Future directions for the management of farm dairy effluent

Review of the Regional Fresh Water Plan for Taranaki

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Preface

It is clear to me that within a decade, current policy and farming practices that allow effluent accumulated in the farm dairies to be continuously disposed of into water, even following treatment in pond systems, will no longer be acceptable to the wider community and international markets.

There is a range of 'drivers' seeking change and better practices in relation to farm dairy effluent management. These drivers range from market expectations, reputational signals, government directives, improved scientific knowledge of the causes and effects of pollution, Maori and broader community aspirations regarding freshwater quality, the need to respond to adverse impacts arising from land use intensification, and indeed farmers' desire to be international leaders across all elements of the dairy business and to be knowledgeable, informed and active environmentally responsible citizens.

Over the last two decades, we have experienced a significant expansion and intensification of dairying in Taranaki. However, alongside the increased productivity there has also been an increased volume of farm dairy effluent that must be disposed of into the environment. The environmental effects associated with the disposal of effluent from farm dairies are a major pressure on our freshwater quality in the region and is contributing to the progressive decline in the 'health' of our waterways downstream.

Nationally, there are policy directives seeking change in the management of farm dairy effluent. In particular, the promulgation of the *National Policy Statement for Freshwater Management*, amongst other things, requires regional councils, when making rules, to effectively adopt the best practicable option to prevent or minimise actual or likely water pollution. Given that continuously allowing the discharge of treated effluent from pond systems is no longer considered best practice, the question is no longer about whether there will be changes in the way we currently manage farm dairy effluent in the region but rather what and how big that change should be.

This working paper entitled *Future Directions for the Management of Farm Dairy Effluent* contributes to the Taranaki Regional Council's (the Council) review of the *Regional Fresh Water Plan for Taranaki* (the Freshwater Plan). It examines the evidence, studies and research on the impacts of farm dairy effluent, the efficiency and effectiveness of treatment and disposal options, and canvases the options in terms of possible changes to the Freshwater Plan that would allow farmers to increase production to meet global demands for dairy produce while at the same time meeting environmental parameters set for freshwater quality in the region.

Policy options canvassed in this paper range from continuing to allow farm dairy treatment ponds to discharge to water all year round, to prohibiting pond discharges to water (and instead require the full land application of farm dairy effluent). However, the Council believes there are no significant added environmental outcomes from prohibiting pond discharges to water during high rainfall/water flow conditions. Indeed, allowing discharges of treated effluent to water at certain times of the year is preferential to spraying effluent onto waterlogged soils.

This paper presents a number of recommendations relating to possible changes to the Freshwater Plan. The recommendations include:

- the cessation of continuous farm dairy treatment pond discharges to water. Instead all farm dairy effluent management systems must be a land treatment or dual discharge system
- allowing pond discharges to water in periods when water flows are high. At other times of the year the effluent must be discharged to land

- requiring land treatment systems to have adequately sized and lined holding ponds
- improving the environmental performance of treatment and holding ponds
- encouraging on-farm waste minimisation and water conservation practices
- requiring feed pad effluent to be managed as part of the farm dairy effluent system.

The proposed changes will result in substantially improved protection of water quality in Taranaki's rivers and streams. In particular, significant reductions in nutrient and bacteriological loadings in our waterways are anticipated. The changes will not only substantially reduce the volumes of treated farm dairy effluent being discharged to our waterways but will also confine the timing of discharges to winter high-flow periods when there will be less than minor adverse environmental effects.

The proposed changes continue the decades-long process of incrementally and systematically improving the management of farm dairy effluent and the maintenance and enhancement of Taranaki's freshwater quality in response to increased intensification and changing community attitudes. The changes come with a cost. However, in the proposed changes, the Council believes it has adopted a logical 'Taranaki' solution for farm dairy effluent management that reflects local environmental conditions, best industry practice, and sound science. In so doing, we are not only giving effect to new national policy requirements, we are also 'future-proofing' the dairying industry. Through the proposed changes Taranaki is looking to be at the forefront of dairy productivity, best practice and respect for the environment, and we will be in a position to demonstrate this.

This paper is a starting point for consulting with stakeholders on possible changes to the Freshwater Plan. The Council looks forward to canvassing these matters with stakeholders to obtain their early input into possible changes to the *Regional Freshwater Plan for Taranaki*.

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Chair
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1. Introduction

1.1 Purpose

The purpose of this working paper is to set out future directions for the management of farm dairy effluent in the Taranaki region.

This paper contributes to the Taranaki Regional Council's (the Council) review of the *Regional Fresh Water Plan for Taranaki* (the Freshwater Plan).

1.2 Background

The Council is currently undertaking a full review of the Freshwater Plan. The Council's aim for the review is to contribute to the maintenance and, where necessary, the enhancement of freshwater quality in the region. Water quality refers to the physical, chemical and biological characteristics of water that affect its ability to sustain environmental values and uses.

The careful management of farm dairy effluent is a key component to achieving the aim of maintaining or enhancing water quality in the region (as at 30 June 2011, 62% of the region's discharge consents are for farm dairy discharges).[1]

Maintaining or improving freshwater quality is essential to the region's well-being. It is important for drinking and community supply, and to meet the consumptive demands of agriculture, industry and commerce. Equally, good freshwater quality is essential for maintaining healthy rivers and streams, including their natural character, ecological, amenity and recreational values, and the cultural and spiritual values of or customary uses by tangata whenua.[2]

[1] *Taranaki Regional Council, 2011.*

[2] *Water forms an important part of the cultural and spiritual values of Maori who have a kaitiaki or guardianship role in relation to water.*

In Taranaki, dairying is a significant contributor to our regional economy and well-being. There are about 1,760 dairy farms in Taranaki. Most dairy farms are seasonal milk suppliers, with the herd calving in the spring and milking through to autumn. Herds are generally milked twice a day, with milking sessions taking about two hours for a herd of 200.

The concentration of dairy cows in yards and milking areas produce considerable volumes of animal waste. It is estimated that the quantity of effluent produced from one cow is roughly equivalent to that from 14 people.[3] The effluent accumulated in the farm dairy is disposed of into the environment via:

- the treatment of effluent in pond systems followed by discharges to land or water
- the spraying of untreated effluent on to land.

The environmental effects associated with the disposal of effluent from farm dairies is a major pressure on the freshwater quality of rivers and streams traversing intensively farmed land.

Exacerbating pressures on our freshwater resource has been the expansion and intensification of dairying in the region.[4] The average farm is now larger in area and herd size. Stocking rates have also increased. The increases in cow numbers, stocking rate and total area in dairy farming has generated greater volumes of farm dairy effluent requiring treatment or disposal.

Since the adoption of the Freshwater Plan in 2001, there have been significant changes in community expectations relating to the maintenance and enhancement of

[3] *Ministry for the Environment, October 1999.*

[4] *Dairy farming has historically focused on the fertile flat areas of the ring plain. However, over the last decade dairying has also expanded into the coastal terraces and the frontal hill country.*

freshwater across New Zealand. There has also been a significant shift in what constitutes best practice for farm dairy effluent management.

Taranaki was one of the first regions to require the appropriate treatment and disposal of farm dairy effluent. Until then the untreated waste generated by tens of thousands of cows as they were milked each day was 'washed' into the region's rivers and streams. The state of our water following milking was poor. In the late 1970s the Council's predecessor, the Taranaki Catchment Commission, required dairy farmers to obtain a resource consent and put in place systems to treat and dispose of their waste. Other regions soon followed suit.

In Taranaki, all farm dairy effluent discharge systems are annually inspected to ensure they are performing adequately. Farmer compliance with relevant rules and resource consent conditions has been consistently high. The Council has also been resolute in taking enforcement action where non-compliance occurs.

Over time there have been improvements in the design, construction and maintenance of ponds. Notwithstanding that, both nationally and in the region (through policies in the Freshwater Plan), there has been an increasing preference and move towards land treatment.

Given changing expectations for freshwater management and additional evidence, studies and research on what constitutes best practice, it is timely for the Council to reconsider what represents best practice for the management of farm dairy effluent in this region.

This review includes a literature review of relevant studies and research on the impacts of farm dairy effluent on the receiving environment and the efficiency and effectiveness of treatment and disposal options.

This paper sets out the findings of that review and represents a starting point for consulting with key stakeholders to obtain their early input into the development of revised Plan provisions addressing the future management of farm dairy effluent.

1.3 Scope

The scope of this paper covers farm dairy effluent management. While the focus of the paper is on point source discharges from farm dairy effluent treatment systems, the paper also addresses other significant farm point sources such as silage pits and feedlots.

Of note farm dairy effluent is but one of many human induced pressures on the region's freshwater quality. Other, arguably more significant pressures, such as the impacts of diffuse source discharges from adjacent land uses to water, will also be addressed as part of the review of the Freshwater Plan. These 'other' issues will be addressed in separate working and technical papers.

1.4 Structure

The working paper has eight sections.

Section 1 introduces the working paper, including its purpose, background, scope and structure.

Section 2 sets out the statutory and planning context for managing farm dairy effluent in the region.

Section 3 provides a brief overview of point source discharges of farm dairy effluent, including farm dairy effluent treatment and disposal options and their advantages and disadvantages.

Section 4 outlines potential environmental effects of farm dairy effluent discharges according to the receiving environment and disposal method.

Section 5 examines key management issues relating to farm dairy effluent management and which need to be addressed in the review of the Freshwater Plan. This section includes key findings arising from research, studies and reviews relating to farm dairy effluent.

Section 6 examines some of the physical and climatic opportunities and constraints relating to farm dairy effluent management in Taranaki that should also be taken into consideration when setting future directions.

Section 7 sets out the desired outcomes and policy options considered in relation to farm dairy effluent management in the region. The section includes recommended changes to the Freshwater Plan and the benefits and costs of those changes.

Section 8 sets out the summary and conclusions for this paper.

A definition of terms, including an explanation of acronyms used in this paper, and the appendices are presented at the back of this paper.

2. Statutory and planning context

This section sets out the statutory and planning context for managing farm dairy effluent in the Taranaki region.

2.1 The RMA framework

The Council is responsible for promoting the sustainable management of freshwater resources, including water quality, in the Taranaki region. This responsibility is set out in section 30 [regional council functions] of the RMA.

Under section 30 of the RMA, the Council, amongst other things, has the following functions:

- the control of the use of land for the purposes of:
  - maintenance and enhancement of water quality
  - maintenance and enhancement of ecosystems in water bodies
- the control of discharges of contaminants into or onto land, air, or water and discharges of water into water
- the establishment of regional rules to allocate the capacity of water to assimilate a discharge of a contaminant.

The RMA provides for a hierarchy of policies and plans and other statutory powers to enable central and local government to carry out their functions. These include national policy statements, national environmental standards, regional policy statements, regional plans, and district plans.

2.2 The National Policy Statement on Freshwater Management

Across New Zealand, freshwater quality is coming under increasing pressure. Subsequently, the Government promulgated the *National Policy Statement on Freshwater Management 2011* (the NPS), which came into effect on 1 July 2011.

The NPS sets out objectives and policies that direct local government to manage water in an integrated and sustainable way, while providing for economic growth within set water quantity and quality limits.

Local authorities must give effect to relevant provisions of the NPS in their planning documents and resource consent authorities must have regard to relevant provisions when considering consent applications.

The NPS, amongst other things, requires all regional councils to set water quality objectives and limits in regional plans for all bodies of fresh water in their regions. It further requires regional councils, when making rules, to adopt the best practical option to prevent or minimise actual or likely adverse effects from discharges. This is more than simply protecting the environmental 'bottom lines'.

The NPS contains two objectives for managing freshwater quality that regional councils must give effect to. The objectives of the NPS relating to freshwater quality are:

"A1. To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of freshwater.

A2. The overall quality of freshwater within a region is to be maintained or improved while
(a) protecting the quality of outstanding freshwater bodies
(b) protecting the significant values of wetlands

(c) *improving the quality of freshwater in water bodies that have been degraded by...over allocation (i.e. of their assimilative capacity)."*

Of particular relevance to this paper are Policies A3 and A4(1) [5] of the NPS[6], which read as follows:

*"**Policy A3***
By regional councils:

(a) *imposing conditions on discharge permits to ensure the limits and targets specified pursuant to Policy A1 and Policy A2 can be met and*

(b) *where permissible, making rules requiring <u>the adoption of the best practicable option</u> to prevent or minimise any actual or likely adverse effect on the environment of any discharge of a contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water."*

*"**Policy A4***

1. *When considering any application for a discharge the consent authority must have regard to the following matters:*
   (a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and*
   (b) *the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the discharge would be avoided."*

[5] *Policy A4 provided for regional councils to immediately amend their regional plans (without using the statutory review process in Schedule 1 of the RMA).*

[6] *Other relevant NPS policies include Policies A1 and A2, which relate to the establishment of freshwater objectives and the setting of water quality limits.*

2.3 The New Zealand Coastal Policy Statement

The *New Zealand Coastal Policy Statement* (the NZCPS) was gazetted on 4 November 2010 and took effect on 3 December 2010. The purpose of the NZCPS is to state national *"… policies in order to achieve the purpose of the Act in relation to the coastal environment of New Zealand"*.

Local authorities must give effect to relevant provisions of the NZCPS in their planning documents and resource consent authorities must have regard to relevant provisions when considering consent applications.

Policy 1 of the NZCPS identifies the extent and characteristics of the coastal environment. Of note the coastal environment extends beyond the coastal marine area (that part of the environment regulated via that Coastal Plan) and may include parts of rivers and streams where there are significant coastal processes, influence or qualities. Such areas would also fall under the scope of the Freshwater Plan.

Of particular significance to the issue of Freshwater Plan review are policies 21 and 23(1) of the NZCPS:

"Policy 21: Enhancement of water quality
Where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering, and cultural activities, give priority to improving that quality by:

(a) *identifying such areas of coastal water and water bodies and including them in plans;*

(b) *including provisions in plans to address improving water quality in the areas identified above;*

(c) *where practicable, restoring water quality to at least a state that can support such activities and ecosystems and natural habitats;*

(d) *requiring that stock are excluded from the coastal marine area, adjoining intertidal areas and other water bodies and riparian* *margins in the coastal environment, within a prescribed time frame; and*

(e) *engaging with tangata whenua to identify areas of coastal waters where they have particular interest, for example in cultural sites, wāhi tapu, other taonga, and values such as mauri, and remedying, or, where remediation is not practicable, mitigating adverse effects on these areas and values.*

Policy 23: Discharge of contaminants

(1) *In managing discharges to water in the coastal environment, have particular regard to:*

- *(a) the sensitivity of the receiving environment;*
- *(b) the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and*
- *(c) the capacity of the receiving environment to assimilate the contaminants; and:*
- *(d) avoid significant adverse effects on ecosystems and habitats after reasonable mixing;*
- *(e) use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and*
- *(f) minimise adverse effects on the life-supporting capacity of water within a mixing zone."*

2.4 The Regional Policy Statement for Taranaki

The *Regional Policy Statement for Taranaki* (the RPS) sets out broad objectives and policies for the Taranaki region to promote integrated management of resources in the region. Both regional and district plans must give effect to the RPS.

Managing adverse effects on water quality arising from point source discharges to water bodies and managing the cumulative adverse effects on water quality arising from multiple point source discharges have been identified as significant issues in the RPS.

In relation to the management of freshwater quality, WQU Objective 1 of the RPS is particularly relevant:

"WQU Objective 1
To maintain and enhance surface water quality in Taranaki's rivers, streams, lakes and wetlands by avoiding, remedying or mitigating any adverse effects of point source and diffuse source discharges to water."

The RPS includes policies and methods of implementation to achieve that objective. Of note is WQU Policy 5, which relates to point source discharges to surface water.

"WQU Policy 5
Waste reduction and waste treatment and disposal practices, which avoid, remedy or mitigate the adverse environmental effects of the point source discharge of contaminants into water or onto or into land will be required. This includes the cumulative adverse effects of multiple point source discharges to the same water body.

In considering policies in regional plans or resource consent proposals to discharge contaminants or water to land or water, matters to be considered by the Taranaki Regional Council will include:

(a) *the actual or potential effects of the discharge on the natural character, ecological and amenity values of the water body, including indigenous biodiversity values, fishery values and the habitat of trout*

(b) *the relationship of tangata whenua with the water body*

(c) *the use of water for domestic and community water supply purposes*

(d) *the actual or potential risks to human and animal health from the discharge*

(e) *the significance of any historic heritage values associated with the water body*

(f) *the degree to which the needs of other resource users might be compromised*

(g) *the allowance for reasonable mixing zones and sufficient dilution (determined in accordance with (a) to (o) of this Policy*

(h) *the potential for cumulative effects*

(i) *measures to reduce the volume and toxicity of the contaminant*

(j) *off set mitigation of the effects of the contaminants*

(k) *measures to reduce the risk of unintended discharges of contaminants*

(l) *the necessity of the discharge and the use of the best practicable option for the treatment and disposal of contaminants*

(m) *the availability and effectiveness of alternative means of disposing of the contaminant*

(n) *relevant national guidelines and national environmental standards on catchment management, and*

(o) *the sensitivity of the receiving environment."*

2.5 The Freshwater Plan

The Council's freshwater management responsibilities are primarily addressed through the Freshwater Plan. This Plan became operative on 8 October 2001.

The Freshwater Plan sets out policies relating to agricultural discharges, including Policy 6.2.5 relating to adopting the best practicable option for the disposal of farm dairy effluent. Policy 6.2.6 states that the Council will promote tertiary treatment or land applications of farm dairy effluent.

Pursuant to rules in the Freshwater Plan, a resource consent is required to discharge farm dairy effluent to either land or water.

Rules 36, 39 and 40 of the Freshwater Plan address farm dairy effluent discharges to water. The Plan requires farm dairy effluent discharges to water to be treated in some way such as via treatment ponds. Standards, terms and conditions apply to ensure that:

- the discharge is not to a regionally significant wetland
- there is a dilution rate of 100 parts of water to one part of effluent at all times (otherwise the activity is discretionary)
- water quality standards are met in relation to nitrogen and biochemical oxygen demand (BOD).

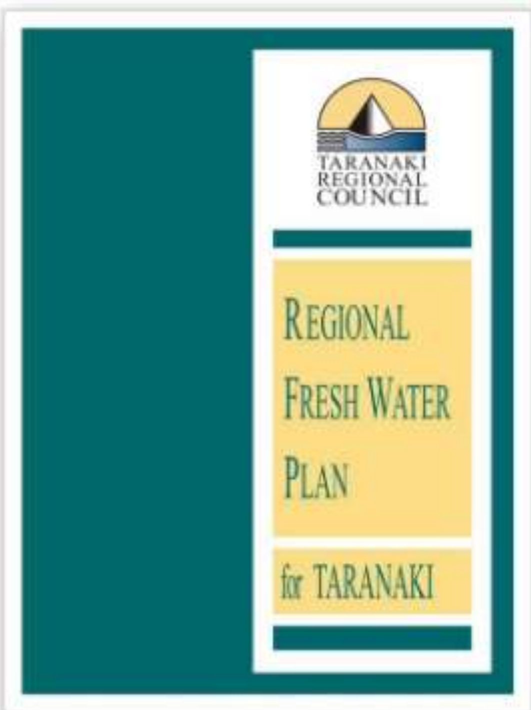
Rule 35 addresses discharges of farm dairy effluent to land. Standards, terms and conditions also apply to ensure that:

- none of the discharge will reach surface water
- the discharge is more than 25 metres from any surface water and 50 metres from any water supply well or spring
- less than 200 kg of nitrogen from effluent is applied to each hectare of land each year.

Discharges of untreated farm dairy effluent to a water body, under any circumstances, is prohibited (Rule 40). **Appendix I** of this paper sets out relevant rules in the Freshwater Plan relating to the management of farm dairy effluent discharges.

Discharges to land of leachate from feedlots are currently a permitted activity, i.e. do not require a resource consent (Rule 30), subject to appropriate set back distances from bores, wells and water bodies.

In addition to the policies, methods and rules, the Plan also contains design and operational guidelines for treatment pond systems and the land application of farm dairy effluent.



2.6 Industry initiatives

The *Dairying and Clean Streams Accord* (the Accord) is a national voluntary agreement to improve the dairy industry's environmental performance. The parties to the Accord are the Ministry for the Environment, the Ministry of Agriculture and Forestry, Fonterra and regional councils. The Accord was signed in May 2003.

The Accord specifies five on-farm actions that have a material influence on dairy farm environmental performance. Of relevance to this paper is the target that all dairy farm effluent discharges to immediately comply with resource consents and regional plans. Farmer compliance with relevant rules and resource consent conditions has been consistently high in this region (i.e. at or above 95%).

Nationally there has been considerable work on developing best practice for farm dairy effluent management with the presumption that land treatment is preferable to discharges to water. This includes guidance developed by DairyNZ promoting land treatment, e.g. best practice advice set out in the manual *Dairy and the Environment – Managing Farm Dairy Effluent*. (2006).

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3. Point source discharges of farm dairy effluent

This section provides a brief overview of farm dairy effluent management in the region, including the methods for treatment and disposal and their respective advantages and disadvantages.

3.1 Farm dairy effluent

Effluent from farm dairies primarily consists of faeces, urine and wash down water, but can also contain storm water, spilled milk, soil and feed residue, detergents and other cleaning chemicals.

Together, these constituents contain nutrients, organic matter, harmful micro-organisms (pathogens), sediments and toxins, which are potential contaminants.

The main sources of farm dairy effluent are associated with the farm dairy. Farm dairies, as defined in the Freshwater Plan, refers to the total area used in the dairy cow milking process and includes covered and uncovered areas where cows reside for longer than five minutes for the purpose of milking, including a stand-off pad or yard.[7]

Common methods for disposing of farm dairy effluent are:

- the treatment of effluent in treatment pond systems followed by discharge to land or water
- the spraying of untreated effluent on to land.

Table 1 below summaries some key statistics and trends relating to farm dairy effluent management in the region.

Table 1: Trends in the management of farm dairy effluent in Taranaki

	2002/2003	2010/2011
Average herd size (cows milked)[1]	210	270
No. of farm dairy effluent systems[2]	2,189	1,803
No. using ponds only[2]	1,211 (55.3%)	900 (50.0%)
No. using land treatment only[2]	922 (42.1%)	758 (42.0%)
No. using dual system[2]	56 (2.6%)	145 (8.0%)

1 Based upon cows milked 15 December – refer Ministry of Agriculture and Forestry farm monitoring reports
2 Derived from Council's consents database (R2D2).

3.2 Treatment pond systems

Treatment pond systems (i.e. oxidation systems involving two or more ponds) remains the common disposal method for managing the environmental risk from farm dairy effluent discharges in Taranaki. The popularity of this system is attributable to their relatively low cost, simple design, simple installation, and low maintenance requirements.

Treatment ponds receive the shed washing and natural runoff from dairy sheds, which are generally piped into the first (anaerobic) pond from the dairy shed sump. Further treatment occurs in a second shallower pond (aerobic) before being discharged to a water body.

The concept behind treatment ponds is to use biological processes to convert the high organic content of dairy shed effluent into less environmentally harmful forms. Each pond contains different naturally occurring types of bacteria.

The anerobic pond, which is free of oxygen, initially treats the high strength effluent. Bacteria break down the organic matter

[7] *Excludes raceways.*

present in the effluent. Suspended solids settle out onto the bottom of the ponds.

The aerobic pond receives and further treats the partially treated effluent. Algae present in the pond generate excess oxygen, which is used by bacteria to further breakdown organic matter, remove odours and pathogenic micro-organisms, and convert some ammonia to nitrate.

'Add ons' such as tertiary ponds and constructed wetlands can further enhance the environmental performance of pond systems.

Over the last decade there has been increasing interest in dual discharge systems, which allow discharge to land or to water, depending on environmental conditions. Dual discharge systems recognise the beneficial qualities of land application during the summer months (their environmental benefits, the fertilizer benefits of the effluent, and the quick payback period) but allow discharges of treated wastewater at times of the year when application to land is not suitable.

The design and construction of farm dairy treatment ponds are based on specifications set out in best practice guidance and as established by the best known science at that time.

There are a number of advantages and disadvantages relating to treatment pond systems

Advantages

- A low cost system
- Simple in design and straightforward to install
- Low maintenance requirements
- Not subject to mechanical failure or periods of unavailability
- Able to readily fit into a larger effluent treatment system as an initial treatment
- Subject to certain environmental conditions being met, have minor adverse effects on the receiving water.

Disadvantages

- Ponds still need to be adequately maintained
- Useful farm nutrients not being applied to the land
- Changes in the design and construction may be required over time to reflect increased herd sizes
- Initial leakage through the bottom of the ponds may, in some circumstances, be a problem until the pond naturally seals and/or ponds need to be lined with clay or plastic if soils are free draining
- The wastewater being discharged contains high nutrient and bacteriological levels and may contribute to cumulative effects and or still fail to meet environmental limits.

3.3 Land treatment

The second form of farm dairy effluent disposal is land treatment. Nationally, land treatment has been the preferred form of farm dairy effluent management. However, in Taranaki there has only been a slight increase in interest in this form of disposal. As noted in Table 1 in section 3.1 of this paper, over the last ten years, the proportion of systems in Taranaki discharging to land or via a dual system has increased from 45% to 50%.

Land treatment involves the collection of farm dairy effluent in a sump, which can then be applied directly to pasture by a spray application system, or a vehicle spreader.

Alternatively, the effluent can be stored in a holding or treatment pond, which is then applied to land when the soil and climatic conditions are most suitable, e.g. as part of a dual discharge system.

The soil can be considered a living filter in terms of its ability to treat farm dairy effluent. It deals with applied effluent in three ways:

1. physically: suspended solids and micro-organisms are filtered out between soil particles
2. chemically: nutrients (e.g. nitrogen) from the effluent can be chemically processed and released (e.g. denitrification) or retained by charged soil particles
3. biologically: organic materials are broken down by soil micro-organisms. Soil micro-organisms and plants will also remove nutrients as part of their own requirements.

Ultraviolet radiation in sunlight and the drying effect of the elements also have an effect in killing harmful micro-organisms following land application.

The nutrient value of farm dairy effluent is significant. Effluent should be thought of as a nutrient rich and valuable by-product of the milking process rather than as waste. The tendency in former years was to dispose of effluent with little regard for its value and use. The possibility of using effluent as a resource (refer section 5.1 below) increases the incentive to install a land application system.

Spray irrigation

There are a number of advantages and disadvantages relating to land treatment systems

Advantages:

- Subject to the system being well designed, maintained and managed there are less than minor adverse effects to surface or ground water
- Farm dairy effluent is a resource and has value as a soil conditioner and fertiliser. The nutrient value can offset fertiliser costs
- Since the operation involves passing effluent through soil, it meets Maori cultural requirements for effluent purification.

Disadvantages:

- Land application has a higher capital cost and a higher running cost than pond treatment systems
- Spray application systems require accurate design, close monitoring, skilled management and regular maintenance
- Where soils are saturated (due to climatic or soil conditions or application rates), there is increased risk of runoff to surface water or leaching to groundwater with significant adverse effects on freshwater quality
- Systems need to incorporate adequate storage to avoid adverse effects.

3.4 Feed pads

Feed pads are usually included in a farm system to improve feed use compared to paddock feeding.

Feed pads are normally sited adjacent to the farm dairy. Stock can be held in the feed pad for some time (1-2 hours), either before or after milking, and provided with supplementary feed. During that time they can accumulate a considerable amount of farm dairy effluent. Non-concrete surfaces are no longer acceptable for feed pads due to problems with cleaning and containing effluent.

4. Why do we need to manage farm dairy effluent discharges to water or land?

This section outlines potential environmental effects of farm dairy effluent discharges according to the receiving environment and disposal method.

4.1 Potential effects of point source discharges to water

The Ministry for the Environment[8] has identified a range of potential effects of farm shed effluent discharges to fresh water in various reports on the subject. These include:

- sediment in effluent can affect the colour, clarity and temperature of waterways. The sediment can also clog fish gills, smother instream flora and fauna and spawning habitat, and reduce light penetration, impairing photosynthesis. This in turn reduces the capacity of the stream to support animals and plants
- organic matter in effluent consumes oxygen as it breaks down, starving plant and animal life in the waterway of oxygen (i.e. increasing the BOD). The organic material can also cause excessive growth of bacterial and fungal slimes, which can raise the pH of water and kill sensitive plants and animals
- inorganic nutrients, in particular nitrogen and phosphorus can increase plant growth and cause algal 'blooms' in streams. Nitrogen, in its ammonia form, is toxic to some aquatic animals in particular fish. Ammonia also consumes a large amount of oxygen when breaking down, further exacerbating the concern identified in the second bullet point above
- pathogenic micro-organisms and bacteria in the effluent can make the water unsafe for drinking or recreational use
- direct discharge of effluent into waterways, and its effects, can be offensive to people. It can reduce amenity values and adversely affect peoples' relationship with the waterways. Maori, in particular, generally regard discharge of treated or untreated effluent direct to waterways as culturally offensive
- treatment ponds and discharges can cause odour nuisance.

Though the aforementioned effects apply to discharges to both land and water, they are typically associated with treatment pond discharges. However, from time to time there may be unauthorised discharges of farm dairy effluent associated with poor land application practices.

Table 2 presents typical physical, chemical and biological characteristics of farm dairy effluent discharged per cow/per day. However, of note these characteristics are extremely variable, changing from farm to farm, and from milking to milking.

Table 2: Characteristics of fresh effluent at the farm dairy[9]

Characteristic	Quantity per cow per day	
	Typical	Range
Total volume produced	50 litres	30 - 70 litres
Total solids	0.55 kilograms	0.3 - 0.6 kilograms
BOD[5]	0.12 kilograms	0.04 - 0.13 kilograms
Total nitrogen (N)	22.0 grams	7.0 - 30.0 grams
Total phosphorus (P)	2.5 grams	0.5 - 4.5 grams
Total potassium (K)	20.0 grams	5.5 - 26.0 grams
Total sulphur (S)	3.0 grams	1.0 - 4.0 grams

[8] *Ministry for the Environment, October 1999.*

[9] *Dairying and the Environment Committee, 2006.*

Potential effects associated with discharges from treatment ponds to water
Generally pond systems are efficient at removing sediment and BOD from the discharge but high concentrations of nutrients remain. When operating optimally, the pond system can result in 95% removal of BOD. Treatment can also reduce the concentration of nutrients and pathogenic micro-organisms in effluent, and decrease odours.

Notwithstanding that, pond systems are less efficient at removing nutrients, ammonia and faecal bacteria.

The cumulative effects of many point source discharges into some catchments are also an issue, particularly during low flow periods. Small effects repeated many times leads to the progressive decline of freshwater quality.

Farm dairy effluent discharges to water also compromise Maori cultural and spiritual values in that the discharge of even treated effluent to waterways is considered culturally offensive.

Significant adverse effects of discharges from farm dairy treatment ponds can generally be attributed to inadequate treatment and/or inadequate dilution of the discharge.

4.2 Potential effects of discharges onto land

Discharge of farm dairy effluent to land can also create adverse effects, especially if applied in a manner which exceeds the soil's absorption capacity (e.g. application to soil waterlogged by rain, or high hydraulic or nutrient loading rates). These include:

- effluent may run off to surface water (with effects as outlined in section 4.1 above)
- effluent may penetrate the surface soil layer and contaminate groundwater with nutrients and pathogens, and can also leach laterally to surface water
- excess effluent application to land may result in palatability problems for stock, pugging and deterioration in soil structure, and weed growth
- land application can create odour and spray drift problems
- treatment and storage ponds may leak, and effluent leach to groundwater.

Compared with the certain, immediate and reversible effects of discharges to surface water, the effects of groundwater contamination from discharge to land is less certain and much more long term. Nitrate leaching from agricultural soils (from urine, farm dairy effluent, clover-based dairy pastures, and nitrogen fertilisers) is regarded as the greatest contamination threat to groundwater, particularly in shallow unconfined aquifers. Nitrate can be toxic to humans at low concentrations.

Environmental effects associated with land treatment
Discharges of farm dairy effluent to land can also have significant environmental effects, which are often overlooked.

Adverse environmental effects from land discharges are largely confined to occasions where a farmer is applying effluent to:
– already saturated soils, or
– too near waterways, including drains, which results in the runoff to surface water or leaching to ground water.

This primarily occurs when a farmer has had insufficient regard to effluent application rates, paddock layout, topography, applicator type, soil type and condition, presence of waterways, storage requirements and energy losses.

5. Review of current policy on farm dairy effluent management in Taranaki

This section examines key management issues relating to farm dairy effluent management in Taranaki and which need to be addressed in the review of the Freshwater Plan. This section includes key findings arising from research, studies and reviews relating to farm dairy effluent management.

5.1 Farm dairy effluent as a resource

Farm dairy effluent is an asset that farmers should utilise to its fullest practicable potential.

Farm dairy effluent offers a source of nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and sulphur (S), as well as trace elements to increase pasture or crop production. The organic matter in the effluent will improve productivity, soil water holding characteristics, aeration and drainage, and will make soil less prone to compaction and erosion. The water content may also be beneficial if irrigated during dry conditions.

Research shows that 1kg N from effluent is equivalent to 1kg N from urea, in terms of pasture production, composition and nitrate leaching. Therefore farm dairy effluent can produce a good pasture response, up to 10 to 15kg dry matter per kg N applied in the effluent.

Table 3 below shows the dollar value of the effluent from 100 cows on an all-grass system.[10] Applying farm dairy effluent to land equates to a potential saving of approximately $3,510 in solid fertiliser per farm per annum (assuming the average Taranaki herd size is 270 cows).

Figure 1 provides a graphical illustration of the on-farm value of farm dairy effluent as a fertiliser.

[10] *Environment Canterbury, May 2007.*

Table 3: Value of farm dairy effluent as a solid fertiliser equivalent (nutrient content only)

Nutrient	Solid fertiliser equivalent and dollar value of effluent from 100 cows per year	
N	1.3 tonnes of urea	$650
P	0.7 tonnes of superphosphate	$130
K	1.1 tonnes of MoP	$450
Mg	0.2 tonnes of MgO	$70
Total dollar value		$1,300

Figure 1: Farm dairy effluent (from 100 cows) as a solid fertiliser equivalent

Table 4 below shows that in the case of a low supplement system, effluent from 100 cows spread over four and a half hectares can provide one half of a farm's required P, eleven times the required K and three quarters of the required sulphur. This indicates that while N loading is at an acceptable level, a larger area for effluent spreading would be needed in order to bring down the K loading.[11]

[11] *Most of the potassium in effluent is available for pasture uptake, and can cause animal health problems if not managed carefully. Therefore, K loading should always be considered when deciding on the appropriate area for effluent irrigation.*

Table 4: Nutrients applied compared to farm maintenance requirements

Nutrient applied	Amount from 100 cows over 4.5ha (kg/ha)	Farm maintenance requirements (1,300kg milk solids/ha)
P	20	40
K	175	15
S	16	20

5.2 Permitted activities versus resource consenting – a regional comparison

Both treatment pond and land application systems carry environmental risks that should be managed through the resource consenting process.

In some regions (e.g. Waikato, Northland and Auckland) concerns about the 'appropriateness' of direct discharges of waste to water, has resulted in those regions encouraging the land application of farm dairy effluent by making the activity a permitted activity (for which no resource consent is required). The reasons advanced for permitting farm dairy effluent discharges to land are: [12]

- it is adequate to manage the environmental effects
- it is generally preferred by the local community, which are opposed to direct discharges of 'waste' to water
- the variable performance of treatment pond systems
- reduced compliance costs on farmers (e.g. to obtain a resource consent).

In Taranaki and other regions, however, it was determined that both treatment pond and land application systems require a resource consent and appropriate monitoring.

[12] *Ministry for the Environment, October 1999.*

The reasons for the Council not adopting a permitted category for farm dairy effluent discharges to land are:

- land application can have more than minor adverse effects (refer section 4.2 above), which require monitoring and the recovery of associated costs[13]
- while there is a low environmental risk from land application when properly undertaken, in practice spray irrigation goes wrong twice as often as ponds and the adverse effects occur more rapidly, i.e. runoff
- there was no community support when preparing the current Plan for treating farm dairy effluent discharges to land differently from discharges to water.

Of note, is the scale and significance of the Council's farm dairy effluent compliance monitoring programme. This programme involves annually inspecting over 1,800 systems. In the event that monitoring indicates compliance issues with a system, re-inspections occur and, if appropriate, enforcement action is taken.

5.3 Environmental outcomes and trends relating to farm dairy effluent management

The Council's state of the environment monitoring shows relatively good to excellent overall water quality in the region.[14] [15]

On most physical, chemical and biological measures, freshwater quality is being maintained in Taranaki – i.e. organic matter, suspended solids, clarity, conductivity (dissolved matter), and bacterial contamination. This is during a time when there has been increasing demands on fresh water, e.g. the number of consents involving water abstractions and discharges has increased considerably, urban centres are

[13] *Recovery of costs via section 36 of the RMA is not possible for permitted activities, and the Council did not consider section 108 financial contributions to be appropriate for permitted activities.*

[14] *Taranaki Regional Council, February 2003.*

[15] *Taranaki Regional Council, February 2009.*

spreading, and livestock farming has intensified.

State of the environment monitoring also shows that, at some sites, freshwater quality has improved.

Notwithstanding the above, monitoring highlights that more nutrients are being released into the region's streams overall, particularly in the middle and lower catchments. This means that some water quality trigger values[16] are not being met. Furthermore, there are two (out of nine) deteriorating trends for ammoniacal nitrogen and water clarity in lower elevation areas (refer Table 5 below).

Table 5: NIWA's analysis of water quality in the Taranaki region[17]

Variable	Low elevation		Hill	
	State	Trend	State	Trend
Clarity	Fail	↓	Pass	NS
Conductivity	NA	NS	Fail	NS
Ammoniacal nitrogen	Pass	↓	Pass	NS
Oxidised nitrogen	Fail	NS	Pass	NS
Total nitrogen	Fail	NS	Pass	NS
Dissolved reactive phosphorus	Fail	NS	Fail	NS
Total phosphorus	Pass	NS	Pass	NS
Escherichia coli	Fail	NS	Fail	NS
Faecal coliforms	Pass	NS	Pass	NS

"Fail" means guideline value triggered/cause for investigation; "Pass" = below guideline trigger value/water is ecologically healthy; "NS" means no significant trends; "NA" means no monitoring.

The Council's Macroinvertebrate Community Index (MCI) monitoring is carried out at 57 sites on 25 rivers twice a year, and ranges from sites in near pristine water to sites in intensively farmed catchments. The MCI provides a measure of the biological health of the rivers.

MCI data confirms a 40-50 unit decline in the index that occurs along the length of ring plain catchments. Poorer water quality is generally found in low elevation pasture areas (Figure 2). In some lower catchments, stream biological health is only fair. Farm dairy discharges are a contributing factor to the progressive decline in downstream health.[18]

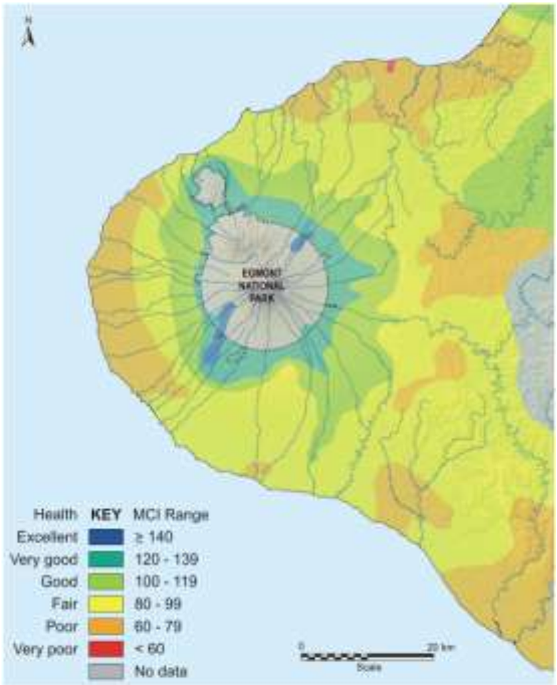

Figure 2: Ecological stream health for Taranaki rivers and streams as measured by MCI values

[16] *Note trigger levels are not national standards but rather have been devised to assess the levels of physical and chemical stressors, which might be having ecological or biological effects. Exceeding trigger levels indicates cause for investigation of water quality issues. Conversely, where trigger levels are not exceeded there is reasonable confidence that water quality is sufficient to support the ecological values.*

[17] *Office of Auditor-General, 2011A.*

[18] *The number of farm dairy effluent systems discharging to water is but one factor contributing to the progressive declines in MCI values. Other contributing factors include diffuse source discharges from adjacent land uses and changes in stream morphology and riparian shading.*

5.4 Studies on the effectiveness of farm dairy effluent systems

In Taranaki a number of studies have been undertaken to investigate the environmental performance of farm dairy effluent management systems in Taranaki. Of particular relevance are the following.

5.4.1 Study on the environmental performance of ponds 2006

Council monitoring and investigations confirm that treatment pond systems work but they have their limitations – to be effective they need to be well designed and maintained and adequate for the herd size, which is not always the case.

In 2006,[19] the Council carried out a study of ten farm dairy treatment pond systems to assess the suitability or otherwise of the Plan's standards, terms and conditions for ponds and to ensure they are providing an adequate level of environmental protection.

The 2006 study noted that the effects of discharges on the biological quality ranged from undetectable to significant in nature. The study confirmed that when ponds were designed and sized in accordance with the Council criteria, and consistently achieved a dilution ratio of 100:1 or greater, they were unlikely to result in effects on the receiving water that were more than negligible, in either duration or degree of severity. Where ponds did not comply with Council guidelines regarding pond sizes and dilution ratios, the effects were more than minor.

The 2006 study did not address the potential cumulative effects of multiple discharges entering any particular water body.

Figure 3 below presents a semi-quantitative analysis of the performance of pond systems against the degree of conformity with Council guidelines for pond size and dilution.

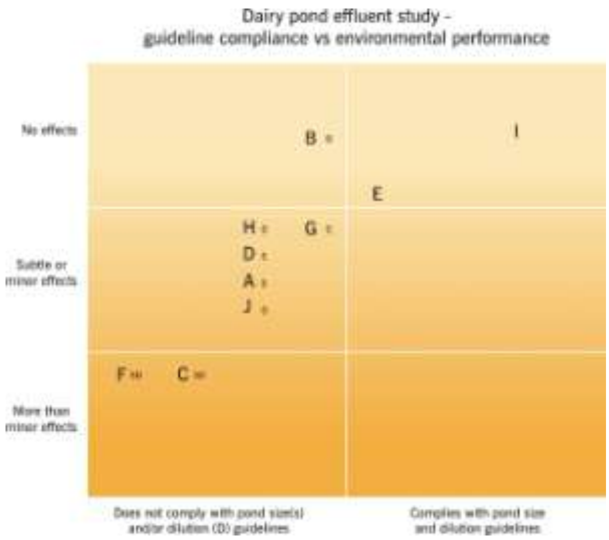

Figure 3: Environmental performance compared with compliance with Council guidelines

5.4.2 Study on in-stream impacts below pond discharges 2008

Another potential limitation to the environmental performance of ponds is where there are a number of discharges in a relatively small catchment. Typically, MCI values in ring plain streams decline with increasing distance from their source, due to point and diffuse source discharges and changes in stream morphology and riparian shading.

In 2008,[20] the Council undertook a second study to look more closely at the rate of assimilation and/or dilution of a farm dairy effluent discharge, in order to ascertain whether criteria can be developed for managing cumulative effects, i.e. controlling the number and effects of multiple discharges in close proximity into the same receiving environment.

The 2008 study noted that short duration high strength dairy pond discharge of low dilution will have only a negligible effect beyond the standard mixing zone. The study concluded that the current Plan's provision of 1:100 "at all times" for a controlled activity is appropriate in the level of protection it affords. The study made a number of recommendations, including:

[19] *Taranaki Regional Council, 2006.*

[20] *Taranaki Regional Council, 2008.*

- that the Plan's criterion of 1:100 should be applied as a 24-hour average (rather than an instantaneous limit applicable at times of peak discharge)
- for the avoidance of cumulative effects, specific consideration should be given to the possible consequences of multiple treatment pond discharges if they are located within 120 to 450 metres of each other.[21]

5.4.3 Study on pond inspections methods 2011

Between November 2010 and February 2011, the Council carried out a detailed study of 25 treatment pond systems to determine their compliance with resource consent conditions. The purpose of the study was to calibrate and review the efficiency of visually inspecting ponds to assess their compliance with resource consent conditions against the results obtained from more in-depth physico-chemical sampling methods.[22]

The study[23] confirmed that the Council's visual technique is adequate for determining compliance for some consent conditions (e.g. herd size loadings and the sizing, construction, and maintenance of the ponds). However, the study also confirmed the need to complement visual assessments with physico-chemical sampling to accurately determine effluent standards or the effects on the receiving waters.

The study also highlighted other issues in relation to the performance of treatment ponds, including:

- very poor pond performance in a number of cases
- issues around poorly performing systems, low dilution ratios, and/or the cumulative impacts from upstream point source discharges effluent standards meant that total BOD_5 : 60 g/m^3 and SS: 200 g/m^3 were seldom achieved by conventional two-pond systems
- in some places receiving water quality conditions were being compromised upstream of consented discharges due to the effects of other similar discharges
- the necessity to review the many discharge consents for 'tertiary' treatment systems, which have been issued as discretionary activities (where dilution has been an issue).

The study will be used to inform the review of the Freshwater Plan, plus the development of revised monitoring protocols for treatment pond discharges and the development of revised and uniform consent conditions.

5.4.4 Study on best practice farming in the Waiokura catchment

Environmental improvements such as enhanced water quality do not need to be achieved at the expense of economic performance.

In 2001 the Council was involved with NIWA in a study in the Waiokura catchment aimed at measuring the benefits of 'best practice' farming operations.

The Waiokura Stream is a small lowland stream that flows through some of the most intensively farmed pasture in New Zealand. Intensive dairying along its length, involving 44 farms, has elevated the levels of nitrogen, phosphorus, suspended solids and faecal bacteria in its water. It was for these reasons the Council selected the catchment to be part of the national/NIWA study.

In 2001 there were approximately 15 farm dairy ponds discharging to water accounting for 29% of the phosphorus lost from farms in that catchment. As the study has progressed, farmers within the catchment have reduced the number of farm dairy treatment pond discharges into the stream and have converted to land irrigation instead.

Between 2001 and 2007, there was a 25% reduction in farm dairy effluent discharges

[21] The study indicates that 450 metres or less is required as the more readily reactive contaminants are assimilated within this distance.

[22] Previously such sampling was only undertaken where non compliance was suspected as a result of the annual visual inspection assessment of the ponds.

[23] Taranaki Regional Council, May 2011.

to the stream and a corresponding increase in land treatment. The change from eight to six treatment pond discharges to the stream represents a possible 12.5% reduction in phosphorus loading. Farmers have also reduced application rates of phosphorus-based fertilisers and they have increased the length of stream bank fenced and protected by riparian works.

Studies (Wilcock, Betteridge *et al* 2009, Shearman and Wilcox, 2009) in the Waiokura catchment have subsequently confirmed significant improvements to the health of the stream.

Regular monitoring has shown that levels of dissolved contaminants (bacteriological and sediment levels) from fertiliser runoff and treatment pond discharges have been reduced by as much as 40%.

Monitoring has also highlighted a 20% reduction in in-stream concentrations and 29% reduction in yields of dissolved reactive phosphorus. The studies found that the primary drivers for this decrease were a reduction in farm dairy pond discharges to water (diverted to land), and a reduction in the use of phosphate fertiliser in the catchment. [24]

Total phosphate concentrations and yields in the Waiokura catchment fell by 30%. This decrease was attributed to less farm dairy pond discharges to water, a reduction in the use of phosphate fertiliser, and improved riparian management. One-third of the total phosphate inputs to the stream are considered to come from pond discharges.

Of particular note, the studies show that the management of farm dairy effluent offers the potential for significant control of dissolved phosphate (the form of phosphate most readily bio-available). It was also estimated that if farm dairy effluent was irrigated to land, the subsequent loss of phosphate by diffuse run-off to water would be only about 10% of the phosphate that would otherwise be directly discharges to water for disposal. That is 90% of the effluent phosphate would be retained on the farm if the effluent was irrigated to land.

The studies also indicated that 10% (±6%) of the observed mean concentration of faecal bacteria comes from pond discharges. Average concentrations of bacteriological indicators such as E.coli have been falling by about 8% per year (refer Figure 4). Significantly, the improvements in freshwater quality have been achieved despite the fact that dairy farm productivity in the catchment has increased by almost 25%.[25]

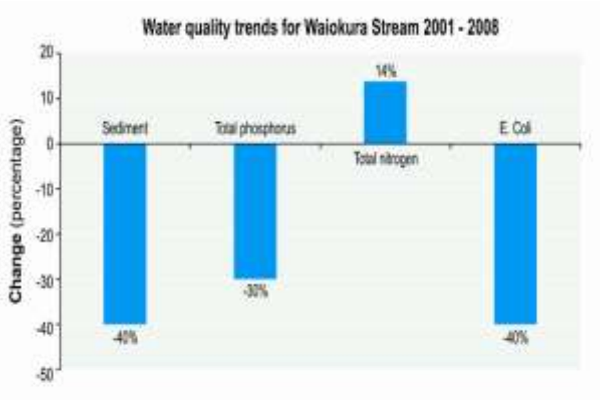

Figure 4: Water quality trends in the Waiokura Stream 2001 to 2008

5.5 Interim review on the effectiveness and efficiency of the Plan

In June 2008, the Council completed an interim review on the effectiveness and efficiency of the Freshwater Plan. The review examined trends, issues and experiences (including state of the environment monitoring and other relevant studies) associated with the implementation of the Freshwater Plan.

In relation to the management of farm dairy effluent, the interim review confirmed that the adverse effects of contaminants discharged to land and water from point sources are generally avoided, remedied or mitigated and that surface water quality has either been maintained or enhanced through

[24] *Farm dairy pond discharges to water are considered to be the largest single source of dissolved reactive phosphate in the region.*

[25] *Wilcock, R., et al, 2009.*

better management of point source discharges.

Notwithstanding that, the interim review identified a number of areas where further improvement and research was required.

As part of the interim review, the Council prepared a report entitled *Effectiveness and Efficiency of the Regional Fresh Water Plan for Taranaki* and sought the views of key stakeholders on the conclusions reached.

Feedback on the report was received from Federated Farmers, the Taranaki / Whanganui Conservation Board, the Department of Conservation, and Taranaki Fish and Game. Most stakeholders were generally satisfied with the implementation of the Freshwater Plan and the conclusions and recommendations presented in the report. However, Fish and Game identified a number of areas where they believed change was required. One area where Fish and Game believed the Plan had not been as effective as it could have been related to farm dairy effluent management.

Key points made by Fish and Game were as follows:

- farm dairy pond discharges to water need to be better addressed in the Freshwater Plan in order to ensure ongoing improvement in water quality and stream health
- the cumulative effects of pond discharges to water are of particular concern
- questioned why the Waiokura research has not been given greater weight by the Council – in particular the recommendation for "…*the elimination of effluent pond discharges to waterways*"
- a Fish and Game audit of 18 randomly selected discharge consents to waterways with high natural, ecological and amenity values (i.e. Appendix 1A of the Plan) found that the land application of farm dairy effluent had not been actively promoted (as per Policy 6.2.6), and that no specific monitoring of in stream conditions (such as levels of ammonia and BOD) had been included as part of the consent renewal process.

There were counter views to some of the points made by Fish and Game. Nevertheless, as noted at the time, the Council undertook to address their points and concerns as part of its full review of the Freshwater Plan.

5.6 Audit on freshwater quality management

In April 2011, the Controller and Auditor-General's office released its interim findings for the Council's management of freshwater quality.[26] The aim of the audit was to provide Parliament with assurance on whether regional councils are effectively maintaining and enhancing freshwater quality.

The audit concluded that the Council is well positioned via the Freshwater Plan to develop and adapt its existing methods to address on-going risks for freshwater quality in the region. The audit suggests that given the Council is so well-positioned, it could therefore be more ambitious with respect to taking action to enhance freshwater quality in those areas where it does not meet relevant trigger values (refer section 5.3 above).

The audit did not make firm recommendations but suggested that the Council consider pursuing more ambitious objectives. These included:

- requiring all farm dairy effluent systems to discharge to land or have a dual discharge system
- dealing more explicitly with the cumulative effects of farm dairy effluent discharges in close proximity
- targeting sensitive catchments for , amongst other things, enhanced

[26] *Taranaki was one of four regional councils examined to identify examples of best practice and effective strategies for enhancing freshwater management – the other councils involved were Southland, Manawatu and Waikato. Refer Auditor-General, 2011.*

management of dairy effluent discharges.

The audit further noted that the Council's dairy effluent management programme "*…is managed efficiently but its effectiveness is dependent on effluent systems being sized correctly and functioning properly and the limited sets of conditions on the discharge consents being appropriate. TRC has done some testing of this, but in our view more sampling is needed to assess the effectiveness of the programme*".

5.7 Key findings

Key findings arising from research, studies and reviews relating to farm dairy effluent management are:

- farm dairy effluent is an asset – as a fertiliser and soil conditioner and for its water content – that farmers should utilise to its fullest potential
- state of the environment monitoring shows relatively good to excellent overall water quality in the region. However, in some areas, certain water quality trigger values are not being met particularly in lower catchments
- both treatment pond discharges and land application carry environmental risks that require consenting and monitoring
- Council monitoring and investigations confirm that treatment ponds work but have limitations, particularly in relation to surface water microbiological and nutrient standards
- another potential limitation to the environmental performance of ponds is cumulative impacts arising from a number of discharges, particularly in smaller catchments
- to be effective ponds need to be well designed and maintained and adequate for the herd size
- the Waiokura study demonstrates that significant improvement in environmental performance does not need to be achieved at the expense of economic performance
- nationally and locally there are a number of drivers seeking a reduction in farm dairy effluent discharges to water
- an audit by the Auditor-General's office suggested that given the Council is so well-positioned in its policies, methods and results, it could be more ambitious with respect to taking action to enhance freshwater quality in those areas where it does not meet relevant trigger values.

6. Local opportunities and constraints for improving farm dairy effluent management

Across New Zealand there is a presumption that land treatment is preferable to discharges to water. However, as previously noted land treatment also has environmental risks and reliance on land treatment only will not necessarily result in better environmental outcomes for this region.

This section examines local physical and climatic variables that may limit or promote the success of farm dairy effluent management options in Taranaki.

6.1 Soil characteristics

Taranaki soils are generally suitable to receive farm dairy effluent applied to land, and for the successful construction of sealed ponds.

Dairying is primarily supported on the ring plain. The soils of the ring plain are mostly yellow-brown loams, which are deep, free-draining, fertile, volcanic ash soils.

When farm dairy effluent is applied to land in the correct manner and in the correct circumstances there is no discharge to surface or groundwater. As previously noted farm dairy effluent will increase soil fertility as it is a source of nitrogen (N), phosphorus (P), potassium (K) and sulphur (S), plus trace elements. The organic matter in the effluent will improve the soil's water holding characteristics, aeration and drainage, and will make soil less prone to compaction and erosion.

The Parliamentary Commissioner for the Environment noted that "… *effluent should not be sprayed onto waterlogged soil. This means that farms must have appropriately sized storage ponds so that they can delay spraying until conditions are right.*"[27]

[27] *Auditor-General: 2011.*

The amount of effluent able to be discharged to land will depend upon the time of year and the topsoil's moisture deficit (Figure 5). It is important to avoid saturating the soil through excessive application. Saturation occurs when all the soil pores are full of water. Saturation commonly occurs in winter and spring immediately after heavy rainfall.

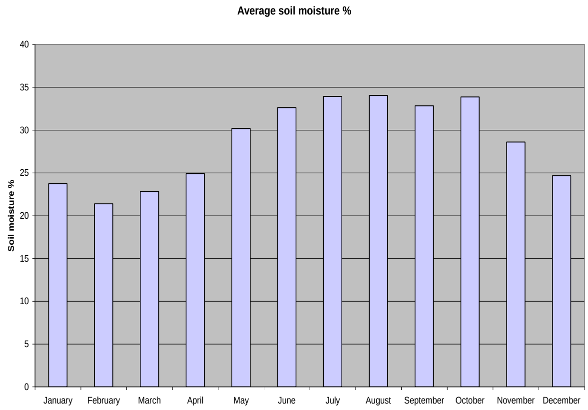

Figure 5: Average soil moisture levels across the Taranaki ring plain

6.2 High rainfall and seasonal considerations

Taranaki's high and regular rainfall represents both an opportunity and constraint for farm dairy effluent discharges to land or water.

The disposal of farm dairy effluent to land carries environmental risks if disposal occurs in a manner that allows the effluent to escape or seep into ground or surface water. This is most likely to occur when the discharge exceeds the soil's capacity to absorb the discharge, when rainfall causes runoff to water, or if applied on sloping ground too close to a waterway.

Taranaki has the country's second highest annual rainfall.[28] There is regular rainfall

[28] *Refer http://www.ssnz.govt.nz/regional-information/newplymouth.asp.*

throughout the year. However, rainfall can vary markedly throughout the region, ranging from less than 1,400 mm in coastal areas to in excess of 8,000 mm on Mount Taranaki. Rainfall peaks in winter months and again in October (Figure 6).

Accordingly, it will not always be practicable or appropriate for farmers to discharge to land. Indeed Taranaki's high rainfall means that the use of land application as a method of effluent disposal may be limited for several months over the season. Best practice advice on the recommended application periods for land discharges highlights that for Taranaki the best months for the land application for farm dairy effluent is between November and April.[29]

Conversely Taranaki's high rainfall in the wetter months results in higher river and stream flows, which, in turn, increase the flushing and assimilative capacity of the water bodies during that period.

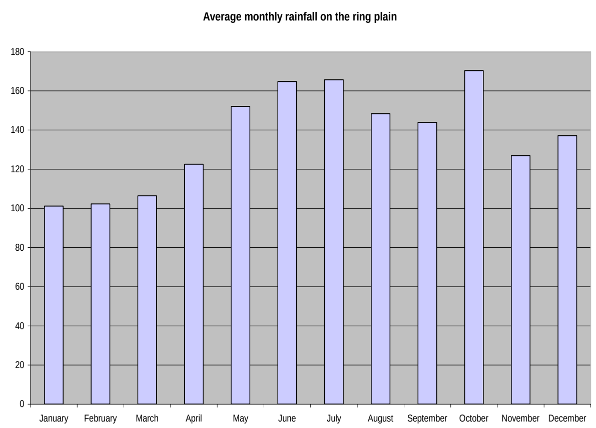

Figure 6: Average monthly rainfall across the Taranaki ring plain

[29] *Dairying and the Environment Committee, 2006.*

6.3 Taranaki river flows and characteristics

How much water there is in a river or stream, how fast it moves, and whether it is constant or fluctuates in flow are the key factors in how vulnerable the water body is to the effects of contaminants.

On land or of themselves, nutrients are not a problem (only rarely will the concentration of nutrients be such that it will result in problems such as ammonia or nitrate toxicity). The problem with excessive nutrient enrichment is how it may affect the physicochemical and biological condition of water once it escapes or seeps into our waterways.

As a general rule, high levels of nitrogen and phosphorus, in particular, contribute to the excessive ('nuisance') growth of plants, including algae, which, in turn, can smother the instream habitat, affect the attractiveness of water for swimming or as a habitat for fish, impede water flows and block water intakes.

Nuisance impacts on water quality vary across the country according to topography. The growth of nuisance aquatic weeds and algae in water can lead to eutrophication, whereby adverse fluctuations in dissolved oxygen and pH result in reduced water clarity and oxygen depletion. This is especially an issue for lakes and streams with retention structures.

There are more than 300 rivers and streams that flow from the flanks of Mount Taranaki in a distinctive radial pattern. On the ring plain, most rivers and streams are typically small. Therefore even the smallest impacts, repeated a number of times, can result in significant cumulative impacts on the receiving water.

Notwithstanding that, rivers and streams on the ring plain are relatively narrow and swift flowing catchments of steep gradient. These catchments typically have shorter travel times for any discharge loadings, with the flow from the headwaters to the sea generally taking less than 24 hours.

Therefore, there is much less of a cumulative problem in Taranaki compared with other regions such as Waikato, which has fewer streams and larger catchments that flow through a series of impoundments or natural lakes, and which take a long time to discharge to the sea.

River and stream flows are typically high in winter and low in summer (refer Figure 7 overleaf). Nutrients tend to have greater effects under warmer low flow conditions.

In most summers, ring plain streams recede to approximately 50% of their normal (median) flow levels and remain at these levels for lengthier periods. Ring plain streams also tend to rise fast when it rains and recede quite rapidly once the rain has stopped.[30]

In times of high flow (including spring, and rainfall events in summer), the streams are so well flushed that the discharge of treated farm dairy effluent is not likely to have more than minor adverse effects on the receiving water (subject to discharges meeting specific minimum environmental conditions), including consumptive and non-consumptive users and instream values. Even in summer Taranaki rivers do not have large bodies of shallow sluggish warm flows along their length, which are conducive to the growth of nuisance aquatic weeds and algae.

Figure 7 below shows average medium flows for ring plain streams based upon a percentage of their mean annual low flows (MALF).[31] MALF is relative to base flows and clearly shows that from May to November, rivers and stream flows are at or above 300% of the MALF.

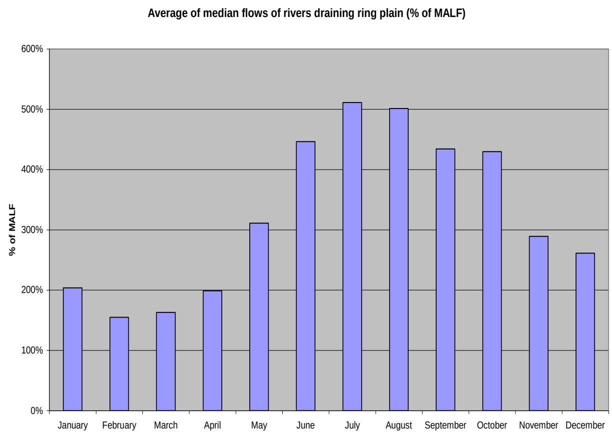

Figure 7: Average medium flows of rivers draining the ring plain based on MALF

6.4 Other factors

The potential for dairy farms to move to land application varies between localities and from farm to farm. Other potential constraints for shifting to land application include:

- water tables: seasonally high water tables can affect the soil's ability to receive land applied effluent
- topography: machinery access is often affected by topography, as is the potential for run-off of effluent applied to land
- location of waterways: the proximity of waterways to a discharging pond or a land application system will affect the siting of the various system components
- location of neighbours and public amenities.

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[30] *Taranaki Regional Council, 2006.*

[31] *As a guide, 67% of natural MALF equates to two-thirds in-stream habitat, which, as a guide, is the minimum proportion of water that is necessary and should be set aside to maintain the catchment's natural character and life-supporting capacity.*

7. Future directions for farm dairy effluent management

With continued dairy intensification on the ring plain, increased effort is required to maintain the region's freshwater quality let alone improve it.

Set out below are the desired outcomes and policy options considered in relation to farm dairy effluent management plus proposed changes to the current Freshwater Plan.

7.1 Desired outcomes

Subject to the outcomes of public consultation associated with the review of the Freshwater Plan, two broad desired outcomes are sought from any future changes to farm dairy effluent management:

1. increased protection of freshwater quality so that Taranaki can continue to maintain and enhance freshwater quality during periods of increased dairy intensification
2. ensure the best practicable option for Taranaki is adopted at a catchment and farm level in relation to farm dairy effluent management.

These outcomes/objectives give effect to national policy directives as set out in the NPS and to the objectives and policies of the RPS (refer section 2 of this paper).

7.2 Policy options

There are essentially three broad policy responses to be considered when reviewing the Freshwater Plan. They are:

- *Option 1: status quo* – this option would retain current Plan policies and rules that allow continuous discharges to water from treatment pond systems. Under this approach neither pond or land treatment systems are incentivise over the other through the consenting process. However, this option is unlikely to address increasing pressures on freshwater quality in the region or give effect to national (NPS) policy directives
- *Option 2: amend Plan to require land treatment only* – this option involves amending the Plan policies and rules to require farm dairy discharges to land only. However, the one-size-fits all solution does not recognise that in some circumstances land treatment is not appropriate nor that there are no significant added environmental outcomes from prohibiting pond discharges to water during high rainfall/water flow conditions. The cost of this option would therefore be disproportionate to the environmental outcomes anticipated
- *Option 3: amend Plan to limit the discharge of farm dairy effluent to water* – this option, which is the preferred option, involves amending the Plan policies and rules to require dairy farmers to adopt the best practical option for the disposal of farm dairy effluent. The best practicable option is land treatment and or via a dual discharge system which allows discharges to land or to water, depending on environmental conditions (i.e. where treated waste water can be discharged to water during high flow conditions e.g. 1 May to 30 November or through a real time conditions tailored system).

Specific changes proposed in relation to future farm dairy effluent management are outlined in section 7.3 below. The benefits and costs of the changes are outlined in section 7.4. **Appendix II** of this paper also outlines an evaluation of the benefits and costs of the three options considered.

7.3 Proposed changes to the Freshwater Plan

Having examined the options relating to farm dairy effluent management in the region, the following amendments to the Freshwater Plan are considered the most appropriate, efficient and effective means of achieving the desired outcomes.

7.3.1 Upgrade or convert systems to promote discharges to land

The continuous discharge of treated effluent from treatment pond systems to water is no longer considered best practice. However, discharging to land in all situations can also cause environmental problems.

Dual systems, in particular which allow discharge to land or to water, depending on environmental conditions, are an increasingly preferred option. Accordingly, the following changes to the Freshwater Plan are proposed:

- stronger policies that require land application or dual systems except in exceptional circumstances
- rules to maximise farm dairy discharges to land by requiring the discharge of farm dairy effluent to be via land treatment and or via dual discharge systems that must discharge to land outside high water flow periods
- in relation to dual discharge systems, only allow discharges to water:
  - during periods of high water flow levels, AND
  - subject to the farmer being specifically notified by the Council. [32]

  During the wetter months of the year and outside the height of the dairying season, the discharge of treated farm dairy effluent to water will generally result in no or less than minor impacts (including cumulative impacts) on the receiving water because of increased assimilative capacity, the high dilution levels, and the increased 'flushing' ability of the watercourse.

Existing treatment pond systems (up to 900) will need to be converted to a land treatment system or a dual treatment system that has the capacity to dispose of farm dairy effluent to both land and water. **Appendix IV** outlines what is involved in retrofitting and upgrading a typical two pond system to a dual discharge system.

The cost to farmers of converting existing ponds to a land/dual treatment system would be significant. The cost would depend upon individual circumstances but conservatively most costs to individual farmers are expected to be in the order of $50,000. It is therefore proposed that the policies and rules be phased in for existing ponds whereby a review of relevant consents will be required within two years of the Plan becoming operative, or, once the Plan has become operative, when consents come up for renewal, whichever is the sooner.[33] Upon review or renewal, existing consent holders will then have two years to give effect to a new condition to upgrade their system. For new systems (and where a consent has been applied for) it is proposed that the aforementioned policies and rules be applied with immediate effect.

Appendix V of this paper sets out an indicative timeline for the proposed rules to take effect taking into account the phasing in period and the date for reviewing or renewing current discharge consents in a given catchment.

The land treatment of farm dairy effluent (i.e. Rule 35) will continue to be a controlled activity. It is further recommended that, subject to the amendments outlined below, discharges of wastewater from treatment ponds to water (i.e. Rule 36) will also continue to be a controlled activity.

Note, in exceptional circumstances, where there are local constraints to discharging farm dairy effluent to land, discharges to

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[32] *The presumption is that discharges must be to land unless the resource consent holder has been specifically notified that they can discharge to water.* ***Appendix III*** *details how this proposal might work in practice.*

[33] *It is further proposed to offset costs through changes to the Council's farm dairy effluent monitoring programme. This is addressed in more detail in section 7.3.7 below.*

water may be authorised as a discretionary activity. In such cases, the Council would give particular consideration to the extent and circumstances for authorising the discharge activity.

Riverlands Eltham – a case study on a dual discharge system

The aforementioned approach has effectively been trialled in Taranaki. The implementation of the 'dual' land/river wastewater disposal system by Riverlands Eltham, which is managed so as to maximise discharge to land, has resulted in significant improvement in the quality of the Waingongoro River since the system was adopted in 2001.

Riverlands Eltham Limited operates a meat processing plant located at Eltham, in the Waingongoro catchment. The plant includes wastewater treatment ponds system from which effluent is disposed of either to land or to the river.

During the 2009-2010 monitoring period about 72 percent of the total plant effluent was sprayed onto about 235 ha of grazed pasture. The irrigation period lasted 30 weeks, from 9 November to 13 May, which represent the low flow periods for the river.

The irrigation system is operated by a farmer in accordance with the procedures of a management plan written by Riverlands and approved by the Council. The resource consent includes conditions specifically addressing nitrogen application rate, prevention of ponding and run-off, and avoidance of odour or spray drift beyond the property boundary.

Applications rates to land are typically 45 mm (range 20-70 mm) in depth, with a minimum stand-down period before grazing of 10 days. Buffer zones are marked around residential dwellings (150 m), property boundaries, public roads and waterways (20 m), and wells or bore used for water supply (50 m).

From May to November, the Waingongoro River has higher flow conditions and, given the increased assimilative capacity of the water, discharges of treated plant effluent are allowed during this period. Monitoring over this period confirms no adverse effects on the river.

7.3.2 Upgrade land treatment systems to include adequate storage

Currently up to 300 of Taranaki's 903 farm dairy land treatment systems may not have adequate holding capacity for farm dairy effluent. [34] Instead, farm dairy effluent is diverted to sumps with the effluent being pumped directly on to the pasture.

Farmers need to ensure their systems include sufficient capacity to hold effluent for when it is not practicable or appropriate to discharge to land (e.g. in the event of pump failure, system blockages, pond maintenance) and or in wet conditions when the application of effluent can damage pasture and soils or result in leaching and run-off to groundwater or streams. Holding capacity also maximises the farmer's ability to manage effluent application to fit in with overall farm management and the grazing rotation.

It is therefore proposed to amend relevant rules in the Freshwater Plan to include new standard, term and conditions that:

- require land treatment systems to have adequate lined storage capacity for farm dairy effluent in accordance with the Council's pond size calculator[35]
- address the land treatment area and application rates.

Appendix IV outlines what is involved in retrofitting and upgrading a typical sump to a larger holding pond.

The cost to farmers of upgrading up to 300 existing land treatment systems to increase their holding capacity would be significant. The cost would depend upon individual

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[34] *A review of consent conditions on the Council's Consents database (R2D2) identifies 515 land systems as not having holding ponds. However, over time many systems irrespective of their consent conditions have been upgraded and now have holding ponds. The Inspectorate Section considers 300 to be a more accurate estimate.*

[35] *The pond size calculator is a simple easy to use computer programme designed by Massey University and Horizons Regional Council to calculate the storage required for any farm dairy effluent disposal system against a variety of potential scenarios so that deferred irrigation can be achieved and to ensure there is compliance with relevant rules 365 days of the year.*

circumstances but conservatively is expected to be in the order of $10,000 - $50,000 for individual farmers. It is therefore proposed that the policies and rules be phased in for existing systems whereby a review of relevant consents will be required within two years of the Freshwater Plan becoming operative, or when they come up for renewal, whichever is the sooner.[36] Upon review or renewal, existing consent holders will then have two years to give effect to a new condition to upgrade their system. For new systems it is proposed that the aforementioned policies and rules be applied with immediate effect.

Appendix V of this paper sets out an indicative timeline for the proposed rules to take effect taking into account the phasing in period and the date for reviewing or renewing current discharge consents in a given catchment.

7.3.3 Improve the environmental performance of pond systems

National and regional research and studies on farm dairy effluent have highlighted a number of areas where the environmental performance of treatment and holding pond systems can be improved.

It is therefore proposed to amend relevant rules in the Freshwater Plan to include revised standards, terms and conditions that more explicitly identify key elements of best practice, including:

- the adoption of measures to reduce stormwater flows into and divert stormwater flows away from treatment and or holding ponds
- set a limit on the maximum permeability for ponds to ensure they do not leak
- ponds to be constructed above the water table
- require the sizing of ponds to be based upon maximum milking herd size and in accordance with the Council's pond size calculator.

[36] *It is further proposed to offset costs through changes to the Council's farm dairy effluent monitoring programme. This is addressed in more detail in section 7.3.7 below.*

7.3.4 Revised policy for promoting on-farm waste minimisation and water conservation practices

In addition to amending the standards, terms and conditions relating to promoting the environmental performance of farm dairy effluent management systems, it is proposed that a revised policy be included in the Freshwater Plan to promote on farm waste minimisation and water conservation practices.

Policy 6.2.3 of the Freshwater Plan already addresses waste reduction and treatment practices. However, a revised policy is proposed that will particularly apply when assessing the application of discretionary activities to discharge farm dairy effluent to land and or water. The policy will be broadened to not only address on-farm water minimisation practices but also water conservation practices that can contribute to the activity avoiding, remedying, or mitigating adverse impacts on freshwater quality.

7.3.5 Update guidelines in the Plan for farm dairy effluent

The Freshwater Plan already sets out best management practices relating to farm dairy discharges to land and to water (refer Appendix VIIA and B of the Plan). To date this information has provided useful guidance to the Council and resource users to support their decision making. However, it is timely to update the guidance to ensure it continues to be aligned with best practice plus the recommendations set out in this section of the paper.

Changes proposed to Appendix VII of the Plan include:

- additional advice on application rates and depths for discharges to land, including advice on return frequency and/or maximum soil moisture content to assist in the interpretation of Rule 35
- recommending dairy farmers reduce stormwater flows into and divert

stormwater flows from treatment pond systems[37]

- recommending the pumping down of ponds at the start of each milking season to give extra storage capacity
- emphasize the significance of constructing ponds above the water table, as a means of minimising groundwater ingress into the system
- insert a table of soil types with associated soil draining properties to provide guidance on application depths and rates to avoid contamination of groundwater
- inserting a table to calculate correct sizing of treatment or holding ponds based upon herd size
- recommending standards and measures for promoting enhanced management of dairy effluent discharges in sensitive catchments.

The Council has more recently commissioned a number of studies to ensure the technical information will be on hand to assist farmers in the giving effect to any increased standards relating to their farm dairy effluent management. In particular, the Council is reviewing its pond size calculator to ensure it is fit for Taranaki conditions and reflects proposed changes presented in this paper.[38] The Council has also commenced a pond permeability study that takes into account Taranaki soil types.

7.3.6 Ensure feed pad effluent is managed as part of the dairy shed effluent system

Currently the discharge of leachate to land from feed pads is a permitted activity under Rule 30 of the Freshwater Plan.

While many farms already treat feed pad effluent as part of the dairy shed effluent management system, others allow the effluent to leach onto the land. However, it is now widely accepted that feed pad effluent should be managed as part of the farm dairy effluent management system on the farm.

The changes proposed are:

- that Rule 30 be amended so that the discharge of leachate from feed pads is no longer a permitted activity
- include a rule requiring feed pads to be constructed of an impervious material and for the effluent to be directed to the farm dairy effluent management system
- other consequential changes (e.g. definitions, relevant rules and guidelines) to broaden the scope of farm dairy effluent to include the management of leachate from feed pads.

It is noted that farmers will need to make adjustments to existing systems due to higher volumes of effluent being treated, the increased nutrient levels and fibre content of the effluent, e.g. increasing the storage and spreading area, or adjusting machinery to suit.

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[37] *Analysis of pond flow data shows that in a number of pond systems, groundwater and/or stormwater flows are contributing to pond discharge rates. This will have the effect of reducing retention time and the effectiveness of the treatment. Reducing pond inflow and ingress will be one of the most effective and cost efficient means of increasing pond treatment capacity. The alternative is constructing additional pond volume.*

[38] *The 'national' pond size calculator may over-state capacity requirements for ponds only discharging to water under high rainfall/high flow conditions. The proposed study will re-examine pond/herd inputs/algorithms based upon recommendations presented in this paper and develop a 'Taranaki pond sized' calculator.*

7.3.7 Amending the farm dairy effluent compliance monitoring programme

From the 2011/2012 season, the Council made significant changes in the way it carries out compliance monitoring for farm dairy discharge consents. In addition to the annual visual inspections of all farm dairy effluent systems the Council also undertakes sampling and testing of all pond systems on a biennial basis.

The cost of farm dairy effluent compliance monitoring is recovered from the consent holder and ranges from $250 to $800 per annum. The charge is $250 for visual inspections. The charge for pond systems being sampled is in the order of $800. In the event of non-compliance, additional charges may apply. [39]

The additional sampling and analysis involves monitoring receiving water above and below the discharge (pH, BOD, conductivity, unionised ammonia, ammonia and turbidity) plus the discharge (BOD, suspended solids, conductivity and ammonia). This level of analysis is considered necessary as the visual inspection technique is no longer fully acceptable and compliance must be demonstrated rather than assumed (refer section 5.4.3 above).

On the assumption that recommendations identified in this section of the paper are adopted, the Council believes there is likely to be substantially reduced environmental risks associated with future farm dairy effluent management. Therefore, there is an opportunity to offset some of the cost implications of the proposed changes to farmers by reducing the scale and frequency of compliance monitoring. [40]

It is proposed that the Council amend the monitoring section in the Plan to encapsulate a revised farm dairy effluent compliance monitoring programme.

The scope and design of the revised monitoring programme needs to be confirmed but key components are likely to be as follows:

- visually inspect all pond and land treatment systems on an annual basis
- adopt an audited monitoring system whereby 5-10% of all ponds are sampled and analysed per annum
- auditing of ponds will be a representative sample and or target systems with a history of non-compliance
- programme costs (excluding follow-up monitoring for non-compliance issues) to be shared by all pond discharge consent holders
- the annual charge (excluding any compliance issues) is likely to be around half that required if farmers continue with the current approach.

7.4 Benefits and costs of the recommended changes

Monetising all the benefits and costs of adopting the changes recommended in section 7.3 above is difficult. Some Council and farmer costs can be quantified but some costs are very difficult to quantify. It is even less easy to quantify environmental and social benefits.

Table 6 below summarises the benefits and costs of making the proposed changes to the Freshwater Plan. It has necessarily relied on a combined qualitative and quantitative evaluation. As noted in Table 6 the environmental benefits of making the proposed changes are substantial over the life of the Plan. While the compliance cost for farmers is significant, nevertheless the environmental benefits significantly outweigh the anticipated costs. Through this document, the Council will be seeking the views of stakeholders to test these assumptions and conclusions.

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[39] *If the analysis of samples reveals non-compliance, additional sampling is carried out and the additional costs are recovered from the consent holder. The consent holder may also be subject to enforcement action.*

[40] *Of note, if the status quo was retained it is likely that the Council would need to move to annual (rather than biennial) sampling to manage the environmental risks. Rather than monitoring charges being $500 per annum, over two years, the annual charge would be more likely to be in the order of $1,000. This is in line with what farmers are paying in other regions.*

Table 6: Summary of the evaluation of the benefits and costs of implementing the recommended changes

Benefits	Evaluation	Costs	Evaluation
Environmental (outcome) benefit • Pressures on freshwater quality arising from farm dairy discharges substantially reduced • Improved protection of freshwater quality during sensitive summer low-flow periods • Overall freshwater quality in Taranaki maintained and, in places, improved • Cumulative impacts from pond discharges to water substantially reduced to the benefit of downstream health • Significant reduction in nutrient and bacteriological loadings in Taranaki waterways (20-30% reductions in total phosphate, 30-50% reductions in dissolved phosphate, and up to 40% reductions in faecal coliforms).	High	**Administrative costs (Council)** • No added administrative costs. All farm dairy discharges to land and/or water already require a resource consent, and the Council is already required to review the Freshwater Plan.	Low
		Administrative and operating costs (farmers) • No added consenting costs (all farm dairy discharges to land and/or water already require a resource consent) • Added costs associated with time and labour, including depreciation costs, for up to 900 dairy farmers that may have to shift to dual/land treatment.	Moderate
Economic benefits • Land productivity gains • Land treatment equates to potential saving of approximately **$3,510** in reduced fertiliser application, per farm, per annum (assuming the average Taranaki herd size is 270 cows) • Land treatment equates to potential ongoing saving in fertiliser costs of approximately **$3.2 million** per annum across the region (for the 900 pond systems currently discharging to water). Over the life of the Plan, this equates to a regional saving of **$32 million** • Reduced compliance monitoring costs for the 1,045 consented systems given reduced risks to the environment. At the farm level the potential saving is in the order of **$500** per annum for consented pond/dual discharges. Across the industry the potential saving is **$522,500** per annum or **$5.2 million** over the life of the Plan.	Moderate (low initially but higher over time)	**Economic (compliance) costs** • Up to 900 pond systems may need to be significantly expanded upon and or upgraded to include capacity to discharge to land • Up to 300 land treatment systems may need to be upgraded to ensure they have adequate storage capacity • The average one-off cost to individual farmers of converting ponds to a dual system is likely to be in the order of **$50,000** • The one-off cost to individual farmers of land treatment systems so that they have adequate storage capacity is about **$10,000 - $50,000** • The one-off total cost to the industry equates to approximately **$54 million** over the life of the Plan.	High
Other benefits • Compliance with national policy directives as set out in the NPS • Operational flexibility for farmers to choose the appropriate treatment/disposal system for their property • Potentially reduced treatment costs for municipal and industrial water supply • Meets increasing community expectations in relation to freshwater quality • Meets Maori cultural expectations with discharges to land being the preferred approach for tangata whenua • Reputational and marketing benefits in terms of demonstrating the dairy industry's compliance with best practice on environmental management • 'Future proofs' the dairy industry in terms of ensuring it can continue to expand and intensify while also meeting its environmental responsibilities.	High		

Conclusion	The anticipated environmental and other benefits of maximising farm dairy effluent disposal to land are assessed as very high. It is likely to result in substantially improved protection of water quality in rivers and streams. The administrative costs to Council for making the recommended changes are assessed as being low. However, the economic costs are assessed as being significant at both the farm and regional level. Up to 900 pond systems and 300 land treatment systems may need to be upgraded to include capacity to discharge to land and or ensure they have adequate holding capacity. The economic costs can be partially offset by fertiliser savings with savings appreciating over time. To mitigate the initial economic costs of making the proposed changes, it is recommended that farmers be given a transition period to comply. It is also recommended that the Council investigate options of reducing the compliance monitoring costs given reduced risks to the environment.

8. Summary and conclusion

The *Regional Fresh Water Plan for Taranaki* was made operative in 2001. Since its adoption, the Plan has stood the test of time well with overall freshwater quality being maintained and, in some places, enhanced within Taranaki.

Notwithstanding that, the 'health' of streams declines downstream and is only 'fair' to 'good' in lower catchments. With continued intensification of dairying on the ring plain, increased effort is going to be required in the future to maintain the region's freshwater quality let alone increase it. The review of the Freshwater Plan is timely and is an opportunity to reassess future directions for the management of farm dairy effluent in the Taranaki region. As previously noted, farm dairy effluent is but one of a number of human induced pressures on our freshwater quality. Other, arguably more significant pressures, such as the impacts of diffuse source discharges from adjacent land uses to water, will be addressed in separate working and technical papers as part of the review of the Freshwater Plan.

In the preparation of this working paper, the Council has undertaken a stock take of the evidence, studies and research relating to improved farm dairy effluent management. Key findings are:

- farm dairy effluent is an asset (as a fertiliser and soil conditioner and for its water content) that farmers should utilise to its fullest potential
- significant improvement in farm dairies' environmental performance can be achieved through increased discharges to land, which does not need to be achieved at the expense of economic performance.

Nationally, there are policy directives requiring change in the management of farm dairy effluent. In particular, the promulgation of the *National Policy Statement for Freshwater Management*, amongst other things, requires regional councils, when making rules, to adopt the best practical option to prevent or minimise actual or likely adverse effects from discharges.

Given that allowing ponds to continuously discharge to water is no longer considered best practice, the question is no longer about whether there will be changes in the way we currently manage farm dairy effluent in the region but rather what and how big that change will be.

Section 7 of this paper outlines a number of areas where, through changes to the Freshwater Plan, higher environmental outcomes can be achieved while also taking into account local climatic and physical variables when developing a 'Taranaki' solution for farm dairy effluent management.

Policy options canvassed in this paper range from continuing to allow farm dairy treatment ponds to discharge to water all year round, to prohibiting pond discharges to water (and instead require the land application of farm dairy effluent). However, it is the Council's view that there are no significant added environmental outcomes from prohibiting pond discharges to water during high rainfall/water flow conditions. Indeed, allowing discharges of treated effluent to water at certain times of the year is preferential to spraying effluent onto waterlogged soils.

Proposed changes to the Freshwater Plan seek to build on the decades long process of incrementally and systematically improving on farm dairy effluent management in the region. The proposed changes include:

- amend policies and 'controlled activity' rules in the Plan to require farm dairy effluent systems to be discharged to land or have a dual discharge system which can only discharge to water during high stream flows

- requiring land treatment systems to have adequately sized and lined holding ponds
- in exceptional circumstances, where there are local constraints to discharging to land, discharges of treated farm dairy effluent to water may be authorised as a discretionary activity
- updating best practice guidelines appended in the Plan relating to farm dairy effluent discharges to land and water and to align with recommendations set out in this paper
- encouraging on-farm waste minimisation and water conservation practices
- requiring feed pad effluent to be managed as part of the farm dairy effluent system.

In brief the recommendations set out in section 7 of the paper will:

- significantly reduce water contamination in the first place
- ensure that discharges of treated farm dairy effluent to water are occurring at a place and time to lessen its impacts on water
- recognises and 'customises' a Taranaki solution, in a reasonable period of time, that is not only suitable for Taranaki conditions but also maximises the cost-benefit of the approach
- in so doing, the Council hopes to future proof the dairying industry to ensure we can continue to maintain and enhance freshwater quality in the region during periods of increased dairy intensification.

The proposed changes will result in substantially improved protection of water quality in Taranaki's rivers and streams. In particular, significant reductions in nutrient and bacteriological loadings in our waterways are anticipated. The changes will not only substantially reduce the volumes of treated farm dairy effluent being discharged to our waterways but will also confine the timing of discharges to winter high-flow periods when there will be less than minor adverse environmental effects.

Through the proposed changes, the Council is doing what is required and expected of it. However, there are significant costs attached to the farming community. This working paper is therefore a starting point for consulting with stakeholders on possible changes to the Freshwater Plan. The Council looks forward to canvassing these matters with stakeholders and obtaining their views and input prior to publicly notifying a revised Plan for public submissions.

Definitions and acronyms

Application rate means the rate at which a given depth of effluent is applied per unit of time (mm/hr).

Best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—

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

Biochemical oxygen demand or **BOD** is a measure of the amount of oxygen consumed during the decomposition of organic matter in water.

Catchment refers to the entire area from which a stream or river receives its water. When it rains, the water flows naturally over and through the soil to the lowest point on the land, forming into springs, wetlands, and small streams that feed into larger streams and rivers as they run downhill. Eventually, all the streams and rivers in a catchment join and have the same outlet to the sea. Natural features such as ridges and hills form the boundaries of a catchment.

Coastal environment refers to:

(a) the coastal marine area
(b) islands within the coastal marine area
(c) areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, salt marshes, coastal wetlands, and the margins of these
(d) areas at risk from coastal hazards
(e) coastal vegetation and the habitat of indigenous coastal species including migratory birds
(f) elements and features that contribute to the natural character, landscape, visual qualities or amenity values
(g) items of cultural and historic heritage in the coastal marine area or on the coast
(h) inter-related coastal marine and terrestrial systems, including the intertidal zone
(i) physical resources and built facilities, including infrastructure, that have modified the coastal environment.

Controlled activity means an activity which:

(a) is provided for, as a controlled activity, by a rule in a plan or proposed plan; and
(b) complies with standards and terms specified in a plan or proposed plan for such activities; and
c) is assessed according to matters the consent authority has reserved control over in the plan or proposed plan; and
(d) is allowed only if a resource consent is obtained in respect of that activity.

Council refers to the Taranaki Regional Council.

Dairy effluent refers to a mixture of dung, urine, water, and milking plant wash water that is created in dairy milking sheds each day.

Deferred irrigation refers to the pond storage of effluent during wet periods and its subsequent application when suitable soil moisture storage exists so as to avoid breaching field capacity.

Discharge includes emit, deposit and allow to escape.

Discretionary activity means an activity:
(a) which is provided for, as a discretionary activity by a rule in a plan or proposed plan; and
(b) which is allowed only if a resource consent is obtained in respect of that activity; and
(c) which may have standards and terms specified in a plan or proposed plan; and
(d) in respect of which the consent authority may restrict the exercise of its discretion to those matters specified in a plan or proposed plan for that activity.

Dissolved oxygen refers to the concentration of free oxygen dissolved in water, and usually expressed as g/m^3 or mg/l.

Drainage refers to the movement of excess water (including effluent water) through the soil body.

E. coli refers to *Escherichia coli*, which is the main coliform found in the gut of warm blooded animals.

Effluent means liquid waste including slurries.

Environmental values refer to the values that reflect the community's aspirations for the water in its region, and the level of water quality desired. They can include ecological function and biodiversity, natural character, natural features and landscape, cultural and spiritual values, scenic and amenity values, contact recreation, and mauri (life force) and mahinga kai (customary places where food is collected or produced).

Excreta means the defecation products from cattle i.e. urine and dung.

Farm dairy includes every area of the dairy cow (or goat) milking process and includes covered and uncovered areas where cows reside for longer than five minutes for the purpose of milking (including a stand-off pad or yard) but does not include raceways.

Farm dairy effluent means contaminated waste which is predominantly composed of organic matter (dung and urine) and water, applied, deposited or used in the farm dairy.

Fresh water means all water except coastal water and geothermal water.

Ground water refers to the freshwater that occupies or moves through openings, cavities, or spaces in geological formations in the ground.

K refers to Potassium.

Land treatment refers to the use of the soil matrix as a medium for removing contaminants either dissolved or suspended, in effluent water or slurries.

Leaching means the drainage of nutrients through the soil beyond the active root zone.

MALF refers to mean annual low flow.

MCI refers to macroinvertebrate community index, an index of biological stream 'health'.

Mg refers to magnesium.

N refers to nitrogen.

Non-point source discharge refers to a discharge of water or contaminant that enters a water body from a diffuse source.

NPS refers to the *National Policy Statement - Freshwater Management 2011*.

NZCPS refers to the *New Zealand Coastal Policy Statement 2010*.

Outstanding, in relation to "outstanding freshwater bodies" means out of the ordinary on a regional basis.

Outstanding freshwater bodies are those water bodies with outstanding values, including ecological, landscape, recreational and spiritual values.

P refers to phosphorus.

Permitted activity means an activity allowed by a regional plan without a resource consent if it complies in all respects with any conditions specified in the plan.

Point source discharge means a discharge that occurs at an identifiable location.

Prohibited activity means an activity which a plan expressly prohibits and describes an activity for which no resource consent shall be granted.

Resource consent means a permit to carry out an activity that would otherwise contravene the Resource Management Act 1991. Requirements included as part of the resource consent are known as resource consent conditions.

RMA refers to the Resource Management Act 1991.

RPS refers to the *Regional Policy Statement for Taranaki 2010*.

S refers to sulphur.

State of the environment refers to a type of environmental monitoring and reporting that provides a snapshot of information about the environment and how it is changing over time.

Surface water refers to water in all its physical forms that is on the ground, flowing or not, but excludes coastal water and geothermal water.

Tangata whenua, in relation to a particular area, means the iwi, or hapu, that holds mana whenua over that area.

Water—
(a) means water in all its physical forms whether flowing or not and whether over or under the ground:
(b) includes fresh water, coastal water, and geothermal water:
(c) does not include water in any form while in any pipe, tank, or cistern.

Water body means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

References

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Appendix I: Regional rules for discharge of farm dairy effluent

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of offal, farm rubbish, leachate from silage pits and feedlots and other on-farm waste material into or onto land excluding those materials covered by Rules 22 and 35-39	30	• Discharge occurs onto or into production land; • Only waste generated on the subject property shall be discharged; • Discharge. shall not occur within 50m of any bore, well or spring used for water supply purposes; • Discharge shall not occur within 25m of any surface water body; • Discharge shall not lead or be liable to lead to any contaminants entering surface water; • Disposal of surplus agrichemical solution and containers shall be undertaken in accordance with the recommendations of the manufacturer or supplier, as stated in the directions on the product container label; • Offal pits shall be securely covered; • Offal pits shall be at least 15m from any other offal pit that has been used within the previous five years.	Permitted			
Discharge of farm dairy effluent onto or into land	35	• The discharge shall not result or be liable to result in any contaminant entering surface water; • Discharge shall not occur within 50m of any bore, well or spring used for water supply purposes; • Discharge shall not occur within 25m of any surface waterbody; • The discharger shall at all times adopt the best practicable option to prevent or minimise any adverse effects of the discharge or discharges on the environment; • The effluent application rate shall not exceed 200 kg N/ha/year.	Controlled	May be non-notified without written approval	• Location and area of disposal; • Design, construction, location, operation, and maintenance of effluent storage, treatment or disposal system; • Conditions relating to minimum effluent quality and to volume and application rates; • The setting of conditions relating to the effects of the discharge on public water supplies; • administrative charges; • Monitoring and reporting requirements; • Duration of consent; • Review of the conditions of consent and the timing and purpose of the review.	3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.2.1, 3.2.2, 3.2.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.1.6, 5.1.1, 5A.1.1, 5A.1.2, 5A.1.3, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.5, 6.2.6

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of treated farm dairy effluent to surface water (excluding the wetlands listed in Appendix II)	36	• A dilution rate of 1:100 shall be maintained at all times at the point of discharge; • The discharger shall at all times adopt the best practicable option to prevent or minimise any adverse effects of the discharge or discharges on any water body; • At or beyond the downstream boundary of a mixing zone, the discharge shall not cause the concentration of unionised ammonia to exceed $0.025gm^{-3}$ NH3 expressed as nitrogen, nor the concentration of filtered carbonaceous biochemical oxygen demand to exceed $2.0gm^{-3}$	Controlled	May be non-notified without written approval	• Design, construction, location, operation, and maintenance of effluent storage, treatment and disposal system; • Conditions relating to minimum effluent quality and to volume and discharge rates; • The setting of conditions relating to the effects of the discharge on public water supplies; • Dilution rate in receiving waters; • Definition and delineation of mixing zone; • Location of discharge point; • Administrative charges; • Monitoring and reporting requirements; • Duration of consent; • Review of the conditions of consent and the timing and purpose of the review.	3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.2.1, 3.2.2, 3.2.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.1.6, 5.1.1, 5A.1.1, 5A.1.2, 5A.1.3, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.6
Discharge of treated farm dairy effluent (that does not meet the conditions of Rule 36), or treated piggery or poultry effluent to surface water (excluding the wetlands listed in Appendix II)	39		Discretionary	May be non-notified		3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6, 3.1.7, 3.2.1, 3.2.2, 3.2.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.1.6, 5.1.1, 5A.1.1, 5A.1.2, 5A.1.3, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.6
Discharge of untreated farm dairy piggery or poultry effluent to surface water	40		Prohibited			

Appendix II: Evaluation of the policy options

Essentially there are three policy options relating to future farm dairy effluent management in the region. They range from the *status quo* to amending the Plan to require farm dairy effluent treatment to land only.

Table 7: Evaluation of the policy options for future farm dairy effluent management

	Options	Increased environmental outcomes	Gives effect to national policy directives	Reflects best practice	Flexibility for resource users	Least economic cost	Conclusion
Outcomes sought:	1. Increased protection of freshwater quality so that Taranaki can continue to maintain and enhance freshwater quality during periods of increased dairy intensification 2. Best practicable option is adopted for Taranaki at a catchment and farm level in relation to farm dairy effluent management.						
1	***Status quo*: continuous pond discharges to water allowed**	X	X	X	√	√	Option 3 is the preferred option. The only criterion that it did not score positively for is in relation to costs. Up to 900 or 50% of farm dairy effluent management systems (i.e. the ponds) will need to be converted to land or dual treatment systems. The cost of converting ponds to a dual system so that they have the capacity to discharge to land is about **$50,000** per system. Up to 300 land treatment systems may also need to be upgraded to ensure they have adequate holding capacity. their systems. The estimated cost of this is likely to be about **$10,000 - $50,000**. It is recommended a transition period apply for farmers to comply with the new requirement to mitigate the impact of the costs incurred. It is also recommended that the Council investigate options of reducing the compliance monitoring costs given reduced risks to the environment.
2	**Amend Plan: discharges to land only**	?	√	√	X	X	
3	**Amend Plan: discharge to land or via dual discharge system**	√	√	√	√	X	
Assumptions	• Farm dairy effluent management and associated impacts on freshwater quality continues to be a regionally significant issue • Taranaki's overall freshwater quality is good to excellent • Dairy intensification will continue with increasing pressures on freshwater quality • Both discharges to land and water have environmental effects. However, discharges to land are generally preferential • Most environmental issues associated with discharges to land are associated with the farmer's management regime, therefore there is a need to continue to consent and monitor such discharges. • Discharges to water in times of high water flows are unlikely to have more than minor adverse effects or result in significant cumulative effects • It is important that farmers retain operational flexibility to choose the appropriate system for them unless there is good reason why not.						

Appendix III: Proposal for allowing the discharge of treated farm dairy effluent to surface water

Set out below is an outline of when and how the discharge of treated farm dairy effluent to water is allowed (as per the recommendations set out in section 7.3.1 of this paper). It briefly outlines the rationale and key features for the proposed changes, including when discharges to surface water could be allowed, the Council's decision-making criteria, and notification processes. The final shape and design of the concept will be confirmed as part of the review of the Freshwater Plan, including determining nutrient and BOD limits and dilution rates.

The proposed rule

As part of the review of the Freshwater Plan, the Council is proposing that the discharge of treated farm dairy effluent to surface water from a **dual discharge system** be authorised as a controlled activity under the RMA. [41]

Outcomes sought

The outcomes sought by the proposed rule are:

1. increased protection of freshwater quality so that Taranaki can continue to maintain and enhance freshwater quality during periods of increased dairy intensification
2. the adoption of the best practicable option for environmental outcomes at a catchment and farm level
3. provide farmers with the maximum operational flexibility to adopt the farm dairy effluent management system that suits their circumstances.

Key features

As part of the proposed change, standards, terms and conditions for Rule 36 of the Freshwater Plan will be amended. Key features of the proposed change are that:

1. the discharge of treated farm dairy effluent to surface water is from a dual discharge system
2. the discharge is to land UNLESS the resource consent holder has been specifically notified by the Council that they can discharge treated farm dairy effluent to surface water from their dual discharge system
3. there will be no pond discharges to water during low flow periods, e.g. from 1 December to 30 April.

Indicative season for discharging to land or water

Local physical and climatic circumstances mean that the appropriate 'season' for discharging to land or water can vary from property to property, catchment to catchment, and year to year.

As a 'rule of thumb' all discharges would be to land between 1 December and 30 April given low water flow conditions and soil moisture levels being generally low enough to accept land

[41] *Discharges to water from pond systems will no longer be allowed except as a discretionary activity where discharging to land is not a best practicable option.*

treatment. During this period, land treatment is the best practicable option for managing adverse environmental effects associated with farm dairy effluent.

As a 'rule of thumb' discharges to water would generally be confined between 1 May to 30 November when the discharge will have less than minor effects on freshwater quality given high water flow conditions.

However, the aforementioned assumptions are subject to confirmation by the Council and will be regularly tested by catchment specific/real time data obtained via the Council's monitoring programmes. As previously noted farm dairy effluent discharges are to land unless the Council has informed the resource consent holder otherwise.

Council decision making criteria

In its deliberations as to when discharges of treated farm dairy effluent to surface water is allowed the Council will ensure that potential adverse environmental effects arising from the discharge are less than minor by having regard to seasonal and catchment considerations.

Seasonal and catchment considerations:

1. water level and flow conditions, including the ability of the receiving water to assimilate the contaminants
2. soil type and moisture levels on the land, which is fundamental to good irrigation management and avoiding spraying onto land when conditions are unsuitable
3. rainfall levels, including the implications on water flow conditions and spray irrigation practices.

Notifying resource consent holders

The presumption is that the discharge is to land unless the Council has informed the resource consent holder otherwise. Options for informing resource consent holders that they can discharge treated farm dairy effluent to surface water include:

- public notice
- email notification, and or
- notice on the Council's Internet site.

The notice allowing discharges of treated farm dairy effluent to surface water will specify:

1. the area/catchment affected
2. the period for which discharges to water in that area/catchment is allowed
3. any special conditions applying to the discharge.

Appendix IV: Retrofitting farm dairy effluent systems

Table 8: What is involved in retrofitting farm dairy effluent systems

Farm dairy treatment ponds	Set out below is an outline of what may be involved in retrofitting and upgrading a typical two pond system to a dual discharge system
	• Install floating pump, suspended on a pontoon, in either anaerobic or aerobic ponds • Construct platforms • Install power supply • Install irrigation line (hydrants) • Install irrigator • Changes to farm infrastructure such as tracks and fencing to accommodate land irrigation • Additional maintenance and operating requirements.
Land treatment system	Set out below is an outline of what maybe involved in retrofitting and upgrading a typical sump to a larger holding pond (assuming average herd size is 270 cows).
	• Construction of new and suitably lined holding ponds.

Appendix V: Indicative timeline for giving effect to the proposed revised rules for discharges to land or water

Set out below is an indicative timeline for giving effect to the proposed revised rules for farm dairy discharges to land or water.

The proposed rules

Sections 7.3.1 to 7.3.3 of this paper outline proposals to amend the Freshwater Plan to require:

- the discharge of farm dairy effluent to be via land treatment and or a dual discharge system, and
- land treatment systems to have adequate lined storage capacity.

When do the proposed rules take effect?

The cost to farmers of converting and or upgrading their farm dairy effluent management systems is significant. It is therefore proposed that the policies and rules be phased in for existing systems whereby a review of relevant consents will be required, with conditions to give effect to the proposed rules above:

- within two years of the Plan becoming operative, or
- once the Plan has become operative, when consents come up for renewal (of note all discharge consents are reviewed every six years on a catchment by catchment basis)

– whichever is the sooner.

Upon review (or renewal), existing consent holders will then have two years to give effect to a new condition to upgrade their system.

For new systems it is proposed that the aforementioned policies and rules be applied with immediate effect.

Indicative timeline for the proposed rules taking effect

Set out in Table 9 overleaf is an indicative timeline for imposing new condition(s) relating to preferential discharges to land and ensuring land systems have holding capacity. Table 10 shows the consent review date for farm dairy effluent systems by catchment.

The timeline is based upon a best case scenario of a revised Freshwater Plan being publicly notified and adopted by late 2014.[42] It takes into account the proposed phasing-in period and the scheduled dates for reviewing current farm dairy discharge consents in catchments across Taranaki. Presuming the Plan is operative by the end of 2014, by the end of 2018 (i.e. four years) all farm dairy effluent systems will be compliant with the new conditions.

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[42] *This date recognises the extensive pre-notification consultation process being adopted by the Council with the aim that a Proposed Freshwater Plan will be publicly notified in late 2013. It assumes issues identified through the public consultation and planning processes under Schedule 1 of the RMA can be satisfactorily resolved without recourse to the Environment Court.*

Table 9: Indicative timeline for the proposed rules to take effect

		Freshwater Plan consultation and development			Transitional period for reviewing consents to include condition to upgrade		Plus 2 years for giving effect to new conditions to upgrade	
					Year 1	Year 2	Year 3	Year 4
		2012	2013	2014	2015	2016	2017	2018
Proposed Freshwater Plan publicly notified			◆					
Revised Freshwater Plan adopted				◆				
Due date for reviewing consents (by catchments)*	1 June 2013							
	1 June 2014							
	1 June 2015							
	1 June 2016							
	1 June 2017							
	1 June 2018							

* Farm dairy effluent consents are scheduled to be reviewed every six years. Consents/catchments being reviewed in 2014 will need to be reviewed early to meet the two-year deadline given to include conditions to ensure systems meet higher standards.

Table 10: Consent review date for imposing new condition(s) relating to preferential discharge to land and ensuring land systems have holding capacity (by catchment)

Review of consents (by catchment) - new condition to be included in resource consent requiring upgraded systems					
1 June 2015	**1 June 2016**	**1 June 2017**			
Waitara River	Waitotara River	Waihi 5 (Waihi)	Otakeho	**Scheduled review date**	**Other catchments**
Catchment 64	Catchment 1	Catchment 23	Waitaweta	Moutoti	Maitahi
Titirangi	Catchment 2	Catchment 24	Taikatu	Tangihapu	Mangakino
Owhakaangi	Catchment 3	Hauroto	Waikaretu	Otuwhenua	Katikara
Waipapa 3	Wairoa	Catchment 25	Opuhi	Manganui 2 (Manganui)	Waiaua 1 (Waiaua)
Manu	Catchment 4	Waingongoro River	Ouwe	Okahu	Pitone
Waihi 2	Catchment 5	Catchment 26	Rawa	Pungareere	Catchment 58
Catchment 65	Catchment 6	Inaha	Waimate	Catchment 41	Timaru
Parahaki	Catchment 7	Kapuni	Wahamoko	Waitaha 2 (Waitaha)	Whenuariki
Catchment 66	Catchment 8	Waiokura	Waihi 4 (Waihi)	Pehu 2 (Pehu)	Otupoto
Waiau 1 (Waiau)	Catchment 9	Catchment 27	Mangatoromiro 1	Waiarere	Catchment 59
Motukara	Catchment 10	Catchment 28	Oeo	Catchment 42	Waimoko
Catchment 67	Whenuakura River	Catchment 29	Waipaepaeiti	Catchment 43	Tasman Sea
Onaero River	Catchment 11	Motumate	Ouri	Waitotaroa	Wairau
Catchment 68	Patea River	Kaupokonui	Puketapu	Moukoro	
Catchment 69	Catchment 12		Catchment 31	Catchment 44	Oakura River
Urenui River	Kaikura		Punehu	Otahi 1 (Otahi)	Tapuae
Catchment 70	Mangaroa		Catchment 32	Catchment 45	Okurukuru
Catchment 71	Waikaikai		Taungatara	Catchment 46	Wairere
Catchment 72	Catchment 13		Catchment 33	Kapoaiaia	Catchment 60
Catchment 73	Manawapou River		Waiteika	Oneroa	Waireka 1 (Waireka)
Catchment 74	Tangahoe River		Mangahume	Temahau	Herekawe
Waitoetoe	Catchment 14		Waiaua 2 (Waiaua) River	Waitekaure	Hongihongi
Catchment 75	Catchment 15		Hihiwera	Catchment 47	Catchment 61
Mimi River	Catchment 16		Otahi 2 (Otahi)	Catchment 48	Huatoki
Catchment 76	Catchment 17		Catchment 34	Catchment 49	Te Henui
Waiiti	Catchment 18		Heimama	Whanganui	Waiwhakaiho River
Papatiki	Catchment 19		Catchment 35	Catchment 50	Catchment 62
Catchment 77	Catchment 20		Catchment 36	Teikaparua/Warea River	Mangati
Catchment 78	Catchment 21		Koteoteo	Catchment 51	Waihowaka
Waikaramarama	Catchment 22		Okaweu	Catchment 52	Waitaha 1 (Waitaha)
Catchment 79			Arawhata	Waiweranui	Catchment 63
Catchment 80			Catchment 37	Catchment 53	Waiongana
Waipingau			Catchment 38	Catchment 54	
Catchment 81			Ngapirau	Wairongomai	
Waikorora			Teikiwanui	Catchment 55	
Catchment 82			Oaonui	Catchment 56	
Waikiekie			Oaoiti	Matanehunehu	
Mangapukatea			Catchment 39	Waitapuae	
Tutapuha			Catchment 40	Waitearata	
Warekarianga				Werekino	
Ohanga				Waikirikiri 2 (Waikirikiri)	
Tongaporutu River				Hangatahua/Stony River	
Rapanui				Horomanga	
Otukehu				Waihi 3 (Waihi)	
Awahakae				Kaihihi	
Catchment 83				Catchment 57	
Kuwhatahi				Waikoukou 2 (Waikoukou)	
Wharau					
Pukerewa					
Awaawaroa					
Catchment 84					
Catchment 85					
Mohakatino River					
Waihi 1 (Waihi)					

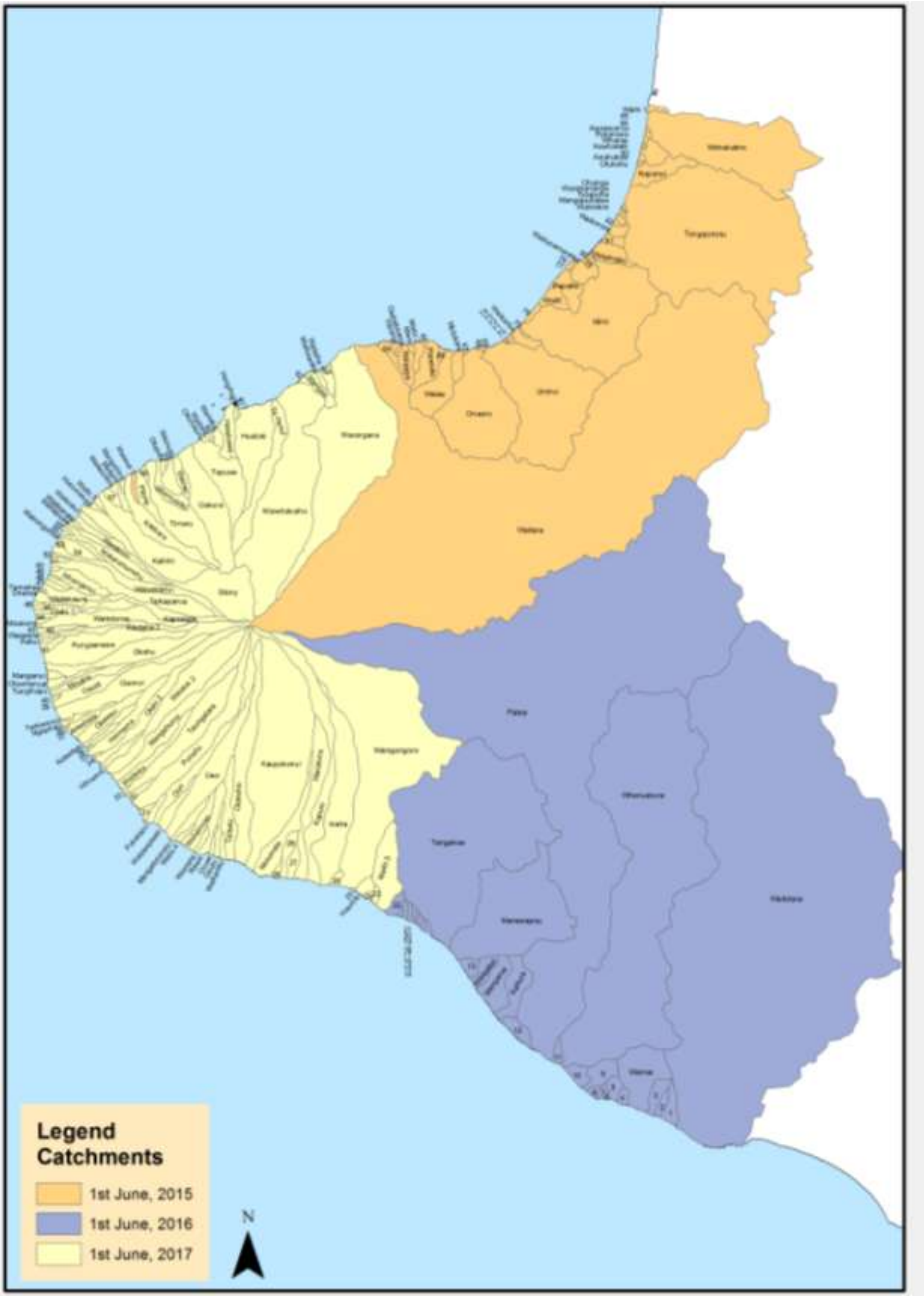

Figure 8: Map showing consent review date for imposing new condition(s) relating to preferential discharge to land and ensuring land systems have holding capacity (by catchment)