Regional plans review – topic summary

Water quality

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

What is water quality?

Water quality means the physical, chemical and biological characteristics (attributes) of water that sustain or support desired values, for example, aquatic ecosystems and swimming.

Water quality management involves defining the types and amounts of contaminants that fresh and coastal waters can assimilate without compromising values. The sources of contaminants are then managed in the most effective and efficient way.

Contaminants enter water from point source and non-point source (diffuse) discharges. Point source discharges are a single or clearly defined source at a known location (for example, a wastewater treatment plan). Diffuse source contamination does not come from a single end-of-pipe source but from many small sources or from a wide area.

The types of contaminant sources that are covered in the report are:

- Stormwater infrastructure
- Domestic and municipal wastewater infrastructure
- Industrial and trade premises
- Animal effluent, other agricultural wastes, and fertilisers, and
- Land disturbance activities (for example, earthworks).

This report does not address hazardous substances, agrichemicals and contaminants associated with solid wastes – these are covered in a separate report ("Hazardous Substances and Contaminated Land").

Overview of the 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

We are required to review the regional plans every 10 years. We have reviewed all three regional plans at the same time.

The review is the first step to prepare a new regional plan. The review looks at:

- 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 options or recommendations for the new regional plan.

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

For more information go to - nrc.govt.nz/newregionalplan

Contents

Key Terms

"Values" are the reasons why we manage water resources, and include uses by people (e.g. drinking water, irrigation, swimming) and intrinsic values (e.g. ecology, natural character, spiritual values).

"Attribute" is a measurable characteristic of fresh or coastal water, including physical, chemical and biological properties, which supports particular values.

"Attribute state" is the level to which an attribute is to be managed.

"Environmental outcome" is the environmental state that occurs after some management action. Intended environmental outcomes are described in water quality objectives. The environmental state is directly related to the suitability of attributes to support values.

"Water quality objective" describes an intended environmental outcome in a water management unit.

"Water management unit" is the water body, multiple water bodies or any part of a water body determined by the regional council as the appropriate scale for setting water quality or quantity objectives and limits. This applies to fresh and coastal waters.

"Water quality limit" is the maximum amount of resource use available, which allows a water quality objective to be met.

"Over-allocation" is the situation where the resource:

a) has been allocated to users beyond a limits; or
b) is being used to a point where a freshwater objective is no longer being met.

1 Introduction

1.1 Purpose of this report

This report presents the key findings from our review of the water quality management provisions in the Regional Water and Soil Plan and Regional Coastal Plan.

It does this by identifying the key issues or problems with the state and management of Northland's fresh and coastal water quality and then presents a range of options to address them.

This report should be considered a starting point for discussion with stakeholders, tangata whenua and the wider community about how Northland's water resources should be managed into the future. Therefore, we expect that the issues and options will be tested, added to and refined.

1.2 Structure of this report

This report is structured as follows:

- Section 2 provides an overview of how water quality is managed under the RMA
- Section 3 sets out the issues with the state of Northland's water quality
- Section 4 summarises the issues with the management of Northland's water quality
- Section 5 looks at options to address the issues. This is done in two parts. The first discusses the overarching framework for managing fresh and coastal waters, namely management units and water quality objectives. Options for managing point source and diffuse discharges to achieve the objectives are then identified and discussed.

2 Water quality and the Resource Management Act 1991 – an overview

The Resource Management Act 1991 (RMA) is the principal statute governing the management of New Zealand's water resources. Under the RMA, regional councils are tasked with managing water quality and quantity. This is done through regional plans, which contain water management objectives and policies and rules for controlling activities that affect water quality to achieve objectives.

The RMA provides regional councils with strong regulatory functions for maintaining and enhancing water quality, including the ability to control discharges and the use of land.[1]

Importantly, regional plans have an enabling role because under the RMA discharges are not allowed unless authorised by a rule in a regional plan or resource consent issued by a council.[2] In other words, regional plans can permit activities that would otherwise require resource consent under the RMA. On the other hand, uses of land that affect water quality (diffuse discharges) are generally permitted under the RMA unless controlled by a rule in a regional plan.[3]

Northland Regional Council has two regional plans for managing water quality. The Regional Water and Soil Plan controls discharges and some land use activities that affect

[1] Section 30, RMA
[2] Section 15(1), RMA
[3] Section 9(2), RMA

freshwater quality, but not downstream coastal water quality. The Regional Coastal Plan controls discharges to the coastal marine area.

National policy statements, which are issued by central government, can 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 are two national policy statements that direct the water quality management functions of regional councils. They were both issued after the Regional Water and Soil Plan and Regional Coastal Plan were made operative. The National Policy Statement for Freshwater Management 2014, sets out a nationally consistent approach for managing freshwater quality, which involves:

1. Defining freshwater management units, for example, similar lake and river types
2. Identifying the values of water in each management unit, for example, healthy aquatic ecosystems and swimming
3. Identifying the attributes that are applicable to each value, for example, nutrients for aquatic ecosystems and faecal bacteria for swimming.
4. Determining an acceptable state for each attribute, for example, maximum concentrations of nitrate and ammonia that provide a certain level of protection to aquatic ecosystems and bacteria counts that correspond to a tolerable human health risk. Different attribute states support values at different levels.
5. Establishing water quality objectives. These describe desired intended environmental outcomes by identifying the values that water quality is to be managed for and the numeric and / or narrative attribute states that provide for or protect the values.
6. Setting associated water quality limits. These set out the maximum amount of resource use that allows a water quality objective to be met, and
7. Establishing methods, including rules to avoid or phase out over-allocation. This is where water quality objectives are not being met or where the maximum allowable amount of dischargeable contaminants has been allocated to users beyond a limit.

Water quality objectives, limits and rules must be included in regional plans. The National Policy Statement for Freshwater Management also directs regional councils to protect the significant values of outstanding freshwater bodies and wetlands in managing water quality.[4]

The New Zealand Coastal Policy Statement 2010 contains three policies that direct regional councils in their management of water quality in the coastal environment, as follows:[5]

- Identify and put in place actions (rules and/or non-regulatory initiatives) to improve coastal waters that have been contaminated to the point that they are having significant adverse effects on values, for example, aquatic ecosystems, swimming, and cultural activities.
- Monitor sedimentation and its effects on the coastal environment and control land uses and discharges that cause it.
- Carry out and put in place specific actions to manage point source discharges to the coastal environment, including sewage, stormwater, and discharges from ports and marine facilities.

[4] See http://www.mfe.govt.nz/publications/rma/nps-freshwater-management-2014/index.html
[5] Policies 21-23, New Zealand Coastal Policy Statement

Northland has a Proposed Regional Policy Statement that also provides direction to the content of the regional plans. Importantly, it contains an objective that seeks that the overall quality of the region's fresh and coastal water is improved with a particular focus on:[6]

(a) Reducing the overall Trophic Level Index status of the region's lakes

(b) Increasing the overall Macroinvertebrate Community Index status of the region's rivers and streams

(c) Reducing sedimentation rates in the region's estuaries and harbours

(d) Improving microbiological water quality at popular contact recreation sites, recreational and cultural shellfish gathering sites, and commercial shellfish growing areas to minimise risk to human health, and

(e) Protecting the quality of registered drinking water supplies and the potable quality of other drinking water sources.

This objective must be given effect to through water quality objectives in regional plans.

3 What are the issues with Northland's water quality?

Monitoring and research has identified three significant issues with Northland's water quality:

3.1 Elevated levels of nutrients in the majority of Northland's lakes and in some rivers

The majority of Northland's natural lakes have elevated levels of nutrients (nitrogen and/or phosphorus). This is promoting the growth of nuisance algae and aquatic plants. High levels of algae (phytoplankton) reduce water clarity and in turn the amount of light that can penetrate through the water column to sensitive native plants and algae. Nuisance aquatic plants (macrophytes) can out-compete native species. The enrichment of Northland's nationally and internationally significant dune lakes is a big concern.

Elevated levels of nutrients are promoting the growth of nuisance algae (periphyton) and macrophytes in some of Northland's rivers. However, other factors include a lack of riparian vegetation and consequently increased light for photosynthesis, warmer water temperatures and altered flows.

3.2 Elevated levels of fine sediment in many of Northland's rivers and estuaries

Water clarity is poor in many of Northland's lowland rivers and sediment accumulation rates are high in a number of estuaries and harbours.

Fine sediment is a major contaminant this is mainly generated from diffuse sources. Fine sediment has a range of adverse effects in rivers and receiving water bodies such as lakes and estuaries. In rivers, it can smother benthic organisms and reduce the clarity of water. Reduced water clarity can affect the visual range of fish and aquatic bird and interfere with fish migration.

Many of Northland's estuaries and harbours, such as the Kaipara, Whāngārei and Hokianga harbours and the Bay of Islands are accumulating sediment at rates that are in the upper range of sedimentation accumulation rates measured in North Island estuaries – typically an

[6] Objective 3.2, Proposed Regional Policy Statement for Northland

order of magnitude higher than pre-human times. This accelerated infilling is creating more muddy environments, causing the spread of mangroves, and changing the composition of benthic invertebrate communities. Fine sediment also changes the natural character of estuaries and harbours, impacts on navigation, and causes the loss and degradation of important habitats of fish species such as seagrass and shellfish beds.

Northland's estuaries and harbours, and the habitats within them, are major nursery areas for many fish species such as snapper, trevally and mullet. Evidence suggests that accelerated sedimentation from land uses in contributing catchments is adversely affecting fish populations.[7]

Our evidence suggests that the current main sources of fine sediment are stream bank erosion, pasture, plantation forests, and other land disturbance activities (for example, earthworks associated with construction and subdivision). However, it is important to note that the effects of current land management on water quality are exacerbated by historical land management, which included wide-scale deforestation and the drainage of wetlands. For example, the majority of sediment that is now in the region's estuaries and harbours is from historic land uses.

3.3 Elevated levels of faecal microbes in the region's rivers and estuaries

Faecal indictor bacteria levels in most of the region's popular coastal swimming sites are normally low and at levels that are acceptable for swimming. On the other hand, our monitoring results suggest that many of the region's popular freshwater swimming sites and all of the river water quality monitoring sites fail the "national bottom line"[8] for primary contact recreation. However, all of the region's fresh water quality monitoring sites are suitable for secondary contact recreation (wading and boating).

Monitoring results show that Northland's freshwater quality is suitable for stock drinking and irrigation. We are not aware of any evidence that suggests that the region's agricultural productivity is being adversely affected by water quality.

On the other hand, the effects of poor microbiological water quality on the region's commercial shellfish farmers are well documented. In some estuarine areas, shellfish farmers are prevented from harvesting for short periods following heavy rainfall. However, there have been longer closures. A prominent example was the decade long closure of oyster farms in the Waikere Inlet of the Bay of Islands. This was caused by the presence of a pathogenic virus from sewage (wastewater).

It is important to note that the council monitors faecal bacteria that are indicative, but not definitive, of the presence of pathogens (e.g. campylobacter, giardia, and norovirus). The faecal source tracking done by the council has shown that the main sources of faecal indicator bacteria are ruminants (livestock), birds, and in some localised areas poorly treated or untreated wastewater from municipal reticulation systems, septic tanks and boats. We have limited information on the prevalence of people getting sick in Northland from swimming in rivers or coastal waters and consuming shellfish.

Please see the following reports for more information on these issues:

- Northland lakes water quality and ecology: State and trends 2007-2011

[7] Morrison, M.A., et.al. (2009). A review of land-based effects on coastal fisheries and supporting biodiversity in New Zealand. New Zealand Aquatic Environment and Biodiversity Report No. 37.
[8] See Appendix 2 of the National Policy Statement for Freshwater Management 2014.

- River water quality and ecology in Northland: State and trends 2007-2011
- Recreational Swimming Water Quality in Northland: Summer 2013-2014
- State of the Environment Report 2012

3.4 Other issues

Feedback from key stakeholders and tangata whenua has also identified a number of additional issues. These are briefly listed and discussed as follows:

- *Mauri of water bodies* – Concerns have been expressed about the reduction of the mauri of water bodies. Mauri refers to the life force or essence of all things. Mauri is not static and can be affected by the environment in which it exists, including contaminants and other substances like cremated remains of people. The maintenance and enhancement of mauri is very important to ensure the wellbeing of the environment as a whole.[9]
- *Heavy metals* – Our monitoring and research suggests that levels of heavy metals in Northland waters are generally low and within technical guidelines. The exception is in the Hatea River arm of the Upper Whangarei Harbour where some heavy metals in benthic sediment are elevated above low-trigger value guideline levels.
- *Climate change* – The predicted effects of climate change in Northland include longer and more frequent droughts and heavy rainfall events. This may result in larger sediment loadings to water bodies, warmer water temperatures and reduced dissolved oxygen levels. However it is important to note that we are not aware of any research on the likely effects of climate change on Northland's water quality.
- *Loss of wetlands* – Wetlands capture and treat sediment and nutrients. The extensive loss of wetlands due to historical land use changes is a key factor in increased contaminant loads to rivers, lakes, estuaries and harbours.
- *Loss of riparian vegetation* – Riparian vegetation shades water bodies and helps capture and treat some contaminants. The widespread loss of riparian vegetation due to past and present land use activities is also a key reason for water quality impairment.
- *Groundwater contamination* – Groundwater quality can be impacted by the use of land and discharges. However, our evidence suggests that groundwater quality is generally good in Northland.
- *Altered flows and water levels* – The taking, damming and diversion of water can impact on water quality by reducing its assimilative capacity[10]. This is particularly relevant in water bodies that are dominated by point source discharges. However, the majority of Northland's water bodies are dominated by diffuse sources. In such systems, their water quality generally worsens with increased flows due to run-off and leaching of contaminants.

Lastly, it is important to note that our information on the pressures on and the state of Northland's fresh and coastal waters is far from complete. There are a number of key information gaps that we need to address in order to develop effective and efficient management interventions.

[9] Ministry for the Environment. 2010. *Maori Values and World Views Supplement*. Part D from Making Good Decisions Workbook ME 679.
[10] Assimilative capacity refers to the capacity for water to dilute contaminants and is directly a function of the amount of water relative to the amount of contaminants.

4 What are the issues with the management of Northland's water quality?

Through our review we have identified four significant issues with the management of Northland's water quality:

4.1 Managing diffuse discharges of the "big three" contaminants

The Regional Water and Soil Plan is largely focussed on managing point source discharges, with the exception of controls on some land disturbance activities. For example, the plan does not contain any controls on nutrient inputs or losses and the access of livestock to the beds of water bodies. Despite good progress in the management of point source discharges, the quality of many of Northland's fresh and coastal waters is impaired. Research suggests that diffuse discharges are the main source of the impairment.

Managing diffuse discharges is challenging because of the difficulties around measuring them, proving causality, and regulating the use of land.

It is important to note though that the National Policy Statement for Freshwater Management requires councils to account for and manage both point source and diffuse discharges of contaminants.

4.2 Fresh and coastal water quality managed in isolation

Northland's fresh and coastal water quality is largely managed in isolation. The Regional Water and Soil Plan controls discharges to land and fresh water and some land disturbance activities but contains no explicit policy or rule requirements to consider the impacts of discharges and use of land in catchments on coastal water quality. This is an issue because almost all of Northland's rivers drain to and influence the quality of water in estuaries and harbours.

Similarly, the Regional Coastal Plan regulates point source discharges to the coastal marine area. Coastal water quality classifications and standards are used for managing such discharges. However, they do not apply to point source and diffuse discharges in contributing catchments. This compromises the effectiveness of the coastal water quality classifications and standards and has proved contentious in some resource consent applications.

It is also important that fresh water quality and quantity are not managed in isolation because they are inherently linked.

4.3 Administrative issues with current policies and rules

The term "administrative issues" refers to shortcomings or problems with the way that current rules are interpreted, monitored and enforced. We have identified four types of administrative issues associated with the Regional Water and Soil Plan and Regional Coastal Plan, as follows:

- *Lack of clarity and certainty in some permitted activity rules* – Some permitted activities rules in the Regional Water and Soil Plan contain vague and subjective conditions. This makes it difficult for people operating under them and introduces discretion to council when monitoring and enforcing them. Key examples include the permitted activity standards for land disturbance.[11]

[11] See Section 32 "Environmental Standards for Land Disturbance Activities", Regional Water and Soil Plan.

- *Incomplete knowledge about the location, timing, and nature of some activities* – There are not requirements in the permitted activity rules to notify the council in advance of an activity taking place. This means that the council is often not aware of some activities until they have happened.
- *Lack of consistency in enforcing rules* – The council does a good job managing most activities but concerns have been raised about inconsistencies in our approach. For example, it has been pointed out than we generally take a much softer approach in regulating overflows and stormwater discharges from municipal networks than we do with discharges from businesses, for example, farm dairy effluent. Concerns have also been raised about inconsistencies in our monitoring and enforcement of land disturbance activities.

4.4 Implementing recent national and regional policy direction

As mentioned earlier, the National Policy Statement for Freshwater Management and the New Zealand Coastal Policy Statement set out a national framework for managing fresh and coastal water quality. The Proposed Regional Policy Statement for Northland provides additional direction on the content of our regional plans.

The policy statements were promulgated after the Regional Water and Soil Plan and Regional Coastal Plan were made operative, and in a number of respects the plans do not give effect to them. Therefore the plans need to be updated as required by the RMA.

These issues and options to address them are covered in section 5 below.

5 What needs to change in the regional plans?

5.1 Background

5.1.1 Water quality management units

Water quality management units enable a diverse region to be divided up so common water quality objectives and limits (in the case of freshwater) can be applied to each unit. Water management units can be a water body, multiple water bodies, or any part of a water body.

The National Policy Statement for Freshwater Management requires management units to be defined that include all freshwater bodies within a region. The New Zealand Coastal Policy Statement does not contain a similar directive for coastal waters. Rather, it directs regional councils to only identify significantly degraded coastal waters in plans and include provisions in plans to improve water quality in such areas.

The way that water quality management units are defined depends on the purposes for which water bodies, or parts of water bodies, are valued. Consequently, there is a level of interdependence between defining water quality management units and determining the values and attributes for which they are managed (discussed later in this report).

There are several of approaches for determining water quality management units and regional councils around the country are currently considering and using different approaches.

Issues with the current regional plans

Currently the Regional Water and Soil Plan treats all of the region's rivers as a single water quality management unit, in other words, to be managed to one common water quality objective. The region's lakes are also treated as a single management unit, although

controls afford a higher level of protection to a number of dune lakes.[12] The plan differentiates between wetlands (wetlands, indigenous wetlands, and significant indigenous wetlands) but this is more for the purposes of managing drainage, diversion and land disturbance activities than their water quality. Aquifers are also generally treated as a single management unit.

The Regional Coastal Plan on the other hand classifies Northland's coastal waters into three broad water quality management units (estuaries and harbours, near shore areas, and open coastal waters) for the purposes of applying default coastal water quality objectives (called standards in the plan). It also contains specific (tailored) classifications and associated water quality objectives for the Bay of Islands and Whangarei Harbour.

Options for new management units

The starting point is identifying the values that water quality needs to be managed for and where they apply. The National Policy Statement for Freshwater Management identifies two compulsory values that must apply to all water quality management units:

- Ecosystem health (Te Hauora o te Wai),[13] and
- Secondary contact recreation (wading and boating).

It is important to note that ecosystems health and other instream values such as recreational and commercial fisheries, natural character, and visual amenity are closely related. This means that by managing water quality for ecosystem health other values will likely be provided for.

However, we think that it is not appropriate to apply one freshwater quality objective and associated limits for ecosystem health to all rivers because there is natural variation in habitats, species and water quality in different river types (for example, lowland muddy rivers versus small stony coastal streams). This is generally accepted by stakeholders.

In addition, while the policy statement only requires water quality to be managed for secondary contact recreation we think that fresh and coastal waters that are popular for swimming, shellfish gathering and growing areas, and drinking water supplies should be identified and managed.

Some parts of the community would like all fresh and coastal waters to be suitable for swimming. This is unlikely to be achievable though without widespread changes in land use, at potentially significant costs.

Options for future water quality management units are discussed in sections 5.2 through 5.6 below.

5.1.2 Water quality objectives

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

A water quality objective can be expressed in a number of ways, including in broad narrative, tight narrative, or in numeric terms.

Broad narrative water quality objectives express desired environmental outcomes in abstract and non-quantified terms, for example, "water quality safeguards the life-supporting capacity and mauri of rivers and is suitable for recreation." Such objectives are open to wide

[12] Schedule E, Regional Water and Soil Plan.
[13] Te Hauora o te Wai: "the health and mauri of water".

interpretation. Tight narrative objectives state desired environmental outcomes in more specific terms but remain difficult to quantify, for example, "water quality is suitable for native fish species and swimming".

Numeric objectives, on the other hand, express the actual minimum or maximum environmental states that support values of water, for example, "*E.coli* concentrations do not exceed 260 per 100 mL so that people are exposed to no more than a low risk of getting sick from swimming", or "nitrate concentrations do not exceed 1.0 mg per litre so that there is not adverse effects on the growth of aquatic fish species".

However, not all desired environmental outcomes can be expressed in numeric terms. For example, some cultural and spiritual values cannot be easily quantified, such as "Mauri"[14]. Expressing water quality objectives in numeric terms can also be challenging because our understanding of the relationships between different contaminants, their concentrations in water, and their effects on values such as fisheries can be difficult to understand and quantify.

In establishing water quality objectives for water quality management units, the National Policy Statement for Freshwater Management directs the council to:[15]

1. Identify the values that the freshwater management unit should be managed for. Ecosystem health and human health (secondary contact recreation, for example, wading and boating) are the two compulsory values and must apply to all water bodies.
2. Identify the attributes (for example, *E.coli,* nutrients and sediment) that need to be managed for the selected values.

   It is important to note that the National Policy Statement for Freshwater Management attribute tables are only partly populated at this stage and will be added to overtime as the science is developed and agreed on (expected to be in 2016 and 2019).[16] However, the government has stated that it expects regional councils to set water quality objectives for attributes that are not currently in the National Policy Statement for Freshwater Management, for example, sediment, nutrients (for managing the growth of nuisance plants and algae), temperature, pH, macroinvertebrates, and heavy metals. In this regard, regional councils have the discretion to determine the appropriate additional attributes and attribute states for their regions.
3. Select the appropriate state for each attribute. The National Policy Statement for Freshwater Management identifies four states ("A", "B", "C" and "D") for the compulsory attributes. The "A", "B" and "C" states represent "excellent", "good" and "fair" conditions of ecosystem health. The boundary between the "C" and "D" states is the minimum acceptable state (in other words, national bottom line). Determining the appropriate state for each attribute ultimately comes down to a choice whether to maintain or improve water quality in each management unit.[17]
4. Establish water quality objectives in numeric terms where practical, otherwise in narrative terms, by reference to the selected attribute state.

It is important to note that new fresh and coastal water quality objectives must also give effect to Objective 3.2 of the Proposed Regional Policy Statement.

[14] "Life force, or essence of living things."
[15] Policy CA2, National Policy Statement for Freshwater Management 2014
[16] Ministry for the Environment. 2013. *Proposed amendments to the National Policy Statement for Freshwater Management 2011: A discussion document.* Wellington: Ministry for the Environment.
[17] For further details on the compulsory attributes please refer to the attribute tables in Appendix 2 of the National Policy Statement for Freshwater Management 2014

Issues with the current regional plans

Freshwater quality objectives

The Regional Water and Soil Plan currently contains a single broad narrative water quality objective for the region's freshwater bodies, as follows:[18]

> *The maintenance or enhancement of the quality of natural water bodies in the Northland region to be suitable, in the long-term, and after reasonable mixing of any contaminant with the receiving water and disregarding the effect of any natural events, for such of the purposes listed below as may be appropriate:*
>
> - *Lakes, rivers, streams – aquatic ecosystems, contact recreation, water supplies, aesthetic and cultural purposes;*
> - *Freshwater wetlands – aquatic ecosystems, cultural purposes;*
> - *Groundwater, potentially usable – water supply, protection of uses of receiving water body; and*
> - *Other groundwater – protection of the uses of receiving water body.*

While very few people would disagree with the outcomes that it seeks, it lacks specificity and therefore certainty. Furthermore, because it is expressed in such broad terms it is difficult to measure or assess whether the outcomes are actually being met. Also, it is not consistent with the requirements of the National Policy Statement for Freshwater Management and the Proposed Regional Policy Statement. For these reasons the objective needs to be updated.

Coastal water quality objectives

The Regional Coastal Plan currently contains default coastal water quality objectives that apply to three management units (estuaries and harbours, near shore areas, and open coastal waters).[19] These water quality objectives are based on the standards in Schedule 3 of the RMA.

The Regional Coastal Plan also contains specific coastal water quality objectives for the Whāngārei Harbour and the Bay of Islands.[20] Some of the objectives are based on technical guidelines that are now considered out of date.[21]

Over the last ten years, the council has gathered a lot of information on the quality of water in Northland's estuaries and harbours. This information will allow us to set new water quality objectives that are more applicable to Northland's coastal waters.

Options for new water quality objectives

Under the National Policy Statement for Freshwater Management we are required to set freshwater quality objectives for some compulsory attributes of ecosystem and human health. However, we are also considering setting water quality objectives for additional attributes. Table 1 below lists the compulsory attributes that the National Policy Statement for Freshwater Management directs the council to set freshwater water quality objectives for. It also identifies other attributes that the council is considering including as the basis for new fresh and coastal water quality objectives, to be expressed in numeric or tight narrative terms.

We also think that we would set coastal water quality objectives in a similar way to freshwater quality objectives. This is in the interests of consistency and because of the close relationships between fresh and coastal water quality in Northland.

[18] Objective 7.4.1, Regional Water and Soil Plan
[19] Method 13.5.3(b), Regional Coastal Plan
[20] Method 13.2.1 and 13.2.3, Regional Coastal Plan
[21] For example, the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 1992)

There are advantages and disadvantages with setting numeric water quality objectives for attributes that are not currently in Appendix 2 of the National Policy Statement for Freshwater Management. Some of these are listed below.

- Advantages:
    - There are attributes of ecosystem health that are relevant to Northland's freshwater bodies that are not currently provided in Appendix 2 of the national policy statement, e.g. sediment and invertebrates.
    - Numeric water quality objectives provide certainty and drive more robust (effective and efficient) interventions.
    - We have fairly good information on a number of attributes that are not currently in the national policy statement, so why wait?
- Disadvantages:
    - The national policy statement directs councils to "avoid" over-allocation. Where over-allocation is defined as the situation where a freshwater quality objective is not being met. Numeric objectives are less flexible when it comes to assessing the likely and actual effects of discharges. This means that current and future resource users can be impeded if the information on which the numeric objectives are based is not robust.
    - While we have good information on most attributes there are some uncertainties around the relationships between some water physical and chemical attributes and biological attributes. For example, relationships between different levels of suspended and deposited sediment and aquatic ecosystems can be difficult to quantify.
    - The Government has signalled that it intends to populate Appendix 2 over time for a number but not all attributes (e.g. nutrients in rivers). This means that the regional council could potentially duplicate this work or set objectives for attributes that may become out of date at a later date.

Sections 5.4 through 5.8 of this report looks at options for new water quality objectives for lakes, rivers, wetlands, aquifers, and coastal waters..

Table 1 – Compulsory and potential attributes for fresh and coastal water quality objectives

Values	Attributes		Water body type				
			Lakes	Rivers	Estuaries & harbours	Groundwater	Wetlands
Ecosystem health / Te Hauora o te Wai / mauri	Biological	Phytoplankton (chlorophyll a)	√		#		
		Periphyton		√			
		Macrophytes	#	#	#		
		Invertebrates	#	#	#		
		Fish	#	#	#		
	Physical / chemical	Nitrate toxicity		√			
		Ammonia toxicity	√	√	#		
		Total nitrogen	√				
		Total phosphorus	√				
		Dissolved inorganic nitrogen		#			
		Dissolved reactive phosphorus		#			
		Dissolved oxygen (below point sources)	#	√	#		
		pH (below point sources)		#			
		Temperature (below point sources)		#			
		Suspended sediment (visual clarity and/or turbidity)		#	#		
		Deposited sediment (accumulation rates)			#*****		
		Heavy metals (in water and sediment)	#	#	#		
		Organic compounds	#	#	#		
Human health / Te Hauora o te Tangata	Biological	*E.coli* (contact recreation)	√	√			
		E.coli (drinking water)				#	
		Enterococci (contact recreation)			#		
		Faecal coliforms (shellfish consumption)			#		
		Planktonic cyanobacteria	√	√			
	Chemical	Nitrate (drinking water)				#	

Key

√	Compulsory attributes with numeric states (Appendix 2, National Policy Statement for Freshwater Management 2014).
#	Other attributes (with narrative and/or numeric states) that are being considered by the council for inclusion in new water quality objectives.
	Attributes not available or not applicable in the near term.

*****The council is investigating approaches for managing sediment accumulation rates in the Kaipara Harbour, Whāngārei Harbour and Bay of Islands

5.1.3 Water quality limits

The National Policy Statement for Freshwater Management also directs the regional council to set water quality limits for all freshwater management units in the region.[22]

The term "water quality limit" is broadly defined in the National Policy Statement for Freshwater Management to mean "the maximum amount of resource use available, which allows a water quality objective to be met."

Limits are not referred to in the RMA, but the term is commonly understood to be an upper or lower bound level beyond which an activity is unlawful or subject to additional restrictions or hurdles.[23] In water quality management, limits are intended to restrict discharges or land use activities so as to protect environmental values (in other words, meet water quality objectives). Because the term "water quality limits" is so broadly defined in the National Policy Statement for Freshwater Management it can mean any provision that directly or indirectly defines the capacity for resource use that allows an objective to be met.[24]

In effect, limits do two things:

1. Ensure that water quality objectives are met
2. Show the amount of available resource for use, in other words, the assimilative capacity of a water body.

Issues with the current regional plans

The Regional Water and Soil Plan does not contain any water quality limits of the type that is envisaged by the National Policy Statement for Freshwater Management. Water quality limits will need to be put in place when setting new freshwater quality objectives.

Options for new water quality limits

Water quality limits can be set at a number of scales and in a different ways. Some of the types are discussed below.

Numeric water quality objectives as limits

We think that it is possible to use numeric water quality objectives as limits. While this may sound confusing, numeric water quality objectives for attributes such as sediment, nutrients, and faecal bacteria specify maximum contaminant concentrations. In doing so, they define the assimilative capacity for discharges and therefore the maximum amount of resource use available for use.

In using this approach, numeric water quality objectives would be met be preventing and minimising discharges of contaminants from point source and diffuse discharges. However, the council would need to demonstrate that the regulatory and non-regulatory interventions would adequately address the cumulative effects of multiple sources.

Controls could include discharge quality standards on point sources, restrictions on the amount of land available for particular activity, for example stock grazing in riparian areas of a river, and limits on contaminant inputs or losses.

The main weakness of using numeric water quality objectives as limits is because they are expressed as concentrations it would not be easy to allocate the concentrations among

[22] Policy A1, National Policy Statement for Freshwater Management 2014

[23] Norton N., Snelder T., Rouse H. (2010) Technical and Scientific Considerations When Setting Measurable Objectives and Limits for Water Management. NIWA Client Report: CHC2010-060. Prepared for Ministry for the Environment.

[24] Ibid

resource users.[25] Similarly, it is also difficult to link the instream contaminant concentrations to diffuse discharges from the use of land.

However, they would be appropriate for water bodies where there is sufficient "room" between a current contaminant concentration and a maximum contaminant concentration specified in a water quality objective and where there is a low risk of the maximum concentration being exceeded.

Contaminant load limits (applied at the catchment/sub-catchment scale)

Contaminant load limits define the maximum load of a contaminant that a water body can receive and still meet its water quality objectives. Load limits are typically expressed in terms of a mass (for example, tonnes of nitrogen) per unit of time (that is, years or days). They are normally derived by multiplying the maximum contaminant concentration set out in a water quality objective by the volume of water that enters a lake or estuary or passes by a particular point in a river over a period of time (typically a year).

Contaminant load limits can be useful for addressing situations where water quality objectives are not being met or are under pressure from multiple discharges, particularly diffuse discharges. Their advantage is that they transparently link water quality objectives and contaminant sources, and can be allocated or apportioned among the sources.

While theoretically appealing, the development, implementation and administration of contaminant load limits can be resource-intensive, even for a single contaminant (for example, nitrogen). Developing contaminant load limits for all of Northland's catchments (>1,400) and lakes (>200) would likely be very expensive and time-consuming.

Contaminant input and loss limits (applied to discharges and at the property scale for diffuse sources)

Water quality limits can be set for discharges as maximum discharge quality standards and at the property scale by regulating contaminant application of loss rates. The latter is typically done by linking application or loss rates to a contaminant load limit rather than directly to a numeric water quality objective. Contaminant input or loss limits can be practicably set for some types of contaminants such as nitrogen and phosphorus. However it is difficult to quantity losses of sediment and faecal microbes at the property scale.

Other forms of limits include restrictions on the use of land as a proxy for regulating contaminant losses.

5.2 Lakes

Northland has a large number of small to medium-sized lakes, 200 of which are greater than one hectare and most are coastal dune lakes. It is thought that Northland has the greatest number of New Zealand's dune lakes and a large proportion of the country's warm lowland lakes with relatively good water quality.

Most of Northland's dune lakes are situated along the west coast, having been formed between stabilised sand dunes. The dune lakes are in four main groups situated on the Aupōuri Peninsula, Karikari Peninsula, north of Dargaville (Kai Iwi lakes) and Poutō Peninsula. They generally range in size between one and 35 hectares and are usually less than 15 metres deep. Many of them are considered to be nationally and internationally significant.

[25] Note: The preamble to the National Policy Statement for Freshwater Management states: "Once limits are set, freshwater resources need to be allocated to users, while providing the ability to transfer entitlements between users so that we maximise the value we get from water." However, there is no corresponding policy requirement to allocate resources.

The lakes and their surrounding wetland margins support a range of endemic endangered species. They also provide the only known habitats, or national strongholds, for a range of other plants and animals.

Dune lakes usually have little or no continuous surface inflows or outflows, being fed primarily by direct rainfall, surrounding wetlands, or from larger groundwater catchments. As a result, water levels can fluctuate considerably with climatic patterns and they have limited capacity to assimilate any contaminants, because most of these lakes are relatively small and shallow.

Despite their high ecological values, the status of dune lakes is not secure. They are prone to nutrient enrichment, particularly where lakeside vegetation has been grazed or removed and where there is direct stock access to the lake.

5.2.1 Aquatic ecosystem health (Te Hauora o te Wai[26])

Management units

Options for lake water quality management units are being developed. Based on our initial research we think that a number of Northland's high value lakes should be treated as individual management units. These lakes have yet to be selected, but it is likely that they will be the majority of Northland's monitored lakes, which include lakes that have been identified as outstanding freshwater bodies.

The remainder of the lakes could be grouped by lake type. The following table provides an example of how the lakes would be grouped into management units.

[26] "The health and mauri of water"

Table 2 – Example of default lake water quality management units for Northland[27]

Management unit	Description	Example lakes
Dune lake unit 1 – Perched in leached dunes	Perched lakes found in leached dunes where organic material has sealed the basin floor and provides humic (tea-stained) water	Most abundant type of dune lake in Northland. Examples include Lake Rotokawau and Lake Waipara
Dune lake unit 2 – Un-perched in leached dunes	Similar to Dune lake unit 1 but close to the sea, not perched, and associated with extensive swamps	Examples include Lakes Morehurehu, Te Kahika, Te Arai, and Mokeno
Dune lake unit 3 – Water-table window lakes	Found in drowned valleys or interdune basin, fed by springs with clear water character.	Examples include northern Aupouri lakes near Te Kao, the Kai Iwia lake group, Sweetwater lakes, and some Pouto lakes.
Dune lake unit 4 – Dune contact lakes	At least one lake shore is in contact with a coastal dune, often but not exclusively humic.	Examples include the northern-most Aupouri lakes, and the Pouto lakes, Humuhumu, Kanono and Kahuparere.
Dune lake unit 5 – Dune lake with marine contact	Freshwater lakes with marine contact, where they may be intermittent connection with the sea.	Waitahora Lagoon is the only example of this lake type
Volcanic lakes	Formed initially in basins dammed by volcanic activity.	Examples include Lakes Omapere, Owhareiti, Tauanu, and Ora
Alluvial lakes	Formed by damming of a stream by alluvium.	Examples include Lake Kaiwai
Man-made lakes	Man-made dames and lakes	Examples include Lake Ngatuwhete (Aupouri), Jacks, and Waro

Water quality objectives

The council routinely monitors 28 lakes in Northland, 27 of which are dune lakes. These lakes are considered to be largely representative of most of Northland's natural lakes. This means that we are able to extrapolate the water quality monitoring results from the lakes to unmonitored lakes.

The National Policy Statement for Freshwater Management directs the council to establish water quality objectives for lake ecosystem health. At a minimum, these objectives need to specify annual median and maximum concentrations (attribute states) for phytoplankton and ammonia toxicity, and maximum concentrations for total nitrogen and total phosphorus. Phytoplankton and nutrients are measures of lake trophic level. Table 2 below shows how the quality of water in Northland's monitored lakes compares to the states for the compulsory attributes in the National Policy Statement for Freshwater Management.

All lake management units

The results in Table 3 show that almost all monitored lakes have ammonia levels that are in an "A" attribute state for ammonia toxicity. We think that it is appropriate to set a water quality objective for all lake management unit based on an "A" attribute state for toxicity.

[27] See Paul Champion and Mary de Winton (June 2012) Northland Lakes Strategy: Part 1. Prepared for Northland Regional Council. *NIWA Client Report No: HAM2012-121*

Specific lake management units

There is natural variability in nutrient levels across Northland's lake types. For example, volcanic lakes are generally have higher levels of nutrients compared to dune lakes. There is also variability between different types of dune lakes. Accordingly, it is not appropriate to set the same water quality objective for total nitrogen, total phosphorus, and phytoplankton for all lake management units.

We will be working with lake water quality scientists to determine a range of possible numeric water quality objectives for different lake management units

As stated earlier in this report, we are considering setting water quality objectives for attributes of lake ecosystem health that are not currently included in Appendix 2 of the National Policy Statement for Freshwater Management (see Table 1 below for further information).

With regard to macrophytes, invertebrates, and fish we do not have robust information on their relationships with physical and chemical attributes (such as nutrients) and their natural abundance and distributions to set numeric water quality objectives for them. Obtaining this information will take time. Therefore, we are likely to specify narrative outcomes.

Water quality limits

We are looking at options for lake water quality limits. Options include setting nutrient load limits and property scale output based limits for the individual lake management units and using more traditional controls such as stock exclusion, and setbacks for earthworks and vegetation clearance, for example. These options are discussed in more detail in section 5.9 below.

Table 3 Comparison of Lake Water Quality Monitoring Network data (2009-2013) with the compulsory attribute states in the National Policy Statement for Freshwater Management [28]

Value		**Ecosystem Health**						**Human Health (Secondary Contact Recreation)**	
Attribute		**Phytoplankton (mg chl-a/m^3)**		**Total Nitrogen (mg/m^3)**	**Total Phosphorous (mg/m3)**	**Ammonia Toxicity (mg NH_4 - N/L**		**Cyanobacteria (cells/mL)**	**E.coli/100 mL****
Compliance Statistic		Annual Median	Annual Maximum	Annual Median	Annual Median	Annual Median	Annual Maximum	80th Percentile	Annual Median
Aupouri lakes	Carrot*	8.4	14.4	545	21.0	0.012	0.040	No Data	No Data
	Heather*	4.4	5.8	308	10.5	0.003	0.004	No Data	No Data
	Morehurehu*	2.1	3.1	518	12.5	0.018	0.036	No Data	No Data
	Ngakapua North*	5.0	9.0	496	14.0	0.008	0.037	No Data	No Data
	Ngakapua South	6.5	9.7	553	16.0	0.007	0.014	No Data	No Data
	Ngatu*	3.3	6.7	806	9.5	0.080	0.144	No Data	No Data
	Rotokawau	4.3	6.6	583	13.0	0.018	0.006	No Data	No Data
	Rotoroa*	6.7	10.2	832	14.0	0.011	0.084	No Data	No Data
	Te Kahika*	1.0	1.9	329	3.5	0.036	0.052	No Data	No Data
	Waihopo*	3.4	6.9	590	15.5	0.012	0.023	No Data	No Data
	Waipara*	2.9	9.8	465	13.0	0.007	0.011	No Data	No Data
	Waiparera	11.9	21.1	793	25.0	0.007	0.015	No Data	No Data
Karikari/ Central lakes	Omapere (east)	3.8	6.0	515	43.0	0.012	0.027	No Data	No Data
	Omapere (west)	3.4	9.8	480	52.0	0.011	0.014	No Data	No Data
	Waiporohita	18.4	30.0	827	35.5	0.006	0.009	No Data	No Data
Kai iwi lakes	Kai Iwi*	1.8	3.2	351	6.5	0.005	0.007	No Data	No Data
	Taharoa*	1.0	1.5	130	2.0	0.002	0.002	No Data	No Data
	Waikare*	1.9	2.9	204	4.0	0.002	0.003	No Data	No Data
Pouto lakes	Humuhumu*	3.8	6.7	305	9.5	0.004	0.004	No Data	No Data
	Kahuparere*	8.5	15.1	400	14.5	0.002	0.014	No Data	No Data
	Kanono*	7.1	9.9	337	18.5	0.002	0.009	No Data	No Data
	Karaka	18.1	110.0	494	33.0	0.015	0.169	No Data	No Data
	Mokeno	4.2	13.6	1012	39.5	0.034	0.169	No Data	No Data
	Rotokawau*	2.0	3.7	337	8.0	0.006	0.053	No Data	No Data
	Rototuna	20.3	57.9	771	32.0	0.005	0.011	No Data	No Data
	Swan	21.4	24.4	912	57.0	0.009	0.024	No Data	No Data
	Wainui*	3.6	15.4	417	16.0	0.007	0.014	No Data	No Data

*Seasonally stratified lake (different numeric attribute states for Total Nitrogen)

** *E.coli* levels are monitored in some lakes but as part of the Recreational Swimming Water Quality Monitoring Programme

Key

- "A" attribute state
- "B" attribute state
- "C" attribute state
- "D" attribute state (exceeds "National Bottom Line"

[28] The results are the 5 year medians of the compliance statistics for each of the compulsory attributes.

5.2.2 Human health (Te Hauora o te Tangata)

Management units

Contact recreation

Some of Northland's natural lakes are highly valued for swimming and other forms of contact recreation. Prominent examples include the Kai Iwi Lakes, Lake Ngatu, and Lake Waro.

We think that there should be management unit for lakes that are used for swimming. For all other lakes, water quality would be managed for secondary contact recreation (wading and boating). This means that two water quality management units would be defined for the purposes of managing water quality for contact recreation. Please note that this applies to river and lakes.

Drinking water supplies

Most urban areas in Northland are serviced by public water supply systems, which capture, treat and supply potable water. These systems are usually very reliable, however during extreme rainfall events there is the potential for reduced treatment and disinfection capacity in some systems due to high levels of suspended sediment.

We think registered drinking water supplies and their contributing catchments should be identified as a separate management unit. Note that this also applies to all water body types.

Water quality objectives

Primary contact recreation (swimming)

Microbiological water quality in monitored popular swimming lakes is within the National Policy Statement for Freshwater Management "A" attribute state for *E.coli*.

We think that we should set a water quality objective for *E.coli* that would seek to maintain this high level of microbiological water quality at an "A" attribute state for primary contact recreation. This means that people would continue to be exposed to only a low risk of infection (up to a 1% risk) when swimming.

Secondary contact recreation (wading and boating)

For all other lakes, we think that an appropriate water quality objective would be based on an "A" attribute state for *E.coli* (secondary contact recreation), which means that people would be exposed to a very low risk of infection (less than 0.1% risk) from contact with water during activities such as wading and boating.

The council is also required to set a water quality objective for secondary contact recreation in lakes, which specifies maximum cyanobacteria levels. Cyanobacteria are photosynthetic bacteria that are an important component of many aquatic ecosystems. However, under certain conditions they can proliferate and be toxic. The toxins can present health risks to humans and other animals when consumed in drinking water or when in contact with skin.

The council only recently began to monitor cyanobacteria in lakes and rivers and therefore our information on cyanobacteria levels in limited. We are likely to be in a better position next year to determine an appropriate water quality objective for cyanobacteria in lakes and rivers.

Drinking water supplies

Based on monitoring and research there are likely to be few lakes **and** rivers in Northland (and indeed New Zealand), including rivers in native forested catchments, which have water quality that meets the Drinking-water Standards for New Zealand.[29] It is unrealistic to expect all lakes and rivers to be safe for drinking because domestic and wild animals in catchments can carry pathogens (for example, giardia and cryptosporidium), which can be washed into water during rainfall.

We think that a water quality objective should be included in the Regional Water and Soil Plan that provides for the protection of the quality of registered drinking water supplies. This could be done in narrative terms.

Water quality limits

It is very difficult to develop contaminant load limits for *E.coli*. Therefore, water quality limit options for achieving water quality objectives for human health are likely to include standards on point source discharges and controls on the access of livestock to water bodies, for example, in order to ensure that the water quality objectives are not compromised.

5.3 Rivers

Northland has a dense network of rivers and streams, many of which are relatively short with small catchments. The exception is the Northern Wairoa River, which drains the northern part of the Kaipara Harbour catchment (approximately 3,650 km^2 or 30% of Northland).

Flows in Northland's rivers vary considerably due to rainfall. High intensity storm events can cause flash floods and prolonged dry spells can cause low flows in small catchments. Northland's rivers are generally slow flowing and muddy due to the region's low gradient topography (mainly low altitude rolling hill country) and clay rich soils. The rivers with the highest ecological values are those whose catchments are the least modified. Most of the region's rivers drain to and influence the quality of water in estuaries and harbours.

Northland's rivers support a diverse range of aquatic species, including plants and algae, invertebrates, fish and birds.

5.3.1 Aquatic ecosystem health (Te Hauora o te Wai)

Management units

Our current thinking around defining river water quality management units involves classifying Northland's rivers and streams into similar types based on key environmental factors (such as topography, geology and ecological values). These 'primary' management units will have narrative and numeric water quality objectives applied to them.

These primary management units will then be linked with Northland's river catchments. The catchments will be the scale at which water quality accounting and limit setting is undertaken.

The two main river classification systems currently used in New Zealand are the River Environment Classification[30] and Freshwater Ecosystems of New Zealand[31].
The River Environment Classification groups rivers and streams according to a number of environmental factors that are thought to influence their ecological values. The factors are

[29] Ministry of Health. 2008. Drinking-water Standards for New Zealand 2005 (Revised 2008). Wellington: Ministry of Health
[30] See https://www.mfe.govt.nz/environmental-reporting/about-environmental-reporting/classification-systems/fresh-water.html
[31] See http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/freshwater-ecosystems-of-new-zealand/

climate, source of flow (topography), geology, land cover, network position and land form. The Freshwater Ecosystems of New Zealand classification system is similar to River Environment Classification but incorporates other information including biological data. The following figure shows how the River Environment Classification applies to Northland.

We will be working with the designers of these systems to define appropriate river classifications (primary management units) for Northland.

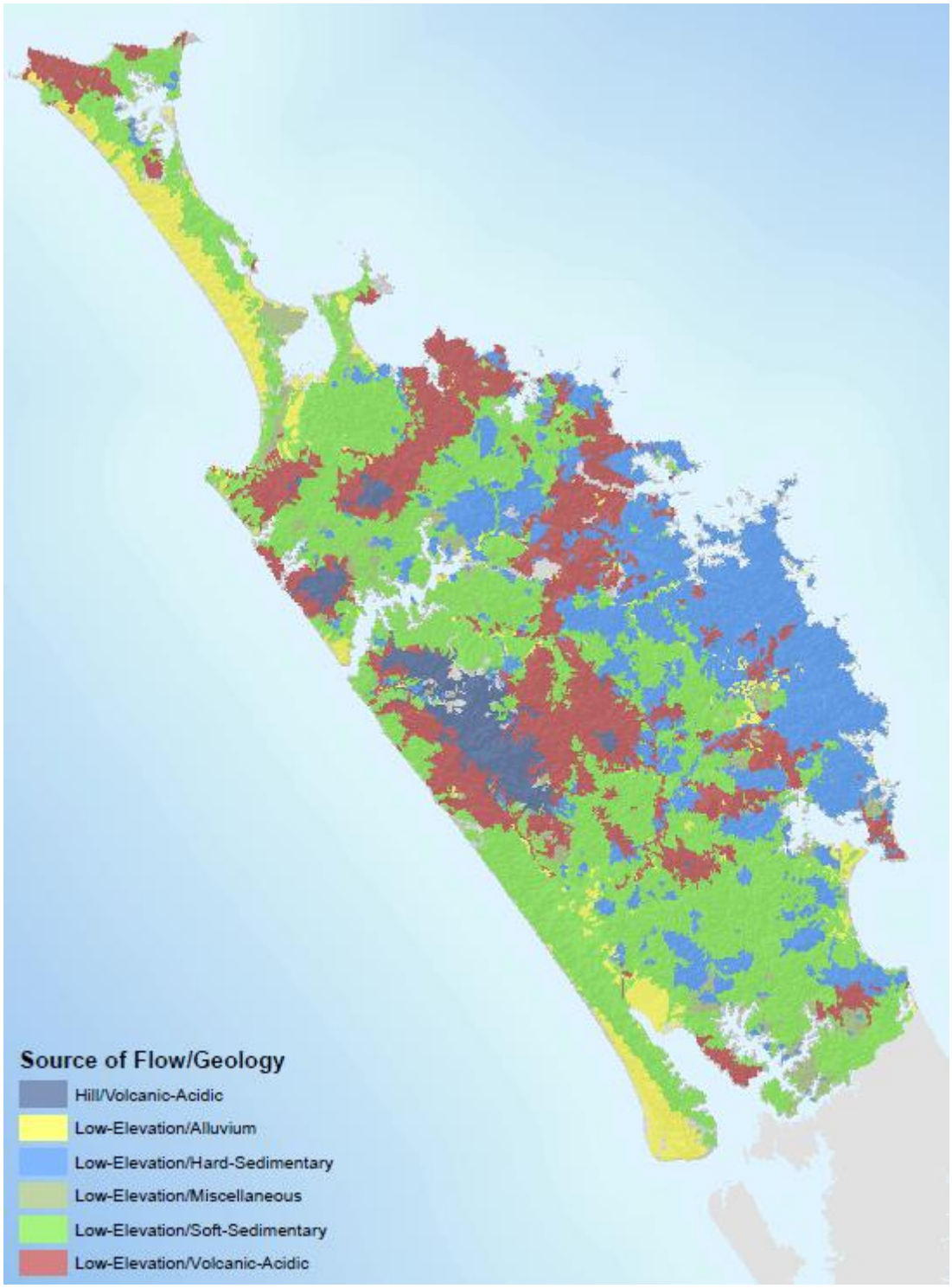

Figure 1 – River classifications for the Northland Region based on the River Environment Classification system.

Water quality objectives

The National Policy Statement for Freshwater Management directs the council to set water quality objectives for attributes of river ecosystem health. At a minimum, the objectives must specify attribute states for periphyton, dissolved oxygen, and nitrate and ammonia toxicity (compulsory attributes).

Table 4 below shows how the 36 river water quality monitoring network sites compare to the range of states for the compulsory attributes in the National Policy Statement for Freshwater Management.[32]

It is important to note that the maximum concentrations for nitrate and ammonia are solely concerned with toxic effects on aquatic animals. They do not take into account the adverse effects of high nitrate and ammonia concentrations on instream plant and algae growth, which is known as eutrophication.

The National Policy Statement for Freshwater Management does not currently include numeric attribute states for nutrients for controlling nuisance plant and algae growth in rivers, although it does for lakes. Furthermore, it does not contain numeric attribute states for other attributes of ecosystem health. This includes sediment, which is the main contaminant in Northland's rivers and downstream estuaries.

As discussed in section 5.1 above, we are considering setting river water quality objectives for attributes that are not currently in the National Policy Statement for Freshwater Management.

[32] The results are based on the 5 year medians of the compliance statistics for each attribute (with the exception of the results for periphyton).

Table 4 – Comparison of River Water Quality Monitoring Network data (2009-2013) with the compulsory attributes in the National Policy Statement for Freshwater Management.

Value	**Ecosystem Health**							**Human Health (Secondary contact recreation)**	
Compulsory Attribute	**Periphyton (mg chl-a/m^2)**	**Ammonia Toxicity (mg NH_4-N/L)**		**Nitrate Toxicity ($N0_3$-N/L)**		**Dissolved Oxygen (mg/L)**		**Cyanobacteria (cells/L)**	**E.coli/100 mL**
Compliance Statistic	Annual Maximum*	Annual Median	Annual Maximum.	Annual Median	Annual 95th Percentile	7-day mean min (1 Nov to 30 Apr)	1-day min (1 Nov to 30 Apr)	80th Percentile	Annual Median
Awanui @ FNDC watertake	90	0.010	0.042	0.035	0.210	No Data	6.64	No Data	276
Awanui @ Waihoe Channel	No Data	0.042	0.230	0.061	0.308	No Data	5.60	No Data	255
Hakaru @ Topuni Creek Farm	492	0.015	0.067	0.238	0.409	No Data	7.28	No Data	249
Hatea u/s Mair Park Bridge	57	0.014	0.054	0.351	0.559	No Data	7.90	No Data	309
Kaeo @ Dip Road	No Data	0.009	0.028	0.043	0.287	No Data	7.46	No Data	757
Kaihu @ gorge	60	0.008	0.036	0.277	0.598	No Data	7.48	No Data	177
Kerikeri @ Stone Store bridge	22	0.011	0.053	0.383	0.590	No Data	7.60	No Data	272
Mangahahuru @ Apotu Road	No Data	0.018	0.081	0.299	0.515	No Data	6.02	No Data	535
Mangahahuru @ Main Road	9	0.009	0.047	0.124	0.211	No Data	7.38	No Data	316
Mangakahia @ Titoki Bridge	No Data	0.011	0.035	0.081	0.240	No Data	8.06	No Data	223
Mangakahia @ Twin Bridges	172	0.007	0.022	0.074	0.199	No Data	8.54	No Data	146
Mangamuka @ Iwiatua Road	13	0.006	0.013	0.006	0.063	No Data	7.88	No Data	351
Manganui @ Mitaitai Road	No Data	0.015	0.080	0.185	0.497	No Data	5.42	No Data	148
Mangere @ Knight Road	No Data	0.028	0.155	0.480	0.895	No Data	5.06	No Data	523
Ngunguru @ Coalhill Lane	No Data	0.014	0.022	0.126	0.265	No Data	8.20	No Data	423
Opouteke @ suspension bridge	150	0.006	0.030	0.060	0.186	No Data	8.32	No Data	172
Oruru @ Oruru Road	No Data	0.008	0.032	0.011	0.222	No Data	5.48	No Data	249
Otaika @ Otaika Valley Road	5	0.020	0.232	1.187	1.613	No Data	7.13	No Data	607
Paparoa @ walking bridge	No Data	0.019	0.272	0.123	0.399	No Data	4.50	No Data	508
Punakitere @ Taheke Recorder	41	0.011	0.051	0.392	0.573	No Data	8.18	No Data	424
Ruakaka @ Flyger Road	55	0.034	0.142	0.338	0.642	No Data	5.38	No Data	705
Utakura @ Okaka Road Bridge	No Data	0.014	0.033	0.107	0.222	No Data	6.44	No Data	310
Victoria @ Thompsons Bridge	49	0.006	0.018	0.007	0.087	No Data	7.38	No Data	153
Waiarohia @ Whau Valley	47	0.010	0.058	0.342	0.552	No Data	7.06	No Data	474
Waiarohia @ Lovers Lane	43	0.009	0.042	0.331	0.552	No Data	6.66	No Data	460
Waiharakeke @ Stringers Road	79	0.016	0.124	0.105	0.246	No Data	6.32	No Data	379
Waimamaku @ SH12	No Data	0.007	0.022	0.004	0.094	No Data	7.86	No Data	382
Waiotu @ SH1	No Data	0.019	0.116	0.285	0.606	No Data	6.48	No Data	460
Waipao @ Draffin Road	3	0.008	0.122	2.683	3.065	No Data	7.64	No Data	604
Waipapa @ Forest Ranger	17	0.003	0.008	0.015	0.083	No Data	8.30	No Data	58
Waipapa @ Waipapa Landing	48	0.011	0.026	0.262	0.434	No Data	6.97	No Data	189
Waipoua @ SH12 Rest Area	6	0.006	0.014	0.020	0.060	No Data	8.74	No Data	88
Wairua @ Purua	No Data	0.017	0.115	0.403	0.631	No Data	6.90	No Data	99
Waitangi @ Watea	No Data	0.009	0.039	0.277	0.506	No Data	8.36	No Data	175
Waitangi @ Waimate Road	72	0.011	0.032	0.355	0.471	No Data	7.40	No Data	450
Whakapara @ cableway	No Data	0.009	0.077	0.273	0.571	No Data	6.86	No Data	258

***** Due to a limited data set we have used an "annual maximum" as a surrogate for the sampling statistic in the National Policy Statement for Freshwater Management ("exceeded on no more than 8% of monthly samples in a 3 year period"

Key

- "A" attribute state
- "B" attribute state
- "C" attribute state
- "D" attribute state (exceeds "National Bottom Line")

All river management units

Currently, we do not have enough data on periphyton to be able to determine appropriate water quality objective(s) for it.

More than 90% of the region's river water quality monitoring sites have nitrate and ammonia concentrations that are within their "A" attribute states (see table 3 above). In order to prevent further degradation, we think that it is appropriate to apply the same water quality objective for nitrate and ammonia toxicity at "A" states to all primary management units (river classifications).

The majority of the region's river water quality monitoring sites have dissolved oxygen levels that fall into the 'A' and 'B' attribute states. We think that at a minimum a 'B' state would be appropriate for all river classifications.

Specific river management units

Ecological values vary between different river types due to natural environmental factors such as geology, climate, flow, and benthic substrate. This means that there is likely to be natural variability in certain attributes of ecosystem health, such as sediment, nutrients, periphyton (discussed earlier), macrophytes, fish, invertebrates, some heavy metals and other stressors, for example. Consequently, water quality objectives for these attributes may need to be specific to each river classification type.

In Northland, sediment is the major pressure on the health of river ecosystems and receiving estuaries and harbours. However, fine sediment is not currently identified as a compulsory attribute in the National Policy Statement for Freshwater Management.

High levels of fine sediment can have a wide range of adverse effects on aquatic ecosystems. It can interfere with feeding and migratory behaviour of some native fish species, and irritate the gills of some native fish and insect larvae. Poor water clarity can also inhibit the growth of native aquatic plants and algae which are important habitats and components of the food chain.

The National Policy Statement for Freshwater Management also does not currently contain numeric attribute states for nutrients for managing nuisance the growth of nuisance plants and algae.

Nutrients are important attributes of aquatic ecosystem health because they are necessary for the growth of aquatic plants (macrophytes) and algae (periphyton and phytoplankton). However, at elevated levels they can promote the growth of nuisance periphyton and macrophytes. High levels of periphyton and macrophytes can cause dissolved oxygen and pH levels to fall outside of their natural ranges and stress aquatic animals such as invertebrates and fish. They can also reduce the amount of sunlight that can penetrate through the water column, which in turn can affect photosynthesis in native submerged plants and algae.

We think that freshwater quality objectives for fine sediment and nutrients could be included in the new regional plan. However it is important to note that the relationships between concentrations of nitrogen and phosphorous and plant and algal growth in water is complex and varies spatially and temporally depending on a number of other environmental factors including light availability, flow variability, temperature, substrate type, geology, and invertebrate grazing. Similarly, information on the quantitative relationships between levels of fine sediment and aquatic ecosystems is also limited.

We are developing options for numeric water quality objectives for fine sediment and nutrients that can be set for different river classification types.

Our information on the natural community composition, diversity and abundance of macrophytes and fish in different river types is limited. Furthermore, we also do not have a good understanding on the preferences and tolerances of macrophytes and fish to nutrients and sediment. For this reason we think water quality objectives for macrophytes and fish should be expressed in narrative terms until our information improves.

Invertebrates are a very good measure of aquatic ecosystem health and include snails, worms, and larvae of flying insects such as flies, dragonflies, midges, mayflies and beetles. In fact, there are hundreds of invertebrate species that live in Northland's rivers and streams. These species have different tolerances to levels of contaminants and therefore rivers with 'good' water quality tend to have different invertebrate species present than rivers with poor water quality

We are also looking at options for numeric water quality objectives for invertebrates. This is consistent with the direction of the Proposed Regional Policy Statement. Water quality objectives for invertebrates would be based on the Macroinvertebrate Community Index (MCI). [33]

Numeric water quality objectives for heavy metals and other toxicants could also be included in the Regional Water and Soil Plan. They could be based on current technical guidelines (for example, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000).

Temperature and pH can have a range of direct and indirect effects in aquatic ecosystems. Water temperature can be affected by point source discharges, reduced flows and a lack of riparian vegetation. pH is naturally driven by geology but can also be affected by point source discharges and aquatic plants and algae. We are considering setting river water quality objectives for temperature and pH by using national guidelines.[34]

Water quality limits

There are a range of options for water quality limits. The nature of the limits will depend on the attribute of concern and the current and likely future pressures on water quality. A number of options are identified in section 5.7 below.

5.3.2 Human health (Te Hauora o te Tangata)

Management units

Contact recreation

The region contains a number of popular freshwater swimming sites. However, not all of Northland's rivers and streams are used or indeed suitable for swimming. Examples include small shallow streams in pasture, deep naturally muddy rivers, and water bodies that cannot be accessed.

[33] See Stark JD. 2014. Macroinvertebrate biotic indices for the Northland region. Prepared for Northland Regional Council. Stark Environmental Report No. 2014-08.
[34] Rob Davies-Colley, et al. (2013) National Objectives Framework – Temperature, Dissolved Oxygen & pH: Proposed thresholds for discussion. Prepared for Ministry for the Environment. *NIWA Client Report No: HAM2013-056.*

As with lakes, we think that all popular swimming sites and contributing catchments should be treated as a single management unit for the purposes of applying a water quality objective for *E.coli* (primary contact recreation).

For all other rivers, water quality would be managed for secondary contact recreation (wading and boating). This means that two water quality management units would be defined for the purposes of managing water quality for contact recreation.

Drinking water supplies

As stated earlier, we think that registered drinking water supplies and their contributing catchments should be identified as a separate management unit. This is consistent with the National Environmental Standards for Sources of Human Drinking Water 2007.

Water quality objectives

Primary contact recreation (swimming)

We think that a water quality objective should be included in the Regional Water and Soil Plan that seeks that all popular swimming sites are suitable for swimming, except during and immediately after heavy rainfall events. Rivers are not typically used during such times and faecal run-off is difficult to mitigate. The objective would specify maximum *E.coli* concentrations based on either the "A" or "B" attribute states in the National Policy Statement for Freshwater Management.[35]

Secondary contact recreation (wading and boating)

For all other rivers and streams water quality would be managed for secondary contact recreation. This is consistent with the requirements of the National Policy Statement for Freshwater Management.

Table 3 above shows that over the 2009-2013 period the majority of Northland's river water quality monitoring network sites had *E.coli* levels that were within the "A" and "B" attribute states for secondary contact recreation. Only four sites had levels in the "C" attribute state. Changes in land management (e.g. excluding stock from rivers) and the use of mitigation methods (e.g. vegetated buffer strips) are likely to result in lower concentrations of faecal bacteria.

At a minimum we think that a water quality objective for secondary contact recreation in rivers should be based on a "B" attribute state for *E.coli.*

Drinking water supplies

As stated earlier, we think that a water quality objective should be included in the Regional Water and Soil Plan that provides for the protection of the quality of registered drinking water supplies. The objective would likely be expressed in narrative terms because most water takes for domestic uses are treated prior to use.

5.4 Wetlands

Northland has many wetlands, although it is thought that they represent only around 5% of their original (pre-human) extent. Drainage and diversions (mostly illegal) are the main pressures on Northland's wetlands. Contaminants are not known to be a major pressure on Northland's wetlands.

[35] Refer to the attribute tables in Appendix 2 of the National Policy Statement for Freshwater Management for further details on the compulsory attributes.

There are approximately nine types of natural (indigenous) wetlands in Northland: saltmarsh, swamps, marshes, seepages, fens, bogs, gumlands, ephemeral wetlands and wet heathlands. We are looking at whether more than one water quality management unit is required for setting water quality objectives and limits for Northland's natural wetlands

The National Policy Statement for Freshwater Management does not specify any compulsory water quality attributes for wetlands and our information on water quality in the different wetland types is limited. Therefore it may be necessary to develop specific water quality management units and associated numeric water quality objectives for wetlands once our information base improves.

In the interim, we think that all indigenous wetlands could be managed under one narrative water quality objective. Consistent with the direction of the National Policy Statement for Freshwater Management, the narrative objective could seek that the significant values of wetlands are protected. We think that the following values of wetland relating to water quality are significant:

- Providing habitat for rare, threatened and at risk species
- Sustaining populations of mahinga kai,[36] and
- Filtering water and assimilating contaminants.

5.5 Groundwater

Groundwater is water that runs through and is stored in soil and rocks. It is a valuable resource in Northland as it is used for domestic water supplies, irrigation, and stock water. It is also important for sustaining the flows and levels of some lakes, rivers and wetlands.

Currently, the National Policy Statement for Freshwater Management does not specify any compulsory water quality attributes for groundwater.

5.5.1 Aquatic ecosystem health (Te Hauora o te Wai)

There are two main types of groundwater systems: those directly connected to surface water bodies and groundwater that is not directly connected. With regard to the first, we are assessing if it necessary to set narrative or numeric water quality objectives for attributes (for example, nutrients) that can impact on hydraulically connected surface waters (lakes and rivers). Aquifers that are not in direct contact with surface water bodies do not need to be managed for aquatic ecosystem health.

5.5.2 Human health (Te Hauora o te Tangata)

Rural communities typically rely on rainwater and groundwater for their supplies. Groundwater quality is generally good in Northland with monitoring showing that most aquifers meet the drinking water standards for nitrate and *E.coli* in drinking water.[37]

We think that a numeric water quality objective could be included in the Regional Water and Soil Plan that specifies maximum levels of nitrate and *E.coli,* and potentially other attributes, in aquifers that are currently suitable for domestic use. These could be based on the Drinking-water Standards for New Zealand. It is important to note however that the Drinking-water Standards only apply in law to water that has been treated and therefore it may not be appropriate to use them as the basis for setting water quality objectives for untreated groundwater sources.

[36] "Traditional sources of food"
[37] Ministry of Health. 2008. Drinking-water Standards for New Zealand 2005 (Revised 2008). Wellington: Ministry of Health

In addition, maximum nitrate concentrations for aquifers that are in direct contact with surface water may need to be based on the more stringent level for ecosystem health.

5.6 Estuaries, harbours and open coastal waters

Northland's estuaries and harbours are a unique and defining characteristic of Northland. They are very productive ecosystems and support a diversity and abundance of aquatic species. They are also highly valued for their biodiversity, natural character, recreational and commercial fisheries, recreation, and mahinga kai.

Estuaries and harbours are at the bottom of most of Northland's river systems and are influenced by freshwater quality. Some are also important receiving environments for wastewater and stormwater discharges (for example, Whāngārei Harbour and Bay of Islands).

Fine sediment is the main pressure on Northland's estuaries and harbours. While nutrient levels are elevated in some areas they are not known to be causing any significant adverse effects on aquatic ecosystems.

Open coastal waters are of high quality and are not under pressure from contaminants.

5.6.1 Coastal water quality management units and objectives

The Regional Coastal Plan currently applies numeric and narrative water quality objectives (called water quality standards in the plan) to three coastal water quality management units: estuaries and harbours, near shore areas, and open coastal waters. For most waters, the water quality objectives are based on Schedule 3 of the RMA. However, the Whāngārei Harbour and the Bay of Islands have specific (numeric) water quality objectives including for nutrients, and heavy metals and other toxicants.

The current coastal water quality management units and objectives are used solely for managing point source discharges to the coastal marine area and do not apply to discharges to freshwater in contributing catchments.

We think that this approach is robust but needs refining. Specifically, the locations and boundaries of the coastal water quality management units should be reviewed for the Whāngārei Harbour and Bay of Islands, which are the two areas of the coastal marine area that are under the most pressure from point source discharges. Commercial shellfish growing areas and popular harvesting sites could also be identified as coastal water quality management units.

We are also considering amending the coastal water quality objectives by making them consistent with current technical guidelines and Northland-specific monitoring data.

We also think that that discharges and land uses in catchments should be managed for the purposes of meeting coastal water quality objectives. Currently, the objectives, policies and rules in the Regional Coastal Plan and Regional Water and Soil Plan are not integrated.

5.6.2 Addressing sediment accumulation rates in Northland's estuaries and harbours

Fine sediment causes a range of significant adverse effects and is the major contaminant in many of Northland's estuaries and harbours, for example, in the Bay of Islands and the Kaipara, Whāngārei, and Hokianga harbours.

We are investigating approaches for managing sediment in harbour catchments to achieve water quality objectives for sediment in receiving coastal waters. We intend to trial an

approach in the Whangarei Harbour Catchment and if it is successful we will look to roll it out to other harbour catchments.

5.7 Managing point source and diffuse discharges

The council has a legal responsibility to identify a range of practical options (policies, rules, and non-regulatory methods) for achieving the water quality objectives.[38] 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 Regional Water and Soil Plan and Regional Coastal Plan contain policies and rules for managing a number of activities that affect fresh and coastal water quality. These provisions are briefly evaluated below in terms of their effectiveness and efficiency. As part of this we identify issues with the current rules and the way that they are implemented by the council, and put forward options for improving our management of point source and diffuse discharges.

5.7.1 General

The council will need to amend some of the existing rules and potentially establish new rules to ensure that water quality objectives are met. This applies to all activities that contribute to water quality contamination.

For permitted activities, the council will need to be confident that they can cumulatively occur while still ensuring that the water quality objectives will be met, in other words, avoid over-allocation. Some types of discharges or land disturbance activities may need to be controlled as non-complying or prohibited activities if they will cause water quality objectives to be compromised. For other types of activities, resource consents will be required where a case-by-case assessment is needed to evaluate whether the water quality objectives/limits will be met.

5.7.2 Discharges of domestic and municipal wastewater

Wastewater refers to liquid waste from domestic (sewage) and commercial sources (industrial and trade wastes). Most wastewater is piped to public wastewater treatment plants although in some areas where there is no access to wastewater treatment plants it is treated in septic (onsite) systems.

Wastewater treatment generally involves the removal of solids, including some associated contaminants such as phosphorus, heavy metals and oil and grease (primary treatment); the oxidation of organic compounds, for example, ammonia to nitrate (secondary treatment), and the disinfection of faecal pathogens (tertiary treatment).

In Northland, most wastewater treatment systems do not fully remove phosphorus and nitrogen (denitrification), and therefore they can be major source of nutrient loads in some receiving waters (for example, in Whāngārei Harbour). In addition, only a proportion of municipal wastewater treatment plants in Northland have tertiary treatment systems.

Untreated and partially treated wastewater can contain high levels of faecal pathogens, which have the potential to pose risks to human health, and solids, which can be visually unpleasant. Sources include failing or overloaded treatment systems and overflows from pump stations and manholes in wastewater reticulation networks. Notable examples of sources of wastewater overflows, which have now been addressed, are the Okara Park and Hatea pump stations in Whāngārei city.

[38] Section 32, RMA

Overflows are common to most networks and there is a range of potential causes of them, including pipe blockages, pump station failures, infiltration and inflow of stormwater into pipes, and poorly managed urban growth. Generally speaking, it is very difficult to prevent all overflows. However, monitoring and research indicates that in some areas they can be a significant source of faecal contaminants during heavy rain events. Wet weather overflows are normally caused by infiltration and inflow of water and poorly managed urban growth.

People also discharge sewage to the coastal marine area from boats, which can present health risks if not managed properly.

Direct discharges of wastewater to water are often controversial, and many Maori consider such discharges to be culturally unacceptable.

Future management options

Under the regional plans, discharges from wastewater treatment plants and contributing pipe networks are required to be authorised by resource consents. The discharge of untreated sewage into water, except from a pipe network, is prohibited. Discharges from septic systems are generally permitted subject to conditions.

There is no evidence that any major changes are required to these rules and the associated policy, although the rules for onsite septic systems may need to be fine-tuned so that they better recognise sensitive receiving environments (for example, dune lakes and shellfish harvesting areas).

Substantial changes however may be required to the controls on wastewater overflows. The regional plans currently require wastewater overflows to be authorised by resource consent. However, it is important to note that most wastewater overflows in Northland remain unauthorised under the RMA (not permitted by a rule in a regional plan or consent) – only a small number are authorised in Whangarei district and not one is authorised in the Kaipara and Far North districts. A prominent example of the issue is wastewater overflows from the Kaitaia Wastewater Network.

Set out below are a range of options to improve the management of wastewater overflows.

Option 1: Retain and enforce current rules

This involves enforcing existing controls on wastewater overflows, which means requiring network operators to apply for resource consent to authorise overflows that are currently unlawful.

As part of applications for resource consents, network operators will be required to demonstrate that they are adopting the best practicable option to prevent or minimise adverse effects on the environment from overflows.[39] They will also be required to demonstrate that overflows will not cause current water quality objectives to not be met or limits exceeded.

This option has been supported by some stakeholders but there is general recognition that the controls on wastewater discharges may need to be updated.

[39] The RMA defines "best practicable option" as "the best method for preventing or minimising the adverse effect on the environment having regard to, among other things, to –

(a) the nature of the discharge…and the sensitivity of the receiving environment to adverse effects; and
(b) the financial implications, and the effects on the environment, of that option when compared with other options; and
(c) the current state of technical knowledge and the likelihood that the option can be successfully applied."

Option 2: Permit wastewater overflows

Under section 15 of the RMA, discharges are prohibited unless permitted by a rule in a regional plan or authorised a resource consent. However, before the council can include a permitted activity rule in a regional plan it must be satisfied that none of the following effects will occur after reasonable mixing:[40]

- The production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- Any conspicuous change in the colour or visual clarity;
- Any emission of objectionable odour;
- The rendering of freshwater unsuitable for consumption by farm animals; or
- Any significant adverse effects on aquatic life.

Under the National Policy Statement for Freshwater Management, the council must also be satisfied that the discharge will not cause a water quality objective to not be met or water quality limit to be exceeded.

Option 2 involves making wastewater overflows a permitted activity subject to the minimum RMA standards (above) and a requirement that overflows meet water quality objectives and limits.

A permitted activity rule could also include a condition that requires network operators to provide the council with information on the locations, frequencies, and volumes of wet weather overflows. It could also include a network containment standard (see option 4 below).

The permitted activity option would require extensive compliance monitoring, with the costs likely falling on the regional council. This is because under the RMA regional councils have to cover the costs of monitoring permitted activities, although the council does have charging policy for monitoring permitted activities that is in accordance with section 150 of the Local Government Act 2002.[41]

It would also mean that the council would have limited control over a wastewater overflow if it was proving contentious but still meeting the conditions of a permitted activity rule.

However, a permitted activity rule for dry weather wastewater overflows (caused by pipe blockages and failures) is probably an appropriate option for our new regional plan. The effects of dry weather overflows are considered minimal and it is not possible to predict when and where they occur.

Option 3: Wastewater network consents

This option would require network operators to apply for wastewater network consents (for example, a controlled or discretionary rule). This differs from the current rules that apply to individual overflow points. As part of this option, the rules in the Regional Water and Soil Plan and Regional Coastal Plan would need to be aligned.

The amended rule would require network operators to demonstrate through the resource consenting process that their network management is sufficient to ensure that wastewater

[40] RMA s70(1)
[41] Section 150 of the Local Government Act is used to charge dairy farmers for the costs of monitoring farm dairy effluent that is discharged under permitted activity rule 16.1 of the Regional Water and Soil Plan.

overflows meet water quality objectives and limits, and is the best practicable option generally.

This option will provide better transparency to communities and other stakeholders that network management is appropriate both now and in the future as network infrastructure ages. It would also prevent re-litigation of issues over time.

The administrative costs to network operators and the council associated with consenting networks would likely be cheaper than Option 1 because multiple overflows would be addressed through one resource consenting process.

This option has received a lot of stakeholder support.

Option 4: Option 3 plus a network containment standard

This option would involve specifying a network containment standard as a condition of a rule (controlled or discretionary) for wastewater overflows. Network containment standards set out the maximum number of wet weather overflow events that are permissible per year from an overflow point. They are typically expressed in terms of a rainfall intensity event (1 in 6 month storm). This is the approach used by Auckland Council in its proposed unitary plan.

This option would provide a relatively high level of certainty to communities and other stakeholders that networks are designed and operated to a reasonable standard.

However, it is important to point out that wastewater networks vary in type and condition across the region. This means that it may be inappropriate to specify the same minimum containment standard to all of them. For example, in some areas upgrading to the standard may be prohibitively expensive or not desired by local communities.

It is also useful to note that Whangarei District Council have committed to upgrading the Whangarei Wastewater Network in order to:[42]

- Reduce the volume of untreated overflows from the network by 80% for the 1 in 1 year rainfall event over a 10 year timeframe (baseline year 2010), and
- Reduce the frequency of untreated overflows to no more than 1 in every 5 years for each overflow point over a 50 year timeframe (baseline year 2010).

It may not be appropriate to apply such a level of service to other networks in the region.

While this approach may be appropriate for Auckland it is probably unsuitable for Northland because it does not recognise the range in the conditions of the region's wastewater networks and the ability of different communities to fund upgrades.

Option 5: Prohibit wet weather overflows

This option would involve a general prohibition on all wet weather overflows, although there would need to be an allowance for exceptional or unavoidable circumstances (for example, pump station failure, pipe blockages).

This option would involve huge costs to network operators and therefore is very unlikely to be practical. This has been recognised by most stakeholders.

Option 6: Prohibit discharges of untreated sewage from boats to the Whangaruru and Whangaroa harbours

[42] Whangarei District Council (2010) Waste & Drainage Wastewater Strategy

Lastly, the Regional Coastal Plan prohibits the discharge of untreated sewage from boats to water in most near shore areas. However, the plan permits the discharge of untreated sewage from boats to waters in the Whangaruru and Whangaroa harbours provided that it is 500 metres from the shore and it is during certain wind and tidal conditions. We consider that the rule is ambiguous, difficult to monitor, and is out of date. We are looking at options for a revised rule.

5.7.3 Discharges of stormwater from urban areas and roads

The main contaminants in urban stormwater are sediment, nutrients, faecal matter, and heavy metals. However, various other contaminants can be present. Sources include point sources (for example, wastewater overflows) and diffuse sources such as roads, roofs and parks. Contaminant concentrations in stormwater are typically the highest during the initial phase of discharge (generally at the start of a heavy rainfall event).

Urban areas and sealed roads normally have lower yields of the major contaminants (sediment, nutrients, and faecal pathogens) than rural areas but typically have higher yields of heavy metals.

Heavy metals such as zinc, copper, and lead can build up over time in the receiving environments such as estuaries, and at high levels have the potential to have toxic effects on aquatic ecosystems as well as humans if they enter the food chain. However, while monitoring shows that heavy metals appear to be elevated above natural levels in some estuarine areas next to significant urban areas in Northland, almost all areas have levels below recommended guidelines.[43] This indicates that there is only a low probability that heavy metals are causing adverse ecological effects. Monitoring of receiving environments also indicates that levels of heavy metals are not increasing at detectable rates.

Future management options

The Regional Water and Soil Plan and Regional Coastal Plan control stormwater discharges differently. The former permits discharges from urban areas and roads subject to a number of conditions, including numeric discharge quality standards for copper, lead, zinc and suspended solids. Stormwater discharges that are unable to meet the conditions of the permitted activity rules are either a controlled or discretionary activity (requiring resource consent).

The Regional Coastal Plan regulates point source discharges of stormwater to the coastal marine area. Most stormwater discharges are a controlled activity (compared to a permitted activity in the Regional Water and Soil Plan). However, discharges from the Whāngārei urban area to the upper Whāngārei Harbour and from new subdivisions are discretionary activities. The Regional Coastal Plan rules require that narrative and numeric receiving water quality standards (in water quality objectives) are complied with. These include receiving water quality standards for heavy metals.

Approximately half of Northland's urban stormwater networks are authorised by resource consents under the Regional Water and Soil Plan, and the remainder are purportedly operating under the permitted activity rules.[44] There are a large number of stormwater discharges to the coastal marine area that are not currently authorised (not permitted by a rule in the Regional Coastal Plan or by resource consent).[45]

[43] Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of New Zealand (2000) Australian and New Zealand Guidelines for fresh and marine water quality. Volume 1.

[44] They are purportedly authorised by permitted activity rules because we generally do not monitor them to determine if they comply with the permitted activity rules.

[45] There are a large number of stormwater outfalls to the coastal marine area that are not authorised by resource consents. These include a number of discharges to the Whāngārei Harbour.

The council has only undertaken limited monitoring of stormwater discharges. For this reason we do not have good information on the quality of most stormwater discharges and it is difficult to enforce rules.

However, monitoring of water quality and sediment in estuaries and rivers has shown that heavy metals do not appear to be a significant issue in most areas. The Hātea River arm of the Whāngārei Harbour is the only area where heavy metals (copper and zinc) in the river bed appear to be above recommended guideline levels.[46]

To date, there has been very little retrofitting of existing stormwater networks to incorporate stormwater treatment systems, mainly because heavy metals do not appear to be a significant issue and retrofitting is expensive. New subdivision and development is encouraged but not required to include such systems unless they are required for stormwater discharges to meet water quality standards.

Against this background, we have identified a range of options to improve our management of stormwater from urban areas and roads. We also think that the rules in the regional plans should be aligned. One or more of the following options could be pursued.

Option 1: Retain and enforce current rules (interim option)

This interim option (until plans are changed) would involve the council undertaking extensive compliance monitoring of all, or a representative selection of, stormwater discharges from urban areas and roads. Where the existing water quality standards in the rules are being breached the council would need to enforce them by requiring that stormwater quality is improved so that it meets existing standards or apply for resource consent to authorise the discharges.

It is important to note that we are investigating whether the existing discharge and receiving water quality standards for heavy metals are appropriate. It may be that they are too environmentally conservative (in other words, restrictive). Alternatively, it might be more appropriate to set numeric water quality objectives based on heavy metal concentrations in benthic sediment.

As stated earlier in this report, we are looking at options for numeric water quality objectives for heavy metals that could be included in the regional plans in the future. These would replace the existing standards in the rules. We will also need to review the sediment discharge quality standards.

Option 2: Permit stormwater discharges to the coastal marine area

This option involves changing the activity status of stormwater discharges to the coastal marine area from controlled and discretionary activities to a permitted activity subject to conditions including the minimum RMA standards[47] and the requirement that discharges meet water quality objectives.

Option 3: Regulate stormwater discharges to fresh and coastal water by controlled activity rules

This option involves making stormwater discharges from urban pipe networks and roads to fresh and coastal water a controlled activity. This would require network operators to apply for resource consents to authorise their discharges.

[46] Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of New Zealand (2000) Australian and New Zealand Guidelines for fresh and marine water quality. Volume 1.

[47] RMA section 70(1)

As part of this, network operators would need to demonstrate their stormwater discharges do not cause water quality objectives to not be met or limits to be exceeded.

Option 4: Stormwater network consents

This option involves requiring network operators to apply for stormwater network consents (for example, by a controlled activity rule).

The conditions of the rule would include the requirement to meet water quality objectives and limits and put in place the best practicable option to prevent and minimise the adverse effects of stormwater contaminants generally.

Option 4: Stronger controls on new development, redevelopment in existing networks, and high contaminant yielding sites

It may be prudent to require that new development or redevelopment in existing networks include measures to mitigate the amount of stormwater contaminants entering receiving waters.

Option 4 is additional to the previous options and involves stronger controls on stormwater discharges from high risk and contaminant generating activities (for example, large car parks). Conditions of the rule could include the requirement for low impact urban design techniques and stormwater treatment systems.

This option has received limited stakeholder support because the evidence does not seem to support it. We also need to look at how this option would work with current district plan requirements for low impact urban design and the requirements of the building regulations.

Lastly, conditions of stormwater rules and consents may need to include standards or conditions that require the discharge to observe numeric water quality objectives for nutrients, sediment, faecal microbes and other contaminants.

5.7.4 Discharges of industrial and trade wastes

Most industrial and trade facilities that produce liquid wastes discharge into municipal wastewater reticulation and treatment systems. However, in Northland there are a relatively small number of facilities that discharge treatment wastes to water and land. Examples include dairy processing, abattoirs, boat maintenance facilities, and timber treatment plants. The composition of industrial and trade wastes varies depending on the nature of the facilities from which it originates.

The majority of industrial and trade discharges are operating under resource consents although some smaller low-risk discharges are permitted by rules in the plans. Over the last few decades there has been a major improvement in the management of them. This is reinforced by monitoring results which show that industrial and trade discharges are generally well managed, as evidenced by good compliance with conditions of resource consents.

The council considers that the current regulatory framework for managing discharges of industrial and trade discharges to water is robust and is not proposing any major changes to it.

5.7.5 Discharges of animal effluent, other agricultural wastes and fertilisers

Agricultural wastes (mainly dung and urine from animals) are a major source of nutrients and faecal microbes in Northland's fresh and coastal waters. A level of contamination is to be expected given that Northland is primarily an agricultural region.

Fertilisers are used in primary sector industries such as horticulture, dairying and forestry, particularly for the reason that large areas of Northland have low fertility soils. The council does not have good information on whether fertilisers are a significant source of nutrients in water, mainly because we do not actively monitor and account for them.

The Regional Water and Soil Plan currently regulates discharges of animal effluent from contained areas, fertilisers, and contaminants associated with dead stock, dumped fruit and vegetables, and silage. The plan does not regulate discharges of dung and urine from grazing animals.

Overall the rules are robust. Noteworthy, is the progress made by dairy farmers in improving their farm dairy effluent treatment systems. This is due to a strongly worded rule, monitoring, technical support, and enforcement by the council and also the efforts of farmers. Today, approximately 75% of dairy farmers routinely discharge effluent to land and a number of farmers that are currently discharging to water (under resource consent) have committed to installing land application systems within the next two years.

Please note that for the purposes of this report options to address livestock access to be beds and margins of water bodies is discussed later in relation to land disturbance activities.

Future management options

While the rules for discharges of agricultural wastes and fertilisers are generally robust we have identified some issues with them and their implementation. The issues and options to address them are described below.

Option 1: Changing the activity status of animal effluent discharges from a permitted to a controlled or restricted discretionary activity

The Regional Water and Soil Plan currently permits discharges of animal effluent to land subject to a number of conditions, including requirements that discharges shall not directly enter water, they must be set-back from water bodies and contingency measures are put in place in the event of system failures. It is important to note that the plan does not regulate dung and urine deposited by individual animals put out to graze.

Despite good improvements in the way that animal effluent is managed there remains a noteworthy level of significant non-compliance on dairy farms, which is most pronounced on the minority (20%) of dairy farms which are operating under the permitted activity rule. Levels of non-compliance are lower on the majority (75%) of dairy farms that are authorised by resource consent to discharge animal effluent to land under certain conditions.

We are considering if it would be appropriate to change animal effluent discharges from a permitted activity to a controlled or restricted discretionary. This would provide the council with the ability to work with farmers who are currently discharging animal effluent under the permitted activity rule to put in place tailored best practicable options for minimising the adverse effects of their discharges, and to ensure that water quality objectives are met.

We are currently looking at how we could do this without impacting on the approximately 75% of dairy farmers that have already applied and been granted resource consents to discharge animal effluent to water under certain conditions.

This option has received mixed stakeholder support. The main arguments against a change in rule status are the permitted activity incentivises land disposal and the council could better address non-compliance by increasing its monitoring and enforcement efforts.

Option 2: Refine the rules for fertiliser discharges

The current Regional Water and Soil Plan rule for fertiliser discharges is subjective and vague.[48] This makes it difficult to comply with, and to monitor and enforce.

We think that it could be amended to provide greater clarity by specifying setback distances from lakes and rivers and expectations around good management practices.

Option 3: Control nutrient inputs/losses

The Regional Water and Soil Plan does not contain any rules that control nutrient application rates or losses. This means that the council is currently unable to control land use intensification in sensitive catchments. It also means that if water quality objectives and limits are put in place for nutrients the council would have very little ability to manage nutrient discharges so that water quality objectives can be met.

Option 3 would involve putting in place rules that control the use of nutrients. This is consistent with the Proposed Regional Policy Statement which directs the council to manage the effects of nutrient losses.[49]

The controls could specify in numeric terms maximum application or loss rates, and/or require compulsory nutrient management plans or budgets. However, we think that such controls may be only required in certain areas where water quality objectives or limits for nutrients are not being met or are close to being exceeded (for example, in dune lake catchments).

The primary production sector considers that any controls should be focusses on outputs rather than inputs.

Option 4: Incentivising and requiring good management practices to mitigate nutrient losses

Good management practices refer to the evolving suite of tools or practical measures that can be put in place at a land user, sector, or industry levels to assist in achieving water quality objectives. Nationally, it is accepted that good management practices are important for maintaining and improving water quality. There are also good business reasons to adopt them.

The Land and Water Forum have recommended that regional plans should incorporate and incentivise good management practices.[50] The Proposed Regional Policy Statement also directs the council to do this.[51] However, respective industries have an important role to play in developing and agreeing on good management practices, rather that the council.

A nationally-applicable suite of good management practices are currently being developed as part of an Environment Canterbury – industry initiative.[52] Relevant good management practices could be incentivised or required through the new regional plan as recommended by the Land and Water Forum. This could involve using different activity thresholds (permitted, controlled, or discretionary). People using accepted good management practices could be incentivised by obtaining any easier regulatory course (for example, permitted activity), and those not using good management practices could be faced with stronger controls (e.g. controlled or discretionary activity rules).

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[48] Rule 23.1.1, Regional Water and Soil Plan
[49] Method 4.2.2, Proposed Regional Policy Statement
[50] Land and Water Forum, 2012. *Third Report of the Land and Water Forum: Managing Water Quality and Allocating Water.*
[51] Method 4.2.2, Proposed Regional Policy Statement
[52] See http://ecan.govt.nz/get-involved/mgmproject/Pages/Default.aspx

Generally, this option received a lot of support including from the primary production sector. However the sector would like the council to support and incentive the use of good management practices before regulating for them. It would also like the council to provide sufficient time for their uptake and recognise the industry guidelines and standards, rather than reinvent the wheel.

The challenge though will be imbedding good management practices within a new regional plan, because inevitably it will need to be monitored and enforced.

Incentivising and requiring good management practices also applies to the management of land disturbance activities (see section 7.6 below).

Option 5: Non-regulatory

As well as regulating discharges the council provides technical and financial support for the uptake of good management practices in primary production activities.

Other than improved management practices and controls on the use of land and discharges, an effective way of preventing and minimising the run-off of nutrients, sediment, and faecal microbes is the revegetation of riparian areas and the construction and restoration of wetlands.

The council could focus its non-regulatory support in the short-term by creating riparian buffer zones around Northland's high value dune lakes. This could be through subsidies or other means. Evidence suggests that the region's dune lakes are under the most pressure (and sensitive) of all water bodies from nutrient enrichment, but could also respond relatively quickly to interventions.

This option has received some stakeholder support, particularly if it is focussed around incentivising and supporting good management practices in primary production activities.

5.7.6 Land disturbance activities

Land disturbance activities expose earth that can become mobilised during rainfall and enter water bodies. This is exacerbated by Northland's geology and climate, which combine to make the region's land very susceptible to erosion. Elevated levels of fine sediment are causing water clarity and deposited sediment issues in many of Northland's rivers, estuaries and harbours. Because of this the Proposed Regional Policy Statement directs the regional council to include policies and rules in plans to reduce sedimentation rates in estuaries.

Future management options

The Regional Water and Soil Plan regulates most types of land disturbance activities including earthworks, vegetation clearance, land preparation, and quarrying.[53] It also contains a weak control on the grazing or access of livestock in riparian areas.[54] However it does not control the access of livestock to the beds of lakes and rivers. In effect, this means that the access of stock to the beds of lakes and rivers is permitted in Northland.

In general, the Regional Water and Soil Plan controls on land disturbance activities are relatively permissive compared to a number of other regional plans and, with regard to forestry, the Proposed National Environmental Standard for Plantation Forestry.[55] There are

[53] See sections 33 and 34 of the Regional Water and Soil Plan
[54] Rule 34.1.1, Regional Water and Soil Plan
[55] Ministry for the Environment. 2010. *Proposed National Environmental Standard for Plantation Forestry: Discuss Document.* Ministry for the Environment: Wellington, New Zealand

several issues with the controls and the way that they are currently implemented. The issues and possible options to address them are identified below.

Option 1: Require the council to be notified in advance of certain permitted activities being undertaken

Under the Regional Water and Soil Plan people undertaking most permitted activities are not required to inform the council in advance of the activities being undertaken. The only exception is vegetation clearance on erosion-prone land that is not in a riparian area.

The council is often never aware of many land disturbance activities. An example is the clearance of plantation forestry. The council has limited information on the timing, location and nature of many harvesting activities, particularly by small woodlot owners.

Like for most permitted activities, the council (in other words, ratepayers) fund the monitoring of permitted activities rather than the resource users. Although, as pointed out earlier, the council does have a charging policy for monitoring permitted activities that is based on section 150 of the Local Government Act 2002.

The council often only become involved after an incident has been reported to council, and it is often too late to take remedial action.

Option 1 involves changing the permitted activity rules for earthworks and vegetation clearance to require resource users to notify council in advance of them undertaking the activities. This will allow the council to better prioritise its monitoring resources by knowing what is to be undertaken, the timing and the location. This mean the council will be more efficient and effective in undertaking monitoring. It would also allow the council to work more closely with resource users in putting in place mitigation measures.

This option could also be extended to other activities such as the application of fertilisers around sensitive water bodies, to name one example.

We are looking at options for the threshold for where notification of the council would be required.

Option 2: Refine the rules to provide greater clarity and certainty for resource users and the council

Most of the current rules for land disturbance activities are subjective and vague. The environmental standards for land disturbance activities are particularly challenging to implement.

This creates difficulties for people operating under the rules and the council in monitoring and enforcing them. In a number of respects the permitted activity rules for land disturbance activities fail established legal principles[56].

Because of the unclear nature of many of the rules, the council, in collaboration with the forestry industry, has developed non-regulatory guidelines that essentially interpret a number of the rules and provide examples of good management practices.[57]

[56] Case law has established that permitted activities must:
1. Be comprehensive to a reasonably informed, but not necessary expert, persons;
2. Not reserve to the council discretion to decide by subjective formulation whether an activity is permitted or not; and
3. Be sufficiently certain to be capable of expert assessment.

[57] Forestry Earthworks & Harvesting Guidelines for Northland (2012)

Option 2 involves amending existing permitted activity rules and associated environmental standards and/or ensuring that new rules are easily understood, are certain, and do not reserve judgment to the council when monitoring and enforcing them. It could also include being more prescriptive and specific about required good management practices.

Option 3: Incentivise and require good management practices

As discussed in section 7.5 above, the council could incentivise and require agreed good management practices through the Regional Water and Soil Plan. We will be looking at options for how this approach could be used for managing certain land disturbance activities, for example, commercial forestry operations and activities undertaken by network operators.

Option 4: Stronger controls on the access of stock to the beds and margins of water bodies

The Regional Water and Soil Plan permits the access of livestock to the riparian management zone (a strip of land adjacent to the banks of lakes and rivers) provided that certain conditions can be met. These include that there are "no more than minor adverse effects on aquatic life" and that the access or grazing does not reduce the visual clarity of water bodies by more than 20% after reasonable mixing. In effect, the rule is difficult to monitor and enforce.

The Regional Water and Soil Plan does not regulate the access of livestock to the beds of lakes and rivers, and therefore permits stock access. On the other hand, the Regional Coastal Plan prohibits the access of livestock to the coastal marine area.

The disturbance of the beds and margins of lakes and rivers is a major source of sediment in water. This is evidenced by recent sediment source tracking in the Bay of Islands and Whāngārei Harbour which shows that stream bank erosion is a significant contributor of sediment to estuaries. Stock movements up and down stream banks can exacerbate this erosion. It is widely accepted that restricting the access of stock to the beds and margins of water bodies is also a very effective way to reduce faecal bacteria levels in water, as well as other contaminants like nutrients and organic matter. This is reflected in the dairy industry's Sustainable Dairying: Water Accord, [58] which commits dairy farmers to exclude dairy cattle from lakes, rivers, streams and drains that are greater than one metre in width and deeper than 30 cm in depth, and significant wetlands by 2017.

The Proposed Regional Policy Statement directs the regional council to put in place rules to control the access of livestock to the beds and margins of water bodies.

We are looking at options for new stock exclusion rules to be included in the Regional Water and Soil Plan. At a minimum, we think that the rules should be consistent with the Sustainable Dairying: Water Accord and prevent the access of all livestock to dune lakes.

Additional controls could include:

- Restricting the access of dairy cows to streams and rivers that are less than one metre in width and shallower than 30cm in depth (the Sustainable Dairying: Water Accord dimensions).
- Restricting the access of dry stock to water bodies in low sloping topography; and/or
- Permitting the access of dry stock to the beds and margins of rivers and non-dune lakes provided that they do not cause any gross pugging, slumping, erosion, or contamination of water; or
- Restricting all livestock from all water bodies.

[58] Sustainable Dairying: Water Accord (2013) Dairy Environment Leadership Group

Option 5: Stronger controls on earthworks

The Regional Water and Soil Plan permits earthworks that are not on erosion-prone land provided that the volume moved or disturbed is less than 5000 m^3 in any 12 month period and certain environmental standards[59] are complied with . The threshold is set lower at 1000 m^3 or 1000 m^2 on erosion-prone land. A lot of land disturbance in forestry, on farms and construction sites is carried out under the current permitted activity rule.

Option 5 involves reducing the current thresholds for earthworks and the period of time that they can be undertaken as a permitted activity. This would provide the council with more control over activities, such as being able to impose tailored consent conditions that are specific to the location and nature of the activity and the sensitivity of the receiving environment. We could also change the threshold from a volume to an area based measure as the latter is easier to assess.

The option could also involve greater setbacks for earthworks from sensitive or high value water bodies.

Option 6: Revise the definition of erosion prone land

The Regional Water and Soil Plan defines erosion prone land as class 7e, 8e, and 8s1 land use capability units, as shown in the New Zealand Resource Inventory, Northland Region, Second Edition.[60] These maps define what activity class (permitted, controlled, or discretionary) applies to certain vegetation clearance, earthworks, and land preparation activities.

We consider that the current definition does not adequately capture all erosion prone land. Our experts are looking at options for a revised definition.

Option 7: Stronger controls on vegetation clearance

The Regional Water and Soil Plan permits vegetation clearance subject to a number of conditions including requirements that areas of exposed soil are revegetated or covered within a period of time (12 months after the harvesting is completed for plantation forestry and 24 months for other activities). Another permitted activity condition is that the minimum setback for harvesting plantation forest planted after 28 August 2004 is 5 metres from a water body. The plan does not specify any harvesting setbacks for plantation forest planted prior to this date.

Reducing the length of time that areas of soil can be exposed for and increasing setback distances for harvesting from water bodies may be required to maintain and improve water quality so that water quality objectives are met, particularly for dune lakes.

Options include reducing time periods to 12 months or less and specifying larger vegetation setbacks from dune lakes and indigenous wetlands and some significant rivers.

Option 8: Stronger controls on land preparation

We are aware of increasing areas of land being cultivated in Northland for crops. A lot of this is on rolling contoured land and in flood plains. Much of it occurs twice per year in spring and late summer. The potential for sediment run-off from soil exposed by land preparation is significant. The Regional Water and Soil Plan currently permits land preparation subject to conditions including that it is undertaken outside of a 5 metre setback from water bodies.

[59] Section 32, Regional Water and Soil Plan
[60] Part VIII (Definitions), Regional Water and Soil Plan

Option 8 involves increasing the setback distances for land preparation. The size of the set-back could be related to the nature of the water quality objective for the water bodies.

Option 9: Permit all land disturbance activities subject only to meeting water quality objectives and limits

Option 9 involves permitting all land disturbance activities subject to the requirement that resulting discharges meet the minimum RMA section 70 standards and water quality objectives and limits. The controls would not specify any other conditions such as good management practices. This option would involve a major change to the current regulatory framework of the Regional Water and Soil Plan.

Discharges that would not meet the RMA section 70 standards would require resource consent.

Option 10: Amend the definition of the Riparian Management Zone

The Regional Water and Soil Plan contains specific controls of land disturbance activities within the Riparian Management Zone. The Riparian Management Zone is a zone of varying widths adjacent to the bed of a river, lake, indigenous wetland, of the coastal marine area which needs to be managed carefully to protect the water body form the adverse effects of land use.

The Regional Water and Soil Plan contains criteria by which the management zone is determined.[61] The criteria are difficult to apply and monitor because it is based on different slopes, which change constantly along a water body.

We think that the definition should be simplified so that it is easier for resource users and the council to apply.

Option 11: Eliminate regulatory overlaps between the regional and district plans

The council should consider working with district councils to eliminate and prevent regulatory overlaps around the management of land disturbance activities.

Option 12: Non-regulatory

Other than improved management practices and controls on land disturbance activities, the primary means of dealing with sediment runoff is the revegetation of riparian areas and the construction and restoration of wetlands.

As suggested earlier, the council could focus its non-regulatory support in the short-term on providing incentives or paying for the restoration of riparian buffer zones and the creation of wetlands on stream inflows around Northland's high value dune lakes. Evidence suggests that dune lakes are particularly sensitive to phosphorus which is normally associated with fine sediment. Non-regulatory support could also go into constructing wetlands at strategic sites on priority estuaries.

Such efforts could also be promoted as offset mitigation as part of resource consent processes.

[61] Figures 7A – 7C, Regional Water and Soil Plan