Policy and Planning Committee

Tuesday 6 June 2017
10.30am
Taranaki Regional Council, Stratford

Agenda for the meeting of the Policy and Planning Committee to be held in the Taranaki Regional Council chambers, 47 Cloten Road, Stratford, on Tuesday 6 June2017 commencing at 10.30am.

Members	Councillor N W Walker	(Committee Chairperson)
	Councillor C L Littlewood	
	Councillor M P Joyce	
	Councillor D H McIntyre	
	Councillor B K Raine	
	Councillor C S Williamson	
	Councillor D L Lean	(ex officio)
	Councillor D N MacLeod	(ex officio)
Representatives	Councillor G Boyde	(Stratford District Council)
	Councillor P Nixon	(South Taranaki District Council)
	Mrs B Muir	(Taranaki Federated Farmers)
Apologies	Councillor R Jordan	(New Plymouth District Council)

Notification of Late Items

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: Confirmation of Minutes – 2 May 2017

Approved by: A D McLay, Director-Resource Management

B G Chamberlain, Chief Executive

Document: 1873480

Resolve

That the Policy and Planning Committee of the Taranaki Regional Council:

1. takes as read and confirms the minutes of the Policy and Planning Committee meeting of the Taranaki Regional Council held in the Taranaki Regional Council chambers, 47 Cloten Road, Stratford, on Tuesday 2 May 2017 at 10.30am
2. notes the recommendations therein were adopted by the Taranaki Regional Council on 8 May 2017.

Matters arising

Appendices

Document #1855699 – Minutes Policy and Planning Committee

Minutes of the Policy and Planning Committee Meeting of the Taranaki Regional Council, held in the Taranaki Regional Council Chambers, 47 Cloten Road, Stratford, on Tuesday 2 May 2017 at 10.30 am.

Members	Councillors	N W Walker	(Committee Chairperson)
		M P Joyce	
		C L Littlewood	
		D H McIntyre	(*from 10.40am*)
		B K Raine	
		C S Williamson	
		D L Lean	(ex officio)
		D N MacLeod	(ex officio)
Attending	Councillor	R Jordan	(New Plymouth District Council)
	Councillor	P Nixon	(South Taranaki District Council)
	Mrs	B Muir	(Taranaki Federated Farmers)
Attending	Messrs	A D McLay	(Director-Resource Management)
		G K Bedford	(Director-Environment Quality)
		M J Nield	(Director-Corporate Services)
		C L Spurdle	(Planning Manager)
		S Tamarapa	(Iwi Communications Officer)
		P Ledingham	(Communications Officer)
		R Ritchie	(Communications Manager)
	Mrs	N West	(Policy Analyst)
	Mr	R Phipps	(Science Manager)
	Mrs	V McKay	(Science Manager)
	Mr	D West	(Environment Team Leader)
	Mrs	K van Gameren	(Committee Administrator)
	Mr	J Clough	(Wrightson Consulting)

Apologies The apology from Councillor G Boyde (Stratford District Council) was received and sustained.

Notification of Late Items There were no late items of business.

1. Confirmation of Minutes – 14 March 2017

Resolved

THAT the Policy and Planning Committee of the Taranaki Regional Council

1. takes as read and confirms the minutes of the Policy and Planning Committee meeting of the Taranaki Regional Council held in the Taranaki Regional Council chambers, 47 Cloten Road, Stratford, on Tuesday 14 March 2017 at 11.00am
2. notes that the recommendations therein were adopted by the Taranaki Regional Council on 3 April 2017.

Williamson/Raine

Matters Arising

Introducing dung beetles to Taranaki dairy farms

Mr A D McLay, Director-Resource Management, advised the Committee that a report exploring an increased investment in a dung-beetle release programme in Taranaki has been delayed and will be presented to the next Committee meeting.

Taranaki Regional Council requirements for good farm management

It was noted to the Committee that the Council's publication *Taranaki Regional Council requirements for good farm management* has been well received following its distribution.

2. Resource Legislation Amendment Act 2017

2.1 Mr A D McLay, Director-Resource Management, spoke to the memorandum outlining the main changes to the Resource Legislation Amendment Act 2017 (the Act) that became law on 18 April 2017.

2.2 Mr McLay noted to the Committee some of the changes to the Resource Management Act 1991 (RMA), including the removal of the financial contributions provisions in five years and the immediate introduction of provisions allowing discussions on Iwi Participation Agreements between iwi authorities and the Council to occur, that address iwi input to resource management. It was noted a review of iwi input to resource management, and the results of a survey of iwi input to resource management at all regional councils, will form part of a review report to the Council.

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum *Resource Legislation Amendment Act 2017*
2. notes that council staff will be developing an implementation plan to give effect to the Act.

MacLeod/Joyce

3. Estimation of water quality contaminant loads and the likely effect of riparian fencing in Taranaki

3.1 Mr G K Bedford, Director-Environment Qaulity, spoke to the memorandum advising the Committee of the preparation of a report for the Council that evaluates the

comparative consequences for water quality improvement, of requiring riparian fencing in the dairying areas of Taranaki either according to the recommendations of the Land and Water Forum, or alternatively according to the Council's working policy as drafted in preparation for the next Regional Freshwater Plan. The report, '*Estimation of water quality contaminant loads and the likely effect of fencing in Taranaki'* has been prepared for the Council by Professor RW McDowell, of the Soil and Physical Sciences department of the faculty of Agriculture and Life Sciences, Lincoln University.

3.2 It was noted that the report validates the Council's long-standing riparian management programme whereby waterways that are fenced and planted improve water quality (reducing pollution and nutrient levels) and go beyond the recommendations by LAWF and central government that involve just fencing to exclude stock from waterways and not fencing and planting as occurs in this region.

3.3 Despite the Council's work in substantially improving regional water quality to date, it is still not enough to meet government's 'swimmability' targets. To achieve the government's targets regarding water quality, the Council will be required to significantly increase resources and costs to adhere to increased water compliance monitoring, with very little real benefit to the community.

Recommended

That the Taranaki Regional Council:

1. receives the memorandum *Estimation of water quality contaminant loads and the likely effect of fencing in Taranaki*
2. receives the report *Estimation of water quality contaminant loads and the likely effect of fencing in Taranaki* prepared for the Council by Prof R W McDowell of Lincoln University
3. notes the findings of the report and supports taking account of them in its submission to the Government on the *Clean Water* discussion document and in its consideration of policies for the revised *Freshwater Plan for Taranaki*.

Nixon/Littlewood

4. Stream macroinvertebrate community responses to adoption of land management mitigation practices

4.1 Mr G K Bedford, Director-Environment Quality, spoke to the memorandum advising the Committee of the publication of a report that evaluates the benefits for in-stream ecological health and overall water quality of various practice and management options in dairy catchments. The Waiokura Stream catchment in South Taranaki is one of the five subject 'best practice dairy' catchments. The report, '*Responses of stream macroinvertebrate communities and water quality of five dairy farming streams following adoption of mitigation practices'* has been published in the *New Zealand Journal of Marine and Freshwater Research*.

4.2 The report shows the benefits of increasing farm dairy effluent system discharges to land, riparian fencing and bridging to remove stock from waterways, and planting the

riparian margin. Profitability of the farms had also increased. Members requested communication material to be prepared based on this and other relevant material, for distribution to the community, particularly dairy farmers.

Recommended

That the Taranaki Regional Council:

1. receives the memorandum *Stream macroinvertebrate community responses to adoption of land management mitigation practices*
2. receives the report '*Responses of stream macroinvertebrate communities and water quality of five dairy farming streams following adoption of mitigation practices*' (A E Wright-Stow and R J Wilcock) published in the *New Zealand Journal of Marine and Freshwater Research*
3. notes the findings of the report and supports taking account of them in its consideration of policies for the revised *Freshwater Plan for Taranaki*.

Williamson/Joyce

5. Submission on Clean Water consultation document

5.1 Mr A D McLay, Director-Resource Manager, spoke to the memorandum introducing a submission made to the Ministry for the Environment of their Clean Water consultation document and to recommend its endorsement. The submission was previously circulated to members for comment and sent by the due date (28 April 2017). The submission raises a number of signiticant scientific/technical, operational and financial (Council and community) concerns about the proposal to meet the swimmability targets.

5.2 The Committee endorsed the submission and wanted its concerns to be summarised into a few key points and sent to key local stakeholders, including local ministers of parliament, under the signature of the Chairman. Accordingly, an additional recommendation was added

Recommended

That the Taranaki Regional Council:

1. receive the memorandum *Submission on Clean Water consultation document*
2. endorses the submission
3. provides a summary of the submission to key local stakeholders.

McIntyre/Joyce

6. Public perceptions of New Zealand's environment: 2016

6.1 Mr A D McLay, Director-Resource Management, spoke to the memorandum introducing a report prepared by Lincoln University on public perceptions of New Zealand's environment.

Recommended

That the Taranaki Regional Council:

1. receives the memorandum *Public perceptions of New Zealand's environment: 2016*.

MacLeod/McIntyre

7. Review of Pest Management in Taranaki: *Proposed Regional Pest Management Plan for Taranaki; Section 71 Report, and Biosecurity Strategy 2017-2037*

7.1 Mr C L Spurdle, Planning Manager, spoke to the memorandum presenting for Members' consideration the *Proposed Regional Pest Management Plan for Taranaki* (the Proposed RPMP), the report *Pest Management Plan for Taranaki - Impact Assessment and Cost Benefit Analyses* (Section 71 Report), and the *Taranaki Regional Council Biosecurity Strategy 2017–2037*.

Recommended

That the Taranaki Regional Council:

1. receives the memorandum and the Proposed Regional Pest Management Plan for Taranaki, Section 71 Report, and Biosecurity Strategy
2. notes that the Proposed Regional Pest Management Plan has been the subject of a successful inter-regional consistency check and is consistent with a regional collective template for proposed plans
3. agrees that the Proposed Regional Pest Management Plan meets the section 71 content requirements for a proposed regional pest management plan as required by the Biosecurity Act 1993
4. agrees that the Proposed Regional Pest Management Plan is not inconsistent with the *National Policy Direction for Pest Management 2015*, other pest management plans on the same organisms, any pathway plan, regional policy statements or plans under the Resource Management Act 1991, or any regulation
5. agrees that that each organism included in the Proposed Regional Pest Management Plan is capable of causing at some time a serious adverse and unintended effect in relation to the region
6. agrees that the benefits of the Proposed Regional Pest Management Plan in relation to each organism to which the proposal applies outweigh the costs after taking account of the likely consequences of inaction or other courses of action
7. agrees that, for each subject, persons who are required to meet directly any or all of the costs of implementing the Proposed Regional Pest Management Plan –

(i) would accrue, as a group, benefits outweighing the costs or

(ii) contribute, as a group, to the creation, continuance, or exacerbation of the problems proposed to be resolved by the plan

8. agrees that for each subject, there is likely to be adequate funding for the implementation of the Proposed Regional Pest Management Plan for five years
9. agrees that each proposed rule would assist in achieving the Proposed Regional Pest Management Plan's objective and would not trespass unduly on the rights of individuals
10. agrees that the Proposed Regional Pest Management Plan is not frivolous or vexatious, that it is clear enough to be readily understood, and that Council has not rejected a similar proposal within the last three years
11. notes that the Section 71 Report will be made publicly available
12. agrees to publicly notify the Proposed Regional Pest Management Plan and Biosecurity Strategy for public submissions on or before 20 May 2017.

Joyce/Raine

There being no further business, the Committee Chairperson Councillor N W Walker, declared the Policy and Planning Committee meeting closed at 11.45am.

Confirmed

Chairperson _____

N W Walker

Date **6 June 2017**

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: **Implementation of the National Policy Statement on Urban Development Capacity**

Approved by: A D McLay, Director – Resource Management

B G Chamberlain, Chief Executive

Document: 1860516

Purpose

The purpose of this memorandum is to introduce the final gazetted *National Policy Statement on Urban Development Capacity* (NPS-UDC) and to outline Taranaki Regional Council (the Council) requirements relating to its implementation.

A copy of the NPS-UDC is attached for Members' information. Further information is available on the Ministry for the Environment's website http://www.mfe.govt.nz/more/towns-and-cities/national-policy-statement-urban-development-capacity-0.

Executive summary

- Under the Resource Management Act 1991 (RMA), regional policy statements and plans must give effect to any national policy statement.
- The NPS-UDC has been publicly notified in the Gazette and came into effect on 1 December 2016.
- The NPS-UDC requires regional and district councils to provide sufficient land for new housing and business to match projected population growth.
- New Plymouth is currently identified as a medium-growth urban area, with a projected population growth of 9.3% between 2013 and 2023. However, population projections are currently being reviewed with strong indications that New Plymouth will be re-defined as a high growth urban area (i.e. 10% + growth).
- Should this occur, there will be significant implications in relation to what this Council must do to implement the NPS-UDC.
- The NPS-UDC (and revised population projections) will involve the Council in some additional work. The *Regional Policy Statement for Taranaki* will need to be amended to include minimum targets to ensure there is sufficient housing development capacity for New Plymouth.

- Other additional work is required relating to the development and implementation of monitoring and reporting systems so as to monitor on a quarterly basis a range of indicators in relation to housing affordability, resource and building consents and business land vacancy rates, and carry out a three-yearly housing and business land assessment.
- The NPS-UDC sets out a staged time-line for implementation of the NPS-UDC.
- New Plymouth District Council, as part of the review of its District Plan, has undertaken a preliminary assessment of residential supply, which concluded there is sufficient supply to meet the short, medium and long-term growth requirements in the NPS-UDC. Going forward, this Council will be in discussions with New Plymouth District Council to give effect to the NPS-UDC while avoiding unnecessary duplication.
- Senior officers of both councils are working closely to implement the NPS-UDC in the most efficient and effective way for the Taranaki community.

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum on the *Implementation of the National Policy Statement on Urban Development Capacity*;
2. notes that New Plymouth is likely to be identified as a high growth urban area; and
3. notes that the Taranaki Regional Council will be working with New Plymouth District Council to set minimum targets relating to New Plymouth's urban development capacity to be included in the *Regional Policy Statement for Taranaki* and in the development of appropriate monitoring and reporting systems.

Background

Some urban areas in New Zealand are growing quickly. Hence, one of the recommendations of the 2015 Productivity Commission inquiry into 'Using land for housing' recommended that Government prepare a national policy statement to help address constraints on development capacity in the resource management system.

On 3 June 2016, the Government released a consultation document for a *Proposed National Policy Statement on Urban Development Capacity* (NPS-UDC).

According to the consultation document, the purpose of a proposed NPS is to ensure regional and district plans provide adequately for the development of business and housing. This is to enable urban areas to grow and change in response to the needs of their communities. 'Development capacity' is defined in the NPS-UDC as "…*the capacity of land for urban development, taking into account: zoning and all of the policies and rules that apply to it; and infrastructure that exists or is likely to exist, that supports the development of the land*."

Pursuant to sections 62 (3) and 67(3) of the RMA, regional policy statements and plans "…*must give effect to a national policy statement*." With this in mind, and because of the potential implications of the proposed NPS-UDC, at its meeting of 28 July 2016, Policy and Planning Committee members considered and endorsed a submission on the consultation document.

The submission noted support, in principle, to the need to plan for urban development capacity in New Zealand but that there is no need for a national policy statement on urban development capacity to be applied in Taranaki. It was Council's contention that the proposed NPS-UDC would only result in added costs to ratepayers with no demonstrable benefit based upon:

- New Plymouth District Council (NPDC), as part of the review of its district plan, had undertaken a preliminary assessment of residential supply, which concluded that there is sufficient capacity to meet the short, medium and long-term urban growth requirements;
- rather than prescriptive and inflexible regulation, other more fundamental reform of the RMA is needed to increase plan agility so that plans can be changed quickly to respond to changes in housing demand and supply issues;
- the 'medium' and 'high growth' area thresholds appear to be quite arbitrary, rather than being linked to the purpose of the NPS;
- the Council has a limited role in land use planning yet it is required by the NPS-UDC to duplicate housing and business land assessments undertaken by district councils. The duplication of roles imposes unnecessary costs on regional councils by having to engage appropriate external housing and economic expertise to undertake work that is already being adequately addressed by district councils within the region; and
- the proposed NPS-UDC provides no direction on how to resolve any potential conflicts between urban development considerations and the national policy statements for freshwater management and the coast.

Submissions on the consultation document closed on Friday 15 July 2016. There were 140 submissions received in response to the consultation document. Subsequently the Minister has considered the submissions and decided to approve the proposed NPS. The NPS-UDC came into effect on 1 December 2016.

The National Policy Statement for Urban Development Capacity

The purpose of the NPS-UDC is to ensure local authorities provide enough land for new housing and business development.

The NPS-UDC directs local authorities to provide for sufficient development capacity in their resource management plans for housing and business growth to meet demand. Development capacity refers to the amount of development allowed by zoning and regulations in plans that is supported by infrastructure. This development can be "outwards" (on greenfield sites) and/or "upwards" (by intensifying existing urban environments).

Through the NPS-UDC the Government is seeking to ensure councils are providing sufficient development capacity necessary for urban land and development markets to function efficiently in order to meet community needs. In well-functioning markets, the supply of land, housing and business space matches demand at efficient (more affordable) prices.

The NPS-UDC contains seven objectives and 29 policies that are structured into four sections:

- outcomes for planning decisions;
- evidence base and monitoring requirements to support planning decisions;
- enablement of responsive planning; and

- coordinated planning evidence and decision-making.

The objectives apply to all local authorities and target 'urban environments' (i.e. land that contains or intends to contain 10,000 or more people and associated business land) – particularly those areas experiencing the most significant growth.

The NPS-UDC adopts a tiered approach to the application of its policies using the Statistic New Zealand urban areas classification, and population projections to target different policies to different local authorities. Local authorities that have high-growth urban areas within their jurisdiction are expected to meet all the requirements of the policies in the NPS, while local authorities with medium-growth urban areas in their jurisdiction, and all other local authorities, have lesser requirements as per Table 1 below.

Table 1: NPS-UDC policy framework

	All local authorities	Local authorities with medium-growth urban areas	Local authorities with high-growth urban areas
Objectives that apply	All	All	All
Policies that apply	PA1 – PA4	PA1 – PA4	PA1 – PA4
		PB 1 – PB7 PC1 – PC4 PD1 – PD2	PB 1 – PB7 PC1 – PC4 PD1 – PD2
			PC5 – PC14 PD3 – PD4
The Taranaki context	South Taranaki District?		Taranaki Regional Council New Plymouth District

NPS-UDC implications for Council

At the time of the proposal, New Plymouth was identified as a medium growth city with a projected population growth of 9.3% between 2013 and 2013. However, in the guidance released with the NPS (refer http://www.mfe.govt.nz/publications/towns-and-cities/introductory-guide-national-policy-statement-urban-development) there has been a strong indication that New Plymouth is to be re-defined as a high growth urban area when Statistics New Zealand revises its population projections in 2017. The revised population projections are expected by September 2017.

The implications of revised population projections for New Plymouth identifying the city as 'high growth', in terms of the Council's obligations for implementing the NPS, are significant. Of particular note, the Council would have the following obligations:

- set up quarterly monitoring of market indicators, including house prices and rents, the number of resource and building consents for urban development, plus housing affordability;
- in 2017 and 2020 undertake a three-yearly assessment of housing and business development capacity (Policy PB1);
- in 2018, set and incorporate minimum targets for sufficient, feasible development capacity for housing into the RPS (and review these targets every three years); and

- in 2018, prepare and consult on a future development strategy to ensure there is sufficient, feasible development capacity in the medium and long term and sets out how minimum targets will be met.

Pursuant to section 55(2A) of the RMA, RPS amendments relating to targets would be made without using the process in schedule 1 of the Act. Under section 55(2) of the RMA, a council may amend its planning documents by public notice only, if a NPS directs it to do so. However, any other or additional changes that might be necessary to give effect to minimum targets would involve the expensive schedule 1 process.

Table 2 below provides a summary of timeframes for implementation.

Table 2: NPS-UDC timeframes for implementation

Tasks	Immediate effect	2017	2018	2019	2020	2021	2022
Objectives OA1-OD2 & policies PA1-PA4, PC1 to PC4, & PD1-PD4	→	→	→	→	→	→	→
Quarterly monitoring of market indicators (PB6)		→	→	→	→	→	→
Indicators of price inefficiencies (PB7)		→	→	→	→	→	→
Housing & business assessments (PB1) for high growth urban areas		★			★		
Set minimum targets in RPS (PC5)			★			★	
Set minimum targets in district plan (PC9)			★			★	
Prepare Future Development Strategy (PC12-PC14)			★			★	
Amend definitions of 'medium' and 'high growth' urban areas			★				
Review NPS-UDC						★	

★ Council requirement ★ Central government requirement.

As noted above, High-Growth Urban Areas (areas that have a projected population growth of more than 10% over the medium term) must set minimum targets for sufficient residential development capacity in accordance with their housing assessment, and incorporate them into regional policy statements, as prescribed by policies PD5-PD9.

In its submission on the Proposed NPS-UDC, the Council noted its concerns that the NPS-UDC creates an unnecessary duplication of roles between this Council and the NPDC in the preparation of housing and business land assessments and monitoring of key indicators. However, no changes were made to the NPS in response to those concerns.

NPDC as part of the review of its District Plan has undertaken a preliminary assessment of residential supply, which concluded there is sufficient supply to meet the short, medium and long-term growth requirements in the NPS-UDC. Going forward, and following confirmation of New Plymouth's population projections, the Council will be seeking to work closely with New Plymouth District Council on setting targets to be included in *Regional Policy Statement for Taranaki* and developing its monitoring and reporting systems in relation to the other NPS-UDC requirements.

Senior officers of both councils are working closely to implement the NPS-UDC in the most efficient and effective way for the Taranaki community.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Biosecurity Act 1993*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Attachment

Document 1868132: National Policy Statement on Urban Development Capacity.

NATIONAL POLICY STATEMENT

on Urban Development Capacity 2016

newzealand.govt.nz

Contents

Preamble

New Zealand is highly urbanised, with 73 percent of us living in urban areas of at least 30,000 people.[1]

Urban environments are characterised by the closeness of people and places, and the connections between them. They enable us to live, work and play in close proximity, giving us access to amenity, services and activities that people value. While urban environments share these common characteristics, they also have unique local variations; the traits that make one urban environment different from another. Urban environments often have high rates of population and economic growth. Reflecting this, they are dynamic, and are constantly changing to reflect the needs of their communities. This constant change can have both positive and negative impacts: well-functioning urban areas maximise the positives and minimise the negatives.

Well-functioning urban environments provide for people and communities' wellbeing. They provide people with access to a choice of homes and opportunities to earn income, good connections between them, and attractive built and natural environments. They have good quality physical and social infrastructure and open space. They make efficient use of resources and allow land uses to change to meet the changing needs of their inhabitants while protecting what is precious. They make the most of their ability to connect to other parts of the world through trade and the movement of goods and people. Such urban environments attract people and investment, and are dynamic places that make a significant contribution to national economic performance.

Local authorities play an important role in shaping the success of our cities by planning for growth and change and providing critical infrastructure. Ideally, urban planning should enable people and communities to provide for their social, economic, cultural and environmental wellbeing through development, while managing its effects. This is a challenging role, because cities are complex places; they develop as a result of numerous individual decisions, and this often involves conflict between diverse preferences.

This national policy statement provides direction to decision-makers under the Resource Management Act 1991 (RMA) on planning for urban environments. It recognises the national significance of well-functioning urban environments, with particular focus on ensuring that local authorities, through their planning, both:

- enable urban environments to grow and change in response to the changing needs of the communities, and future generations; and
- provide enough space for their populations to happily live and work. This can be both through allowing development to go "up" by intensifying existing urban areas, and "out" by releasing land in greenfield areas.

This national policy statement covers development capacity for both housing and business, to recognise that mobility and connectivity between both are important to achieving well-functioning urban environments. Planning should promote accessibility and connectivity between housing and businesses. It is up to local authorities to make decisions about what sort of urban form to pursue.

This national policy statement aims to ensure that planning decisions enable the supply of housing needed to meet demand. This will contribute to minimising artificially inflated house prices at all

[1]According to Statistics New Zealand's most recent estimates.

levels and contribute to housing affordability overall. Currently, artificially inflated house prices drive inequality, increase the fiscal burden of housing-related government subsidies, and pose a risk to the national economy.

Local authorities need to provide for the wellbeing of current generations, and they must also provide for the wellbeing of the generations to come. The overarching theme running through this national policy statement is that planning decisions must actively enable development in urban environments, and do that in a way that maximises wellbeing now and in the future.

This national policy statement does not anticipate development occurring with disregard to its effect. Local authorities will still need to consider a range of matters in deciding where and how development is to occur, including the direction provided by this national policy statement.

Competition is important for land and development markets because supply will meet demand at a lower price when there is competition. There are several key features of a competitive land and development market. These include providing plenty of opportunities for development. Planning can impact on the competitiveness of the market by reducing overall opportunities for development and restricting development rights to only a few landowners.

This national policy statement requires councils to provide in their plans enough development capacity to ensure that demand can be met. This includes both the total aggregate demand for housing and business land, and also the demand for different types, sizes and locations. This development capacity must also be commercially feasible to develop, and plentiful enough to recognise that not all feasible development opportunities will be taken up. This will provide communities with more choice, at lower prices.

Development capacity must be provided for in plans and also supported by infrastructure. Urban development is dependent on infrastructure, and decisions about infrastructure can shape urban development. This national policy statement requires development capacity to be serviced with development infrastructure, with different expectations from this infrastructure in the short, medium and long-term. It encourages integration and coordination of land use and infrastructure planning. This will require a sustained effort from local authorities, council-controlled organisations, and infrastructure providers (including central government) to align their intentions and resources.

Another key theme running through the national policy statement is for planning to occur with a better understanding of land and development markets, and in particular the impact that planning has on these. This national policy statement requires local authorities to prepare a housing and business development capacity assessment and to regularly monitor market indicators, including price signals, to ensure there is sufficient development capacity to meet demand. Local authorities must respond to this information. If it shows that more development capacity needs to be provided to meet demand, local authorities must then do so. Providing a greater number of opportunities for development that are commercially feasible will lead to more competition among developers and landowners to meet demand.

This national policy statement also places a strong emphasis on planning coherently across urban housing and labour markets, which may cross local authority administrative boundaries. This will require coordinated planning between local authorities that share jurisdiction over urban housing and labour markets. This includes collaboration between regional councils and territorial authorities who have differing functions under the RMA, but which all impact on and are impacted on by urban development.

This national policy statement recognises that the benefits of the statement are greatest in urban areas experiencing the highest levels of growth. It takes a tiered approach to the application of policies using the Statistics New Zealand urban areas classification, and population projections to target different policies to different local authorities. This classification also informs local authorities that they must work together. The boundaries of the urban areas do not restrict the area in which the local authorities apply the policies.

Local authorities that have a high-growth urban area within their jurisdiction are expected to meet all of the requirements of policies in this national policy statement, while local authorities with medium-growth urban areas in their jurisdiction, and all other local authorities, have lesser requirements, as per the table below.

	All local authorities	**Local authorities that have a medium-growth urban area within their district or region**	**Local authorities that have a high-growth urban area within their district or region**
Objectives that apply	All	All	All
Policies that apply	PA1 - PA4	PA1 - PA4	PA1 - PA4
		PB1 - PB7 PC1 - PC4 PD1 - PD2	PB1 - PB7 PC1 - PC4 PD1 - PD2
			PC5 - PC14 PD3 - PD4

This preamble may assist the interpretation of the national policy statement.

Title

This national policy statement is the National Policy Statement on Urban Development Capacity 2016.

Commencement

This national policy statement comes into force on the 28th day after the date on which it is notified in the *New Zealand Gazette*.

Interpretation

In this national policy statement, unless the context otherwise requires, –

Act means the Resource Management Act 1991.

Business land means land that is zoned for business uses in urban environments, including but not limited to land in the following examples of zones:

- industrial
- commercial
- retail
- business and business parks
- centres (to the extent that this zone allows business uses)
- mixed use (to the extent that this zone allows business uses).

Decision-maker means any person exercising functions and powers under the Act.

Demand means:

In relation to housing, the demand for dwellings in an urban environment in the short, medium and long-term, including:

a) the total number of dwellings required to meet projected household growth and projected visitor accommodation growth;

b) demand for different types of dwellings;

c) the demand for different locations within the urban environment; and

d) the demand for different price points

recognising that people will trade off (b), (c) and (d) to meet their own needs and preferences.

In relation to business land, the demand for floor area and lot size in an urban environment in the short, medium and long-term, including:

a) the quantum of floor area to meet forecast growth of different business activities;

b) the demands of both land extensive and intensive activities; and

c) the demands of different types of business activities for different locations within the urban environment.

Development capacity means in relation to housing and business land, the capacity of land intended for urban development based on:

a) the zoning, objectives, policies, rules and overlays that apply to the land, in the relevant proposed and operative regional policy statements, regional plans and district plans; and

b) the provision of adequate development infrastructure to support the development of the land.

Development infrastructure means network infrastructure for water supply, wastewater, stormwater, and land transport as defined in the Land Transport Management Act 2003, to the extent that it is controlled by local authorities.

Feasible means that development is commercially viable, taking into account the current likely costs, revenue and yield of developing; and ***feasibility*** has a corresponding meaning.

High-growth urban area means any urban area (as defined by Statistics New Zealand in 2016) that:

a) has either:

- a resident population of over 30,000 people according to the most recent Statistics New Zealand urban area resident population estimates

or

- at any point in the year a combined resident population and visitor population of over 30,000 people, using the most recent Statistics New Zealand urban area resident population estimates

and

b) in which the resident population of that urban area is projected to grow by more than 10% between 2013 to 2023, according to the most recent Statistics New Zealand medium urban area population projections for 2013(base)-2023.

Note that the definition of high-growth urban area is a transitional definition, and will be reviewed and amended no later than 31 December 2018.

Local authority has the same meaning as in section 2 of the Resource Management Act 1991.

Long term means between ten and thirty years.

Medium-growth urban area means any urban area (as defined by Statistics New Zealand in 2016) that:

a) has a resident population of over 30,000 people according to the most recent Statistics New Zealand urban area resident population estimates

and

b) in which the resident population of that urban area is projected to grow by between 5% and 10% between 2013 to 2023, according to the most recent Statistics New Zealand medium urban area population projections for 2013(base)-2023.

Note that the definition of medium-growth urban area is a transitional definition, and will be reviewed and amended no later than 31 December 2018.

Medium term means between three and ten years.

Other infrastructure means:

a) open space;

b) community infrastructure as defined in the Local Government Act 2002;

c) land transport as defined in the Land Transport Management Act 2003, that is not controlled by local authorities;

d) social infrastructure such as schools and healthcare;

e) telecommunications as defined in the Telecommunications Act 2001;

f) energy; and

g) other infrastructure not controlled by local authorities.

Plan means any plan under section 43AA of the Act or proposed plan under section 43AAC of the Act.

Planning decision means any decision on any plan, a regional policy statement, proposed regional policy statement, or any decision on a resource consent.

Short term means within the next three years.

Sufficient means the provision of enough development capacity to meet housing and business demand, and which reflects the demands for different types and locations of development capacity; and ***sufficiency*** has a corresponding meaning.

Urban environment means an area of land containing, or intended to contain, a concentrated settlement of 10,000 people or more and any associated business land, irrespective of local authority or statistical boundaries.

National significance

This national policy statement is about recognising the national significance of:

a) urban environments and the need to enable such environments to develop and change; and

b) providing sufficient development capacity to meet the needs of people and communities and future generations in urban environments.

Objectives

The following objectives apply to all decision-makers when making planning decisions that affect an urban environment.

Objective Group A – Outcomes for planning decisions

OA1: Effective and efficient urban environments that enable people and communities and future generations to provide for their social, economic, cultural and environmental wellbeing.

OA2: Urban environments that have sufficient opportunities for the development of housing and business land to meet demand, and which provide choices that will meet the needs of people and communities and future generations for a range of dwelling types and locations, working environments and places to locate businesses.

OA3: Urban environments that, over time, develop and change in response to the changing needs of people and communities and future generations.

Objective Group B – Evidence and monitoring to support planning decisions

OB1: A robustly developed, comprehensive and frequently updated evidence base to inform planning decisions in urban environments.

Objective Group C – Responsive planning

OC1: Planning decisions, practices and methods that enable urban development which provides for the social, economic, cultural and environmental wellbeing of people and communities and future generations in the short, medium and long-term.

OC2: Local authorities adapt and respond to evidence about urban development, market activity and the social, economic, cultural and environmental wellbeing of people and communities and future generations, in a timely way.

Objective Group D – Coordinated planning evidence and decision-making

OD1: Urban environments where land use, development, development infrastructure and other infrastructure are integrated with each other.

OD2: Coordinated and aligned planning decisions within and across local authority boundaries.

Policies

Outcomes for planning decisions

Policies PA1 to PA4 apply to any urban environment that is expected to experience growth.

PA1: Local authorities shall ensure that at any one time there is sufficient housing and business land development capacity according to the table below:

Short term	Development capacity must be feasible, zoned and serviced with development infrastructure.
Medium term	Development capacity must be feasible, zoned and either: • serviced with development infrastructure, or • the funding for the development infrastructure required to service that development capacity must be identified in a Long Term Plan required under the Local Government Act 2002.
Long-term	Development capacity must be feasible, identified in relevant plans and strategies, and the development infrastructure required to service it must be identified in the relevant Infrastructure Strategy required under the Local Government Act 2002.

PA2: Local authorities shall satisfy themselves that other infrastructure required to support urban development are likely to be available.

PA3: When making planning decisions that affect the way and the rate at which development capacity is provided, decision-makers shall provide for the social, economic, cultural and environmental wellbeing of people and communities and future generations, whilst having particular regard to:

a) Providing for choices that will meet the needs of people and communities and future generations for a range of dwelling types and locations, working environments and places to locate businesses;

b) Promoting the efficient use of urban land and development infrastructure and other infrastructure; and

c) Limiting as much as possible adverse impacts on the competitive operation of land and development markets.

PA4: When considering the effects of urban development, decision-makers shall take into account:

a) The benefits that urban development will provide with respect to the ability for people and communities and future generations to provide for their social, economic, cultural and environmental wellbeing; and

b) The benefits and costs of urban development at a national, inter-regional, regional and district scale, as well as the local effects.

Evidence and monitoring to support planning decisions

Policies PB1 to PB7 apply to all local authorities that have part, or all, of either a medium-growth urban area or high-growth urban area within their district or region.

The application of these policies is not restricted to the boundaries of the urban area.

PB1: Local authorities shall, on at least a three-yearly basis, carry out a housing and business development capacity assessment that:

a) Estimates the demand for dwellings, including the demand for different types of dwellings, locations and price points, and the supply of development capacity to meet that demand, in the short, medium and long-terms; and

b) Estimates the demand for the different types and locations of business land and floor area for businesses, and the supply of development capacity to meet that demand, in the short, medium and long-terms; and

c) Assesses interactions between housing and business activities, and their impacts on each other.

Local authorities are encouraged to publish the assessment under policy PB1.

PB2: The assessment under policy PB1 shall use information about demand including:

a) Demographic change using, as a starting point, the most recent Statistics New Zealand population projections;

b) Future changes in the business activities of the local economy and the impacts that this might have on demand for housing and business land; and

c) Market indicators monitored under PB6 and PB7.

PB3: The assessment under policy PB1 shall estimate the sufficiency of development capacity provided by the relevant local authority plans and proposed and operative regional policy statements, and Long Term Plans and Infrastructure Strategies prepared under the Local Government Act 2002, including:

a) The cumulative effect of all zoning, objectives, policies, rules and overlays and existing designations in plans, and the effect this will have on opportunities for development being taken up;

b) The actual and likely availability of development infrastructure and other infrastructure in the short, medium and long term as set out under PA1;

c) The current feasibility of development capacity;

d) The rate of take up of development capacity, observed over the past 10 years and estimated for the future; and

e) The market's response to planning decisions, obtained through monitoring under policies PB6 and PB7.

PB4: The assessment under policy PB1 shall estimate the additional development capacity needed if any of the factors in PB3 indicate that the supply of development capacity is not likely to meet demand in the short, medium or long term.

PB5: In carrying out the assessment under policy PB1, local authorities shall seek and use the input of iwi authorities, the property development sector, significant land owners, social housing providers, requiring authorities, and the providers of development infrastructure and other infrastructure.

PB6: To ensure that local authorities are well-informed about demand for housing and business development capacity, urban development activity and outcomes, local authorities shall monitor a range of indicators on a quarterly basis including:

a) Prices and rents for housing, residential land and business land by location and type; and changes in these prices and rents over time;

b) The number of resource consents and building consents granted for urban development relative to the growth in population; and

c) Indicators of housing affordability.

PB7: Local authorities shall use information provided by indicators of price efficiency in their land and development market, such as price differentials between zones, to understand how well the market is functioning and how planning may affect this, and when additional development capacity might be needed.

Local authorities are encouraged to publish the results of their monitoring under policies PB6 and PB7.

Responsive planning

Policies PC1 to PC4 apply to all local authorities that have part, or all, of either a medium-growth urban area or high-growth urban area within their district or region.

The application of these policies is not restricted to the boundaries of the urban area.

PC1: To factor in the proportion of feasible development capacity that may not be developed, in addition to the requirement to ensure sufficient, feasible development capacity as outlined in policy PA1, local authorities shall also provide an additional margin of feasible development capacity over and above projected demand of at least:

- 20% in the short and medium term, and
- 15% in the long term.

PC2: If evidence from the assessment under policy PB1, including information about the rate of take-up of development capacity, indicates a higher margin is more appropriate, this higher margin should be used.

PC3: When the evidence base or monitoring obtained in accordance with policies PB1 to PB7 indicates that development capacity is not sufficient in any of the short, medium or long term, local authorities shall respond by:

a) Providing further development capacity; and

b) enabling development

in accordance with policies PA1, PC1 or PC2, and PC4. A response shall be initiated within 12 months.

PC4: A local authority shall consider all practicable options available to it to provide sufficient development capacity and enable development to meet demand in the short, medium and long term, including:

a) Changes to plans and regional policy statements, including to the zoning, objectives, policies, rules and overlays that apply in both existing urban environments and greenfield areas;

b) Integrated and coordinated consenting processes that facilitate development; and

c) Statutory tools and other methods available under other legislation.

Minimum targets

Policies PC5 to PC11 apply to all local authorities that have part, or all, of a high-growth urban area within their district or region.

Local authorities that have part, or all, of a medium-growth urban area within their district or region are encouraged to give effect to policies PC5 to PC11.

The application of these policies is not restricted to the boundaries of the urban area.

PC5: Regional councils shall set minimum targets for sufficient, feasible development capacity for housing, in accordance with the relevant assessment under policy PB1 and with policies PA1 and PC1 or PC2, and incorporate these minimum targets into the relevant regional policy statement.

PC6: A regional council's minimum targets set under policy PC5 shall be set for the medium and long term, and shall be reviewed every three years.

PC7: When the relevant assessment required under policy PB1 shows that the minimum targets set in the regional policy statement are not sufficient, regional councils shall revise those minimum targets in accordance with policies PC5, and shall incorporate these revised targets into its regional policy statement.

PC8: Regional councils shall amend their proposed and operative regional policy statements to give effect to policies PC5 to PC7 in accordance with section 55(2A) of the Act without using the process in Schedule 1 of the Act.

PC9: Territorial authorities shall set minimum targets for sufficient, feasible development capacity for housing, as a portion of the regional minimum target, in accordance with the relevant assessment under policy PB1, and with policies PA1, PC1 or PC2, and PD3 and incorporate the minimum targets as an objective into the relevant plan.

PC10: If a minimum target set in a regional policy statement is revised, the relevant territorial authorities shall also revise the minimum targets in their plans in accordance with policy PC9.

PC11: Territorial authorities shall amend their relevant plans to give effect to policies PC9 and PC10 in accordance with section 55(2A) of the Act without using the process in Schedule 1 of the Act.

Note that using section 55(2A) of the Act for policies PC8 and PC11 only applies to setting minimum targets and not to plan changes that give effect to those minimum targets.

Future development strategy

Policies PC12 to PC14 apply to all local authorities that have part, or all, of a high-growth urban area within their district or region.

Local authorities that have part, or all, of a medium-growth urban area within their district or region are encouraged to give effect to policies PC12 to PC14

The application of these policies is not restricted to the boundaries of the urban area.

PC12: Local authorities shall produce a future development strategy which demonstrates that there will be sufficient, feasible development capacity in the medium and long term. This strategy will also set out how the minimum targets set in accordance with policies PC5 and PC9 will be met.

PC13: The future development strategy shall:

a) identify the broad location, timing and sequencing of future development capacity over the long term in future urban environments and intensification opportunities within existing urban environments;

b) balance the certainty regarding the provision of future urban development with the need to be responsive to demand for such development; and

c) be informed by the relevant Long Term Plans and Infrastructure Strategies required under the Local Government Act 2002, and any other relevant strategies, plans and documents.

PC14: The future development strategy can be incorporated into a non-statutory document that is not prepared under the Act, including documents and strategies prepared under other legislation. In developing this strategy, local authorities shall:

a) Undertake a consultation process that complies with:

- Part 6 of the Local Government Act; or
- Schedule 1 of the Act;

b) be informed by the assessment under policy PB1; and

c) have particular regard to policy PA1.

Coordinated planning evidence and decision-making

Policies PD1 and PD2 apply to all local authorities that have part, or all, of either a medium-growth urban area or high-growth urban area within their district or region.

The application of these policies is not restricted to the boundaries of the urban area.

PD1: Local authorities that share jurisdiction over an urban area are strongly encouraged to work together to implement this national policy statement, having particular regard to cooperating and agreeing upon:

a) The preparation and content of a joint housing and business development capacity assessment for the purposes of policy PB1; and

b) The provision and location of sufficient, feasible development capacity required under the policies PA1, PC1 and PC2.

PD2: To achieve integrated land use and infrastructure planning, local authorities shall work with providers of development infrastructure, and other infrastructure, to implement policies PA1 to PA3, PC1 and PC2.

Policies PD3 and PD4 apply to all local authorities that have part, or all, of a high-growth urban area within their district or region.

Policy PD3 a) applies to all local authorities that have part, or all, of a medium-growth urban area within their district or region and choose to set minimum targets under policies PC5 to PC11.

PD3 b) and PD4 apply to all local authorities that have part, or all, of a medium-growth urban area within their district or region and choose to prepare a future development strategy under policies PC12 to PC14.

The application of these policies is not restricted to the boundaries of the urban area.

PD3: Local authorities that share jurisdiction over an urban area are strongly encouraged to collaborate and cooperate to agree upon:

a) The specification of the minimum targets required under PC5 and PC9 and their review under policies PC6, PC7 and PC10; and

b) The development of a joint future development strategy for the purposes of policies PC12 to PC14.

PD4: Local authorities shall work with providers of development infrastructure, and other infrastructure, in preparing a future development strategy under policy PC12.

Timeframes to implement this national policy statement

The timeframes for giving effect to particular policies in this national policy statement are as follows.

Objectives OA1 to OD2, policies PA1 to PA4 (outcomes for planning decisions), policies PC1 to PC4 (responsive planning) and policies PD1 to PD4 (coordinated planning evidence and decision-making) must be given effect immediately.

Local authorities that have part or all of either a medium-growth urban area or a high-growth urban area within their district or region shall begin to monitor indicators under policy PB6 within 6 months of this NPS coming into effect.

Local authorities that have part or all of either a medium-growth urban area or a high-growth urban area within their district or region shall begin to use indicators of price inefficiency under policy PB7 by 31 December 2017.

Local authorities that have part or all of a high-growth urban area within their district or region shall have completed the housing and business development capacity assessment under policy PB1 by 31 December 2017.

Local authorities that have part or all of a medium-growth urban area within their district or region shall have completed the housing and business development capacity assessment under policy PB1 by 31 December 2018.

Local authorities that have part or all of a high-growth urban area within their district or region shall have produced the future development strategy under policies PC12 to PC14 by 31 December 2018.

Local authorities that have part or all of a high-growth urban area within their district or region shall have set minimum targets in their relevant plan or regional policy statement under policies PC5 and PC9 by 31 December 2018.

Local authorities with part or all of an urban area in their district or region that, through revisions to the Statistics New Zealand medium urban area population projections for 2013(base)-2023, comes to be defined as either a medium-growth urban area or a high-growth urban area, shall give effect to the requirements by the dates set out above with the following exceptions:

- Local authorities with part or all of an urban area in their district or region that is newly classified as a medium-growth urban area shall begin monitoring indicators under policy PB6 and using indicators of price efficiency under policy PB7 by 31 March 2018.
- Local authorities with part or all of an urban area in their district or region that is newly classified as a high-growth urban area shall complete the housing and business development capacity assessment under policy PB1 by 30 June 2018.

Review of this national policy statement

The Minister for the Environment intends to review and amend the definitions of high-growth urban area and medium-growth urban area no later than 31 December 2018.

The Minister for the Environment intends to review the implementation and effectiveness of this national policy statement in achieving all its objectives and policies and in achieving the purpose of the Act, no later than 31 December 2021. The Minister shall then consider the need to review, change or revoke this national policy statement.

Regulatory impact statement

The Ministry for the Environment produced a regulatory impact statement on 29 September 2016 to help inform the decisions taken by the Government relating to the contents of this instrument.

A copy of this regulatory impact statement can be found at:

- http://www.mfe.govt.nz/more/cabinet-papers-and-related-material-search/regulatory-impact-statements/ris-proposed-nps-urban
- http://www.treasury.govt.nz/publications/informationreleases/ris

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: **Report by Office of the Prime Minister's Chief Science Advisor: *New Zealand's fresh waters: values, state, trends and human impacts***

Approved by: G K Bedford, Director-Environment Quality

B G Chamberlain, Chief Executive

Document: 1859695

Purpose

The purpose of this memorandum is to advise the Committee of the release of a report on *New Zealand's Fresh waters: values, state, trends and human impacts*. The report has been prepared by Sir Peter Gluckman, the Prime Minister's Chief Science Advisor (PMCSA), and his office. The report is in two main sections. The Summary Report is attached to this memorandum, while the Technical report (and a digital version of the Summary report) are available at www.pmcsa.org.nz .

There will be a presentation on the report during today's meeting.

Executive summary

The release of the PMCSA report has followed closely on, but is independent of, the preparation and recent release of separate reports on water quality in New Zealand by the Parliamentary Commissioner for the Environment[1] and the Ministry for the Environment[2], as well as the government's 'Clean Water' discussion document (see agenda of 2 May 2017). The report has been prepared to speak into the *'increasingly complex and at times confusing public discourse about fresh water'* (Foreword).

The report is a well-informed and very informative discussion of the state of and trends in measures of fresh water in New Zealand; the importance of water within New Zealand's life, culture, and economy; the history of water use; the broad issues caused by industrialisation, agricultural intensification, and urbanisation; interventions and their effectiveness, and perspectives on what the future might look like. It provides a very useful primer as the Council looks ahead to finalisation of and public discussion around the next Freshwater Plan for Taranaki.

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1 Next steps for fresh water submission, Parliamentary Commissioner for the Environment, April 2016
[2] *Our fresh water 2017*, Ministry for the Environment/StatsNZ, April 2017. See separate item in today's agenda

Recommendations

That the Taranaki Regional Council:

1. receives this memorandum noting the release of a paper by the Prime Minister's Chief Science Advisor on the issues surrounding fresh water in New Zealand
2. receives the report *New Zealand's fresh waters : values, state, trends and human impacts*
3. notes the strong alignment between much of what the Council is undertaking or promoting for environmental management of fresh water, and the stance taken by Sir Peter within the report to address environmental issues.

Background

The Foreword to the paper notes that fresh water is an issue on the minds of many New Zealanders. Accordingly, the office of the PMSCA undertook to prepare and release a paper explaining the issues surrounding the state of fresh water in New Zealand. The paper (and indeed the PMSCA's office) is independent of the government and its ministries and policies.

The paper was prepared with assistance from senior scientists within NIWA. The paper consists of brief questions and answers, intended to provide a rapid insight into the matters of the highest public interest; then a summary report (written with input from the chief scientists of MfE and DoC) to outline core issues that have implications for policy development; accompanied by a more technical and scientifically referenced document that reviews both the state of fresh water in New Zealand, and matters related to restoration and remediation.

Discussion

A number of key points are made by Sir Peter:-

- all human activity affects water quality, and water quality in New Zealand has been impacted ever since the very first arrival of humans and their accompanying animals and plants;
- effects occur across urbanisation, industrialisation, and agriculture;
- hopes of rapid restoration are unrealistic and indeed scientifically impossible;
- there will be no silver bullets- NZ needs multiple actions that will require multiple partnerships;
- the protection of water resources is a 'wicked problem' involving complex science intertwined with a range of stakeholder values and interests that can never be fully aligned;
- he frames water quality in terms of measures of ecological health;
- water quality and its definitions and standards need to be nuanced, taking into account uses, acceptable risk levels, recognition of seasonality and extreme events, and the very diverse range of freshwater systems across regions. Sir Peter notes the need for '*locally-relevant objectives for water quality and ecosystem health. The differences in waterbody character greatly influence management actions and their outcomes*';
- determining acceptable levels of nitrogen and phosphorus is complex because different situations (eg light/shading, river flow regimes, river bed type, lake type) influence the response of algae and lead to one or other of the nutrients being the limiting factor for the growth of plants and for determining the trophic state;
- water quality patterns are strongly related to the local catchment environment (topography and land cover and land use). For example, while the MfE 'Our fresh water 2017' report (see elsewhere in today's agenda) makes generalised statements about nitrogen trends degrading in pastoral land uses, Sir Peter notes nitrogen

losses reducing across most of the North Island while increasing in some specific areas of the South Island;
- the fundamental ecosystem health issue is whether nutrients (in combination with local environmental factors) is triggering excessive phytoplankton growth (blooms within the water column) or excessive periphyton (slime on stream beds); these potential effects vary considerably between catchments; and
- many fresh water systems are under increasing stress. Overall there is a mixture of both positive and negative trends; there is evidence that restoration efforts are having some positive effects. Phosphate and ammonia levels in urban and in pastoral areas are now improving, but degrading trends outnumber positive trends for nitrate and total nitrogen. Visual clarity and *E coli* levels are improving in some areas but progressively deteriorating elsewhere.

In terms of some particular matters amongst the many addressed, Sir Peter describes the measures of physical-chemical variables such as nutrients as stressors (rather than measures of state); that is, they do not directly measure ecosystem health. Sir Peter notes the use of the macroinvertebrate community index (such as extensively used by this Council) as a measure of ecosystem health.

Sir Peter devotes some considerable space to the subject of swimmability, exploring the government's recent proposals. He notes that it is logical to have a swimmability rating system that accounts for extreme events and that focuses on the anticipated range of measurements at the times when people are likely to be swimming. He notes that storm events in particular can lead to temporary high counts due to runoff or overload. He notes that the government's proposed criteria would require sampling during times when contamination is likely and swimming is not. Sir Peter states *'it is logical to have a rating system that considers the possibility of such extreme measures and focuses on the anticipated range of measurements when swimming is likely*'.

In the Summary Report, Sir Peter notes that there are actually multiple dimensions to swimmability, including depth, temperature, current strength, visual appeal (clarity and colour), the absence of nuisance weeds or algae, and human health risks from microbial pathogens or from toxic algae.

This mirrors closely the Council's position on the swimmability proposals.

Sir Peter makes no comment on whether riparian fencing (as proposed for regulation by the government) will actually assist in achieving the government's swimmability targets. He notes rather than the requirements for very low median *E coli* values as targets to be attained in our rivers will force overall and progressive improvements in the safety of fresh water for swimming. 'M*aking rivers safe for swimming in intensively farmed areas that do not currently meet proposed swimmability guidelines will require a commitment to changing farming practices and implementing mitigations. After these changes are made, there may still be times eg after rains when it may not be wise to swim*'.

In terms of fresh water monitoring regimes (the Committee will recall that the government's proposals for swimmability monitoring would impose an onerous monitoring regime that is to be implemented at the times when people are most unlikely to be swimming), Sir Peter's comments stress that monitoring should be fit for purpose and based on when and where information is required. '*It is a matter of considering the priorities for monitoring, the values placed on the resource, the geography of the catchment and the activities that occur within it, in planning a robust monitoring regime*'.

In terms of what is being done to improve water quality, Sir Peter notes that there are '*proven methods and technologies for reducing stresses imposed on freshwaters, including:*

- *protecting and restoring riparian zones and wetlands… this includes riparian planting and fencing to keep livestock out of waterways*.'

The technical report has several lengthy sections on the virtues and benefits of riparian zones, particularly for in-stream ecological health enhancement. It concludes '*The management of vegetation and disturbance in riparian areas is therefore important to control impacts of land use on aquatic ecosystems*'.

Sir Peter goes on:-
'*Efforts such as the Taranaki Riparian Management programme, begun in the early 1990s with ratepayer support, is a voluntary scheme that entails a significant investment for farm owners, but offers a choice to take the lead in environmental stewardship rather than wait for regulatory enforcement*'.

This endorsement of the Council's policies and implementation actions around water quality improvement is welcome, although entirely consistent with any number of scientific studies including regional investigations within demonstration catchments, as from time to there are activist naysayers over this approach.

In terms of the issues around nutrient standards, Sir Peter offers what could be interpreted as a note of caution: having examined a number of situation where high nutrient levels can be associated with low periphyton biomass, or vice versa, he goes on '*These dynamics, and between-river variations in other influences including flow regimes, shade (and water temperature), bed stability, and grazing by benthic herbivores, lead to high variation in nutrient/periphyton relationship (Larned, 2010) and high uncertainty in statistical models used to predict periphyton biomass from these combined influences (Snelder et al, 2014). As a consequence, location-specific studies and location-specific nutrient targets are needed to effectively manage periphyton. This is very complex and difficult from a management perspective….. Riparian shading in small-medium streams and flow regime management can also support eutrophication control'.* In discussing whether nutrient limits can control eutrophication, Sir Peter notes that '*given that trophic status can vary spatially and temporally due to a number of dynamic factors including climate, flow, geology, soil composition, and biological processes, this is now considered to be overly simplistic*'.

The report reviews options for on-farm management of nutrients, and the relationships between losses from individual farms and the potential for cumulative downstream effects (while stressing that consequences and effects are catchment-specific). Perhaps notably in the light of the tone of the usual national conversation around drivers of water quality being predominantly agricultural, Sir Peter also spends some considerable space outlining the adverse consequences of urbanisation, providing a number of examples of such impacts across New Zealand. Pest invasions (weeds, fish, algae) are also noted and reviewed.

Sir Peter stresses the need for policies to be evidence-based and scientifically robust.
'*Freshwater science advice is increasingly sought in the area of catchment management and catchment-scale planning for development of regional policies and plan rules. Evidence-based policy development is important, recognising that there is a need to consider how scientific advice on improving water quality and ecological health is placed alongside advice on the economic, social, and cultural aspects of implementing that advice*'.

Sir Peter concludes '*We are often dealing with legacy effects and cumulative effects, exacerbated by new urban or agricultural developments. Even where restoration has occurred, this is generally not to the original state, not can it generally be, given the fact that humans and terrestrial mammals are only recent arrivals in Aotearoa. As New Zealanders, we want a vibrant economy, a quality environment, and preserved natural heritage- and there are no simple solutions'*.

Officer comments

The paper from the PMSCA comes across as a carefully considered, well-researched, and authoritative examination of the state of and trend in water quality in New Zealand. Although relatively brief, it has a broad scope (and nuanced differentiations) in history, land use, and geographical perspectives. It makes it plain that all parts of society contribute to the water quality issues the country is facing. By including analysis of the range of interventions that are underway, it offers a more informative view that that which is apparent in the more restricted water quality environmental report just released by the Ministry for the Environment (see separate item in today's agenda). The science that is offered emphasizes that superficial analysis and glib and simplistic solutions will do little to advance fresh water management in New Zealand. There is strong alignment between much of what the Council is undertaking or promoting, and the stance taken by Sir Peter at a number of points. The Council will find much in the paper that validates the Council's approach as set out in its policy and regional plan statements and working papers.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Document 1859675: *New Zealand's fresh waters: Values, state, trends and human impacts*. (Summary Report), Office of the Prime Minister's Chief Science Advisor, Professor Sir Peter Gluckman, April 2017.

New Zealand's fresh waters:

Values, state, trends and human impacts

Summary report

INTRODUCTION

Fresh water[2] in Aotearoa/New Zealand is a taonga – a treasure of great cultural, environmental, social and economic significance. Having healthy freshwater systems is absolutely vital to our wellbeing. Despite this status, the quality of our fresh water in many places has become a significant concern for many stakeholders. Demands on our freshwater systems continue to increase.

Less than 800 years ago Aotearoa/New Zealand had no terrestrial mammalian inhabitants. Today 4.5 million humans and many millions of terrestrial mammals make this land their home: the impact of this transition on our waterways has been profound.

The drivers of change are complex and inter-related, and the impacts are cumulative over many decades. Human involvement through changed land-use, the development and then recent intensification of pastoral agriculture and progressive urbanisation and industrialisation have all played their role. The state of our fresh water is a consequence of this social and economic history. Preventing further degradation, protecting and enhancing water quality and ecosystem health, and addressing the likely impact of climate change are priorities for New Zealanders. The required management responses are complex, time-dependent, sometimes uncertain, and will be costly.

Because of its all-encompassing nature and wide range of stakeholders, debates over water use and quality are inevitable. The issues around using and protecting our water resources are 'post-normal' in nature, also referred to as 'wicked problems' involving complex science intertwined with a range of stakeholder values and interests that can never be fully aligned. National and regional standard setting, regulation and consenting must take the science into account while finding a point of equilibrium between these very diverse perspectives and interests.

To ensure better informed debate and policy discussion in this contentious area, it is helpful to assess the current state of fresh water, the scientific understandings of the factors underlying changes to water quality, and the approaches to remediation that policy makers and the public might consider. With better and broadly based understandings, more informed decisions on freshwater issues can be made – decisions that will be widely understood and supported, and that will be underpinned by good science. We have an opportunity and an obligation to make things better, but doing so isn't easy.

This summary report draws out the core points from the extensive data and commentary provided in the accompanying technical report.[3] It is not the purpose of this paper to enter into political debate, but rather to assist New Zealanders through what is a complex and often contentious set of issues involving inevitable scientific uncertainties and unknowns that can create reasons to avoid addressing the necessary solutions.

2 For the purpose of both this summary report and the full technical report, fresh water is defined as 'all water except coastal and geothermal water', in accordance with its definition in the Resource Management Act 1991.
3 New Zealand's fresh waters: Values, state, trends and human impacts. Technical report (this volume, pp.1-67)

This set of reports has had a long gestation and has been developed independently of work that has led to the recent release of a consultation document on the 'Clean Water: 90% of rivers and lakes swimmable by 2040' goal[4]. However given that the 'Clean Water' package is out for consultation, the Office of the Prime Minister's Chief Science Advisor (OPMCSA) has given priority to accelerating completion of this report before that consultation period is complete. The attached technical report was prepared in early draft form by freshwater scientists at the National Institute of Water and Atmospheric Research (NIWA), but since then has been subject to extensive review and rewriting by the OPMCSA, informed by a number of freshwater academics and the relevant departmental science advisors. It was also subject to independent peer review. The technical report has been intentionally written in a form to be fully accessible with extensive referencing.

This paper is independent of, but complements the "Our Fresh water" report to be published at the end of April 2017, within the regular series of reports produced by the Ministry for the Environment and Stats NZ under the Environmental Reporting Act 2015.[5] That report will follow the specific requirements of the Act, and will report on the state of our freshwater environment, the pressures that affect the state, and how this state influences aspects of the environment and our well-being. The present paper and underlying technical report take a broader and more explanatory approach, presenting the science relevant to the condition of our fresh waters and to restoration of water quality.

FRESHWATER VALUES

Fresh water contributes greatly to our economy, and is highly valued by New Zealanders for cultural, social and recreational reasons. Indeed it is an inherent part of our national identity. The provision and benefits of fresh water to meet economic, social, cultural and environmental needs are referred to as 'ecosystem services', and include water for:

- intrinsic cultural value and a source of mahinga kai;
- potable water supply and household use (bathing, toilets, cooking, gardening, etc.);
- economic uses (agriculture (irrigation and stock use); industrial use; hydroelectric energy generation; fisheries; tourism);
- recreation and social amenity; and
- sustaining our indigenous biodiversity, which in turn delivers its own set of ecosystem services.

All consumptive uses of water have some impact on the freshwater environment, even where water recycling is involved. Some non-consumptive uses have serious impacts through introduced biota, changing water chemistry or hydrology, and other effects on ecosystem services. With increasing use and demand for fresh water, it becomes harder to reconcile varying interests of households, agriculture and industry, and of communities that require other values be catered for, including those of conservation, recreation, tourism and of iwi.

4 Ministry for the Environment; Clean Water package 2017. http://www.mfe.govt.nz/fresh-water/freshwater-management-reforms/clean-water-package-2017

5 New Zealand Legislation: Environmental Reporting Act 2015 http://www.legislation.govt.nz/act/public/2015/0087/latest/DLM5941105.html?search=taactEac%40ainf%40anifan%40bn%40rn_25_a&p=2

CULTURAL VALUES

The national significance of fresh water for all New Zealanders is recognised in the National Policy Statement for Freshwater Management (NPS-FM), as is *Te Mana o te Wai*. Safeguarding the health of the water (*te hauora o te wai*), the health of the environment (*te hauora o te taiao*) and the health of people who come in contact with the water (*te hauora o te tāngata*) are essential objectives of the NPS-FM that support high-level 'national values' for fresh water – they are fundamental to meeting the needs of the nation and of all its citizens.

Water is a taonga to Māori; it is a source of mahinga kai[6] and it carries a life force (*mauri*). This is reflected in the concept of *Te Mana o te Wai* - the innate relationship between *te hauora o te wai* (the health and mauri of water) and *te hauora o te taiao* (the health and mauri of the environment), and their ability to sustain *te hauora o te tāngata* (the health and mauri of the people).

The mauri of water is now being embodied in Treaty of Waitangi settlements; for example the Whanganui River Deed of Settlement of 2014 and the recent Te Awa Tupua (Whanganui River Claims Settlement) Bill (2017)[7], which focuses on the river and recognises the river as a being. Water is viewed, with land, as a total system - *Ki uta ki tai* (mountains to sea) which should be managed within this framework. However, current management practices are not necessarily aligned to such a framework, so it is not surprising that many within the Māori community

continue to express concerns about the state of fresh water generally, about mahinga kai, and about important places like the Whanganui River and Te Waihora/Lake Ellesmere, which to them are a major concern.

POTABLE WATER SUPPLY AND URBAN USE

Potability, or suitability and safety for drinking is an expectation New Zealanders have of the water that comes out of their taps. Some towns and cities get their potable water from surface water (reservoirs and rivers) and others use a groundwater (aquifer) source. Of the water allocated for consumptive use, 8% is allocated to potable supply. The reliability of this supply is generally high, but it faces increasing pressure from rising demand as the population grows (which puts pressure both on supply and on the treatment and distribution infrastructure), and from insufficient storage capacity to cope with droughts.

Municipal supplies sourced from surface waters are invariably chlorinated to treat for pathogens, whereas those sourced from groundwater aquifers may not necessarily be treated, because where groundwater is overlain by layers of materials of low permeability, such as clay, the risk of contamination is considered to be extremely low. However, the 2016 contamination of groundwater-sourced water in Havelock North (possibly via contaminated surface water entering through bores) highlights the importance of careful monitoring and management of all aspects of the water supply system. The event raised questions about whether the expectation of potability is being met adequately throughout New Zealand. Even Christchurch, generally perceived to be home to New Zealand's highest quality drinking water, is now having to chlorinate some of its water, in the face of earthquake-related infrastructure issues.

6 Mahinga kai refers to the production and gathering of all foods and other natural resources, as well as the areas from which they are sourced.
7 New Zealand Legislation http://www.legislation.govt.nz/bill/government/2016/0129/latest/DLM6830851.html?src=qs

Urban use extends to household, gardening and commercial use, and council use for irrigation of sports fields, etc. Even though not all of this needs to be treated water, in general the same supply and distribution system is used; only a few individual organisations and dwellings have separate rainwater collection and storage for non-potable use.

ECONOMIC VALUES

Water for agriculture

Water is vital to our primary industries-based economy. In regions like Canterbury, Hawkes Bay, Tasman, Marlborough and Central Otago, water is relied on for irrigation purposes, sourced from both underground and surface supplies. But water is not just used by agriculture, viticulture and horticulture for irrigation – since the 19th century it has also been used for stock watering, and is used extensively in dairy farming for activities other than just growing grass (e.g. cleaning of milking sheds and equipment). Demand for irrigation water is high in spring and autumn for cropping farmers, but also in summer for dairy farmers as they seek to extend the 'spring flush' of grass growth.

Water for industrial use

Industrial use of water for some industries (e.g., steel, horticulture, dairy and meat processing, manufacturing) has high value returns, often with relatively low commercial costs as the water is of sufficient quality to be used without treatment prior to use. However, there are potential environmental costs in terms of water quality impacts from industrial discharge.

Water for energy production

Fresh water is used in hydro-power operations that generate over half of New Zealand's total electricity supply. Water for hydroelectric power is of high economic value for meeting energy needs while reducing carbon emissions, and although this is considered to be non-consumptive use, it is not without environmental impact. For example, impoundments (e.g. dams) turn rivers into lakes that slow the movement of water and facilitate the growth of phytoplankton[8]. In some large New Zealand rivers the natural flow regime has been altered, with impacts on natural ecosystems and aquatic and terrestrial habitats both upstream and downstream of hydro dams. Birds that rely on braided rivers (e.g., wrybill, black stilt, black-fronted terns and black-billed gulls) are particularly vulnerable to the effects of flow alteration by hydropower operations, and dams often impede the passage of fish that require access to the sea. Our beloved beaches and coastlines rely on a constant supply of sand that is generated from rocks and gravel that move from mountains to sea through our rivers. Interrupting the natural supply can result in coastal erosion effects, which in turn may require engineering interventions. All hydropower schemes in New Zealand operate under resource consents generally aimed at both minimum flow protection and the maintenance of some flow variability. Some schemes (e.g., in the Mackenzie Basin), however, are not necessarily bound by such conditions, but are instead subject to complementary mitigation agreements.

Freshwater fisheries

Lakes and rivers (and their associated estuarine systems) are important for freshwater-based fisheries in New Zealand. Native fisheries include customary iwi fisheries, and recreational and

8 Phytoplankton are microscopic algae and cyanobacteria suspended in the water column and are able to produce oxygen through photosynthesis.

commercial fisheries for whitebait and eels. There is mounting concern about the state of some whitebait species and long-finned eels. Habitat loss, often a function of alteration of river flows and drainage of wetlands, is a particular concern for whitebait in the lower spawning reaches of many systems.

New Zealand is world renowned for its introduced trout, and to a lesser extent its salmon fisheries. These fisheries are recreational but also have an important international and domestic economic value for tourism. In recent times there have been declines in lowland trout fisheries in particular, associated with land use intensification and water loss.

There are many native fish species that have no recreational or commercial value, but they have high conservation value. Many of these are at risk, especially those found in Central Otago and the Mackenzie Basin. Once again habitat loss is an important threat, but so too are predation and competition from introduced trout and other predatory fish.

Tourism

Healthy waterways are critically important economically for tourism, which was New Zealand's largest export industry in 2015. A substantial proportion of domestic and international tourist activities in New Zealand occur in or adjacent to fresh water, especially in places like the central North Island, Mackenzie Basin and southern New Zealand including Queenstown – where wild and scenic rivers and streams are used for 'adventure' tourism – but there is also tourism values associated with some urban rivers like the Avon in Christchurch.

RECREATIONAL/SOCIAL AMENITY

Socially, our water bodies and their physical diversity provide a resource for many different (mainly recreational) users. It is hard to know what the most popular use of fresh water for recreation is, but clearly swimming, boating (jet-boating, kayaking and canoeing), fishing (for trout and salmon and whitebait mainly), and picnicking are the main uses. All of these values have been impacted over time, negatively in many places, by water and land resource development. This is most notable in lowland streams used for angling, in many lowland rivers and streams used for swimming, and in some rivers used for jet-boating and whitewater kayaking. Dams have created new resources for some activities, but at a cost to other activities: e.g., whitewater kayaking needs rapids and gorges; flatwater kayaking typically occurs on lakes and downstream sections of rivers.

Of these activities, perhaps the one that garners most attention is swimming, with freshwater quality often becoming synonymous with "swimmability" (see **Box i**). Unfortunately because of the multiple dimensions to measuring water quality, this is a complex concept. Several factors are relevant to considering whether a particular location is suitable for swimming, including depth, temperature, current strength, visual appeal (clarity and colour), the absence of nuisance weeds or algae, and human health risks from microbial pathogens or toxic algae.

It is important to understand that the swimmability measures in Box i do not include all the measures of water quality that regulators must take into account in managing the fresh-water domain. The swimmability measures are defined around human health considerations with activities likely to involve full immersion into the water. A much broader range of considerations and measures is needed to manage for potability, extraction for agricultural, industrial and urban uses, and ecological and aesthetic considerations. These other measures assess the ecological health of the river or lake and whether, for example, the concentrations of nutrients (nitrogen and phosphorus) are within acceptable levels.

Box i. What is meant by "Swimmability"?

A range of characteristics need to be considered when assessing a water body's suitability for swimming, including depth, temperature, current strength, visual appeal (clarity and colour), the absence of nuisance weeds or algae, and human health risks from microbial pathogens or toxic algae. Microbial pathogens in the water can enter the body by ingestion, or through the ears, nasal passages, mucous membranes or cuts in the skin, and can cause gastrointestinal illness, respiratory symptoms, or more harmful diseases like hepatitis A. Microbial contamination is a concern in in both rivers and lakes, whilst the presence of toxic cyanobacteria is primarily a concern of lakes.

Suitability for swimming - assessing microbial contamination

The test used to assess the presence of pathogens in New Zealand freshwater systems is detection of *Escherichia coli* (*E. coli*). Detecting *E. coli* signals the presence of animal or human faeces in the water, and the likelihood that other harmful water-borne pathogens such as *Campylobacter*, *Cryptosporidium*, *Giardia*, hepatitis A viruses, and Salmonellae may also be present. Faecal contamination from animals can occur via runoff from farms during rainfall events, or if animals have direct access to waterways. Human faecal contamination of waterways can occur via poorly treated sewage or septic tank systems, or during heavy rain when sewerage systems cannot cope and they overflow into stormwater systems. Because of these heightened health risks from runoff and stormwater, people are often advised to avoid swimming for 48 hours after prolonged or heavy rain.

There are two distinct components to assessing the suitability of a site for swimming – grading and surveillance. Grading assesses the general suitability of a site for swimming over the long term (and uses long term monitoring to determine that) whilst surveillance assesses the suitability of a site for swimming in the short-term (is it OK to swim today?). Surveillance also reduces the risk of selective assessments and allows for long-term trend assessment to ensure that there is progressive improvement at sites that are not optimal. Guidelines established by the Ministry for the Environment and the Ministry of Health in 2003 included both grading and surveillance, whilst the National Policy Statement for Freshwater Management (NPS-FM) 2014 considered only grading. The proposed changes to the NPS-FM included in the 2017 'Clean Water' consultation package brings both grading and surveillance together again, with proposed surveillance criteria being numerically identical to the 2003 guidelines for microbial water quality.

Under the surveillance criteria, during the swimming season authorities should warn against swimming when *E. coli* levels in rivers and lakes are detected at a concentration at or above 540 counts per 100 millilitres (ml). Such a sampling result indicates that the water, at that time, has exceeded the upper level of contamination that is considered acceptable for swimming – beyond this threshold the risk of infection from full immersion can be more than 5%. To ensure that risk remains low, the surveillance criteria also specify that if *E. coli* concentration on a given day exceeds 260 per 100 ml, daily sampling is required until the concentration falls below 260. Because storm events in particular can lead to a transient high count due to faecal runoff and/or wastewater overload, it is logical to have a rating system that considers the possibility of such extreme measures and focuses on the anticipated range of measurements when swimming is likely.

In order to ensure an overall low level of risk for swimming in a particular water body, standards have been established that require the level of *E. coli* to be well below the 540 /100ml swimmability threshold most of the time. This is one aspect of the grading criteria. Importantly, the use of a guideline that includes a low median value (which means that half of measurements made at a site must be below that level) is an effective way of putting an obligation on waterway management to reduce continual or repeatable sources of contamination to generally very low levels. The 2017 'Clean Water' package proposes that all 'swimmable' water bodies should have a median *E. coli* concentration of no more than 130 /100ml. The risk of infection at this level is extremely low (approximately 0.1%, or 1 in 1000 exposures). This means that at least 50% of the time, even in rivers that are only graded as 'fair' (yellow or C grade category in the NPS-FM), there is very low risk to swimmers.

Rivers are also graded on how often they exceed a level of 260 *E. coli* per 100 ml – a level conferring between 0.1 and 1% risk. For the proposed gradings the *E. coli* level must be lower than 260 /100ml at least 70% of the time and below the 540 /100ml threshold at least 90% of the time for a 'good' (green or B grade) rating. An 'excellent' (blue or A grade) rating requires 80% below 260 and 95% below 540 /100ml. Overall, this proposed grading would mean that the risk across all time (disregarding weather events or other risk factors which would reduce the likelihood of swimming in any case), the risk of infection from contact in rivers graded as 'swimmable' is very low. For example, the risk would be approximately 1% for an A grade river, and if one knew nothing else and could swim at any time, but in practice the risk will be much lower because the highest risk would be at times when swimming is least likely.

Box i. (continued)

Swimming in lakes - assessing toxic cyanobacteria

Councils monitor lakes, with a focus on popular recreational sites, for presence and amount of the planktonic cyanobacteria, which can produce a variety of toxins. For a lake to be considered safe for swimming, in addition to meeting the requirements for *E. coli* as for rivers, potentially toxic cyanobacteria cannot be present in quantities that could harm people's health.

Assessments of lake state and trend for toxic algae are based on total cyanobacterial biovolume. If potentially toxic cyanobacteria are present, the threshold level for contact recreation (e.g. swimming) is a cyanobacterial biovolume >1.8 mm^3/L. These guidelines are based on the assumption that all species of cyanobacteria in the lake are toxic, which might not be the case. This is precautionary and is likely to suggest a higher risk in some situations than actually exists. If no known toxin-producing species are detected on further investigation, the upper limit is 10 mm^3/L biovolume.

When cyanobacterial biovolume exceeds guideline levels, the lake is more actively monitored and warnings are put in place. If an algal bloom is suspected, swimming is not advised, and dogs should be kept on a lead – accidental consumption or exposure to the water could be harmful.

Another concern about water quality regards the safety of domestic animals, including dogs, because *Phormidium*, a potentially toxic cyanobacterium that is generally associated with low- flow conditions in streams with compromised water quality, appears to be becoming more widespread.

INTRINSIC ENVIRONMENTAL AND CONSERVATION VALUES

At a more fundamental level of ecosystem services (i.e., not just the services of direct benefit only to water users), freshwater systems perform filtration, flood control, nutrient cycling[9] and carbon sequestration[10] functions.

New Zealand freshwater systems are naturally diverse, reflecting the diversity of the landscapes they are located within. High proportions of our freshwater invertebrate, fish and bird species are not found elsewhere in the world (endemic), including many species that are classified as threatened or at risk[11] (notably 28% of native fish species).[12] This uniqueness brings with it both conservation responsibilities and the need for application of local research and knowledge to protect them. Many of these endemic species are vulnerable to changes in environmental conditions, and concerns exist about their resilience to current and future pressures.

From a conservation perspective, many of New Zealand's rivers (especially the eastern South Island's large braided rivers) are biodiversity hotspots for endemic and threatened species of birds (e.g., black-billed gull, black stilt and wrybill – the only bird in the world with a beak curved to the side) and for many species of plants and terrestrial invertebrates (e.g., the robust grasshopper). They also play an important role as hosts for migratory birds globally. Some of these rivers and many others around the country are important native fisheries habitats, including the culturally important whitebait and eel fisheries. Lowland lakes, notably Te Waihora (despite its hypertrophic state[13]), are also important for birdlife.[14] Even our groundwater resources contain life – over 100 invertebrate species live in aquifers, and are believed to play an important cleansing role for the water in those aquifers

9 Nutrient cycling is the movement and exchange of nutrients (elements) from organic and inorganic matter back into the production of living matter.

10 Carbon sequestration is a natural process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. For example, freshwater wetlands act as 'carbon sinks' because their plants absorb carbon dioxide from the atmosphere through photosynthesis, and standing water reduces respiration of that carbon dioxide back to the atmosphere.

11 The conservation status of native species is assessed by the Department of Conservation according to the risk of extinction they face within New Zealand. http://www.doc.govt.nz/nature/conservation-status/

12 Conservation status of New Zealand freshwater fish. Allibone, R., et al. (2010). *New Zealand Journal of Marine and Freshwater Research*, 44, 271-287.

For all of the species and communities in rivers, lakes, wetlands and groundwater, their habitat is being affected in ways that impact conservation efforts. We know this because we can count birds (and they are declining in many places), we can measure the health of the aquatic invertebrate community in rivers via the Macroinvertebrate Community Index (MCI),[15] and we have long term records of the distribution and populations of some fish species.

MONITORING NEW ZEALAND'S FRESHWATER SYSTEMS

Water quality can be defined in a number of ways. For New Zealanders, the issue of 'swimmability' is an important measure of the quality of a freshwater body (see Box i). But for freshwater systems, 'quality' relates not only to the state of the water itself; it encompasses the biological health of the system as a whole, and multiple measures are needed to provide a full picture (see Box ii).

Box ii. What is water quality?

Water quality as defined in this report refers to the physical, chemical and biological characteristics of a water body. These characteristics determine how and for what purpose water can be used and the species and ecosystem processes it can support. It includes such characteristics as pH (acidity), dissolved oxygen, suspended sediment, nutrients, *E. coli*, heavy metals and pesticides. It can also include key biological and biochemical variables, such as aquatic plant, invertebrate and fish composition, the abundance of algae, and oxygen demand. Multiple measurement variables are used in virtually all assessments of water quality, leading to a 'rich picture' of the state of the water body, describing those characteristics that are within 'healthy' ranges and those that are outside of these. In an attempt to rank sites and simplify communication, composite indices of water quality have been developed. While such indices provide a useful aggregate snapshot, they can also inadvertently disguise specific problems within a waterbody that need acting upon.

A number of 'variables', or indicators, are monitored to determine freshwater quality and ecosystem health. The 'trophic state' of a freshwater body is an important proxy for health relating to the levels of nutrients and plant growth (or plant *biomass*). A 'eutrophic' lake has high nutrients and high plant growth; 'hypertophic' is a more extreme state of nutrient enrichment. The trophic state is primarily determined by the concentration of nitrogen and phosphorus in the water, so these nutrients are key monitoring variables to determine water quality.

The major monitoring variables used to assess freshwater states and trends for rivers, lakes and groundwater are listed below. These variables are assessed against a scale of values ranging from those indicative of a healthy state (conditions of little or no stress to aquatic life) to those indicative of an unacceptable state (conditions of significant, persistent stress exceeding tolerance levels). When one or more variables have values nearing the unacceptable end of the scale, there is a risk of species loss and other negative ecological effects.

13 A hypertrophic state is a state of excessive productivity, with a high concentration of nutrients and very high primary producer biomass.
14 Te Waihora has the most bird species of any habitat in New Zealand, with 169 species recorded.
15 The Macroinvertebrate Community Index (MCI) is a community-level biological indicator of general river health based on the presence or lack of macroinvertebrates such as insects, worms and snails in a river or stream. The MCI assigns a score to each species or taxon based on its tolerance or sensitivity to organic pollution, then calculates the average score of all taxa present at a site.

The list of measures is considerable, reflecting the multiplicity of factors that can affect water quality and the multiple uses that water is put to. The most common measures include:

- **Physical-chemical variables**: temperature, acidity (pH), dissolved oxygen, nitrate-nitrogen (NO_3-N), a mmoniacal-nitrogen (N H_4-N), total nitrogen (TN), dissolved reactive phosphorus (DRP), total phosphorus (TP), lake-bottom dissolved oxygen (DObottom), visual clarity, and for groundwater, dissolved iron and manganese, electrical conductivity and total dissolved solids

- **Biological variables for rivers**: abundance and composition of periphyton (algae and associated organisms attached to rocks, fine sediment and plants), and a river health index based on benthic (bottom dwelling) invertebrates, which is known as the 'macroinvertebrate community index' (MCI)

- **Biological variables for lakes**: phytoplankton biomass (as chlorophyll-*a* concentration), the trophic level index (TLI) based on integrating chlorophyll-*a*, water clarity, total nitrogen and total phosphorus concentrations, and the lake submerged plant indicator (LakeSPI)

- **Wetland monitoring**: Where wetland monitoring occurs, itis mostly based on the Wetland Condition Index (WCI) which incorporates five ecological indicators: hydrological integrity, physiochemical parameters, ecosystem intactness, animal impacts, and dominance of native plants.

- **Public health risk**: Concentration of the faecal indicator bacterium *Escherichia coli* (abbreviated *E. coli*) is used as an indicator to assess risks of contamination by pathogens such as *Campylobacter*, *Cryptosporidium*, *Giardia*, Salmonellae and hepatitis A – and *E.coli* is therefore a standard measure for drinking water supplies, including groundwater.[16] River-bed periphyton mats are monitored in most river monitoring programmes because they can include the cyanobacterium *Phormidium*, which can produce neuro-muscular toxins (anatoxins). Levels of toxic planktonic cyanobacteria (often called blue-green algae even though they are not actually algae) are monitored in popular recreational lakes as the main criteria for determining their safety for swimming (see **Box i**).

Water quality monitoring is complicated further by what standards should be set, and how and where monitoring is to occur. For example, determining acceptable levels of nitrogen and phosphorus is complex because different situations (e.g., light/shading, river flow regimes, river bed type, lake type) influence the response of algae and lead to one or the other nutrient being the limiting factor for the growth of plants and determining the trophic state.

The science highlights a clear need to ensure long-term, repeated measurements through time at the same sites, and that the sites chosen need to be informative. Irrespective of any global goal that is set, most people want to know whether at any monitored site the water quality meets requirements for human and ecosystem health, and if it does not, that there is evidence of improvement over time. Given that any such goal can only be a reflection of the sum of sites monitored, the issue is to ensure a logic to where, when and how often monitoring is performed. This is complex in itself. Monitoring at the downstream-most point in a catchment can give an overall view of the catchment, but monitoring upstream can point to

16 Ministry of Health. (2008). Drinking-water standards for New Zealand 2005 (Revised 2008).

sites of potential contamination to allow for more targeted allocation of mitigation activities. It is not a matter of choosing a balance of upstream and downstream sites, rather it is a matter of considering the priorities for monitoring, the values placed on the resource, the geography of the catchment and the activities that occur within it, in planning a robust monitoring regime.

FRESH WATER IN NEW ZEALAND - PLENTIFUL BUT CAPRICIOUS

New Zealand's freshwater supply is driven primarily by the predominant westerly weather systems and the underlying physical geography of the country – these systems typically wet the West Coast with rain year round,[17] and dump snow in the mountains in winter. At the same time they leave much of the agriculturally and horticulturally productive east subject to highly variable rainfall, typically leading to drought conditions somewhere every year. But the topography of New Zealand, with its northeast-southwest oriented mountain ranges, also provides opportunity. As the West Coast gets very wet, especially in the South Island, so do the mountain catchments draining to the east. It is these catchments that supply over half of NZ's electricity needs and also provide for the irrigation needs of agricultural development. But these same rivers also deliver other services – for recreation and for conservation of endangered species of birds and fish. It is these rivers, along with rainfall and occasional snowfalls (on the plains) that help recharge the groundwater resources of the Canterbury Plains. There are lakes in many of the headwater catchments of the Southern Alps that are vital to the New Zealand tourism industry, but which also act as storage buffers for the downstream river flows; and downstream there are lowland lakes and wetlands, much reduced in area but vital for Māori cultural use and for conservation. The North Island has river systems that primarily have their origin either in the mountain chain that extends from Wellington to the East Cape, or in the volcanic plateau that is the origin of the Waikato and Whanganui – rivers of great importance across multiple domains.

Clearly New Zealand has abundant water resources, but not always in the right places at the right times for our needs. The eastern sides of both islands are far drier than the west, and the northern portion of the North Island can also be very dry (on occasion). As noted, especially in the South Island, large snow and rain-fed rivers flow to the east, but even these rivers have low-flow periods when they cannot meet all natural and human demands. Mid- to late summer (when peak snow melt is over and the country is in a more stable, sunnier weather pattern) and autumn are often particularly water-scarce times.

Despite the above challenges, on a per capita basis New Zealand has the second highest volume of renewable fresh water of all countries in the OECD[18] (107,527 m3/yr – around 43 times the amount of water in one Olympic swimming pool per head). We have 3800 large lakes (area >1ha) and more than 413,000km of streams and rivers (around 10-times the circumference of the earth). However the total per capita water use in New Zealand is also significantly higher than in most other OECD countries, partly because it is used in hydro-electricity generation, supplying approximately 60% of our electricity requirements, and from extensive use in irrigation.

17 Drought does occur occasionally on the West Coast, and fire restrictions have been implemented.

18 Organisation for Economic Cooperation and Development http://www.oecd.org/about/

We have extensive groundwater systems and aquifers, especially along the eastern sides of both islands and in the central North Island. Aquifers are "recharged" with water from rainfall soaking through ground overlying the aquifer, and from river water that flows from riverbeds into aquifers. A key feature of aquifers is residence time – the average amount of time that water stays in the system. Groundwater residence time assessments are useful for determining the amount of time it will take for a contaminant to reach a groundwater drinking water source or a surface water body, and will assist in calculating its likely concentration when it arrives. Depending on the depth, structure and location of the aquifer, this can vary from 5-10 years (e.g. Canterbury shallow aquifers) to 100 years or more (e.g. Lake Rotorua catchment), and there are implications for restoration from these variable residence times.

New Zealand's hydrological system also includes glaciers and snowpack, as well as significant wetlands, albeit only around 10% remain intact. Within this system, it is important to note the great diversity of catchment geographies, the types of river and their relatively short length, and a number of key rivers interrupted by dams. Our four largest river catchments (Clutha, Waikato,

Waitaki and Waiau) are all significantly affected by dam systems for power generation.

THE IMPACT OF CLIMATE CHANGE

Further pressure on our freshwater systems can be expected to arise as a result of climate change. The most likely scenarios arising from climate change will impact significantly on both where and when rain falls, and thus on river flows and the regional availability of fresh water. There are likely to be increased flows on the west coast of the South Island and in rivers draining the eastern flank of the Southern Alps, and decreased flows rivers on the east coasts of both islands, and in Waikato and Northland.

Other expected impacts on New Zealand's fresh water include:

- Greater variability over time in river flows, with increased frequency of extreme floods and prolonged droughts. The degree of this variation will be different across the country due to New Zealand's complex geography.
- Intensified stratification in deep lakes, and possibly intensified wind-driven mixing in shallow lakes.
- Changes in the distributions of native species, valued introduced species, and invasive pests, and in the timing and severity of phytoplankton blooms. Warmer habitats are likely to favour the colonisation and spread of invasive species.
- Increased need for water storage in eastern areas to meet irrigation demands that increase due to projected warming and drying.
- Salinisation of coastal wetlands as sea level rises and seawater reaches further inland.

THE STATE OF OUR FRESH WATER

New Zealand's freshwater resources, in terms of 'quantity' and quality, are in variable states, as summarised in **Table i**. We know about these states and these trends, and other states and trends reported here because of the monitoring undertaken in New Zealand, mainly by Regional Councils and by NIWA, but also by universities, the Department of Conservation, Fish and Game Councils and numerous others. The results of much of this monitoring are reported in Environment Aotearoa 2015[19] and can be found in individual catchment reports on the Land Air Water Aotearoa (LAWA) website (https://www.lawa.org. nz). The reliability of this information is ensured by a variety of quality assurance processes and by the public availability of most of the monitoring data. The Ministry for the Environment and Stats NZ will be releasing their freshwater domain report at the end of April 2017, which will include the latest data on states and trends.

Table i. State of freshwater resources in New Zealand (qualitative assessment)

Resource type	Current state and trend		Major pressures	Secondary pressures
	Quantity/ Area	**Quality**		
Snow and ice	• Declining	• Very good	• Climate change	
Lakes	• Lowland lakes - wetland edges drained, reducing in area	• Lowland lakes - severely degraded	• Agricultural intensification	• Farming • Urban development (for urban lakes)
	• Upland lakes - many modified by level control	• Upland lakes - very good	• Hydro-electric power	• Forestry • Invasive plants and fish
Rivers	• Large rivers - very mixed with some excellent and some very degraded and/or experiencing allocation impacts	• Large rivers - very mixed with some excellent and some very degraded (especially in the North island)	• Agricultural intensification • Urban development • Loss of connectivity	• Hydro power • Artificial barriers affecting fish migration • Flow regime changes
	• Lowland rivers and streams - many over allocated	• Lowland rivers and streams - many very degraded	• Agricultural intensification • Loss of riparian vegetation • Channelisation, loss of connectivity	• Urban development • Artificial fish migration barriers
Wetlands	• Over 90% of original wetlands lost	• Many in very degraded condition	• Agricultural intensification	• Urban development • Invasive weeds • Water level decline
Groundwater	• Increasing rates of depletion and reduced recharge in some regions	• Overall good but declining in many areas	• Agricultural intensification - extraction and water quality effects • Horticulture	• Urban development; • Climate change

19 Ministry for the Environment & Statistics New Zealand. Environment Aotearoa 2015 http://www.mfe.govt.nz/publications/environmental-reporting/environment-aotearoa-2015

The current, compromised state of some water bodies in New Zealand may be linked to agricultural development, to urban expansion or pollution, to hydroelectric development, or to the effects of drought. Major lakes in mountain catchment areas of the South Island, including Manapouri, Tekapo, Pukaki and Coleridge, have been negatively impacted from hydro-electric development. Most rivers, lakes and wetlands elsewhere have experienced some degree of negative impact by development, mostly agricultural in origin.

Associated with these resources are their linked values, often diverse and sometimes conflicting in terms of competing requirements. From a resource management and decision-making perspective, we need to think about what the various values and demands are, why they are important, what their current state is and how they might be changing, and what is driving the changes. These are big societal questions that can be informed by the science of water quality and assessments of trends.

TRENDS AND PRESSURES

The current state of our fresh water reflects the fact that all of the values that we ascribe to it have been compromised to varying degrees (see **Table ii**). The science is clear - New Zealand's fresh waters are under stress because of what we do in and around them. The impacts of our activities include:

- Modification and destruction of riparian habitats and wetlands due to drainage, flood control, and land development and intensification;
- Reductions in suitable habitat due to altered flow regimes caused by takes for irrigation, impoundment for hydropower, flood control, and water diversion for all of these;
- Effects on sensitive species and ecological processes due to river channelization and flood control works, elevated inputs of sediment, nutrients, bacteria and toxicants from point sources and diffuse runoff from land, particularly agricultural and urban land;
- Contamination by urban, industrial and agricultural activities;
- Introductions of invasive plants, invertebrates and fish that alter ecological processes and displace native species;
- Creation of barriers to native fish migration such as dams, culverts and flood control gates;
- Depletion of native fish populations due to habitat loss and fishing pressures;
- Cumulative effects of multiple stressors that can push ecosystems towards tipping points and increase resistance to recovery;
- Climate change impacts on flow regimes, groundwater levels, water temperatures, biotic invasions, and consequences for freshwater ecosystems.

Among this long list, it is clear that the major drivers of growing concern have been rural land use practices, industrialisation (power generation and discharges) and urban development. Pest invasions, (for example, the incursion of didymo into South Island rivers or koi carp into Waikato wetlands) have also had major impacts.

The real question we face is whether or not it is possible to sustain the economic gains New Zealand has enjoyed, but which are associated with increased water use, together with the cultural, conservation, recreation and other services our freshwater resources have historically afforded us.

Table ii. State and trend of freshwater values in New Zealand (qualitative assessment)

Value	Current state	Trend	Major driver of change	Secondary drivers
Conservation values				
Native birds	Mixed to good in mountain-fed rivers; poor elsewhere	Declining for braided river birds	Predators and weeds, habitat loss	Water abstraction[20] and hydropower
Native fish	Mixed to good in mountain-fed rivers; poor in pastoral and urban rivers. Canterbury galaxias at risk.	'At risk – declining' for galaxias, declining for whitebait and longfin eel, increasing for shortfin eel, torrentfish	Habitat loss – flows, access (migration barriers), water quality	Introduced fish
Aquatic invertebrates	Mixed to good in mountain-fed rivers; poor in many places elsewhere		Hydropower development	Land use/sedimentation
Wetlands	Estimated 10% remaining, many of degraded quality	Continuing net decline	Agricultural and urban development	Pests and weeds; hydrological modifications
Recreation values				
Swimming		Declining in places; static in others	Agricultural intensification/water abstraction Urban development	
Fishing		Declining of much of country, particularly in lowland areas	Agricultural intensification/water abstraction	Didymo in the South Island Continued expansion of invasive aquatic weeds in many areas
Jetboating	Good in most places		Hydro power and water abstraction	
Kayaking	Excellent in most places		Hydro power and water abstraction	
Drinking water values				
Potable, drinking, water	Mixed - good in many areas but moderate to degraded in parts of eastern SI and NI		Agricultural intensification Poor well-head management	Urban land use
Maori cultural expectations				
Mahinga kai; mana kaitiaki; taonga species	Depending on comparative historical measure, often very degraded, e.g., Te Waihora	Likely worsening in many places	Habitat destruction via multiple causes - farming and urban development mainly	Drainage, channelization and hydrological modification generally

Urban development

Although agriculture is the major driver of change in the state of our freshwater resources and values nationally, the urban environment is an important driver in some places. Urban pressure issues are not limited to the provision of adequate drinking water (e.g., the current debate over a water treatment plant in west Auckland), but also over the adequacy of sewerage and

20 Abstraction is the process of taking water from a river, groundwater or other source, either temporarily or permanently, for irrigation, industry, recreation, flood control or treatment to produce drinking water.

stormwater systems. Even generally adequate systems can be overloaded under extreme weather conditions, and deciding the capacity such systems need to have in order to cope with intermittent or rare events is complex, and the solutions expensive. Septic tanks in some recreational areas are another source of potential contamination if they are not maintained.

In Auckland historically, wetlands were drained and freshwater streams have been affected by activities such as infilling and loss of riparian vegetation, discharges of contaminants, sediment runoff and abstraction of water. Some of the most notable impacts have been observed in the city of Christchurch, where urbanisation has impacted its rivers for more than 100 years. The swamps of Christchurch are largely gone (although some are now being restored), the Avon and Heathcote rivers are heavily polluted by heavy metals and sediment, and there is an added issue of reduced flows due to groundwater level declines. Contact recreation guidelines in these rivers are almost always breached. Heavy metals, which also affect the Avon-Heathcote estuary, require considerable remediation. Heavy metal contamination in rivers is the result of both historical industrial practices (e.g. mining and smelting), weathering of roofs, and vehicle components such as brake linings (copper) and tyre fillers (zinc), that collect on impermeable surfaces and wash off during rainfall and runoff processes. These and other pressures create habitat and recreational issues. In time and with effort and community commitment, contact recreation standards should be achievable.

Agricultural intensification

Table ii indicates that the main drivers of change (typically decline) in values are linked primarily to agriculture and to its recent intensification (mainly dairying). First, and perhaps most obvious, are the detrimental changes to water quality. Livestock farming impacts on water quality are both direct and indirect, both of which are important in considering mitigation strategies.

Direct impacts occur through:

- Trampling and pugging of stream edges and wetlands, leading to increasing sedimentation and habitat loss;
- Defecation directly into water, contributing to high *E. coli* concentrations that can breach contact recreation guidelines. Management strategies are to fence off streams and/or build stream crossings.

Indirect impacts occur through:

- Application of fertilisers on land, which release phosphorus and nitrogen into water bodies via surface runoff and leaching. Phosphorus can be managed by planting at edges of streams, lakes, and wetlands [called riparian management], contour cultivation to avoid direct runoff of sediment which has phosphorus attached, and careful management of areas within farms that contribute or concentrate most of the runoff (called critical cource areas). Nitrogen losses from fertilizer can be managed by carefully matching application rates to plant requirements.
- Nitrogen entry into waterways from livestock urine. When cows and cattle urinate, they create nitrogen-rich urine patches and when it rains or when the ground is irrigated the water in which the nitrogen is dissolved flows downward through the soil into the groundwater system, often finding its way into surface water further down the catchment. Nitrogen is also present in surface runoff.
- Sediment - pastoral erosion produces more sediment in waterways than forested areas, affecting downstream coastal and estuarine areas by reducing water clarity. Harvesting of plantation forests also produces very high sediment run-off.

Nitrogen and phosphorus in water, in combination with other environmental factors such as light, flow, temperature and stream bed condition, contribute to growth of periphyton[21] or algae (including cyanobacteria). This growth is often prolific in summer in nutrient-rich environments – it can negatively affect swimming, angling and other recreation at times when it is present. Some algae, including several cyanobacteria species, can be toxic.

We know that faecal deposition, and phosphorus and nitrogen input, are problematic. However, *E. coli* contamination can be reduced through appropriate farm management practices and wastewater and stormwater treatment. And we also know that at low concentrations of phosphorus and/or nitrogen, we can limit algal growth to within acceptable levels most of the time.

The complications of maintaining acceptable levels of nitrogen and phosphorus are multiple and often interacting and cumulative – small amounts leaching from multiple properties add up to significant issues when they accumulate in downstream waterbodies. We measure these nutrient losses from farmland by the amount lost in kilograms per hectare per year. Low-intensity agricultural properties typically lose around 10 kg or less of nitrogen per hectare per year. High-intensity properties (e.g., some types of horticulture or an irrigated dairy farm on free-draining soils) can be lose more than 80 kg of nitrogen per hectare per year. We can measure these losses directly,[22] and we have models – most commonly known as nutrient budget models – that calculate estimates of nutrient losses at the root zone, and can also be used to identify potential environmental impacts. These models combine knowledge about soils, pasture or other vegetation type, land use, rainfall, and fertiliser input and work out a nutrient balance sheet of nutrient inputs and outputs. Any nitrogen or phosphorus loss can be thought of as a loss of a resource for the farmer, and ultimately as a potential loss of water quality in the receiving environment for all of us. Achieving a low nutrient-loss farming system requires careful land use and management practices, increasingly following industry-recommended 'good management practices'[23]. These include a variety of farm-specific tools and strategies that can be used to keep a farm within its nutrient budget. Some of these strategies are relatively cheap (e.g., matching fertiliser inputs to plant uptake requirements), whereas some can be very capital intensive (e.g., herd homes[24] for dairy cows).

There is obviously a critical relationship between the entry of nutrients from farms and other sources in a catchment into rivers, streams and groundwater, and the attenuation processes operating beyond the farm (e.g. uptake and transfer of nutrients in the riparian environment or in groundwater with low oxygen concentrations), affecting rivers and lakes downstream. The sum of nutrient losses from land can ultimately exceed the level at which the river or lake can cope before it becomes unacceptably affected by algal growth or nitrogen toxicity. For rivers another critical variable is the flow or amount of water in the river or lake, which influences dilution or the frequency of flushing flows. In general, the more water, the lower the

21 Periphyton are freshwater organisms including algae, fungi, and bacteria that cling to plants and other objects on beds of rivers, lakes and streams (usually in shallow water) and turn dissolved nutrients into food for invertebrates.

22 Nutrient losses can be measured using lysimeters – cylindrical devices buried upright in the soil that collect water moving through the soil column, which can then be analysed for its nutrient content.

23 The Matrix of Good Management: defining good management practices and associated nutrient losses across primary industries http://www.massey.ac.nz/~flrc/workshops/14/Manuscripts/Paper Williams 2014.pdf;
Dairy NZ Good management practices;
www.dairynz.co.nz/media/4106341/Good_management_practices_April_2016.pdf;

24 Herd homes are shelters for housing animals, where effluent is managed to reduce environmental impacts by applying it to pastures to fertilise feed crops for the animals.

concentration of nutrients, and therefore the lower the likelihood of severely detrimental effects – support the idea that 'the solution to pollution is dilution' (see **Box iii**). But flow and water level are affected by water use; for example, water taken from a river for irrigation reduces the ability of that river to dilute nutrients. In lakes, however, it is the total mass of nutrients flowing into the lake that is as important or more important than the inflow concentration because lakes have long residence times, allowing contaminants to accumulate.

Other local geographical factors also play a role. Consider two neighbouring lakes in Canterbury. Te Wairewa/Lake Forsyth is in a narrow valley, it has surrounding hills which shelter it to some degree from the winds that help oxygenate the waters, and the hills and their soils are volcanic and naturally rich in phosphorus, and nitrogen inputs are high. In addition, the lake rarely opens to the sea for flushing. All these circumstances contribute to the lake's hyper-eutrophic state. But in Te Waihora/Lake Ellesmere, the wind plays a greater role in keeping the water well-oxygenated, and most of the existing values of the lake are retained, albeit at sub-optimal levels. The differences between these two lakes highlights the importance of thinking about the diversity of drivers of water quality when considering how to address the challenges ahead.

Box iii. Is "dilution the solution to pollution"?

The concept of dilution as the solution to pollution revolves around the idea that the concentrations of pollutants in wastewater discharges or agricultural runoff can be reduced to below harmful levels if they enter water bodies that have sufficiently high flow or volume to dilute them. This is a relatively simple premise that, unfortunately, is not quite so straightforward in practice.

Historically, consenting processes for point source discharges have sought to ensure that the receiving waterway could assimilate the discharge without unacceptable effects beyond a "mixing zone" immediately downstream. However, this approach often ignores the cumulative effects of multiple discharges on waterways, something that now needs to be explicitly taken into account when operating within the limits required by the National Policy Statement for Freshwater Management. Additionally, some pollutants bio-accumulate – they persist and are transferred through the food chain.

A new approach is emerging in Canterbury. The large mountain catchment braided rivers are being carefully 'mined' for their plentiful supplies of fresh clean water. This water is being used to recharge groundwater, thus diluting the pollutant and improving reliability of supply – a process known as Managed Aquifer Recharge (MAR). There is a relatively small environmental cost to the large rivers (provided sufficient flow is retained to support their values) but a relatively large gain then to the lowland streams where this cleaner groundwater then later emerges.

WHERE TO FROM HERE?

There is a lot of fresh water in New Zealand and that water is highly valued by New Zealanders. It is greatly valued when it is in the rivers and lakes and wetlands and in groundwater for a wide variety of generally passive, or "in stream" uses (tourism, maintaining biodiversity, recreation). It is also greatly valued when it is abstracted, or actively used – whether for irrigation, industry or for drinking, bathing, gardening etc. Yet there is tension between all of the passive uses and some of the active ones – especially irrigation, industry, potable water supply and hydropower. So we must ask the question – is it really possible to have our cake and eat it too? As a nation, do we have the scientific understanding, the management tools, the policy solutions, and the resolve to do it? In theory we do, but in practice this is a real challenge because of the way costs and benefits are distributed among those who value the water; this challenge is made greater if

the decision-making framework appears to create winners and losers. This in turn raises a number of policy dilemmas. These issues have been highlighted recently in the 2017 OECD review of New Zealand's environmental performance.[25]

Despite the challenges outlined above, there are important choices that New Zealand has to make. No single strategy will be enough. Major changes will be needed in some sectors of the economy, and in planning and consent activity. These changes will be neither instantaneous nor cost-free. The lag effects associated with flushing contaminated groundwater, for example, means that it will be decades or longer before results are noticeable in many places, even with immediate management interventions. Investment over time will be needed. The collaborative Land and Water Forum[26] and regional initiatives such as the Canterbury Water Management Strategy[27] are important in addressing these tensions. Many policy decisions will be needed, supported by land-use planning and commercial decisions both by large companies and by farming businesses. Whatever policy settings are chosen there are costs to some stakeholders. On the other hand there are high expectations for prevention of further degradation and progress to restoration, and in many catchments that restoration will take time. Catchments that are small, with simple geomorphology and land-use characteristics, and with socially coherent and motivated communities, will generally be easier to manage or remediate than large and complex catchments.

Despite these challenges we are seeing improvements – indeed the recent data indicate that improving trends are underway in the urban and pastoral land-cover classes with regard to phosphorus and ammonia, although the reverse is true for nitrate and total nitrogen. Across all classes, many rivers now show improving trends with regards to visual clarity and median *E. coli* concentrations, but others still show progressive deterioration. There is still much to be done by government, regional councils, NGOs, farmers and businesses, and indeed all New Zealanders.

Thus far only a few major catchments in New Zealand, for example the Hurunui in North Canterbury and Lake Taupo, provide examples of multi-stakeholder agreement and progress. Many catchments all over the country are undertaking restoration activities that include riparian planting, fencing waterways, developing and operating within farm environment plans involving calculating nutrient budgets, and other approaches. But in some cases it may take over 100 years to reach the desired outcomes because of the residence time of existing high nutrient levels in the water (groundwater around Lake Rotorua being but one example). We are often dealing with legacy effects and cumulative effects, exacerbated by new urban or agricultural developments. Even where restoration has occurred, this is generally not to the original state, nor can it be, given the fact that humans and terrestrial mammals are only recent arrivals. Some systems have gone beyond deleterious tipping points. As New Zealanders, we want a vibrant economy, a quality environment, and preserved natural heritage – and there are no simple solutions.

The technical report that follows details the science of our freshwater system – what we know of its state, and the challenges that need to be addressed. Continued, expanded and scientifically determined monitoring, reporting and learning will be essential so that policy settings and decisions by all stakeholders are appropriate as we strive to enhance the quality and sustainability of fresh water across all of New Zealand

25 OECD Environmental Performance Reviews: New Zealand 2017. http://www.oecd.org/newzealand/oecd-environ mental-performa nce-reviews-new-zea la nd-2017-9789264268203-en .htm
26 Land & Water Forum http://www.landandwater.org.nz
27 Canterbury Water Management Strategy http://www.cwms.org.nz/

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: SEM Freshwater physico-chemical monitoring programme 2015-2016 report

Approved by: G K Bedford, Director-Environment Quality

B G Chamberlain, Chief Executive

Document: 1855789

Purpose

The purpose of this memorandum is to present an update to the Committee on the latest results of the Council's state of the environment monitoring programme for fresh water quality (physicochemical measures). Current and long-term trends are also set out for Members' information.

The full physicochemical report (*Freshwater Physicochemical Programme State of the Environment Monitoring Annual Report 2015-2016, Technical Report 2016-27*) is available upon request. It provides full details of the Council's monitoring of the SEM freshwater physicochemical sites in the 2015-2016 year, and including analysis of trends in this data since 1995. The Executive summary and recommendations of the report are attached to this memorandum.

There will be a presentation on the material during today's meeting.

Executive summary

In order to ascertain the successful adoption and application or otherwise of the Council's policies and methods of implementation, the Council conducts 'state of the environment' (SEM) monitoring to obtain and report up to date robust information for parameters that characterise the region's environment and resources. The results and findings of the SEM programme for the region's freshwater systems can be interrogated to determine trends and changes in trends in the quality of freshwater's physicochemical parameters, alongside the information on the current 'state' of the region's freshwater resources that SEM generates. With SEM established in 1995, the database is extensive enough to allow regular robust trend analysis, conducted according to nationally recognised methodologies, for such reviews.

Further, with the establishment of national standards for water quality by the Government through the National Policy Statement for Freshwater- National Objectives Framework, and the requirement that representative monitoring be established for each of the region's Freshwater Management Units, the Council and regional community can determine how good Taranaki's surface water is according to nationally recognised criteria.

The latest results and findings describing the state of and long-term trends in the state of physicochemical data from the report are summarised and presented herein for Members' information. Results that are statistically and environmentally significant are identified.

This report also includes a separate section on trend analysis for the most recent 7-year period (2009-2016), which has been provided so the Committee and public can review both the long-term and the most recent trends. Recent trend data reflects the effects of the Council's methods of water management through the provisions of the current Regional Fresh Water Plan and its implementation.

Further, this memorandum also assesses the state of the region's waterways in the light of the attribute values (standards) established within the National Objectives Framework (NOF) that is part of the National Policy Statement for Freshwater Management 2014 (NPS-FW) (see Policy and Planning agenda 24 July 2014). This gives the Council and community guidance as to whether the surface waters in Taranaki are 'good' or 'bad', according to nationally promulgated criteria.

Flows: during the 2015-2016 period, median flows at times of sampling were universally lower than typical of those during the previous 20 year period, by between 9% and 46%.

Aesthetic and physical measures: the 2015-2016 median results for turbidity, suspended solids, and clarity were either similar to or much better (about half and half) than the medians for the previous long term period. Median temperatures were higher at all sites, and temperature ranges wider.

Nutrients: the 2015-2016 median results for total nitrogen were either similar to (73%) or better than (27%) the long term medians. On the other hand, increase in ammonia concentrations out-numbered decreases 5 to 3, and dissolved reactive phosphorus increased at 4 of 11 sites with no noticeable overall reductions at any site.

Bacteria: the number of sites showing an increase in median bacterial levels was matched very closely by the number of sites showing a reduction

Other measures: The 2015-2016 median levels of dissolved oxygen saturation, pH, and biochemical oxygen demand (a measure of putrescible organic material) were all similar to long term medians.

Sites: Several measures in the Stony River showed continuing deterioration, following a natural erosion event in February 2016. The Maketawa and upper Patea rivers were two other sites to show a number of deteriorations in median results across a number of parameters, in 2015-2016. On the other hand, the Punehu Stream at both mid-catchment and lower catchment sites, the Waingongoro River at both mid-catchment and lower catchment sites, the mid-catchment Patea River site, and the Mangaehu River all had considerably more median results that were better than worse.

The state of our waterways: comparing the 2013-2016 results against the criteria set out in the compulsory National Objectives Framework (which requires comparison with the latest 3-year data set), there are 55 results which can be categorised, across 5 parameters. 69% of all results lie in their respective 'A' band, and 27% in the 'B' band- a total of 96.4% of all results being either 'A' or 'B'. There is a single 'C' grade result; and a single result in the 'D' grade-that is, this result is the only result in Taranaki that lies below the national 'bottom line'. The latter result is for *E coli* in the Mangaoraka Stream.

Long term trends: Over the long term (21 years), 82% of all parameters have either shown no trend ('maintenance') or improvement ('enhancement'). Total nitrogen is showing the strongest indications of improvement on a regional scale over this period of time; dissolved and total phosphorus have shown the strongest deterioration, with lesser deterioration in ammonia and clarity. The Stony River, Waiwhakaiho River (mid catchment site), and Mangaoraka Stream and lower Punehu Stream (lower catchment sites) are the sites that have shown deterioration to the greatest extent of all sites, over the long term. The lower Waingongoro River has shown the greatest extent of improvement. In addition, over the long term the NIWA site in the lower Waitara River has shown some deterioration (only in forms of nitrogen), while the Manganui River has shown no long term changes.

Recent trends: Over the last seven years, 89% of all parameters have either shown no trend ('maintenance') or improvement ('enhancement'). That is, there is an overall shift towards improving rather than the continuation of deteriorating trends in the region as time passes. The number of parameters showing a deteriorating trend has reduced from 18% in the long-term trends, to 11% in the most recent seven years- a reduction of 40% in the number of measurements showing degradation.

Total nitrogen and nitrate are showing no trends on a regional scale over this period of time; a few sites are currently showing some degree of deterioration in dissolved and total phosphorus. When the current together with previous seven-year trends are examined, it becomes apparent that over the last ten years, trends in total nitrogen and nitrate have been predominantly positive (ie concentrations are reducing). In each of the last four years, the calculation of seven-year trends in these two nutrients have found no deteriorating trends at any site. The Committee will note another item in today's agenda that flags that nationally, nitrogen levels continue to degrade at a concerning rate.

Six sites of the eleven Council sites show either no or only a single deteriorating trend in any parameter over the last seven years. Of the two NIWA sites, the lower Waitara River site is likewise showing no trends in recent years, and the Manganui River site (upper catchment) some degree of deterioration in phosphate and aesthetic measures.

There continues to be a clear pattern of trends in water quality parameters becoming more positive as time passes, notwithstanding that on a year by year basis there will be natural fluctuations.

The report makes recommendations to continue the freshwater physicochemical component of the SEM programme in a similar format (with minor changes to sampling) and to update the trend analysis reports following analysis at the end of the 2016-2017 year.

The value of this monitoring and analytical work lies in the advantage of up-to-date feedback to the Council and regional community on the consequences of land use and water quality management initiatives adopted in the region. In addition, the report helps give a regional perspective to national-level reviews of water quality and water quality management that have just been released ('*Our fresh water 2017*', Ministry for the Environment/Stats New Zealand, and '*New Zealand's fresh waters: values, state, trends and human impacts* ' Office of the Prime Minister's Chief Science Advisor- see separate agenda items in today's agenda).

Recommendations

That the Taranaki Regional Council:

1. receives this memorandum noting the preparation of a report into the state of and trends in regional physicochemical water quality data for Taranaki, for 2015-2016 and over the periods 1995-2016 and 2009-2016, respectively, together with information on trends for the period and compliance with the NOF and regional guidelines;
2. receives the report *Freshwater Physicochemical Programme State of the Environment Monitoring Annual Report 2015-2016 Technical Report 2016-27;*
3. notes the findings of the trend analyses of data from the SEM physicochemical programme;
4. notes the findings of the analysis of water quality state data from the SEM physicochemical programme; and
5. adopts the specific recommendations therein.

Background

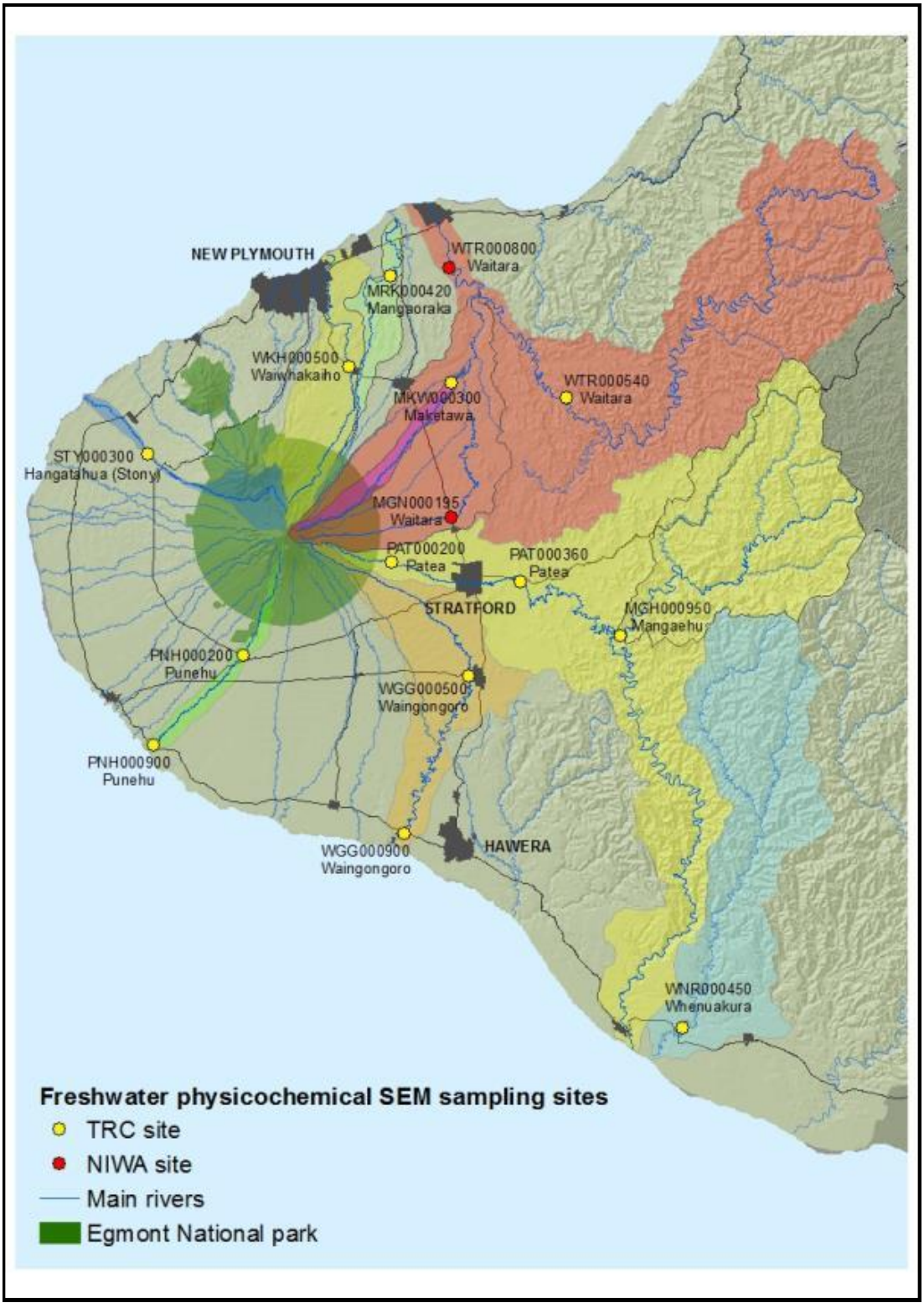
This Committee has been regularly informed of the findings that emerge from the Council's various fresh water 'state of the environment' monitoring programmes. These programmes are important as indicators of the effectiveness of the Council's and community's interventions and resource management initiatives addressing fresh water quality in the region. Members will be aware that there is a high level of interest nationally in the state and management of the country's fresh water resources.

The *Regional Fresh Water Plan for Taranaki* contains objectives to manage the state of the region's surface freshwater. Objective 6.2.1 requires the Council and region 'to maintain and enhance the quality of the surface water resources of Taranaki by avoiding, remedying or mitigating the adverse effects of contaminants discharged to land and water from point sources', while Objective 6.3.1 is an equivalent objective for diffuse sources of contaminants. In Section 10.3 of the Plan, the Council commits to continued monitoring, research and investigations related to fresh water quality, to provide information on the state of fresh water in the region and the effectiveness of the Plan.

The Council's 2012-2022 LTP has, under the 'Levels of service' specified for resource management, a commitment to '*maintain and enhance overall water quality in our rivers and lakes, groundwater and coastal waters*'. The measure for this activity is: '*parameters that characterise the physical, bacteriological, biological and chemical quality of surface water*', and the target is '*improvements in nutrient levels.. appearance... organic contamination... bacterial levels... temperature and algal cover, against a baseline of 1995 water quality, as applicable, at 10 representative sites*.'

Staff have, and have been trained in, the software and methodology used by NIWA for trend analysis of freshwater systems, to ensure that data and analysis provided to the Council and the public of Taranaki is robust, defensible, and consistent with analyses delivered at a national level. In this way timely and reliable feedback on the quality and health of the region's streams and the effectiveness of water quality management in the region can be generated and utilised.

The Council has previously received a report on the latest results of the companion SEM programme monitoring the state of the ecological health of the region's streams (Policy and Planning Committee, 31 January 2017).



Discussion

The Council monitors 11 sites on its own account, and also makes use of data from two further sites monitored by NIWA (for a smaller range of parameters). In years gone by, one Council site was also monitored independently by NIWA (lower Waingongoro River site). This multiple sampling regime provided a quality control and independent audit function for both agencies. However, NIWA have now reduced its national water quality monitoring programme and have abandoned this site. This memorandum includes data from the two remaining water quality sites being maintained by NIWA as part of its National Rivers Water Quality Monitoring Network. This programme has been running for some 29 years. NIWA analyse for a much narrower range of parameters than does this Council.

The programme was expanded by the Council for the 2015-2016 year in response to the obligation signalled by the government through the 2014 National Policy Statement for Fresh Water management, that all surface waters in every region must be incorporated into Freshwater Management Units and every FMU must have representative monitoring established. A mid-Waitara River site (Tarata) and lower Whenuakura River site were accordingly added to the suite of sites monitored within this programme.

Each sampling run by the Council measures up to 22 physical and chemical water quality parameters at thirteen sites that represent six selected ring plain catchments, two catchments with sub-catchments covering both the ring plain and eastern hill country, and one eastern hill-country catchment.

The data includes parameters for organic contamination (BOD), bacteriological quality (enterococci and faecal coliforms), appearance (suspended solids and clarity), and the nutrient species phosphorus (total and dissolved reactive) and nitrogen (ammonia, nitrate, and total nitrogen), as well as general measures of water quality (conductivity, pH and temperature). In the year under review, surveys were performed regularly in the second week of every month from July 2015 to June 2016, as is standard for this programme.

In the 2015-2016 year, variability in site water quality occurred in response to flow conditions and with season. Generally there was some spatial deterioration in most aspects of water quality in a downstream direction. This was illustrated by poorer water clarity (increased turbidity), increased bacteriological counts and nutrient levels, and wider water temperature and pH ranges at downstream sites. The eastern hill country sites typically have elevated suspended solids and turbidity.

2015-2016 results

Unlike 2014-2015, which was characterised by slightly higher median flows in most rivers and streams, the 2015-2016 year was overall considerably drier than usual.

Flows: during the 2015-2016 period, median flows at times of sampling were universally lower than typical of those during the previous 20 year period, by between 9% and 46%. This effect was particularly noticeable at sites to the south and east of the region, rather than the western rivers.

Aesthetic and physical measures: the 2015-2016 median results for turbidity, suspended solids, and clarity were either similar to or much better (about half and half) than the medians for the previous long term period. The exception was the Stony River, which was markedly worse than usual across all aesthetic measures, due to a natural erosion event half way through the year.

Median temperatures were higher at all sites (as to be expected with lower flows), and temperature ranges wider.

Nutrients: the 2015-2016 median results for total nitrogen were either all similar to (73%) or better than (27%) the long-term medians. Nitrate-nitrogen and total phosphorus showed no overall regional pattern of being either better or worse than usual.

On the other hand, increases in ammonia concentrations out-numbered decreases 5 to 3, and dissolved reactive phosphorus increased at 4 of 11 sites with no noticeable overall reductions at any site.

Bacteria: the number of sites showing an increase in median bacterial levels was matched very closely by the number of sites showing a reduction, so there was no overall pattern of these measures being either better or worse than usual.

Other measures: The 2015-2016 median levels of dissolved oxygen saturation, pH, and biochemical oxygen demand (a measure of putrescible organic material) were all similar to long term medians.

Sites: As noted above, **s**everal measures in the Stoney River showed continuing deterioration, following an erosion event in February 2016. The Maketawa and upper Patea rivers were two other sites to show a number of deteriorations in median results across a number of parameters, in 2015-2016. On the other hand, the Punehu Stream at both mid-catchment and lower catchment sites, the Waingongoro river at both mid-catchment and lower catchment sites, the mid-catchment Patea River site, and the Mangaehu River all had considerably more median results that were better rather than worse.

Water quality and national criteria
The Government's National Policy Statement for Freshwater Management 2014 includes compulsory attributes (parameters) with accompanying criteria for water quality. For each attribute there are four bands or grades, with the bottom band ('D') being deemed to represent unacceptable water quality ('Below the National Bottom Line'). Gradings are generally to be made on the basis of the last three years' worth of data.

Comparing the 2013-2016 results against the criteria set out in the compulsory National Objectives Framework, there are 55 results which can be categorised, across 5 parameters. It is found that 69% of all results lie in their respective 'A' band, and 27% in the 'B' band- a total of 96.4% of all results for water quality in Taranaki being either 'A' or 'B'. There is a single 'C' grade result; and a single result in the 'D' grade- that is, this result is the only result in Taranaki that lies below the national 'bottom line'. The latter result is for *E coli* in the Mangaoraka Stream. Officers have previously noted to the Council that stock entry to the stream is a particular issue in this catchment. There have been increased inspections within this catchment in recent years. The Committee may note that the NOF criterion is that the annual median of *E coli* should be less than 1000 counts/100 ml; this was satisfied in the Mangaoraka Stream throughout the year under review.

In terms of sites with 100% of 'A' grade parameters, the best sites in the programme include the Stony River (note- there are no aesthetic attributes in the NOF), upper Punehu Stream, upper Patea River, and the Mangaehu River. The Maketawa Stream, lower Waiwhakaiho River, and mid Patea River have either 1 or 2 'B' grades together with their 'A' grade parameters.

Long-term trends (21 years)
Section 7(f) of the Resource Management Act 1991 requires the Council to have particular regard to the '*maintenance and enhancement of the quality of the environment*'.

Over the long term (21 years), 82% of all parameters measured within the physico-chemical monitoring programme have shown either no trend ('maintenance') or improvement ('enhancement'). There continues to be a clear pattern of trends in water quality parameters becoming more positive as time passes, notwithstanding that on a year by year basis there may be natural fluctuations (such as in the year under review).

Total nitrogen is showing the strongest indications of improvement on a regional scale over this period of time; dissolved and total phosphorus have shown the most evident deterioration, with a lesser extent of deterioration in ammonia and clarity.

These trends of long-term deterioration have occurred across all points within catchments. The Stony River, Waiwhakaiho River (mid catchment site), and Mangaoraka Stream and lower Punehu Stream (lower catchment sites) are the sites that have shown deterioration to the greatest extent of all sites, over the long term. The lower Waingongoro River has shown the greatest extent of improvement. In addition, over the long term the NIWA site in the lower Waitara River has shown some deterioration (although only in forms of nitrogen), while the Manganui River has shown no long term changes. Likewise, the Mangaehu River, Patea River (upper and mid catchment sites), and Maketawa and Waingongoro Rivers (mid catchment sites) have shown no or minimal long-term changes. Overall, 5 of 13 sites have shown a degree of deterioration in some parameters over the long term.

Recent trends
Over the last seven years, 89% of all parameters have either shown no trend ('maintenance') or improvement ('enhancement'). That is, there is an overall shift towards improving rather than the continuation of deteriorating trends in the region as time passes. As a result of taking the 2015-2016 results into account, when medians of dissolved reactive phosphate and ammonia were worse than typical, the percentage of parameters showing maintenance or improvement in recent trends is slightly down on the percentages reported to the Council in the past few years. Nevertheless, the number of parameters showing a deteriorating trend has reduced from 18% in the long-term trends, to 11% in the most recent seven years- a reduction of 40% in the number of measurements showing degradation.

Total nitrogen and nitrate are showing no trends on a regional scale over this more recent period of time; a few sites are currently showing some degree of deterioration in dissolved and total phosphorus. The upper Patea River site is the site with the greatest extent of deterioration in some parameters in recent years. Phosphate and bacterial parameters at this site show likely but not definite deterioration. All other sites are overall showing no pattern of either extensive improvement or deterioration. Six sites of the eleven Council sites show either no or only a single deteriorating trend in any parameter over the last seven years. Of the two NIWA sites, the lower Waitara River site is likewise showing no trends in recent years, and the Manganui River site (upper catchment) some degree of deterioration in phosphate and aesthetic measures.

When the current and past seven-year trends are examined, it becomes apparent that over the last ten years, trends in total nitrogen and nitrate have been predominantly positive (ie concentrations have been and are reducing). In each of the last four years, the annual calculation of seven-year trends in these two nutrients have found no deteriorating trends at any site. The Ministry for the Environment have reported that at monitoring sites in the

pastoral class of land use, nitrate nitrogen is deteriorating at 39% of sites and improving at 23% (latest 10-year trend).

In further comparing the long-term and the seven year trends, there is a noticeable change in trend patterns for the better for the Waiwhakaiho River, Mangaoraka Stream, and lower Punehu River. The Manganui River is the only site showing an increase in the number of deteriorating measures, when long-term and recent trends are compared.

Conclusion:
A drier than usual year in 2015-2016 meant some noticeable changes in overall water quality during the year when compared with the long-term record, with aesthetic measures generally showing improvement and some nutrient forms either better or worse than usual. Water quality in the region is 'fit for purpose' by almost all measures at most sites most of the time, and more so when the compulsory national criteria are considered.

There continues to be a clear pattern of trends in water quality parameters becoming more positive as time passes, notwithstanding that on a year by year basis there will be natural fluctuations.

These results, together with other results presented to the Council (eg in-stream ecological health monitoring and research findings) validate the investment by the Council and the regional community in the continuing policy and plan measures to improve the region's surface water quality.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Document 1780684: *Freshwater Physicochemical Programme State of the Environment Monitoring Annual Report 2015-2016, Technical Report 2016-27 (*Executive summary)

Executive summary

Section 35 of the Resource Management Act requires local authorities to undertake monitoring of the region's environment, including land, air, and fresh and marine water quality. The freshwater physicochemical component of the State of Environment Monitoring (SEM) programme for Taranaki was initiated by the Taranaki Regional Council in the 1995-96 monitoring year and subsequently has been continued in each year. Data from this programme were used as the basis for the first five-year SEM report published in 2003, for trending purposes over the ten year period, 1995 to 2005 and the thirteen year period 1995 to 2008 as presented in the third SEM report published in 2009, and the nineteen year period 1995-2014 as presented in the fourth SEM report (TRC, 2015a)

In the year under review, surveys continued to be performed regularly in the second week of every month from July 2015 to June 2016, under a narrower range of flow conditions than typical, ranging through some moderate freshes to very low late summer-autumn flows. This year was characterised by lower median flows sampled by the programme in all rivers and streams. Each sampling run measured up to 22 physical and chemical water quality parameters at thirteen sites representing eight selected ring plain catchments and three eastern hill-country catchments. Two of the sites were newly included, to increase representation of the eastern hill-country, in anticipation of the government's requirement that the Council must establish Freshwater Management Units and have representative monitoring across the entire region.

The twelve months of water quality data are presented for each of the sites together with a statistical summary for both the year and accumulated data to date. Results are discussed on a site-by-site basis, and more briefly, on a comparative parameters' basis. Data from the two Taranaki sites included in the NIWA national network monitoring programme are also presented and discussed.

Variability in site water quality occurred in response to flow conditions and with season. Generally there was some spatial deterioration in most aspects of water quality in a downstream direction. This was illustrated by poorer water clarity (increased turbidity), increased bacteriological counts and nutrient levels, and wider water temperature and pH ranges at downstream sites. This was usually coincident with increases in substrate algal cover during summer-autumn low flow conditions, a feature of Taranaki ring plain streams (and surface waters elsewhere in New Zealand); a response to elevated nutrient runoff, and warmer more open conditions in lower reaches of developed and farmland catchments. Higher turbidity and suspended solids levels (and therefore poorer visual clarity) characterised the eastern hill country Mangaehu, Whenuakura and Waitara Rivers sites in these rivers' lower reaches.

Over the 2015-2016 monitoring year, flows at times of sampling were much lower than usual, with no flood flows sampled. In general terms, water quality was comparatively better in clarity and suspended solids concentrations, and similar in bacteria numbers and nutrient levels, to past quality. Wider temperature ranges, mainly due to higher maximum temperatures that included record high values at five eastern sites, and higher median water temperatures, were measured in the 2015-2016 period compared with ranges and medians measured during the first 20 years of the SEM programme. The 2015-2016 median dissolved reactive and/or total phosphorus levels were higher at five sites and lower at two sites. Median nitrate and/or total nitrogen species' levels were lower at four sites and higher at

two sites, while median ammonia nitrogen levels were lower at three sites and higher at five sites.

The report also provides an assessment of each site's statistical water quality in terms of appropriate guidelines and standards for various usages based upon a summary of the record for the complete 1995-2016 period.

For the second time, results are also compared with the compulsory national water quality criteria set out in the National Objectives Framework (NOF) that is part of the National Policy Statement for Freshwater Management 2014 (NPS-FW). The NOF assigns grades ('attribute states') for indicators ('attributes'), from A (best) to D (worst), with a National Bottom Line of acceptability being a C state.

The Resource Management Act requires that particular regard be given to the *'maintenance and enhancement of the quality of the environment'*. Therefore a key determinant for the Council is to identify where trends in water quality show no change ('*maintenance*') and/or improvement ('*enhancement*'), or alternatively show decline. With the availability of a suitable period (minimum of ten years) of robust data and access to appropriate statistical software, temporal trend analyses were performed for state of the environment reporting purposes and reported elsewhere during 2006. Regular updates of these temporal trends subsequently have been prepared at appropriate intervals and reported separately, and data for the period 1995 to 2016 are summarised and presented for all eleven sites briefly in the current Annual Report.

Also, for the second time, trends over the most recent period (the last seven years) have been incorporated into this report. Previously, they were calculated and presented separately; for the sake of convenience and completeness of reference they have now been included herein. These data help identify and evaluate the current state of flux in water quality, rather than those trends that are more historical in nature.

Long term (21-year) physicochemical trends have shown some significant deterioration in some aspects of water quality (particularly phosphorus) in many of the middle and lower catchments (e.g. the Mangaoraka Stream at Corbett Road, Punehu Stream at SH 45, and Waiwhakaiho River at SH3). On the other hand, there has been a significant long term improvement in total nitrogen at three of the eleven sites monitored, with no site that is showing deterioration in this measure. Long term trends for faecal coliforms and enterococci bacteria showed statistically significant changes over the 21-year period for one or other species at four sites, out of eleven, with improvement at one site (Punehu Stream at Wiremu Road) and deterioration at three sites (Waiwhakaiho River at SH3, Mangaoraka Stream at Corbett Road and Punehu Stream at SH45). Significant deteriorations in black disc clarity were recorded at three sites, two of which reflected historical erosion events in the headwaters.

The most improvement in long term water quality has been illustrated in the Waingongoro River at SH 45, with significantly improving trends in DRP and total phosphorus, and with reduction in nitrate and total nitrogen by slightly less than the rate defined as significant. This improvement has been coincident with land-irrigation of a major industrial (meatworks) discharge and the diversion of Eltham's WWTP discharge out of the river in recent years. Most long term deterioration in aspects of water quality have been found in the mid reaches of the Waiwhakaiho River, where five parameters have deteriorated significantly (dissolved phosphorus, nitrate, ammonia, faecal coliforms and black disc), and

in the lower reaches of the Mangaoraka Stream, where five parameters have significantly deteriorated (both phosphorus species, both bacteriological species and black disc) and no parameters show significant long term improvement. More recent data for these sites indicate the deterioration has ceased, except for bacteriological species in the Waiwhakaiho River.

Analysis of recent trends indicates a better direction in water quality, although the latest seven-year trends do not show the same wide-spread improvements that have been evident in recent years. The latest rolling seven-year trend is more positive than the long-term trend, with fewer sites and measures showing significant deterioration, particularly in nutrient concentrations. Other measures (bacteria, organics, aesthetics) show no regional pattern of change in either direction.

This report on the results of the 2015-2016 monitoring period also includes recommendations for the 2016-2017 period and the results of internal and external laboratory quality control exercises, which, with relatively few exceptions, resulted in good inter and intra-laboratory precision.

Recommendations provide for the continuation of this programme.

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: ***Our Fresh Water 2017*- national environmental report from Ministry for the Environment/StatsNZ**

Approved by: G K Bedford, Director-Environment Quality

B G Chamberlain, Chief Executive

Document: 1861491

Purpose

The purpose of this memorandum is to present to the Committee, the main findings and observations of the report '*Our fresh water 2017: Data to 2016'*, recently released by the Ministry for the Environment and Stats NZ, together with brief commentary by Council officers. The Executive Summary of the report is attached to this memorandum, while the full report is available at http://www.mfe.govt.nz/publications/environmental-reporting/our-fresh-water-2017 . Also attached to this memorandum is selected commentary from experts/authorities on water quality and management in New Zealand.

Executive summary

The report under discussion is one of the on-going six-monthly series that the Ministry for the Environment and StatsNZ (formerly Statistics New Zealand) are obliged by the Environmental Reporting Act 2015 to prepare and release publicly. In doing so, they are able to utilise any data or information from a wide range of sources. The environmental domain reports are to be regular, robust and reliable reports that provide comprehensive information on specific aspects of the environment of New Zealand. They are intended to not only inform, but to provide the evidential basis for subsequent better decision-making on environmental management.

The Council has previously been advised of similar reports by MfE/StatsNZ covering the air (May2014) and marine (November 2016) domains, and an 'omnibus' report *Environment Aotearoa 2015* (November 2015).

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum *Our Fresh Water 2017- national environmental report from Ministry for the Environment/StatsNZ*

2. notes the release by the Ministry for the Environment/StatsNZ of the report referenced in the memorandum.

Background

The Ministry for the Environment (MfE) has recently released its fourth report in its Environmental Reporting Series, this time covering the fresh water domain, following earlier reports on air quality, the marine environment, and on a general overview of the country's environment as a whole. These reports are intended to give a reliable and independent national statement concerning the country's environment. They are to be published at six-monthly intervals, covering five 'domains' in turn (marine, freshwater, atmosphere/climate, land, and air), with a sixth report to be an omnibus report across all domains. Biodiversity is to be integrated into each domain report as appropriate. The obligation for the two government ministries to prepare the reports comes from the Environmental Reporting Act 2015.

The reports are based on a framework of pressure and influences, state and changes in state, and impacts and effects (the ecological, economic, social, and cultural consequences of changes in the state of the environment).

As has been noted to the Committee previously by officers, one direct and inevitable consequence of this model is that it sets out problems and issues without any reference to whether or how these are being addressed ('responses'). The Council has previously taken issue with this framework, as it notably omits any reference to or description of management interventions and outcomes, and the 'pressures' discussions tend to highlight predominantly the negative pressures i.e. threats and problems, rather than any counterbalancing or advantageous drivers of environmental quality and enhancement. MfE's argument for taking this approach is that any discussion of interventions and their effectiveness would be subjective and open to political slant or bias; the Council's strong view is that descriptions of management activities and measures of their effectiveness or otherwise can be every bit as objective and independent as any other data. While negative effects of human activities can be reported freely and fully, positive effects of human activities are not. It is noted that councils within New Zealand and countries around the world routinely report on environmental quality using a 'pressure-state-response' model. It is again suggested that this alternative framework provides a more comprehensive and meaningful reporting mechanism for assisting public understanding of what is happening within the natural environment.

Discussion

The presentation of the full report is accompanied on the MfE website by an 'At a glance' infographic, and by technical datasets available for access by anyone interested in the data itself. The attached Executive Summary from the report encapsulates the main points of the report (see Appendix I of this memorandum). The report is constructed around three main themes-water quality; water quantity and flows; and ecosystems, habitats, and species.

MfE note that the report includes extra subject material that was not presented within *Environment Aotearoa 2015,* and also that the national data has not been updated since that report. The additional material covers:-

- modelled water quality data

- trends in water quality by land use category
- a greater focus upon water quality in urban areas
- inclusion of information on levels of pesticides in groundwater
- ecological condition of lakes
- trends in species and discussion of physical change that affect habitats and migration patterns, and
- cultural health status reporting.

Councillors are referred to Appendix I for the Executive Summary of the report's contents. Main points of either general interest with regard to the contents of the report, or of particular relevance to Taranaki, are further highlighted below.

Introductory comments flag that the report is intended to present both a national picture and to highlight the significance of regional and local variation, to help identify where the greatest pressures are and where the country is performing well. Notwithstanding the latter, the introductory commentary goes on to explicitly state '*We do not report on response under the [*Environmental Reporting*] Act due to the requirements to be independent of the government of the day. Therefore, 'Our fresh water 2017' does not include any recommendations for management or policy responses for freshwater issues'*.

The introductory comments refer to the availability of information and data that present a story, but also to '*things we inherently know are an issue…in some instances we talk about areas we see as important although we did not have access to appropriate data'*. There is thus evidence-based commentary, but the report also includes discussion that could be considered to be somewhat more speculative in nature. Further, it is noted that there has been a reliance on modelling of water quality in several instances, in order to supplement available fact-based data.

Water quality:
The Executive Summary focuses on nutrients (for its potential effects on algal blooms) and on *E coli* as a measure of safe recreation. There is no reference to sediment in rivers within this section.

Urban pollution of waterways is high-lighted, but the list of causes of urban pollution makes no mention of sewage plants and the adequacy of their performance in many communities.

Both trends in and the levels of nitrogen are discussed. While there is more deterioration than improvement in nitrogen levels, the report notes also that for more than 99% of NZ's waterways, nitrate levels are so low that multiple sensitive freshwater species will not be affected. Phosphate levels are worst in urban areas. Phosphate level are improving more widely than they are deteriorating. Over 80% of NZ's waterways are not expected to be subject to extended or regular algal blooms (see later in this memo). There are more general water quality monitoring sites showing a reduction in *E coli* than an increase, and most sites show no trend. (That is, overall 'swimmability' is at the least showing no deterioration, or alternatively is actually already improving, on a national scale).

Included in this section is a discussion of the proposed Government criteria for 'swimmability'.The grounds for including this reference in the report, given that : (i) it is still under submission/consultation and therefore not confirmed; and (ii) is clearly reporting on policy, not on environmental data, are unclear.

Water quantity:
The report notes that there is both consumptive and non-consumptive uses of water (the latter being been abstracted water that is returned in short order to the water body from which it was extracted). The largest consumptive use is for irrigation; the region of greatest demand is Canterbury. It notes also that currently it is difficult to form a national picture of how much consumptive water is used, as distinct from permitted, but that the national regulations around metering abstractions will mean better data on usage in future.

Ecosystems, habitats, and species
There is a general discussion of possible causes of habitat loss and effects on freshwater ecosystems. There is no mention at this point in the report of how or whether ecosystems and habitats can be or are being restored. Freshwater fish, invertebrate species, and plants are discussed from the perspective of health, abundance, and population threats. The report flags that water bodies are being changed but the extent of this change is unknown on a national scale; likewise, there is no national picture around sedimentation in rivers although vegetation clearance (including burning) over the past 800 years means that this has likely increased. Nationally there is no information on the health of wetlands, but measures of wetland extent show great reductions in original wetland extent (now only 10% of what they were).

Most freshwater sites that have been assessed show moderate cultural health, but ratings for mahinga kai (freshwater food resources) are 'poor' or 'very poor'.

Main sections of report
The report makes the same point as Gluckman (see separate item in today's agenda), that human habitation from the first arrival has meant change and impact upon freshwater in New Zealand (that is, adverse impacts are not associated only with recent land use change or human activities or with a single cause). While the RMA in 1991 is referenced as a driver of increasing controls of point sources, there is no reference to the wider effects of regional freshwater plans in controlling abstractions or diffuse sources, or implementing associated land use controls and interventions (whether regulatory or non-regulatory).

Water quality- more detailed discussion
In respect of agriculture, the report notes that the country's agricultural practices are yet to reach the same degree of intensification of other countries such as in Europe. The variation by region across NZ is explicit in the report. The report notes a decline in dairy cattle numbers in Taranaki over 20 years. Nitrogen leaching rates per region are stated, on the basis of calculations using OVERSEER; there is no acknowledgement in the report of the considerable uncertainty involved in this model.

There is a lengthy section on the characteristics of urban runoff, waterways, and flows, and the need for urban infrastructure improvement nationwide.

Water quality nationwide is modelled by land use type. This overview demonstrates that nationwide, nitrate and ammonia are not at levels that would impact freshwater species, and that generally our invertebrate communities are in 'good' or 'excellent' or fair' state, with only about 1-2% of waterways nationwide having 'poor' communities. Modelling suggests that, taking into account not only nutrient concentrations but factors such as hydrological conditions, sunlight measures, and temperature, 83% of the total river length in New Zealand is not expected to have regular or extended algal blooms. The report notes that with

the new obligation (NPS-FW) for regional councils to monitor periphyton, future reports will have specific data results to report.

In terms of swimmability, the report focuses on an analysis of *E coli* figures, compared against the latest MfE proposals for assessing and grading suitability. Interestingly, the report notes that modelling one of the four proposed criteria gave such imprecise results it could not be used.

Importantly the report also notes that 'swimmability' is in fact determined by a wide range of factors, and not just *E coli* measurements.

Addressing other water quality measures, the report flags two points- that regional council monitoring networks by design concentrate on parts of regions where there are water quality issues, so collectively this data does not represent New Zealand as a whole, but rather the zones of greater concern or impact- it is a biased dataset; and regional council datasets have been adjusted within the reporting process for the sake of national consistency in reporting: '*As a result, our evaluations may differ from those based on original data. If you want detailed regional-level information, we recommend you review the relevant regional council's environmental reports'*. This caveat arose out of a challenge by this Council to MfE concerning the way regional monitoring data had been adjusted and re-presented in *Environment Aotearoa 2015*.

The discussion of phosphate (which is overall improving nation-wide) includes a considerably involved presentation of the land use changes and management and abatement interventions that may underlie the improvements, notwithstanding the earlier references within the report that such discussions are out of scope.

Alongside the usual discussions of nutrients within all land use categories, the report extends to include a discussion of heavy metal concentrations in urban catchments, including a note that concentrations increase as the proportion of land in urban use increases.

The section on groundwater quality notes that *E coli* is a more widespread potential public health risk than nitrate levels. On the other hand, pesticides pose minimal health risk, with only one result nationwide above an acceptable value.

Water quantity- more detailed discussion
Changes to baseline flows that can enhance instream values are mentioned alongside those changes that have adverse impact. Regional variations in water demand are presented, with Taranaki being shown as one of the regions with lowest demand by either number of takes or by volume. The complexities of determining whether there is over-abstraction are noted- eg consents for abstraction that require reduction or cessation of use as flows drop.

Maps of abstraction as a proportion of flow or groundwater availability show that Taranaki is amongst the regions under least pressure on availability.

Ecosystems, habitats, and species- more detailed discussion
This section focuses on biodiversity rather than ecological health. The key message in this section is that there has been a decline since human settlement began, in populations of

freshwater species, and many of our native freshwater plants, fish, and invertebrate species are now at risk. Concern is expressed over this loss of biodiversity.

The most detailed discussion of sediment is within this section, as a threat to habitat and thus to community abundance or diversity. The section also covers wetland habitat, in-stream structures, and pest species, and measures of cultural health. The adverse effects of trout are explained.

Feedback process
MfE/StatsNZ invite feedback on the report.

Further commentary by officers

Future reporting
Repeatedly throughput the report there is reference made to the lack of appropriate datasets upon which to base any discussion. So on one hand there is an emphasis upon the report being informed only by data of an acceptably high quality, and national reporting needing more such data; but on the other hand it has been acceptable to present modelled data as authoritative, and further, to offer commentary on areas deemed important even though there is an absence of suitable data as an evidential basis.

Descriptions of interventions and impacts
The Committee will recall that this Council has previously expressed concerns that the domain reports tend to regard 'pressures' on the environment in solely a negative light, and choose not to report on any interventions that are having a positive effect. The Council has challenged the rationale that human activities that have a negative effect can be highlighted, but activities that have a positive effect cannot be mentioned. The current report avows adherence to previous practice. However, a number of instances of the outcomes of positive interventions are indeed presented.

The place of fresh water in the life, culture and economy of New Zealand
Earlier domain reports have presented considerable information on the centrality of environmental domains in question to the life, culture, and economy of New Zealand. This report addresses these subjects only in brief.

Data gaps/ further monitoring at national and regional level
In respect of the data gaps that the Ministry has identified (see last part of Appendix I attached), officers comment as follows:-

- the extent of our rivers affected by excessive algal growth: *the Council monitors periphyton proliferation at over 20 sites twice each spring-summer, under flow and weather conditions most conducive to excessive growth. This data consistently shows well over 99% compliance with MfE guidelines;*
- how much water is actually being used and how it is affecting flows, water availability, and habitats: *the Council has continuous flow measuring stations on major rivers, to continuously monitor in-river flows for availability and the effects of abstraction, as well as for flood risk. The Council has worked with abstractors of water over the last few years to require and achieve compliance with the Government's water take monitoring regulations;*
- the extent of physical change to water bodies: *the Council has undertaken a regional survey of the extent of stream modification in the region, and has reported this to Council;*
- the amount of sediment deposition: *the Council does not currently undertake*

deposited sediment monitoring, in part because the region's waterways are prone to frequent flushing so that our rivers are highly dynamic, and in part because there are no nationally agreed methods for sediment deposition monitoring. The Council awaits further work on this theme by the technical groups advising the Land and Water Forum;

- the extent and impact of barriers to fish migration: *the Council already has a register of fish passage barriers and information on fish passes in the region. There is a project currently underway to update the register and to address barriers where they exist. Regional fish distribution monitoring is one of our state of the environment monitoring programmes;*
- a fuller understanding of the cultural health of our water bodies*: the Council is currently working with two iwi/hapu groups to explore more culturally meaningful measures of stream health and waiora;*
- the national abundance and distribution of many of our native species: *Councils are identifying where the responsibility rests for information on and the monitoring of biodiversity;*
- the health of our wetlands and recent changes in extent: *The Council has extensive records on wetland extent and condition, including state of protection.*

Expert reaction
In terms of a selection of comments about *Our fresh water 2017* made by various freshwater experts and authorities (see Appendix II attached):-

Professor Jenny Webster-Brown notes the interventions that are likely the cause of improving concentrations of phosphorus, alongside the escalating problem of nitrogen; she also endorses the fact that the report identifies the poor state of urban streams, rather than focus solely on dairy farming as though it were the cause of all water quality problems. She also highlights the need to focus on actions, as well as on the collection and presentation of data- this reinforces officers' comments above on the poor service done by the report in informing any national conversation on current management interventions and their outcomes.

Ken Taylor, Director of the Our Land and Water (OLW) National Science Challenge, likewise deplores the lack of reporting of positive interventions, and suggests that this cannot be blamed on an apparent lack of data, for data is in fact available; and the reporting gap leaves the reader ignorant of promising results that are already evident.

Dr Joanne Clapcott considers the report robust, but limited in that nationally there are data gaps in key areas such as biodiversity.

Professor Richard McDowell of Lincoln, and chief scientist for the OLW Challenge, notes the report does not provide the important context that water quality in New Zealand is very good, by some orders of magnitude, when compared with water quality overseas.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Document 1861482: *Our fresh water 2017. Data to 2016* – Ministry for the Environment/Stats NZ (Executive summary)
Document 1858613: Our fresh water 2017. Selected expert reaction (provided through the Science Media Centre).

Appendix I:

Our freshwater 2017-Executive summary

Introduction

Fresh water supports almost every aspect of life. We use fresh water to drink, enjoy it for recreation, and use it to produce goods and services. Māori tribal identity is linked to fresh water, for whom each water body has its own mauri (life force).

Ki uta ki tai (from the mountains to the sea) captures the movement of water through the landscape and the many interactions it may have on its journey. Ki uta ki tai acknowledges the connections between the atmosphere, surface water, groundwater, land use, water quality, water quantity, and the coast (see *Our marine environment 2016*). It also recognises the connections between people and communities, people and the land, and people and water.

As a society, we have seen a clearing of native vegetation, the draining of wetlands, farming, forestry, and urbanisation, which have all placed increasing pressure on our water bodies and their ecosystems. As our population and agriculture-based economy grow, our need for fresh water is likely to increase in the future.

The way we use the land differs across New Zealand so the impacts on our fresh water, whether positive or negative, are often specific to a catchment or region. This makes it difficult to paint a national picture. It can also take decades for water (and any contaminants it contains) to cycle from the earth's surface through the ground to aquifers, and back to surface water systems. This means some effects we see today are legacies of past activities, and the impact of our activities today, both positive and negative, may not be seen in our waters for a long time.

Summary of top findings

Here is a selection of findings grouped by the three key themes of this report – Water quality; Water quantity and flows; and Ecosystems, habitats, and species.

In some instances, we talk about areas we see as important, although we did not have access to appropriate data. These gaps are where more work is needed, so that in future we could provide a more complete understanding of the freshwater environment.

We used four principles to select our top findings:

- spatial scale of impact to natural systems
- magnitude of change
- scale of impact on culture, recreation, health, and the economy
- irreversibility or long-lasting effects of change.

The symbols show the amount of data we had to support a top finding:

A blue circle indicates we had a lot of data.

A circle, the bottom half blue and the upper half white, indicates we had limited data.

Water quality

Water quality relates to the condition of water and includes factors like how well it can support plants and animals, and whether it is fit for us to use.

This summary focuses on two nutrients, nitrogen and phosphorus, which can tell us something about the risks of algal blooms; and *E.coli* (an indication of faecal contamination), which can tell us whether water bodies are safe for recreation.

Nutrients occur naturally and are necessary for plants to grow. However, high nutrient concentrations can result in too much growth of algae in water (this algae is generally periphyton in rivers and phytoplankton in lakes). Excessive algae in water can decrease oxygen levels, prevent light from penetrating water, and change the composition of freshwater plant and animal species that live there. High concentrations of nitrogen can be toxic to species and make water unsafe to drink.

The activities we do on the land, mainly urban and agricultural activities, can cause excess nutrients and *E.coli* to wash into our water bodies through run-off or filter through the land into groundwater. Phosphorus often enters surface water attached to sediment.

In urban environments, contaminants enter water bodies mainly through stormwater and wastewater networks, illegal connections to the networks, and leaky pipes, pumps, and connections.

In agricultural areas, nutrients and pathogens (organisms that can cause disease) come from animal waste and urine, and fertilisers. Since the late 1970s, agricultural practices have intensified in some areas of New Zealand, indicated by higher stocking rates and yields, increased use of fertiliser, pesticides, and food stocks, and moves to more intensive forms of agriculture, such as dairying. Agricultural land use is the world's greatest contributor to diffuse pollution (run-off from the land or filtration through the soil). However, since diffuse discharges are hard to measure, it is difficult to determine the relationship between specific land use and water quality.

In our findings for nitrogen, we report on nitrate-nitrogen, which is highly soluble, leaches through soils easily, and is available for plant and algal growth. For phosphorus, we report on dissolved reactive phosphorus, which can be released from fertilisers or dissolved from soil or sediment and becomes available for plant and algal growth.

Nitrate-nitrogen concentrations were worsening at more monitored river sites than improving. Dissolved reactive phosphorus concentrations were improving at more monitored river sites than worsening.

In monitored rivers, nitrate-nitrogen was worsening (55 percent) at more sites than improving (28 percent), and dissolved reactive phosphorus was improving (42 percent) at more sites than worsening (25 percent) between 1994 and 2013. However, the trends for nitrate-nitrogen and dissolved reactive phosphorus vary across the country. For some monitored sites, nitrate-nitrogen concentrations were improving and dissolved reactive phosphorus concentrations were worsening. For some sites we could not determine a trend direction.

Both concentrations and ratios of nitrogen and phosphorus in a water body are important, as there needs to be a supply of both nutrients for excessive algal growth to occur. We know that concentrations of nitrogen and phosphorus are much higher in urban and pastoral areas than in native areas, so the likelihood of algal growth is higher in these environments.

We lack information on how the impact of worsening nitrate-nitrogen concentrations is affecting our fresh water, but it is estimated the vast majority of rivers do not have nitrate-nitrogen levels high enough to be toxic to most freshwater species.

We do not know the direct cause of improving dissolved reactive phosphorus concentrations in rivers. In rural areas, these may be due to improved farming practices and the targeting of areas highly susceptible to phosphorus loss. In urban areas, it may be due to improvements in treating wastewater.

Supporting findings

- Nitrate-nitrogen concentration was 18 times higher in the urban land-cover class, and 10 times higher in the pastoral class compared with the native class for the period 2009–13. We classify sites by land cover: pastoral, urban, exotic forest, and native.
- Of 175 monitored river sites in the pastoral class, nitrate-nitrogen trends were worsening at 61 percent and improving at 22 percent of sites for the period 1994–2013. Similarly in the exotic forest and native classes more sites were worsening than improving, but there were few monitored sites in these classes.
- Nitrogen leaching from agricultural soils was estimated to have increased 29 percent from 1990 to 2012.

- More than 99 percent of total river length was estimated not to have nitrate-nitrogen concentrations high enough to affect the growth of multiple sensitive freshwater species for the period 2009–13.
- Dissolved reactive phosphorus concentration was 3 times higher in the urban class and 2.5 times higher in the pastoral class compared with the native class (2009–13).
- Of 145 monitored river sites in the pastoral class, trends in dissolved reactive phosphorus were improving at 46 percent and worsening at 21 percent of sites for the period 1994–2013. Similarly, in the urban and native classes more sites were improving than worsening, but there were few monitored sites in these classes.
- Of total river segment length of large rivers, 83 percent was not expected to have regular or extended algal blooms. This is because it was modelled to either meet the periphyton national bottom line in the National Objectives Framework (60 percent) or had fine sediment (23 percent) that does not usually support algal growth (2009–13).

E.coli concentrations affect our ability to swim in some

Animal or human faeces in fresh water can increase the risk of illness for swimmers in the area. When *Escherichia coli (E.coli)*, a group of bacteria usually found in the intestines of mammals, is detected in rivers or lakes, this indicates that faecal matter is present in fresh water. Concentrations of *E.coli* in a water body are used to measure risk to public health.

Of monitored sites, most had indeterminate trends for *E.coli* for the period 2004–13, meaning we have insufficient data to determine a trend at those sites.

We do not have *E.coli* data for lakes. We also do not assess trends in *E.coli* for groundwater sites because of the large number of values below detection limits.

Supporting findings

- *E.coli* concentration was 22 times higher in the urban land-cover class and 9.5 times higher in the pastoral class compared with the native class (2009–13). We classify sites by land cover: pastoral, urban, exotic forest, and native.
- Of 268 monitored river sites in the pastoral land-cover class, *E.coli* trends were indeterminate at 65 percent, improving at 21 percent, and worsening at 14 percent of sites for the period 2004–13. Sites in the urban, exotic forest, and native classes had similar results, but there were few monitored sites in these classes.

Developing a national indicator for swimmability

We are assessing whether modelled *E.coli* data can be used as a suitable indicator to track over time the risks of infection associated with swimming in water bodies. Although this is still in development, we recognise this topic is an area of great public interest, so we are providing some initial results of this work.

The Clean Water Package, launched by the Government in February 2017, proposed a new approach to measuring the swimmability of water bodies. The package proposes a definition of swimmable based on *E.coli* concentrations for rivers and cyanobacteria for lakes. For a river to be swimmable under the new guidelines, the risk of getting sick from infection averaged across time is between 1 and 3.5 percent. See Public health considerations for swimming in rivers for more information.

Water quantity and flows

New Zealand has plenty of fresh water, but because the flow of our rivers varies naturally over time and different water bodies, it is not always there where or when we need it. When the flows of rivers are reduced, algae and fine sediment can build up, reducing the amenity and recreational value of water resulting in a poor habitat for freshwater species. This can also affect the mauri of water bodies in their ability to support abundance of life.

Our activities influence the quantity and flow of water, for example, when we take water or physically alter water bodies. We take water for farming (irrigation and stock drinking water), power generation, drinking water, and industrial uses. We physically alter water bodies when we create diversions, build dams, and drill bores. Larger effects on water flow happen when we take higher volumes of water from multiple locations, particularly in dry periods. Surface water and groundwater are often connected, so taking water from one affects both.

Climate change is projected to increase the pressures on water flows and the availability of water – in New Zealand, annual rainfall is expected to decrease in the east and north.

This summary focuses on how much water councils allow to be taken for various uses (which are specified in consents to take water). This shows us how much water may be used, although it does not necessarily match what is actually used.

More than half the water allocated (or consented) by councils is for irrigation, but we do not know how much of this is actually used.

Regional councils allocate water by giving consents for industrial, energy, agricultural, and domestic use. It is called consumptive use when the water is not immediately returned to water bodies, and non-consumptive use when water is returned to downstream water bodies after use (such as in most hydroelectricity schemes).

In 2013–14, irrigation was the largest consented user of consumptive water by volume, followed by household use and industry.

Data quality and the completeness of records on actual takes (as opposed to consented) is mixed across the regions, so it was not possible to report on how much water is actually taken at a national scale. In some cases, actual use is less than consented use for a number of reasons, for example, when water flows drop below a certain level restrictions on use can be applied.

From November 2016, legislation requires most water users to provide continuous records of water takes each year. In future reports we aim to provide a more complete national picture of how much water is actually used.

- In 2013–14, excluding hydroelectricity use, New Zealand's total consented water volume was allocated for irrigation (51 percent), followed by household consumption (14 percent), and industry (13 percent).
- Canterbury accounted for 64 percent of the total consented volume of water for irrigation.

Ecosystems, habitats, and species

The health and mauri of some of our freshwater ecosystems face multiple pressures, which may compound one another. These pressures negatively affect biodiversity – many of our freshwater species are threatened with, or at risk of, extinction.

Most of the pressures come from the way we are changing freshwater environments. Land- based activities, infrastructure development, and the deliberate modification of water bodies, such as draining wetlands or channelling rivers, contribute to the degradation and loss of habitats. These activities can degrade cultural health, reduce water quality, increase sediment yields, alter water flows, introduce pests, and modify or degrade habitats or the connections to habitats.

This summary focuses on the conservation status of our freshwater biodiversity, the cultural health of rivers and lakes, and some of the pressures affecting freshwater ecosystems.

Of the native species we report on, around three-quarters of fish, one-third of invertebrates, and one-third of plants are threatened with, or at risk of, extinction.

New Zealand is vulnerable to biodiversity loss as many of our native species are endemic (found nowhere else in the world). Freshwater biodiversity supports opportunities for recreational activities such as fishing, and customary activities such as mahinga kai.

Our freshwater environment supports approximately 53 known resident native freshwater fish species, 630 known native freshwater invertebrate types, and 537 known native freshwater-dependant plant and algae types. We report on the conservation status of our freshwater species where we have sufficient information on taxonomy, distribution, and abundance.

Freshwater fish

More than half our known fish species migrate between the sea and fresh water to complete their life cycles, meaning they can be severely affected by barriers to migration in rivers and streams. Other pressures negatively affecting native fish include pests that outcompete and prey on our fish, and habitat loss and deterioration.

We report on the conservation status of 39 of our native freshwater fish. However, long-term, national level information on native fish is currently limited, but we have enough data to report on the trends of eight fish species.

. Of the 39 native freshwater fish species we report on, 72 percent were either threatened with (12 species), or at risk of (16 species), extinction in 2013.

. Native freshwater fish threatened with, or at risk of, extinction include taonga species such as inanga, shortjaw kakopu, giant kakopu, kôaro (all are whitebait species), kanakana/piharau (lamprey), and one species of tuna (longfin eel).

Declines in conservation status were observed for four species between assessment periods (2009 and 2013) – Central Otago roundhead galaxias, Canterbury galaxias, black mudfish, and kanakana/piharau (lamprey).

Of eight native fish species, two were estimated to have increased in abundance (shortfin eel and upland bully), and four decreased in abundance (longfin eel, kôaro, Canterbury galaxias, and common bully) between 1977 and 2015.

Freshwater invertebrates

Freshwater invertebrates include many organisms such as crustaceans, molluscs, worms, and freshwater insects. Invertebrates perform important ecosystem services – they graze on periphyton (algae) and break down leaves and wood. They also provide food for native fish and birds and some provide food for people. Our native invertebrates are

negatively affected by pests that prey on them for food, and other pressures that result in habitat deterioration.

Supporting findings

.Of the 435 native freshwater invertebrate types we report on, 34 percent were either threatened with (66 types), or at risk of (82 types), extinction in 2013.

Three of the freshwater invertebrate types experienced a decline in conservation status, and none had an improvement between assessment periods (2005 and 2013).

The South Island kôura (freshwater crayfish) and all three species of kākahi/kāeo (freshwater mussel) are included in the at-risk or threatened categories.

Freshwater plants

The habitats that support native freshwater plants only cover a small proportion of New Zealand's land area, but are rich in abundance of diverse freshwater plant species.

Plants dependent on fresh water include vascular plants, mosses, hornworts and liverworts, and green algae that live in and around fresh water. These plants are negatively affected by invasive weeds, drainage, and when vegetation is grazed, trampled on, and cleared.

Of the 537 plant types we report on, 31 percent were either threatened with (71 types), or at risk of (97 types), extinction in 2013.

Some water bodies have been physically changed, but we do not know the extent or the impact this is having.

Our rivers have changed because we placed structures in them (such as weirs and culverts), and redefined river channels to prevent water from damaging infrastructure and houses.

Physically changing our rivers makes floodplains available for urban and agricultural development and improves flood control and security. However, these changes have altered the natural character of rivers, which can cause river banks to erode and more sediment to be deposited downstream. The structures we place in rivers can also hinder fish migration (some fish species move from fresh water to the sea as part of their lifecycle).

Physical changes to rivers reduce how floodplains (and associated lakes and wetlands) are connected to rivers, which affects flood pulses. A flood pulse is the periodic flooding of a river, and is considered to be good for a river's ecosystem. It aids in dispersing seeds,

establishing plants, cycling nutrients, scouring, depositing sediments, and maintaining the richness of species.

Changes to physical habitats have significant effects, but we currently have limited data on the extent or impacts these changes are having on ecosystems.

Fine sediment deposited on riverbeds is estimated to have increased, but we don't know the national extent or impact this is having.

Deposited sediment occurs naturally in the beds of rivers and streams, but too much fine sediment (particles less than two millimetres in size) can severely degrade streambed habitat, carry excess nutrients into surface water, and affect water clarity and recreational activities. Fine sediment levels greater than 20 percent cover can have negative effects on streambed life.

Our marine environment 2016 reported that some sediment can wash out to estuaries where it smothers important nursery habitats of marine animals.

Our activities can affect the natural cycle of sediments by accelerating the delivery of sediment to streams. Models suggest a significant increase in sediment cover has occurred since human occupation. Over the past 800 years, the clearing of native forests, along with farming practices and earthworks, resulted in sediment in rivers being deposited above natural levels. There are not many sites across the country where fine sediment has been observed over time using consistent methods. This makes it difficult for us to report on the status of deposited fine sediment cover at a national level, so in this report we rely on modelled estimates.

.Modelled results suggested fine sediment would cover an average of 8 percent of riverbeds in the absence of humans.

.The same model suggested an average fine sediment cover of 29 percent of riverbeds in 2011.

Wetland extent has greatly reduced and losses continue.

Wetlands perform many functions. They filter nutrients and sediment from water, absorb floodwaters, and provide habitat for plants, fish, and other animals.

We have no national information on the health of our wetlands, but we do have information on their extent. The vast draining of our wetlands due to the way we use our land has left only a small portion of original wetland extent. This led to a loss of biodiversity and natural function in some areas.

We are less clear on recent changes in national wetland extent, but we know that losses are still occurring.

Supporting findings

.In 2008, the extent of wetlands was only 10 percent of their original extent (before humans settled New Zealand).

.As an example of recent wetland loss, Southland's wetlands not on conservation land were reduced in area by 1,235 hectares, or 10 percent, between 2007 and 2014–15.

.The West Coast has the greatest extent of wetlands (84,000 hectares), followed by Southland (47,000 hectares), and Waikato (28,000 hectares).

Cultural health is rated moderate at most tested freshwater sites.

For Māori, fresh water is a taonga and essential to life and identity. Freshwater ecosystems provide valuable resources, and support Māori values and practices including healing and harvesting kai (food).

Cultural health indicators support kaitiakitanga (the cultural practice of guardianship) and how Māori use the environment. These indicators provide a holistic understanding of the cultural aspects of our freshwater environment to the benefit of all New Zealanders.

The cultural health index measures the factors that are of cultural importance to Māori. It provides an overall indication of the cultural health of a site on a waterway. A cultural health index score cannot be produced without local indigenous knowledge. Three components make up the overall cultural health index score: site status, mahinga kai (customary food gathering) status, and cultural stream health status.

Tangata whenua and hapū/rūnanga groups across the country determined cultural health index scores at 41 sites between 2005 and 2016. As more tangata whenua monitor water bodies for cultural health, we will incorporate these into future reports.

Supporting findings

- Of the 41 sites assessed, 11 had a good or very good overall cultural health index rating.
  Twenty-one sites had a moderate rating, and nine had a poor or very poor rating.
- Of the 39 sites assessed, 28 had a poor or very poor mahinga kai status.
  Seven sites had a moderate status, and four sites had a good or very good status.

Data gaps

We identified many gaps in available data and information that if (and when) they are filled would improve future environmental reports. We want to build a fuller and more

representative picture of the pressures on our freshwater environment and the effects of these pressures on the environment and our well-being.

Data and information we would like to get more information about include:

- the extent of our rivers affected by excessive algal growth
- how much water is actually being used and how it is affecting flows, water availability, and habitats
- the extent of physical change to water bodies
- the amount of sediment deposition
- the extent and impact of barriers to fish migration
- a fuller understanding of the cultural health of our water bodies
- the national abundance and distribution of many of our native species
- the health of our wetlands and recent changes in extent.

Some of this information is being gathered now, such as recording freshwater takes. The next steps for this programme are to work with others to prioritise and determine how we start to fill these, and other, important gaps that may arise.

Appendix II

Some expert reaction to 'Our fresh water 2017' (selected from Science Media Centre)

Professor Jenny Webster-Brown, director, Waterways Centre for Freshwater Management, University of Canterbury, comments:

"The report highlights the ongoing and escalating problem of nitrogen leaching from land into the waterways. This compares with apparently improved control of phosphorous, from the same source, likely due to more fencing and planting of riparian strips on agricultural streams.

"The report also highlights the poor state of urban streams, something which is easily overlooked in the rush to blame dairy farmers for all of our freshwater problems.

"There are already solutions available for preventing contamination of urban streams, a problem shared by all cities, and yet we still cling to the same systems of stormwater control and choice of problematic building materials that have led to these issues …. and over-use urban water supplies that would otherwise recharge these systems.

"Obstacles to uptake of sustainable urban water technologies need to be identified and removed.

"So, by all means, collect more data to address the data gaps identified in the report … this is essential. However, it is vital that we also invest in, and otherwise provide incentives for, actions that will protect our freshwaters and change this scenario for the better."

Ken Taylor, Director, Our Land and Water National Science Challenge, comments:

"One of the problems with the report is that it only presents half the story, the bad news half not the good news half.

"In many cases the report points to a lack of data which is unfortunate because there is a lot of available data on these issues which could have been included, this means this picture we're being presented is only a partial one.

"The report is constrained by the Environmental Reporting Act, which limits what can be reported on to the current state and trend of environmental pressures, it doesn't discuss the levels of response which are already going on to counteract these issues.

"We're already seeing promising responses at a community level, in policy and in scientific research working towards offsetting the issues we're dealing with now."

Dr Joanne Clapcott, freshwater ecologist, Cawthron Institute, comments:

"The *Our fresh water environment 2017* report provides a robust assessment of the degraded state of New Zealand's freshwaters. However, it's important to note we are limited as we can only report on topics with available data".

Professor Richard McDowell, Chief Scientist, Our Land and Water National Science Challenge, comments:

"Some important context is that the state (i.e. concentrations of water quality indicators) are still very good when compared internationally; indeed, some by several orders of magnitude."

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: Submission on managing third party risk exposure from onshore petroleum wells

Approved by: A D McLay, Director – Resource Management

B G Chamberlain, Chief Executive

Document: 1860042

Purpose

The purpose of this memorandum is to introduce a submission made to the Ministry of Business, Innovation and Employment on their discussion document *'Managing third party risk exposure from onshore petroleum wells'* and to recommend its adoption by the Council.

Submissions closed on 28 April 2017 but owing to the tight timeframe for making submissions, a draft was not circulated to Members prior to the closing date. The submission addresses points the Council has made previously to the Parliamentary Commissioner for the Environment and others in submissions endorsed by the Council.

A copy of the submission is attached to this memorandum.

Executive summary

The Ministry of Business, Innovation and Employment (MBIE) is assessing options to manage the financial risk exposure to third parties (mainly landowners, occupiers and the Crown) from current and future onshore petroleum wells and has released a public discussion document to help in the assessment.

There are currently no mechanisms under which the original permit holder (under the Crown Minerals Act) contributes to the financial management of the residual risk of a well failure. A number of mechanisms can be used by different parties but these are not widely used because third parties are not aware of the circumstances in which they are financially exposed.

Four options are proposed for managing third party risk exposure. The submission supports Option 4, the establishment of a pooled fund to pay for remediation and plugging and abandonment costs where third parties are financially exposed. The submission also comments on the legislative overlap in regulating well integrity and argues for a central approach to resolving the issue. The issue of historical (legacy) wells, while not part of the

discussion document, is also raised with the suggestion that the Crown assume responsibility for this issue.

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum *'Submission on managing third party risk exposure from onshore petroleum wells'*
2. adopts the submission.

Background

The Ministry of Business, Innovation and Employment (MBIE) is assessing options to manage the financial risk exposure to third parties from current and future onshore petroleum wells.

New Zealand's current regulatory regime for managing onshore petroleum wells is based on the principle that the liability for remediating a well that fails or for plugging and abandoning a well that poses an environmental or health and safety risk, lies with the permit holder or those who have assumed liability in the case of a transfer of permit interest. There is currently no mechanism that is explicit in law, under which the original permit holder, contributes to the financial management of a residual risk of well failure.

This leaves third parties (e.g. landowners on whose property a current or future well is located or the Crown as a last resort) exposed to these costs.

Different parties can use a number of mechanisms to manage third party risks but in practice, these mechanisms are not widely used because third parties do not appear to be aware of them or the circumstances in which they might be financially exposed.

The discussion paper presents four options to manage third party risks: issue non-statutory guidance on the nature of financial exposure and existing financial assurance mechanisms; require assessment and monitoring of insurance policies; require bonds to cover plugging and abandonment obligations; and establish a pooled fund to pay for remediation and plugging and abandonment costs where third parties are financially exposed.

The paper makes it clear that the options are not mutually exclusive and that a combination of options may be the most effective way to manage the risks. The options proposed require the petroleum industry, either collectively or individually as permit holders, to assume the majority of the risk to third parties.

Discussion

The submission congratulates the Ministry for preparing the discussion document to address this longstanding potential issue for Taranaki – and for New Zealand, as hydrocarbon exploration and production potentially expands beyond Taranaki.

The Council emphasises the point that it has made on a number of previous occasions, that ensuring well integrity throughout the lifecycle of the well must be the highest priority in preventing harm to people and the environment from a well failure or well abandonment.

We have again pointed to legislative overlap in regulating well integrity and the fact that compliance with the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations will also address well integrity management from an environmental point of view. There is also the question of cost efficiencies for all councils in not having to duplicate this expensive capability and capacity issue.

The Council notes that the discussion document only covers third party risk exposure from current and future onshore petroleum wells and that older wells that pre-date modern standards and regulation, probably present a higher risk. The submission calls for the Government to assume responsibility for these wells, noting that the cost of addressing legacy issues for well abandonment will represent an insurmountable cost for the landowner. Furthermore, the Crown as owner of petroleum resources derives benefits from their extraction through royalties and taxes. There are therefore strong arguments that the Crown should assume responsibility for any legacy issues associated with well abandonment.

The submission argues that this legacy role should be made explicit in law and should not be become a 'default' local authority or landowner responsibility.

We have also noted that landowners and occupiers do not appear to be aware of situations where they may be liable and financially exposed from problems with an abandoned well. We have submitted that clarity should be provided on this matter so that it can be addressed, otherwise there will landowner resistance to drilling activities.

Of the four options presented for dealing with current and future wells, the submission supports Option 4, which would see the establishment of a pooled fund to pay for plugging and abandonment costs where third parties are financially exposed. Option 3 (requiring bonds to cover plugging and abandonment obligations) is also supported provided this is centrally regulated under the Crown Minerals Act and not left to be dealt with under the RMA.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Attachment

Document 1852972: Submission on managing third party risk exposure from onshore petroleum wells MBIE March 2017

28 April 2017
Document: 1852972

Ministry of Business, Innovation and Employment
PO Box 1473
Wellington 6140

Submission on MBIE Managing third party risk exposure from onshore wells report

Introduction

1. The Taranaki Regional Council (the Council) thanks the Ministry of Business, Innovation and Employment for the opportunity to make a submission on the Ministry's discussion document *Managing third party risk exposure from onshore wells, March 2017*.

2. The Council makes this submission in recognition of the purpose of local government set out in the Local Government Act 2002, and the role, status, powers and principles under that Act relating to local authorities. In particular, the Council's comments are made in recognition of its:

    - functions and responsibilities under the *Resource Management Act 1991*; and
    - its regional advocacy responsibilities whereby the Council represents the Taranaki region on matters of regional significance or concern.

3. The Council has also been guided by its Mission Statement *'To work for a thriving and prosperous Taranaki* including *by promoting the sustainable use, development, and protection of natural and physical resources and representing Taranaki interests and contribution to the regional , national and international community'* across all of its various functions, roles and responsibilities, in making this submission.

4. The Council makes these comments, in relation to the discussion document, based on more than 30 years successfully regulating the oil and gas sector, and is again pleased to be able to provide advice to central government based on that experience and that obtained from the study of overseas regulatory regimes.

5. Having provided some important context around the regulation of well integrity, answers to the questions in the document are then provided.

General comments

6. The Council congratulates the Ministry for preparing the discussion document to address a challenging and longstanding potential issue in this region and for the country, as hydrocarbon exploration and production potentially expands beyond Taranaki.

7. The Council made a submission to the Parliamentary Commissioner for the Environment (PCE) in 2013 on the critical areas of well integrity management and well abandonment. The submission noted responsibility for a potential future failure of well integrity needed to be clarified and addressed by central government.

8. Ensuring well integrity through the well lifecycle must be the highest priority to prevent harm to people and environmental contamination. There is legislative overlap in regulating well integrity. Under the current regulatory framework there is duplication of this function with Work Safe NZ who is responsible for ensuring all aspects of well integrity under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2016. Ensuring well integrity is the key element in addressing potential environmental impacts, particularly water contamination, which is regulated by regional councils under the RMA.

9. In Taranaki the drilling and construction of a hydrocarbon well is a permitted activity subject to conditions (i.e. no resource consent is required provided the conditions are complied with). This regime implicitly relies on the well integrity management provisions of the Regulations.

10. Elsewhere in New Zealand a resource consent may be required but the provisions of the regulation are still used to address well integrity management.

11. Hence the reference in para 17 that councils under the RMA may impose plugging and abandonment consent conditions needs to recognise that this primarily would be by reference to complying with the Regulations. The use of bonds under the RMA is also unlikely because it is not practicable for a mining permit holder to be responsible for a well after they had surrendered the permit and potentially left the country. The Crown Minerals Act (CMA) mining permit, Petroleum Regulations, and RMA well management regimes need to be aligned.

12. The RMA is not the place to regulate well integrity and councils should be able to rely on the Petroleum Regulations in respect of well integrity and not have to duplicate this expensive capability and capacity which would be costly and inefficient for councils, the industry and New Zealand as a whole.

13. The strengthening of work place safety involving requirements in relation to independent "safety case" review of drilling operations and the well examiner scheme under the Regulations, adds an important additional level of expert scrutiny and review to well design and operation prior to well drilling commencing and throughout the entire life cycle of the well including its subsequent operation, maintenance, modification, suspension and abandonment.

14. The discussion document scope (paras 27 & 28) only covers third party risk exposure from current and future onshore petroleum wells. Current wells are those that have a permit holder with an active CMA permit or any applicable resource consents. It would be useful to know how many wells this includes so risk levels can be assessed.

15. Wells prior to this represent a higher risk level. Older wells that pre-date modern standards and regulation pose the greatest risk and are unfortunately not addressed in the discussion document. There needs to be a clear Government position on these wells

to assist land use planning and in the event of a well integrity failure. The Bayley Road wells in New Plymouth that failed about 2001, resulting in hydrocarbons pooling under a house, are examples of such wells. The wells were properly abandoned at a cost of approximately $0.5 million.

16. In the absence of a party responsible for an abandoned well, the enforcement tools under the RMA could be used to require the current owner or occupier of the land on which the problem exists, to undertake remedial action. However, there are reasonable arguments against taking this course of action. Land owners and occupiers are likely to have taken ownership and/or residence on the property without any knowledge of past petroleum operations. The cost of addressing well abandonment problems and the likely limited financial resources of property owners or occupiers mean that effectively dealing with well abandonment issues may represent an insurmountable cost for the landowner. The deeper the well the higher the cost.

17. The Crown should be the regulator responsible for ensuring well integrity and that proper well abandonment standards are in place in the first instance. The Crown also owns and controls petroleum resources and derives benefits from their extraction through royalties and taxes. These amount to over $3 billion. There are therefore strong arguments that the Crown should assume responsibility for any legacy issues associated with well abandonment. The Crown's legacy role should be made explicit in law and under no circumstances should this become a 'default' local authority or landowner responsibility.

18. In para 18 of the document it is noted there is a 'small risk of any onshore petroleum well failing after plugging and abandonment has occurred'. What is the basis of the statement particularly when the risk exposure survey referenced in para 23 has not been completed and available for assessment?

19. In para 32 it is noted that land owners and occupiers do not appear to be aware of situations where they may be liable and financially exposed from problems with an abandoned well. Clarity should be provided on this important matter so it can be addressed. Otherwise there will be land owner resistance to drilling activities. Also in para 32 reference is s made to 4 wells requiring remedial work. To provide important context it would be useful to determine where the wells are, what RMA regime they were consented under and who took responsibility for undertaking the remedial work.

20. While to date the failure of 4 out of 964 wells represents a low percentage there is no information about these wells, how they failed and how much it cost to fix them which would greatly assist the management of well abandonment from current and future wells which this document addresses. It would also be very useful for legacy wells.

21. Given the acknowledgement of land owners and occupiers liability in the discussion document the response of landowners to future wells will likely be for the permit holder to carry the liability in the well site lease agreement. This will provide challenges beyond the term of the mining permit and reinforces the need for a long term central government based solution.

22. At paras 35- 38 reference is made to an expert modelling exercise which estimates the potential financial exposure to third parties of current and future wells. It concludes that, over a 10 year period, the mean estimate of risk exposure is $14 million. Limitations of

the modelling are then set out and the transferability of risk data from overseas to NZ is acknowledged. The Council agrees with the limitation comment and notes for example in Canada there is a different regulatory regime, geology and reservoirs (sour gas). Interestingly, Canada has a fund that drillers contribute to in order to fund situations where there are well integrity issues with historic wells. However, they drill thousands each year while we may drill about 40 so to create a meaningful fund the contribution per well would have to be high in NZ.

23. It is noted an additional study has been commissioned by MBIE to better understand the nature of the risk exposure. Reliable information on costs is critical to developing an appropriate response and determining who should and can pay if there are well integrity failures in the future. It is inevitable that there will be future well integrity failures. Hence this work is strongly supported by the Council.

24. Fundamentally it is about minimising well integrity failures by having an effective and efficient regulatory regime in the first place and then providing mechanisms to identify and manage risks going forward. This is not only for the current and future wells referenced in the document but also for legacy wells.

Question 1
Do you agree with our assessment of the issues? If not, why not? What other factors would you consider?

25. See the comments above about well integrity failure risks and the need for more detail to properly assess the risk level and costs and importantly where the responsibility to address the failure liability should lie.

Question 2
Do you agree with our assessment of New Zealand's current financial risk management mechanisms for onshore petroleum activities? If not, why not?

26. The assessment is adequate but lacks some important detail.

27. In para 39 reference is made to the MFE Contaminated sites fund as a possible way of funding the remediation of environmental effects of a well integrity failure. However, only regional councils can apply and may only get a percentage (50 %) of the cost. It is not appropriate that rate payers should have to fund the reminder when the major beneficiary of the drilling (either a commercial discovery made and royalties and taxes paid or use geological data obtained to inform future drilling) has been the Crown who own the hydrocarbon resource.

28. In paras 47 to 49 it is acknowledged that under the RMA well drilling may require a consent or be a permitted activity, subject to meeting certain conditions. In Taranaki, where most of the onshore wells in NZ are located, the activity is a permitted activity as noted above. Hence there is no consent and ability to have a bond. In any case a bond is not an appropriate solution as a the driller would have to hold the consent for multiples of 35 years to be held responsible for future well integrity issues, which would be out of sync with the CMA permit system and having an effective and integrated regulatory regime.

Question 3
Do you agree with these objectives? Would you suggest any others?

29. Objective one refers to minimising the risk to third parties. This acknowledges there may be risks.

30. Objective two refers to risks being equitable to different parties and any mechanism to address these do not disproportionally financially benefit or impose costs on any party. Parties include permit holders, central government, local authorities, and land owners and occupiers.

31. Comments are made above about the Crown being the benefactor and so they should pay.

Question 4
Do you agree with Option 1 to release non-statutory guidance on existing financial assurance mechanisms available to third parties?

32. Option 1 is not supported as it is too uncertain in a potentially high cost/liability environment.

Question 5
Do you agree with Option 2 to assess and monitor insurance policies?

33. Option 2 is not supported because it only covers the permit period not into the future when issues may arise with casing corrosion.

Question 6
Do you agree with Option 3 to require bonds to cover plugging and abandonment obligations under the CMA?

34. Option 3 is supported as a central approach to this issue is required. The CMA provides an appropriate option and an ability to link to permit terms and is associated with a party who gets all the royalties and taxes (and who should carry any liability if it goes wrong)

35. As noted above this should be centrally regulated with an acknowledgement that he RMA is not the place to collect a levy. It is not within the scope of the RMA and better sits within CMA and the Crown. However, we don't drill many wells each year so a levy would have to be high to address the estimated risk level.

Question 7
Do you agree with Option 4 to establish a pooled fund that permit holders contribute to through a levy?

36. This option is supported for the reasons set out above.

37. However, the Council is concerned there are no arrangements in place for legacy wells.

Question 8
What option or combination of options do you prefer and why?

38. The Council does not support a combination approach, but supports option 4. A combination approach will be much too complicated to administer and enforce. There is a need for a central approach to managing well integrity.

Conclusion

39. The Council congratulates the Ministry for preparing the discussion document to address a challenging and longstanding potential issue in this region and for the country, as hydrocarbon exploration and production potentially expands beyond Taranaki.

40. A regulatory overlap exists in terms of well integrity management between the RMA and Petroleum Regulations. If MBIE wish to improve the regulatory regime and encourage petroleum exploration and have an integrated and efficient regulatory approach then this issue should be addressed with MFE. The revised regulation making powers associated with the recent changes to the RMA should be investigated and used to address this important issue. If these are not suitable then other responses should be assessed and implemented. The preparation of guidelines is not sufficient. A law change is required.

41. Fundamentally it is about minimising well integrity failures by having an effective and efficient regulatory regime in the first place and then providing mechanisms to identify and manage risks going forward. There may be a low risk of well integrity failure but appropriate mechanisms need to be in place and liability assigned to the beneficiary. This is not only for the current and future wells referenced in the document but also for legacy wells.

42. The risk levels for legacy wells are probably the greatest. The document acknowledges (at para 32) land owners and occupiers do not appear to be aware of situations where they may be liable and financially exposed from problems with an abandoned well, but does not specify under what circumstances. Clarity on this critical issue is important and should be urgently communicated to all stakeholders. District councils with responsibility for managing land use would be particularly interested, as would Federated Farmers.

43. It is acknowledged that the residual well integrity failure risk level for modern wells is extremely low. However, providing certainty to all concerned that there will be a responsible party in the event there are problems is critical for the maintenance and growth of the industry in this region and elsewhere.

44. Given the deadline for this submission it has not been formally endorsed by the Council. However, the matters raised have formed part of other submissions to Government and the PCE. Nonetheless the Council reserves the right to raise further matters after the Council has had an opportunity to review the submission.

45. The Council looks forward to further discussions on a number of important matters raised in the discussion document and addressed above.

Yours faithfully

F McLay
Director- Resource Management

Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: Coastal and Marine Area (Takutai Moana) Act 2011: Taranaki applications

Approved by: A D McLay, Director – Resource Management

B G Chamberlain, Chief Executive

Document: 1869058

Purpose

The purpose of this memorandum is to:

- summarise the provisions of the Coastal and Marine Area (Takutai Moana) Act 2011 (the Act or MACA) that recognise Maori customary rights in the marine and coastal area
- identify the applications for Maori customary rights that have been made in Taranaki
- note, after legal advice, the Council has joined proceedings in relation to these applications.

Executive summary

Under the Marine and Coastal Area (Takutai Moana) Act passed in 2011, an iwi, hapu or whanau group may apply to have their customary rights in the coastal marine area recognised and provided for. Applications can be made for protected customary rights and customary marine title either by negotiation directly with the Crown or by application to the High Court. Applications were required to be made by 3 April 2017.

In Taranaki 14 applications have been made to the High Court or directly to the Crown, covering the entire Taranaki coastline, with some overlaps between the applications.

There are a number of implications for the Council if protected customary rights or customary marine title are granted. These relate particularly to the resource consents process and to plan making processes under the Resource Management Act (RMA).

The Council has filed notices of appearance with the High Court in relation to the High Court applications. These are to ensure that its statutory responsibilities are taken into consideration when decisions are made on the applications and to ensure that the terms of any orders made are certain and workable.

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum *Coastal and Marine Area (Takutai Moana) Act 2011: Taranaki applications*
2. notes the Council has joined the High Court proceedings
3. notes that further information will be provided to Members on the applications as it comes to hand.

Background

Members may recall that the MACA was enacted in 2011 to replace the Foreshore and Seabed Act 2004.

Under the Act, neither the Crown nor any other person owns the common marine and coastal area. However, an iwi, hapu or whanau group may apply to have their customary rights in the coastal marine area recognised and provided for. Applications can be made for:

- protected customary rights, and
- customary marine title.

There are two options that an applicant has to obtain either a protected customary right or a customary marine title:

- a recognition agreement negotiated directly with the Crown; or
- a recognition order issued by the High Court.

In relation to High Court proceedings, any person may lodge a notice with the Court to appear and be heard in relation to the application.

The Act provides that all applications for recognition agreements or recognition orders had to be made within six years of commencement of the Act i.e. by 3 April 2017.

Protected customary right

The MACA states that a protected customary right is a right that:

> *'(a) has been exercised since 1840; and*
>
> *(b) continues to be exercised in a particular part of the common marine and coastal area in accordance with tikanga by the applicant group, whether it continues to be exercised in exactly the same or similar way, or evolves over time; and*
>
> *(c) not extinguished as a matter of law.'*

The threshold for establishing protected customary rights is not as high as for customary marine title. It reflects certain customary practices, for example collecting hangi stones or launching waka.

There are a number of implications of an applicant group being granted protected customary rights over an area. For the Council the most relevant is the effect on resource consent applications.

The Act provides that where an application for a resource consent is made for an activity within a protected customary rights area, and that activity will or is likely to have adverse effects that are more them minor on the exercise of a protected customary right, a consent authority must obtain written approval from the relevant protected customary rights group before it may grant the consent.

There are a number of exceptions to this requirement, including where the application relates to:

- certain aquaculture activities;
- a resource consent for an emergency activity under section 330A of the RMA; and
- a resource consent for certain 'accommodated infrastructure' and activities.

A protected customary right may be exercised without a resource consent under the RMA.

Customary marine title

The Act states that a *'customary marine title exists in a specified area of the common marine and coastal area if the applicant group –*

> *(a) holds the specified area in accordance with tikanga; and*
> *(b) has in relation to the specified area –*
> *(i) exclusively used and occupied it from 1840 to the present day without substantial interruption; or*
> *(ii) received it at any time after 1840, through a customary transfer in accordance with subsection (3).'*

The Act sets out matters to be considered in determining whether the requirements for customary marine titles are met in a specific case, including expanding on terms used such as 'exclusively used and occupied.' This is a relatively high threshold for establishing customary marine title.

Customary marine title provides an applicant group with an interest in land, which reflects some aspects of, but is not, ownership. The MACA states however, that this does not include a right to alienate or otherwise dispose of any part of that land. Resource consents are also required to be obtained by the holders of a customary marine title for use and development within the customary marine title area.

Certain 'accommodated activities' as defined in section 64 of the Act may be carried out in the common coastal and marine area despite the existence of a customary marine title. These activities include accommodated infrastructure (Crown or local authority works, network utilities, port company operations etc), activities required for the management of marine reserves etc, existing aquaculture activities, emergency activities, and scientific research.

There are a number of implications for the Council that are associated with the granting of customary marine title, including:

- an 'RMA permission right' which means that resource consents may not be implemented in the customary marine title area without the permission of the customary marine title group;
- the ownership of certain minerals in the customary marine title area (excluding petroleum, gold, silver and uranium); and
- the right to create a 'planning document' which local authorities must take into account in Local Government Act processes and which has a significant weighting in RMA planning processes.

Section 93 of the Act, in fact, sets out specific obligations on regional councils in relation to planning documents. These include obligations to alter any regional planning document prepared under the RMA to recognise and provide for the matters in a planning document that relate to customary marine title area and to take into account matters that relate to those parts of the common marine and coastal area that are not in the customary marine title area.

Applications made in Taranaki

The Council has been notified of 14 applications that have been made to the High Court or directly to the Crown, for protected customary rights or customary marine title in Taranaki (see attached list). They cover the entire Taranaki coastline and some of the applications overlap. However, one of these is in relation to an application that covers the whole country (the application by Rihari Dargaville on behalf of the New Zealand Maori Council members).

We have also received a letter from the Minister of Treaty Negotiations, The Hon Chris Finlayson, outlining the requirements of the Act and listing the applications that have been received by his office in the Taranaki region (letter attached). Our advice is that the applications in the Minister's letter only relate to applications to the Crown for direct engagement and not applications to the High Court. We understand that some applicants have applied under both the High Court pathway and the direct engagement pathway and others have applied only under one. This would account for the differences in the list of applicants given in the Minister's letter and the list of applicants to the High Court.

For applications to the High Court, public notice of the application is required. If the Council wishes to appear before the Court in relation to the applications, it must file a notice of appearance with the High Court within 20 working days of the first public notice. Following advice from our lawyers, Simpson Grierson, Barristers and Solicitors, they have filed notices of appearances in relation to the applications on the Council's behalf. There is no avenue for the Council to submit on applications made to the Crown.

All the notices filed on behalf of the Council are similar. A notice of appearance for one applicant group is attached to this memorandum for Members' information. The only variation is the appearance for the Te Atiawa application makes reference to the Council's river control infrastructure in the lower reaches. MACA applies to the coastal marine area in estuaries 1 km or 5 times the river mouth width up stream, whatever is the smaller.

Implications for the Council

As previously noted there are a number of important implications for the Council arising from the granting of protected customary rights or customary marine title for all or part of the area applied for. These relate particularly to the resource consents process and to planning processes under the RMA.

Members will see from the attached notice of appearance that the Council's appearance before the Court is to ensure that its statutory responsibilities are taken into consideration when decisions are made on the orders and to ensure that the terms of any orders made are certain and workable.

Further reports on progress with the applications as they make their way through the Court process will be provided as they come to hand.

An applicant for a coastal permit, where a MACA application has been made, is required to consult with the applicant and pass the applicant's feedback on the coastal permit application to the Council for consideration.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Attachments

Document 1869795: List of applications to High Court for protected customary rights or customary marine title in Taranaki

Document 1870069: Letter from the Hon Chris Finlayson on the Coastal and Marine Area Act

Document 1869461: High Court Notice of appearance: Te Kaahui o Rauru Trust.

List of applications for protected customary rights and customary marine title in Taranaki

1. Mokau ki Runga Regional Management Committee on behalf of Ngā Hapū o Mokau ki Runga

2. Trustees of the Te Kaahui o Rauru Trust

3. Liana Huia Poutu, Chairperson, Te Kotahitanga o Te Atiawa Trust

4. Clive Moses Tongaaw'ikau, Chairperson of Araukuuku Hapū, on behalf of Araukuuku Hapū

5. David Wiremu Moore, on behalf of Ngāti Hāua Hapu of Ngāruahinerangi iwi

6. Trustees of the Te Korowai o Ngaruahine Trust for and on behalf of Kānihi-Umutahi Hapū, Okahu-Inuawai Hapū, Ngāti Manuhiakai Hapū, Ngāti Tū Hapū, Ngati Hāua Hapū and Ngati Tamaahuroa-Titahi Hapū

7. Wharehoka Craig Wano on behalf of Taranaki Iwi

8. Oeo Pā Trustees on behalf of Ngati Tamaahuroa and Titahu Hapū

9. Te Runanga o Ngati Tama

10. Te Rūnanga o Ngāti Ruanui Trust on behalf of Ngāti Ruanui

11. Hori Manuirirangi, Chairman of Ngāti Tū Hapū Whenua Toopū Trust and of the Waiōkura Marae and Reserves Trust on behalf of Ngāti Tū Hapū

12. Rihari Dargaville on behalf of New Zealand Māori Council members

13. Ngāti Mutunga o Wharekauri Iwi Trust on behalf of Ngāti Mutunga o Wharekauri

14. Jamie Grant Daniel Tuuta on behalf of Te Runanga o Ngāti Mutunga

Office of Hon Christopher Finlayson

22 MAY 2017

Basil Chamberlain
Chief Executive
Taranaki Regional Council
Private Bag 713
Stratford 4352

By email: basil.chamberlain@trc.govt.nz

Tēnā koe

Marine and Coastal Area (Takutai Moana) Act 2011

As you may be aware applications to have customary rights in the common marine and coastal area recognised under the Marine and Coastal Area (Takutai Moana) Act 2011 (the **Act**) had to be filed by 3 April 2017 in accordance with sections 95(2) and 100(2) of the Act.

Under the Act an iwi, hapū or whānau could apply to enter into direct engagement with the Crown for a recognition agreement or apply to the High Court for a recognition order. After 3 April these groups were no longer able to apply to have customary rights recognised.

The Crown has received approximately 380 applications to enter into direct engagement and I have been advised that the High Court has received over 200 applications. Many groups are likely to have applied both to the Crown and to the High Court. These numbers are subject to change as officials in the Marine and Coastal Area (**MACA**) team and at the High Court continue to process and confirm details of the applications received.

Applications in your jurisdiction

Officials have estimated that there are approximately 12 applications for engagement that fall within your council's jurisdiction (see appendix A for a list of the applicant groups). Crown Law will provide further information about the High Court applications to you in early June. This information is important because of the obligations under section 62 of the Act, concerning applications for consents or permits.

Private Bag 18041, Parliament Buildings, Wellington 6160, New Zealand. Telephone 64 4 817 6808 Facsimile 64 4 817 6508

Officials in the MACA team have been in contact with your consents department to remind them of these obligations and advise them how the MACA team will provide up to date information to them about the applications that fall within your council's jurisdiction. Officials will continue to update your team on a regular basis until they have a complete list of information about the applications in your area.

Recognition of customary interests

The marine and coastal area is the area between the mean high water springs and the outer limits of the territorial sea - 12 nautical miles from shore. The common marine and coastal area is the parts of the marine and coastal area that are not in private ownership or part of a conservation area. The Act provides that the common marine and coastal area is not owned and can never be owned.

The recognition of customary interests through customary marine title (**CMT**) or protected customary right (**PCR**) does not affect the ongoing rights of free public access, the right to fish and to navigation[1]. The only exception is where specific restrictions are required to protect wahi tapu in a CMT area. Existing consents and permits are also protected by the Act.

CMT is not the same as freehold title. It can't be sold and free public access, fishing and other recreational activities continue in customary marine title areas. In order to have CMT recognised groups must be able to show that[2]:

- they have held the area applied for in accordance with tikanga; **and**
- have either exclusively used and occupied the area from 1840 to the present day without substantial interruption or received the area at any time after 1840 through a customary transfer, and have exclusively used and occupied the area without substantial interruption since the transfer.

To have a PCR recognised the group must be able to show that[3]:

- the activity, use or practice had been exercised since 1840;
- it continues to be exercised in a particular part of the common marine and coastal area in accordance with tikanga by the applicant group; and
- is not extinguished as a matter of law.

A PCR must not include an activity that is regulated by the Fisheries Act 1996 or that is a commercial aquaculture activity or that involves the exercise of any commercial Māori Fishing right or interest or any non-commercial fishing right or interest[4].

The sequence and timing for determination of Crown engagement applications is being developed and officials will keep you updated about this.

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[1] Section 3(3)(b), Marine and Coastal Area (Takutai Moana) Act 2011
[2] Section 58, ibid
[3] Section 51(1), ibid
[4] Section 51(2), ibid

The High Court is likely to issue procedural directions for the various High Court applications in the coming months. The Crown Law Office represents the Attorney-General in the court proceedings.

Further information

Information about the rights that are conferred if customary interests are recognised is available on the Ministry of Justice website at: https://justice.govt.nz/maori-land-treaty/marine-and-coastal-area/customary-interests-under-the-marine-and-coastal-area-act/.

If you have any further questions about this please do not hesitate to contact Rhonda Taylor, Marine and Coastal Area Team Manager at rhonda.taylor@justice.govt.nz or on 04 494 9769.

Nāku noa, nā

Hon Christopher Finlayson
Minister for Treaty of Waitangi Negotiations

Taranaki Regional Council – Appendix A:

Araukuuku Hapu
Nga Hapu o Poutama
Ngaa Rauru
Ngati Haua Hapu and Ngaruahinerangi Iwi
Ngāti Mutunga
Ngati Tama
Ngati Tamaahuroa and Titahi hapu
Ngati Tu
Puketapu Whanau / Hapu O Te Mana Whenua
Taranaki Iwi
Te Atiawa (Taranaki) Iwi
Te Rūnanga o Ngāti Ruanui Trust

IN THE HIGH COURT OF NEW ZEALAND
WHANGANUI REGISTRY

NO. CIV-2017-485-183

UNDER THE	Marine and Coastal Area (Takutai Moana) Act 2011
IN THE MATTER	of an application by the Trustees of the Te Kaahui o Rauru Trust

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NOTICE OF APPEARANCE ON BEHALF OF TARANAKI REGIONAL COUNCIL

Dated: 19 May 2017

Simpson Grierson
Barristers & Solicitors

Matt Conway / Hamish Harwood
Telephone: +64-4-499 4599
Email: matt.conway@simpsongrierson.com / hamish.harwood@simpsongrierson.com
DX SX 11174
PO Box 2402
Wellington

To: the Registrar at the High Court in Whanganui

And to: the applicant

And to: the Solicitor-General on behalf of the Attorney-General

This document notifies you that –

1. Taranaki Regional Council (**Council**) gives notice of its intention to appear and be heard on the application by Te Kaahui o Rauru Trust for recognition orders for customary marine title and protected customary rights.

2. The grounds on which the notice of appearance is made are:

(a) The application is within the Council's jurisdiction. The Council has regulatory responsibilities (including enforcement responsibilities) over the application area under the Marine and Coastal Area (Takutai Moana) Act 2011 and other legislation, particularly the Resource Management Act 1991.

(b) If granted, the application could impact on the exercise and administration of the Council's regulatory functions.

(c) The Council reserves its final position on the application pending the receipt of further detail and information about the application. Given the potential impacts on the Council if the orders are made, the Council wishes to record that its interest in the application relates to:

(i) whether the applicant is able to satisfy the statutory tests to the requisite standard of proof for customary marine title and protected customary rights for all or part of the land which is the subject of its application;

(ii) ensuring that the terms of any orders made by the Court are certain and workable.

3. This notice of appearance is filed in reliance on section 104 of the Marine and Coastal Area (Takutai Moana) Act 2011.

Dated: 19 May 2017

Matt Conway / Hamish Harwood
Counsel for Taranaki Regional Council

This document is filed by **Matthew Grant Conway**, solicitor for Taranaki Regional Council, of the firm Simpson Grierson.

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Agenda Memorandum

Date 6 June 2017

Memorandum to
Chairperson and Members
Policy and Planning Committee

Subject: Extension to the dung beetle introduction programme to Taranaki dairy farms

Approved by: A D McLay, Director – Resource Management

B G Chamberlain, Chief Executive

Document: 1858555

Purpose

The purpose of this memorandum is to provide information on a dung beetle release programme for Taranaki as requested by Members at their January meeting. At the meeting, Dr S Forgie of Beetle Innovations Ltd (DBI) provided information on the releases made to date in Taranaki and the potential environmental benefits of dung beetles. Members requested a proposal on an extension to the current programme.

Recommendations

That the Taranaki Regional Council:

1. receives the memorandum on the *Extension of the dung beetle programme to Taranaki dairy farms;*
2. notes it is considered too early to consider an investment in an extension programme until there is evidence of beetle establishment and growth from past releases; and
3. notes if there is further Council investment it will be minimal with farmers contributing most of the cost.

Background

Members may recall in May 2016 that the Committee agreed to potentially fund a beetle release if a suitable proposal could be developed. Work with Federated Farmers and Taranaki Demonstration Farm managers was successfully completed and the first release made.

The beetles were released at the Whareroa and Stratford Demonstration Farms on 10 January 2017 and a release of a different species at each farm was made about a month later. The Council agreed to invest $10,000 from existing budgets in the dung beetle release project.

At the January Policy Committee meeting, Dr Shaun Forgie made a presentation to members and provided information on the releases made to date in Taranaki and the potential on farm and environmental benefits of dung beetles.

The recommendation of the meeting was the Taranaki Regional Council:

- receives the memorandum on the *Introduction of dung beetles to Taranaki dairy farms;*
- notes this is a collaborative project between the Council, Federated Farmers and the Dairy Demonstration Farms in the region;
- notes the effectiveness of the spread will be monitored and results provided to the Council and community;
- the Council work with Dung Beetle Innovations to investigate extending the release programme, including an assessment of what other councils have done and its outcome.

Information on the potential benefits of dung beetles is set out in the proposal below and was also presented to the 16 May 2016 and 17 January 2017 committee meetings.

Training of council staff to monitor dung beetle numbers and spread has commenced. These results will be reported to the Council.

Extension Proposal

The extension proposal is set out below.

The target of the proposal is for all Taranaki dairy farms to have an established dung beetle population by 2040. To achieve this 75% of farms would be seeded with beetles over the next 20 years with the balance of farms having beetles through natural dispersal. Sixty-five farm packages would be available each year for beetle seeding on farms throughout the region.

The total annual cost of the proposal has been estimated by DBI to be $325,000 with an assumption made the cost would be split 50/50 with the Council and farmers over the 20-year programme life. This equates to $162,500 per year for the Council assuming farmer financial support is provided. This level of contribution is equivalent to a 2.2 % general rate increase.

Information on the release of dung beetles in other parts of New Zealand is set out in the proposal (section 5 Appendix). In 2013, beetles were released in Southland and Wellington as part of a Sustainable Farming Fund project. They have been released in Northland (2014- 2016) and consideration is being given to a release in Hawkes Bay.

Dung beetles (*Copris incertus*) were established in Taranaki just north of the White Cliffs more than 40 years ago, in the 1970's. According to the farmer (Mr R Gibb) the population flourishes and has spread from the seeding farm. However, there is no scientific monitoring data to support this. A delimiting survey is required to establish any spread in the last 40 years.

The same beetle was established by Dr Forgie in the south Kaipara area in 1994 and a population based on a minimal number of adults (100) flourishes and has been observed a minimum of 10 km from the seed farm. A delimiting survey is required to establish any spread in the last 23 years.

There is a lack of scientific data on whether the dung beetles have survived and successfully established in New Zealand from the earlier releases in 2013 and those undertaken subsequently.

In Taranaki, there is anecdotal data available in North Taranaki.

An application to the Governments Freshwater Improvement fund has been made by DBI and some cattle farmers in the North Island to establish dung beetles on their farms.

Research by Landcare Research has been undertaken into the impact of dung beetles activity on water quality percolated through the soil horizon. The research trial concluded the successful use of dung beetles to remove dung and nutrients from the soil surface[1].

Funding Policy

The Council is required to manage revenue, expenses, assets, liabilities, investments and general financial dealings prudently and in a manner that promotes the current and future interests of the regional community. A funding policy is included in the Long Term Plan that is relevant to the consideration of the dung beetle extension proposal. A key consideration in the policy is the distribution of benefits between the community as a whole and, any identifiable part of the community and individuals. The proposal sets out the benefits to farmers and those to the community. The proposal identifies the on farm benefits: improved drainage; increased dry matter production; and less environmental impact.

Discussion

It is early days in terms of establishing whether dung beetles can be established and will achieve the farm and environmental benefits asserted. The dung beetle establishment graph in the proposal shows a 6-year period before beetle numbers increase and a 10-year period for farms to reach their carry capacity. Hence, the alleged soil and increased dry matter benefits do not arise immediately as there is minimal beetle growth in the first 6 years.

The annual programme cost to the Council ($162,500) is considered high and farmer support for the remainder ($162,500) would have to be obtained. No one in New Zealand would have commissioned such a large-scale dung beetle release programme before. There are considerable unknowns. If the Council proceeded there are financial and reputation risks to be considered as an early innovator promoting this technology. The Council has recently agreed budgets for 2017/18, which do not include provision for dung beetle funding.

Given the purported soil, dry matter and environmental benefits arising from the beetles farmers should pay all or most of the cost. The original concept was to invest $10,000 and monitor to see if the beetles actually establish and spread in the region before considering any further expenditure. At the time, there was no awareness of the North Taranaki release. Hence, it would be prudent to undertake some monitoring in the area to establish population levels and spread before considering any further expenditure.

Given the on farm benefits identified by DBL any further Council investment would be minimal with farmers meeting all or most of the cost according to the Council's funding policy.

The Council will monitor the dung beetle application made to the Government's Freshwater Improvement fund and if successful consider an application for this region if the 50 % local share can be found. Recommendations recognising the above are provided for Members consideration.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

[1] A Barber, Aglink SFF 408137 report, February 2017.

Financial considerations—LTP/Annual plan

This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Biosecurity Act 1993*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Dung Beetle Establishment in Taranaki

Taranaki Regional Council Partnership Programme for Catchment Scale Dung Beetle Releases

Programme Proposal

February 2017

PROGRAMME TITLE

Dung Beetle Establishment in Taranaki
Taranaki Regional Council Partnership Programme for Catchment Scale Dung Beetle Releases

PROGRAMME PROPOSAL

1. Background and benefits

Following a presentation by Dr Shaun Forgie to the Policy and Planning Committee of the Taranaki Regional Council on the 31st January. The committee requested that:

> "the Council work with Dung Beetle Innovations to investigate extending the release programme, including an assessment of what other councils have done and its outcome."

This proposal has been prepared to support the TRC staff develop their dung beetle release programme.

Dung beetles provide a range of ecosystem services, including reduced nitrogen leaching through improved soil quality, improved soil fertility, biology and structure, improved water infiltration reducing surface runoff, improved water quality, reduce forage fouling, suppress livestock pests, sequester carbon and greater forage productivity (Figure 3).

Exotic pastoral dung beetles have been deliberately introduced into a number of countries engaged in livestock farming where they were previously absent, notably Australia where 55 species of dung beetles were imported between 1968 and 1982.

Overseas establishment projects show conclusively that introducing dung beetles helps significantly: improve long-term sustainability; reduce costs of agricultural inputs; boost productivity; and, increase profitability. Once established, the system is self-sustaining and will operate without running or maintenance costs.

New Zealand has no native grass grazing mammals and consequently lacks native dung beetles that are adapted to exploit the dung produced by pastoral livestock. Introduction of exotic dung beetles therefore has the potential to greatly improve the sustainability of extensive livestock production in New Zealand. An application lodged by a group of farmers and councils to release eleven species of exotic dung-burying beetles into New Zealand was approved in 2011 by the Environmental Risk Management Authority (ERMA) which, like its successor, the Environmental Protection Authority (EPA), makes decisions by evaluating the risks, costs, and benefits of introducing 'new organisms'. Six species have been imported and mass reared with a subsequent number of limited releases occurring in parts of the North and South Islands.

Dung Beetle Innovations (DBI) was founded off the back of the initial release project with the objective to commercially rear all 11 species to rebalance New Zealand's pastoral farming systems; through the sale, management and research of dung beetles. It currently has 6 different types of dung beetles that are available on a commercial scale for sale to livestock farmers throughout New Zealand. Two winter active species currently in a Landcare Research (LCR) containment facility will be available for sale in 2018 once they

have been disease tested and permitted to leave quarantine. Additional species are to be imported to New Zealand in 2017 and 2018 bringing the total number of beetles available to 11.

In addition to importing, commercial rearing and establishment of these beetles, a number of post release research projects have been undertaken to ascertain several key benefits reported overseas in a NZ pastoral context (http://dungbeetle.org.nz/benefits/). These assessed the impact of dung beetle activity on surface water run-off and sediment load, and survivorship of cattle helminths with results from these studies showing significant reductions comparable to published overseas findings. Current research projects are investigating dung beetle activity under individual cow pats on the percolation of *E. coli*, nitrogen, and phosphate in compact prone soils, and also soil physics and chemistry over a three year period.

Partnership is the key
Individual Farmer vs a Collaborative Catchment Based Approach
While there are compelling economic reasons why farmers should purchase beetles, experience over the last two years has proven that while a few progressive farmers will purchase beetles (40 packages in 2016 and 22 to date in 2017) it will not be enough to make any measureable different at a catchment level.

The economic benefits from dung beetles are primarily from increased grass production. Research conducted for Meat & Livestock Australia (MLA) show a pasture response of 0.057 kg dry matter per kilogram of buried dung. For an averaged sized dairy farm the Net Present Value of their $6,000 investment is $41,000, with an Internal Rate of Return of 37%. However due to the time it takes to establish the payback period is 8 years.

While the economics justify farmers purchasing beetles outright, it simply will not happen. At this stage purchasing beetles is simply too left field for most farmers to commit to. Therefore for the next 10 years beetles need to be funded in a partnership approach between farmers and council.

Taranaki cannot wait another 50 years before dung beetles organically establish in enough numbers to make a detectable difference at a catchment scale. Just like riparian planting and biological control organisms for weeds, dung beetles must be funded using a mixture of private (farmer) and public money or it simply will not happen quickly enough to make a difference to the increasingly polluted country we live in.

Onthophagus binodis
- Size: < 12 mm
- Day active: spring – autumn
- generations per season: multiple
- Egg-adult: 6-8 weeks
- Burial depth: 15-30 cm
- Soil preference: all soils

Onitis alexis alexis
- Size: < 20 mm
- Dusk and dawn active: spring – autumn
- generations per season: 2+
- Egg-adult: 8-12 weeks
- Burial depth: 15-30 cm
- Soil preference: all soils

Geotrupes spiniger
- Size: < 25 mm
- Night active: Summer – winter
- generations per season: 1+
- Egg-adult: 4-6 months
- Burial depth: 20-40+cm
- Soil preference: all soils

Copris incertus
- Size: < 17 mm
- Night active: spring – autumn
- generations per season: 2+
- Egg-adult: 8-12 weeks
- Burial depth: 15-30 cm
- Soil preference: all soils

Onthophagus taurus
- Size: < 10mm
- Day active: spring – autumn
- generations per season: multiple
- Egg-adult: 6-8 weeks
- Burial depth: 10-20 cm
- Soil preference: all soils

Figure 1. Beetles proposed for release in Taranaki.

2. Approach – Partnership is the key

The objective of this programme is to establish dung beetles in Taranaki using a catchment based seeding approach. The net outcome is a naturally populating beetle that once established, will provide self-sustaining long-term benefits to the farmer, improving water quality, soil health and productivity, and reducing costs.

Taranaki has a proud history as being the leading council for riparian planting. Over the past 20 years TRC has taken a partnership approach with landowners to develop and implement riparian plantings. TRC, through contracted nurseries, have supplied 4.3 million native plants to farmers at cost.

Exactly the same approach now needs to be applied to dung beetles. This will enhance and compliment the planting programme which is now reaching its conclusion (84% of streams are fenced and 70% are planted)

Target:
All Taranaki farms have an established dung beetle population by 2040.

To achieve that target 75% of farms are seeded with beetles over the next 20 years. Note the balance of farms will have beetles through natural dispersal.

Approach:
Just like the riparian planting scheme, Dung Beetle Innovations will supply dung beetles to Taranaki farmers at cost.

For the purposes of this proposal we have focused on dairy, however the approach is equally applicable to sheep and beef farms.

Number of Taranaki dairy herds	1,716
75% seeded with 4 dung beetle species	1,287
Number of Whole Farm dung beetle packages per year (over 20 years)	65
Annual cost	
Taranaki Regional Council	$162,500
Farmers	$162,500
Total	**$325,000**

Timetable:

Date	Description	Cost		
		TRC	Farmer	Total
January 2017	TRC seeds 2 demonstration dairy farms with beetles	$10,000		$10,000
February 2017	DBI boosts beetle numbers on the demonstration farms			Free
February 2017	Landcorp purchases beetles for one of their Taranaki dairy farms		$6,000	$6,000
March to April 2017	Pilot the beetle partnership scheme 10 Whole Farm Packages are purchased	$25,000	$25,000	$50,000
Annual				
December to April	65 Taranaki farms are seeded with dung beetles per year	$162,500	$162,500	$325,000

Between now and April we have proposed running a pilot scheme for the dung beetle partnership model between DBI, farmers and council.

This will provide good experience on which to develop a longer term programme. It could also be used to promote TRC's leading approach at the National Fieldays, where DBI has a stand.

DBI will conduct post release monitoring that will be carried out annually to determine:

- Establishment success
- Rate of spread
- Soil health

  - **Establishment success.** Dung-baited pitfall traps (Figure 5), observation of physical evidence - soil casts (Figure 6), dung pat feed/breeding evidence (Figure 7).

  - **Rate of spread.** Delimiting surveys from points of seeding employing 'Establishment Success' methodologies radiating outwards at increasing intervals until no signs of 'Establishment Success' are found.

  - **Soil health.** To assess biological activity and chemistry, soil core samples (e.g., 50cm diameter x 400 mm deep) will be obtained from points of seeding to capture elevations and seasonal variations in parameter levels. Sampling will also occur in control sites where there is no evidence of establishment success for comparison. All core samples will be analysed for moisture content, pH, organic carbon, total nitrogen (Leco), KCl-extractable NO_3 and NH^4 (Min-N), P (Olsen), and microbial biomass at the Environmental Chemistry Laboratories, Palmerston North.

TRC staff and farmers will be trained through workshops and videos in integrated beetle and stock management.

This programme will showcase Taranaki Regional Council as the leading region in sustainable livestock farming and environmental management.

To achieve the programme's goal of establishing beetles at a catchment level, the majority of farms in a target catchment will need to be seeded. Beetles reach a farm's carry capacity in approximately 9 years. Figure 2 shows the increase in beetle numbers after seeding a colony of beetle's on-farm.

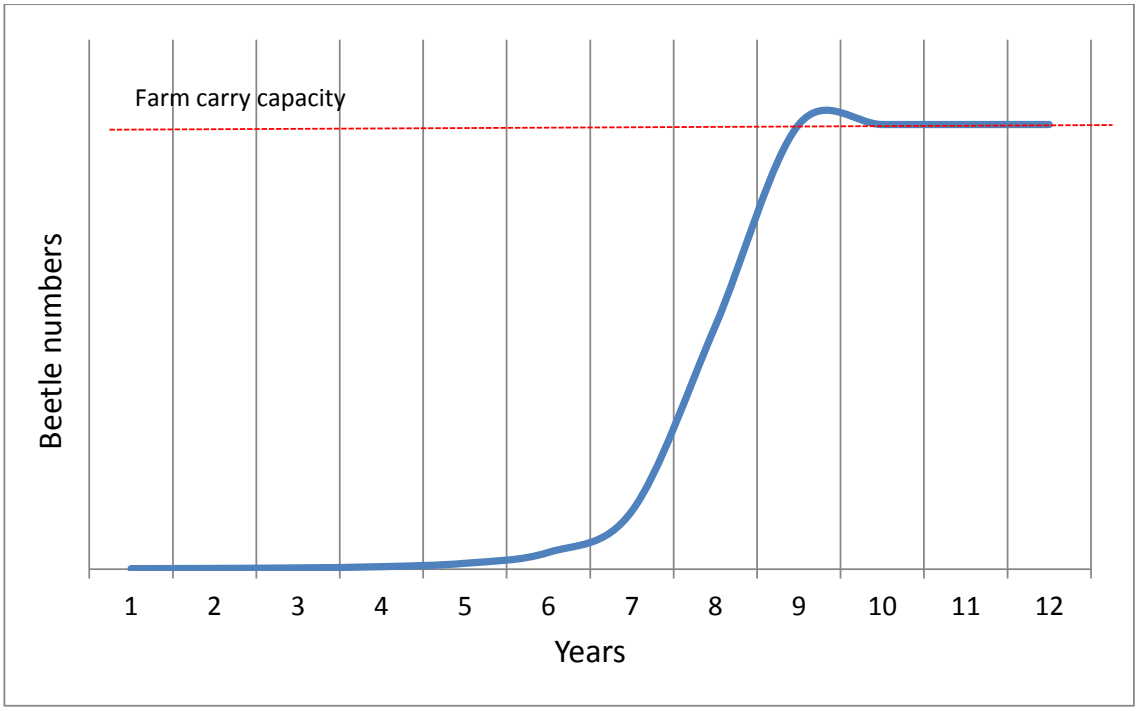

Figure 2. On-farm beetle population growth

3. Deliverables

- Partnership programme pilot. DBI to supply 10 Whole Farm Packages of dung beetles to Taranaki farmers by May 2017.
- In March 2017 deliver a workshop on the dairy demonstration farm where beetles have been released on integrated stock and beetle management.
- DBI to provide post-release monitoring and soil health tracking (This would begin three years after seeding).
- DBI to provide progress reports to TRC.
- DBI to annually supply a minimum of 65 Whole Farm Packages of dung beetles to Taranaki farmers from December 2017.

4. DBI Programme Personnel

Dr Shaun Forgie
Director – Dung Beetle Innovations

Shaun Forgie is a director of Dung Beetle Innovations and is head of Production and Research. In his previous role as a research scientist for Landcare Research, New Zealand's foremost environmental research institute, Shaun received a science excellence award for his key role in the Dung Beetle Project. Shaun is a globally recognised dung beetle expert with PhD and MSc (Hons) degrees specialising in dung beetle reproduction, ecology and evolution. His research has been disseminated in media and peer reviewed scientific journals, and combined with his extensive rearing experience and fieldwork, he brings to DBI a wealth of expertise that is instrumental in its success.

Andrew Barber
Managing Director – Dung Beetle Innovations

Andrew also owns Agrilink NZ, an agricultural consultancy company specialising in energy and resource use efficiency across the agricultural and horticultural industries. He has been consulting for over 20 years, and running his own company since 2002. Andrew manages large multi-stakeholder projects. Andrew brings to DBI his project and business management skills, together with an understanding of the agricultural industry.

5. Appendix

Other councils approached.

Council	Description	Contact
Greater Wellington Regional Council	First releases of copris incertus in … First North Island releases as part of the SFF project in September 2013 Purchased 4 whole farm packages in Feb 2017. DBI presented to staff in November 2016. Have discussed developing a proposal for supporting beetle releases as part of their 10 year Long Term Plan.	Davor Bejakovich Davor.Bejakovich@gw.govt.nz Previously Richard Grimmett, now richard@kotarevillage.org.nz 027 9247484
Environment Southland	Funding support for the original SFF project. First NZ release of dung beetles in September 2013.	
Northland Regional Council	Entomologist Jenny Dymock has purchased and released several farm starter packages, starting in 2014 through to 2016. Found beetles on a release farm in Feb. 2017 (see DBI Facebook post 17/2/17.)	Run through Jenny Dymock jennydymock@ihug.co.nz 09 406 0033
Hawkes Bay Regional Council	Staff presentation in Nov. 2016. Supportive, but are yet to develop a plan.	Maddy McLean maddy.mclean@hbrc.govt.nz

Iwi approached

Iwi	Description	Contact
Rangitāne iwi in the Manawatū	Purchased 2 whole farm packages in 2016. DBI is supporting Rangitāne iwi develop a catchment based funding proposal.	Paul Horton Paul@rangitaane.iwi.nz 021 1805197
Waikato River Authority	Submitted a catchment based proposal in 2016. The application was viewed positively but requested that it be resubmitted with greater certainty around iwi support.	James Allen Agfirst james.allen@agfirst.co.nz 0274 743 093

Figure 3. Dung beetle benefits.

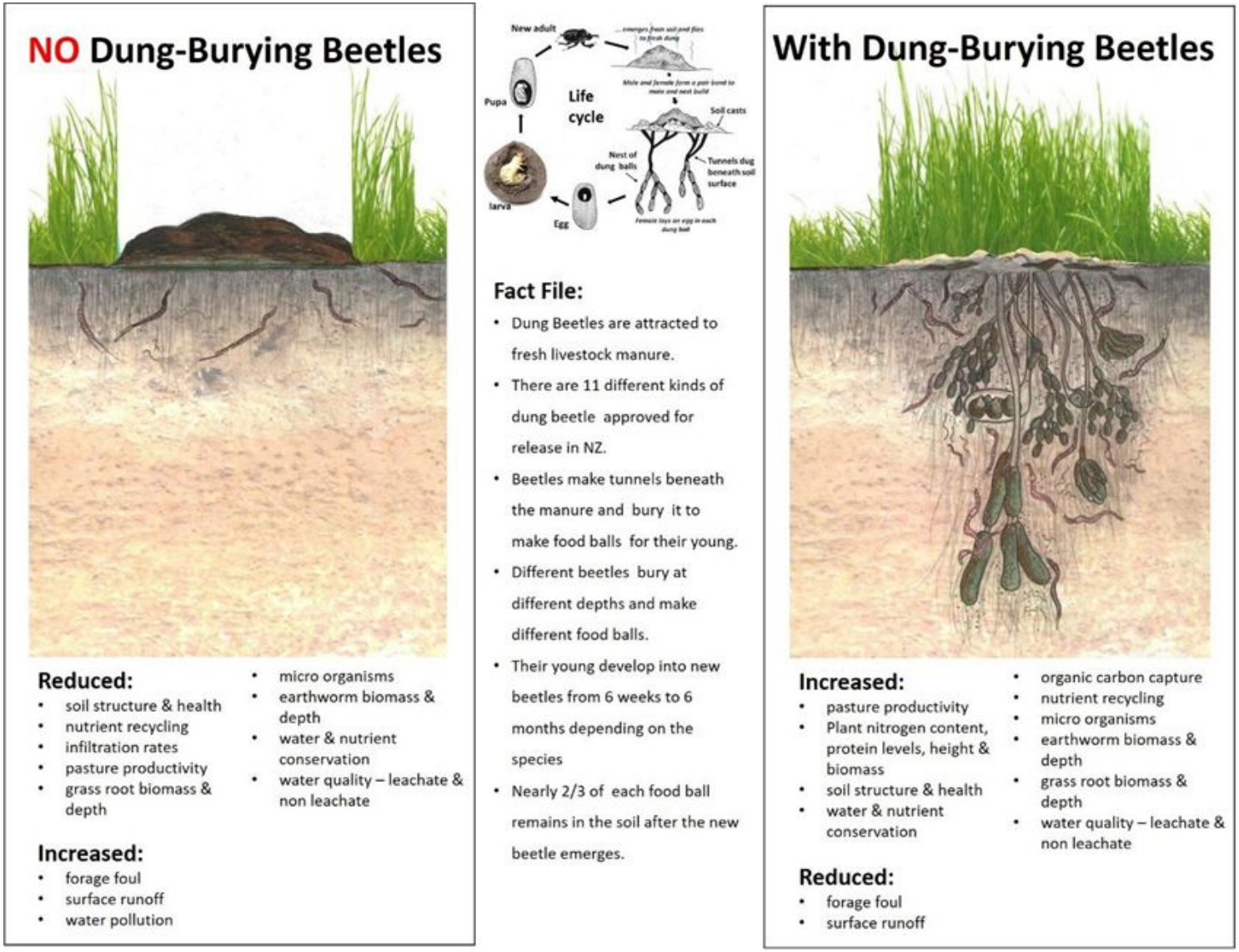

Figure 4. Dung beetle population levels at a farm's carry capacity. Year 9 onwards following standard release of Whole Farm Package's proportional to number of stock units.

Figure 5. Dung beetle pitfall trap used to monitor post release establishment and population growth.

Figure 6. Soil casts showing evidence of dung beetle tunnelling.

Figure 7. Dung pat feed/breeding evidence by nesting dung beetles. Most of the manure is buried leaving a thin layer of dry loose chaff that forage can grow through.

DUNG BEETLE INNOVATIONS

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Agenda reports

Policy & Planning Committee, June 2017

Item 4

Freshwater Physicochemical Monitoring Report 2015-16 (4 MB)