted threshold for off-stream dams; and

[17] CHES (Cumulative Hydrological Effects Simulator)

- A greater control on water takes from permitted or consented dams.

3.4 Diversions and drainage

Most diversion activities are associated with earthworks and involve temporary stormwater diversion; however they also included stream channel and coastal water diversions. With the exception of drainage and diversion affecting wetlands (see Wetlands below), current controls on these activities are generally sound.

3.4.1 Future management options

Despite strong controls in the Regional Water and Soil Plan, illegal activities do occur, particularly activities that affect water levels in wetlands. This means that the council may need to increase its monitoring and compliance efforts to better address illegal activities, particularly where they are having a significant effect.

We are also looking at whether the plan adequately controls stormwater diversions and drainage in urban areas for the purposes of mitigating the effects of flooding. Please refer to the summary document on Natural Hazards for this information.

3.5 Structures in the beds of lakes and rivers

The Regional Water and Soil Plan takes a relatively permissive approach to most structures (culverts, weirs, fords, bridges etc.) in water bodies that do not involve a listed dune lake, outstanding water body, or indigenous wetland. However, issues are evident in the following areas:

- Without appropriate design and installation long-term effects can occur including obstructing fish and invertebrate passage, increased flooding on neighbouring property, and erosion; and
- Currently there is no requirement to notify council when installing permitted in-stream structures and as a result comparatively large-scale works are permitted with no checks on the appropriateness of culvert capacity and other design details, such as allowing for fish passage.

3.5.1 Future management options

We are considering options to address these issues including:

- Requiring that the council is notified prior to some in-stream works;
- Placing greater emphasis on the design of structures that that makes appropriate allowance for rainfall events given the size, steepness and land cover within contributing catchments;
- Improving the level of guidance over how to provide for fish and invertebrate passage including sensitive periods for some species during migration and/or spawning;
- Specifying catchment area thresholds for permitted culverts (such as 150 hectares) to increase the council's control over the design of structures (particularly in urban environments or when structures are close to a neighbouring property);
- Making the retrofitting of fish passages in existing structures a permitted activity; and
- Encouraging stock crossings by providing guidance on farm culvert design and installation, for example Ministry for the Environment Culvert Guidelines.[18]

[18] https://www.mfe.govt.nz/publications/land/culvert-bridge-oct04/html/page2.html

3.6 Land uses

Changes in land use can affect the recharge of an aquifer and base flows to surface water. For example, the development of a paved urban environment over part of an aquifer recharge area, which diverts and discharges the stormwater to a surface water body and prevents the natural recharge to the aquifer.

The development of plantation forests over an aquifer recharge area may not have a significant effect on recharge in the first few years but when the canopy is closed, a large proportion of the rainfall recharge is intercepted and this can reduce groundwater levels and water available for allocation. Therefore this cyclic nature of plantation forestry needs to be considered.

3.6.1 Future management options

Further Northland research needs to be carried out to identify recharge areas and land uses where there is a likelihood of significant adverse effect on aquifer recharge and consequently significant effect on identified values. The effects of any major land use changes that impact on flows/levels and limits need to be considered prior to land use change occurring.

3.7 Land use affecting wetlands

We think that in some respects some Regional Water and Soil Plan controls on activities that affect wetlands:

- Act as a disincentive to retention and/or creation of indigenous wetlands;
- Add unwarranted consenting/enforcement costs;
- Impede beneficial management for water quality/storage or buffering purposes; and
- Do not adequately prevent stock access to indigenous wetlands.

It is necessary to protect outstanding and significant values of wetlands and safeguard Northland's indigenous wetlands as a whole. However, often regardless of the proportion of indigenous vegetation, wetlands can provide valuable habitat, benefits to water quality through nutrient and sediment reduction, maintaining stream flows during dry periods, recharging groundwater, and mitigating high flows. Wetlands can also be valued for cultural reasons, natural character and amenity, recreation and sport (e.g. game bird habitat). These values are identified in the Proposed Regional Policy Statement for Northland and therefore need to be reflected in regional plans.

Grazed indigenous wetlands can quickly become degraded to an extent that exotic plants establish and they no longer qualify as 'indigenous'. These degraded wetlands are no longer covered by rules preventing drainage and diversion of indigenous wetlands and as a consequence are currently being permanently lost as a result of these activities. To address this issue and reflect the values wetlands provide to buffering effects of storm and low flows, biodiversity and water quality, we are considering provisions that improve stock exclusion from wetlands.

Despite wetlands wide range of values, activities involving wetlands in the Regional Water and Soil Plan tend to be non-complying and beneficial activities such as wetland maintenance (including water level management), restoration, creation, and works to improve public access (such as boardwalk construction where appropriate) are not recognised or positively encouraged.

The Regional Water and Soil Plan defines "indigenous wetlands" and "significant indigenous wetlands" and rules relate to either of these as opposed to simply "wetlands". The definitions for indigenous wetlands and significant indigenous wetlands distinguish between

natural wetlands and non-natural wetlands in that they state “naturally occurring” and “natural areas” respectively.

There are some concerns with the definitions of both indigenous wetlands and significant indigenous wetlands as problems have arisen over what is naturally occurring and/or natural and what isn’t, for example wetlands forming in forestry blocks and on farm land by virtue of circumstance of the land use, not through being purpose built. These particular types of wetlands can satisfy (and in some cases “more than” satisfy) the criteria that determine significant indigenous wetlands and therefore become subject to those particular rules.

While we are obliged to follow the definition of “wetland” provided for within the Act, we have considered and concluded that the clarification of definitions (indigenous/significant indigenous), to provide more certainty and to differentiate between natural and non-natural wetlands, is desirable. Feedback from stakeholders also suggested that we need to set wetland boundaries in the wet season and that we need to recognise compatible/ incompatible land uses and wetlands resilience.

We are looking at ways to improve the balance of a high level of protection for wetlands while better encouraging beneficial activities through improved wetland definitions and guidance, and clearer more encouraging provisions. We are also looking to potentially schedule some wetlands within the plan; however we acknowledge that this will require close work with potentially affected land owners.