Healthy Rivers PLAN FOR CHANGE | Wai Ora HE RAUTAKI WHAKAPAIPAI

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Social impacts and trends analysis - a review of indicators and social impact trends for selected water quality plan changes

This report was not commissioned by the Technical Leaders Group for the Healthy Rivers Wai Ora Project

The Technical Leaders Group approves the release of this report to Project Partners and the Collaborative Stakeholder Group for the Healthy Rivers Wai Ora Project.

Signed by: 

Date: 21 October 2015

SOCIAL IMPACT AND TREND ANALYSIS

A REVIEW OF INDICATORS AND SOCIAL IMPACT TRENDS FOR SELECTED WATER QUALITY PLAN CHANGES AND PLAN REVIEWS

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Document Approval

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1. Introduction

The purpose of this report is to provide an overview of social indicators, impacts and trends that have been considered as part of selected recent water quality plan changes and plan reviews throughout New Zealand. It is intended that this report will form part of a suite of information that will assist in informing the Healthy Rivers Integrated Assessment. In providing an overview of plan changes and reviews that have occurred elsewhere, it is intended that the Healthy Rivers Collaborative Stakeholders Group will have the opportunity to consider that extent to which the information (indicators, impacts and trends) are relevant to the Waikato Region and the Healthy Rivers project.

Four recent plan changes/reviews have been identified as being of a similar character to Healthy Rivers in that they were either developed to give effect to the National Policy Statement for Freshwater Management, or in response to community needs and demands to better manage effects on water quality (and in some instances also quantity). The four plan changes/reviews were also chosen due to availability of information, and while not all plan changes/reviews included social impact assessments, this in itself is considered to be a relevant finding of this report.

The four plan changes/reviews assessed are:

- Variation 1 to the Proposed Canterbury Regional Plan;
- The review of the Greater Wellington Natural Resources Plan (Regional Plan);
- Plan Change 6 to the Hawkes Bay Regional Plan (Tukituki); and
- The review of the Horizons Regional Plan and Regional Policy Statement (the One Plan).

In reviewing the four plan changes/reviews, the following information is provided in this report, where available:

- A brief overview of the process leading to notification of the plan change/review, including any identified values;
- Identification of indicators used to measure the current and future state of the resource;
- A comparison of those indicators with the indicators identified for use as part of the Healthy Rivers process;
- Identification of any social impacts and trends anticipated to occur as a result of the plan change/review.
- Brief conclusions are drawn by the author of this report as to the extent to which social indicators, impacts and trends have been interrelated, utilised and implemented as part of the plan change/review process.

2. Canterbury Regional Plan – Variation 1 (Selwyn Waihora catchment)

2.1 Overview of Plan Change

Variation 1 introduced new policies, rules, and limits to manage water quality and water quantity in the Te Waihora/Lake Ellesmere catchment, with particular emphasis on the long-term health of Te Waihora. Commencing in 2011, Environment Canterbury ran a collaborative and community-centred process to set water quality and water quantity limits in the Selwyn Waihora catchment.

The Selwyn Waihora Zone Committee, supported by wider community focus groups was responsible for recommending water quality and quantity limits to Environment Canterbury Commissioners.

To develop limits, a series of exploratory scenarios were developed to examine the social, cultural, economic and environmental consequences of different outcomes for the catchment. This information was used by the community and stakeholders to reach a negotiated agreement on limits for the catchment.

In brief, the following process was used to develop the Plan Change:

- The Zone Committee described their aspirations for the catchment in the form of priority outcomes;
- The technical team developed indicators based on these outcomes, against which attainment of outcomes could be assessed;
- The Zone Committee agreed a suite of scenarios, to test 'what if' questions that they wanted to understand the consequences of;
- The technical team developed models, tested each of the scenarios, and used the indicators to predict the likely consequences on the community values. This information was integrated and simplified and then communicated back to the Zone Committee and wider community to help inform their discussions;
- After the exploratory scenarios had been considered, the Zone Committee, wider community and technical team each brainstormed all potential aspects of a solutions package and selected an initial suite of solutions to model. This became Solutions Package 1. Solutions Package 1 was modelled in the same way as the earlier scenarios and the outcomes delivered to the Zone Committee and wider community;
- A final package of solutions, the 'Zone Committee Solutions Package' was agreed upon. This was recommended to the Environment Canterbury Commissioners and then modelled by the technical team to generate the catchment limits that relate to the agreed outcomes.

A form of Integrated Assessment was undertaken, which required the inputs and consideration of the following reports:

- **Social impact assessment**

  The social impact assessment (SIA) identified the potential positive and negative social effects for people associated with predicted changes. The two main components of the SIA were:

  - To develop a baseline of the current socio-economic context
  - To undertake an impact assessment of each of the scenarios and predict the consequences of the change on the social indicators

  The scenario assessments drew on comparative case data from, for example, the Hurunui, Waitaki and Opuha irrigation areas. These comparison cases were only used as indicators of social change; local conditions were taken into account in predicting the impacts of each scenario. Key informant interviews were used to investigate the potential implication of land-use changes. Additional information was derived from the wider community focus group sessions and included in information presented to the Zone Committee.

- **Economic impact assessment**

  The economic impact assessment used a combination of farm scale and regional scale economic models to predict the consequences of different land use scenarios.

  A set of revenue, expense and cash farm surplus estimates were derived from MAF farm monitoring reports (last 3 years). Estimates of regional outcomes from changes in agricultural land use were assessed using a regional input/output table model. Input/output tables are developed to describe the interdependencies of different aspects of a regional (or national) economy and were based on production functions and profitability relationships. It was considered as the most suitable type of model for use at this scale with the information and time available. The outputs generated include regional GDP and employment, revenue and profit, capital expenditure, taxes and population.

- **Cultural assessment**

  An assessment of Ngai Tahu cultural values was undertaken. The predictions of cultural health under each scenario were tested and agreed with Ngai Tahu whakapapa prior to going to the technical team, community and Zone Committee. The assessment draws from the perspectives of tangata whenua articulated in published management plans, evidence presented at hearings, and lake reports. In addition, whanau from the kaitiaki Rūnanga actively engaged in assessing river flows and cultural health as part of a concurrent study.

- **On farm assessment**

  On-farm information was derived from a variety of sources and was presented to the Zone Committee and community focus groups. The key types of information used were on farm nitrate-N losses, the cost and efficacy of nutrient loss reduction measures across a range of farm types and soils and the maximum feasible mitigation across farm types and associated financial implications. This information was used in the modelling as well as directly by the Zone Committee and community focus groups.

Understanding the community values, as determined by the Zone Committee, was the starting point for the technical team to determine the project scope to build the assessment framework. The values used are described as Priority Outcomes and Priority Sub Outcomes, outlined alongside associated indicators. These can be found in Table 7 in Appendix One of this report.

2.2 Indicators Used

Each scenario was tested against the Zone Committee's priority outcomes and sub-outcomes. The relevant outcomes were often not in a form that could be used or modelled directly; therefore the technical team developed a suite of indicators for each outcome/value.

The indicators were developed in a two stage process. The Zone Committee was asked to describe what their outcomes and sub-outcomes would look like for the catchment. These descriptions were formalised into a narrative for each sub outcome and provided to the technical team. Some indicators were used for multiple for different outcomes and sub-outcomes.

2.3 Comparison of Indicators Used in Healthy River

Table 1 below lists the indicators identified for use as part of the Healthy Rivers process, with any comparable indicator from Variation 1 listed alongside.

Table 1: Comparison of indicators used in Healthy Rivers with Selwyn Waihora

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
Employment (with an emphasis on type, variety and diversity of jobs)	**Thriving sustainable community** • On farm economic impacts including revenue, farm working expenses, variable expenses and cash farm surplus • Regional economic impacts including GDP, earned household income, rates and taxes • On farm and regional employment • Median household income • Unemployment • Population in Selwyn Waihora catchment
Infrastructure	**Energy security is increased**

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
(reliable, affordable to consumers, investment/reinvestment risk - only covers energy, waste and water)	• Amount of stored water in catchment available for power generation and or irrigation • Volume of surface water vs. groundwater sourced irrigation • Area of irrigation in catchment • Services including health, infrastructure and education. Social connectedness
Recreation use (including access and safety)	**Recreation opportunities are improved** • Tropic Lake Index (TLI) • Phytoplankton blooms • Water safe for contact recreation • Recreational fish populations trout, eel, flounder and whitebait • Other recreational uses on or around the lake **Popular swimming places meet contact recreation standards** • Periphyton in the Selwyn River - Coes Ford • Macrophytes in the Selwyn River – Coes Ford • Suitability for contact recreation – microbial quality • Recreational use **Flows are sufficient to provide swimming at popular swimming places** • Annual and summer flows at Selwyn River - Coes Ford
Regional Ecological Monitoring of Streams (REMS which includes MCI, Clogginess (Macrophytes), stream habitat)	**Customary and commercial fisheries are improved** • Periphyton and macrophyte for recreation, aesthetics and benthic biodiversity • Nitrate-N concentrations and nitrate-N toxicity

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
	There are healthy macrophyte beds and water clarity is improved • Water clarity and colour in Te Waihora/Lake Ellesmere • Macrophyte beds • Trophic Lake Index (TLI) • Phytoplankton blooms
Riparian (effective for land-use)	Not identified as an indicator.
Wetland (unique habitat protected)	**Wetlands associated with hill fed river flows are protected and restored** • Base flow at springs increase or decrease • Lake level, opening and closing regime **The wetlands of Te Waihora are enhanced** • None. Qualitative assessment made
Regional GDP with sector breakdown	**Thriving sustainable community** • On farm economic impacts including revenue, farm working expenses, variable expenses and cash farm surplus • Regional economic impacts including GDP, earned household income, rates and taxes • On farm and regional employment • Median household income • Unemployment • Population in Selwyn Waihora catchment • Services including health, infrastructure and education. Social connectedness • Housing (housing affordability, rent to • income ratio) • Trust (level of trust in policy makers and other actors involved in policy process) • Safety and security (crime rates, perceptions of safety)

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
Waikato regional contribution to national exports	Not identified as an indicator.
Total value of employment	**Thriving sustainable community** • On farm economic impacts including revenue, farm working expenses, variable expenses and cash farm surplus • Regional economic impacts including GDP, earned household income, rates and taxes • On farm and regional employment • Median household income • Unemployment • Population in Selwyn Waihora catchment • Services including health, infrastructure and education. Social connectedness • Housing (housing affordability, rent to income ratio) • Trust (level of trust in policy makers and other actors involved in policy process) • Safety and security (crime rates, perceptions of safety)
Waitemata (water clarity) – currently an attribute	**There are healthy macrophyte beds and water clarity is improved** • Water clarity and colour in Te Waihora/Lake Ellesmere • Macrophyte beds • Trophic Lake Index (TLI) • Phytoplankton blooms **Fish recruitment and food gathering on and around the lake is improved** • Water clarity and colour in Te Waihora/Lake • Ellesmere • Macrophyte beds • Trophic Lake Index (TLI)

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
	• Phytoplankton blooms • Lake level and opening/closing regime; • impact on fish passage and recruitment • Customary and commercial fish populations
Te Rere (flow) – measures in cumecs at monitoring stations / effects from expert panel	**Water quality, flows and habitat supports increased abundance and diversity of aquatic life** • Overall flows plus low flows and minimum flows • Periphyton and macrophyte for recreation, aesthetics and benthic biodiversity • Nitrate-N concentrations and nitrate-N toxicity • Diversity and abundance of aquatic species • Cultural assessment
Paemakariri (temperature) – measured across the monitoring network / effects from expert panel Survey (in tributaries)	Not identified as an indicator.
Pareparenga o te wai (Riparian margin – access and acceptability) – riverbank condition is monitored as part of Regional Ecological Monitoring	Not identified as an indicator.
He kai pai (edible food) – E.coli measured but food standards not reported	**Wahi tapu and mahinga kai are respected, understood, protected and enhanced** • Customary fish stocks • Cultural assessment of Mahinga kai and Wahi Tapu sites **Safe and plentiful food gathering is available** • Customary fish stocks including tuna and whitebait.

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
	• Stream beds are safe and accessible without deep sediment beds, or nuisance algal mats. • Ecological impact of changes in flows • Cultural assessment **Fish recruitment and food gathering on and around the lake is improved** • Water clarity and colour in Te Waihora/Lake Ellesmere • Macrophyte beds • Trophic Lake Index (TLI) • Phytoplankton blooms • Lake level and opening/closing regime; impact on fish passage and recruitment • Customary and commercial fish populations
Te nui o nga kai i te wai (abundance of fish species – koura) – monitored as part of Regional Ecological Monitoring Survey (in tributaries)	**Safe and plentiful food gathering is available** • Customary fish stocks including tuna and whitebait. • Stream beds are safe and accessible without deep sediment beds, or nuisance algal mats. • Ecological impact of changes in flows • Cultural assessment
Nga tarukino me nga ika rawaho i te wai (presence of pest weeds and fish) – not sure yet where quantitative data is / Pest Strategy	Not identified as an indicator.
Matauranga ki nga wai kaukau (Knowledge of swimming places) – information currently held by River Iwi	Not identified as an indicator.
Au Putea (economic benefit of water) – can measure effects in employment and profit from sectors and industries and on farm cost in economic model	**Sustainable and productive land use** • Farm ownership, types and size of holding • Average age of farmers • Qualifications of farmers and involvement in agricultural extension activities

Healthy Rivers Indicator	Comparable Selwyn Waihora Sub Outcome and Indicators
	• On farm economic impacts • Number of farmers and farm workers **Energy security is increased** • Amount of stored water in catchment • available for power generation and or irrigation • Volume of surface water vs. groundwater sourced irrigation • Area of irrigation in catchment **Thriving sustainable community** • On farm economic impacts including revenue, farm working expenses, variable expenses and cash farm surplus • Regional economic impacts including GDP, earned household income, rates and taxes • On farm and regional employment • Median household income • Unemployment • Population in Selwyn Waihora catchment • Services including health, infrastructure and education. Social connectedness • Housing (housing affordability, rent to income ratio) • Trust (level of trust in policy makers and other actors involved in policy process) • Safety and security (crime rates, perceptions of safety)

2.4 Trends

Table 2 below highlights the identified social impact or trend, as sourced from Technical Report to support Water quality and water quantity limit setting process in Selwyn Waihora Catchment. The table provides the opportunity to compare social impacts and trends and the ability for them to be considered adaptable or relevant to the Waikato setting.

Table 2: Social impacts and trends identified for Selwyn Waihora

Scenario - Current land use plus 30,000 ha new irrigation with on-farm nutrient reduction measures at a catchment level achieving the mid-way between "good management practice" and maximum feasible mitigation.

- Lake interventions and better management of lake opening and closing and reducing lake legacy phosphorus levels by 50 percent, macrophyte bed and marginal wetland restoration, and construction of floating wetlands.
- Catchment mitigations to manage phosphorus and sediment in streams, and a small amount of managed aquifer recharge and targeted stream augmentation.
- A requirement for annual volumes on water take consents to reflect demonstrated (water metered) use;
- Restrictions on water transfers
- A minimum flow and restriction regime for surface water to reflect ecological or cultural flow requirements;
- Use of Farm Environment Plans to manage diffuse discharges of phosphorus, sediment and microbial contaminants;
- Allowing properties where nitrogen losses would be less than 15 kgN/ha/yr to intensify up to 15 kgN/ha/yr (provided they operate at good management practice);
- Requiring properties leaching greater than 15 KgN/ha/yr to achieve good management practice nitrogen loss rates from 2017 then further improving practices from 2022 to achieve the catchment nitrogen load limit by no later than 2037;
- The introduction of nitrogen load limits for point source discharges to land from community sewage and industrial and trade processes and the requirement to operate using the best practicable options within the catchment;
- Recommendations to specifically deal with the cultural, spiritual, historic and traditional associations Ngāi Tahu has with Te Waihora and its catchment; and
- Riparian margins changed from a blanket 10 metres to 'effective'. This will mean in some areas they may need to be greater than 10 m, and other areas, they will be much less.

Identified social impact / trend	**Description**
Increased irrigation will see a change towards increased	The land uses changes will favour larger scale farms and higher herd numbers (consistent with national trends in

Identified social impact / trend	Description
areas of dairying and intensification of arable farming.	the dairy sector towards larger farms and herds and away from owner-operator farm systems). Larger, and more capital intensive, dairy operations will see a shift from dairy farm ownership by families and a reduced involvement of sharemilkers in production activities and livestock ownership. There will be an increase in the number of farms owned by corporate entities and "absentee" owners employing farm managers and workers, as these types of entities will have the capital necessary to develop irrigated dairying and adopt the intensive new on-farm mitigation strategies and regulatory controls. The number of family farms (properties owned and primarily operated by farm families) will therefore reduce and there will be a lower proportion of sharemilkers.
Increased on farm employment	A substantial increase in on farm employment with irrigation and land use intensification, and a corresponding increase in off farm employment in rural businesses and supply services, with this finding supported by quantitative and qualitative data from comparison cases in the social model. In particular, there will be an increased need to employ dairy farm workers, especially on the more intensive and corporate-structured operations. These workers will include farm managers and migrant workers from other regions of New Zealand. For an increase in the proportion of Maori workers employed on or off farm to occur, however, there would need to be a specific programme designed to train and place Maori workers with new and intensified farming operations and the contractors or businesses servicing them.
Lower average age of farmers	The shift to dairy production, and more intensive production with on farm "mitigation" strategies as part of the Zone Committee package, will tend to lower the average age of farmers, managers and farm workers in areas where they are located and increase the number of families with children.
Technical qualifications of farmers and farm workers are expected to increase	This change will become evident for intensive farming operations in particular. It will also occur across the catchment due to the increased emphasis on environmental sustainability with regulatory controls, and

Identified social impact / trend	Description
	on-farm mitigation strategies which will demand an increasingly sophisticated set of skills and active involvement in agricultural extension.
Population change into employment off farm	The flow on effect of land-use and population change into employment off farm, such as expenditure for rural services, means that the population effect is broadly based and will include the smaller communities and townships. The location of major processing activities such as the dairy factories or any vegetable processing will drive population growth in nearby areas as well as in the catchment.
Health, infrastructure and education benefits	With increased areas of intensive, irrigated farming, social infrastructure with population-based funding, such as health services and schools, will benefit from increased employment and population and an increase in (younger) families with children. The effect on secondary schools will be minor.
Unstable school rolls	With increased dairy farming activity, pre and primary schools, are likely to experience increased instability of their rolls due to the more transient elements of the populations from incoming workers associated with increased farm production. The additional annual churn of dairy farm workers and seasonal employment on farms will create extra demand and delivery issues for social service providers and communities due to the turnover in population.
Increased international workers	An increase in international workers with increased dairying activity, and greater ethnic diversity, will create challenges and new demands for health services, churches and schools, and skilled farm managers. There are likely to be both positive and negative effects on community cohesion and participation as a result of a more transient community, language differences and cultural diversity.
Conflicts in relation to resource value	With further development of intensive farming, value conflicts could arise between traditional pastoral farming areas and areas farmed more intensively. Conflicts are also likely to occur between urban and rural values around water and intensive farming practices, particularly the use of hardened surfaces and structures (e.g. large cow sheds) for dairy farming.

Identified social impact / trend	Description
Housing affordability likely to decrease	Housing affordability is likely to decrease in townships within commuting distance of intensive dairy production. Changes in land use such as dairying and horticulture, and increased on-farm workforces, can lead to short-term shortages of rural housing, and some upward pressure on rental prices, until such time as sufficient new housing is supplied on and off farm.
Varying levels of trust, in relation to policy makers and politicians	For all scenarios the level of trust generated will depend on the level of community participation and effort to involve different stakeholder groups in the process of policy implementation and adjustment of land uses and farming practices. Under all scenarios some community conflict is likely between the different value sets that support increased farm production and improved environmental outcomes. Intensification of irrigation and farm systems (including housing cows in order to control nutrients better) is likely to generate opposition; with greater rural-urban values conflict becoming evident. There is also potential for conflict between these value sets with respect to the control of lake levels if a permanent opening was built.
Rise in on-farm health and safety issues	Intensification of land uses as in the Zone Committee Solutions Package is frequently associated with an increase in issues of on-farm health and safety through increased mechanisation and a high rate of accidents in the dairy sector, especially slips and falls. There is likely to be a modest reduction in safety on rural roads due to an increase in heavy traffic volumes (e.g. milk tankers). There may be some effects on community cohesion and participation as a result of a more transient community, language differences and cultural diversity. Long-term residents may have negative perceptions of security from an influx of newcomers. Negative perceptions, however, do not necessarily translate to an increase in crime rates or a threat to personal safety. Community safety can be addressed through consultation and monitoring, and programmes of community development including community events and celebrations.
Positive effect recreation	Positive effects on the Lake in general (from control of lake levels, with low summer levels and saltwater intrusion avoided, higher water quality, enhanced biodiversity and

Identified social impact / trend	Description
	habitat improvements) are likely to see improvements in participation for activities such as passive recreation (e.g. walking and lake viewing in general) and more specific nature-based activities such as bird watching, gamebird hunting, and fishing (including trout and whitebait/flounder). An improvement in water quality (e.g. trophic levels), as obtained with projections from the solutions packages, means there would be a small positive effect from a decrease in the frequency of temporary recreation restriction warnings due to toxic algal blooms and potentially decreased probability of dog, stock and wildlife poisoning.
Increased participation in recreation	Greater flows in the streams will enhance current recreational uses, such as swimming or fishing, in terms of the level of participation and the quality of the recreational experience. Any increase in stream flows, so long as water quality is not compromised by the increase, should lead to an increase in swimming and related contact recreation activities, as well as for picnicking and passive activities, raising the profile of the fords as recreation reserves close to the city and the growing settlements of the catchment.
Increased Angling	An improved trout habitat in rivers and streams (stream ecology and biodiversity and better spawning areas and food resources), with improved flows, riparian planting, sediment removal and active management, and phosphorous reduction, would see an increase in angling activity. Along with reduced risk of periphyton and macrophyte growth and enhanced stream aesthetics with riparian planting, there will be improvements around the mouths of streams from lake management and an increase in numbers of sea-run trout. The overall perceptions of the fishery should improve.

3. Proposed Natural Resources Plan – Greater Wellington Council

3.1 Overview of Plan Review

The Plan has been developed in collaboration with people from the diverse communities that make up the Wellington Region and have economic, spiritual, cultural and environmental interests in the region's air, land, water and coastal resources. The development of the Plan has been informed by an ongoing programme of engagement with stakeholders, mana whenua and the community around the review of the five existing regional plans (Regional Coastal Plan, Regional Air Quality Management Plan, Regional Freshwater Plan, Regional Plan for Discharges to Land and Regional Soil Plan).

A range of methods and tools have been used to identify the natural resource issues of the region, including environmental monitoring and research programmes, scientific research, community engagement, resource consent monitoring, mana whenua perspective, Māori and community consultation and rulings of the Environment Court.

The key natural resource management issues identified across the region relate to:

- the quality of fresh water in both urban and rural areas;
- the allocation and efficient use of water, including groundwater;
- the state of the coastal environment, particularly the impacts that land-use and degraded fresh water systems have on coastal and estuarine ecosystems; and
- the management of natural hazards, including earthquakes, flooding hazard and coastal erosion.

Values of water in the Plan are defined as the worth or desirability to the community of a particular set of qualities, uses or outcomes.

The Plan reflects a wide range of values from across society. Values have been brought into the Plan through consultation with the community, mana whenua and other stakeholders. The concept of shared values expressed by the committee is also fundamental to the Plan. Key directions on providing for values of water are also given in the objectives and policies of the RPS.

The discussion and development of the values is further informed by the way values are expressed in the NPS-FM. The NPS-FM is particularly important in describing values, and provides a framework for establishing freshwater objectives in respect of fresh water resources. It provides a management framework to guide the allocation of fresh water so that it may be used in a way that contributes to economic growth and at the same time maintains environmental integrity.

3.2 Indicators / Attributes Used

Table 8 in Appendix One of this report identifies the indicators (Greater Wellington uses the term 'attribute') used to measure each water quality related value in the plan review.

3.3 Comparison of Indicators Used in Healthy Rivers Plan Change

Table 3 below lists the indicators identified for use as part of the Healthy Rivers process, with any comparable indicator from Greater Wellington Natural Resources Plan listed alongside.

Table 3: Comparison of indicators used in Healthy Rivers with Greater Wellington

Healthy Rivers Indicator	**Comparable Greater Wellington Natural Resources Plan indicator**
Employment (with an emphasis on type, variety and diversity of jobs)	Not identified as an indicator.
Infrastructure (reliable, affordable to consumers, investment/reinvestment risk - only covers energy, waste and water)	**Stock watering** • E.coli • Benthic cyanobacteria • pH • Toxicants/irritants
Recreation use (including access and safety)	**Trout fishery and spawning** • Macroinvertebrate community index - MCI • Ash free dry weight • Filamentous algae • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate - N • Ammonia • NH3-N (acute) • Other toxicants • Sediment cover **Contact recreation and tanagata whenua use** • E.coli

Healthy Rivers Indicator	Comparable Greater Wellington Natural Resources Plan indicator
	• Filamentous algae • Mat algae • Benthic cyanobacteria • Macrophyte • pH • Water clarity • Sediment cover • Toxicants/irritants
Regional Ecological Monitoring of Streams (REMS which includes MCI, Clogginess (Macrophytes), stream habitat)	**Trout fishery and spawning** • Macroinvertebrate community index - MCI • Ash free dry weight • Filamentous algae • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate - N • Ammonia • NH3-N (acute) • Other toxicants • Sediment cover **Stock watering** • E.coli • Benthic cyanobacteria cover • pH • Toxicants/irritants
Riparian (effective for land-use)	**Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass

Healthy Rivers Indicator	Comparable Greater Wellington Natural Resources Plan indicator
	• Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N • Ammonia (chronic) • Ammonia (acute) • Other toxicants
Wetland (unique habitat protected)	**Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N • Ammonia (chronic) • Ammonia (acute) • Other toxicants
Regional GDP with sector breakdown	Not identified as an indicator.
Waikato regional contribution to national exports	Not identified as an indicator.
Total value of employment	Not identified as an indicator.
Waitemata (water clarity) – currently an attribute	**Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N

Healthy Rivers Indicator	Comparable Greater Wellington Natural Resources Plan indicator
	• Ammonia (chronic) • Ammonia (acute) • Other toxicants
Te Rere (flow) – measures in cumecs at monitoring stations / effects from expert panel	Not identified as an indicator.
Paemakariri (temperature) – measured across the monitoring network / effects from expert panel Survey (in tributaries)	**Aquatic Ecosystem Health and Mahinga Kai** • Temperature
Pareparenga o te wai (Riparian margin – access and acceptability) – riverbank condition is monitored as part of Regional Ecological Monitoring	**Trout fishery and spawning** • Macroinvertebrate community index - MCI
He kai pai (edible food) – E.coli measured but food standards not reported	**Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N • Ammonia (chronic) • Ammonia (acute) • Other toxicants **Trout fishery and spawning** • Macroinvertebrate community index - MCI • Ash free dry weight • Filamentous algae

Healthy Rivers Indicator	Comparable Greater Wellington Natural Resources Plan indicator
	• Temperature • pH • Dissolved oxygen • Water clarity • Nitrate - N • Ammonia • NH3-N (acute) • Other toxicants • Sediment cover
Te nui o nga kai i te wai (abundance of fish species – koura) – monitored as part of Regional Ecological Monitoring Survey (in tributaries)	**Trout fishery and spawning** **Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N • Ammonia (chronic) • Ammonia (acute) • Other toxicants
Nga tarukino me nga ika rawaho i te wai (presence of pest weeds and fish)	**Aquatic Ecosystem Health and Mahinga Kai** • Periphyton biomass • Temperature • pH • Dissolved oxygen • Water clarity • Nitrate –N • Ammonia (chronic)

Healthy Rivers Indicator	Comparable Greater Wellington Natural Resources Plan indicator
	• Ammonia (acute) • Other toxicants
Matauranga ki nga wai kaukau (Knowledge of swimming places) – information currently held by River Iwi	**Contact recreation and tanagata whenua use** • E.coli • Filamentous algae • Mat algae • Benthic cyanobacteria • Macrophyte • pH • Water clarity • Sediment cover • Toxicants/irritants
Au Putea (economic benefit of water) – can measure effects in employment and profit from sectors and industries and on farm cost in economic model	Not identified as an indicator.

3.4 Trends

A review of the available technical reports and section 32 analysis that contributed to the development of the Greater Wellington Proposed Natural Resources Plan has not revealed any information that describes social impacts or trends as a result of the new water quality management regime. Based on all available information, the Greater Wellington Proposed Natural Resources Plan development appears to have been strongly premised on achieving environmental bottom lines and dealing with environmental impacts, with limited use of indicators related to social values and desired outcomes.

4. Hawkes Bay Regional Plan – Plan Change 6 (Tukituki)

4.1 Overview of Plan Change 6

Plan Change 6 is the first of a number of catchment specific plan changes for the Hawke's Bay region which seek to implement the National Policy Statement for Freshwater Management, as well as address specific water allocation and water quality issues in the catchment. It proposes water quality limits and targets for a range of variables to achieve objectives: to maintain or enhance aquatic habitats, maintain safe contact recreation, and reduce the effects of algae and slime on recreational use and amenity. It proposes new policies and rules intended to implement a nutrient management framework. Plan Change 6 also proposes new water allocation limits for surface water and groundwater bodies and increases current minimum flows. It provides for the consideration of community irrigation schemes that are intended to improve the efficient allocation and efficient use of water

The generic policy development process involved a number of sequential steps, which can be summarised as:

i. Identification of catchment values;

ii. Identification of the management objectives having regard to the freshwater values;

iii. Identification of a full range of management options (including policy responses) in relation to the freshwater values and selection of the most appropriate option based on an objective comparison of the advantages and disadvantages of each; and

iv. Implementation of the selected option, and monitoring its performance in terms of appropriately managing the freshwater resources in relation to the identified freshwater values

Reflecting a relatively broad, values based approach to managing the catchment, Plan Change 6 was supported by a numerous technical documents, including:

- **A social impact assessment**

  The social impact assessment was confined solely to the effects of the construction of the Ruataniwha Dam, and did not consider the broader implications of the Plan Change, which included setting environmental bottom lines. The scope of this assessment was directed at the potential social effects of the scheme associated with:

  - Changes in farming practices
  - Changes in land ownership
  - Demographic changes (numbers and composition of the population)
  - Strengthening rural communities (education, health, commerce, clubs etc)
  - Value conflicts associated with new / intensified land uses versus traditional dryland farming practices
  - Wider regional socio-economic effects including construction effects.

- **Economic Impact of Future Scenarios report**

  This report describes the economic outcomes for the catchment under each of the scenarios. The report focuses on four key elements of the Tukituki choices review, each of which has different impacts on the catchment. The elements assessed were:

  - Land use change
  - Nutrient caps
  - Minimum flows
  - Seasonal volumes
  - Storage

- **Cultural Values and Uses of the Tukituki Catchment assessment**

  This report sought to clarify and to define key Māori environmental cultural values and their uses specifically within the Tukituki River catchment. In order to ensure adherence to kaupapa Māori principles a cultural values and uses conceptual framework was developed. The aim was to acknowledge key kaupapa and tikanga principles significant in terms of Māori environmental management and planning perspectives such as, monitoring the effective achievement of Māori indicators and outcomes. Constructing a Māori cultural values and uses framework is underpinned by a Kaupapa Māori philosophy providing the context for the qualitative methods used.

- **Tukituki Catchment Freshwater Values assessment**

  This report outlines the results of a freshwater values assessments for the Tukituki catchment. The presence and/or significance of freshwater values underpinned the setting of freshwater objectives and numerical limits for water quality and water allocation. The Tukituki catchment was divided into 17 surface water sub-catchments based on the NIWA Rivers Environment Classification. To establish a suite of values that might apply to all or some parts of the Tukituki catchment, a review of national legislation and other regional approaches was undertaken. The report summarises each value with a definition, description of methodology used to determine the spatial distribution of the value, and results of that assessment.

With particular regard to the reports relating to catchment values and uses (including the social impact, economic and cultural reports), the following final values were identified for use as part of the objective and policy development process for Plan Change 6:

Economic Values	**Ecological Values**
• Long term economic growth (including potential) • Flexibility • Investment certainty • Employment	• Healthy ecosystems – life supporting capacity Biodiversity • Native fish habitats • Trout habitats • Fish passage

• Opportunities • Reliable • Water Supplies for commercial, industrial and irrigation • Tourism	
Social Values • Human and stock drinking water needs • Swimming and fishing • Passive enjoyment Food gathering Public access Lifestyle	**Cultural Values** • Mauri – the life force • Wāhi tapu – sacred places • Tikanga – protocols • Kaitiakitanga – guardianship • Manaakitanga – being good hosts • Mahinga kai – food gathering places • Mātauranga Māori – knowledge • Te reo – language • Taonga – highly prized things

4.2 Indicators Used

While values were identified across the four wellbeings, direct identification and use of indicators in relation to values is fairly limited in scope.

In Plan Change 6, the term 'indicators' is used to reflect a water quality state measured by certain 'parameters'. The text of Plan Change 6 states that:

> *"The "Indicators" define what the state of certain water quality parameters should be in order to safeguard the life supporting capacity of the water body but they are not "limits" or "targets". The "indicators" stated will be used by Hawke's Bay Regional Council to monitor the effectiveness of the RRMP in achieving the purpose of the RMA in the Tukituki River catchment."*

The parameters used in Plan Change 6 are shown in Table 9 in Appendix One of this report, and relate to objectives for achieving contact recreation for health and amenity, drinking water standards, and life supporting capacity for fish and invertebrates. Some water quality parameters are directly associated with the freshwater objectives, such as water clarity and periphyton biomass. These are referred to as direct parameters. Other water quality parameters are a means of achieving a direct parameter; for example nutrient thresholds can be set to maintain a certain level of periphyton biomass. These are referred to as indirect parameters.

Irrespective of the Objective being measured against, the parameters are all 'natural science' water quality measures which can be quantifiably measured.

A Hawkes Bay Regional Council Technical Report provides the technical rationale for the process used and appropriateness of the water quality variables selected when developing the water quality policies outlined in Change 6, including the indicators identified above. It recommends numerical values for each of the limits, targets or state indicators identified. According to the Report, the numerical values of the variables selected were determined using the best scientific knowledge and advice available to the Hawke's Bay Regional Council. In-house staff and external consultant expertise was used extensively. The selection of variables and numeric targets was supported by referring to international guidelines, long-term monitoring data-sets and in some cases, the results from specially commissioned technical research projects.

4.3 Comparison of Indicators Used in Healthy River

Table 4 below lists the indicators identified for use as part of the Healthy Rivers process, with any comparable indicator from Plan Change 6 listed alongside.

Table 4: Comparison of indicators used in Healthy Rivers with Plan Change 6

Healthy Rivers Indicator	Plan Change 6 Comparison
Employment (with an emphasis on type, variety and diversity of jobs)	Not identified as an indicator, but is reflected in the economic analysis of the four scenarios considered as part of the PC6 process.
Infrastructure (reliable, affordable to consumers, investment/reinvestment risk - only covers energy, waste and water)	Not identified as an indicator.
Recreation use (including access and safety)	Contact recreation (Health) • E Coli
	Contact recreation (Amenity) • Periphyton Biomass and cover • Dissolved nutrient limits (Periphyton)
Regional Ecological Monitoring of Streams (REMS which includes MCI, Clogginess (Macrophytes), stream habitat)	Life Supporting Capacity Native Fish and Trout habitat Invertebrate habitat

Healthy Rivers Indicator	Plan Change 6 Comparison
	• Water Clarity • Dissolved Oxygen • Temperature • Macro-invertebrate Index • Nitrate and Ammonia • Periphyton Biomass and cover • Other toxicants • Sediment (Clarity) • Dissolved nutrient limits (Periphyton) • Sediment Cover (Macroinvertebrate Community Index) • Organic Matter (Dissolved Oxygen)
Riparian (effective for land-use)	Not identified as an indicator. Recognised in technical reports as being critical for managing water temperature (which is an indicator).
Wetland (unique habitat protected)	Not identified as an indicator. Recognised in technical reports as being important for managing water quality and sediment (which is an indicator).
Regional GDP with sector breakdown	Not identified as an indicator, but is reflected in the economic analysis of the four scenarios considered as part of the PC6 process.
Waikato regional contribution to national exports	Not identified as an indicator.
Total value of employment	Not identified as an indicator, but is reflected in the economic analysis of the four scenarios considered as part of the PC6 process.
Waitemata (water clarity)	Life Supporting Capacity Native Fish and Trout habitat Invertebrate habitat

Healthy Rivers Indicator	Plan Change 6 Comparison
	• Water Clarity
Te Rere (flow)	Not identified as an indicator.
Paemakariri (temperature)	Life Supporting Capacity Native Fish and Trout habitat Invertebrate habitat • Temperature
Pareparenga o te wai (Riparian margin – access and acceptability)	Not identified as an indicator.
He kai pai (edible food)	No indicator specifically for mahinga kai, however E.coli is measured for achievement of contact recreation (health).
Te nui o nga kai i te wai (abundance of fish species – koura)	Not identified as an indicator.
Nga tarukino me nga ika rawaho i te wai (presence of pest weeds and fish)	Not identified as an indicator.
Matauranga ki nga wai kaukau (knowledge of swimming places)	Not identified as an indicator.
Au Putea (economic benefit of water)	Not identified as an indicator.

4.4 Trends

Table 5 below outlines the social impacts and trends identified as part of Plan Change 6. The anticipated social impact trends identified for Plan Change 6 below have been premised on the scenarios identified prior to notification of the plan change. The Board of Inquiry decision on Plan Change 6 made significant changes to the environmental bottom lines required to be met (most notably further limiting dissolved organic nitrogen leaching). The decision has resulted in many commentators questioning the viability of significant parts of the Plan

Change, including the proposal to construct the Ruataniwha dam, which was to provide for irrigation in dry periods, and potentially allow for intensification of land use.

For the scenarios identified below, a social impact assessment has only been prepared for the Ruataniwha dam component of the Plan Change. For this aspect of the plan change, there is little that connects the assessed social impacts with the indicators identified in the table above. For example, safety for contact recreation is measured through the presence of E.coli as an indicator. The social impact assessment focuses more on safety from an education and awareness raising perspective.

No social impact assessment is available for the broader plan change. Indicators relating to social outcomes (specifically contact recreation) are quantifiable natural science measures, being the presence of E.coli and periphyton. In essence, the broader plan change appears to have limited direct connectivity between social impacts and indicators used to monitor trends and achievement of objectives.

Table 5: Social impacts and trends identified for Plan Change 6

Scenario - Environmental bottom lines for all activities in the Tukituki catchment (taking water, discharging to water and land, and use of the land):

- Water quality limits set for dissolved organic nitrogen and phosphrus to maintain the mauri and life supporting capacity of freshwater bodies and associated ecosystems
- minimum flow limits based on 90% habitat protection for longfin eel for Waipawa River at SH 2 and Tukituki at Tapairu Rd, transitioning from current over a 3-5 year period
- minimum flows for Tukituki at Red Bridge based on 90% habitat protection for trout, transitioning from current over a ten year period
- applications allowed to be lodged to take water for community irrigation schemes over and above the core allocation limits.

Identified social impact	**Description**
Presence of E.coli in waterways may adversely impact people's perception of safety for contact recreation.	E.coli concentrations recorded at the 5 monitoring sites along the Tukituki River have nearly always been below MfE guidelines (at least 95% compliance), indicating water of a swimmable standard most of the time.
Presence of periphyton in waterways may adversely impact people's perception of safety and amenity for contact recreation.	There is a clear trend of increasing measured periphyton biomass going downstream in the Tukituki River.

Scenario - Ruataniwha dam constructed, resulting in increased areas of irrigation and associated changes in land use:

- Intensified dairying and its associated dairy support
- Intensified horticultural operations
- Irrigated arable farming
- Some irrigated sheep and beef farming

Identified social impact	**Description**
Increasing employment as a result of intensified land use.	Land use intensification in newly irrigated areas will boost the numbers of farmers and farm workers. With an increase in the area of orchards there is likely to be an increase in the number of orchard workers at various times of the year, especially for harvesting but also for pruning and thinning. More intensive land uses and increased farm viability and on farm employment typically leads to an increase in employment off farm through employment in farm services and indirect and induced employment in other sectors (known as the multiplier effect). The services affected will include veterinary, transport, building, engineering and farm supply services (which are all represented in the district). Regionally, transport firms, irrigation engineering and rural servicing and processing will also get more business from the changes in land use.
Population increase	The increase in on and off farm employment will combine with other demographic factors such as a reduced average age of farmers, with new families coming into the area. Some of the new farm workers are likely to live in the villages and also the main townships. Seasonal workers are likely to live in on-farm accommodation or "camps" as they do now. The effect of these changes will be a turnaround from negligible growth in population evident in the district over recent years. In addition to changes in total population there is likely to be a change in the composition of the population, especially of the rural areas. This change will see some increase in the number of

Identified social impact	Description
	younger families and children, with consequent rises in school rolls. Increases in population on and off farm, ranging in type from young families to more professional people and migrant seasonal workers, will mean an increased demand for services such as schools, sport and recreation. Sports and community organisations get a boost from new members and provide a basis for building community attachment and support.
Increased turnover of population and more overseas workers, with more ethnic diversity and a need to provide social support to new comers	An increase in the number of workers, short-term, seasonal and longer term will very likely mean an increase in the number of new comers working in the district. Over time the increased number of jobs available will also lead to an increase in the numbers of ethnic groups represented and the size of these groups. Increases in the numbers of newcomers and an increase in ethnic diversity could potentially lead to an increase in community participation and vitality such as participation in school activities and some cultural groups. It is also likely to mean an increase in demand for social services and support, including recreation and sport to offset any needs arising from social isolation. There will be a larger pool of members/volunteers but the effect will be limited unless there is a concerted effort to encourage newcomers to participate in local organisations and clubs and adapt to new work schedules. These changes will create a demand for programmes that integrate new settlers into the community and meet their particular needs, including information about the community and ways of assisting cross cultural communication, access to services, and support around working conditions and visa requirements.
Increase in health and safety risk and awareness	The new reservoir and other headworks such as open canals, and on-farm waste-water treatment raise the issue of water safety. Rural people are very aware of the dangers that on and off-farm waterways, water races, ditches, ponds, and troughs present to children in particular. Awareness

Identified social impact	Description
	of such dangers has been increasingly promoted in rural areas and this should be extended to new comers such as migrant workers and their families through appropriate education. Fencing of open channels and signs warning the public of dangers associated with the headrace and reservoir is an issue covered in the Project Description and the Recreation Assessment. Availability of irrigation will reduce the high stress on farmers, farm families and farm service providers that arises in periods of successive droughts. Although, it was also apparent through interviews for this assessment that famers and farming communities in the district have had to adapt in many ways to the vagaries of their climate. Any change is inherently stressful, so an openess to change will help to reduce potential levels of stress from introducing new farming systems and debt from irrigation, and change as some farmers sell out. Higher volumes of road traffic generated by the increased number of movements of workers and heavy vehicles such as milk tankers and fruit transport could decrease safety on roads raising the risk of accidents on local roads. However, heavy vehicles tend not to be the cause of accidents in which they are involved. Also, there will be potential for increased use of heavy machinery on farms with the intensification of land use. Long hours in dairy farming has been found to lead to tiredness, mistakes and accidents.49 Respondents also identified the need for strong health and safety practices for managing the use of chemicals in orchards. Central Hawke's Bay already has a relatively high number of machinery and farm related accidents prompting an active programme to reduce them.
Effects on local amenity	Effects on the bio-physical changes from construction activities can have social consequences for local people and communities. The actual or perceived physical impacts on people and communities from the construction of the project will be temporary and depend on mitigation measures and management plans.

Identified social impact	Description
	Some loss of some amenity values in flooded valley. Gain of new amenity values for reservoir lake. Some risk of reduced values for surface water if there is poor nutrient management. Water allocation rationalised.
Disruption of current practices through land takes	Land takes for the reservoir, canals and other head works have the potential to disrupt housing and farming activities.
Strengthening of physical and mental health	Strengthening determinates of health particularly through reduced unemployment and increased opportunities for youth. Reduced dependence on benefits amongst working families. Potential health effects if social change is poorly managed, including pressure on health services.
Increased education opportunities	Potential for enhanced agricultural and horticultural training in support of land use change with irrigation. Opportunities to add to career opportunities for high school students and youth, including disadvantaged youth. Opportunities for technology transfer on farms around new farming systems, water and nutrient management and environmental management. Opportunities for local business training and development.
Change in housing demand	Short-term demand for rental housing during construction could pressure price and quality of housing for low-income renters. Changes in sense of place with new land uses, landscapes and people coming into the district – felt as a loss by some people Possible conflicts in values over use of water, economic growth and development. General improvement in housing and neighbourhoods over time with the flow-on from employment and higher incomes.
Increased demand for communications	Increased impetus to broadband development and cellular services through land use intensification and economic activity
Increased participation in community and society	Boost to participation, leadership and community engagement.

5. Horizons Regional Council – One Plan

5.1 Overview of Plan Change

Horizons Regional Council developed a plan combining the Regional Plan and Regional Policy Statement: the One Plan. The One Plan includes provisions which aim to improve water and catchment management regime for the Manawatu-Wanganui Region. The central component of the management regime is the clear definition and identification of the values that the regional community associates with water bodies.

The One Plan was developed, and is being implemented, using the following broad policy framework:

- Definition of water management zones
- Definition of the community values associated with the waterbodies
- Definition of water quality standards
- Identification of the waters that meet the standards, and those that don't meet the standards
- Development of water quality management plans to maintain or improve water quality.

The process has been supported with a number of technical documents, including:

- A report identifying community values to guide water management in the Manawatu-Wanganui Region
- A report recommending water quality standards for the Manawatu-Wanganui Region
- Numerous scientific reports.

With particular regard to the reports relating to catchment values and uses, the following values were identified for use as part of the objective and policy development process for the One Plan, classed into four groups:

Ecosystem Values	**Recreational and Cultural Values**
• Natural State • Life-Supporting Capacity • Sites of Significance-Aquatic • Sites of Significance-Riparian • Ecosystem Values • Native Fish Spawning	• Contact Recreation • Amenity • Native Fishery • Mauri • Shellfish Gathering • Sites of Significance-Cultural • Trout Fishery • Trout Spawning • Aesthetics

Consumptive Use Values	Social and Economic Values
• Water Supply • Industrial Abstraction • Irrigation • Stockwater	• Capacity to Assimilate Pollution • Flood Control • Existing Infrastructure • Drainage • Gravel Extraction

5.2 Indicators Used

The process for developing the One Plan water quality provisions does not appear to have specifically identified 'indicators'. Rather, seven of the 23 proposed values were translated into numerical water quality standards which have 'parameters' assigned to each, against which baseline data has been collected. These can be found in Table 10 of Appendix One of this report, and can be summarised as the life-supporting capacity, contact recreation, amenity, trout fishery, trout spawning, shellfish gathering and livestock drinking water. Narrative standards are recommended in relation to a further two values (natural state and mauri).

The underlying philosophy guiding the "translation" of values into water quality standards is to represent the environmental bottom line beyond which the value would be compromised, in other words the "good state" of the water in relation to that value. The recommended standards cover a number of water quality aspects, to ensure that each value is adequately protected, including: - physicochemical parameters to ensure conditions are adequate for aquatic life and water users: pH, dissolved oxygen, temperature, water clarity, biochemical oxygen demand (BOD), particulate organic matter (POM), toxicants; - parameters relating to the recreational use of the waterbodies and the protection of public health, including indicators of faecal contamination, water clarity and algal biomass and cover; - biological parameters, directly linked with the integrity of aquatic ecosystems: quantitative macroinvertebrate communities index (QMCI) and periphyton biomass; and - nutrient (nitrogen and phosphorus) standards to control algal growth.

By comparing the recommended standards to the current state of the water quality, the aim is to identify the waters that

- clearly meet the standards;
- are close to the standards (on either side of the standards); and
- clearly do not meet the standards (degraded waters).

The translation of the remaining values into water quality standards did not occur, as they were considered better protected by standards attached to other values.

5.3 Comparison of Indicators Used in Healthy River

The following table lists the indicators identified for use as part of the Healthy Rivers process, with any comparable indicator from One Plan listed alongside.

Table 6: Comparison of indicators used in Healthy Rivers with One Plan

Healthy Rivers Indicator	One Plan Comparison
Employment (with an emphasis on type, variety and diversity of jobs)	Not identified as an indicator.
Infrastructure (reliable, affordable to consumers, investment/reinvestment risk - only covers energy, waste and water)	Not identified as an indicator.
Recreation use (including access and safety)	Not identified as an indicator.
Regional Ecological Monitoring of Streams (REMS which includes MCI, Clogginess (Macrophytes), stream habitat)	MCI
Riparian (effective for land-use)	MCI (in part)
Wetland (unique habitat protected)	MCI (in part)
Regional GDP with sector breakdown	Not identified as an indicator.
Waikato regional contribution to national exports	Not identified as an indicator.
Total value of employment	Not identified as an indicator.
Waitemata (water clarity)	Water clarity
Te Rere (flow)	Not identified as an indicator.
Paemakariri (temperature)	Temperature
Pareparenga o te wai	Not identified as an indicator.

Healthy Rivers Indicator	One Plan Comparison
(Riparian margin – access and acceptability)	
He kai pai (edible food)	Not identified as an indicator.
Te nui o nga kai i te wai (abundance of fish species – koura)	Not identified as an indicator.
Nga tarukino me nga ika rawaho i te wai (presence of pest weeds and fish)	Not identified as an indicator.
Matauranga ki nga wai kaukau (knowledge of swimming places)	Not identified as an indicator.
Au Putea (economic benefit of water)	Not identified as an indicator.

5.4 Trends

A review of the available technical reports and section 32 analysis that contributed to the development of the One Plan has not revealed any information that describes social impacts or trends as a result of the new water quality management regime. Based on all available information, the One Plan development appears to have been strongly premised on achieving environmental bottom lines and dealing with environmental impacts, with limited use of indicators related to social values and desired outcomes.

6. Conclusions

The following broad observations and conclusions are made by the author of this report:

- There is significant variation in methodology and information/technical inputs into the plan changes/reviews included in this report. Of the plan changes/reviews included, Variation 1 to the Proposed Canterbury Regional Plan presents itself as being most similar to the process being undertaken by Healthy Rivers. In this example, a form of integrated assessment was undertaken leading up to development of provisions for notification, which was informed by environmental, social, economic and cultural assessments. Of the four plan changes/reviews assessed, only Variation 1 and Plan Change 6 had specific social impact assessments undertaken.
- Despite starting with a range of identified community values, across the four wellbeings (environmental, social, economic, cultural), subsequent development of indicators (and to a large extent plan provisions) is significantly narrowed to environmental matters. In all examples included, there is a significant disconnect between indicators used to measure

current and future state of identified values and desired outcomes, and any identified social trends and impacts. Indicators are predominantly focussed on measurable (quantifiable) environmental matters, such as water clarity, E.coli and periphyton biomass.

- Cultural / iwi values appear to have been diluted in general through the development of the reviewed plan processes. Where iwi values have been identified there tends to be a trend, where commonality exists with generic values, that resulting 'hybrid' indicator does not really reflect or provide visibility for the original iwi value.
- The social impacts assessment for Variation 1 to the Proposed Environment Canterbury Regional Plan and Plan Change 6 to the Hawkes Bay Regional Plan provide the most useful insights into the potential social impacts of a regional plan change in the Waikato. However both these social assessments are based on increased irrigation and thus potential expansion of dairying into new areas, or intensification of current dairy operations, so long as environmental bottom lines are met. Each assessment takes place in areas where current land use/productivity is considered to be constrained by water availability and frequent drought. In these cases, the positive impact of irrigation may overshadow the negative impacts on land owners of compliance with tighter environmental management practices.

7. Information Sources

7.1 Variation 1 to the Proposed Canterbury Regional Plan

Environment Canterbury. 2014. *Section 32 Evaluation Report for Variation 1 to the Proposed Canterbury Regional Plan*

Robson. 2014. *Predicting Consequences of Future Scenarios: An Overview Report*

Harris Consulting. 2014. *Predicting Consequences of Future Scenarios: Economic Impact*

Tipa Associates. 2014. *Predicting consequences of future scenarios: Cultural Impact Assessment.*

Taylor Baines and Associates. 2014. *Predicting consequences of future scenarios: Social Impact Assessment.*

7.2 Greater Wellington Natural Resources Plan Review

Greenfield, Milne, Perrie, Oliver, Tidswell and Crisp. 2015. *Aquatic ecosystem health and contact recreation outcomes in the Proposed Natural Resources Plan*

Greenfield, Milne, Vujcich, Conwell, Tidswell, Crisp, and Perrie. 2013. *Technical report for Schedule H of the Regional Plan working document for discussion*

Greater Wellington Regional Council. 2015. *Section 32 Report: Water Quality*

7.3 Plan Change 6 to the Hawkes Bay Regional Plan (Tukituki)

Taylor Baines and Associates. 2012. *Ruataniwha Water Storage Project: Social Impact Assessment Technical Report*

Aquanet Consulting Ltd. 2008. *Water Quality in the Tukituki Catchment - State, Trends and Contaminant Loads*

Harris. 2012. *Economic Impact of Future Scenarios for the Tukituki River*

Sharp. 2012. *Tukituki Catchment Freshwater Values Assessment*

Codlin. 2013. Freshwater Management Objectives

Uytendaal. 2013. *Recommended Water Quality Limits and Targets for the Tukituki Plan Change 6*

Hawkes Bay Regional Council. 2013. *Proposed Plan Change 6 Section 32 Evaluation Summary Report*

7.4 Horizons One Plan Review

Ausseil and Clark. 2007. *Identifying community values to guide water management in the Manawatu-Wanganui Region. Technical report to support policy development.*

Ausseil and Clark. 2007. *Recommended water quality standards for the Manawatu-Wanganui Region Technical report to support policy development.*

Gibbarrd, Roygard, Ausseil and Fung. 2006. *Water Quality Trends in the Manawatu - Wanganui Region 1989 - 2004*

Horizons Regional Council. 2005. *State of the Environment of the Manawatu Wanganui Region - Technical Report - Freshwater Quality*

Horizons Regional Council. 2007. *Section 32 Report for One Plan*

Appendix One – Tables of Indicators

Table 7: Priority outcomes, sub outcomes and technical indicators for Selwyn Waihora

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
Thriving communities and sustainable economies	Sustainable and productive land use	• Farm ownership, types and size of holding • Average age of farmers • Qualifications of farmers and involvement in agricultural extension activities • On farm economic impacts • Number of farmers and farm workers
Thriving communities and sustainable economies	Energy security is increased	• Amount of stored water in catchment available for power generation and or irrigation • Volume of surface water vs. groundwater sourced irrigation • Area of irrigation in catchment
Thriving communities and sustainable economies	Customary and commercial fisheries are improved	• Trophic Lake Index (TLI) • Phytoplankton blooms • Lake level and opening/closing regime • Satisfaction that seasonal runs and migrations of taonga species observed • Iwi satisfaction quantity, catch effort and condition of kai/cultural materials collected of species, age

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
		and seasonality, gathering consistent with tikanga etc • Overall flows plus low flows and minimum flows. Flow intermittency and proportion of river length accessible from the sea for migratory fish species with a marine phase • Periphyton and macrophyte for recreation, aesthetics and benthic biodiversity • Nitrate-N concentrations and nitrate-N toxicity • Cultural assessment • Economic valuation for commercial fishery • Secure water supply to provide a target of 95% reliability for irrigation • Amount of stored water in catchment
Thriving communities and sustainable economies	Thriving sustainable community	• On farm economic impacts including revenue, farm working expenses, variable expenses and cash farm surplus • Regional economic impacts including GDP, earned household income, rates and taxes • On farm and regional employment • Median household income • Unemployment

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
		• Population in Selwyn Waihora catchment • Services including health, infrastructure and education. • Social connectedness • Housing (housing affordability, rent to income ratio) • Trust (level of trust in policy makers and other actors involved in policy process) • Safety and security (crime rates, perceptions of safety)
High quality and secure supplies of drinking water	All domestic drinking water meets national standards preferably without treatment	• Average groundwater nitrate-N concentrations in comparison with ½ Maximum Allowable Value (MAV) • Exceedences of MAV • Bacterial contamination of groundwater • Nitrate-N concentrations in surface waters • Cost of deepening wells
Kaitiakitanga is integrated into water management in the zone	Wahi tapu and mahinga kai are respected, understood, protected and enhanced	• Customary fish stocks • Cultural assessment of Mahinga kai and Wahi Tapu sites
Healthy lowland streams	Water quality, flows and habitat supports increased abundance and diversity of aquatic life	• Overall flows plus low flows and minimum flows • Periphyton and macrophyte for recreation, aesthetics and benthic biodiversity

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
		• Nitrate-N concentrations and nitrate-N toxicity • Diversity and abundance of aquatic species • Cultural assessment
Healthy lowland streams	Safe and plentiful food gathering is available	• Customary fish stocks including tuna and whitebait. • Stream beds are safe and accessible without deep sediment beds, or nuisance algal mats. • Ecological impact of changes in flows • Cultural assessment
Healthy lowland streams	Nutrient inflows decline over time to acceptable levels	• Modelled spring fed stream nitrate-N concentrations decreasing from current • Nutrient levels decline to deliver macrophyte and periphyton targets
Te Waihora is a healthy ecosystem	There are healthy macrophyte beds and water clarity is improved	• Water clarity and colour in Te Waihora/Lake Ellesmere • Macrophyte beds • Trophic Lake Index (TLI) • Phytoplankton blooms
Te Waihora is a healthy ecosystem	Fish recruitment and food gathering on and around the lake is improved	• Water clarity and colour in Te Waihora/Lake Ellesmere • Macrophyte beds • Trophic Lake Index (TLI) • Phytoplankton blooms • Lake level and opening/closing regime;

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
		impact on fish passage and recruitment • Customary and commercial fish populations
Te Waihora is a healthy ecosystem	Nutrient inflows decline over time to acceptable levels	• Nutrient loads entering the lake • Trophic Lake Index (TLI) • Phytoplankton blooms • Lake nitrate-N concentrations • Water safe for contact recreation • Watercress safe to eat
	Recreation opportunities are improved	• Tropic Lake Index (TLI) • Phytoplankton blooms • Water safe for contact recreation • Recreational fish populations trout, eel, flounder and whitebait • Other recreational uses on or around the lake
Hill-fed waterways support aquatic life and recreation	Popular swimming places meet contact recreation standards	• Periphyton in the Selwyn River - Coes Ford • Macrophytes in the Selwyn River – Coes Ford • Suitability for contact recreation – microbial quality • Recreational use

Selwyn-Waihora Zone Committee Priority Outcomes	Priority sub outcomes	Technical indicators
Hill-fed waterways support aquatic life and recreation	Flows are sufficient to provide swimming at popular swimming places	• Annual and summer flows at Selwyn River - Coes Ford
Hill-fed waterways support aquatic life and recreation	Flows support aquatic life and fish passage	• Overall flows plus low flows and minimum flows • Periphyton and macrophyte for recreation, aesthetics and benthic biodiversity • Nitrate-N concentrations and nitrate-N toxicity • Flow intermittency • COMAR flow preference assessment • Diversity and abundance of aquatic species including tuna, trout and native fish in upper catchment • Fishing activity in the upstream tributaries
Enhanced indigenous biodiversity across the Zone	Wetlands associated with hill fed river flows are protected and restored	• Base flow at springs increase or decrease • Lake level, opening and closing regime
Enhanced indigenous biodiversity across the Zone	The wetlands of Te Waihora are enhanced	• None. Qualitative assessment made
Enhanced indigenous biodiversity across the Zone	No further loss of indigenous biodiversity habitat and ecosystems	• None. Qualitative assessment made

Table 8: Attributes used for water quality values in Greater Wellington

Value	Attribute	Narrative
Aquatic ecosystem health and mahinga kai	**Biological** Periphyton biomass	Periphyton biomass does not exceed … mg/m2 Chl a.
Aquatic ecosystem health and mahinga kai	**Water quality** Temperature	The temperature of the water does not exceed …°C.
Aquatic ecosystem health and mahinga kai	**Water Quality** pH	The pH of the water is between … and …
Aquatic ecosystem health and mahinga kai	**Water Quality** Dissolved oxygen	The concentration of dissolved oxygen exceeds …% of saturation.
Aquatic ecosystem health and mahinga kai	**Water quality** Water clarity	The 20th percentile of visual clarity measured as the horizontal sighting range of a black disc is no less than …m, at flows at or below median flow.
Aquatic ecosystem health and mahinga kai	**Water quality** Nitrate-N	Chronic: annual median nitrate-N concentration does not exceed … mg/L, and annual 95th percentile concentration does not exceed … mg/L. Acute: In-stream nitrate-N concentration does not exceed 20mg/L.
Aquatic ecosystem health and mahinga kai	**Water quality** Ammonia (chronic)	Annual median ammonia concentrations must not exceed the trigger value for freshwaters defined in the ANZECC (2000) guidelines table 3.4.1 for the level of protection of …% of species. The trigger value must be adjusted for temperature and pH as

Value	Attribute	Narrative
		directed in section 8.3.7.2 of the guidelines.
Aquatic ecosystem health and mahinga kai	**Water quality** Ammonia (acute)	The concentration of ammonia does not exceed ….mg/L as defined in the US EPA 2009 table referring to acute criterion for freshwaters with mussels present.
Aquatic ecosystem health and mahinga kai	**Water quality** Other toxicants	Toxicants other than nitrate and ammonia do not exceed the trigger values identified in the ANZECC (2000) guidelines for the level of protection of …% of species.
Contact recreation and tangata whenua use	**Health** E. coli	The concentration of E. coli must not exceed 260cfu/100mL between 1 Nov - 31 Mar (inclusive) when flows are at or below the median flow, or 550cfu/100mL when flows are between the median and 3x median flow. The concentration of E. coli must not exceed 550cfu/100mL between 1 Apr – 31 Oct (inclusive) when flows below 3x median flow.
Contact recreation and tangata whenua use	**Aesthetic** Filamentous algae	Filamentous algae cover does not exceed …%
Contact recreation and tangata whenua use	**Aesthetic** Mat algae	Mat algae cover does not exceed …%
Contact recreation and tangata whenua use	**Health** Benthic cyanobacteria	Benthic cyanobacteria cover does not exceed …%
Contact recreation and tangata whenua use	**Aesthetic** Macrophyte	Macrophyte cover does not exceed …%
Contact recreation and tangata whenua use	**Health** pH	The pH of the water is between … and ….

Value	Attribute	Narrative
Contact recreation and tangata whenua use	**Aesthetic** Water clarity	The 20th percentile of visual clarity measured as the horizontal sighting range of a black disc is no less than …m, at flows at or below median flow.
Contact recreation and tangata whenua use	**Aesthetic** Sediment cover	Sediment cover of stream and river beds is less than …%.
Contact recreation and tangata whenua use	**Health** Toxicants/irritants	Concentrations of toxicants/irritants do not exceed those specified in tables 5.2.3 and 5.2.4 of ANZECC 2000.
Stock watering	E.coli	The concentration of *E. coli* does not exceed …cfu/100mL.
Stock watering	Benthic cyanobacteria cover	Benthic cyanobacteria cover does not exceed …%
Stock watering	pH	The pH of the water is between … and ….
Stock watering	Toxicants/irritants	Concentrations of toxicants/irritants do not exceed those specified in tables 5.2.3 and 5.2.4 of ANZECC 2000.
Trout fishery and spawning **Trout fishery and spawning**	**Biological** Macroinvertebrate community index - MCI	The average MCI score shall be or exceed ….
Trout fishery and spawning	**Biological** Ash free dry weight	Periphyton AFDW does not exceed …mg/m2.
Trout fishery and spawning	**Biological** Filamentous algae	Filamentous algae cover does not exceed …% during the open fishing season.
Trout fishery and spawning	**Water quality** Temperature	Water temperature does not exceed… degrees C.
Trout fishery and spawning	**Water quality**	The pH of the water is between … and ….

Value	Attribute	Narrative
	pH	
Trout fishery and spawning	**Water quality** Dissolved oxygen	The concentration of dissolved oxygen exceeds …% of saturation.
Trout fishery and spawning	**Water quality** Water clarity	The 20th percentile of visual clarity measured as the horizontal sighting range of a black disc is no less than …m, at flows at or below median flow.
Trout fishery and spawning	**Water quality** Nitrate - N	Chronic: annual median nitrate-N concentrations do not exceed … mg/L, and annual 95th percentile values do not exceed … mg/L. Acute: In-stream nitrate-N concentrations do not exceed 20mg/L.
Trout fishery and spawning	**Water quality** Ammonia	Annual median ammonia concentrations must not exceed the trigger value for freshwaters defined in the ANZECC (2000) guidelines table 3.4.1 for the level of protection of …% of species. The trigger value must be adjusted for temperature and pH as directed in section 8.3.7.2 of the guidelines.
Trout fishery and spawning	**Water quality** NH_3-N (acute)	The concentration of ammonia does not exceed ….mg/L as defined in the US EPA 2009 table referring to acute criterion for freshwaters with mussels not present….
Trout fishery and spawning	**Water quality** Other toxicants	Toxicants other than nitrate and ammonia do not exceed the trigger values identified in the ANZECC (2000) guidelines for the level of protection of …% of species

Value	Attribute	Narrative
Trout fishery and spawning	**Habitat** Sediment cover	Sediment cover of river beds is less than …%.

Table 9: Parameters used for water quality objectives in Plan Change 6

Objective	Direct Parameter	Indirect parameter **(helps to achieve the direct parameter in brackets)**
Contact Recreation (Health)	E Coli	
Contact Recreation (Amenity) and Angling	Periphyton Biomass and cover	Dissolved nutrient limits (Periphyton)
Life Supporting Capacity Native Fish and Trout habitat Invertebrate habitat	Water Clarity Dissolved Oxygen Temperature Macro-invertebrate Index Nitrate and Ammonia Periphyton Biomass and cover Other toxicants	Sediment (Clarity) Dissolved nutrient limits (Periphyton) Sediment Cover (Macroinvertebrate Community Index) Organic Matter (Dissolved Oxygen)
Drinking water	E Coli Nitrate-nitrogen Other organic and inorganic determinands of health significance	

Table 10: Standards/Parameters used for water quality values in the One Plan

Value Group	Standards/Parameters
Ecosystem values	pH Temperature Dissolved oxygen

Value Group	Standards/Parameters
	Biochemical oxygen demand Water clarity MCI Particulate Organic Matter Ammonia
Recreational and cultural values	E.coli Enterococci Periphyton biomass Water clarity pH Temperature Dissolved oxygen Biochemical oxygen demand MCI Ammonia Sediment and particulate organic matter
Consumptive values	ANZECC guidelines to be used as/if required on a case by case basis
Social and economic values	No indicators/parameters identified