

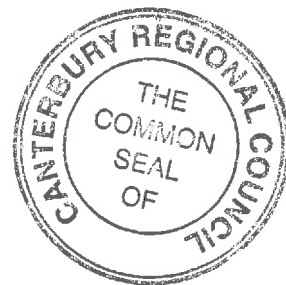
Section 32 Report - Plan Change 6 to the Partly Operative Canterbury Land and Water Regional Plan

I hereby certify this is the Section 32 Report for Plan Change 6 to the partially operative Canterbury Land and Water Regional Plan, as adopted by the Canterbury Regional Council at its meeting on 24 September 2015.

The Common Seal of the Canterbury Regional Council was fixed in the presence of:



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Chief Executive
Canterbury Regional Council



David Caygill
Acting Chairperson
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24 September 2015

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Abbreviations

Table 1: Abbreviations

7DMALF	Seven-day mean annual low flow
CCC	Christchurch City Council
CMA	Coastal Marine Area
CRC	Canterbury Regional Council
CRPS	Canterbury Regional Policy Statement 2013
CWMS	Canterbury Water Management Strategy
DoC	Department of Conservation
ECan Act	Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010
L/s	Litres per second
LWRP	Canterbury Land and Water Regional Plan (operative in part)
MALF	Mean Annual Low Flow (1 day)
MAV	Maximum Allowable Value in the Drinking Water Standards for New Zealand 2005 (Revised 2008)
N (in text)	Nitrogen
Nitrate-N	Nitrate Nitrogen
NOF	National Objectives Framework in the National Policy Statement for Freshwater Management 2014
NPSFM	National Policy Statement for Freshwater Management 2014
NRRP	Canterbury Natural Resources Regional Plan
NZCPS	New Zealand Coastal Policy Statement 2010
P	Phosphorus
RMA	Resource Management Act 1991
TLI	Trophic Level Index (a classification system to indicate the health of New Zealand lakes)
TN	Total Nitrogen
TP	Total Phosphorus
ZIP	Zone Implementation Programme
ZIP Addendum	Zone Implementation Programme Addendum
Zone Committee	Banks Peninsula Zone Committee

PART A: INTRODUCTION AND PLANNING CONTEXT

1 Introduction

1.1 Purpose of this Report

This report provides an evaluation of the provisions contained in Plan Change 6 to the Canterbury Regional Council's Land and Water Regional Plan (LWRP) (operative in part) in accordance with section 32 of the Resource Management Act 1991 (RMA). This report includes the following:

- A summary of the issues in the Lake Forsyth / Wairewa catchment to be addressed by Plan Change 6;
- A description of Plan Change 6 and its provisions;
- A description of the development of Plan Change 6, including alternative options considered and relevant background information; and
- An effectiveness and efficiency evaluation of the Plan Change 6 provisions.

This report is to be read in conjunction with the provisions contained in Plan Change 6 and the list of supporting documents outlined in section 13 of this report (References).

1.2 Understanding the Relationship of Plan Change 6 with the LWRP

The LWRP is Council's plan for the integrated management of land and water resources within the Canterbury Region. The LWRP operates at two levels:

- the region-wide section contains the objectives, policies and rules that apply across the region; and
- sub-region sections 6 to 15 implement the objectives in the LWRP in the most appropriate way for each of those sub-regions.

Plan Change 6 (PC6) proposes amendments to Section 10 (Banks Peninsula sub-region), Section 16 (Schedules) and the Planning Maps of the LWRP specifically for the Lake Forsyth / Wairewa catchment.

1.3 Extent of Plan Change 6

Changes proposed to Section 10 of the LWRP include the addition of new material, and deletion of some existing material in that section.

The substantive changes proposed in Plan Change 6 only apply a single catchment within the Banks Peninsula Sub-region, being the Lake Forsyth / Wairewa catchment (see Chapter 3, Figure 1). Substantive changes include the addition of:

- freshwater outcomes, water quality limits, and environmental flow and allocation limits
- "Valley Floor Area" to the Planning Maps
- policies and rules associated with stock exclusion from riparian areas and the bed and banks of surface waterbodies in the Valley Floor Area
- policies and rules primarily associated with activities to improve the quality of the freshwater environment.

- Schedule 24c “Valley Floor Area River Bank Erosion Plan”

This evaluation report focuses on these aspects of Plan Change 6.

Plan Change 6 also proposes adding to the front of Section 10 introductory text, and a map, about the Lake Forsyth / Wairewa catchment, for information purposes

In addition, Plan Change 6 proposes a number of changes that apply to the entire Banks Peninsula Sub-region. These changes are all of a minor nature or for information only purposes, to achieve consistency with the headings and general structure adopted in the decisions version of Plan Change 1 to the LWRP (Selwyn - Te Waihora). These changes include:

- minor amendments to some headings
- renumbering of the heading “Flow Sensitive Catchments” (other than moving associated text and a table, PC6 does not change any of the existing provisions in Section 10 relating to flow sensitive catchments)
- the addition of new headings in Section 10, including “10.1A Definitions” (associated definitions only apply to the Lake Forsyth / Wairewa catchment); “10.3 Iwi Management Plans that apply to the Banks Peninsula Sub-region” (with associated text listing the “Mahaanui Iwi Management Plan 2013” and the “Te Rūnanga o Ngāi Tahu Freshwater Policy Statement”); “10.9 High Naturalness Waterbodies” (associated text is ‘nil’); and “10.10 Schedules” (an associated Schedule only applies to the Lake Forsyth / Wairewa catchment).

1.4 Matters Outside the Extent of Plan Change 6

Plan Change 6 does not include any changes to the region-wide objectives, policies and rules in the LWRP.

Of particular note, is that Plan Change 6 does not include any amendments to the policies and rules in Sections 4 and 5 of the LWRP that relate to nutrient management, or to the taking and use of fresh water. This means that the relevant provisions in these sections will continue to apply in the Lake Forsyth / Wairewa catchment. The appropriateness of these and other region-wide LWRP provisions have already been subject to a section 32 evaluation (and a hearings process in accordance with the RMA and ECan Act) during the development of the LWRP, and are not subject to further evaluation in this report.

No part of Plan Change 6 applies to the Coastal Marine Area, which is controlled by the Regional Coastal Environment Plan (RCEP).

2 Planning Context

Section 32 of the Act does not require a statutory or planning evaluation of Plan Change 6. However, this section identifies the key statutory and planning documents to assist understanding of the statutory context within which Plan Change 6 has been prepared.

A more comprehensive planning evaluation is provided in Appendix 2.

2.1 Resource Management Act 1991

Section 32 of the RMA is reproduced in Appendix 1. In summary, Section 32 requires regional councils, when amending regional plans, to examine whether the provisions are the most appropriate way to achieve the objectives by identifying other reasonably practicable options for achieving the objectives; assessing the efficiency and effectiveness of the provisions in achieving the objectives; and summarising the reasons for deciding on the provisions. The evaluation report must be made available for public viewing.

Plan Change 6 has also been prepared to fulfil Council's functions under section 30 of the RMA, and in accordance with the applicable requirements of sections 65 to 70 of the RMA.

2.2 Canterbury Earthquake Recovery Act 2011

The Canterbury Earthquake Recovery Act 2011 is relevant to any plan change made in the Canterbury region.

As required by that Act, Plan Change 6 is not inconsistent with the Recovery Strategy, or any Recovery Plan

2.3 ECan Act

The Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010 (ECan Act) is also relevant to Plan Change 6.

Particular regard has been given to the vision and principles of the Canterbury Water Management Strategy (CWMS) in developing Plan Change 6.

2.4 NPS, NZCPS and RPS

Section 67(3) of the RMA requires that regional plans must give effect to any national policy statement (NPS), New Zealand coastal policy statement (NZCPS), and regional policy statement (RPS).

The NPS of particular relevance to Plan Change 6 is the National Policy Statement for Freshwater Management 2014 (NPSFM). Plan Change 6 has been prepared to give effect to the NPSFM.

Council also considers that Plan Change 6 gives effect to the NZCPS 2010 and the Canterbury Regional Policy Statement 2013 (CRPS).

2.5 NES

Section 43B(3) of the RMA requires that a rule in a regional plan cannot be more lenient than a national environmental standard (NES).

The NES of particular relevance to Plan Change 6 is the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 ("Drinking Water NES"). Council considers that the rules in Plan Change 6 are not inconsistent with any NES.

2.6 Other Regional Plans Including the LWRP

Section 67(4) requires that a regional plan must not be inconsistent with any other regional plan for the region.

Other regional plans in the Canterbury region that apply to the Lake Forsyth / Wairewa catchment include the Natural Resources Regional Plan (NRRP) and the Land and Vegetation Management Regional Plan. As noted in Appendix 2, many parts both plans were revoked when most provisions in the LWRP became operative on 1 September 2015.

Council considers that Plan Change 6 is consistent with the remaining parts of both the NRRP and the Land and Vegetation Management Regional Plan.

The Regional Coastal Environment Plan is also relevant to Plan Change 6. Council considers that Plan Change 6 is consistent with this plan.

The LWRP became operative in part on 1 September 2015. The operative provisions include all policies and rules except those relating to the 'take and use of surface water' and 'dams and damming'.

LWRP region-wide Policies 4.9 and 4.10 direct the development of sub-region sections of the plan. Plan Change 6 has been prepared in accordance with Policies 4.9 and 4.10.

Plan Change 4 (Omnibus) to the LWRP was notified on 12 September 2015¹. It addresses implementation issues and other resource management matters, identified following the implementation of the LWRP. The changes apply across the Canterbury region except in those areas subject to an operative catchment plan, or sub-region section of the LWRP, that includes specific provisions that address the same subject matter. Plan Change 4 will impact the Lake Forsyth / Wairewa catchment through amendments (including the addition of new rules) to be considered when proposing to undertake activities. An example relevant to the Lake Forsyth / Wairewa catchment, are changes to the stock exclusion rules in the region-wide section of the LWRP, to protect potential inanga spawning habitats.

2.7 Iwi Management Plans

Section 66(2A) requires regional councils take into account any relevant planning document recognised by an iwi authority. Two iwi management plans are considered to be particularly relevant to Plan Change 6:

- Mahaanui Iwi Management Plan 2013
- Te Rūnanga o Ngāi Tahu Freshwater Policy Statement.

Council has taken these documents into account when developing Plan Change 6.

¹ Work is also underway on the preparation of Draft Plan Change 5 (Nutrient Management) to the LWRP, which is likely to be publicly notified in early 2016. This may have implications for the Lake Forsyth / Wairewa catchment based on the application of the region-wide rules.

2.8 Management Plans and Fisheries Regulations Prepared under other Acts

Section 66(2) requires that regional councils have regard to management plans prepared under other Acts, and regulations relating to fisheries resources.

The Canterbury Water Management Strategy was developed through an extensive collaborative process, endorsed by all councils in Canterbury and provides the land and water management framework for the region. As previously noted, the vision and principles of the CWMS are required to be given particular regard to when a decision is made on Plan Change 6 through the Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010.

The CWMS vision is:

"To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework."

This vision is supported by nine principles and goals for 2010, 2015, 2020 and 2040 in ten target areas: ecosystem health/biodiversity, natural character of braided rivers, kaitiakitanga, drinking water, recreational and amenity opportunities, water-use efficiency, irrigated land area, energy security and efficiency, regional and national economies, and environmental limits. These targets embody the concept of land use development in parallel with environmental improvement.

As previously noted, the vision and principles of the CWMS are required to be given particular regard to when a decision is made on Plan Change 6 through the Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010.

Other management plans or fisheries regulations relevant to Plan Change 6 include the:

- North Canterbury Sports Fish & Game Management Plan
- Fisheries (Declaration of Wairewa/Lake Forsyth Mataitai Reserve and Appointment of Tangata Tiaki/Kaitiaki) Notice 2010 (made pursuant to Regulations 20, 21 and 22 of the Fisheries (South Island Customary Fishing) Regulations 1999).

Council has had regard to these matters, and to the full Canterbury Water Management Strategy, in preparing Plan Change 6.

3 Area to which Plan Change 6 applies

Aside from the minor or information only aspects of this plan change (see section 1.3), Plan Change 6 applies to the Lake Forsyth / Wairewa catchment (shown in Figure 1 below). This catchment is situated in the Banks Peninsula District between Christchurch and Akaroa. It covers the land from the mean high water springs at Birdlings Flat to the south, Mount Fitzgerald and Mount Sinclair to the north, High Bare Peak to the west and Saddle Hill / Wainui Pass to the east. The main water resources in the catchment include Lake Forsyth / Te Roto o Wairewa and the waterways that flow into the lake, such as the Okana, Okuti and Takiritawai Rivers. The catchment includes the townships of Little River, Birdlings Flat and Cooptown.

The area covered by Plan Change 6 comprises approximately 109 km² (10,900 ha) of which Lake Forsyth / Te Roto o Wairewa comprises 5.6 km² (560 ha).

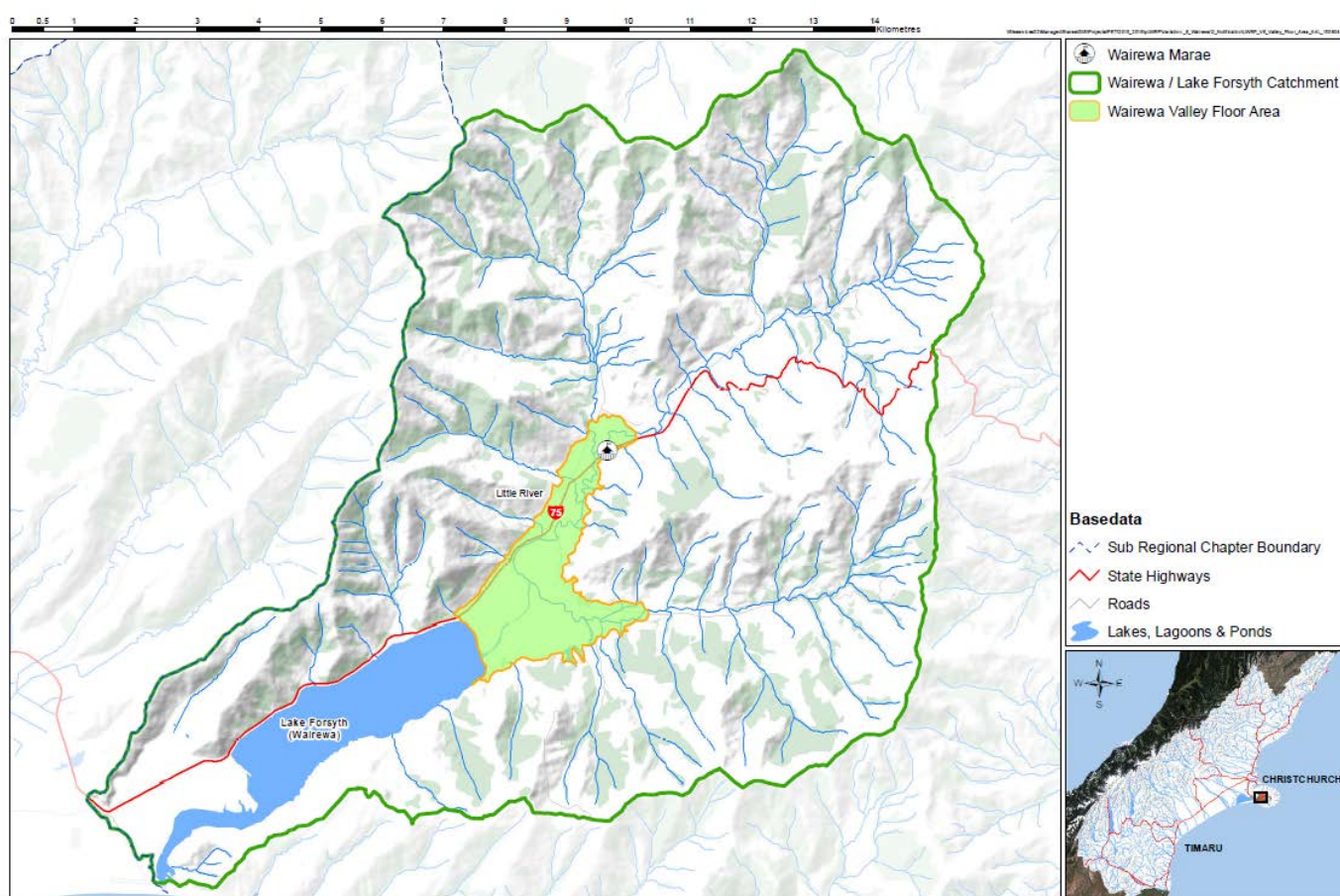


Figure 1: Lake Forsyth / Wairewa catchment

The geographical area for Plan Change 6 is based primarily on surface water characteristics and topography. The main outcome sought by Plan Change 6 is to improve the ecosystem health and water quality of Lake Forsyth and its catchment. The geographical extent of Plan Change 6 therefore includes the lake as well as the waterways that flow into the lake, such as the Okana, Okuti and Tākiritawai Rivers. These waterways are a primary mode of transport for, and source of, phosphorus entering the lake.

4 Current State of the Lake Forsyth / Wairewa Catchment

This section provides an overview of the current state of the Lake Forsyth / Wairewa catchment and describes the biophysical, economic, cultural and social factors in the environment.

4.1 Biophysical Environment

This section explains the biophysical, water quality and water quantity characteristics of the Lake Forsyth / Wairewa catchment.

4.1.1 Overview of Lake Forsyth / Te Roto o Wairewa

Lake Forsyth / Te Roto o Wairewa is a small, shallow lake that is fed by the Okana and Okuti Rivers. The Okana and Okuti Rivers join for a short stretch (named the Takiritawai River) before flowing into the head of Lake Forsyth / Te Roto o Wairewa. The lake also receives lesser inflows from smaller creeks which flow directly into the lake, as well as an unknown but likely minor component contributed directly from groundwater.

The lake is separated from the sea by the eastern end of an active barrier-beach complex known as Kaitorete Spit. This narrow barrier ($\leq 100\text{m}$ width) has evolved over 8000 years as an accumulation of material which has been transported north along the coast of the Canterbury Bight (Schallenberg et al. 2013). The timing of the transition of the lake from marine estuary to closed-in lake is uncertain but appears to have begun at least 450 years ago (Schallenberg et al. 2013). A lake outlet still existed in the 19th century and whalers, canoes and coastal traders accessed the lake from the ocean implying that the lake was open at least periodically (Schallenberg et al. 2013). Currently the lake is intermittently brackish with a wide range of salinities (Main et al. 2003). Artificial opening of the lake to the sea first occurred in 1866 and now occurs to provide capacity for floodwaters and reduce flooding of the catchment, as well as for mahinga kai purposes (Schallenberg et al. 2013).

The average depth of Lake Forsyth / Te Roto o Wairewa varies between one and two metres depending on the lake level, with a maximum depth near the outlet of four metres. The lake has a volume of 5 to 10 million cubic metres (depending on lake water level), and a mean turnover time of 29 to 58 days, assuming a mean inflow of 2 cubic metres per second (Waters, 2014). Rainfall in the catchment is higher than on the Canterbury Plains; NZ Meteorological Service recorded mean annual rainfalls of 1097 mm at Puaha and 1219 mm at a site at 61m elevation in the Okuti Valley, compared with only 689 mm at Lincoln.

4.1.2 Artificial Lake Opening

Historical records suggest that Wairewa/ Lake Forsyth was open to the sea prior to the 1830s to allow transporting people and goods. However, this situation had changed by the late 1800s, by which time periodic artificial openings of the lake were necessary to avoid flooding and improve drainage. The earliest recorded opening was in 1866 (Jacobson, 1940) (Wairewa Rūnanga / CCC, 2015).

In January 2008, Wairewa Rūnanga obtained consents to construct, operate and maintain a canal and groyne at the eastern, seaward end of Lake Forsyth / Te Roto o Wairewa. The consents were part of a feasibility trial to establish whether a permanent or semi-permanent mouth for the lake was a viable solution to restore and enhance the quality of the lake. The canal begins on the bed of the lake, traverses the beach and then crosses legal and unformed road into the Coastal Marine Area (CMA). Wairewa Rūnanga and Christchurch City Council are currently joint applicants for further resource consents to construct, operate and maintain the canal and groyne on a more permanent basis.

The canal opening provides for a more controlled opening, compared to the previous method of a mid-beach opening. The canal is a permanent feature with a gravel bund at the seaward end forming a barrier to the sea. This provides for a faster and more controlled opening, and crucially the ability to close the canal when sufficient water has drained

from the lake. During winter 2010, the first year the canal was in service, the lake was opened seven times for a total period of approximately 42 days from June until mid-October, or for just over 30% of this period. The lake openings are most frequently undertaken during the winter months (May – August) as the primary purpose is to prevent flooding, although there are still some October openings. The period of May - August is outside the main period for both glass eel migration and spring whitebait migrations. Openings usually occur for 2-10 days at a time / per year.

Over the period since the canal was built, surf-driven gravel deposition at the mouth of the canal appears to be reducing and the canal is currently remaining open for longer periods. In winter 2013, the canal was opened in early June and remained open until the end of July.



Figure 2: Photos showing the Lake Forsyth / Te Roto o Wairewa canal looking towards the sea (left photo) and the groyne structure looking towards the sea when the canal is open to the sea (Photos from Wairewa Rūnanga / CCC lake opening consent application 2015)

A permanent opening during migration periods would give fish the best opportunity to enter and leave the lake. But even at present, the narrow and highly permeable canal beach berm which builds up between openings is likely to have significantly extended the period when elvers may get into the lake. Eel fishermen have reported seeing elvers entering the lake by worming through outflows between the gravels (B. Ruru pers comm.). The lake openings also appear to have improved the water quality of the lake as measured by trends in the Trophic Level Index (TLI)² score, discussed further in section 4.1.3 below.

4.1.3 Water Quality of Lake Forsyth / Te Roto o Wairewa

Lake Forsyth / Te Roto o Wairewa is a nationally and regionally significant wetland habitat for waterfowl (including the crested grebe), a variety of salt and freshwater marsh plants and invertebrate species (Hughey 2013). The lake and its tributaries provide habitats for a variety of fish species including tuna (long finned and short finned eel), inanga (whitebait), patiki (flounder), banded kōkopu, and common and upland bullies. The Okuti River is a known spawning site for the kanakana (lamprey *Geotria australis*). Apart from the upland bully all these species require access to the sea to complete their lifecycle. Perch and brown trout can also be found in Lake Forsyth / Te Roto o Wairewa and its tributaries.

Over the last 160 years, the Lake Forsyth / Wairewa catchment has been dramatically modified by major deforestation that has caused erosion and the subsequent loss of sediment into waterways. Sedimentation rates in Lake Forsyth / Te Roto o Wairewa have increased substantially (Schallenberg et al. 2013). Total nitrogen, total phosphorus and

² Trophic Level Index (TLI) is a classification system to indicate the nutrient status and productivity of New Zealand Lakes. It runs from <1 (almost pure water) to >7 (highly nutrient enriched).

chlorophyll *a* within Lake Forsyth / Te Roto o Wairewa typically exceed the water quality limits for coastal lakes set in the Land and Water Regional Plan (LWRP).

At times, the lake is in a hypertrophic state (saturated with phosphorus and nitrogen) which contributes to poor water quality, excessive algal growth and poor suitability for recreational uses. Toxic cyanobacteria blooms are common in Lake Forsyth / Te Roto o Wairewa and have been recorded at least as far back as 1907 (Schallenberg et al. 2013). Farmers grazing stock near the lake have been aware of the risk of stock being poisoned when blooms are present, since at least the 1920s. The blue-green cyanobacteria blooms produce toxic byproducts which are harmful to humans and animals, having an adverse effect on the human nervous system and causing skin irritation on contact. The blooms also impact on cultural, recreational and amenity values associated with the lake.

Nodularia spumigena has been confirmed as the main toxic species present during the blooms (Dolamore, 2007). This species grows well in brackish water and calm conditions and is typically present in Lake Forsyth / Te Roto o Wairewa between December and April, often peaking in concentration during February. Accumulations of toxins can persist for several months along the lake edge, particularly at Catons Bay and at the coastal end of the lake, when *Nodularia* is blown ashore by light winds. Other species of phytoplankton are dominant in the lake for the remainder of the year. Several factors may predispose the lake to cyanobacterial proliferations, including warm summer temperatures, brackish conditions, a plentiful dissolved phosphorus supply, and internal or external mechanisms of nutrient supply which support large blooms. The levels of phosphorus in the lake are the main concern in terms of promoting cyanobacterial blooms because their growth is limited by the availability of this nutrient (Davie, 2007). The phosphorus is primarily sourced from the surrounding soils in the catchment which come from basalt volcanic rocks and loess from greywacke source rocks, all naturally high in phosphorus (Lynn, 2005).

As stated previously, Lake Forsyth / Te Roto o Wairewa is highly eutrophic and although a high eutrophic level generally means poorer water quality, it does not mean that the lake is biologically dead. Lake Forsyth / Te Roto o Wairewa is biologically very active although some species, such as tuna (eels), appear to be on the decline (Cranwell, 2011). Macrophytes (aquatic plants) flowered in the spring of 2013, indicating that the health of the lake may be improving due to the artificial lake opening regime (Davie, 2014).

Canterbury Regional Council (CRC) has monitored water quality parameters in the lake since 1993 (Schallenberg et al., 2013). Nutrient levels are variable and often very high. Lake core samples indicate that sediment layers in the lake increased from approximately 1.0 mm/year, peaking at 3.7 mm and stabilising at 3.0mm/year as a result of deforestation of the catchment. The lake also contains a wide temperature range and varying pH levels between 6.5 and 9.9, with earlier research reporting a similar range of 6.2 to 10.2 (Schallenberg et al., 2013). The high variability is unusual compared to other freshwater lakes in the Canterbury region and may be influenced by varying salinity and the occurrence of the algal blooms (Main et al., 2003).

As noted earlier, Trophic Level Index (TLI) is a measure of a lake's quality. The National Policy Statement for Freshwater Management (2014) does not refer to TLI directly but it does provide attribute states and national bottom lines for the components of TLI i.e. total nitrogen, total phosphorus and chlorophyll-*a*. Lake Forsyth / Te Roto o Wairewa has a fluctuating TLI, varying between 4 and 7 (eutrophic to hypertrophic). Monthly TLI scores for Lake Forsyth / Te Roto o Wairewa between 1999 and 2015 are shown below.

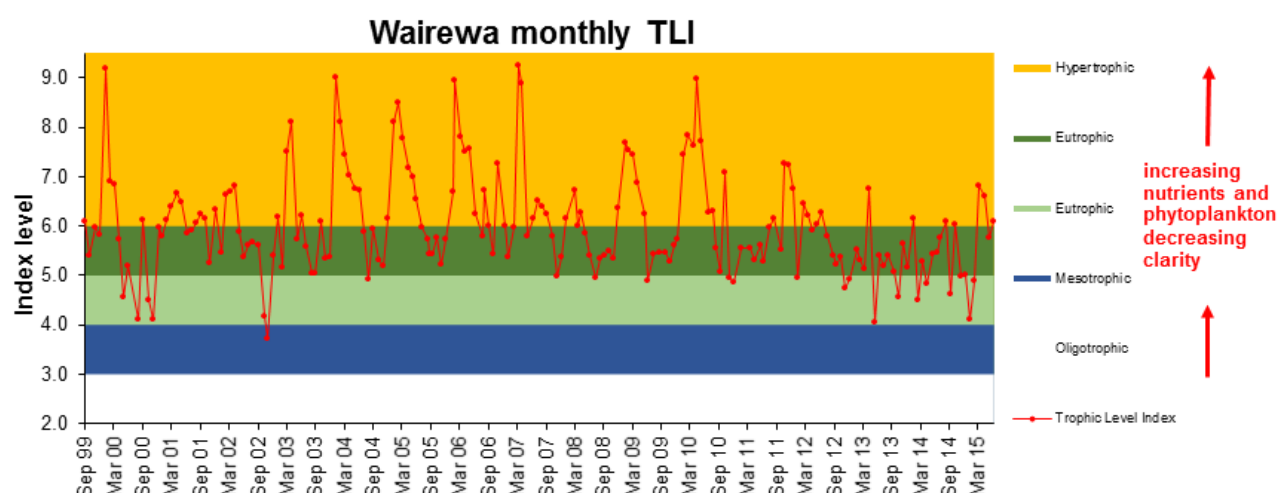


Figure3: Monthly TLI for Lake Forsyth / Te Roto o Wairewa between September 1999 and March 2015

There are two important points to note from this graph:

1. The TLI is highly variable, reaching peaks of over 9, regularly dropping to between 5 and 6 and at times going as low as 4. This variability is in marked contrast to the nearby Lake Ellesmere / Te Waihora, where the TLI only varies between 6 and 7.
2. The index and variability have declined in the past 2-3 years. This is a good sign and may reflect the higher lake level over the summer due to better management of lake levels from the canal opening regime.

Although it is possible to calculate TLI from monthly measurements, the guidelines for New Zealand lake management suggest that it should be treated as an annual average. The recent Lake Forsyth / Te Roto o Wairewa annual TLI data are shown below.

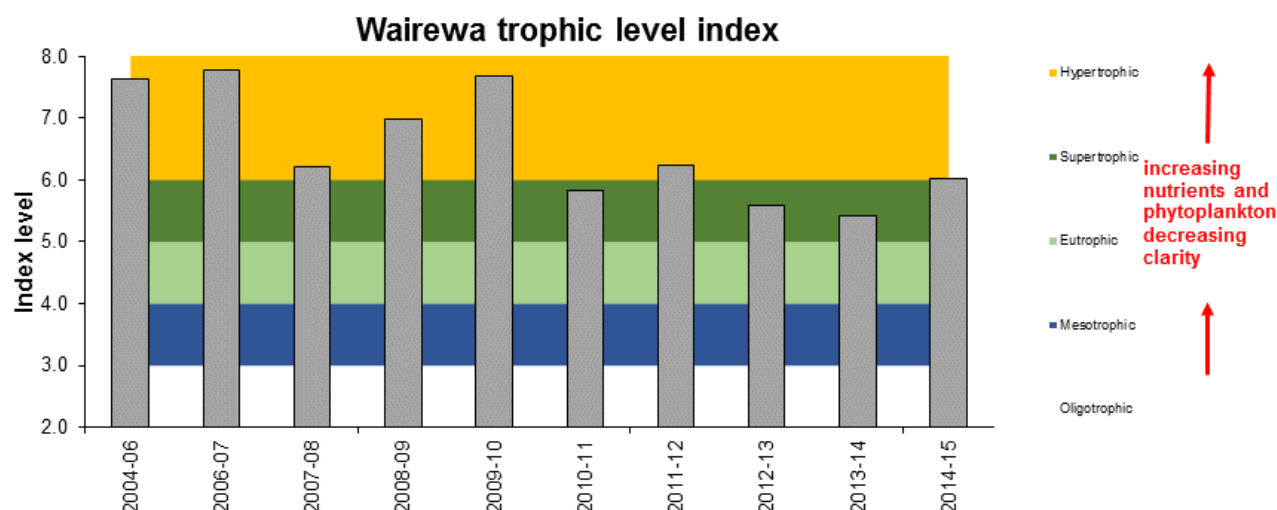


Figure 4: Annual TLI for Lake Forsyth / Te Roto o Wairewa between 2004 and 2015

The data shows an improved TLI in Lake Forsyth / Te Roto o Wairewa in recent years, which suggests that using the canal for opening and closing the lake has benefits for water quality. A longer-term dataset is required before this can be affirmed as a permanent trend.

4.1.4 Sources of Phosphorus in Lake Forsyth / Te Roto o Wairewa

High phosphorus levels in Lake Forsyth / Te Roto o Wairewa are primarily due to the presence of phosphorus in the surrounding volcanic soils, with phosphorus lost to waterways bound to sediment. Other sources of phosphorus can be fertilizer and effluent, but this is considered to be a less significant contributor in this catchment (Main et al., 2002).

Parts of the catchment that are particularly susceptible to erosion are:

- The streambanks of the Okana, Okuti and Tākiritawai Rivers (the reaches between the lake and approximately the Church Road bridge, and Usshers road bridges respectively – referred to in Plan Change 6, along with part of Lake Forsyth / Te Roto o Wairewa, as the ‘Valley Floor Area’);
- Hillside erosion areas that are directly connected to a waterway (which may be ephemeral); and
- Tunnel gullies adjacent to the south-eastern lake shoreline which can discharge erosion debris directly to the lake.

Land disturbance near waterways can cause phosphorus to enter waterways bound to soil, which is then transported down the waterways into the lake. Land activities that can disturb soil and / or create pathways for runoff to enter water include stock disturbing riparian margins and river banks and entering waterways, building and maintaining tracks (and roads), cultivation, and drain clearance.

A lack of riparian vegetation along the stream banks is also contributing to the loss of phosphorus-rich sediment. Less forest and more stock access in the catchment and adjacent to streams tends to allow bank erosion and siltation to occur, encouraging algae and aquatic weeds to accumulate, and lowering habitat quality (Gray, 2013).

The stream banks in the Valley Floor Area (refer to Figure 1) are considered to be the largest contributor of phosphorus in the lake (Lynn, 2014). The amount of phosphorus entering Lake Forsyth / Te Roto o Wairewa has been estimated as 11,300kg per annum, based on a study over a 15 month period, during which at least two large storm events occurred (Waters, 2014). However, Davie (2015) has reviewed this study, concluding that the phosphorus loads may have been over estimated, and the current annual load annual load of phosphorus entering the lake is closer to 4,400 kg per year.

4.1.5 River Water Quality

The main rivers of the catchment, the Okana and Okuti Rivers, are located in an extensively modified agricultural catchment. Riparian vegetation in the lower reaches of these rivers is comprised primarily of pasture grasses with a scattering of introduced trees such as willows; as a result, there is limited shading over the rivers. The removal of the original riparian vegetation has resulted in poor bank stability with erosion events commonly occurring during periods of high stream flows (Main et al., 2003).

Despite some poor and declining values in water quality parameters, the fish and invertebrate communities are relatively healthy and typical of Banks Peninsula streams (Gray, 2013). The majority of fish species must migrate from the ocean to complete their life cycle. Thus, access to the sea is likely to be the most critical determinant on populations (Gray, 2013). However, the importance of catchment and riparian vegetation to streams is apparent. Biological communities in streams are resilient to a point, but at some stage the increase in nutrients may well begin to result in a marked decline in ecosystem health. Gray (2013) stated that “*protection and enhancement of the Lake*

Forsyth / Wairewa streams should focus on reducing inputs of nutrients, sediment and faecal matter. Additional shading of streams by riparian vegetation would enhance habitat for native fish and reduce the growth of algae and aquatic weeds."

Water quality in the two main rivers (Okuti and Okana) can be characterised as having naturally elevated and increasing Dissolved Reactive Phosphorus (DRP) concentrations (Gray, 2013). Dissolved Inorganic Nitrogen (DIN) concentrations are mildly elevated but stable, although ammonium-N concentrations (a component of DIN) in both rivers are elevated and increasing (Gray, 2013). *E. coli*, a measure of faecal matter in water, is highly elevated and well in excess of the counts considered acceptable for primary and secondary contact recreation in the NPSFM. The elevated or increasing soluble phosphorus, ammonium nitrogen and *E. coli*, are an unusual combination for Canterbury streams (Gray, 2013).

4.1.6 Water Quantity

Overall, the main concern for the Okana, Okuti and Takiritawai Rivers is the low flows during summer which affect the ecosystem and aquatic health of the streams.

Approximately three-quarters of the flow into Lake Forsyth / Te Roto o Wairewa is contributed by the Okana River, and the remainder by the Okuti (Main et al., 2003; Berry, 2012).

Water taken and used from the Okana and Okuti Rivers and their tributaries by households in the catchment is a permitted activity and thus no resource consent is required. Therefore, there is no overall record of the volume of water currently taken and used for stock water and domestic supply purposes. It is unclear what effects these existing takes are having on the flow of these streams, particularly during periods of low flow over the summer period.

Whitehead (2013) conducted a study which investigated water use in households in the Okuti and Okana River catchments, where a model was created that could estimate catchment wide water use. The study concluded that the average domestic water use in the study area appeared to be high, at just over 580L/person/day. The model calculated total water requirements for this area as just over 400,000 L/day (equivalent to just below 5 L/s) with an error of $\pm 35\%$ (Whitehead, 2013).

The only continuous flow record in the catchment is a NIWA water level recorder on the Hukahuka Turoa Stream, a tributary of the Okana River. The recorder has been operating since 1987. CRC has been carrying out stream gauging at different places around the Lake Forsyth / Wairewa catchment since the early 1990s. Correlations between these gaugings and the recorded flows have been used to model flow in the Okana and Okuti rivers and derive the flow statistics shown below.

Table 2: Estimated Flows of the Rivers in the Lake Forsyth / Wairewa Catchment

Stream	7DMALF ³ (L/s)	Mean flow (L/s)
Hukahuka Turoa Stream @ recorder	34.3	217
Okana River @ SH75	108	763
Okuti River @ Kinloch Bridge	66.3	399
Police Creek @ Little River*	2.2	42

* This is a rough estimate based on few data points

There are only two consented surface water abstractions and five groundwater abstractions within the Lake Forsyth / Wairewa catchment. Two of the groundwater consents are not currently active but retain the right to start at any time. The Christchurch City Council abstraction for Little River is a combined surface and groundwater take which means they can be used conjunctively. Of the groundwater consents, two are close enough to streams to be considered “hydraulically connected”, i.e. their abstraction will have a direct effect on the flows of a nearby stream.

The only other water-related consent in the Lake Forsyth / Wairewa catchment (apart from discharge consents) is one to dam the Hukahuka Turoa Stream. The consent does not state why the stream requires damming, but it is assumed it is to enable a domestic and / or stock water take.

4.1.7 Nutrient Allocation Zones in the LWRP

Under the LWRP, land uses are managed according to the nutrient allocation status of each zone. These “Nutrient Allocation Zones” are based on a broad assessment of whether water bodies meet (green zones), are at risk of not meeting (orange zones), or do not meet (red zones) water quality outcomes.

The entire Lake Forsyth / Wairewa catchment is classified as a ‘red’ Nutrient Allocation Zone in the LWRP. In summary, LWRP rules for red zones require farmers to restrict their average nitrogen losses to that which occurred during what is referred to as the “nitrogen baseline” (2009 – 2013) period. As noted in Section 1, Plan Change 6 does not amend these rules.

4.2 Economic Environment

The Lake Forsyth / Wairewa catchment is mainly used for farming, and in particular grazing. The type of farming activity in the catchment affects employment, the size and composition of the community, and services.

4.2.1 Historical Land Use

The Māori settlement at Little River was on the east bank of the Okana River (the site of the present Māori reserve). With the arrival of European whalers and settlers, Māori from the Okana River settlement were employed at several whaling operations on the Peninsula and worked at Hugh Buchanan’s Kinloch run as shepherds, musterers and shearers. A Māori fishing settlement also existed at Waikakahi (Birdlings Flat) which later became the site for holiday homes around 1900 (Taylor, 2013).

The logging of indigenous forests on Banks Peninsula by European settlers rapidly increased during the 1860s. This timber was not only used for firewood and house building, but also for public works such as railway projects. After the sawmilling boom had ended in 1880, the area of forest on Banks Peninsula had declined by 34,000 acres in 20 years. The opening of the railway from Christchurch to Little River in 1886 facilitated agricultural settlement in the vicinity of

³ Mean annual 7 day low flow (7DMALF) is a commonly used statistic that indicates the lowest flow that typically occurs for a 7 day period in a year.

the Lake Forsyth / Wairewa catchment. Landowners cleared the ground of trees and bush by controlled burning that created an ash layer which enhanced the fertility of the soil. The conversion of indigenous forest to pasture grass was transformed by cocksfoot introduced to New Zealand from Europe. By the end of the 19th century, Little River Township had a population of 380, and there were about 45 farms in the area engaged in dairying, sheep farming and seed production.

The decline of the cocksfoot industry began about 1910 when the export of seeds became erratic, and the First World War had “a negative effect on the industry from which it never recovered” (Taylor *et al.*, 2013). Dairying and fattening of lambs became more profitable after the war contributed to changes in land use.

Dairy farming and the production of cocksfoot seed remained dominant until the 1940s, but since then sheep and beef production have provided the economic base of Banks Peninsula. A series of droughts and the withdrawal of farm subsidies during the 1980s affected the financial viability of many farms. Farmers diversified into other land uses such as viticulture, horticulture, wood lot forestry and tourism.

4.2.2 Current Land Use

The dominant land use within the catchment is sheep and beef farming, which represents approximately 76% of land use within the catchment. Mixed sheep and beef farming is the most dominant (49%) followed by beef cattle farming (19%) and sheep farming (9%)⁴.

Unlike other Canterbury catchments, there is no dairy farming within the catchment. It is considered unlikely that dairy farming will become a dominant land use within the catchment due primarily to the steepness of the terrain.

Apart from farming, the catchment contains areas of commercial forestry (8%) and native bush (5%). There is also lifestyle blocks within the catchment (4%), predominantly located around Little River. Overall, the majority of the catchment is in tussock grassland (56%) or pasture (39%).

Lane (2005) reported that 77% of the Okana and Okuti Rivers were unfenced (approximately 35km). This means a high proportion of the streams are unprotected from stock, resulting in increased stream sediment and nitrogen loadings. Stocking rates in the upper catchment are relatively low as is the use of artificial fertiliser. It is understood that properties are likely to be losing in the range 5-10 kilograms of nitrogen per year on average (L Fietje, pers. comm., 15 Sept. 2015).

Banks Peninsula in general is a popular holiday destination, with a high proportion of dwellings in the district owned by non-residents. Most domestic day visitors to Banks Peninsula are from the Canterbury region. Within the Lake Forsyth / Wairewa catchment, the township of Little River not only acts as a gateway to the Peninsula from Christchurch, but itself is a tourism destination, particularly in the summer season. It is the terminus of the Christchurch-Little River Rail Trail which follows the 45km route of the former railway line and is used by cyclists and other visitors to the Lake Forsyth / Wairewa catchment.

Visitor accommodation in Little River comprises several bed and breakfasts, motel units, a camping ground, garden eco-stay, holiday lodge, hotel and some holiday homes. Accommodation providers are busy all year round catering to walkers, cyclists, duck shooters, bird-watchers, and travelers passing through the area, and hosting local weddings and other social events. There has been a reported increase in the number of visitors since the Canterbury earthquakes (Taylor *et al.*, 2013).

⁴ Source: Information extracted from AgriBase[®] 20 February 2014.

The large and variable visitor population is likely to put pressure on wastewater infrastructure such as septic tanks at certain times. Water and wastewater infrastructure is discussed in section 5.4.3.

4.2.3 Future Land Use

As stated previously, there is no dairy farming currently within the Lake Forsyth / Wairewa catchment and steepness of much of the terrain means a change in the current land use is not expected in the near future.

However, development continues to occur in the catchment. Farmland is increasingly being broken down into lifestyle blocks, which may increase demand for drinking water and expectations of better river, and lake water quality.

4.3 Cultural Environment

4.3.1 Cultural Significance

Lake Forsyth / Te Roto o Wairewa is a tribal taonga (treasure). It was once an abundant source of mahinga kai and famous for its tuna (eels), which provided sustenance for mana whenua, Kāti Irakehu and Kāti Makō. The taking of tuna from the lake is limited to whānau consumption, with no commercial tuna harvest allowed.

The outstanding cultural significance of Lake Forsyth / Te Roto o Wairewa is recognised by its Statutory Acknowledgement status in the Ngāi Tahu Claims Settlement Act 1998. Under the Ngāi Tahu Claims Settlement Act 1998, ownership of part of the lake shore at the head of Lake Forsyth / Te Roto o Wairewa was returned to Te Rūnanga o Ngāi Tahu. The management of the lake is carried out jointly by Te Rūnanga o Ngāi Tahu and the Department of Conservation. Lake Forsyth / Te Roto o Wairewa is also one of only two customary lakes in New Zealand, which means that only Wairewa Rūnanga can take tuna from the lake. This enshrines in legislation the importance of the lake to Ngāi Tahu whānui and Wairewa Rūnanga, who hold manawhenua over the lake and its surrounds.

The Fisheries (South-East Area Amateur Fishing) Regulations 1986, confirm that the tuna fishery at Te Roto o Wairewa is for Ngāi Tahu only. In December 2010 two Mātaitai were gazetted, the first being the Te Kaio Mātaitai from Te Kaio to Birdlings Flat, and the second being the Wairewa Mātaitai, which includes Te Roto o Wairewa and the Tākiritāwai River. The Mātaitai offers a formal process to gain management of these important customary food gathering areas and resources. (Mahaanui Iwi Management Plan, 2013).

4.3.2 Decline of Mahinga Kai

The degradation of Lake Forsyth / Te Roto o Wairewa has resulted in decreased mahinga kai opportunities. Over the past 160 years, the catchment has been modified by major deforestation that has caused erosion and the subsequent loss of sediment into waterways and accumulating on the lake bed of Lake Forsyth / Te Roto o Wairewa. Due to the sediment being naturally high in phosphorus, the lake has become highly eutrophic and as noted earlier, experiences regular summer blooms of the toxic cyanobacteria, *Nodularia spumigena*. These blue-green blooms produce toxic by-products, which are harmful to humans and animals, and impact on mahinga kai.

Sedimentation of Lake Forsyth / Te Roto o Wairewa is a natural process but the rate has increased due to human activities, stream bank erosion induced by farming and other factors. One of these 'other' factors is the increasing size of Kaitorete Spit, which has become a barrier beach. This constrains fish passage between the sea and the lake, but also the ability of nutrients to flow into the sea from the lake. The deterioration of the lake has threatened the cultural practice of harvesting tuna with the tuna population within the lake considered to be in critical decline (Cranwell, 2011).

To address this decline, the Wairewa Rūnanga began investigating means to improve the water quality of the lake and subsequently mahinga kai opportunities. In particular, research has been undertaken by the Rūnanga in respect of alternative methods to manage the opening and closing of Lake Forsyth / Te Roto o Wairewa.

For Wairewa Rūnanga the ability to precisely control how and when the lake is open and closed contains many benefits, most importantly the ability to recruit tuna into the lake in September and October in order to address the critical decline in the lake's population. This led to investigations as to whether a permanent lake opening would be beneficial and feasible (see sections 4.1.1 and 4.1.2).

4.4 Social Environment

The community of the Lake Forsyth / Wairewa catchment includes one main township (Little River) with two smaller villages (Birdlings Flat and Cooptown). The nearest large settlements include the township of Akaroa, located approximately 28km to the east of Little River, and the city of Christchurch, located approximately 52km to the north of Little River.

4.4.1 Population

Little River township is the largest settlement in the catchment and is located at the head of Lake Forsyth / Te Roto o Wairewa. The population of Little River in the 2013 census was 1,101, an increase of 75 people or 7.3% since the 2006 census⁵. The population of Birdlings Flat in the 2006 census was 168 (data for the 2013 census was not available); however, several new residential dwellings have been built in the years since the 2006 census with a corresponding increase in the number of permanent residents (Taylor Baines & Associates, 2013).

Data from the 2013 census indicates that 93.5% of the Little River population is of European descent with 9.0% of Maori descent⁶. The major source of employment for residents in the catchment is the agriculture sector with employment also recorded in the fishing and forestry sectors (Taylor Baines & Associates, 2013). Due to the limited employment opportunities available, a number of residents commute to Christchurch or Lincoln for work. The 2013 census recorded an unemployment rate in Little River of 1.8% whilst the social report undertaken for the catchment stated that 75% of the population is in paid employment (Taylor Baines & Associates, 2013).

4.4.2 Community Infrastructure

The roll of the Little River Primary School, the only school within the catchment, fell slightly between 2004 and 2012 (90 to 73 pupils) but the school received an increase in pupils following the Canterbury earthquake events, giving a total school roll of 120 in 2012 (Taylor Baines & Associates, 2013). Approximately half of the children who attend the primary school travel daily by school bus from Birdlings Flat, Okuti Valley, Cooptown, Puaha Valley and Western Valley. Secondary school students from the catchment generally travel to schools in Lincoln and Christchurch (Taylor Baines & Associates, 2013).

Little River contains a marae, town hall, library, Masonic hall and Catholic Church. The Little River gallery, cafes, general store, hotel, campground and bush walks, together with the Christchurch-Little River Rail Trail, attract many domestic and overseas visitors. These businesses and activities provide residents with opportunities to socialise and a strong sense of community. Many of the hospitality-based businesses have experienced an increased number of

⁵ Downloaded from the Statistics New Zealand website in July 2015.

⁶ The results include all people who stated each ethnic group, whether as their only ethnic group or as one of several. Where a person reported more than one ethnic group, they have been counted in each applicable group. As a result, percentages do not add up to 100.

visitors since 2011, perhaps as a result of the closure of many Christchurch cafes and restaurants following the Canterbury earthquakes. An increasing number of cruise ships arriving in Akaroa in recent years has resulted in more visitors to Little River, a mid-way point on the way to Christchurch. The community lacks a health centre and pharmacy, with most residents travelling to Akaroa, Christchurch or Lincoln for healthcare.

Birdlings Flat contains a number of permanent homes as well as some holiday homes. Birdlings Flat attracts visitors to a gemstone and fossil museum; a nearby surf-casting recreational fishery; and recreational opportunities on Lake Forsyth / Te Roto o Wairewa.

Cooptown is a village located 4km north of Little River. Cooptown has a garage for auto repairs, a holiday lodge at Puaha Valley, and for several years hosted the Little River Music Festival. Neither Birdlings Flat nor Cooptown currently contain recreational or community facilities.

4.4.3 Water and Wastewater Infrastructure

Christchurch City Council (CCC) supplies approximately 74 residential and 23 commercial properties in the Little River and Cooptown communities with reticulated water supply sourced from Police Creek, a spring-fed tributary of the Okana River. The supply did not previously meet Drinking Water Standards so CCC is currently upgrading the water supply system. Stage one of the water supply development was completed in 2014. This involved the renewal of reticulation (water pipes) within the Little River settlement, a new water main to the Cooptown settlement, and installation of a new bore and booster pump station in Little River. Stage two consists of an upgrade to the existing water treatment plant located in Council Hill Road. Stage two is planned to be completed in 2015.

Little River, Cooptown and Birdlings Flat are not reticulated for wastewater. Concerns identified by the CCC include risks related to a high water table and water quality problems due to the close proximity of Lake Forsyth / Te Roto o Wairewa. The current system of privately owned and serviced septic tanks has been identified as a source of phosphorus loss to water that requires management. CCC has programmed construction of a reticulated wastewater system for 2016 – 2019 in its long-term plan⁷. This would transport domestic wastewater to a treatment plant that would service the settlements of Little River and Cooptown and the Western Valley area (Taylor Baines & Associates, 2013).

4.5 Recreation

This section presents a profile of the recreation values associated with the Lake Forsyth / Wairewa catchment, particularly the freshwater bodies such as the lake and upstream rivers.

Given Little River's close proximity to Christchurch, the trip to Little River has become a popular excursion for families, motorcyclists and car enthusiasts, some of whom stop to rest and refuel in the village before they continue on to other parts of the peninsula. The village is also a gateway for a range of local outdoor recreation activities including: fishing, kayaking, cycling, tramping, bird watching, mountain biking, swimming and rural walks. The website of the settlement's hotel describes the catchment as *"...one of the country's top bird watching areas with Lake Forsyth / Wairewa and Te Waihora / Ellesmere [the latter outside the catchment] hosting large numbers of resident and migratory birds"*. It notes that, in season, there are opportunities for game bird hunting with the easy access to the lake and rivers which provide habitat for geese, swans and ducks. The Birdlings Flat end of the lake is a bird sanctuary

⁷ CCC Long Term Council Community Plan TCCP for 2009-2019. See p75

<http://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/Long-Term-Plan/ltp2009/LTCCP2009-19Volume1-ActivitiesAndServices-docs.pdf>

(not protected), providing habitat for about 15-20 species of birds at different times of the year and associated ornithological (bird-watching) activities (Hughey, 2013).

Lake Forsyth / Te Roto o Wairewa is recognised as a regionally important site for recreation. Specific lake activities were identified in Environment Canterbury's Inventory of Recreation Values for Rivers and Lakes of Canterbury where they were evaluated using two indicators: frequency and intensity of use (Taylor, 2013). The following scores were reported for nine recreation activities for Lake Forsyth / Te Roto o Wairewa (noted here by frequency / intensity):

1. Sightseeing: High/High
2. Picnicking/Barbeque: Low/Low
3. Bird-watching: High/Low
4. Water Skiing: Low /Low
5. Power Boating: High/High
6. Canoeing/Kayaking: Low/Low
7. Trout Fishing: Low/Low
8. Eeling: Low/High (only persons of Ngāi Tahu descent can harvest eels from the lake)
9. Waterfowl Hunting: High (Frequency)

Interview data indicates that people use the lake for swimming, kayaking, sailing and sometimes wind-surfing (most users are either local or Christchurch people who use the lake intermittently). One interviewee noted that residents of Birdlings Flat use the lake for fishing at certain times of the year; catching yellow belly flounder, trout, herring and eels (mahinga kai). Power-boaters also use the lake about twice a year. Occasionally a hovercraft has been seen on the lake. Every August, the Radio Flyers club holds its annual Float and Field Fly-on on Lake Forsyth / Te Roto o Wairewa (float planes, helicopters, jets, and sport models).

The Okana River and Lake Forsyth / Te Roto o Wairewa are the only waters of the catchment listed on the website of NZ Fishing where they are described as good angling sites "close to Christchurch". The website of Fish and Game notes that the lower reaches of the Okuti and Okana Rivers (at Little River) are particularly good places to target perch (Hughey, 2013).

While fishing opportunities exist in the catchment's waterbodies, NZ Fishing's description of Lake Forsyth / Te Roto o Wairewa includes commentary relating to the frequency of lake toxicity warnings (particularly blooms of blue-green algae) and the health and safety risks associated with eating fish caught in the lake. Such issues with lake water quality have attracted much media attention which is likely to have had a negative impact on public perceptions with respect to the suitability of the water for recreational activities.

Since the opening of the Little River Rail Trail in 2006, cycling activity has increased around Lake Forsyth / Te Roto o Wairewa with trail users provided with a 7km section of track running from Birdlings Flat to Little River following an historic railway embankment located on the margins of Lake Forsyth / Te Roto o Wairewa. It provides recreationists (cyclists and pedestrians) with an appreciation of the lake landscape (flora and fauna) and the socio-cultural and heritage values of the area. Picnicking opportunities are available at many points along the Rail Trail (including alongside the lake at Catons Bay, a spot which is also a popular overnight or rest spot for tourists travelling by campervan). Further nature-based outdoor recreation activities are located in the Okuti Valley - a secluded western orientated valley accessible by road from Little River. This area of the catchment is highly valued for the views it offers

across Lake Forsyth / Te Roto o Wairewa to the Pacific Ocean, attracting walkers, picnickers, sightseers and (mountain) bikers.

Four kilometres up the Okuti Valley Road (5km east of the lake), is the Okuti Valley Scenic Reserve. This site is a popular with visitors for picnicking, short walks, and bird and nature viewing.

Little River Campground (formerly Birdlands) is also located near the Okuti River where it provides opportunities for camping, walking, river swimming and river-side picnicking. It is also the site of Manaia Native Habitat and associated walking tracks and includes a large area of mature native trees and bird species.

PART B: ISSUES AND RESPONSES

5 Issues and Responses

The current state of the Lake Forsyth / Wairewa catchment (see Section 4 of this report) demonstrates that there are a number of significant water management issues that need addressing to achieve the outcomes sought by the local community, iwi and Zone Committee.

The most significant issue in the catchment is the poor water quality and ecosystem health of Lake Forsyth / Te Roto o Wairewa as evidenced by the lake's toxic cyanobacterial blooms. The degraded quality of the lake affects its environmental, cultural, social and economic values. The algal blooms are attributed to the amount of phosphorus entering the lake from upstream rivers, as well as the re-suspension of phosphorus accumulated within the lakebed sediments. The amount of phosphorus both entering and exiting the lake therefore needs addressing if the water quality, ecosystem and cultural health of Lake Forsyth / Te Roto o Wairewa are to improve to meet community and iwi expectations.

The rivers within the catchment also experience low flow issues, which can affect their ecosystem health and water quality.

A summary of these issues is provided below with an overview of the main statutory and non-statutory responses proposed to address them. Subsequent sections of this report evaluate the proposed provisions in Plan Change 6 as required by section 32 of the RMA.

5.1 The Phosphorus Load Entering Lake Forsyth / Te Roto o Wairewa is Reducing Water Quality of the Lake

As described in section 4.1 of this report, the current water quality and ecosystem health of Lake Forsyth / Te Roto o Wairewa is poor, with the accelerated inflow of phosphorus-rich sediment from upstream waterways a significant driver behind this decline. Sedimentation, particularly within the Okana, Okuti and Takiritawai Rivers, is largely due to stream bank erosion which could be improved by stabilising the banks via improved land practices (i.e. stock not accessing waterways and riparian planting).

A lesser contributor of phosphorus loss within the catchment, is septic tank systems located in the valley floor area which are not appropriately sealed.

Plan Change 6 establishes a Valley Floor Area where certain rules to manage water quality apply. The Valley Floor Area is the main source of sediment and nutrients entering the lake and where improving land management practices is likely to provide the greatest gains for achieving the freshwater outcomes

The key targets and actions proposed to improve the water quality, and ecological and cultural health of Lake Forsyth / Te Roto o Wairewa include:

- Introducing ecological, cultural and recreational freshwater outcomes and water quality limits for the Forsyth / Wairewa catchment. This includes an annual load target for reducing the load of phosphorus entering the lake. The Zone Committee sought an 85% reduction in phosphorus-rich sediment entering the lake so that sediment entering the lake was approximately equivalent to the sediment being flushed from the lake.
- Reliance on LWRP region-wide provisions for controlling the effects of vegetation clearance and earthworks in High Soil Erosion Risk Areas (defined in LWRP), which make up a large part of the catchment.
- Requiring all stock (including non-intensively farmed stock such as beef cattle and sheep) to be excluded from all rivers in the Valley Floor Area from January 2020. This will stabilise stream banks and keep waste out, thus

reducing erosion and the subsequent loss of phosphorus-rich sediment to rivers and Lake Forsyth / Te Roto o Wairewa.

- Encouraging actions to reduce erosion of riverbanks in the Valley Floor Area and the subsequent loss of phosphorus-rich sediment to waterways.
- Supporting local scale actions to reduce the volume of phosphorus entering the lake, such as providing education on bank stabilisation techniques.
- Facilitating the construction and maintenance of a sediment retention basin and / or wetland at the head of Lake Forsyth / Te Roto o Wairewa to intercept sediment (and phosphorus) before it enters the lake.
- Promoting a reticulated wastewater system for Little River that includes phosphorus removal, and promoting septic tanks to be sealed to prevent floodwater inundation.

5.2 Accumulated Phosphorus Within the Bed of Lake Forsyth / Te Roto o Wairewa Reducing the Ecosystem Health and Water Quality of the Lake

The water quality and health of Lake Forsyth / Te Roto o Wairewa is poor and even if the volume of phosphorus-rich sediment entering the lake each year is reduced, the volume of existing phosphorus accumulated on the bed of the lake requires reduction if the water quality and ecosystem health of the lake is to be improved. This will also reduce the toxic algal blooms occurring within the lake.

The current water quality of Lake Forsyth / Te Roto o Wairewa does not meet community outcomes or those LWRP objectives focused primarily on environmental or recreational matters (for example, LWRP Objective 3.8). In addition, water quality within the lake does not at all times meet the national bottom lines for some attributes within the NPSFM.

Key actions proposed to address this issue include:

- Enabling an artificial lake opening and closing regime that improves water quality by better controlling summer lake levels and marine ingress which can influence nutrient concentrations.
- Enabling lake investigations to remove or neutralise existing phosphorus in the bed of Lake Forsyth / Te Roto o Wairewa to improve water quality, ecological health and mahinga kai, and to inform future lake restoration activities to re-establish or enhance aquatic plants.

5.3 Address Low Flow Issues within the Okana, Okuti and Takiritawai Rivers

Minimum flows are critical for the ecological health of waterways as low flows put stream ecology under stress. Small streams such as those in the Lake Forsyth / Wairewa catchment are particularly susceptible to the negative impacts of low flows. As the Okana, Okuti and Takiritawai Rivers have significant biodiversity values, as described in section 4.1 of this report, it is important to maintain and where possible, improve the habitat for indigenous species and the abundance of mahinga kai in these water bodies.

To address the potential for low flow issues within these waterways and the potential impact on the ecological health of the waterway, the key following actions are proposed:

- Introduce revised (higher) minimum flow restrictions and set allocation limits for the Okana, Okuti and Takiritawai Rivers, including their tributaries, to protect habitat and ecology at low flows.

5.4 Improving Water Quality and Ecosystem Health of Rivers in the Lake Forsyth / Wairewa Catchment

As indicated in Section 4, the river water quality in the Lake Forsyth / Wairewa catchment is generally good for certain attributes. The Okuti and Okana rivers currently meet the proposed limits in Plan Change 6 for nitrogen and ammonia, and fall within the NOF band A (the most protective in the NPSFM). Nevertheless, water quality in these waterbodies could be further improved by reducing inputs of sediment, phosphorus and microbiological contaminants.

The local community and Zone Committee therefore seek to at least maintain, and preferably improve, the current state of the rivers and their associated cultural, environmental, economic and social values. The local community and Zone Committee also wants to allow limited land use development within the catchment for economic purposes, but this must be achieved whilst also maintaining the water quality of these waterways.

The nitrate-nitrogen concentration limits for rivers would allow for small scale development, such as pasture improvement, whilst ensuring that good water quality and the ecosystem health of the rivers in the catchment is maintained and improved.

Key actions to maintain and improve river water quality are:

- Reliance on LWRP provisions for “red” Nutrient Allocation Zones for requiring Farm Environment Plans and limiting any increases in nitrogen leaching from below the root zone to groundwater and rivers.
- A suite of freshwater outcomes, limits and targets for the catchment’s rivers (outcomes and targets to be met by 2030) including (among others) indicators for ecological health, human health for recreation and mahinga kai.
- Excluding all stock from rivers in the Valley Floor Area from 1 January 2020.
- Educating and encouraging landowners within the Valley Floor Area to implement practical measures to reduce stream bank erosion.

6 Development of Plan Change 6

Plan Change 6 contains the regulatory provisions that reflect the recommendations made by the Banks Peninsula Zone Committee in its Zone Implementation Plan Addendum (ZIP Addendum). The ZIP Addendum was developed through a collaborative approach led by the Banks Peninsula Zone Committee.

This section explains how Plan Change 6 was developed, including the collaborative approach taken under the CWMS and how the community, including Ngāi Tahu, were involved in this process.

6.1 Canterbury Water Management Strategy (CWMS)

The CWMS establishes ten water management zones in Canterbury as the key delivery mechanism for the CWMS. The Lake Forsyth / Wairewa catchment covered by Plan Change 6 lies within the Banks Peninsula Zone.

The Banks Peninsula Zone Committee was formed in 2012. Membership of the Zone Committee includes representatives from the community with a range of interests including agribusiness, sheep and beef farming, biodiversity and recreation sectors. There are also four Rūnanga (Wairewa, Koukourarata, Ngāti Wheke/Rāpaki and Ōnuku) representatives, a Christchurch City Council representative, and an Environment Canterbury Commissioner.

The Zone Committee completed its Zone Implementation Programme for Banks Peninsula in 2013, and its Zone Implementation Programme Addendum (ZIP Addendum) for the Lake Forsyth / Wairewa catchment in November 2014.

6.2 ZIP Addendum Recommendations

The ZIP Addendum focuses on recommendations to improve the management of freshwater in the Lake Forsyth / Wairewa catchment and was developed with community and stakeholders that give effect to the CWMS vision, principles, targets and goals in the catchment. These recommendations informed preparation of Plan Change 6.

The Zone Committee facilitated community dialogue that combined community held values with technical information to establish freshwater outcomes, catchment limits, and actions to manage to those limits. The Zone Committee undertook consultation over an 18 month period in order to develop a ZIP Addendum that met community outcomes and objectives. The community was involved in the development of the ZIP Addendum via open days, discussions with technical experts; several hui; meetings and fieldtrips; workshops and zone committee meetings. Phase 1 of the community engagement process focused on identifying perspectives of the community and the values held. Phase 2 was about identifying and testing the acceptability of options from a community perspective. Several themes emerged from the community engagement:

- A strong vision for the lake to be improved so that it could support recreational activity and an acceptance that there were no 'quick fixes' but that change would take time;
- A range of tools is required, from education in the community to rules in the Plan Change and large scale intervention in the lake;
- There was support for a package of options that will provide some immediate benefit and "bang for buck" in the catchment, alongside longer term, larger scale lake-based options that require planning and assessment of cost spread out over generations;
- Strong support for riparian management, planting, and exclusion of stock from waterways;
- Strong support for intercepting flows to remove sediment and phosphorus before they enter the lake;

- Strong support for phosphorus stripping from wastewater; and
- A strong rejection of the use of the chemical compound “alum” as a possible means of neutralising the effect of existing phosphorus in the lake bed sediments.

This consultation laid the foundation for the development of the recommendations and actions described in the ZIP Addendum. The result is a solutions package that comprises actions that sit both inside and outside the regulatory framework:

Regulatory aspects (either Plan Change 6 or via region-wide provisions in the LWRP)

- Catchment load target for phosphorus and freshwater outcomes and limits for Lake Forsyth / Te Roto o Wairewa and rivers within the catchment.
- Exclusion of all stock from surface water bodies in the Valley Floor Area.
- Provisions that support actions to reduce bank erosion provided they comply with the requirements for a Valley Floor Area River Bank Erosion Plan.
- Provisions that provide for a sediment retention basin and / or wetland at the head of Lake Forsyth / Te Roto o Wairewa.
- Provisions that support lake restoration activities that re-establish or enhance aquatic plants, enhance water quality, ecosystem health and mahinga kai, or remove phosphorus from lake bed sediments, including associated in-lake field investigations.
- Provisions that support a lake opening regime that improves water quality, addresses cultural values held by Ngāi Tahu and fulfills the land drainage function.
- Revised minimum flows and allocation limits for the Okana, Okuti and Takiritawai Rivers and their tributaries to protect the ecosystem health of these waterways during low flows.
- Higher standards for the treatment of wastewater to reduce phosphorus in the discharge.
- Existing LWRP region-wide provisions governing (among other activities) nutrient management, fertiliser use, stock exclusion, wastewater treatment, vegetation clearance and earthworks in erosion prone areas and riparian areas.

Non-regulatory aspects

- Education on bank stabilisation techniques in the Valley Floor Area;
- Encourage the construction and maintenance of a sediment retention basin and / or wetland at the head of the lake; and
- Lake opening regime that improves lake water quality.

The actions work together as a package to achieve the limits. For the lake this means an improvement of water quality to achieve the bottom line of the National Objectives Framework in the NPSFM. The key plan provision for achieving this is the exclusion of stock from waterways as this will reduce bank collapse and prevent stock waste entering water. Ideally, this would occur via the preparation and implementation of an integrated River Bank Erosion Plan for the whole of the Valley Floor Area.

The rivers in the catchment exhibit reasonable water quality for nitrogen and ammonia, though other aspects such as sediment, phosphorus and *E.coli* warrant further action. The key measure to address this is stock exclusion. The successful implementation of the suite of statutory and non-statutory measures means that the freshwater limits and targets proposed in the plan change can be achieved.



Figure 5: Lake Forsyth / Wairewa catchment process

6.2.1 Giving Effect to the NPSFM 2014

The desired outcomes sought for the catchment match the compulsory national values of the NPSFM:

- Te hauora o te wai / the health and mauri of water – ecosystem health
- Te hauora o te tangata / the health and mauri of the people – human health for recreation

Additional national values that are present in the Lake Forsyth / Wairewa catchment and provided for by Plan Change 6 are:

- Mahinga kai

- Mahi māra – animal drinking water
- Wai Māori – water supply

The National Policy Statement for Freshwater Management 2014 (NPSFM) was released subsequent to the community engagement aspect of the process. Nevertheless, it is considered that the Lake Forsyth / Wairewa catchment process and Plan Change 6 provisions give effect to the NPSFM, including the steps set out in Policies CA1 to CA4 to give effect to the National Objectives Framework (NOF).

6.3 Ngāi Tahu

Te Rūnanga o Ngāi Tahu is the iwi authority for the entire Canterbury region (Te Rūnanga o Ngāi Tahu Act 1996). The Te Rūnanga o Ngāi Tahu Act also sets out the takiwa (area or jurisdiction) of the 18 Papatipu Rūnanga of Te Rūnanga o Ngāi Tahu. The Wairewa catchment area lies within the takiwa of Wairewa Rūnanga, whose marae is located at Little River.

Wairewa Rūnanga was represented on the Zone Committee throughout the collaborative process leading to the development of the ZIP Addendum.

6.4 Schedule 1 Consultation

Clause 3, Schedule 1 of the RMA includes requirements to consult certain parties during the preparation of the plan, as well as specific obligations relating to consultation with iwi authorities.

A formal draft copy of Plan Change 6 was sent to the following parties for comment:

- Hon Nick Smith (Minister for the Environment)
- Hon Nathan Guy (Minister for Primary Industries)
- Hon Maggie Barry (Minister of Conservation)
- Department of Conservation
- Christchurch City Council
- Te Rūnanga o Ngāi Tahu (TRoNT) (as the iwi authority for the area affected by PC6)
- Canterbury District Health Board (CDHB), Community and Public Health

Two supporting responses were received – from the CDHB, and Te Rūnanga o Ngāi Tahu. The CDHB did not have any specific comments.

In addition, two meetings held with TRoNT elicited several verbal suggestions on plan drafting. Substantive issues, in summary, raised by TRoNT included:

- ensuring the role and importance of Wairewa Rūnanga is adequately recognised;
- the purpose of lake opening provisions should extend to more than the needs of tuna (eel)

Plan Change 6 was amended to address these comments by amendments to better recognise the importance of cultural values held by Ngāi Tahu for Lake Forsyth / Te Roto o Wairewa. This extends to a wider purpose for the lake opening.

PART C: EVALUATION

7 Introduction

7.1 Section 32 of the RMA

Part C of this report provides the evaluation of Plan Change 6 required under section 32 of the RMA. The full text of section 32 is set out in Appendix 1.

In summary, section 32(1)(b) of the RMA requires that the proposed provisions (policies, rules and associated tables and appendices) in Plan Change 6 are the most appropriate way of achieving the LWRP objectives (see Appendix 4) by assessing their efficiency and effectiveness. Other reasonably practicable options must also be identified.

This section of the report explains how the section 32 evaluation has been carried out, including:

- how provisions have been “grouped” for assessment purposes;
- the options assessment;
- the effectiveness assessment; and
- the efficiency assessment.

7.2 Evaluation Method

7.2.1 Grouping Provisions

The approach taken in this evaluation report is to assess collective groupings of policies and rules in Plan Change 6:

- Section 8 of this report evaluates the provisions which set the freshwater outcomes and limits for water quality, such as the target for the total phosphorus load entering Lake Forsyth / Te Roto o Wairewa. Sections 9 and 10 evaluate the provisions that, in combination with region-wide provisions in LWRP and non-statutory actions, are intended to achieve the water quality targets and limits.

The policies and rules to manage to water quality limits are evaluated separately from the limits themselves. The first group of provisions focuses on managing phosphorus and sediment upstream of Lake Forsyth / Te Roto o Wairewa (Section 9). The second group of provisions focus on managing the existing phosphorus accumulated within the lake bed sediments (Section 10).

- Finally, the minimum flow and allocation limits for the main rivers in the catchment are evaluated in Section 11.

7.2.2 Options Assessment

While section 32 requires that “other reasonably practicable options” are identified, it does not require those options to be subject to an evaluation of their effectiveness or efficiency. This report provides a comparative assessment of all of the reasonably practicable options that takes into account their relative:

- practicality (including technical feasibility and affordability)
- certainty (including enforceability and any significant risks of not meeting statutory planning requirements)

- acceptability to the community (including the extent to which an option is likely to achieve the Bank Peninsula Zone Committee’s “community outcomes” listed in Appendix 3).

7.2.3 Effectiveness Assessment

Section 32(1)(b)(ii) requires that effectiveness is assessed in terms of how well the provisions achieve the plan’s objectives.

All objectives in the LWRP are relevant to each grouping of provisions. However, for assessment purposes, some LWRP objectives are more relevant to particular groupings than others. Effectiveness is therefore assessed according to how well a provision grouping achieves those particularly relevant LWRP objectives.

A rating system is also used to indicate the degree of effectiveness of a particular grouping of provisions. A “high” rating indicates that the provisions are likely to achieve all of the nominated LWRP objectives. A rating of “moderate” effectiveness indicates the provisions are likely to achieve most but not all nominated objectives. A “low rating” indicates that the provisions may not achieve a majority of the nominated objectives (though they may achieve a few).

7.2.4 Efficiency Assessment

An assessment of the efficiency of the provisions at achieving the plan’s objectives is also required (section 32(1)(b)(ii)). This must cover the anticipated benefits and costs of the environmental, economic, social and cultural effects resulting from the implementation of the provisions. The Act explicitly requires consideration of anticipated changes to opportunities for economic growth and employment; and where practicable, costs and benefits should be quantified (section 32(2)).

When evaluating benefits and costs, the Council’s baseline is the current environment and the policy and rule framework provided by the partly operative LWRP (operative in part) and proposed Plan Change 4 (Omnibus).

In evaluating benefits and costs across the four well-beings anticipated to result from implementation of Plan Change 6, benefits and costs are categorised as follows:

- Environmental benefits and costs fall upon ecosystems and natural and physical resources. Generally, the impacts of these changes fall in the locality of where nutrients are lost to waterways but some benefits are felt further downstream. An example is the implementation of stream bank stabilization measures, and of stock exclusion from the riparian margins, banks and beds of surface water bodies, which has environmental benefits in the streams but also downstream in Lake Forsyth / Te Roto o Wairewa.
- Economic benefits and costs are those that accrue to the productive economy and are based around economic well-being and efficiency considerations and anticipated effects, including opportunities for economic growth and employment that are anticipated to be provided or reduced. Economic benefits and costs can be felt at a number of scales, locally, regionally and nationally. For example, excluding stock from the riparian margins of water bodies will incur costs to landowners but may also have economic benefits to the local economy, such as benefits to a fencing contractor. Changes to economic growth and employment are both categorised as economic effects.
- Social benefits and costs are those that fall on people and the community. Often these impacts relate to changes in environmental and economic conditions and fall in the locality where phosphorus is lost to waterways or further downstream in the catchment such as Lake Forsyth / Te Roto o Wairewa. Recreational use of water and associated use of riverbeds, riparian margins, headwater catchments, lagoons and hāpua are included under the social benefits and costs.

- Cultural benefits and costs are those that relate to the customs, values and beliefs of people and communities, particularly Ngāi Tahu. These considerations can be specific or holistic in nature. They often relate to changes in environmental, economic or social conditions.

Quantification is provided where practicable, including monetisation of some of the anticipated costs.

The efficiency assessments also use a rating system based on relative magnitude of benefits versus costs. Groupings of provisions rated as having “high” efficiency are expected to generate a high benefit-cost ratio (this may or may not also mean a high overall net benefit). A “moderate” efficiency ranking indicates a positive net benefit is anticipated, though the benefit-cost ratio is likely to be only small. “Low” efficiency indicates that the costs are likely to exceed the benefits.

The section 32 evaluation does not, in all cases, include full details of the technical assessments undertaken that support Plan Change 6 or the evaluation of the provisions. A full list of the technical reports and other information relied on is included in section 13 at the end of this report.

7.3 Risk

Section 32 also requires an assessment of risks. The evaluation of each set of provisions identifies gaps or uncertainties in the information relied upon, and an assessment of the risk of acting or not acting is provided.

8 Freshwater Outcomes and Water Quality Limits and Targets

8.1 Introduction

This section evaluates the appropriateness of the provisions of Plan Change 6 in establishing freshwater outcomes and setting water quality limits for the Lake Forsyth / Wairewa catchment.

The provisions of Plan Change 6 that are intended, in combination with relevant region-wide provisions in the LWRP and non-statutory actions, to achieve these outcomes and limits are evaluated in Sections 9 and 10 of this report.

8.1.1 Relevant Provisions within Plan Change 6

The relevant proposed changes in Plan Change 6 include:

Freshwater Outcomes

- Table 10(a) Freshwater Outcomes for Lake Forsyth / Wairewa Catchment Rivers to be achieved by 2030.
- Table 10(b) Freshwater Outcomes to be achieved for Lake Forsyth / Te Roto o Wairewa by 2030.

Limits and Targets

- Table 10(d) Water Quality Limits for Rivers in the Lake Forsyth / Wairewa Catchment.
- Table 10(e) Water Quality Limits, and Targets to be achieved by 2030, for Lake Forsyth / Te Roto o Wairewa.
- Table 10(f) Total Phosphorus Load Target for Lake Forsyth / Te Roto o Wairewa to be achieved by 2030.

This section includes two separate evaluations, where:

- Tables 10(a) and 10(b) are assessed in section 8.2 “Freshwater Outcomes”.
- Tables 10(d), 10(e) and 10(f) are assessed in section 8.3 “Water Quality Limits”.

8.1.2 Relevant LWRP Objectives

All objectives in the LWRP are intended to be read in their entirety and no single objective has more importance than another (refer to Appendix 4). However, the following objectives are considered particularly relevant to all three assessments in this section:

- Objectives 3.1, 3.8, 3.11 and 3.12

8.2 Freshwater Outcomes

8.2.1 Reasonably Practicable Options

Two reasonably practicable options have been identified that provide a set of freshwater outcomes for Lake Forsyth / Te Roto o Wairewa and the rivers within the catchment.

Table 3: Reasonably Practicable Options: Freshwater Outcomes

Option		Description
1	Status Quo (LWRP provisions)	<ul style="list-style-type: none"> Numeric freshwater outcomes for Lake Forsyth / Te Roto o Wairewa and the rivers in the catchment as per Tables 1(a) and 1(b) in the LWRP
2	Plan Change 6	<ul style="list-style-type: none"> Numeric freshwater outcomes for rivers and lakes specific to the catchment that replace Tables 1(a) and 1(b) in the LWRP Addition of cultural mahinga kai indicators for Lake Forsyth / Te Roto o Wairewa and the rivers in the catchment
Both Options 1 and 2 also include the narrative freshwater outcomes for groundwater in region-wide policies 4.1 to 4.4. These are not subject to an evaluation in this report.		

Option 1

Option 1 is the status quo where the region-wide numeric freshwater outcomes, contained in the LWRP Tables 1(a) and 1(b), apply to the surface waterbodies located in the Lake Forsyth / Wairewa catchment. These outcomes need to be met by 2030.

The relevant freshwater outcomes in Table 1(a) would apply to the rivers in the Lake Forsyth / Wairewa catchment, such as the Okana, Okuti and Takiritawai Rivers, with all rivers in the Lake Forsyth / Wairewa catchment classified within the “Banks Peninsula” management unit.

The numeric freshwater outcomes in Table 1(b) for Canterbury Lakes would apply to Lake Forsyth / Te Roto o Wairewa, with the lake classified under the “Coastal Lakes” management unit.

Option 2

Option 2 includes specific freshwater outcomes for rivers and lakes in the Lake Forsyth / Wairewa catchment. These outcomes are set out in Tables 10(a) and 10(b) in Plan Change 6 and prevail over Tables 1(a) and 1(b) of the LWRP.

The differences between the freshwater outcomes for **rivers and lakes** in Option 1 and Option 2 are that:

- Option 2 sets the SFRG to “Good” for rivers in Table 10(a) and whereas Option 1 does not set a value for Banks Peninsula rivers in Table 1(a).
- Option 2 sets the SFRG to “Good” for Lake Forsyth / Te Roto o Wairewa in Table 10(b) and whereas Option 1 does not set a value for Coastal Lakes in Table 1(b).
- Option 2 adds new *E.coli* indicators of 260 *E.coli*/100 ml (annual median and 95th percentile) for rivers in Table 10(a) and Lake Forsyth / Te Roto o Wairewa in Table 10(b) to align with the National Objectives Framework (“the NOF”).
- Option 2 adds a cultural indicator to Table 10(a) for rivers and Table 10(b) for Lake Forsyth / Te Roto o Wairewa that “Freshwater mahinga kai species are sufficiently abundant for customary gathering, water quality is suitable for their safe harvesting, and they are safe to eat”.

In all other respects Option 1 and Option 2 are identical.

Options Assessment

Overall, Option 2 is considered more appropriate as it sets freshwater outcomes specific to the waterbodies within the Lake Forsyth / Wairewa catchment, rather than relying on the generic outcomes provided in the LWRP.

Under Option 1, the region-wide LWRP freshwater outcomes for rivers and lakes in Tables 1(a) and 1(b) would continue to apply. These regional outcomes and indicators have been determined at a high level and are generic to water body types in the Canterbury region. This results in less certainty that they are appropriate for the Lake Forsyth / Wairewa catchment. For example, Option 1 does not include a cultural indicator which is an important outcome in the Lake Forsyth / Te Roto o Wairewa catchment, which provides important mahinga kai opportunities and which includes a Statutory Acknowledgement Area. The outcomes and indicators in Option 2 are specific to named waterbodies.

In addition, there are several indicators in LWRP Tables 1(a) and 1(b) that do not align with the NOF in the NPSFM (Option 1). Option 2 aligns with the compulsory attributes within the NOF (see Appendix 2). It also introduces a SFRG grade of “good” for rivers and the lake to support the use of waterbodies in the catchment are used for recreational purposes.

The freshwater outcomes for the Lake Forsyth / Wairewa catchment reflect what is anticipated to be achieved through the package of statutory requirements and actions incentivised through Plan Change 6, alongside the LWRP region-wide provisions and non-statutory actions.

Neither option achieves the community outcome of a TLI of 4.0 by 2035. While it is possible this may be achieved, it is considered highly unlikely, and a more realistic TLI of 6.0 has been set in Option 2 to be achieved by 2030.

Taking all of these factors into account, the freshwater outcomes in Option 2 are considered more applicable to the local situation, more certain of being achieved, and will be more acceptable to the community.

8.2.2 Effectiveness

The following table assesses the effectiveness of the freshwater outcomes in Plan Change 6 against the particularly relevant LWRP objectives identified in section 8.1.2. See section 7.2 for an explanation of the assessment methodology.

Table 4: Effectiveness of Variation 6: Freshwater Outcomes

Objective	Provisions
<p>3.1</p> <p>Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water</p>	<p>The addition of cultural freshwater outcome in Tables 10(a) and 10(b) support achieving this objective. The wording of the cultural freshwater outcome is inclusive of both water quality and environmental flows and recognises that the ability for tangata whenua to practice mahinga kai is dependent upon both healthy water quality and sufficient quantities of water.</p> <p>The 2030 date for achieving all freshwater outcomes is 15 years away. However, it is understood that Ngāi Tahu takes a multi-generational view to water management and appreciates that improving flows and water quality in the catchment, particularly in Lake Forsyth / Te Roto o Wairewa, will take some time.</p> <p>Overall, the freshwater outcomes in Plan Change 6 will contribute positively to the achievement of this objective.</p>
<p>3.8</p> <p>The quality and quantity of water</p>	<p>The freshwater outcomes for rivers and lakes in Tables 10(a) and 10(b) are specific to the Lake Forsyth/Wairewa catchment and are set to safeguard the life</p>

in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon	<p>supporting capacity of freshwater bodies and represent an improvement in water quality.</p> <p>Overall, the freshwater outcomes in Plan Change 6 will contribute positively to achievement of this objective.</p>
<p>3.11</p> <p>Water is recognised as an enabler of the economic and social wellbeing of the region</p>	<p>The date at 2030 for achieving all the freshwater outcomes for Lake Forsyth / Wairewa and the rivers is set to provide a realistic timeframe for implementing the provisions in Plan Change 6 and non-statutory actions in the ZIP Addendum.</p> <p>The freshwater outcomes and limits do not preclude small scale land use development in the catchment (Davie 2015a).</p> <p>Three of the freshwater outcomes will enable the community to use the lake and rivers in ways that provide for their economic and social wellbeing. The 'cultural indicators' seek that mahinga kai is abundant and safe to eat. The SFRG grade and <i>E.coli</i> indicators are sufficiently stringent to support primary and secondary contact recreation, wading and boating.</p> <p>The freshwater outcomes in Plan Change 6 will contribute positively to the achievement of this objective.</p>
<p>3.12</p> <p>When setting and managing within limits, regard is had to community outcomes for water quality and quantity</p>	<p>While freshwater outcomes are not 'limits', the inter-relationship between the two means this objective is relevant to this assessment.</p> <p>The freshwater outcomes (and their achievement by 2030) in Plan Change 6 reflect what was agreed through the collaborative process led by the Zone Committee for the Lake Forsyth / Wairewa catchment (as set out in its ZIP Addendum for this area).</p> <p>Neither option achieves the community outcome of a TLI of 4.0 by 2035, which is unlikely to be achieved. A more realistic TLI of 6.0 has been set in Option 2 to be achieved by 2030.</p> <p>The freshwater outcomes and timescale for achieving them contribute positively to the achievement of this objective.</p>

Overall Rating of Effectiveness

Overall, it is considered that the Plan Change 6 freshwater outcomes achieve the LWRP objectives, meaning these provisions receive a **high** effectiveness rating.

8.2.3 Efficiency

The following table assesses the efficiency of provisions in Plan Change 6 in achieving Freshwater Outcomes. See Section 7 for an explanation of the assessment methodology.

Table 5: Efficiency of Plan Change 6: Freshwater Outcomes

	Benefit	Cost	Net outcome
Environmental	<p>There is expected to be a high environmental benefit in the Lake Forsyth / Wairewa catchment if the freshwater outcomes in Plan Change 6 are achieved.</p> <p>Achieving the outcomes should improve water quality and be positive for aesthetic, habitat and ecological values. The projected reduction in the TLI score for Lake Forsyth / Te Roto o Wairewa from 7.0 to 6.0 is an improvement on the current situation and should lessen the occurrence of toxic algal blooms.</p> <p>Environmental benefits will arise from meeting the added cultural health indicator for mahinga kai and meeting the <i>E.coli</i> outcomes to support recreation.</p> <p>Overall, the environmental benefit from meeting the freshwater outcomes in Plan Change 6 is considered to be high, although it should be noted that the freshwater outcomes may not be met until 2030.</p>	<p>There are no significant anticipated environmental costs from the freshwater outcomes themselves. The mechanisms for meeting the outcomes, including good land management practices, are discussed in detail in Sections 9 and 10 of this report.</p>	HIGH Environmental Benefit
Social	<p>A high social benefit is anticipated from the freshwater outcomes in Plan Change 6. The benefit is expected to arise from an increase in the recreational use of the Lake Forsyth / Wairewa catchment as a result of better water quality and meeting the freshwater outcomes.</p> <p>This includes an increase in recreational fishing (i.e. white-baiting and floundering) in the rivers and Lake Forsyth / Te Roto o Wairewa; and an increase in contact recreation of the rivers and lake such as swimming, kayaking and picnicking. There will also be social benefits in that the community expectations for the lake will be met.</p> <p>The size of this benefit also takes into account that the</p>	<p>There are no expected social costs from the freshwater outcomes in Plan Change 6.</p>	HIGH Social Benefit

	freshwater outcomes may not be met until 2030.		
Cultural	<p>A high cultural benefit is anticipated from the freshwater outcomes in Plan Change 6. This benefit is expected to arise from achieving the cultural health indicator which should:</p> <ul style="list-style-type: none"> • Better enable tangata whenua to make greater use of the waterbodies in the catchment for mahinga kai, particularly eeling in Lake Forsyth / Te Roto o Wairewa; and • Better recognise the place of tangata whenua as kaitiaki for the Lake Forsyth / Wairewa catchment by improving the quality of the environment for mahinga kai purposes. <p>The size of this benefit also takes into account that the cultural health indicator will not be met until 2030.</p>	There are no expected cultural costs from the freshwater outcomes in Plan Change 6.	HIGH Cultural Benefit
Economic	<p>Meeting the freshwater outcomes will result in better water quality of the lake and rivers in the catchment. This may result in more contact recreation activities, such as rowing regattas on the lake or more kayaking on the rivers. If contact recreation within the catchment increases, this would provide economic benefits to the local community. However, these benefits are hard to estimate and quantify. Overall, there is potential for a small economic benefit resulting from Plan Change 6.</p>	<p>A small economic cost is anticipated from the freshwater outcomes in Plan Change 6 themselves. The costs are associated with complying with the statutory measures in Plan Change 6 and implementing the non-statutory actions in the ZIP Addendum to achieve the outcomes. The costs associated with these measures have been assessed separately in Sections 9 and 10.</p> <p>Overall, the relevant provisions in Plan Change 6 are not expected to reduce economic growth or employment.</p>	LOW Economic Cost

Overall Assessment of Efficiency

The environmental, social and cultural benefits are considered to outweigh the costs and overall the efficiency rating of Plan Change 6 is considered to be **high**.

8.2.4 Risk of Acting or Not Acting

There are several risks when it comes to the freshwater outcomes in Plan Change 6. Although cultural health indicators have been added to Tables 10(a) and 10(b), there is some uncertainty as to how these will be monitored. Environment Canterbury is working towards harmonising its state of the environment monitoring with cultural health monitoring by other parties, which over time will assist in better understanding the kinds of information that will need to be collected.

The risk of not acting to set catchment freshwater outcomes and limits is that the water quality and ecosystem health of the waterways in the catchment will not improve and so not meet social, cultural, environmental and economic outcomes. Lake water quality is currently below the bottom line of the NPSFM and the risk of not acting is that this will not improve.

8.2.5 Overall Assessment of Appropriateness and Reasons for Deciding on Provisions

Having regard to the above evaluation, it is Council's view that the Freshwater Outcomes in Plan Change 6 are the most appropriate to achieve the objectives of the LWRP.

The Council has decided to notify Plan Change 6 freshwater outcomes having considered the other reasonably practicable option of status quo, being the region-wide freshwater outcomes, and having assessed the efficiency and effectiveness of the Plan Change 6 in achieving the objectives of the LWRP.

8.3 Water Quality Limits and Targets

8.3.1 Reasonably Practicable Options

This section identifies two reasonably practicable options for setting water quality limits and targets. Each option is made up of a “bundle” of water quality limits / targets.

Table 6: Reasonably Practicable Options: Water Quality Limits

Option		Description
1	Status Quo (LWRP provisions)	<ul style="list-style-type: none"> No catchment load for phosphorus Existing LWRP water quality limits in Schedule 8: <ul style="list-style-type: none"> Lakes – Total Phosphorus, Total Nitrogen and chlorophyll <i>a</i> Rivers - no nitrate toxicity limit for Banks Peninsula rivers Groundwater – nitrate-N, <i>E.coli</i> and other contaminants in NZ Drinking Water Standards
2	Plan Change 6	<ul style="list-style-type: none"> Phosphorus load target for Lake Forsyth / Te Roto o Wairewa Lake Forsyth / Te Roto o Wairewa water quality limits which align with the “NOF” Okuti and Okana rivers – water quality limits which align with the “NOF” Groundwater – LWRP Schedule 8 limits for groundwater
Both options also include the region-wide water quality limits for groundwater in Schedule 8 of the LWRP. These limits are not subject to further evaluation in this report.		

Option 1: LWRP provisions

Water quality limits in Schedule 8 would apply to the Lake Forsyth / Wairewa catchment. There would be no catchment load target for phosphorus.

Option 2: Plan Change 6

- Table 10(d) ‘Water Quality Limits for Rivers in the Lake Forsyth / Wairewa Catchment’ includes nitrate and ammonia concentration limits that comply with the NOF
- Table 10(e) ‘Water Quality Limits, and Targets to be achieved by 2030, for Lake Forsyth / Te Roto o Wairewa’ include Total Phosphorus, Total Nitrogen, Chlorophyll *a* and Ammoniacal Nitrogen concentrations that comply with the NOF.
- Table 10(f) ‘Total Phosphorus Load Target for the Lake Forsyth / Wairewa catchment to be met by 2030’.

Options Assessment

Lake Forsyth / Te Roto o Wairewa

Option 1 would apply the region wide limits for TP, TN and Chlorophyll *A* for coastal lakes in Schedule 8 (Region-wide Water Quality Limits) to Lake Forsyth / Te Roto o Wairewa. The limits for TP (0.096 mg/l), TN (1.56 mg/l) and Chl *a* (30

mg/l) are all below the National Bottom Lines for lakes attributes in the NOF (i.e. Attribute State D). This is not allowable in order to give effect to the NPSFM. Furthermore, Schedule 8 in the LWRP does not include an ammoniacal nitrogen limit for lakes. Ammonia toxicity is a compulsory attribute for lakes under the NOF.

Under Option 1, there is no phosphorus load target for Lake Forsyth / Te Roto o Wairewa. Without a clear catchment load target to aim for, the certainty that the ecological health and water quality of the lake will be improved and then maintained is much reduced. This is unlikely to be acceptable to the community or iwi and will result in the freshwater outcomes not being met.

Option 2 on the other hand, sets TP, TN and Chlorophyll *a* targets for the lake to be met by 2030 that comply with the NPSFM (NOF) National Bottom Lines for ecosystem health for lakes. It also sets a catchment phosphorus load target of 2,600 kg per year. The phosphorus load target was set based on work undertaken to estimate the current load entering Lake Forsyth / Te Roto o Wairewa and a level of reduction that was agreed with zone committee and local community.

Option 2 also sets a concentration limit for ammonia toxicity at the 99% species protection level (NOF band A), which the lake currently meets.

Rivers

Option 1 would not include any limits for rivers, as the only limit in Schedule 8 of the LWRP is a nitrate toxicity limit for lowland streams.

Option 2 on the other hand, includes nitrate-nitrogen and ammonia concentration limits for the Okuti and Okana rivers that provide a very high degree of species protection (in NOF band A). Both rivers currently meet these limits.

There was substantial discussion with the Zone Committee prior to settling on a nitrate limit of 0.2 mg/l (annual median) and 0.5 mg/l (95th percentile). The options discussed are set out in an Environment Canterbury Memorandum (Davie 2015a). The NPSFM-NOF “A” attribute level for nitrate (toxicity) is less than 1.0 mg/l (annual median) and less than 1.5 mg/l (95th percentile). Wairewa streams easily fit within the “A” attribute state. The current median for with the Okana is 0.17 mg/l, while the Okuti figure is a little lower.

Setting the nitrate limits at the bottom of NOF “A” band for nitrate-nitrogen would protect more than 99% of aquatic species from nitrate toxicity⁸. However, it would represent a significant increase on the current state, and importantly periphyton modelling predicted that such a limit would not protect streams against excessive periphyton growth.

The limits in Plan Change 6 therefore allow a small increase in the nitrate concentration based on the recommendation of the zone committee that allows for small-scale agricultural development in the catchment, without causing adverse effects on instream health. Other provisions in Plan Change 6 on stock exclusion and sediment control, are likely to lead to improvements in E.coli, phosphorus and sediment concentrations in the rivers, meaning that overall, water quality is improved.

Overall, Option 2 is considered the best option as the limits and targets for the rivers and Lake Forsyth / Te Roto o Wairewa, although challenging, are considered achievable give effect to the NPSFM, are protective of aquatic species, and avoid excessive periphyton growth.

⁸ National Policy Statement for Freshwater Management 2014 (see Appendix 2: Attribute Tables).

8.3.2 Effectiveness

The following table assesses the effectiveness of the water quality limits in Plan Change 6 against the particularly relevant LWRP objectives identified in section 8.1.1. See section 7.2 for an explanation of the assessment methodology.

Table 7: Effectiveness of Plan Change 6: Water Quality Limits and Targets

Objective	Provisions
<p>3.1</p> <p>Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water</p>	<p>The catchment phosphorus load limit for Lake Forsyth / Te Roto o Wairewa represents a significant improvement on the current state. The proposed reduction in phosphorus entering the lake from 4,400 to 2,600 kg per year will improve water quality and ecosystem.</p> <p>The phosphorus load target and therefore the water quality limits for the lake shall be met by 2030. It is understood that Ngāi Tahu takes a long-term view to water management and appreciates that improving water quality in Lake Forsyth / Te Roto o Wairewa will take time. The measures proposed to reduce the volume of phosphorus entering Lake Forsyth / Te Roto o Wairewa, such as stock exclusion from rivers in the Valley Floor Area from 2020, river bank stabilization works, and construction of a wetland / sediment retention basin may provide tangible water quality improvements earlier than 2030.</p> <p>The other water quality limits for rivers and the lake maintain or represent an improvement on the current state and are set to be highly protective of aquatic species, which supports customary use of the waterbodies in the catchment.</p> <p>Overall, the water quality limits and target in Plan Change 6 will contribute positively to achieving this objective.</p>
<p>3.8</p> <p>The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon</p>	<p>A wide range of factors contribute to a healthy lake, however, levels of phosphorus are understood to have a greater influence on the health of Lake Forsyth / Te Roto o Wairewa than nitrogen. Setting a phosphorus load limit for the lake (Table 10(e)) goes a step further than the region-wide water quality limits, which for lakes, only include a phosphorus concentration.</p> <p>The water quality limits (TP, TN and Chlorophyll <i>a</i>) for Lake Forsyth / Te Roto o Wairewa meet the NPSFM National Bottom Lines for healthy lake ecosystems. These equates to an annual TLI score of 6.0 which is an improvement on the current state. The health of the lake is likely to improve from its state in the recent past and support a diverse range of fish, invertebrates and aquatic plants. The limits for rivers are currently being met and are highly protective of aquatic species and the nitrate is set low enough to avoid excessive algal growth.</p> <p>Overall, the water quality limits and targets in Plan Change 6 will contribute positively to achieving this objective.</p>
<p>3.8A</p> <p>High quality fresh water is available to meet actual and reasonably foreseeable needs for community drinking supplies</p>	<p>Phosphorus is not considered a major contaminant of drinking water. However, too much phosphorus in surface waterbodies can cause excessive growth of algae and aquatic plants which may cause water to become polluted and unsuitable for abstraction for drinking.</p> <p>The lake itself is not abstracted for community drinking supply, however, Police Creek and nearby groundwater is abstracted for community supply. The limit for nitrate is well below half MAV in the NZ Drinking Water Standards.</p> <p>Overall, the limits and targets in Plan Change 6 will contribute positively to achieving this objective.</p>
<p>3.11</p> <p>Water is recognised as an enabler of the economic and</p>	<p>The target date of 2030 for achieving the water quality limits in the Lake Forsyth / Wairewa catchment provides time for the package of statutory and non-statutory actions in Plan Change 6 and the ZIP Addendum to be implemented.</p> <p>The water quality limits and phosphorus load target for Lake Forsyth / Wairewa</p>

social well-being of the region	<p>catchment will avoid a reduction in river water quality and improving the water quality in Lake Forsyth / Te Roto o Wairewa.</p> <p>The nitrate-nitrogen limits for rivers allows for small scale development in the catchment without compromising meeting the limits and freshwater objectives, which will enable the community to use water in a way that provides for their economic, cultural and social well-being.</p> <p>Accordingly, it is considered that the water quality limits and targets in Plan Change 6 will contribute positively to the achievement of this objective.</p>
<p>3.12</p> <p>When setting and managing within limits, regard is had to community outcomes for water quality and quantity</p>	<p>When setting the water quality limits and targets, regard has been given to all of the community outcomes listed in Appendix 3. The limits and targets, when met, will result in improved water quality within the Lake Forsyth / Wairewa catchment.</p> <p>Accordingly, it is considered that the water quality limits in Plan Change 6 will contribute positively to the achievement of this objective.</p>

Overall Rating of Effectiveness

Overall, it is considered that the water quality limits in Plan Change 6 will achieve most of the particularly relevant LWRP objectives, meaning these provisions receive a **moderate to high** effectiveness rating.

8.3.3 Efficiency

The following table assesses the efficiency of provisions in Plan Change 6 in achieving the objectives. See section 7 for an explanation of the assessment methodology.

Table 8: Efficiency of Variation 6: Water Quality Limits and Targets

	Benefit	Cost	Net outcome
Environmental	<p>There is expected to be a high environmental benefit in the Lake Forsyth / Wairewa catchment resulting from the achievement of the water quality limits and targets in Plan Change 6, particularly in terms of the health and quality of the lake.</p> <p>Achieving the water quality limits and targets should improve water quality and provide tangible improvements in aesthetic, habitat and ecological values. In particular, the projected reduction in the phosphorus load limits for Lake Forsyth / Wairewa should lessen the occurrence of toxic algal blooms. The water quality limits and targets are expected to be met by 2030.</p> <p>Overall, the environmental benefit from meeting the water quality limits and targets in Plan Change 6 is considered to be high.</p>	<p>There are no significant anticipated environmental costs from the water quality limits themselves. The mechanisms for meeting the limits, are discussed in detail in Sections 9 and 10 of this report.</p>	HIGH Environmental Benefit
Social	<p>A moderate social benefit is anticipated from achieving the water quality limits in Plan Change 6. This benefit is expected to arise primarily as a result of improving the water quality and ecosystem health in Lake Forsyth / Te Roto o Wairewa, which should will enable people to make greater use of the lake and rivers for recreational activities such as fishing, boating, swimming or rowing (relative to current use).</p> <p>Recreational activity, such as fishing in the lower reaches of the rivers, may increase if the phosphorus limits for rivers are met. There will also be social benefits in that the community expectations for the waterways will be</p>	<p>There are no social costs anticipated from the water quality limits and targets in Plan Change 6. The costs arising from the implementation of the actions required to meet the targets, such as exclusion of stock from the riparian margins, banks and beds of water bodies, are assessed in sections 9 and 10 of this report.</p>	MODERATE Social Benefit

	met. The size of this benefit also takes into account that the water quality targets will be met by 2030.		
Cultural	<p>A high cultural benefit is anticipated from the water quality targets and limits in Plan Change 6, in particular as a result of improving water quality in Lake Forsyth / Te Roto o Wairewa.</p> <p>This will enable local tangata whenua to make greater use of the lake for mahinga kai and recognises the place of tangata whenua as kaitiaki for Lake Forsyth / Te Roto o Wairewa.</p> <p>The size of this benefit also takes into account that the water quality targets will be met by 2030.</p>	There are no cultural costs from the water quality limits and targets in Plan Change 6.	HIGH Cultural Benefit
Economic	<p>Meeting the water quality limits and targets will result in better water quality of the lake and rivers in the catchment. This may result in more contact recreation activities within or on these waterbodies, such as rowing regattas on the lake or more kayaking on the rivers. If contact recreation within the catchment increases, this would provide economic benefits to the local community. However, these benefits are hard to estimate and quantify.</p> <p>Overall, there is potential for a small economic benefit from the limits in Plan Change 6.</p>	<p>There are no anticipated economic costs from the water quality limits and targets in Plan Change 6 themselves. The costs are associated with implementing the statutory and non-statutory components to achieve the water quality limits and targets. These costs are covered in Sections 9 and 10.</p> <p>Overall, the relevant provisions in Plan Change 6 are not expected to reduce economic growth or employment.</p>	MODERATE Economic Benefit

Overall Assessment of Efficiency

The environmental, social and cultural benefits are considered to outweigh the costs and overall the efficiency rating of the water quality limits and targets in Plan Change 6 is considered to be **moderate to high**.

8.3.4 Risk of Acting or Not Acting

The water quality limits and targets have been derived from modelling and CRC monitoring data. There is always the risk that modelling may not be accurate. This risk will be addressed through further CRC monitoring and validation.

The risk of an increase in periphyton growth from the nitrate limits for rivers is considered small. Continued monitoring of periphyton will ensure that any problems are detected from the small change in nitrogen concentrations.

However, the risk of not acting to set limits and targets is that the water quality and ecosystem health of the waterways in the catchment and the lake do not improve

8.3.5 Overall Assessment of Appropriateness and Reasons for Deciding on Provisions

Having regard to the above evaluation, it is Council's view that the water quality limits and targets in Plan Change 6 are the most appropriate to achieve the objectives of the LWRP.

The Council has decided to notify the Plan Change 6 water quality limits and targets having considered the other reasonably practicable option of retaining the region-wide limits, and having assessed the efficiency and effectiveness of Plan Change 6 in achieving the objectives of the LWRP.

9 Managing to Water Quality Outcomes and Limits Upstream of Lake Forsyth / Te Roto o Wairewa

9.1 Introduction

This section evaluates the appropriateness of the provisions of Plan Change 6 to manage water quality in the rivers upstream of Lake Forsyth / Te Roto o Wairewa to reduce the sediment and phosphorus load entering the lake.

9.1.1 Relevant Provisions within Plan Change 6

The relevant proposed changes in Plan Change 6 include:

Policies

- Policy 10.4.1 is a broad policy that identifies the key methods or actions that will be necessary to enhance the cultural values held by Ngāi Tahu and the ecological health and water quality in the catchment. The actions include:
 - excluding **all** stock from surface waterbodies in the Valley Floor Area from 1 January 2020
 - encouraging bank stabilisation activities
 - planting riparian margins with native species where this is compatible with stabilising river banks
 - providing for a wetland or sediment basin upstream of the lake to remove phosphorus and sediment
 - minimising phosphorus in community wastewater treatment system discharges
 - preventing inundation of septic tanks from floodwaters in flood-prone areas
- Policy 10.4.3 is to improve the flood carrying capacity of the Okana, Okuti and Takiritawai rivers by excluding stock from the beds and riparian margins and encouraging bank stabilisation works to avoid erosion and collapse.

Rules

- Rules 10.5.2 and 10.5.3 control activities undertaken for the purpose of stability of riverbanks in the Valley Floor Area as a restricted discretionary and non-complying activity.
- Rule 10.5.5 prohibits **all** stock from accessing the bed, banks and riparian margins of the rivers, and that part of the lake that is within the Valley Floor from 1 January 2020. Rule 10.5.4 confirms that the regional rules apply until Rules 10.5.5 comes into effect.
- Rule 10.5.6 is specific to the Valley Floor Area and allows the disturbance of the bed and riparian margins of a river and lake to construct, maintain, and use a sediment basin or wetland (to intercept sediment and phosphorus before it enters Lake Forsyth /Te Roto o Wairewa) as a discretionary activity.

Schedules

- Schedule 24c sets out the content and requirements of a “Valley Floor Area River Bank Erosion Plan” which is referred to in Rule 10.5.2.

Additions to Planning Maps

The following are additions to the Planning Maps:

- Valley Floor Area

9.1.2 Relevant LWRP Objectives

All objectives in the LWRP are intended to be read in their entirety and no single objective has more importance than another (refer to Appendix 4). However the following objectives are considered particularly relevant to the assessments in this section:

- Objectives 3.5, 3.7, 3.11, 3.12 and 3.24

9.2 Reasonably Practicable Options

Three reasonably practicable options have been identified for managing phosphorus and sediment upstream of Lake Forsyth / Te Roto o Wairewa to meet freshwater outcomes in surface waterbodies.

Table 9: Reasonably Practicable Options for Managing to Water Quality Outcomes and Limits Upstream of Lake Forsyth / Te Roto o Wairewa

Option		Description
1	Status Quo (LWRP provisions)	<ul style="list-style-type: none"> • The LWRP region-wide policies and rules (including relevant proposed changes in Plan Change 4) would apply with no additional policies and rules introduced into the Lake Forsyth / Wairewa catchment
2	Plan Change 6	<p>LWRP provisions plus:</p> <ul style="list-style-type: none"> • Set a new management area, the Valley Floor Area, that demarcates the critical source area for phosphorus loss into waterways. • A rule prohibiting all stock from accessing surface water bodies and their riparian margins in the Valley Floor Area to reduce erosion of river banks (prohibited activity). • Policy and rules to enable stabilisation of river banks in the Valley Floor Area as a restricted discretionary activity / non-complying activity. • Policy to require reticulated wastewater systems to minimise phosphorus and the volume of wastewater discharged, and for septic tanks to be sealed. • Provisions to enable the construction of a sediment retention basin and / or wetland at the head of the lake.
3	Alternative solutions package	<p>As Option 2 but:</p> <ul style="list-style-type: none"> • A rule classifying exclusion of all stock from surface water bodies and their riparian margins in the Valley Floor Area as a <u>non-complying</u> activity • A rule classifying bank stabilisation works in the Valley Floor Area as a <u>permitted</u> or <u>controlled</u> activity • Land use provisions (section 9 RMA), including rules, which <u>require</u> all landowners in the Valley Floor Area to prepare and implement Erosion Plans.
All three options include LWRP provisions controlling earthworks and vegetation clearance High Soil Erosion Risk Areas		

(shown planning maps), which make up a large part of the catchment and are considered adequate for controlling sediment and phosphorus losses from these steeper areas. These provisions are not subject to further evaluation in this report.

Option 1: LWRP provisions

Policies

- Exclude intensively farmed livestock from lakes, rivers, wetlands and from certain sites with particular uses and values (Policy 4.31);
- Design stock crossing points and manage movement across waterbodies so as to minimise effects on water clarity, colour and bank stability and riparian vegetation (Policy 4.32)
- Minimise nutrient losses by raising awareness, by farm activities operating at good management practices (Policy 4.34);
- On erosion prone land, earthworks, forestry harvesting and clearance of vegetation minimises soil erosion, run-off and re-establishes vegetation quickly (Policy 4.20);
- In Hill and High Country areas the use of vegetation burning avoids inducing soil erosion (Policy 4.21)
- Sedimentation of waterbodies from land clearance, earthworks and cultivation is avoided or minimized by maintaining vegetation cover adjacent to waterbodies or capturing surface water run-off to remove sediment (Policy 4.22);
- Disposal of domestic effluent and wastewater avoids adverse effects on surface water or groundwater and where residential density is greater than 1.5 dwellings/ha or population is more than 1000, community reticulated systems should be promoted (Policy 4.14A).

Rules

- Stock exclusion from rivers, lake and wetlands (Rules 5.68 to 5.71)
- Sewerage systems (Rules 5.84 to 5.88)
- On-site wastewater treatment (Rules 5.7 to 5.9)
- Rules related to bank stabilisation activities including: Gravel Extraction from Lake and Riverbeds (Rules 5.147 to 5.153); Vegetation in Lake and Riverbeds (Rules 5.163 to 5.166); Earthworks and Vegetation Clearance in Riparian Areas (Rules 5.167 to 5.169) and Vegetation clearance and earthworks in erosion prone areas (High Soil Erosion Risk Areas on planning maps) (Rules 5.170 to 5.171).

Option 2: Plan Change 6

Plan Change 6 contains a suite of policies and rules intended to reduce losses of sediment and phosphorus into waterways in addition to those in the LWRP (Option 1). The additional provisions in Plan Change 6 to those in Option 1 relate to:

- Establishing a management area, the Valley Floor Area, where certain provisions in Plan Change 6 would apply.

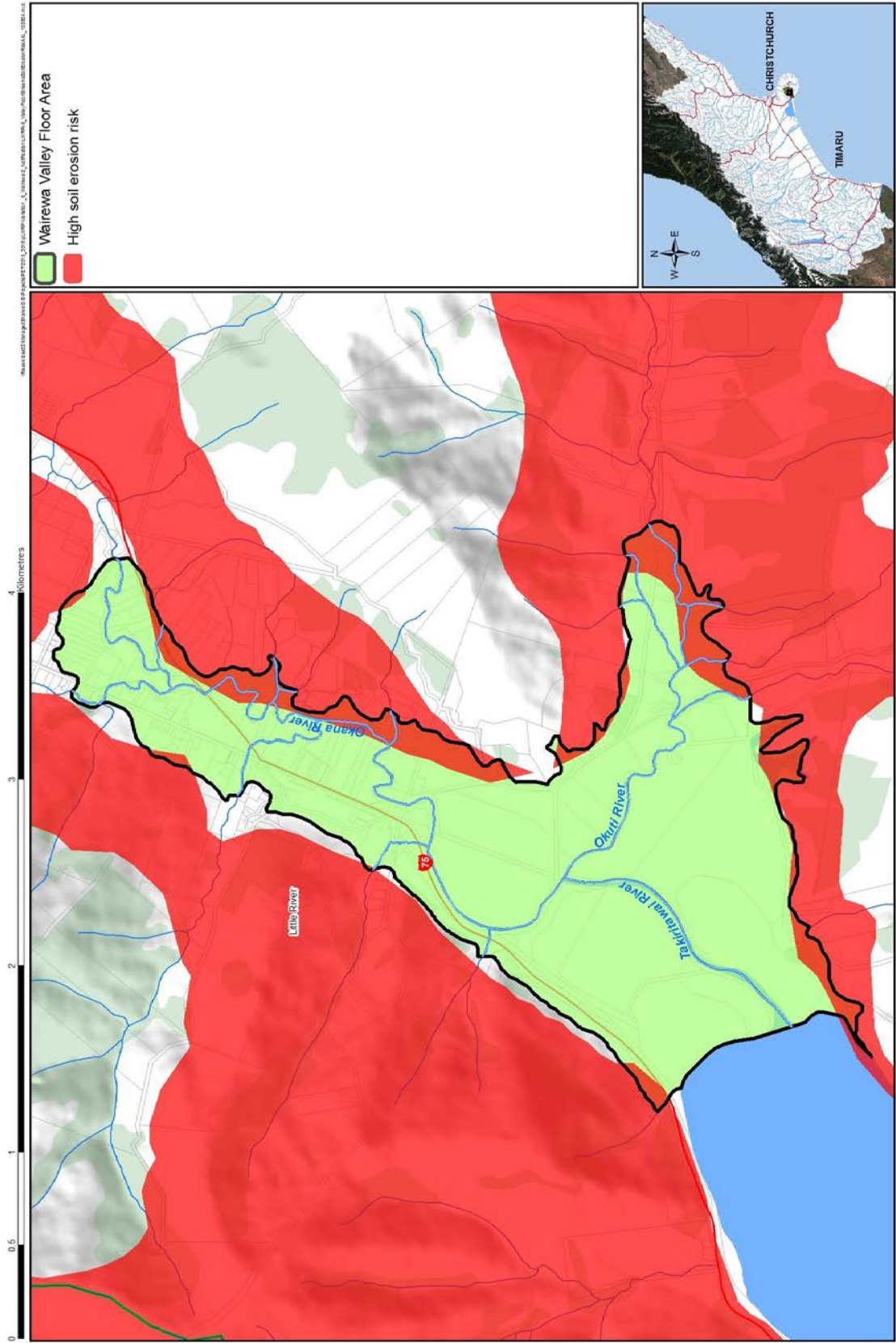
- Excluding all stock, including non-intensively farmed stock such as beef cattle and sheep, as well as intensively farmed stock, from the riparian margins of surface water bodies in the Valley Floor Area by 2020 via a prohibited activity rule (Rule 10.5.5); Riparian margins (defined in the LWRP) would be 5 metres from the bed of a river, lake or wetland in the Valley Floor Area or 10 metres where the Valley Floor Area is also within (i.e. overlaps) the High Soil Erosion Risk Area shown on planning maps (see Figure 6 below)
- Providing for activities undertaken for the purpose of reducing bank erosion and collapse as a restricted discretionary activity if a Valley Floor Area River Bank Erosion Plan is prepared and submitted with the application (Rule 10.5.2), or a non-complying activity if it is not (Rule 10.5.3).
- Requiring discharges from community wastewater treatment systems to minimise phosphorus and the volume of the discharge (Policy 10.4.1(5)).
- Encouraging the construction and maintenance of a sediment retention basin and / or wetland at the head of the lake via a discretionary activity rule (Policy 10.4.1(4)).
- Content of a Valley Floor Area River Bank Erosion Plan (Schedule 24c).

Option 3: Alternatives

Option 3 is the same as Option 2 (Plan Change 6) except for the following changes in rule classification:

- Allowing consent to be sought for stock access to surface water bodies and riparian areas in the Valley Floor Area as a non-complying activity rule (instead of prohibited).
- Either enabling bank stabilisation works within the Valley Floor Area without requiring resource consent (permitted activity) or as a controlled activity which means consent must be granted (instead of a restricted discretionary activity); or
- Rules making it compulsory for landowners within the Valley Floor Area to prepare and implement Erosion Plans to control the erosion of river banks (instead of rules that only apply if the activity is undertaken voluntarily).
- Change activity status for the construction and maintenance of a sediment retention basin and / or wetland at the head of the lake to restricted discretionary (instead of discretionary).

Figure 6: Map showing the overlap between the High Soil Erosion Risk Area (LWRP) and Valley Floor Area (Plan Change 6)



Options Assessment

Option 1

The technical work underpinning Plan Change 6 has identified that the soils in the Valley Floor Area are the primary source of sediment and phosphorus inputs to Lake Forsyth / Te Roto o Wairewa (Lynn, 2013).

Excluding stock from the waterways and riparian areas in this catchment is considered essential to reducing stream bank erosion and phosphorus loss into waterways. Option 1 (LWRP) would control sediment to some degree by managing disturbance in waterways and controls on stock access to rivers, lakes and wetlands. In very general terms, the stock exclusion rules prevent (make prohibited or non-complying) farmed cattle, farmed pigs and farmed deer from entering the bed of a river or wetland in certain locations. However, other non-intensively farmed stock, such as sheep, can graze the bed of a river, providing they comply with the permitted activity rule (no pugging or de-vegetation or change in water colour or clarity etc.). Also, region-wide rules require that stock also be excluded from the banks of a river, this is not necessarily protective of riparian margins (which Option 2 is).

This catchment is not intensively farmed so it is not intensively farmed stock such as dairy cattle that are causing the water quality problems. Rather, it is non-intensively farmed stock such as sheep and beef cattle that are causing the erosion of stream banks. Option 1 (LWRP) stock exclusion rules, would not change the current situation and so would not reduce the erosion of riverbanks and loss of phosphorus to water (because non-intensively farmed stock would be allowed to access riverbeds).

Plan Change 4 (Omnibus) identifies the Okana and Okuti rivers in the valley floor as “inanga spawning areas” for the purpose of amendments to the region-wide stock exclusion rules. Plan Change 4 would prohibit farmed cattle, deer and pigs from accessing the bed of a river that is identified as “inanga spawning habitat” between 1 January and 1 June inclusive. In addition to habitat protection, this may provide some additional benefits by reducing stock access to these rivers and exacerbating bank erosion. However, the additional benefits are likely to be limited. The prohibited rule applies only to farmed cattle, deer and pigs (which are not the predominant farming types in the catchment) and only apply for part of the year. As discussed below, Option 2 would provide more benefit as **all** stock would be excluded from rivers and their riparian margins in the Valley Floor Area from 2020.

It is understood that many farming activities in the catchment are likely to have low nitrogen loss rates in the range 5 to 10 kg per hectare per year (L Fietje, pers. comm., 15 Sept. 2015) and so are likely to be permitted under the ‘red nutrient allocation zone’ rules. This makes the stock exclusion rules, and enabling provisions of in Plan Change 6 even more important as few farmers will be required to prepare and implement Farm Environment Plans in this catchment.

A sediment retention basin and / or wetland at the head of Lake Forsyth / Te Roto o Wairewa is foreseen in the future as something that could provide substantial environmental benefits in reducing sediment and phosphorus inputs to Lake Forsyth / Te Roto o Wairewa. LWRP Rule 5.159 provides for the creation and maintenance of a wetland as a permitted activity, provided applicable conditions can be met. However, the construction of a sediment retention basin is not specifically provided for and there is currently no policy or rules to direct decision-makers.

Region-wide rules on on-site wastewater treatment (septic tanks) would apply and permit the discharge of wastewater from existing, new, modified and upgraded septic tanks subject to meeting various conditions relating to (among other things) the volume and location of the discharge and compliance with the NZ Standard for On-site Domestic Wastewater Management. If conditions are not met consent is required.

Overall, on its own, Option 1 is not considered appropriate as it will not alter the status quo; changes are required if stream banks are to be stabilised to reduce the volume of phosphorus being lost to waterways and subsequently, Lake Forsyth / Te Roto o Wairewa.

Option 2

Erosion of stream banks in the Valley Floor catchment from stock accessing waterways is considered to be the primary source of phosphorus lost to waterways, which eventually enters Lake Forsyth / Te Roto o Wairewa. Stream bank stabilisation is therefore a key component of achieving the freshwater outcomes and water quality limits contained in Plan Change 6.

Option 2 (Plan Change 6) supplements Option 1 and takes a practical, multi-pronged approach to controlling sediment and phosphorus losses through plan provisions that support the following key interventions:

- Extending the existing LWRP rules on stock exclusion to include **all** stock, not just intensively farmed stock such as dairy cows, from all surface waterbodies in the Valley Floor Area, **including** exclusion from riparian margins (defined in the LWRP as land within 5 metres from the bed of any lake, river or wetland or 10 metres in High Soil Erosion Risk Areas). This will reduce the inputs of phosphorus-rich sediment entering waterways as the erosion of stream banks from stock access is one of the major contributors to phosphorus losses. The parts of the Valley Floor Area that are also within the High Soil Erosion Risk Area will require stock to be excluded from a 10 metre riparian margin. Figure 6 above shows the small area and rivers where the Valley Floor Area in Plan Change 6 overlaps with the High Soil Erosion Risk Area in the LWRP.
- The stabilisation of river banks, riparian margins, and associated works (e.g. planting, structures, cables, earthworks, diversions, discharges) are grouped together as a restricted discretionary activity if done in accordance with a Valley Floor Area River Bank Erosion Plan.
- Requiring any installed reticulated wastewater systems to remove phosphorus before discharging to the environment, and relying on the existing LWRP rules to implement the policy.
- Requiring that on-site waste water systems (septic tanks) located in the Valley Floor Area are sealed to prevent inundation by floodwaters.
- Construction and maintenance of a sediment retention basin or wetland at the head of Lake Forsyth / Te Roto o Wairewa will be enabled through a policy and a new rule (discretionary activity). This will provide a signal to decision-makers that a sediment retention basin or wetland is envisaged as part of the package of solutions for Lake Forsyth / Te Roto o Wairewa as it would intercept phosphorus-rich sediment before entering the Lake.

It is noted that the stabilisation of river banks is supported by provisions in the Proposed Replacement Christchurch City District Plan which has a special zone called the “Te Wairewa/Lake Forsyth Floor Level and Fill Management Zone”⁹.

Option 3

Option 3 consists of a non-complying stock exclusion rule rather than the prohibited activity rule specified in Plan Change 6 (Option 2). Prohibited status is preferred over non-complying as this is consistent with the Zone Committee’s recommendation for all stock to be excluded from surface waterbodies in the Valley Floor Area and total exclusion would ensure that that stock do not exacerbate stream bank erosion and re-suspend sediment in the riverbed. Exclusion from the riparian area would also avoid damage to banks that are fragile and undercut as well as making sure there is enough room for battering banks. Total exclusion in all circumstances from 2020 provides

⁹ Proposed Replacement Christchurch City District Plan (Chapter 5 Natural Hazards) has a permitted activity rule (5.8.9.1) for: “*Filling or excavation associated with the maintenance of flood protection and bank erosion protection works; and the maintenance of existing drains or ponds.*”

maximises confidence of achieving the freshwater outcomes and limits for the Lake Forsyth / Wairewa catchment. Therefore, Option 2 with its prohibited activity status is preferred.

Option 3 consists of a regulatory approach to stream bank erosion plans rather than voluntary approach via land use controls under section 9 of the RMA, rather than an enabling approach as taken in Option 2 for those who choose to undertake bank stabilization works. Option 3 would require a landowner located in the Valley Floor Area, which contains a stream bank, to prepare and fully implement an Erosion Plan by 1 January 2025. After this time, if a landowner had not prepared and fully implemented the Erosion Plan, they would be required to do so as well as obtain land use resource consent for the activity of using the land in the riparian margin for any purpose. The Erosion Plans would identify areas prone to phosphorus and sediment loss, describe the practical actions to reduce erosion and also include a maintenance schedule for the works. This would be identified within a new Schedule which would outline what an Erosion Plan should include and assess, as well as bank stabilisation methods based on Blakely (2013).

The risk with this option is that although it will provide greater certainty that the freshwater outcomes will be achieved, it is requiring landowners to undertake works to fix a historical problem, which they may not be personally responsible for. In addition, requiring each landowner to do their own works on a piecemeal or individual basis increases the risk of other adverse effects downstream of the works (i.e. increase flooding effects or divert the flow of the river onto an adjacent bank).

The costs of preparing and implementing Erosion Plans may also be expensive (\$14-35 per metre of stream bank if planting and battering or \$110-120 per metre of bank if undertaking anchored weighted tree protection) (Blakeley, 2014). These costs would be additional to the costs associated with excluding stock from waterways and may be unreasonable to impose on all landowners. Option 2 mitigates these potential risks and means that these costs would only be incurred if the person, or organization, voluntarily chooses to undertake the works.

A further alternative to the bank stabilization rules in Option 2 is considered under Option 3. Under this alternative, Option 3 would classify bank stabilisation works in the Valley Floor Area as a permitted or controlled activity. Permitted activity status is not favoured because bank stabilization works can be complex (as evidenced by Schedule 24c) and require assessment of a several issues including downstream effects on the environment and landowners, that if not properly addressed, could result in environmental damage. Allowing the works to be undertaken as a controlled activity carries a similar risk to permitted status (albeit to a lesser extent) because resource consent cannot be refused. The restricted discretionary classification in Option 2 provides the right mix of guidance for those who want to do the right thing, and ability for Council to decline consent for works that could make the situation worse. This is particularly important given the current lack of Bylaw power (see Appendix 2).

Option 3 consists of a permitted activity rule for the construction and maintenance of a sediment retention basin and / or wetland at the head of the lake. This status was not supported as there are several matters that have the potential for adverse effects. These are best dealt with through a consent application. Consideration was also given as to whether the location of the basin / wetland could be shown on the planning maps. However, showing a potential site on the maps was not favoured as its final location will be determined by property purchase. Option 3 is therefore not favoured for the reasons discussed above.

Overall, Plan Change 6 (Option 2) was considered the most appropriate as it presented the most significant benefits whilst also presenting the least amount of risks and uncertainties.

9.3 Effectiveness

The following table assesses the effectiveness of Plan Change 6 for managing phosphorus, sediment and against the particularly relevant LWRP objectives identified in section 9.1.1. See section 7.2 for an explanation of the assessment methodology.

Table 10: Effectiveness of Plan Change 6: Managing to Water Quality Outcomes and Limits Upstream of Lake Forsyth / Te Roto o Wairewa

Objective	Provisions
<p>3.5</p> <p>Land use continues to develop and change in response to socio-economic and community demand</p>	<p>Phosphorus is managed alongside the management of sediment through restricting stock access to waterways (including non-intensively farmed stock), encouraging bank stabilisation techniques, and classify the rules for construction of a sediment retention basin or wetland at the head of Lake Forsyth / Te Roto o Wairewa.</p> <p>Overall, the provisions in Plan Change 6 will contribute positively to achieving this objective.</p>
<p>3.7</p> <p>Freshwater is managed prudently as a shared resource with many in-stream and out-of-stream values</p>	<p>Plan Change 6 will help to maintain in-stream ecological values of the waterways within the Lake Forsyth / Wairewa catchment by managing phosphorus and sediment. Bank stabilisation methods, which may be undertaken by individual landowners on their property, or at a larger scale, are encouraged by Plan Change 6.</p> <p>Plan Change 6 also extends the LWRP rules on stock exclusion to protect waterways prone to bank erosion by requiring all stock, not just intensively farmed stock, to be excluded from waterways within the Valley Floor Area, and by extending this exclusion to include riparian margins.</p> <p>Overall, the provisions in Plan Change 6 support this objective.</p>
<p>3.11</p> <p>Water is recognised as an enabler of the economic and social well-being of the region</p>	<p>Plan Change 6 recognises that water is important in the Lake Forsyth / Wairewa catchment, particularly in regards to mahinga kai, contact recreation and farming activities (such as stock water supply) and ensures the quality of the resource is improved over time to enable economic and social well-being. The policies and rules in Plan Change 6 that relate to phosphorus and sediment will mean that better quality water is available for the catchment.</p>
<p>3.12</p> <p>When setting and managing within limits, regard is had to community outcomes for water quality and quantity</p>	<p>Considerable community input and extensive technical support from a variety of perspectives were provided in the development of Plan Change 6. The integrated approach used involved testing solutions with the community and refining it using the community's feedback.</p> <p>Therefore, it is considered that the proposed provisions in Plan Change 6 will contribute positively to achieving this objective.</p>
<p>3.24</p> <p>All activities operate at "good environmental practice" or better to optimise efficient resource use and protect the region's freshwater resources from quality and quantity degradation</p>	<p>The proposed provisions relating to excluding stock from waterways and implementation of bank stabilisation methods will improve the water quality and ecosystem health of not only the rivers, but also Lake Forsyth / Te Roto o Wairewa which currently suffers toxic algal blooms. However, it should be noted that bank stabilization works are not mandatory, which means that complete re-stabilisation of river banks is a guaranteed result of Plan Change 6.</p> <p>Overall, it is considered that Plan Change 6 will contribute positively to this objective.</p>

Overall Rating of Effectiveness

The overall effectiveness rating of Plan Change 6 is considered **moderate to high** on the basis that the variation enables positive actions and imposes restriction on the activities (stock accessing riparian margins) that is contributing to existing water quality issues. Plan Change 6 provisions will help to maintain in-stream ecological values of streams whilst improving the ecological health of Lake Forsyth / Te Roto o Wairewa, hence contributing to improved cultural values of all waterways in the catchment.

9.4 Efficiency

The following table assesses the efficiency of provisions in Plan Change 6 in managing phosphorus and sediment upstream of Lake Forsyth / Te Roto o Wairewa. See section 7.1 for an explanation of the assessment methodology.

Table 11: Efficiency of Variation 6: Managing to Water Quality Outcomes and Limits Upstream of Lake Forsyth / Te Roto o Wairewa

Environmental	Benefit	Cost	Net outcome
	<p>Excluding non-intensively farmed stock such as beef cattle and sheep from rivers and riparian margins in the Valley Floor Area from 2020 will have significant environmental benefits as erosion of stream banks is considered to be the largest contributor of phosphorus loss. This measure will contribute significantly towards achieving freshwater outcomes including reducing microbial contamination (<i>E.coli</i>).</p> <p>A rule enabling the creation of a sediment retention basin and / or wetland at the head of the lake is intended to provide a clearer planning framework for an activity that would provide an environmental benefit, as it will absorb a portion of the phosphorus-rich sediment discharging into the lake and entrap this phosphorus within the wetland / sediment retention basin.</p> <p>The proposed provisions will better enable the water quality outcomes (Tables 10(a) and 10(b)) and limits for Lake Forsyth / Te Roto o Wairewa to be achieved, resulting in improved health and quality of Lake Forsyth / Te Roto o Wairewa.</p> <p>Bank stabilisation methods will not only improve the aesthetic values associated with the rivers, but it will improve the water quality and ecosystem health of these rivers.</p> <p>There are also likely to be benefits for surface water quality from policy seeking to minimise phosphorus and the volume of discharges from any reticulated wastewater system.</p> <p>Unless the requirement for resource consent is triggered, the benefits of policy 10.4.1(6) requiring that inundation of septic tanks by floodwaters be prevented will be small as in most cases existing, upgrading and installation of new septic tanks is</p>	No environmental costs are anticipated.	HIGH Environmental Benefit

	a permitted activity.		
Social	Methods to manage to limits have negligible social benefit in themselves (though meeting the outcomes and limits does carry a large social benefit as noted in Section 9.)	There are negligible social costs from implementing the provisions in Plan Change 6 to meet the water quality outcomes and limits	NEUTRAL Social Benefit
Cultural	Methods to manage to limits have negligible cultural benefit in themselves (though meeting the outcomes and limits does carry a large cultural benefit as noted in Section 9).	There are no anticipated cultural costs from these provisions.	NEUTRAL Cultural Benefit
Economic	<p>No direct economic benefit is expected from the proposed provisions in Plan Change 6 related to managing to the water quality outcomes and limits.</p> <p>However, there may be an economic benefit to the local rūnanga if water quality improves mahinga kai opportunities. Meeting the freshwater outcomes and limits through the management of phosphorus and sediment may potentially create jobs and employment in the local community, such as for a fencing contractor or planting businesses. The economic benefit of this has not been quantified and is difficult to estimate as it is unknown how many landowners may undertake these activities themselves, and how many may employ others to undertake the activities.</p> <p>In addition, managing phosphorus and sediment upstream of the lake will result in better water quality of the lake and rivers in the catchment. This may result in more contact recreation activities within or on these waterbodies, such as rowing regattas on the lake or more kayaking on the rivers. If contact recreation within the catchment increases, this would provide economic benefits to the local community. However, these benefits are hard to estimate and quantify.</p> <p>In summary, the potential for economic benefits resulting from Plan Change 6 are possible, but likely to be small.</p>	<p>There will be additional costs for landowners associated with excluding stock from waterways. These costs have been quantified as:</p> <ul style="list-style-type: none"> Costs borne by landowners associated with exclusion of all stock from waterways. This cost is estimated at \$27 per metre fencing for sheep (Hewson, 2014). The Valley Floor Area contains 27.86km of stream bank which equates to approximately \$752,220.00 to fence all the stream banks in the Valley Floor Area. The average stream bank length (per property) in the Valley Floor is 696m, which equates to approximately \$18,804 per property (assuming they all have stock on them). Note the above fencing costs are worst case and likely to be an over-estimate since they assume there is no fencing currently in the valley floor currently and permanent sheep fencing. In reality, there will be riparian margins where (a) no stock are present (so no costs are incurred) (b) stock may already be excluded (again no costs incurred) or (c) only cattle are present for which fencing costs are estimated at \$1/m (hotwire) rather than \$27/m. Costs borne by landowners (or other organisations) who choose to undertake bank stabilisation techniques. These range from \$14-35 per metre if undertaking planting and battering, or \$110-120 if 	MODERATE Economic Cost

		<p>undertaking anchored tree protection (Blakely, 2014). This would therefore equate to approximately \$390,000 to \$975,100 for the Valley Floor Area, or an average of \$9,751-\$24,377 per property.</p> <ul style="list-style-type: none"> Costs borne by landowners from the loss of productive land to riparian margins in the Valley Floor Area (5m from the bed of a river, lake or wetland or 10m in the small part of the Valley Floor Area that overlaps with the High Soil Erosion Risk Area on planning maps. This is shown in Figure 6) and cost of pest plant control in riparian margins as a result of stock being excluded from that land The value of production from riparian land has not been calculated and so this cost has not been quantified. However, off-setting this cost is that some parts of this land are subject to ongoing erosion, so in the longer term, the implementation of these rules may reduce the area of productive land lost or degraded. An estimated cost of \$400,000-\$800,000 has been estimated to construct a 15 ha sediment retention basin / wetland at the head of the lake. It is unknown who will bear this cost as it is not yet known who exactly will construct the basin / wetland, and how the funds will be obtained (i.e. privately or ratepayer funding). Significant costs to CCC of reticulating wastewater systems and installing phosphorus removal by 2016-19. However, the costs from Plan Change 6 would only relate to any additional costs to minimise phosphorus and the volume of wastewater, rather than the entire costs of the project (as Plan Change 6 does not require reticulation). Cost to individuals from policy sealing septic tanks to 	
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		<p>prevent inundation by flood waters.</p> <p>Overall it is not expected that these economic costs will create a significant negative impact on job opportunities or wider economic growth of the Lake Forsyth / Wairewa catchment.</p> <p>Overall, the relevant provisions in Plan Change 6 are not expected to reduce economic growth or employment.</p>	
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Overall Assessment of Efficiency

The environmental, social and cultural benefits of the new provisions are considered to outweigh the costs and overall the efficiency rating of Plan Change 6 is considered **moderate**.

9.4.1 Risk of Acting or Not Acting

With the exception of the Valley Floor Area stock exclusion rules, the other provisions in Plan Change 6 do not compel anyone to undertake any activity, or to modify their behavior. There is a risk that the positive actions that these actions are intended to enable are not implemented, despite Plan Change 6, in which case water quality is likely to continue remain in its current state.

However, the risk of not acting to encourage these key activities because of these uncertainties increases the risk of not achieving water quality outcomes for rivers and the lake.

9.4.2 Overall Assessment of Appropriateness and Reasons for Deciding on Provisions

Having regard to the above evaluation, it is Council's view that the provisions in Plan Change 6 for managing phosphorus, sediment and microbial contaminants are the most appropriate to achieve the objectives of the LWRP. The Council has decided to proceed with the Plan Change 6 provisions having considered the reasonably practicable options, and having assessed the efficiency and effectiveness of Plan Change 6 in achieving the objectives of the LWRP.

10 Managing Phosphorus within Lake Forsyth / Te Roto o Wairewa

10.1 Introduction

This section evaluates the appropriateness of the provisions of Plan Change 6 to manage existing phosphorus within Lake Forsyth / Te Roto o Wairewa, and to enable its artificial opening and closing.

10.1.1 Relevant Provisions within Plan Change 6

The relevant proposed changes in Plan Change 6 include:

Policies

- Policy 10.4.4 recognises the cultural values and enhance the ecological health Lake Forsyth / Te Roto o Wairewa, whilst maintaining flood control and land drainage functions, by three means: reducing the phosphorus and sediment load entering the lake; allowing investigations of legacy phosphorus issues in the lake and that facilitate its restoration; and providing for the artificial opening and closing of the lake.

Rules

- Rule 10.5.7 classifies the disturbance of the bed of Lake Forsyth / Te Roto o Wairewa as a permitted activity (subject to conditions) for the purpose of investigating legacy phosphorus.
- Rule 10.5.8 classifies non-compliance with one or more conditions of Rule 10.5.7 as a discretionary activity.
- Rule 10.5.9 classifies the artificial opening and closing of Lake Forsyth / Te Roto o Wairewa as a discretionary activity including ancillary activities: disturbing the bed and riparian margins, gravel extraction and deposition, diverting surface water and the discharge of water with sediment in it.

10.1.2 Relevant LWRP Objectives

All objectives in the LWRP are intended to be read in their entirety and no single objective has more importance than another (refer to Appendix 7). However the following objectives are considered particularly relevant to the assessments in this section:

- Objectives 3.1, 3.7 3.8, and 3.11

10.2 Reasonably Practicable Options

Three reasonably practicable options have been identified for managing existing phosphorus within the bed of Lake Forsyth / Te Roto o Wairewa to meet freshwater outcomes in surface water.

Table 12: Reasonably Practicable Options for Managing Phosphorus within Lake Forsyth / Te Roto o Wairewa

Option		Description
1	Status Quo (LWRP provisions)	<ul style="list-style-type: none"> The LWRP region-wide policies and rules would apply with no additional policies and rules introduced into the Lake Forsyth / Wairewa catchment
2	Plan Change 6	<p>LWRP provisions plus:</p> <ul style="list-style-type: none"> Policy to enable lake opening regimes that improve the ecological health and water quality of Lake Forsyth / Te Roto o Wairewa, and enhance biodiversity and mahinga kai. Policy direction to allow activities for the purpose of investigating legacy phosphorus issues to facilitate lake restoration. Additional rules (permitted activity and discretionary activity status) which allow the disturbance of the bed of Lake Forsyth / Te Roto o Wairewa, including deposition or discharge, if undertaken for the purposes of investigating legacy phosphorus. A rule classifying activities associated with lake opening or closing as a discretionary activity.
3	Alternative solutions package	<p>As Option 2 except:</p> <ul style="list-style-type: none"> Additional rules (permitted activity then controlled activity) for in-lake investigations. The permitted activity rule would focus on handheld devices whilst the controlled activity would focus on mechanical devices; and Additional rule to allow for lake opening regimes as a restricted discretionary. This would cover all the activities associated with the lake opening, except for those under the ambit of the Regional Coastal Plan.
<p>Note: Proposed Plan Change 4 (Omnibus) also includes a new Rule (5.140A) that allows equipment or devices to be used on lake beds for monitoring, measuring or sampling as a permitted activity that may also be beneficial.</p>		

Option 1: LWRP provisions

The policies and rules regarding in-lake investigations, and lake opening regimes would apply within the Lake Forsyth / Wairewa catchment.

Relevant policies in the LWRP include:

- Damming, diversion or taking of water in coastal lakes is limited to that associated with maintaining infrastructure, pest management, or habitat restoration or enhancement work, or artificial opening of hapua to assist in fish migration (Policy 4.43).
- Small-scale diversions of water within the bed of lakes are provided for when part of certain activities such as investigations (Policy 4.47);
- Any take, use, damming or diversion of water and land use activities such as earthworks and planting, do not adversely affect the significant values of hapua and coastal lakes, except for the artificial opening of coastal lakes to assist in fish migration (Policy 4.81)
- Enhancing water quality, indigenous biodiversity and ecosystem health in lakes through establishing or restoring riparian planting (Policy 4.85)

Relevant rules in the LWRP include:

- The taking and use of surface water is a restricted discretionary activity (Rule 5.123).
- Vegetation clearance and earthworks on land within 10 m of the bed of a lake, river or wetland (in Hill and High Country Land shown as High Soil Erosion Risk) or within 5 m (in all other land), is a restricted discretionary activity (Rule 5.169).
- Deposition, excavation and disturbance of bed would be a discretionary activity (Rule 5.150).

Option 2: Plan Change 6

Option 2 would include a new policy that specifically require artificial opening of the lake to recognise cultural values held by Ngāi Tahu and enhance the ecological health of the lake, whilst maintaining flood control and land drainage functions. A new rule would support artificial opening of the lake by allowing gravel extraction, disturbing the bed of the lake and its riparian margin, deposition of substances and discharge of sediment laden water as a discretionary activity.

Additional policies and rules would allow as a permitted activity (subject to conditions) in-lake field investigations to reduce existing (legacy) phosphorus in the lake bed sediments. This would be a discretionary activity where any condition is not met.

Option 3: Alternative solutions package

Option 3 is very similar to Option 2 but differs in two respects:

First, Option 3 would include a new rule on artificial lake opening and closing for Lake Forsyth / Te Roto o Wairewa as Option 2, except the rule would group all the activities associated with a lake opening regime (take and use of surface water, damming, earthworks and structures) into one rule and allow for this as a “restricted discretionary” activity, provided the lake opening was undertaken for the benefit of improving the ecological health, water quality, or mahinga kai opportunities, or for flood control or land drainage purposes. Council discretion would be restricted to effects on mahinga kai, which would assess the timing of the opening on fish migration; effects on other cultural values; effects on ecological health of the lake; effects on bird life, and effect on the drainage of surrounding land.

Secondly, there would be two new rules supporting in-lake investigations into legacy phosphorus issues. A “permitted activity” rule would allow in-lake investigations if they were undertaken with a handheld device. This would allow for small investigations that aren’t expected to adversely affect the lake environment. A “controlled activity” rule would allow in-lake investigations if undertaken by a mechanical device. Matters for Council control would be limited to the duration and extent of the investigations, and their purpose.

Options Assessment

Although Option 1 would be the easiest and most cost-effective to implement (i.e. continuing to rely on LWRP provisions), it may not be as enabling of investigations to reduce the legacy phosphorus in the lake to improve its ecological and cultural health as Plan Change 6. Option 1 is not preferred for these reasons.

At face value, Option 3 is appealing in that it bundles all the requirements for a lake opening and closing regime together as a restricted discretionary activity rule and provides specific policy direction to ensure decision makers provides for Ngāi Tahu cultural values when artificially opening or closing the lake.

However, it should be noted that “non-complying” resource consent is still required under the Regional Coastal Environmental Plan to open the lake to the sea. In addition, restricted discretionary activity status assumes that all

potential environmental effects can be foreseen. This is a risk given the complexities of the lake environment, and the range of activities associated with lake opening and closing.

Providing a rule framework in Option 3 based on hand-held investigation devices being a permitted activity and mechanical devices a controlled activity is too narrowly focused as many investigations are likely to involve a range of methods and other activities.

On balance, Option 2 is preferred. In respect of the lake opening regime, the LWRP contains a variety of relevant rules with the status ranging from restricted discretionary to non-complying (see description of Option 1 above). A single rule under Option 2 that allows the lake to be artificially opened and closed (including ancillary activities) as a discretionary activity strikes an appropriate balance between simplifying the consenting process whilst retaining discretion over all potential environmental effects from lake opening and closing.

Past research shows that to restore aquatic plants to the lake and reduce the toxic algal blooms in the lake, legacy phosphorus in the lake bed sediments must be reduced or prevented from being re-released into the water column. This also requires control over lake levels and marine ingress which affects salinity, nutrient concentrations, flushing and sediment re-suspension. The timing and degree of saline intrusions also affects the establishment of aquatic plants such as *Ruppia* which grow in brackish water (Schallenberg, 2013).

The permitted activity rule for lake investigations under Option 2 provides certainty for organisations wishing to undertake relevant and practical research specifically into the management of legacy phosphorus in Lake Forsyth / Te Roto o Wairewa. The proposed Rule 5.140A in Plan Change 4 (Omnibus) would provide for investigations for other purposes as a permitted activity.

Therefore, Option 2 is considered the most appropriate and effective for managing legacy phosphorus in the lake, lake restoration and an effective lake opening regime.

10.3 Effectiveness

The following table assesses the effectiveness of Plan Change 6 for managing phosphorus in the bed of Lake Forsyth / Te Roto o Wairewa against the particularly relevant LWRP objectives identified in section 9.1.1. See section 7.2 for an explanation of the assessment methodology.

Table13: Effectiveness of Variation 6: Managing Phosphorus within Lake Forsyth / Te Roto o Wairewa

Objective	Provisions
<p>3.1</p> <p>Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water</p>	<p>The proposed framework in Plan Change 6 will ensure that Lake Forsyth / Te Roto o Wairewa is managed in a way that recognises the cultural significance of the lake to Ngāi Tahu. The provisions specifically recognise the benefits of a lake opening regime to Ngāi Tahu. This is particularly important as an effective opening regime will increase the mahinga kai opportunities within the lake which were once abundant.</p> <p>The provisions on lake restoration activities will support Ngāi Tahu to achieve its goal to enhance and restore the lake.</p>
<p>3.7</p> <p>Freshwater is managed prudently as a shared resource with many in-stream and out-of-stream values</p>	<p>Plan Change 6 will help to improve the in-stream ecological values associated with Lake Forsyth / Te Roto o Wairewa as the provisions will enable activities (lake opening and closing and lake investigations) that will address legacy phosphorus issues, or inform future actions to do so.</p>
<p>3.8</p> <p>The quality and quantity of water in fresh water bodies and their</p>	<p>The provisions within Plan Change 6 are designed to improve the water quality and ecosystem health of Lake Forsyth / Te Roto o Wairewa by supporting investigations on how best to address the existing (legacy) phosphorus in lake bed</p>

<p>catchments is managed to safeguard the life-supporting of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioral requirements of indigenous species, nesting birds and, where appropriate, trout and salmon</p>	<p>sediments. This existing phosphorus is thought to be causing summer algal blooms which negatively affects aquatic and bird ecosystems. The provisions about future investigations will better enable future restoration activities, and lake opening and closing which will improve water quality to better support ecosystems and habitats. In addition, the lake opening and closing provisions are intended to support the passage of tuna (eels) which migrate up the lake from the sea.</p> <p>The provisions within Plan Change 6 will therefore contribute positively to achieving this objective for the Lake Forsyth / Wairewa catchment.</p>
<p>3.11</p> <p>Water is recognised as an enabler of the economic and social well-being of the region</p>	<p>The accumulated phosphorus on the bed of Lake Forsyth / Te Roto o Wairewa is causing the water to become polluted with toxic algal blooms. This makes the water unsuitable for abstraction for drinking by people and stock or dogs, and creates a health risk for recreational users of the lake as some toxins can make people and animals ill, with reported cases of animal deaths.</p> <p>The provisions in Plan Change 6 aim to improve the quality and health of the lake by allowing investigations and providing greater certainty about the planning framework for lake opening and closing activities.</p> <p>The provisions in Plan Change 6 therefore contribute positively to achieving this objective.</p>

Overall Rating of Effectiveness

The overall effectiveness rating of Plan Change 6 in relation to removing or neutralising accumulated phosphorus on the bed of Lake Forsyth / Te Roto o Wairewa is considered **moderate** on the basis that the plan change encourages lake investigations to inform future decision-making about actions to improve lake water quality and improve the certainty about the planning framework for lake opening and closing.

10.4 Efficiency

The following table assesses the efficiency of provisions in Plan Change 6 in removing or neutralising existing phosphorus in the bed of Lake Forsyth / Te Roto o Wairewa. See section 7.1 for an explanation of the assessment methodology.

Table 14: Efficiency of Plan Change 6: Managing Phosphorus within Lake Forsyth / Te Roto o Wairewa

	Benefit	Cost	Net outcome
Environmental	<p>Evidence from water quality monitoring in the last 5 years indicates that lake openings are having a positive effect on water quality in the lake. Plan Change 6 supports the ongoing active management of lake opening and closing through policy and a rule. A high environmental benefit is expected from the provisions for Plan Change 6 facilitating artificial opening and closing of the lake to help “flush” sediment out to sea and control lake levels in the summer to support the re-establishment of aquatic plants.</p> <p>A moderate environmental benefit is expected from the provisions in Plan Change 6 facilitating investigations into legacy phosphorus issues. Investigations will help inform future decisions about how best to reduce or neutralise phosphorus on the bed of Lake Forsyth / Te Roto o Wairewa. Combined with management of lake openings and water levels, this is expected to reduce the TLI and enable NPSFM national bottom lines for “attributes” TN, TP and Chlorophyll a to be met. This will also reduce the occurrence of the algal blooms which occur in the lake each summer.</p>	No environmental costs are anticipated.	HIGH Environmental Benefit
Social	<p>A high social benefit is expected to arise from improving the current water quality and ecosystem health of Lake Forsyth / Te Roto o Wairewa, associated with enabling lake opening and assisting future decision making through allowing investigations.</p> <p>Improvements to the quality of the freshwater environment will provide enhanced opportunities for recreational use. The toxic algal blooms means the community cannot</p>	There are no social costs anticipated.	HIGH Social Benefit

	currently use the lake for recreational activities (i.e. kayaking or rowing which used to occur on the lake) or even allow animals to swim or drink from the lake. The social benefit of improving the quality of the lake will be significant. Impacts on the aesthetics of the lake (i.e. weeds and algal blooms) are likely to encourage greater swimming, fishing and picnicking, and other lake uses particularly considering the popular Rail Trail is nearby.		
Cultural	The provisions in Plan Change 6 that facilitate the removal or neutralisation of existing phosphorus on the bed of Lake Forsyth / Te Roto o Wairewa, and artificial lake opening regime, will contribute to cultural values of the lake, particularly by improving mahinga kai opportunities. Eels (tuna) are particularly important in this catchment and the proposed provisions are an important element of a wider package of statutory and non-statutory measures that provide better water quality and ecosystem health of Lake Forsyth / Te Roto o Wairewa, therefore providing a better environment for eels (tuna). In addition, the lake opening regime will improve the passage of fish between the lake and the sea.	There are no anticipated cultural costs from these provisions	MODERATE Cultural Benefit
Economic	Permitted activity provisions will facilitate in-lake investigations without the need to obtain consents. This will lessen the cost of investigations. There may also be an economic benefit to the rūnanga given that as water quality improves mahinga kai opportunities should also improve.	There are no additional economic costs from these provisions as Plan Change 6 does not compel anyone to undertake investigations or to open or close the lake, and should reduce uncertainty associated with the regulatory framework for these activities. The costs associated with the lake opening regime are not considered to be high as the canal and groyne have previously been constructed. The costs to maintain the lake opening cannot be quantified at this time but it is noted that this is not a regulatory action imposed on a certain landowner. It is instead a measure that Wairewa Rūnanga and CCC proposes to undertake in the future, and Plan Change 6 is a mechanism to support and encourage this lake opening regime for mahinga kai and environmental benefits.	LOW Economic Benefit

		<p>The cost of in-lake investigations cannot be quantified as it is not known exactly what these may entail or the scale of the activities. Again, these measures are not imposed on landowners or organisations by Plan Change 6, instead, Plan Change 6 enables these measures to be implemented by people or organisations if they wish to in the future.</p> <p>Overall, the relevant provisions in Plan Change 6 are not expected to reduce economic growth or employment.</p>	
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Overall Assessment of Efficiency

The environmental, social and cultural benefits of the new provisions are considered to outweigh the costs and overall the efficiency rating of Plan Change 6 is considered **moderate to high**.

10.4.1 Risk of Acting or Not Acting

The Plan Change 6 provisions seek to reduce existing phosphorus levels in Lake Forsyth / Te Roto o Wairewa by including provisions which encourage lake restoration, in-lake investigations and an effective artificial lake opening and closing regime. Collectively, these activities will improve the quality of the lake.

The main risk is that Plan Change 6 relies on people undertaking environmental improvement works voluntarily, so in theory they may not happen. However, there is evidence that with Zone Committee support, Councils and Wairewa Rūnanga will act, as evidenced by their joint involvement in lake opening.

Therefore, not acting to encourage actions to reduce existing phosphorus levels in the lake through provisions in Plan Change 6 because of these uncertainties increases the risk that freshwater outcomes and limits for the lake are not achieved.

10.4.2 Overall Assessment of Appropriateness and Reasons for Deciding on Provisions

Having regard to the above evaluation, it is Council's view that the provisions in Plan Change 6 for addressing the existing phosphorus accumulated on the bed of Lake Forsyth / Te Roto o Wairewa are the most appropriate to achieve the objectives of the LWRP. The Council has decided to proceed with the Plan Change 6 provisions having considered the reasonably practicable options, and having assessed the efficiency and effectiveness of Plan Change 6 in achieving the objectives of the LWRP.

11 Environmental Flow and Allocation Limits for Rivers

11.1 Introduction

This section evaluates the appropriateness of Plan Change 6 with regard to water quantity limits for rivers in the Wairewa catchment.

Only water quantity limits in respect to surface water within the catchment have been considered but there are important interrelationships for managing both surface water and groundwater limits.

11.1.1 Relevant Provisions within Plan Change 6

The relevant proposed changes in Plan Change 6 include:

- Environmental flow and allocation limits, and restriction regimes for the Okana, Okuti and Takiritawai Rivers and their tributaries (Table 10(c)).

11.1.2 Relevant LWRP Objectives

All objectives in the LWRP are intended to be read in their entirety and no single objective has more importance than another (refer to Appendix 4). However the following objectives are considered particularly relevant in this assessment:

- Objectives 3.1, 3.8, 3.11 and 3.12

11.2 Reasonably Practicable Options

Three reasonably practicable options have been identified for managing to environmental flow limits for rivers within the Lake Forsyth / Wairewa catchment.

Table 15: Reasonably Practicable Options for Managing to Environmental Flow Limits for Rivers in the Lake Forsyth / Wairewa Catchment

Option		Description
1	Status Quo (LWRP provisions)	<ul style="list-style-type: none"> • Environmental flow and allocation limits currently in Rule 5.123 for surface water would be applied • Minimum flow restrictions would apply to stream depleting groundwater takes as per LWRP Rule 5.128 • Rules 5.111 to 5.115 on small and permitted water takes • Existing provisions for Flow Sensitive Catchments applied to Okuti and Okana rivers and Police Stream
2	Plan Change 6 – revised minimum flows	LWRP region-wide rules on take and use of surface water plus: <ul style="list-style-type: none"> • Revised environmental flow (minimum flow and partial restrictions) added for the Okuti River, Okana River and Takiritawai River and their tributaries.
Both Options 1 and 2 would manage groundwater through the region-wide provisions of the LWRP (Note that there is no Groundwater Allocation Zone in the Lake Forsyth / Wairewa catchment). Accordingly, no further evaluation of groundwater limits is undertaken in this report.		

Option 1

The environmental flow limits under Option 1 would be as per Rule 5.123 of the LWRP. Rule 5.123 classifies the taking and use of surface water as a restricted discretionary activity provided specified conditions are met. Condition 2 states that unless the proposed take is the replacement of a lawfully established take, where no limits are set, the take shall itself and cumulatively with other takes meet a flow regime with a minimum flow of 50% of the 7-day mean annual low flow (7DMALF) and an allocation limit of 20% of the 7DMALF. Applications for replacement water permits would be assessed on a case-by-case basis without any specific direction in the LWRP as to appropriate minimum flow limits.

For completeness, Section 10 of the LWRP already classifies the Okuti River, Okana River and Police Stream catchments as Flow Sensitive Catchments. This status is not proposed to be changed under Plan Change 6 as it supports achieving the environmental flow limits. Flow-sensitive catchments are catchments where there is potential for afforestation to intercept rainfall runoff and significantly reduce stream flows. LWRP Rules 5.72 to 5.74 apply to these catchments. Re-planting of existing forest is permitted, but new areas of forest require resource consent and there are limits on the percentage of the catchment that can be planted and reductions in the 7DMALF and mean flow that are allowed.

Option 2

Option 2 proposes that the Okana, Okuti and Takiritawai Rivers contain a minimum flow of 90% 7DMALF and allocation of 30% 7DMALF, along with restrictions that require reductions in take as flows approach the minimum flows. Under Option 2, replacement consents and new consents (except for community water supply) would be subject to the regime in Table 10(c).

Options Assessment

Minimum flows are critical as low flows can put stream ecology under stress, particularly small streams such as those in the Lake Forsyth / Wairewa catchment. Partial restrictions on takes as flows approach minimum flows also contribute to alleviating stress on stream ecology.

The flow regime in Option 1 is a region-wide default regime until catchment-specific environmental flow regimes are introduced, by way of a plan change into sections 6-15 of the LWRP. The LWRP default regime in Rule 5.123 was based on modelling work by NIWA that focused on mid to large rivers (e.g. the Clarence River was the key river modelled) and had no particular case studies in Banks Peninsula streams.

Option 1 is easy to implement and would provide certainty to the few consent holders in the catchment, but in-stream values associated with water reducing low flows, would not improve.

The LWRP default regime provides for very high reliability for users but only a limited allocation (20% 7DMALF). In the Okuti catchment there would be only another 3 L/s available for allocation and in the Okana another 18.5 L/s. If the catchment became fully allocated and all consents were exercised there is high chance that the Okuti and Okana would be drawn down below the 7DMALF level and lower than current levels with potential for negative impacts on ecological values.

Under Option 2, the rivers within the Lake Forsyth / Wairewa catchment would have a flow and allocation regime (rather than have a generic default under the LWRP) broadly based on the proposed NES on Ecological Flows¹⁰ (Davie and Gray, 2014). As stated earlier in this report, the Okana and Okuti Rivers have significant biodiversity values including spawning sites for lamprey (kanakana). Option 2 has therefore taken an approach to design minimum flows

¹⁰ Proposed NES on Ecological Flows and Water Levels (Ministry for the Environment, 2008)

for these waterbodies that provides for at least some flow to be able to pass down the catchment during low flow periods (i.e. the summer months)

The minimum flows do not protect full connectivity along the length of the rivers (because this would not have occurred naturally) but provides for a wet refuge habitat at the bottom of the catchments that is appropriately related to the conditions that would typically occur during the driest period of each year (i.e. as approximated by the 7DMALF flow). The refuge provided by the minimum flows will be smaller and less reliable than would naturally have occurred, due to the significant abstraction volume occurring below the minimum flow, but the minimum flow provides at least some security that some wet refuge habitat will exist each year, compared to the case where there is no minimum flow (Clarke & Gray 2014).

Overall, Option 2 is more favourable due to the following factors;

- The proposed flow and allocation regime in Option 2 will give an adequate level of protection to the species resident in the Wairewa catchment streams, which are known to have high ecological values.
- The proposed flow and allocation regimes in Option 2 would lower reliability of supply for existing water users but this is a low water use area, without extensive irrigation. It is likely the reliability could be considerably improved for the existing surface water take with small scale on-farm storage.
- The proposed flow and allocation regime in Option 2 would allow more water to be allocated than the status quo LWRP regime (albeit with lower reliability) which would allow for a small amount of further development and/or adaptation for climate change by water users.

11.3 Effectiveness

The following table assesses the effectiveness of the Environmental Flow Limits in Plan Change 6 against the particularly relevant LWRP objectives identified in section 4.1.1. See section 7.2 for an explanation of the assessment methodology.

Table 16: Efficiency of Plan Change 6: Environmental Flow and Allocation Limits

Objective	Provisions
<p>3.1</p> <p>Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water</p>	<p>The setting of water quantity limits has taken into account the economic, cultural, social and environmental values of the catchment and is considered to manage natural resources in an integrated way.</p> <p>Overall, it is considered that the water quantity limits in Plan Change 6 will contribute positively to achieving this Objective.</p>
<p>3.2</p> <p>Water management applies the ethic of ki uta ki tai - from the mountains to the sea - and land and water are managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between fresh water, land and the coast.</p>	<p>The provisions are a package that will improve connectivity between surface water and groundwater, and between freshwater, land and the coast. This implements the ethic of ki uta ki tai by recognising that all of the systems in Lake Forsyth / Te Roto o Wairewa are interconnected to one another.</p> <p>Overall, the environmental flow and allocation limits in Plan Change 6 contribute positively to achieving this objective.</p>
<p>3.7</p> <p>Fresh water is managed</p>	<p>Rivers in the catchment suffer from low flow issues. Allowing the current environmental flows to continue would continue to impact on the in-stream</p>

prudently as a shared resource with many in-stream and out-of-stream values	<p>values of the rivers. The new environmental flow limits contained in Plan Change 6 will ensure in-stream and out-of-stream values are managed as a shared resource.</p> <p>Therefore, the water quantity limits in Plan Change 6 contribute positively to achieving this objective.</p>
<p>3.8</p> <p>The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon</p>	<p>To achieve safeguarding the life-supporting capacity of ecosystems and ecosystem processes, the minimum flows have been set at 90% 7DMALF.</p> <p>The change in the flow regime is designed to reduce the stress that in-stream values have been under as a result of abstraction, and to incentive alternative sources.</p> <p>When the regime is fully implemented, it will more closely reflect the natural flow pattern of the waterbodies, which should in turn will better support the ecosystems and ecosystem processes than the current regime.</p> <p>Overall, in time the water quantity limits in Plan Change 6 will contribute positively to achieving this Objective.</p>
<p>3.12</p> <p>When setting and managing within limits, regard is had to community outcomes for water quality and quantity</p>	<p>The limits will meet all of the community outcomes. In particular, it will contribute positively to achieving outcomes seeking to achieve healthy rivers that are not subject to low flow issues. However, the limits would, if imposed on replacement consent, impact on reliability of supply for the affected consent holders (as detailed in section 5).</p> <p>Overall, the flow and allocation limits in Plan Change 6 will contribute positively to achieving this Objective.</p>

Overall Rating of Effectiveness

The overall effectiveness rating of Plan Change 6 in relation to environmental flow and allocation limits is considered **moderate** on the basis they are designed to protect in-stream values. There may be a small economic impact for the very few consent holders, but these could potentially be offset by small-scale on-farm storage.

11.4 Efficiency

The following table assesses the efficiency of provisions in Plan Change 6 in achieving Environmental Flow Limits. See section 7.2 for an explanation of the assessment methodology.

Table 17: Efficiency of Plan Change 6: Environmental Flow and Allocation Limits

	Benefit	Cost	Net outcome
Environmental	<p>There is a moderate environmental benefit in the Lake Forsyth / Wairewa catchment through the altered flow regime. This benefit arises for waterways that do not currently have minimum flows set specifically for these rivers in the LWRP, and will do so through Plan Change 6.</p> <p>It is anticipated in time that these rivers and their tributaries will experience improved habitat for native fish (such as kanakana) and invertebrates, and slight improvement for tuna habitat, as a result of more suitable minimum flows, in combination with other aspects of Plan Change 6 and non-statutory measures.</p> <p>Overall, the environmental flow regime in Plan Change 6 will deliver positive environmental benefits by ensuring the waterways are not subject to low flows which may adversely affect their ecosystem health.</p>	There is a no environmental cost from water quantity (low flow) limits.	MODERATE Environmental Benefit
Social	<p>A small social benefit is anticipated from the environmental flow limits in Plan Change 6. This benefit is expected to arise from a small increase in the recreational use of the Okana, Okuti and Takiritawai Rivers resulting from a reduction in summer low flows.</p>	There are no anticipated social costs from the environmental flow limits in Plan Change 6.	LOW Social Benefit
Cultural	<p>A medium cultural benefit as a result of the flow regime as proposed in Plan Change 6 as minimum flows will increase. Increasing the minimum flows should:</p> <ul style="list-style-type: none"> • Enable tangata whenua to make greater use of the waterbodies in the area for mahinga kai (relative to current use); and • Better recognise the place of the tangata whenua as kaitiaki for the Lake Forsyth / Wairewa catchment; and 	Other than recognising that the limits will not change immediately for existing consent, there are no anticipated cultural costs from the environmental flow limits in Plan Change 6.	MODERATE Cultural Benefit

Economic	<ul style="list-style-type: none"> Better recognise the ethic of ki uta ki tai – from the mountains to the sea. <p>There is potential for a small economic benefit from the minimum flows in Plan Change 6 in that more water would be available for abstraction, albeit with lower reliability.</p>	<p>The environmental flow regime for the rivers in the Lake Forsyth / Wairewa catchment may result in medium costs for existing abstractors. These costs may be incurred if abstractors change to alternative water sources (e.g. deep groundwater or build a water storage facility) as a result of higher minimum flows being imposed. This cost is estimated to be low due to the number of abstractors in the catchment - two surface water (one of which is for CCC community supply) and five groundwater abstractions.</p> <p>The water within the catchment is largely abstracted for stock water purposes, or drinking water purposes. These uses are exempt from minimum flows and will not be affected by the proposed amendments. In addition, LWRP rules 5.111 to 5.115 allow small volumes of surface water and groundwater to be taken without resource consent as a permitted activity.</p> <p>Overall, the relevant provisions in Plan Change 6 are not expected to reduce economic growth or employment.</p>	<p>LOW Economic Cost</p>
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Overall Assessment of Efficiency

The environmental, social and cultural benefits are considered to outweigh the costs and overall the efficiency rating of Plan Change 6 is considered to be **moderate**.

11.4.1 Risk of Acting or Not Acting

The risk of not acting is that the surface waterbodies in the Lake Forsyth / Wairewa catchment continue to suffer from low flows and that environmental, social (recreational) and cultural outcomes continue not to be met. Plan Change 6 addresses this risk.

11.4.2 Overall Assessment of Appropriateness and Reasons for Deciding on Provisions

Having regard to the above evaluation, it is Council's view that the Environmental Flow Limits in Plan Change 6 are the most appropriate to achieve the objectives of the LWRP.

The Council has decided to proceed with the Plan Change 6 environmental flow limits having considered the other reasonably practicable option of staying with the region-wide limits, and having assessed the efficiency and effectiveness of the Plan Change 6 in achieving the objectives of the LWRP.

12 Glossary

Cyanobacteria – Cyanobacteria are also known as blue-green algae and are a group of bacteria that obtain their energy through photosynthesis. Cyanobacteria can be found in almost every terrestrial and aquatic habitat including fresh water, oceans, damp soil, bare temporarily moistened rocks and even hot springs. They play an important role in the global carbon and nitrogen budgets, being able to fix nitrogen gas from the atmosphere into ammonia and nitrates that are then available as nutrients to plants. However they can also form nuisance and toxic mats on the beds of rivers and scums on the surface of lakes, degrading habitat for other aquatic life and reducing amenity and recreation values for people. In recent years toxic cyanobacteria mats have periodically appeared in several Canterbury hill-fed rivers (including the South Coastal Canterbury Area) and have, when eaten, caused the deaths of dogs.

Dissolved oxygen (DO) – the amount of oxygen that is dissolved in water (DO) is an important measure of water quality because oxygen is needed by aquatic invertebrates and fish to respire and thus survive. DO is typically measured in the units mg/L or as the percentage saturation. DO can be depleted to levels that are harmful to aquatic life by excessive decomposition of organic matter and/or nutrient pollution leading to algae or macrophyte blooms.

E. coli (Escherichia coli) - A type of bacteria that indicates the presence of faecal contamination and the risk of exposure to pathogens.

Intermittency – An intermittent river (or intermittent reach of a river) only has surface water flow for some of the time. Intermittent rivers are typically found in regions with limited or highly variable rainfall, or can occur where a highly permeable river bed loses flow to groundwater. Typically some flow in intermittent rivers occurs beneath the surface of the river bed (even when there is no surface flow).

Lowland stream/spring - Rivers whose flow is dominated by the contribution from lowland areas. These generally comprise a low gradient shallow single thread channel. The flow generally covers the bed. Source of flow ranges from rainfall to solely springfed from groundwater. The proportion of groundwater flow generally increases in lower reaches. Rainfall dominated streams show a very strong seasonal pattern of flows, with the highest flows in winter when precipitation is highest. Tributaries or sections of the main stem may be dry for part of the year. Spring-fed streams may show little seasonality with regular year round flows. The flow regime can be modified by irrigation.

Macrophyte – A rooted aquatic plant that may be emergent (i.e. protruding above the water surface), submerged or have floating leaf parts.

Manawhenua - Those who exercise customary authority or rangatiratanga.

Mahinga kai - Food and places for obtaining natural foods and resources. The work (mahi), methods and cultural activities involved in obtaining food and resources.

MALF7d (Mean annual 7 day low flow) – A commonly used statistic that indicates the lowest flow that typically occurs for a 7 day period in a year. Calculated as the mean of the lowest seven day moving average flow (ALF) for each year of record.

Minimum flow - The flows at which abstractions must cease, except for domestic needs, drinking water for animals and fire fighting. Minimum flows are set to prevent abstractions reducing rivers to very low flows.

NES (Proposed National Environmental Standard on Ecological Flows and Levels Discussion Document). This document recommends interim limits of: minimum flow 90%MALF; allocation 30% MALF – see Proposed National Environmental Standard on Ecological Flows and Water Levels: Discussion Document | Ministry for the Environment.

Nitrate-N – Water soluble and oxidised inorganic form of nitrogen that is readily available for plant uptake and constitutes a large proportion of the nitrogen that is lost from land.

Phytoplankton blooms –blooms of microscopic algae that live floating or suspended in the water.

Periphyton – Algae that live attached to surfaces such as a stream bed.

QMCI (Quantitative Macroinvertebrate Community Index) – The QMCI is a measure of general stream ecological health. Although the index was initially developed to measure the response of the benthic macroinvertebrate community to water quality impairment caused by organic pollution, it has also been used widely to provide an indication of general stream ecological health. As an indicator of stream health, the LWRP set numerical QMCI targets for hill-fed rivers and spring-fed streams of 5.0-6.0 and 4.5-5.0, respectively.

SFRG (Suitability for Recreation Grade) – The SFRG is a grading system published in national guidelines for assessing the suitability of a waterway for contact recreation. The grade (SFRG) is derived from both E. coli data and a sanitary inspection assessment, with grades ranging from “very good” to “very poor” (MfE/MoH, 2003). SFRG grades for hill-fed rivers and spring-fed streams have been set in LWRP outcomes and range from “good” to “no value set”, respectively - see Kelly 2015; Appendix 7)

TN – Total nitrogen – Includes all forms of nitrogen including inorganic (nitrate, nitrite and ammonia) and organic forms of nitrogen.

TP – Total Phosphorus – Includes all forms of phosphorus including dissolved reactive phosphorus (DRP) and particulate phosphorus.

Trophic Level Index (TLI) - A classification system to indicate the nutrient status and productivity of New Zealand lakes. It ranges from <1 (almost pure water) to >7 (highly nutrient enriched)

13 References

The References below can be found on the following website www.ecan.govt.nz/lwrrp-v6

Additional references:

Banks Peninsula Zone Committee (2014). Wairewa ZIP Addendum November 2014. Environment Canterbury Report No. R14/105 ISBN 978-0-908316-03-8 (Hard copy) ISBN 978-0-908316-04-5 (Web).

Banks Peninsula Zone Committee (2012). Banks Peninsula Zone Implementation Programme. Environment Canterbury Report No. R13/6 ISBN 978-1-927234-29-7 (Hard copy) ISBN 978-1-927234-30-3 (Web).

Biggs B.J. (2000) New Zealand periphyton guideline: detecting, monitoring and managing enrichment in streams. Prepared for the Ministry of the Environment, NIWA, Christchurch.

Blakely, R. (2014) Lake Forsyth / Wairewa Sediment Management: Treatment methods for river and stream sediment sources. Prepared for Environment Canterbury by Restorationz.

Cranwell, I. (2011) Statement of Evidence as part of hearing of Canterbury Regional Policy Statement.

Cranwell, I., Jolly, D. (2014). Ngai Tahu Cultural Evaluation Report: An evaluation of proposed options for the Wairewa catchment against Ngai Tahu desired outcomes. Prepared for Environment Canterbury.

Davie, Tim (2015) Environment Canterbury Memorandum: Phosphorous Loads to Lake Forsyth.

Davie, Tim (2015a) Environment Canterbury Memorandum: Nitrogen limits in Wairewa streams

Davie, T., Gray, D. (2014). Environment Canterbury memorandum to Banks Peninsula Zone Committee: Options for flow allocation in Wairewa catchment.

Environment Canterbury (2013) Canterbury Regional Policy Statement 2013. Report Number: R14/22. ISBN: 978-1-927299-07-4 (hard copy), ISBN: 978-1-927299-08-1 (web), ISBN: 978-1-927299-09-8 (cd). Environment Canterbury 2013.

Environment Canterbury (2011) Canterbury Natural Regional Resources Plan 2011. Report No. R11/19. ISBN: 978-1-927161-16-6 (hard copy), ISBN: 978-1-927161-17-3 (electronic). Environment Canterbury 2013.

Gray, D (2013). Stream ecology in tributaries of Wairewa/Lake Forsyth. Prepared for Environment Canterbury.

Hewson, D. (2014). Sediment Management Options for Hill Slopes in the Lake Forsyth / Te Roto o Wairewa Catchment. Prepared for Environment Canterbury by Opus Consultants Ltd.

Hughey, K. (2014). Wairewa / Lake Forsyth – wetland bird management issues. Prepared for Environment Canterbury by Department of Environmental Management, Lincoln University.

Lynn, I.H. (2013). Sediment sources in the Wairewa catchment. Technical report for Environment Canterbury. Report No. R13/103. ISBN: 978-1-927274-74-3(print) 978-1-927274-77-4 (web).

Mahaanui Iwi Management Plan 2013 ISBN: 978-0-473-23667-0

Main, M. R., Lavender, R.M., Hayward, S. (2003). The Okana River: assessment of water quality and ecosystem monitoring, July 1992 to May 2002 and water quality implications for Lake Forsyth/Wairewa. Report No. U03/20.

McDowell, R.W., Nash, D. (2012). A review of the Cost-Effectiveness and Suitability of Mitigation Strategies to Prevent Phosphorus Loss from Dairy Farms in New Zealand and Australia.

Ministry for the Environment (2014) The National Policy Statement for Freshwater Management 2014. Issued by notice in gazette on 4 July 2014.

Ministry for the Environment (2009) New Zealand Guidelines for Cyanobacteria in Recreational Waters: Interim guidelines. ME 981. 978-0-478-33249-0 (print) 978-0-478-33250-6 (electronic).

Ministry for the Environment (2008) Proposed National Environmental Standard on Ecological Flows and Water Levels. Discussion Document. ISBN: 978-0-478-30213-4 (print), 978-0-478-30214-1 (electronic). Publication number: ME 868.

Ngāi Tahu (1990) Te Whakatau Kaupapa - Ngāi Tahu Resource Management Strategy for the Canterbury Region 1990 (Reprinted 1992).

Resource Consent Application (2015) Artificial Opening of Wairewa/Lake Forsyth. Wairewa Rūnanga Incorporated and Christchurch City Council (Consent application numbers: CRC134847, CRC134849, CRC134864, CRC135050).

Schallenberg, M., Schallenberg, L.A. (2013). Lake Forsyth / Wairewa: A literature review. Environment Canterbury technical report prepared by Hydrosphere Research Ltd. Technical Report. Report No. R13/106. ISBN 978-1-927274-93-4 (print) 978-1-927274-94-1 (web).

Painter, D (2014). Reducing sediment input to Te Roto o Wairewa / Lake Forsyth. Environment Canterbury Technical Report. Report No. R14/32. ISBN 978-1-927299-34-0 (print) 978-1-927299-35-7 (web).

Parliamentary Council Office Te Rūnanga o Ngāi Tahu Act 1996.

Taylor, N., McClintock, W., Mackay, M., Goodwin, M. (2013) Social Profile for Lake Forsyth-Wairewa area and Rural Banks Peninsula. Prepared for Environment Canterbury. June 2013.

Waters, S. (2014). Phosphorus Loading to Lake Forsyth / Te Roto o Wairewa: Preliminary Results for a Lake Phosphorus Budget. Prepared by Waterways Centre for Freshwater Management for Environment Canterbury. Report 2014-006. 4 July 2014.

Whitehead, J. (2013). Assessing Unmonitored Water Use in Semi-Rural Environments: An Investigation into the Okana and Okuti River Catchments, Little River, Canterbury. Prepared by Waterways Centre for Freshwater Management for Environment Canterbury. Report 2013-002. 15 February 2013.

14 Appendix 1: RMA Requirements for Section 32 Evaluation Reports

The Canterbury Regional Council is required to examine the objectives, policies, rules, and other methods of the Plan Change in accordance with the requirements of section 32 of the Resource Management Act 1991 (RMA).

Section 32 states:

- (1) *An evaluation report required under this Act must –*
 - a) *examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and*
 - b) *examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by –*
 - i. *identifying other reasonably practicable options for achieving the objectives; and*
 - ii. *assessing the efficiency and effectiveness of the provisions in achieving the objectives; and*
 - iii. *summarising the reasons for deciding on the provisions; and*
 - c) *contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.*
- (2) *An assessment under subsection (1)(b)(ii) must –*
 - a) *identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for –*
 - i. *economic growth that are anticipated to be provided or reduced; and*
 - ii. *employment that are anticipated to be provided or reduced; and*
 - b) *if practicable, quantify the benefits and costs referred to in paragraph (a); and*
 - c) *assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.*
- (3) *If the proposal (an **amending proposal**) will amend a standard, statement, regulation, plan, or change that is already proposed or that already exists (an **existing proposal**), the examination under subsection (1)(b) must relate to –*
 - b) *the provisions and objectives of the amending proposal; and*
 - c) *the objectives of the existing proposal to the extent that those objectives—*
 - i. *are relevant to the objectives of the amending proposal; and*
 - ii. *would remain if the amending proposal were to take effect.*
- (4) *If the proposal will impose a greater prohibition or restriction on an activity to which a national environmental standard applies than the existing prohibitions or restrictions in that standard, the evaluation report must examine whether the prohibition or restriction is justified in the circumstances of each region or district in which the prohibition or restriction would have effect.*
- (5) *The person who must have particular regard to the evaluation report must make the report available for public inspection –*
 - a) *as soon as practicable after the proposal is made (in the case of a standard or regulation); or*
 - b) *at the same time as the proposal is publicly notified.*
- (6) *In this section, –*

objectives means, -

- (a) for a proposal that contains or states objectives, those objectives:
- (b) for all other proposals, the purpose of the proposal

proposal means a proposed standard, statement, regulation, plan, or change for which an evaluation report must be prepared under this Act

provisions means, —

- (a) for a proposed plan or change, the policies, rules, or other methods that implement, or give effect to, the objectives of the proposed plan or change:
- (b) for all other proposals, the policies or provisions of the proposal that implement, or give effect to, the objectives of the proposal.

The objectives in the LWRP are unchanged by Plan Change 6 and not reassessed in this report. Accordingly, the appropriateness of the provisions proposed to be introduced by Plan Change 6 are measured against achieving the objectives of the LWRP.

15 Appendix 2: Policy Framework

Plan Change 6 is a catchment-specific change to the LWRP. It has been prepared by the Canterbury Regional Council under the RMA. The RMA creates a hierarchy of planning documents including national, regional and local (city or district) level documents. There are also a number of other statutes that are relevant to Plan Change 6.

The key relevant statutory requirements and planning documents are summarised below.

1. Resource Management Act 1991

The RMA, with its purpose to promote the sustainable management of natural and physical resources, provides the mandate and initial direction for managing water resources. The RMA is generally restrictive towards water and relies on resource consents and regional plans to enable access to water resources.

Part 2

Section 66 of the RMA states that a regional council shall prepare a regional plan (including a plan change) in accordance with its functions under section 30, the provisions of Part II, its duty under section 32, and any regulations.

In carrying out its functions, the Canterbury Regional Council must also ensure that it does so in accordance with Part 2 of the RMA – Section 5 (Purpose), Section 6 (Matters of National Importance), Section 7 (Other Matters) and Section 8 (Principles of the Treaty of Waitangi).

Plan Change 6 has been prepared in accordance with Part 2 of the RMA.

Section 30 of the RMA

The relevant functions of Canterbury Regional Council under section 30 in relation to Plan Change 6 are:

- The establishment, implementation, and review of objectives, policies and methods to achieve integrated management of the natural and physical resources of the region (section 30(1)(a)).
- The preparation of objectives and policies in relation to any actual or potential effects of the use, development or protection of land which are of regional significance (section 30(1)(b)).
- The control of the use of land for the purpose of:
 - The maintenance and enhancement of the quality of water in water bodies (section 30(1)(c)(ii)); and
 - The maintenance and enhancement of the quantity of water in water bodies (section 30(1)(c)(iii)).
- The control of the taking, use, damming and diversion of water, and the control of the quantity, level, and flow of water in any water body, including -
 - The setting of any maximum or minimum levels or flows of water (section 30(1)(e)(i)); and
 - The control of the range, or rate of change, of levels or flows of water (section 30(1)(e)(ii)).
- The control of discharge of contaminants into or onto land, air, or water and discharges of water into water (section 30(1)(f)).
- If appropriate, the establishment of rules in a regional plan to allocate:
 - The taking or use of water (other than open coastal water) (section 30(1)(fa)(i)); and
 - The capacity of water to assimilate a discharge of a contaminant (section 30(1)(fa)(iv)).
 - The establishment, implementation, and review of objectives, policies, and methods for maintaining indigenous biological diversity (section 30(1)(ga)).

Plan Change 6 has been prepared in accordance with a regional council's functions under section 30 of the RMA.

Requirements of Preparing Regional Plans

The general RMA requirements that apply in preparing a change to a regional plan include:

- A regional plan should be designed to accord with, and assist the regional council to carry out, its functions so as to achieve the purpose of the RMA (sections 30,66, 66(1) and 63(1)).
- A rule in a regional plan must not be more lenient than a national environmental standard (section 43(b)(3)).
- When preparing its regional plan a regional council must give effect to any national policy statement or New Zealand Coastal Policy Statement (section 62(3)). Although not alone, of particular relevance to this Plan Change is the National Policy Statement for Freshwater Management 2014 (NPSFM 2014).
- A regional plan must also record how a regional council has allocated a natural resource, if it has done so (section 67(3)).
- When preparing its regional plan the regional council shall give effect to any operative regional policy statement. The Canterbury Regional Policy Statement 2013 is the operative policy statement for this purpose (section 65(6) and 67(3)(c)).
- The regional plan must not be inconsistent with (section 67(4)):
 - water conservation order, or
 - any other regional plan for the region, or
 - a determination or reservation of the chief executive of the Ministry of Fisheries made under section 186E of the Fisheries Act 1996.
- When preparing its regional plan the regional council must also:
 - have regard to any relevant management plans and strategies under other Acts, any relevant entry in the Historic Places Register and to various fisheries regulations (section 66(2)(c)); and
 - have regard to the extent to which the plan needs to be consistent with regional policy statements, plans and proposed regional policy statements and plans of adjacent regional councils (section 66(2)(d)); and
 - take into account any relevant planning document recognised by an iwi authority (section 66(2A)(a)); and
 - recognise and provide for the management plan for the foreshore and seabed reserve located in its region (section 66(2A)(b)); and
 - not have regard to trade competition (section 66(3)).
- The formal requirement is that a regional plan must also state its objectives for the region, the policies to implement the objectives and the rules (if any) to implement the policies. A regional plan may state other matters, including issues, reasons, and expected environmental results (sections 67(1) and 66(2)).
- In making a rule the regional council must have regard to the actual or potential effect of activities on the environment (section 68(3)).
- There are special provisions for rules about protection of property from the effects of surface water, restricted coastal activities, flows or rates of use of water, some activities in the coastal marine area and contaminated land (section 68).
- There are special provisions that apply where a regional council provides in a plan that certain waters are to be managed for any purpose described in Schedule 3 of the RMA and includes rules in the plan about the quality of water in those waters (section 70A and 70B).
- There are also special provisions which deal with permitted activity rules about discharges, including the need for the Council to be satisfied that any significant adverse effects on aquatic life are not likely to arise as a result of a permitted discharge of a contaminant (section 70).

In preparing Plan Change 6, Council has been mindful of the Act's general requirements relating to regional plans.

2. Canterbury Earthquake Recovery Act 2011

The Canterbury Earthquake Recovery Act 2011 requires that a regional plan cannot be interpreted or applied in a way that is inconsistent with the Recovery Strategy (Section 15(1)). In addition, the preparation and decision on the proposed regional plan cannot be inconsistent with any recovery plan gazetted under the Canterbury Earthquake Recovery Act 2011 (Section 23).

Plan Change 6 is not inconsistent with the Recovery Strategy or any Recovery Plan.

3. Environment Canterbury (Temporary Commissioners and Improved Water Management Act 2010)

The Environment Canterbury (Temporary Commissioners and improved Water Management) Act 2010 (ECan Act) was enacted in 2010. The purpose of the ECan Act is contained in section 3:

- to provide for the replacement of the elected members of the Canterbury Regional Council with commissioners who will act as the Council's governing body until new elected members come into office following the next election; and
- to provide the Council with certain powers that it does not otherwise have to address issues relevant to the efficient, effective, and sustainable management of fresh water in the Canterbury region.

In relation to plans, the main way in which the ECan Act enables the Council to address issues relevant to the efficient, effective and sustainable management of fresh water in the region is through section 63. This section provides that, in considering any regional plan, a decision maker must have particular regard to the vision and principles of the Canterbury Water Management Strategy ("CWMS") as set out in Schedule 1, Part 1 of the ECan Act. Consideration of the CWMS vision and principles is to take place in addition to the matters which are relevant under the RMA.

In preparing Plan Change 6, particular regard has been had to the vision and principles of the CWMS..

4. National Policy Statement for Freshwater Management 2014

Under section 67(3) of the RMA, Plan Change 6 must give effect to any national policy statement.

The NPSFM 2014 is of particular relevance to Plan Change 6.

The NPSFM 2014 came into effect on 1 August 2014. It requires the Council to set freshwater objectives, limits and targets to give effect to the objectives of the NPSFM 2014.

While the objectives of the NPSFM 2014 remain largely the same as the objectives in the NPSFM 2011, the process which regional councils must use to set freshwater objectives (i.e. the intended environmental outcomes) is different. Under the NPSFM 2011 the Council was required to establish freshwater objectives and set freshwater quality limits for all bodies of fresh water in their regions. The policies did not set out how the Council was required to do this. In contrast, the NPSFM 2014 contains a prescriptive process in which freshwater objectives are to be set (called the National Objectives Framework). This process is contained in a new set of policies: Policies CA1 to CA4.

In particular, Policy CA2 requires the council to consider all national values for water and identify the values for each freshwater management unit (i.e. water body) which includes two compulsory values and may include any other national value or values that the regional council considers appropriate.

The process under Policy CA2 also requires the Council to assign attribute states for the compulsory values and also for the other values identified by the regional council for the particular freshwater management unit (some attribute states are specified in an Appendix to the NPSFM 2014 and if an attribute state is not given the Council is required to set an attribute state that the regional council considers appropriate). In formulating freshwater objectives (i.e. the outcomes for a water body) which are required to be set under Policies A1 and B1, the regional council is required to

set the freshwater objective in numeric terms by reference to the specified numeric attribute state contained in the Appendix of the NPSFM 2014 (if there is a numeric attribute state).

Additional Information Specific to Plan Change 6

The content of Plan Change 6 gives effect to the objectives and policies in the NPSFM, and Council considers that the process for developing Plan Change 6 complies with the steps set out in Policies CA1 and CA4 of the National Objectives Framework. In particular:

- The Lake Forsyth / Wairewa catchment, including all waterbodies within that catchment, has been identified as a single freshwater management unit.
- Values for the waterbodies in the catchment have been identified, including through discussions with the community led by the Banks Peninsula Zone Committee to develop the ZIP Addendum. Of particular note are the significant mahinga kai values associated with Lake Forsyth / Te Roto o Wairewa.
- Plan Change 6 includes freshwater objectives (called “freshwater outcomes” in the LWRP) and water quality limits for rivers and the lake that include all of the attributes in Appendix 2 to the NPSFM 2014; other objectives and limits are also included that are relevant to managing for the values present in the rivers and lake in the Lake Forsyth / Wairewa catchment
- The “states” for all attributes in Appendix 2 are above the specified national bottom lines, and give effect to Objective A2 which (in summary) is that overall water quality is maintained or improved.
- Targets have been set that, by 2030, will phase out over-allocation.
- Environmental flow and allocation regimes have been set for rivers in the catchment.

5. New Zealand Coastal Policy Statement (NZCPS) (2010)

The NZCPS deals with matters relating to both the coastal marine area and also the coastal environment. It recognises that activities on land can have impacts on coastal water quality as a consequence of point and non-point sources of contamination.

To the extent that parts of the Lake Forsyth / Wairewa catchment are within the coastal environment, Plan Change 6 must give effect to the NZCPS. Objectives 1 and 6 below are most relevant to the development of Plan Change 6. Objective 1 requires water quality to be maintained and enhanced. Objective 6 is important insofar that parts of the catchment are within the coastal environment, as it refers to some of the enabling aspects of subdivision, use and development occurring in the coastal environment.

Objective 1 - *To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:*

- *maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;*
- *protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and*
- *maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.*

Objective 6 - *To enable people and communities to provide for their social, economic, and cultural wellbeing and their health and safety, through subdivision, use, and development, recognising that:*

- *the protection of the values of the coastal environment does not preclude use and development in appropriate places and forms, and within appropriate limits;*

- *some uses and developments which depend upon the use of natural and physical resources in the coastal environment are important to the social, economic and cultural wellbeing of people and communities*
- *functionally some uses and developments can only be located on the coast or in the coastal marine area;*
- *the coastal environment contains renewable energy resources of significant value;*
- *the protection of habitats of living marine resources contributes to the social, economic and cultural wellbeing of people and communities;*
- *the potential to protect, use, and develop natural and physical resources in the coastal marine area should not be compromised by activities on land;*
- *the proportion of the coastal marine area under any formal protection is small and therefore management under the Act is an important means by which the natural resources of the coastal marine area can be protected; and*
- *historic heritage in the coastal environment is extensive but not fully known, and vulnerable to loss or damage from inappropriate subdivision, use, and development.*

The following policies are most relevant to Plan Change 6:

Policy 4: Integration requires the integrated management of natural and physical resources in the coastal environment, and activities that affect the coastal environment.

Policy 7: Strategic planning covers what must be considered in preparing regional policy statements and plans

Policy 22: Sedimentation sets out requirements to assess, monitor and control sources of sediment and impacts on the coastal environment

Policy 23: Discharge of contaminants requires (amongst other things) that in managing discharges to the coastal environment the need to have regard to the sensitivity of the receiving environment, the nature and concentration of contaminants to be discharged to achieve the required water quality and risks if concentrations are exceeded, the capacity of the receiving environment to assimilate the contaminants, and avoiding significant adverse effects on ecosystems and habitats after reasonable mixing.

Plan Change 6 is considered to give effect to the NZCPS.

6. National Environmental Standards

National environmental standards (NES) are regulations issued under section 43 of the RMA which apply nationally and therefore provide a consistent approach and decision-making process throughout the country.

A NES can prescribe standards, methods or other requirements for a range of matters referred to in the RMA. Each regional, city or district council must enforce the same standard. In some circumstances, councils can impose stricter standards. Under section 43B(3) of the RMA, a rule cannot be more lenient than a national standard.

There are currently five NES in force:

- National Environmental Standards for Air Quality
- National Environmental Standard for Sources of Drinking Water
- National Environmental Standards for Telecommunication Facilities
- National Environmental Standard for Electricity Transmission Activities
- National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health.

The NES of particular relevance to PC6 is the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 ("Drinking Water NES"). Regulation 10 of the Drinking Water NES prevents

regional councils from including permitted activity rules in a regional plan, under section 9, 13, 14, or 15 of the Act, upstream of an abstraction point, in certain circumstances.

The Council considers that PC6 is not inconsistent with the Drinking Water NES. In particular, the rules in PC6 are not considered to be more lenient than the Drinking Water NES.

7. Water Conservation Orders

Under section 67(4)(a) of the RMA, PC5 must not be inconsistent with any water conservation order (WCO).

There are no water conservation orders in the Lake Forsyth / Wairewa catchment.

8. Iwi Management Plans

The regional council must take into account any relevant planning document that is recognised by an iwi authority and that is lodged with the regional council.

Mahaanui Iwi Management Plan 2013

The Mahaanui Iwi Management Plan (IMP) 2013 has been prepared by the six Papatipu Rūnanga of the takiwā that extends from the Hurunui River in the north, to the Hakatere/Ashburton River in the south, inland to Kā Tiritiri o Te Moana (the Southern Alps), and including Te Pātaka o Rākaihautū (Banks Peninsula), and the coast:

- Ngāi Tūāhuriri Rūnanga
- Te Hapū o Ngāti Wheke (Rāpaki) Rūnanga
- Te Rūnanga o Koukourārata
- Ōnuku Rūnanga
- Wairewa Rūnanga
- Te Taumutu Rūnanga

The IMP contains both region-wide and catchment-specific objectives and policies. The need to protect and enhance the waterways is paramount, as is restoring the life-supporting capacity of these waters.

Te Rūnanga o Ngāi Tahu Freshwater Policy Statement

The Te Rūnanga o Ngāi Tahu Freshwater Policy Statement provides policy messages around Ngāi Tahu values and interests in freshwater.

In preparing Plan Change 6, Council has taken into account relevant iwi planning documents.

Council understands that Te Whakatau Kaupapa has been superceded by the Mahaanui Iwi Management Plan for the area to which the latter applies. For this reason, unlike the two iwi management plans mentioned above, it is not listed under the new heading “10.3 Iwi Management Plans that Apply to the Banks Peninsula Sub-region” that is introduced by Plan Change 6.

9. Canterbury Regional Policy Statement 2013

Under section 67(3), Plan Change 6 must give effect to any operative regional policy statement.

The Canterbury Regional Policy Statement 2013 sets out a policy framework for the management of natural resources in the Canterbury Region. As stated above, in relation to the management of water resources, regional councils have functions to control:

- The taking, use, damming and diversion of water and the quantity, level and flow of water in any water body;
- The discharge of contaminants on to land or into water, and discharge of water into water; and
- The use of land for the purpose of the maintenance or enhancement of the quality of water in water bodies, or ecosystems in water bodies.

Fresh Water

The purpose of the fresh water chapter of the Canterbury Regional Policy Statement 2013 is to address the resource management issues pertaining to fresh water for the Canterbury region, including:

- Effects of activities on fresh water environments, including the quantity, quality and natural character of fresh water bodies;
- The need to manage different and potentially competing values and uses of fresh water; and\The way fresh water is managed, including opportunities for kaitiakitanga and stewardship.

The management of fresh water is a significant resource management issue in the region and is of fundamental importance to Ngāi Tahu, as tangata whenua. Significant resource management issues can include:

- Widespread or region-wide problems or problems that cross territorial authority boundaries;
- The use, development or protection of scarce resources;
- Resource use conflict;
- Conflicting values and aspirations for freshwater, and incorporating tangata whenua views; or
- Cumulative impacts or effects.

All of these issues are relevant to fresh water management in the Lake Forsyth / Wairewa catchment. For example, there are water bodies which have low flow issues and others that have degraded water quality.

The Canterbury Regional Policy Statement 2013 contains four objectives which specifically relate to the management of fresh water.

Objective 7.2.1 – sustainable management of fresh water

The region's fresh water resources are sustainably managed to enable people and communities to provide for their economic and social well-being through abstracting and/or using water for irrigation, hydro-electric generation and other economic activities, and for in-stream recreational and amenity values, and any economic and social activities associated with those values, providing:

(1) the life supporting capacity, ecosystem processes, and indigenous species and their associated freshwater ecosystems, and mauri of the fresh water is safe-guarded;

(2) the natural character values of wetlands, lakes and rivers and their margins are preserved and these areas are protected from inappropriate subdivision, use and development and where appropriate restored or enhanced; and,

(3) any actual or reasonably foreseeable requirements for reasonable domestic needs of individuals and for reasonable needs of individuals animals, for drinking water and customary uses, are provided for.

Objective 7.2.2 – parallel process for managing fresh water

Abstraction of water and the development of water infrastructure in the region occurs in parallel with:

(1) improvements in the efficiency with which water is allocated for abstraction, the way it is abstracted and conveyed and its application or use;

(2) the maintenance of water quality where it is of a high standard and improvement of water quality in catchments where it is degraded

(3) the restoration or enhancement of degraded fresh water bodies and their surroundings.

Objective 7.2.3 – protection of the intrinsic value of water bodies and their riparian zones

The overall quality of freshwater in the region is maintained or improved, and the life supporting capacity, ecosystem processes and indigenous species and their associated freshwater ecosystems are safeguarded.

Objective 7.2.4 – integrated management of fresh water resources

Fresh water is sustainably managed in an integrated way within and across catchments, between activities, and between agencies and people with interests in water management in the community, considering:

(1) the Ngāi Tahu ethic of Ki Uta Ki Tai (from the mountains to the sea);

(2) the interconnectivity of surface and groundwater

(3) the effects of land uses and intensification of land uses on demand for water and water quality;

(4) Kaitiakitanga and the ethic of stewardship; and

(5) Any net benefits of using water, and water infrastructure, and the significance of those benefits to the Canterbury region.

The objectives are implemented through 13 policies in the Regional Policy Statement, which address:

- Natural character values (Policy 7.3.1), including effects on braided rivers (Policy 7.3.2) and environmental protection, restoration and enhancement programmes (Policy 7.3.3);
- Managing effects on water quality and quantity (Policies 7.3.4 - 7.3.7);
- Efficient allocation and use of fresh water (Policy 7.3.8);
- Integrated solutions for water management, and storage and harvest of freshwater, and existing activities (Policy 7.3.9 - 7.3.11);
- Precautionary approach where information is uncertain (Policy 7.3.12); and Stewardship and Kaitiakitanga (Policy 7.3.13).

Plan Change 6 has been drafted to give effect to the Canterbury Regional Policy Statement 2013.

10. Regional Plans

Council has a number of regional plans. Of particular relevance to Plan Change 6 is the Canterbury Land and Water Regional Plan (LWRP).

Canterbury Land and Water Regional Plan (LWRP)

The LWRP contains region-wide policies and rules, which apply in all circumstances, in the absence of catchment-specific rules. It also includes location-specific policies and rules in ten “sub-regional” sections.

The location-specific policy and relevant rules of the Canterbury Natural Resources Regional Plan (NRRP) were brought over into the sub-regional sections of the LWRP. Over time, it is the Council's intention that the sub-regional sections will be the subject of plan changes to incorporate the results of collaborative planning processes under the Canterbury Water Management Strategy to set catchment specific outcomes, limits, policies and rules. Until these provisions are in place, the region-wide rules of the LWRP act as a "default position".

Plan Change 6 amends Section 10 (Banks Peninsula) of the LWRP by introducing catchment-specific freshwater outcomes, limits, targets and water quality and quantity provisions for the Lake Forsyth / Wairewa catchment.

The LWRP directs how the sub-regional sections to the Plan are to address freshwater outcomes and water quality limits. Policy 4.9 states they are to be developed in accordance with Appendix 2 of the CRPS 2013; they are to identify and provide for the social, economic, cultural and environmental values of each catchment, have particular regard to collaboratively developed local water quality and quantity outcomes and methods and timeframes to meet them; and to establish methods and time frames to phase out any over-allocation. Policy 4.9 also states that sub-region sections will not make changes to policies 4.1 to 4.9, except to introduce catchment specific freshwater outcomes and limits to implement objectives and policies in the Plan.

At its meeting on 13 August 2015, Council resolved to make the LWRP partially operative. Those parts of the Land and Water Regional Plan that became operative on 1 September 2015 are as follows:

- All of Section 1 – Introduction, Issues and Major Responses
- All of Section 2 – How the Plan Works and Definitions
- All of Section 3 – Objectives
- All of Section 4 – Policies
- Section 5 – Region-wide Rules – All rules relating to all topics other than:
 - Take and use of surface water (Rules 5.123 - 5.127)
 - Dams and damming (Rules 5.154 - 5.158)
- All of Sections 6, 7, 8, 9, 10, 11, 12, 14 and 15
- Section 13 (except for policies and rules relating to the Ashburton River, being Policies 13.4.1, 13.4.2, 13.4.3, 13.4.7 and 13.4.8 and Rules 13.5.1, 13.5.5 and 13.5.6 (including the Hakatere/Ashburton River catchment environmental flow and allocation limit table))
- All of Section 16 (comprising Schedules 1 to 23)
- All of Volume 2 – Map Volume.

Plan Change 6 has been prepared in accordance with Policy 4.9 of the LWRP.

Natural Resources Regional Plan (NRRP)

Prior to the development of the LWRP, the Natural Resources Regional Plan was the primary regional plan for regulating the management of natural resources in Canterbury. Chapters 4, 7 and 8, relating to water quantity and quality, beds and lakes of rivers, wetlands and soil conservation were revoked when the LWRP was made operative.

PC6 is not inconsistent with the Natural Resources Regional Plan.

Land and Vegetation Management Regional Plan

This plan addresses the management of earthworks and vegetation clearance in the Kaikoura East Coast; earthworks and vegetation clearance in the Port Hills; and land management fires in the Canterbury hill and high country. Parts I, II and IV were revoked when the LWRP was made operative

PC6 does not propose any changes that would make the CLWRP inconsistent with this plan.

Regional Coastal Environment Plan

The Regional Coastal Environment Plan (RCEP) covers the Coastal Marine Area and areas immediately landward of this within the Canterbury region. Chapter 7 of the Plan deals with Coastal Water Quality and includes objectives, policies and rules that seek to manage the discharge of contaminants and water within the Coastal Marine Area.

The RCEP identifies that point source and non-point source discharges of contaminants, directly or indirectly into the Coastal Marine Area, can adversely affect coastal water quality and its ecological values, the cultural relationship tangata whenua has with water, and the use of the water by the Canterbury community. In relation to coastal water quality, the RCEP seeks to maintain the overall high existing water quality (Objective 7.1(a)). The RCEP recognises that discharges inland of the Coastal Marine area can adversely affect coastal water quality, and therefore Policy 7.10 promotes measures, including regional plans, to manage the effects of these discharges on this area.

Plan Change 6 is not considered to be inconsistent with the Regional Coastal Environment Plan.

11. Flood Protection and Drainage Bylaw 2013

The Canterbury Regional Council Flood Protection and Drainage Bylaw 2013 was prepared under the Local Government Act 2002 to provide for the ongoing management and efficient operation of flood protection and flood control works that are owned or controlled by the Canterbury Regional Council. It is crucial that these works function properly when needed. These include drainage schemes, flood protection schemes, floodways and areas of flood protection vegetation constructed and managed to prevent damage, danger, or distress to the community from river flooding and poor drainage. The assets protected in the Bylaw are those mapped in Flood Protection and Drainage Bylaw Map Volume (Schedule 1 to 3).

The Wairewa Rating District was initiated in 2015, which is after the commencement date of the Bylaw (2 April 2013). For that reason, the relevant sections covered by the River Rating District of Takiritawai, Okuti, Okana Rivers and Hukahuka Turoa and Opuahou Streams are not mapped, nor protected under the Bylaw.

As required by s158 of the LGA (2002), the Bylaw will be reviewed no later than five years after it was made. This review will likely take place in 2017/18, and until that time, the Wairewa Rating District network and assets will not be protected by the Bylaw. For that reason, it is important that adequate protection is afforded through the LWRP, including Section 10 and the provisions proposed through Plan Change 6 for the Lake Forsyth / Wairewa catchment.

12. Canterbury Water Management Strategy

In accordance with section 63 of the ECan Act, the Council, in considering this plan change, must have particular regard to the vision and principles of the CWMS, in addition to the matters relevant under the RMA, in making its decisions. Under section 66(2)(c)(i) the Council must also have regard to the full CWMS, as a management plan or strategy prepared under another Act, to the extent that its content has a bearing on the resource management issues of the region. The CWMS vision, principles and targets have also been incorporated into the CRPS where appropriate.

The CWMS is a non-statutory document which provides the framework for land and water management for the region. It was developed through an extensive collaborative process and endorsed by all councils in Canterbury. The CWMS vision is:

"To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework."

The CWMS sets out a number of priorities that underpin it, and is supported by 3 "primary principles":

1. sustainable management;
2. regional approach; and

3. tangata whenua.

There are 6 “supporting principles”:

1. natural character;
2. indigenous biodiversity;
3. access;
4. quality drinking water;
5. recreational opportunities; and
6. community and commercial use.

The CWMS also contains goals for 2010, 2015, 2020 and 2040 in ten target areas: ecosystem health/biodiversity; natural character of braided rivers; kaitiakitanga; drinking water; recreational and amenity opportunities; water-use efficiency; irrigated land area; energy security and efficiency; regional and national economies; and environmental limits. These targets embody the concept of “parallel development” - making progress on all targets, so that all aspects of the solution are advanced in parallel.

Zone committees and the regional committee are the key delivery mechanism for the CWMS. The CWMS divides Canterbury into 10 zones each of which has a committee established. The Committees were charged with preparing an implementation programme for their zone or region.

In preparing PC6, the Council has had particular regard to the vision and principles of the CWMS and also had regard to the CWMS as a whole.

13. Fisheries Regulations

Under section 66(2)(c)(iii) of the RMA, the Council must have regard to “regulations relating to ensuring sustainability, or the conservation, management, or sustainability of fisheries resources (including regulations or bylaws relating to taiapure, mahinga mataitai, or other non-commercial Maori customary fishing)”.

The Fisheries (Declaration of Wairewa/Lake Forsyth Mataitai Reserve and Appointment of Tangata Tiaki/Kaitiaki) Notice 2010 declares a mātaitai for:

“...Lake Forsyth and outlet that flows into the sea and the Takiritawai River that flows into the northern end of Lake Forsyth, excluding any other river or stream or tributary that flows into or from any of these fisheries waters.”

The regulations prohibit commercial fishing in this area.

Council has had regard to these regulations when developing Plan Change 6.

14. Sports Fish and Game Management Plans

Under section 66(2)(c)(i) of the RMA, the Council must have regard to any management plan or strategy prepared under another Act, to the extent that its content has a bearing on the resource management issues of the region.

The Conservation Act requires each Fish and Game Council to prepare any sports fish and game management plans that are necessary for the management of sports fish and game birds within its region of jurisdiction, for approval by the Minister of Conservation. The Lake Forsyth / Wairewa catchment is within the area of the North Canterbury Fish & Game Council.

Council has had regard to the relevant management plans for this council.

16 Appendix 3: Zone Committee Outcomes

The solutions package in the Banks Peninsula Zone Committee's Wairewa ZIP Addendum is designed to achieve the following outcomes for the Lake Forsyth / Wairewa catchment.

Catchment

- Sediment discharges into waterways is reduced
- All streams that flow into Lake Forsyth / Te Roto o Wairewa are flourishing ecosystems reflecting mauri, kaitiakitanga and mahinga kai values

Flood Hazard

- Risks of flooding are known and understood
- The flood hazard is reduced

Lake Forsyth / Te Roto o Wairewa

- Te Roto o Wairewa is a nationally significant project showcasing outstanding environmental restoration
- Annual Average Trophic Level Index (TLI) = 4 within 20 years (2035)
- No more than 30% of water quality samples in a year have chlorophyll a levels above 20 µg/l
- Chlorophyll a levels should not exceed 50 µg/l
- The lake supports mahinga kai and contact recreation all year round within 15 years (2030)

17 Appendix 4: Land and Water Regional Plan Objectives

The objectives in the LWRP identify the resource management outcomes or goals for land and water resources in Canterbury region, to achieve the purpose of the RMA. The objectives form a comprehensive suite of outcomes to be attained and implemented by the policies, rules and other methods.

The objectives of the LWRP must be read in their entirety and considered together. In any particular case some Objectives may be more relevant than others, but in general, no single Objective has more importance than any other.

Table 18: Land and Water Regional Plan Objectives

Number	Objective
3.1	Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water.
3.2	Water management applies the ethic of ki uta ki tai - from the mountains to the sea - and land and water are managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between fresh water, land and the coast.
3.3	Nationally and regionally significant infrastructure is enabled and is resilient and positively contributes to economic, cultural and social wellbeing through its efficient and effective operation, on-going maintenance, repair, development and upgrading.
3.4	A regional network of water storage and distribution facilities provides for sustainable, efficient and multiple use of water.
3.5	Land uses continue to develop and change in response to socio-economic and community demand.
3.6	Water is recognised as essential to all life and is respected for its intrinsic values.
3.7	Fresh water is managed prudently as a shared resource with many in-stream and out-of-stream values.
3.8	The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon.
3.8A	High quality fresh water is available to meet actual and reasonably foreseeable needs for community drinking water supplies.
3.9	Abstracted water is shown to be necessary and reasonable for its intended use and any water that is abstracted is used efficiently.
3.10	Water is available for sustainable abstraction or use to support social and economic activities and social and economic benefits are maximised by the efficient storage, distribution and use of the water made available within the allocation limits or management regimes which are set in this Plan.
3.11	Water is recognised as an enabler of the economic and social wellbeing of the region.
3.12	When setting and managing within limits, regard is had to community outcomes for water quality and quantity.
3.13	Groundwater resources remain a sustainable source of high quality water which is available for abstraction while supporting base flows or levels in surface water bodies, springs and wetlands and avoiding salt-water intrusion.
3.14	Outstanding fresh water bodies and hapua and their margins are maintained in a healthy state or are improved where degraded.
3.15	Those parts of lakes and rivers that are valued by the community for recreation are suitable for contact recreation.
3.16	Freshwater bodies and their catchments are maintained in a healthy state, including through hydrological and geomorphic processes such as flushing and opening hāpua and river mouths, flushing algal and weed growth, and transporting sediment.
3.17	The significant indigenous biodiversity values of rivers, wetlands and hāpua are protected.

Number	Objective
3.18	Wetlands that contribute to cultural and community values, biodiversity, water quality, mahinga kai, water cleansing and flood mitigation are maintained.
3.19	Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hāpua and coastal lagoons, are protected.
3.20	Gravel in riverbeds is extracted to maintain floodway capacity and to provide resources for building and construction and maintenance, while maintaining the natural character of braided rivers and not adversely affecting water quality, ecosystems or their habitats, access to or the quality of mahinga kai or causing or exacerbating erosion.
3.21	The diversion of water, erection, placement or failure of structures, the removal of gravel or other alteration of the bed of a lake or river or the removal of vegetation or natural defences against water does not exacerbate the risk of flooding or erosion of land or damage to structures.
3.22	The effectiveness of both man-made natural hazard protection infrastructure, and wetlands and hāpua as natural water retention areas, is maintained to reduce the risk of and effects from natural hazards, including those arising from seismic activity and climate change.
3.23	Soils are healthy and productive, and human-induced erosion and contamination are minimised.
3.24	All activities operate at “good environmental practice, “or better, to optimise efficient resource use and protect the region’s fresh water resources from quality and quantity degradation.

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