

# **HEALTHY RIVER, HEALTHY PEOPLE?**

A strategic overview of the Ruamahanga river catchment  
from a public health perspective

**Author: Dr Clair Mills**

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# **HEALTHY RIVER, HEALTHY PEOPLE?**

## **A strategic overview of the Ruamahanga river catchment from a public health perspective**

### **SUMMARY**

#### **1.0 Objective of the project**

This project aims to provide a strategic overview of a regional ecosystem from a public health perspective. It is placed within the context of public concern about water quality and continued discharge of partially treated sewerage into the Ruamahanga river in the Wairarapa. A health impact assessment (HIA) approach is used as a framework to examine existing data and information available on the Ruamahanga river alongside health and socio-economic data. Sub-objectives of the project include identifying current and likely future issues affecting the river which are of relevance to public health, in particular those where there are gaps in knowledge or need for further consultation or work by Regional Public Health.

#### **2.0 Method**

The health impact assessment framework used is adapted from models developed by the Swedish Federation of County Councils, UK councils and enHealth Council of Australia.<sup>a</sup> These models have explicit values and emphasise the determinants of health, the importance of addressing inequalities in health and use of HIA as a tool for equity and social justice. The framework used here takes a broad perspective of health and uses a holistic Maori model to define health. It identifies the principles of the Treaty of Waitangi, the Resource Management Act and values outlined in the Wairarapa District Health Board Strategic Plan as key in carrying out the assessment.

The project involved consultation with key stakeholders in order to understand the dynamics of the different relationships that communities have with the river, and collation and analysis of existing environmental and health data on the river and its surrounding communities. Some quantitative data on recreational use of the river was obtained through collection of tourist and tour operator data, as well as information from local sources and observational visits. An important aspect of the project became that of building relationships with individuals and groups in the Wairarapa region, and encouraging coalitions of interested people to work together. An accessible web-based presentation on the Wairarapa District Health Board (DHB) website is an integral part of the final project product, providing an overview of the project, reports and documents linked to maps and visual information, and relevant web-based links.

#### **3.0 Strengths and weaknesses of using HIA in this context**

In this HIA of the Ruamahanga there remain large areas of uncertainty from a “traditional” risk assessment perspective, with data gaps and difficulties in assessing long term as opposed to short- term health impacts of river

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<sup>a</sup> The EnHealth Council is a subcommittee of the Australian National Public Health partnership

pollution. The epidemiological and dose-exposure data is limited, and many assumptions have been made in assessing physical health risk. However, in taking a “broad” holistic view of health, and focusing on health inequalities, this HIA framework has clearly outlined some key environmental issues Public Health Services need to resolve internally with respect to Treaty of Waitangi obligations and Maori aspirations. In taking a holistic view, it has allowed other “voices” and views to be heard that might be ignored if using a biomedical model of health. In order to respond effectively to environmental health issues, we need to understand the complex interplay between the policy or intervention and the reality for different communities or populations, especially those that are marginalised or vulnerable. This requires different forms of “evidence” in order to answer different questions, and these need to be combined to provide a more complete assessment of health impacts.

#### **4.0 Recommendations for public health action**

Despite the limitations noted, this HIA can usefully inform public health action by RPH and ChoiceHealth (subsequently referred to as Public Health<sup>b</sup>). The following recommendations are focused on a key current issue in the Wairarapa (the resource consent application by Masterton District Council for continued discharge of partially treated sewage to the Makoura and Ruamahanga rivers) where public health has a recognised statutory, as well as an advocacy role to play. However some general recommendations to enhance environmental public health action are also made.

##### ***Specific recommendations concerning the Masterton consent process:***

- Public Health and the Wairarapa DHB should continue to take an active role in the resource consent application process, working closely with the Wairarapa DHB to harmonise submissions so that they are mutually supportive. Submissions should point out the potential broad health impacts of poor water quality as well as concerns for the physical health of those in direct contact with the river. Public Health should actively oppose the consent application if the potential short and long-term health risks outweigh any gains, and seek more rapid action to improve effluent quality as an interim step. Additional support in the submission process for ChoiceHealth staff from a Medical Officer of Health at RPH would be valuable.
- Recognising the principles of the Treaty of Waitangi under which we work, Public Health should ensure full participation by tangata whenua both in Public Health/DHB submissions, and through promoting the Treaty obligations of the District and Regional Councils. Public Health submissions should specify the impacts on Maori health of continued sewerage disposal into the river, and support iwi aspirations in this regard. This will require commitment to building long-term relationships with iwi.
- Public health can provide technical support to the broader community in the Wairarapa e.g. by providing key guidelines on water and effluent quality, monitoring data, and providing analysis of technical data in

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<sup>b</sup> Regional Public Health (RPH) is the regional public service provider, covering Capital and Coast, Hutt Valley and Wairarapa DHBs; ChoiceHealth (a provider arm of the Wairarapa DHB) is contracted by RPH to provide health protection and promotion services in the Wairarapa.

“everyday” language. Public health should network with and support community coalitions and groups of interest which are advocating public health goals as well as optimal river management.

- Public health can advocate and support a *regional* integrated view of the river and effluent disposal (through getting the three territorial authorities, iwi, community and health working together). The process to resolve the Martinborough resource consent can be used as an example (assuming the Regional Council will accept the agreement reached between submitters and District Council), using Tasmanian guidelines for effluent quality as an interim target and promoting discharge to land as an optimal solution. A similar approach can be taken in Masterton (i.e. Public Health assisting with setting quality standards rather than defining the technical options for treatment).
- RPH needs to provide greater continuing support to the health protection officer (HPO) in the Wairarapa. This could include hiring of a further senior HPO or ensuring the existing consultancy arrangement is improved (e.g. one consistent person from the consultancy would ensure greater continuity and support for the HPO). Another option would be for a senior HPO from RPH to spend at least 2 days/week in the Wairarapa. On the basis of health needs, one day per week of Medical Officer of Health (MOH) time should also be allocated to cover communicable disease and environmental health issues in the Wairarapa. The MOH needs to be physically present on a regular basis in order to provide a useful service.

***General recommendations to Regional Public Health:***

- Notification of potentially water-borne diseases is mandatory in NZ but under-reporting is well recognised.<sup>1</sup> Reporting should be encouraged as a potential tool for public health advocacy, and further work with primary care practitioners and laboratories is necessary to increase data quality. Public health needs to ensure timely, useful feedback to primary care.
- Public Health should use the annual plan process of District and Regional Councils (written and oral submissions) as an important opportunity for public health advocacy, as well as health protection.
- RPH needs to develop a pro-active, health promoting and enhancing framework for environmental health, rather than responding reactively when health has already been adversely affected. Given the importance and public concern about water quality in the region, RPH health protection staff should prioritise freshwater quality issues in their strategic planning over the next 3-5 years. Some key principles should be discussed and agreed on internally: for example, should RPH promote land-based sewerage discharge as an optimal solution across the region? If not, what does this mean for our relationship with iwi? What are the health risks of sewerage discharge to land? Should RPH be more critical of council plans, rather than as is more common at present, neither “supporting or opposing” them? How can we best use public health knowledge and health data (even when incomplete) to assist in enforcing existing consents, and in actively promoting health?

## 1.0 Introduction and Project Objectives

This project aims to provide a strategic overview of a regional ecosystem from a public health perspective. A health impact assessment approach is used as a framework by which to examine existing data and information available on the Ruamahanga river in the Wairarapa (including land use and discharges to water in the catchment area, recreational and commercial use of the river) alongside health and socio-economic data. Some quantitative data on recreational use of the river has been obtained through collection of tourist and tour operator data, as well as information from local sources and observational visits.

Sub-objectives of the project include identifying current and likely future issues affecting the river which are of relevance to public health, in particular those where there are gaps in knowledge or need for further consultation or work by RPH.

The project has involved consultation with key stakeholders in order to understand the dynamics of the different relationships communities have with the river, and collation and analysis of existing environmental and health data on the river and its surrounding communities. A key aspect of the project has become that of building relationships with individuals and groups in the Wairarapa region, and encouraging coalitions of interested people to work together. An accessible web-based presentation on the Wairarapa DHB website is an important part of the final project product, providing an overview of the project, reports and documents linked to maps and visual information, and relevant web-based links.

## 2.0 Health Impact Assessment Framework

Health Impact Assessment (HIA) has been defined by different agencies in different ways, but there is general consensus around the “Gothenburg Consensus Paper” definition of HIA published in 1999 by the WHO EURO office.<sup>2</sup> That definition states that HIA is:

*“a combination of procedures or methods by which a policy, program or project may be judged as to the effects it may have on the health of a population.”*

HIA aims to predict the health impact of a policy or programme ideally before implementation, and “facilitate the reduction or avoidance of negative impacts on human health and enhancements of the positive impacts, and in so doing promote sustainable development- human health being central to the concept of sustainable development.”<sup>3</sup> HIA can be seen as having three aspects: as a concept, incorporating the thinking and values related to sustainable development, health, equity and participation; as a process- the basic steps involved (see below); and as a tool to support decision-making.<sup>4</sup>

A review of different models of HIA (see references<sup>2,3,5,6,7,8,9,10,11</sup>) was undertaken, in order to choose a model appropriate to this project.

**Table 1:** (Department of Health, UK) <sup>12</sup>

Health Impact Assessment	Broad Perspective	Tight Perspective
View of health	Holistic	Emphasis on defined and observable aspects
Disciplinary roots	Sociology	Epidemiology; toxicology
Ethos	Democratic	Technocratic
Quantification	In general terms	Towards measurement
Types of evidence	Key informants; popular concern	Measurement
Precision	Low	High

All models of HIA follow a series of key steps, although the emphasis in some models varies (see table below, adapted from references 3,7+8).

<b>Key Steps</b>	
<b>Preliminary analysis</b>	<p><b>1: Screening</b> - does the proposed activity pose any significant potential or actual health impacts?</p> <p><b>2: Scoping</b> -the process of broadly outlining the issues and questions to be addressed</p> <p><b>3: Profiling</b> - what is the current status of the population and the local environment?</p>
<b>Risk Analysis</b>	<p><b>4: Risk assessment</b> -what are the risks and benefits, and who will be affected?</p> <p><b>5: Risk communication</b> -has there been adequate consultation on risks? -have public concerns been taken into account?</p>
	<p><b>6: Risk management</b> - how can negative impacts be minimised or avoided? Are there better alternatives? How can differing perceptions be mediated?</p>
<b>Implementation</b>	<p><b>7: Decision making</b> -Does the assessment provide sufficient information that is robust and reliable? -Presentation of options and ways of mitigating disadvantages or conflict -Action to implement the decision(s)</p> <p><b>8: Monitoring</b> -How will conditions be enforced? -Who/how will the impacts be monitored? -How will this be resourced?</p>
<b>Audit</b>	<p><b>9: Environmental and health auditing, post project evaluation</b> -How well has the HIA process achieved its aim of protecting health?</p>

The process is not necessarily sequential, but iterative<sup>13</sup> - for example, preliminary risk assessment may identify further questions, requiring further assessment. To be useful, HIA must be closely integrated with the decision-making process - but it is a decision *support* tool, rather than a decision

making tool. In this project, the aim was to develop a support tool for decision-making about a range of issues relating to the Ruamahanga catchment, so “key steps” 1-6 are the focus for the project, with some development of options for action, monitoring and evaluation.

The type of HIA method chosen must be “...guided by the need to make it add value to the decision making process”.<sup>14</sup> Factors that influenced the choice of model in this project included:

- The need to address health inequalities, particularly poor Maori health outcomes, in the Wairarapa (*as in the District Health Board (DHB) Strategic plan*)
- Maori as a Treaty partner; operationalising the principles of partnership, participation and protection
- The importance of participatory process and involvement of stakeholders and community (*as in the DHB strategic plan*)
- Public concern about health risks, despite limited epidemiological information linking disease to river water quality
- Recognition of the difficulties in quantifying the impact of degraded water quality on, for example, mental well-being or mana of tangata whenua, and therefore the need for a holistic model of health
- The broad strategic nature of the project as outlined by Regional Public Health’s brief.

The “building blocks”<sup>15</sup> of an HIA –that is, the core elements required to use during the process include:

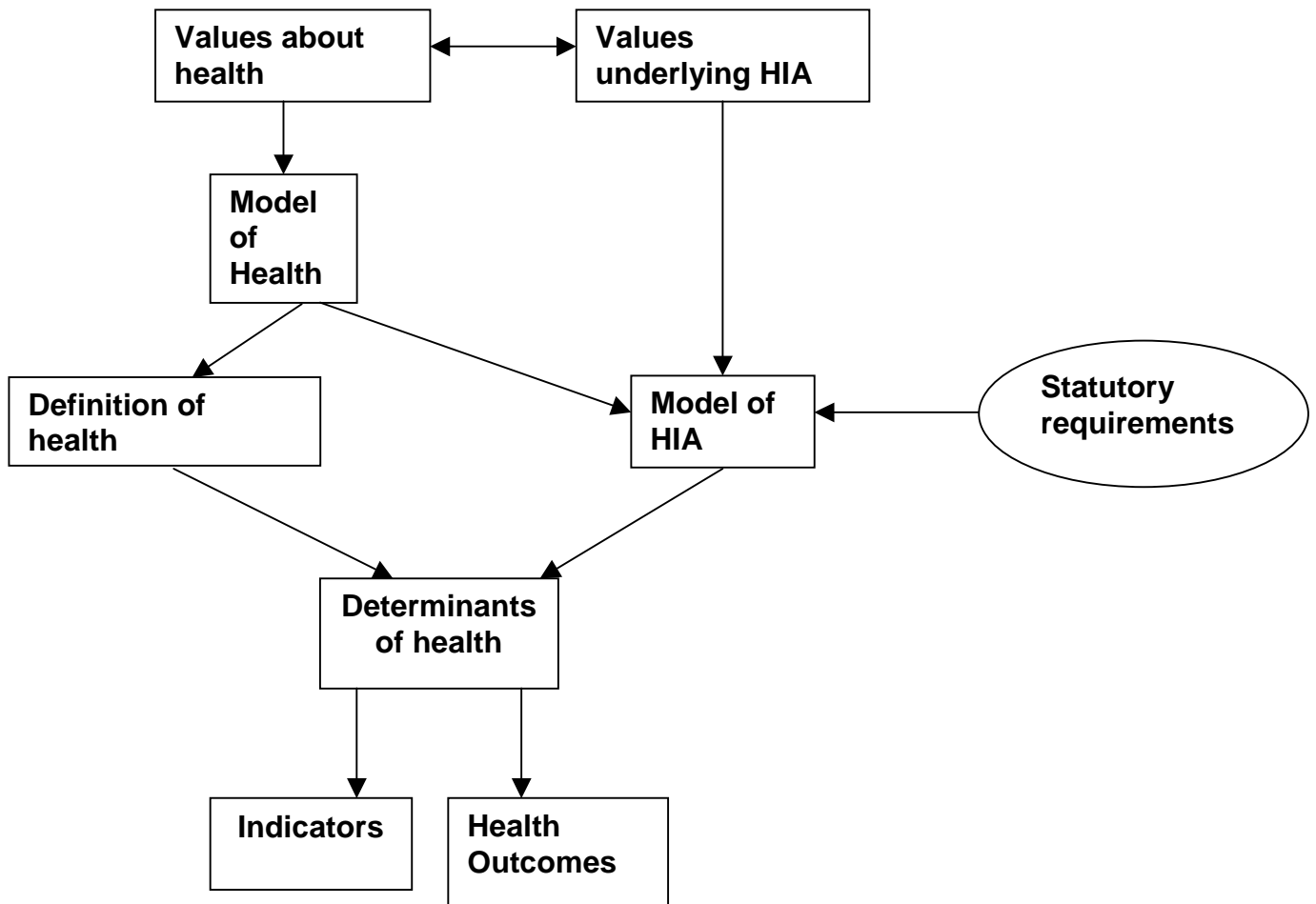
- examining the values given to health, and those underlying the HIA;
- defining the model and definition of health to be used
- defining the determinants of health
- defining the indicators and health outcomes used in monitoring and evaluation.

Some of these should be chosen/identified at the outset, while others, such as indicators, may be developed during the process (see diagram, following page, identifying how these relate and influence each other). This project takes a “broad perspective” approach, and uses a holistic, Maori model/definition of health.

**Model and definition of health used for the Ruamahanga river project<sup>16</sup>**

- Te taha wairua-spiritual wellbeing
- Te taha hinengaro emotional and mental health
- Te taha tinana- physical
- Te taha whaanau- family sustenance and support
- Te Ao Tuuroa the environment –tiakitanga, well being of te ao (the environment) linked to mana Maori
- Te Reo Rangatira- importance of language as a taonga, expresses the values and beliefs, focus of identity for Maori

## The “Building Blocks” of a Health Impact Assessment<sup>16</sup>



The values underpinning the use of HIA for this project are based on those in public health practice and relevant legislation:

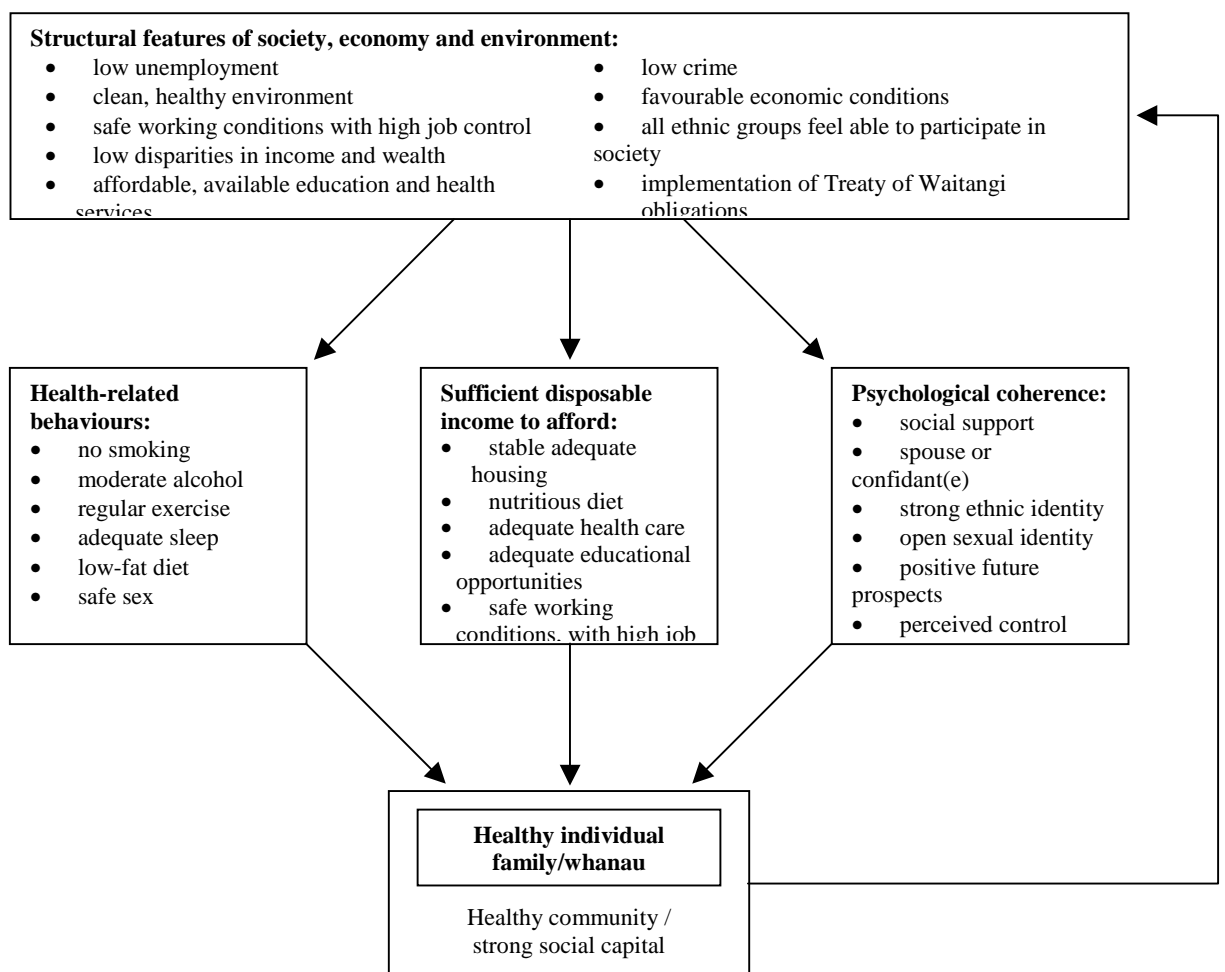
- Treaty of Waitangi
- As stated in the Wairarapa DHB Strategic Plan “ways of working” - improving health, community participation, reducing health inequalities
- RMA legislation- sustainable environmental management, kaitiakitanga

The framework of HIA used here combines aspects of the Australian enHealth Council model, with a focus on health inequalities, as in the Swedish County Councils’ model<sup>17</sup> (whose particular focus is assessing the impacts on those likely to be most vulnerable in the affected population).

Health impacts are mediated, and thus assessed through changes in the underlying determinants of health (see diagram below). Relevant indicators and health outcomes also need to be chosen in an HIA approach, to determine the impact of exposure on population health. These could include traditional indicators of physical health, such as notification rates for

campylobacteriosis or cryptosporidiosis. However this has limited usefulness, as high levels of pollution and/or exposure would have to occur before significant change is seen, and notification rates are not an accurate or reliable measure of water-borne gastrointestinal disease in the community. Given the broad definition of health chosen here, and the multiple determinants of health, other specific health outcomes relating to improved or degraded water quality are also likely to be difficult to interpret. Indicators of increased social capital, mental health indicators and Maori health status could be considered. These indicators would need to be developed with the community affected in order to be appropriate and relevant, but there would remain issues of sensitivity, validity and reliability of measurement.

*Model of social and economic determinants of health*



Source: Howden-Chapman P and Tobias M (eds). *Social Inequalities in Health: New Zealand 1999*, p4.

### 3.0 RUAMAHANGA HEALTH IMPACT ASSESSMENT: KEY STEPS

This section outlines the steps in a health impact assessment looking at a key environmental and public health issue for the Ruamahanga catchment and its population: discharge of partially treated sewerage from municipal oxidation ponds into the river.

#### **PRELIMINARY ANALYSIS**

##### **3.1 SCREENING**

**Does the proposed activity pose any significant potential or actual health impacts?**

Screening tool: <sup>18</sup>

<b>Nature of potential health impacts (example of continuing discharge of sewage to water)</b>		
<b>Bias towards HIA</b>	<b>To your knowledge:</b>	<b>Bias against HIA</b>
<b>Yes/don't know</b>	Are the potential negative health impacts likely to be serious?	No
<b>Yes/don't know</b>	Are the potential negative health impacts likely to be disproportionately greater for some groups in the population?	No
<b>Yes</b>	Are there community concerns about potential health impacts?	No
<b>No/don't know</b>	Is there a robust evidence/experience base to support <ul style="list-style-type: none"> <li>• Appraisal of the impacts?</li> <li>• The recommendations that could be made to ameliorate those impacts?</li> </ul>	Yes
<b>Yes/don't know</b>	Could any of the actions to ameliorate the potential negative health impacts of the proposal actually have a negative impact on health?	No
<b>No/don't know</b>	If allowed to occur, could the potential negative impacts be easily reversed through current service provision?	Yes
<b>Yes</b>	Is there a need to increase social capital in the community or population affected?	No

On the basis of this tool, many of the issues relating to the Ruamahanga river water quality clearly fulfil the criteria for “bias towards HIA”. Other screening tools take a more “health enhancing” perspective- for example the Swedish County Council model has a number of key questions:<sup>19</sup>

1. Will the proposal promote health development for various groups in relation to the social environment (eg mutual work and support)?
2. Will the proposal promote health development with regard to certain risk factors (eg the physical environment)?
3. Is the project consistent with overall health targets and objectives?

Other general questions in the Swedish model focus on inequalities: what does a health needs assessment show regarding the health conditions of different groups within the region? Are there groups that are particularly vulnerable or already exposed to numerous health risks, or are there groups with evident health-trend problems? Are there defined health policy targets?

Given the Ruamahanga river's status under the Regional Freshwater Plan (WRC),<sup>20</sup> recreational water quality guidelines apply. The existing low water quality (that at some points at some times means the river is unfit for recreational use) and concern from iwi about their loss of resource are two important negative health impacts. Contamination of water by partially treated sewerage and the run off from farms are major contributors to low quality (turbidity, high nitrite levels etc) and risk of pathogen contamination with zoonoses such as *Campylobacter* and *Salmonella*. Although direct health risk (ie gastrointestinal infections) for those using the river is currently low, it is not non-significant; and there is uncertainty about the impact of future continued pollution and long-term health effects.

Public concern about health and environmental risks is also evident- current risks are no longer seen as acceptable by significant parts of the community, and there is a growing discontent over the attitude of the territorial authorities from a range of community interests. While the benefits of having a reticulated community based system for sewage disposal are not disputed, and dairy farming is a major economic contributor to the region, tourism sources are concerned at the low water quality and the potential damage to the "clean green" image promoted by the industry.

There is an argument for environmental issues assisting in creating community coalitions of interest, and promoting community action towards a common goal. However, some sections of the community may see raising certain issues (such as riparian management or sewage disposal options) as directly challenging their economic security or political support, and this has to be done strategically and sensitively. For Maori there are key issues around the river, including tino rangatiratanga, kaitiakitanga and the mauri of the river. The improvement of water quality is key to health for that population.

Continued discharge of waste to the waterways will eventually have a permanent impact on the environment and subsequently, the health and development of the whole community. Promoting water quality is consistent with the values and models of health espoused in the HIA, and the health of Maori in particular.

## **3.2 SCOPING**

### **3.2.1 Process**

1: Discussions with key stakeholders (see stakeholder table following pages): Territorial Authorities (TAs)-Environmental Health Officers and engineers, Wellington Regional Council (WRC) officers and scientists, local Department of Conservation staff, iwi representatives, concerned landowners, tourist operators and Tourism Wairarapa; DHB and Choice Health staff, Aratoi

(Wairarapa museum of art and history), NIWA (re current research on dairy farm effluent impact on the Waikato river), Ministry of Agriculture and Forestry.

2: Visits to key sites on river, including the headwaters, recreational sites, sewage point discharge sites, Lakes Onoke (Ferry) and Wairarapa etc (see photo file).

3: Search for and consultation of existing information including: TA and WRC documentation (reports, maps, strategic and annual plans etc), financial data from councils, consultant reports on options; debate in local media; tourist/visitor information; Waitangi tribunal (claim documents), historical documents on the history of the river and land use; DHB Health Needs Assessment; internet searches on integrated river management, sewage disposal options, water quality guidelines, HIA, environmental policy and issues, networking with environmental health researchers (eg Margot Parkes, Gail Tipa and Laurel Tierney), and similar projects in Southland.

4: Oral history- discussions with kaumatua and elders about the history of key sites on the river eg Papawai marae, Gladstone, Onoke, traditional mahinga kai, waahi tapu, urupa, taiapure.

5: Involvement in the hearings process for resource consents (Martinborough and Masterton District Council resource consent applications for discharge of oxidation pond effluent to water), including reading and writing of submissions, oral submissions and participation in mediation with community submitters and council.

6: Networking with Wairarapa DHB, ChoiceHealth staff and other health providers such as Whaiora Whanui.

**Stakeholder table: Ruamahanga river and catchment<sup>21</sup>**

Stakeholder Group		Knowledge (generation process, capacity, skills and understanding of issues)	Motivation (regarding catchment and public health issues)	Options for action to address issues -direct -potential -affected	Notes
IWI	Rangitaane	Holistic view, historic, local knowledge; formal and informal	Mana whenua Kaitiakitanga Tino rangatiranaga Cultural and spiritual needs Whare Tapa Wha/Te Wheke – integrated models of health	Potential- Waitangi Tribunal- current claims Tangata whenua/mana whenua status- Treaty of Waitangi Articles I-III Affected-mana whenua status; health status	Many hapu and whanau; some issues over mana whenua status Key environmental knowledge- kaumatua; previous RMA/Waitangi tribunal work (Murray Hemi, Peter Flynn)
	Ngati Kahungunu ki Wairarapa				
National Government Agencies	Ministry of Agriculture and Forestry	Strategic, specialised	National goals and strategies regarding agricultural and economic policy, environmental protection, sustainable management and population health	National policy direction; legislation Funding of regional and local projects	May be apparent conflicting goals eg between maximising economic growth and environmental protection
	Department of Conservation				
	Ministry for the Environment				
	Ministry of Health				
Regional and Local government	Wellington Regional Council	Strategic and specialised; formal scientific	Statutory obligations Freshwater Plan, Strategic plans, sustainable development	Resource consents Relationship with Territorial Authorities	Economic vs environmental pressures; farming vs tourism Regulatory vs encouraging
	Masterton District Council	Strategic and specialised; local knowledge	Statutory obligations Local constituency interests Financial limitations Economic development especially tourism, agriculture Environmental interests	Direct-statutory powers, governance, funding	Bureaucracy vs political, environmental goals vs economics (small rates base)
	South Wairarapa District Council				

Stakeholder Group		Knowledge (generation process, capacity, skills and understanding of issues)	Motivation (regarding catchment and public health issues)	Options for action to address issues -direct -potential -affected	Notes
	Carterton District Council				
	Wairarapa DHB (includes Regional Public Health service)	Specific	Statutory obligations Local constituency interests; health concerns, population health goals and strategic plan	Direct- statutory powers Potential- resource consents, advocacy	DHB has passed resolution on water issues and requested TAs for current plans and commitment to improving river water quality
National NGOs	Forest and Bird	Specific	Reflect membership/constituency interests ie recreational, environmental, farming etc	Potential- democratic processes, advocacy Affected- by catchment concerns eg water quality	
	Fish and Game Council				Active in submissions- contact Blake Abernathy
	Federated Farmers				Has tended to not be supportive of perceived "green" issues
Community	Local business and recreational operators, Tourism Wairarapa	Specific	Health concerns Economic/employment concerns	Direct- land/river users Potential- local governance processes, advocacy, use of media	Kayak/canoe and jet boat operators
	Environmental activists	Specific	Environmental concerns		Individuals- no organised groupings apparent locally
	Local media	Broad	Public interest A good story	Affected- as local community/residents Direct- media attention, political pressure, community coalitions of interest	Have been supportive of public concerns
	Interested individual landowners	Specific	Economic Environmental		Eg landowners along Ruamahanga/Makoura
	Recreational users- youth, fishermen etc	Specific	Environmental and enjoyment/health concerns		

### **3.2.2 Key Issues identified through stakeholder discussions:**

- Poor water quality of the river, below guidelines for recreational use at times
- Currently discharges of partially treated sewage into the Ruamahanga (Masterton and Martinborough District Councils) are occurring without legal resource consents; Wellington Regional Council are not carrying out their enforcement role
- Iwi concerns at any discharge of human sewage into waterways; current Waitangi Tribunal claims around Ruamahanga, tino rangatiratanga, wai ora; frustration with attitudes of local councils.
- Tourist operator concerns- damage to the “clean, green” image
- Concern from local dairy farmers about water pollution (Fonterra demanding high quality water for farm irrigation)
- Local landowners environmental concerns and frustration at the Regional Council's lack of enforcement of standards/consents
- Health risks of contaminated water (bores etc used by rural people, as well as recreational use)
- Direct economic costs to small councils/ratepayer base
- Inadequate community knowledge or involvement in the issue

### **3.3 PROFILING**

#### **What is the current status of the population and the local environment?**

(See also powerpoint presentation on website for mapped data (MAF/WRC land use and discharge consents) and linked files for detailed data)

#### **3.3.1 HEALTH PROFILE-a summary**

(Website link: [Wairarapa DHB Health Needs Assessment technical report and summary](#))

The recent health needs assessment carried out for the Wairarapa DHB<sup>22</sup> identifies the area as showing greater disadvantage for nearly all measures of socio-economic status relative to the NZ average. Consistent with this picture is the health data, which shows higher morbidity and mortality rates, and lower life expectancy in the Wairarapa, compared to the NZ average. Deprivation is not evenly spread, with some intense pockets in Masterton and South Wairarapa. Two main groups are identified as having particularly high health needs- those of low socio-economic status, and Maori (whose health status is poor compared to non-Maori, even after adjusting for socio-economic status). Mental health, asthma, diabetes, cancer and cardiovascular disease show higher death and hospitalisation rates for Maori than non-Maori. A key issue for Maori in the Wairarapa is “the need for Maori to be a visible Treaty partner”, both in assessment of health needs, and in the implementation of recommendations arising from that.

Environmental health is cited as a concern, with only two of the 31 treatment plants for drinking water in the DHB region fully compliant, and risks to recreational water quality from effluent discharges. Notifications of gastrointestinal disease however have been lower than the national average for *Campylobacter* and *Giardia*, though consistently higher for *Salmonella* and *Cryptosporidium*.

#### DISEASE NOTIFICATION DATA 1997-2001 (EpiSurv Data, ESR)

<b>Carterton</b>	<b>Year</b>					<b>Total</b>
<b>Disease</b>	1997	1998	1999	2000	2001	
Campylobacteriosis	13	11	15	13	16	<b>68</b>
Cryptosporidiosis	0	1	2	1	1	<b>5</b>
Gastroenteritis	4	0	0	1	1	<b>6</b>
Giardiasis	0	5	1	1	2	<b>9</b>
Hepatitis A	0	0	0	0	0	<b>0</b>
Salmonellosis	1	6	9	7	8	<b>31</b>
VTEC/STEC Infection	0	0	1	0	0	<b>1</b>
<b>Total</b>	<b>18</b>	<b>23</b>	<b>28</b>	<b>23</b>	<b>28</b>	<b>120</b>
<b>Masterton</b>						
<b>Disease</b>	<b>Year</b>					<b>Total</b>
<b>Disease</b>	1997	1998	1999	2000	2001	
Campylobacteriosis	14	16	15	24	33	<b>102</b>
Cryptosporidiosis	0	2	4	5	1	<b>12</b>
Gastroenteritis	4	0	0	3	9	<b>16</b>
Giardiasis	3	2	4	5	2	<b>16</b>
Hepatitis A	1	1	0	0	1	<b>3</b>
Salmonellosis	4	19	15	46	10	<b>94</b>
VTEC/STEC Infection	0	0	0	0	0	<b>0</b>
<b>Total</b>	<b>26</b>	<b>40</b>	<b>38</b>	<b>83</b>	<b>56</b>	<b>243</b>
<b>South Wairarapa</b>						
<b>Disease</b>	<b>Year</b>					<b>Total</b>
<b>Disease</b>	1997	1998	1999	2000	2001	
Campylobacteriosis	26	27	38	39	51	<b>181</b>
Cryptosporidiosis	2	3	7	6	4	<b>22</b>
Gastroenteritis	0	0	0	0	1	<b>1</b>
Giardiasis	2	1	5	4	3	<b>15</b>
Hepatitis A	0	0	0	0	0	<b>0</b>
Salmonellosis	2	12	11	15	7	<b>47</b>
VTEC/STEC Infection	0	0	0	0	0	<b>0</b>
<b>Total</b>	<b>32</b>	<b>43</b>	<b>61</b>	<b>64</b>	<b>66</b>	<b>266</b>

In addition 3 cases of shigellosis and 7 cases of yersinosis were reported in this period. Notification of laboratory confirmed gastrointestinal disease in the Wairarapa appears to be reasonably complete when ESR and private

community laboratory data<sup>c</sup> are compared for the period 1997-2001. However, given poor access for some populations to primary care in the Wairarapa, this is likely to be a considerable under-estimate of the extent of disease in the community. It is also well known from international and NZ studies that the bulk of gastrointestinal disease in the community is not reported as medical care is not sought.<sup>23</sup>

### **3.3.2 ENVIRONMENTAL PROFILE OF THE RUAMAHANGA RIVER**

#### **Summary of key data**

(See also website links to detailed reports including WRC Freshwater Plan and Wairarapa Oxidation Ponds report; Freshwater Microbiological Research Programme, Ministry for the Environment)

The Ruamahanga river is identified in the Wellington Regional Council's Freshwater plan<sup>24</sup> as requiring enhancement for contact recreation purposes, while the Makoura stream (a tributary into which the Masterton Oxidation ponds outfall flows) requires enhancement for aquatic ecosystems purposes.<sup>d</sup>

The Department of Conservation's "Lake Wairarapa Wetlands: Action Plan 2000-2010" recognises the ecological, cultural and recreational values of the lower catchment area, which is the largest wetlands complex in the southern North Island and is considered to be of national and international importance for indigenous plant and animal communities. Major flood protection schemes, including the diversion of the lower Ruamahanga to bypass Lake Wairarapa (the Ruamahanga "cut-off"), have resulted in only an estimated 7% of the original wetlands (excluding lakes) remaining.<sup>25</sup> Deforestation of the valley and surrounding hills since Pakeha settlement has also had major impacts on the river catchment. In addition to pollutants going into the river, water flow and quality is affected by the volume of water "takes" from the river, and gravel extraction.

The Ruamahanga is currently affected not only by point discharges of treated sewage from Rathkeale school, Masterton and Martinborough oxidation ponds, but indirectly from Carterton (via Mangatarere stream) and Greytown (via Papawai stream) sewage treatment plants (Featherston oxidation ponds discharge into Donald creek and then into Lake Wairarapa). There has been a decrease in effluent quality from all the sewage treatment plants since 1999, with a corresponding water quality decline in the receiving waters (Ruamahanga and tributaries).<sup>26</sup> Intensive fortnightly monitoring of the upper Ruamahanga at Double Bridges (considered "relatively clean") and also at Morrison's Bush carried out for the Ministry for the Environment's Freshwater

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<sup>c</sup> Only Valley Diagnostic laboratory data is available for comparison- this covers the South Wairarapa. Masterton is serviced by MedLab Central, and due to changes in data collection over the period, MedLab Central was unable to provide a breakdown of the relevant data for Masterton during this period.

<sup>d</sup> The Freshwater Plan objectives for water quality and discharges to fresh water are: "5.1.1: The quality of fresh water meets the range of uses and values for which it is required while the life supporting capacity of water and aquatic ecosystems is safeguarded. 5.1.2: The quality of fresh water has the potential to meet the reasonably foreseeable needs of future generations; 5.1.3 The quality of the water is, as far as practicable, consistent with the values of the tangata whenua". See also Pt 5.2.12 and Appendix 7.

Microbiological Research programme in 1999/2000 showed low levels of giardia cysts, and 20/58 tests positive for enteroviruses.<sup>27</sup> “Higher than anticipated” levels of *Campylobacter* were found (29/58 samples were above the detectable threshold of >0.3/100mls, and 4 samples were >110/100mls, three of which were at Double Bridges). 24/58 samples had greater than 126 *E.coli* /100mls (the acceptable level for recreational bathing, see below). Both are popular swimming sites.

**ESTIMATE OF TOTAL SEWERAGE DISCHARGE INTO THE RUAMAHANGA RIVER:**

(based on median daily values from the Wairarapa Municipal Oxidation ponds *Water Quality Monitoring Report* July 1999 –June 2001)

<b>Masterton</b>	10,680 m <sup>3</sup> /day
<b>Carterton</b>	762 m <sup>3</sup> /day
<b>Greytown</b>	691 m <sup>3</sup> /day
<b>Martinborough</b>	518 m <sup>3</sup> /day <sup>e</sup>
<b>Total</b>	<b>12,651 m<sup>3</sup>/day or 12,651,000 litres/day</b>

Although *E.coli* levels have generally remained below the threshold recreational water guidelines during routine monitoring, three exceedances (>410cfu/100ml ie “red mode”) were reported in the 1999-2001 period at the Martinborough monitoring sites, and once at Masterton. Rises in phosphorus, total nitrogen and nitrite-nitrogen are of concern. Significant effects on water clarity, chemical loading, aquatic life and suitability for farm animal consumption (ANZECC guidelines<sup>28</sup>) have been noted in receiving streams and the main river. Monitoring data shows that the current effluent quality from the Masterton sewage oxidation ponds is having an adverse effect on the water quality of both the Makoura Stream and the Ruamahanga river.<sup>29</sup> The classification of the Makoura stream (receiving Masterton effluent) shows degradation downstream from “probable mild pollution” to “probable severe pollution” based on median macroinvertebrate community index (MCI) and semi-quantitative community index (SQMCI) scores.<sup>f</sup>

Degradation of lowland waterways in New Zealand has occurred where any type of intensive agriculture exists, and is cumulative and gradual in impact. Non-point discharges (ie water contamination from diffuse sources such as pasture run-off) are the major contributor. The population of domesticated animals in New Zealand has been estimated to produce an excreta load equivalent to between 100-180 million people.<sup>30</sup> Dairy farming has the greatest potential to degrade water quality because of high nitrogen losses, high physical impacts on waterways (stock access etc), faecal contamination, and requirement for high volumes of water (drinking water, effluent management, irrigation etc).<sup>31</sup> One dairy cow has been estimated to produce the same volume of effluent as between 6-14 humans.<sup>32</sup> Drainage, especially

<sup>e</sup> Estimate based on a flow of 6l/s

<sup>f</sup> Macroinvertebrate community index (MCI) and semi-quantitative community index (SQMCI) are measures of the presence and abundance of macroinvertebrates. Scores are assigned to different taxa in relationship to their tolerance of organic enrichment of streams.

by channelisation and laying of drains as is common in the Ruamahanga valley, causes serious disruption to stream channels and aquatic life, and increases erosion. Direct access by animals and leaching of effluent and fertilisers contributes to poor water quality.

Research elsewhere in NZ suggests that water quality is reduced beyond a threshold stocking intensity of 6-8 stock units per hectare (ie approximately 1 cow, or 6-8 sheep/hectare). Stock density in the Ruamahanga river valley is mostly between 7.5 and 50 stock units per hectare (the average intensity of dairy farms in NZ is 2.7 cows, or about 16 stock units per hectare).<sup>33</sup> In the Waikato catchment, modelling work shows that the percentage of poorly drained soil and the density of cattle within a catchment, coupled with median turbidity at a catchment outlet, are the 3 explanatory variables for predicting almost 70% of the observed variance in median *E. coli* across the region.<sup>34</sup> These factors are also likely to be important in the Ruamahanga catchment.

In addition to the great significance the Ruamahanga has for tangata whenua, the river is valued by the Pakeha population as a recreational and food resource. Recreational use data (see annexed) gives an idea of its popularity for swimming and water sports, as well as fishing. These numbers are likely to considerably under-estimate the total numbers accessing the river and potential “exposure” that is occurring, as no formal bathing or recreational use survey has been carried out.

## **RISK ANALYSIS**

### **3.4 RISK ASSESSMENT**

#### **What are the risks and benefits, and who will be affected?**

Traditional risk assessment can be seen as a scientific, “objective” process that seeks to quantify the risk on the basis of evidence.<sup>35,36</sup>

A widely used model comprises four inter-related phases:

- Hazard identification
- Dose-response relationship (determines the degree of effect at different doses)
- Exposure assessment (magnitude, frequency, population etc exposed)
- Risk characterisation (assess risk associated with each exposure)

However in a health impact assessment, many questions will arise, which in principle or practice, are unanswerable by available “evidence”. Thus issues of risk are not purely technical but have political and value components. Risk management (as discussed below) then becomes the whole process of risk assessment, risk communication, implementation and monitoring. It must consider political, social, cultural, economic and technical information, what options are available and identify the uncertainties and assumptions made.<sup>37</sup>

In this HIA, using the above risk assessment methodology identifies pathogenic bacteria, protozoa and viruses in polluted river water as the

primary hazard to physical health. Contact with these organisms (inhalation, swallowing, via mucous membranes etc) may cause gastrointestinal, skin and respiratory diseases. Children may be more susceptible to illness than adults, partly because they tend to swim in waters which are shallower and hence more polluted.<sup>38</sup> The long-term and, in some cases, less well understood, health impacts of other pollutants (eg heavy metals, chlorinated organic compounds and oestrogens) might also be examined in a formal HIA, given water quality monitoring data and extrapolation from published hazard and dose-response data.

Dose-response relationships for pathogenic organisms in freshwater are an area of current research in New Zealand (for example, the Freshwater Microbiological Research Programme, a joint programme between the Ministry for the Environment, Ministry of Health and MAF;<sup>39</sup> Environment Waikato and NIWA research in the Waikato). Although *E.coli* is a good indicator organism of recent faecal pollution, its presence does not correlate well with some of the more persistent protozoal and viral pathogens, which are present in sewerage discharges. Given this, international and New Zealand studies suggest that current guideline levels may underestimate disease risk.<sup>40,41</sup> Initial results from the Freshwater Microbiological Research Programme suggest that there is moderate correlation between *E.coli* levels and *Campylobacter*, which is a pathogen of major concern in New Zealand.

Most current New Zealand water quality guidelines have used risk assessment frameworks to derive standards or cut-off levels for indicator organisms (*E.coli* is the indicator of choice for freshwater). Compliance standards for community drinking water purposes<sup>42</sup> are obviously more stringent than for recreational and other purposes.

#### **New Zealand Freshwater Bathing- Interim Guidelines<sup>43</sup>**

**Acceptable:** running (monthly) median <126 *E.coli* /100mls

- Continue routine monitoring

**Alert/Amber Mode I:** *E.coli* between 126-273/100mls

- Increase monitoring to at least twice weekly

**Alert/Amber Mode II:** Single sample *E.coli* > 273/100mls (irrespective of running median)

- Increase sampling to daily
- Undertake a sanitary survey and report on any sources of contamination

**Action/Red Mode:** Single sample >410 *E.coli*/100mls (irrespective of running median)

- Increase sampling to daily
- Undertake sanitary survey
- Erect warning signs and inform public through media that a problem exists

The current Recreational Water Quality Guidelines health risk values for fresh water of a “maximally acceptable” eight episodes of swimming-associated illness per 1000 bathers are based on US Environmental Protection Agency

(USEPA) guidelines and consistent with “international practice”. The USEPA indicator level was derived from studies by Cabelli and Dufour in the 1980s. These studies developed linear regression relationships between the logarithm of grouped faecal indicator concentrations and the appropriate illness risk. In fact the current US indicator levels are *calculated* (based on risks corresponding to previous US criteria of 200 faecal coliforms/100ml), rather than chosen *a priori*, and assume a continuous relationship of declining risk as indicator concentration falls.

The Australia and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines<sup>44</sup> are also based on risk assessment methodology (largely environmental rather than human health risk) and outline a management framework and “trigger values” with guidelines to show how site specific criteria can be developed. Findings of current New Zealand-specific freshwater research should improve risk assessment frameworks in future, particularly concerning the role of water-borne pathogens such as *Campylobacter* and *Cryptosporidium* from animal hosts in human illness.<sup>45</sup>

An estimate of the number of “acceptable” illnesses based on the Freshwater Bathing Guidelines has been calculated for the Ruamahanga at one site (Morrison’s Bush) over the peak summer period. Using observational data from the summer of 1996, there would be an expected 22 illnesses for the estimated 2800 bathing events.<sup>46</sup> This figure is thought to underestimate the health risk, due to the presence of three major point source sewerage discharges above the chosen site, and monitoring results that identify several measurements exceeding the guideline indicator level. Calculating the number of expected illness episodes for the whole river requires further quantitative data collection, particularly on visitor/bather numbers at each swimming site. However on the basis of existing and very incomplete data, a hypothetical calculation can be made. A more accurate calculation may be possible when the final risk assessment analysis data from the Freshwater research programme are made available.

**Assumptions made:**

Each swimming site identified by WRC (13 sites) with 100 people/day, over six weeks per year, 60% of whom enter the water = 32,760 swimming episodes. (This may under-estimate swimmer numbers, as there are a number of other sites where local people swim, and annual visitor numbers have increased by an average of 10% over the last five years).

Jet boat users and canoeists may inhale aerosol, or pathogens may enter via abrasions or mucous membranes. They are also likely to swim on hot days. Angler exposure is likely to be prolonged, through direct superficial transmission or aerosol inhalation. Assuming varying (probably lower) exposure risk for these latter groups, the risk is calculated arbitrarily at 50% that of swimmers. Further research into dose-exposure risk faced by these groups would be useful. Risk is based on the USEPA risk value ie 8/1000 bathers.

River Contacts*	Estimated number of people/year
Swimming episodes	32,760
Jet boat contacts/year	2040
Canoe and kayak/year	3260
Angling (days/season)	7386
<b>TOTAL</b>	<b>45,446 river contacts</b>

\*See data sources in annex

If the water quality remains at or below the indicator level (ie <126 *E.coli* /100mls, running median) throughout the length of the Ruamahanga, up to an expected 8/1000 (0.8%) of swimmers might be expected to develop water exposure-related illness ie approximately 262 people/year. Adding those with half of this risk (ie 12,686 x (0.8% x 0.5) = 51 people/year), would result in a total of up to 313 people per year being adversely affected. Obviously where water quality limits are exceeded, or where there is prolonged exposure or increased vulnerability (for example, children, immuno-compromised individuals), risk to health is likely to be greater. This calculation also excludes any infection contracted by food-gathering activities or eating food gathered from the river.

These approaches based on risk of physical illness can, however, only be of limited value in a health impact assessment that takes a broad view of health determinants and a holistic model of health. Therefore, this HIA also models a qualitative framework for assessing health impact that includes those impacts falling outside the short-term, direct physical risks. The matrix below, adapted from the Swedish Federation of County Council's model, aims to incorporate the agreed values of this project, multiple determinants of health and the holistic model of health in assessing risk. In the example given (continued discharge of sewerage from Masterton plant into the Makoura stream and Ruamahanga river), I have identified **potential** consequences on key determinants of health (adapted for the Aotearoa/NZ models-see Section 2). Impacts are identified in qualitative terms (signified by the use of one or more plus or minus signs, as appropriate; 0=no impact). In a formal HIA process, qualitative "grading" could be assigned by a range of community groups, iwi and other affected populations, and the range of views collated.

The questions following the matrix (based on the Swedish HIA model) focus on health inequalities and health risks likely to have disproportionate impacts on groups already in poorer health.

### A Health Matrix for the Wairarapa

The health matrix below, adapted from the Swedish County Councils model, identifies for one example (continued discharge of sewerage from Masterton plant into the Makoura stream/Ruamahanga river) **potential** consequences on key determinants of health (adapted for the Aotearoa/NZ models-see pgs 3+5). Impacts are identified in qualitative terms (signified by the use of one or more plus or minus signs, as appropriate; 0=no impact).

THE HEALTH MATRIX					
Impact of continued sewerage discharge from Masterton oxidation ponds into the Ruamahanga					
HEALTH DETERMINANTS		MAORI		Entire Population	
		Long term	Short term	Long term	Short term
Democracy/opportunity to exert influence/equality Treaty of Waitangi, Tino rangatiratanga, Te Reo Rangatira	Structural features (Social, economic, environment)	---	--	--	-
Employment/meaningful pursuits/education Te Oranga		---	-	--	-
Physical environment Te Ao Turoa		---	-	---	-
Access to health and disability services Te taha tinana, Toi ora		0	0	0	0
Social network Te taha whanau	Psychological coherence	--	--	--	-
Life goals and meaning Te taha wairua, Te taha hinengaro		---	--	-	0/-
Financial security	Sufficient disposable income	--	0	--	0
Living habits Te taha tinana	Health behaviour	---	--	--	0/-

## **RISK ASSESSMENT continued—general questions adapted from Swedish Federation of County Council’s HIA model**

*1a: What does the DHB Health Needs Assessment show regarding the health conditions of different groups within the region? Are there groups which are particularly vulnerable or already exposed to numerous health risks, or are there groups with evident health-trend problems?*

The health needs assessment carried out for Wairarapa DHB indicates that generally, Maori and low-income people have greater health needs. Mental health and chronic disease morbidity and mortality rates are key concerns. Maori health statistics, even give disproportionate Maori representation in low-income populations, are worse than Pakeha.

With regard to the Ruamahanga, it is likely that a range of groups would be more likely to be exposed to the direct risks posed by river water pollution. These include swimmers and other recreational users, particularly children; Maori, especially when collecting traditional kai; and those residents close to the river whom access water (via bores) for drinking and agricultural use. The impact of pollution by human sewage has additional cultural and spiritual insults for tangata whenua.

*1b: Are there defined health policy targets? Is the proposal in accordance with the overall targets of public health (or other authority)?*

The DHB strategic plan outlines the goals of reducing inequalities in health and improving Maori health in particular. Improving child health outcomes is also a priority. There are no formal environmental health targets set. However, recent DHB statements concerning the desire to improve water quality in the river would support public health action on this issue. Improving water quality also addresses the NZ Health Strategy population health goal of creating a “healthy physical environment”<sup>47</sup>

### **Specific questions (linked to the matter at hand)**

*2: Are there particular health risks which can be expected to decrease or increase as the result of the proposal? Will impacts become apparent in the short-term (5 years) or in the long term?*

Short term, assuming current trends continue, it is likely that continuing discharge of sewage into the river will contribute to the biochemical loading of the river, and increase the risk and frequency of exceeding water quality guidelines for recreational contact. The risk of contracting infectious gastrointestinal disease will correspondingly increase. Upgrading sewage treatment or discharging to land will be a direct cost to ratepayers over the next decade, but provide longer-term environmental benefits.

Longer term, continuing pollution leading to loss of water quality will have further significant impacts on freshwater aquatic species, use of the river for recreational purposes, and economic use (agricultural irrigation, viticulture, tourism etc). This has likely direct and indirect impacts on health (via socio-economic determinants such as creation of employment, economic costs to farmers, tourism “image” etc).

*3: For the distribution of ill health within a population, it is of decisive importance which groups are subjected to increased/decreased health risks, and whether any decision will affect these groups' capacity either to deal with difficulties, or by contrast, increase their vulnerability.*

The impact on rural communities and Maori in particular should be considered. Kaitiakitanga of the river is a key concern for local iwi, and decisions relating to management of the river need to be made in a relationship of partnership with iwi. Present consultation mechanisms have failed to recognise Treaty principles; a greater role for Maori in governance is essential.

*4: In what way will the social environment in the local community be affected by the proposal?*

There is evidence that the water quality of the river is a common concern for a broad range of community interests, including iwi, landowners and farmers, recreational users and tourist operators. A recent telephone poll in Masterton suggests a reasonable consensus of opinion, with 70% of those surveyed in a NRB survey early in 2002 assigning top priority to improving the quality of sewage treatment.<sup>48</sup> The river provides a recreational focus, as well as being a key cultural and environmental asset for the Wairarapa. Improving water quality will potentially enhance social capital and "connectedness" especially in rural communities around the river.<sup>9</sup>

*5: Is there a risk that a proposal may have a "double" impact on certain groups (ie that both their health risks increase and their social/physical environment deteriorate)?*

This is conceivably an outcome both for Maori, and rural communities in the Wairarapa- that continuing environmental degradation will contribute to both poor physical health and less quantifiable health impacts (mental and spiritual health, etc).

*6: Are there alternative policies which might result in better health for exposed groups and the population as a whole?*

Improving sewage treatment and effluent quality is likely to lower both environmental pollution and risks to health. However tangata whenua see any discharge of human sewage to water as offensive, and choosing an effective, environmentally sustainable system of discharge to land would be the optimal outcome. Real consultation with tangata whenua and their direct participation in this process would also contribute to a positive outcome.

Greater emphasis on, and support for, improved riparian management would be the other major policy measure required to improve river water quality.

### *7: Summary*

The poorer health of Maori and low income groups in the Wairarapa is an important consideration when assessing the likely impact of policies relating to water quality of the river. Although continuing pollution will have both short and long-term health impacts on the community, the *causal* relationship is

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<sup>9</sup> See current research questions being studied in Integrated Catchment Management project in Motueka  
[http://icm.landcareresearch.co.nz/science\\_themes/human-dimensions/people\\_social.htm](http://icm.landcareresearch.co.nz/science_themes/human-dimensions/people_social.htm)

likely to be difficult to quantify, given the multifactorial nature of health determinants. Direct effects on physical health are most likely to impact on children, recreational users, Maori and local residents. The impact on mental and cultural health, social capital and vulnerability needs further research, and there are inadequate data to quantify these aspects.

### **Weighting benefits and impacts (adapted from Kirklees model)<sup>49</sup>**

Beyond determining possible health risks and their positive or negative direct and indirect health effects, the Kirklees model suggests criteria for relative weighting of these impacts. Assigning weights is necessarily subjective to a large extent, and different stakeholders are likely to have differing priorities. The criteria include:

- Numbers of people likely to be affected
- Geographical area likely to be affected
- Amount of benefit/detriment of likely health effects
- Likelihood of impacts
- Policy priority
- Target and community priority
- Cost/benefit
- Time to deliver benefits
- Community capacity/availability of community-based skills and resources

Scores are assigned on a scale of 1-5 to one or more criteria to form a ranked list, from which priorities can be selected.

An example demonstrated below (weights are subjectively assigned) looks at the direct negative health effects of ongoing sewage discharge, compared with positive indirect effects.

Issue	Maori	Wider community	Weighting	Rating
	impact	impact		
Increase in infectious diseases from polluted water	---	---	Numbers affected- small	1/5
			Geographical area- large	4/5
			Amount of detriment of likely health effect- health/economic/social/cultural	2/5
			Likelihood of impact- increasing with increasing pollution	3/5
			Policy priority +	2/5
			Target and community priority ++ and increasing	4/5
			Cost/benefit- significant direct costs to town ratepayers and TA;, long-term benefit large to community but inadequate in itself to improve water quality due to contribution of pollution from other sources.	2/5
			Time to deliver benefits- intermediate	2/5
			Community capacity- broad range of community interest, some technical expertise and \$\$	3/5
			Weighting total	
Positive indirect impacts of	+++	++	Numbers affected- large	4/5
			Geographical area- large	4/5
			Amount of benefit- economic (tourism, agriculture,	4/5

	Maori	Wider community		
improved water quality			viticulture etc); social and cultural	
			Likelihood of impact- requires improvement of the whole catchment	2/5
			Policy priority	2/5
			Target and community priority	4/5
			Cost/benefit- large to clean up whole river; direct cost to ratepayers	2/5
			Time to deliver benefits- longer term	2/5
			Community capacity	3/5
			Weighting total (of improved quality)	27/45

This is another useful tool for capturing broader community perceptions of health risks and the impact on different determinants.

### 3.5 RISK COMMUNICATION

Risk perception analysis (“fright factors”) suggests that an issue like water pollution, which poses perceived involuntary, man-made rather than natural risks and which may cause future hidden or irreversible health damage, will trigger more alarm and public outrage than other risks. There are also identifiable triggers that tend to make media stories about risk “run”. Response to a risk will also depend on people’s values, and perceived benefits and costs. Many recent studies on risk perception also document a decline in trust in scientific expertise, and the importance of the manner adopted, emotional tone and openness in decision processes and communications about risk.<sup>50</sup> Therefore it will be important for Public Health to be open in dealing with the community about the uncertainty in this risk analysis, while advocating the optimal solution for public health.

Managing communication about risks to the public’s health must focus both on improving treatment of effluent and/or removing it from the river, and on informing the public of the risks of contact with the river. From a health promotion and protection perspective, removing sewerage from the river is the optimal solution, and is the only long-term sustainable option: the community needs to be informed of this. In the short-term, publication of monitoring data, signage at key sites and informing the community of expected health risks may be useful, both to reduce immediate health risk and to encourage the community to take action to improve the water quality of their river. Public health can assist in focusing community outrage into productive action, for example, by presenting coherent, well-argued submissions to resource consent applications, and participating in mediated discussions with local authorities. This is likely to lead to improved outcomes for public health in the medium to long-term.

### 3.6 RISK MANAGEMENT

**How can negative impacts be minimised or avoided? Are there better alternatives? How can differing perceptions be mediated?**

As stated above, the negative impacts of poor water quality in the Ruamahanga can best be avoided through action to improve sewage treatment options, and by enhanced riparian management on farms. The

direct health impacts can be minimised by measures such as increased monitoring of recreational sites, particularly in the high use summer months, and appropriate signage to deter swimming and food-gathering, when necessary.

However there also needs to be increased community awareness of the true economic costs of environmental pollution, and encouragement to value water as a finite economic resource. The opportunity costs, and social and health costs of continued pollution as well as direct cost to Councils and ratepayers for improving sewerage treatment should be considered. This requires offering the community information with more accurate cost/benefit assessments, and not merely the direct costs of improved sewerage treatment.

Another issue is the impact of non-point discharges into the river. Evidence from other New Zealand studies suggests the largest contributor to water pollution in rural areas is farm run-off. Thus attempts to address water quality should include strategies to improve riparian management, both of upper catchment areas (as potential sources of drinking water), and the mid-lower catchment areas (significant recreational use and food-gathering). Enhanced riparian management will require support and advocacy from the Regional Council, Federated Farmers and other farming interests, such as Fonterra.

A reconciliation of viewpoints between iwi and Council is not possible if sewerage discharge to water continues. Likewise, increasing public opposition to sewerage discharge to the river means that the traditional practice of discharge to water, and local Councils' acceptance of this, is unlikely to prevail over time. Regional Public health should consider developing policy on sewerage disposal and best public health practice for the region that will meet iwi aspirations.

## ***Implementation and Recommendations for Public Health Action***

### **3.7 DECISION MAKING**

**Does the assessment provide sufficient information that is robust and reliable?**

**Presentation of options and action to implement the decision(s)**

Health Impact Assessment is an approach to examining the relationship between programmes or policies and impacts on human health. However there are obvious limitations, particularly if a holistic concept of health is used. Quantifying non-physical health impacts (cultural and spiritual impacts, mental health etc) is difficult if not impossible, and attributing negative health outcomes to broad environmental change, such as a moderate degradation in water quality, is likely to be unconvincing. Extrapolation of data from individuals to populations is also fraught. In addition, epidemiological studies that report associations between measures of health of populations and the presence of hazardous factors in the environment are frequently difficult to interpret.<sup>51</sup>

In this HIA of the Ruamahanga, there remain large areas of uncertainty, with data gaps and difficulties in assessing long term as opposed to short- term

impacts on health. The epidemiological and dose-exposure data is limited, and many assumptions have been made in assessing physical health risk. Lack of up to date, reliable observational data and limited knowledge of exposure risk for non-swimming recreational users are two issues. Although current modelling being undertaken for the Freshwater Microbiological Research Programme will assist in improving the evidence base for risk assessment, no formal epidemiological study has been done and this is now unlikely for ethical reasons.

Modelling quality of life measures might go some way to quantifying areas of social, mental and cultural health and possible impacts, but qualitative research and community opinions are likely to be as valuable and easier to obtain, given the difficulty in assigning causation.

Despite these limitations, this HIA can usefully inform public health action by RPH and ChoiceHealth. The following recommendations are mainly focused on a key current issue in the Wairarapa, where public health has a recognised statutory, as well as advocacy, role to play. However some general recommendations to enhance environmental public health action are also made.

### **3.7.1 RECOMMENDATIONS FOR PUBLIC HEALTH ACTION**

(Relating to the resource consent application by Masterton District Council for continued discharge of partially treated sewage to the Makoura and Ruamahanga rivers)

#### ***Specific recommendations concerning the Masterton consent process:***

- Public Health and the Wairarapa DHB should continue to take an active role in the resource consent application process, working closely with the Wairarapa DHB to harmonise submissions so that they are mutually supportive. Submissions should point out the potential broad health impacts of poor water quality as well as concerns for the physical health of those in direct contact with the river. Public Health should actively oppose the consent application if the potential short and long-term health risks outweigh any gains, and seek more rapid action to improve effluent quality as an interim step. Additional support for ChoiceHealth in this process from a Medical Officer of Health at RPH would be valuable.
- Recognising the principles of the Treaty of Waitangi under which we work, Public Health should ensure full participation by tangata whenua both in Public Health/DHB submissions, and through promoting the Treaty obligations of the District and Regional Councils. Public Health submissions should specify the impacts on Maori health of continued sewerage disposal into the river, and support iwi aspirations in this regard. This will require commitment to building long-term relationships with iwi.
- Public health can provide technical support to the broader community in the Wairarapa e.g. by providing key guidelines on water and effluent quality, monitoring data, and providing analysis of technical data in “everyday” language. Public health should network with and support

community coalitions and groups of interest which are advocating public health goals as well as optimal river management.

- Public health can advocate and support a *regional* integrated view of the river and effluent disposal (through getting the three territorial authorities, iwi, community and health working together). The mediated process used to resolve the Martinborough resource consent application can be used as an example (promoting Tasmanian guidelines for effluent quality as an interim target and discharge to land as an optimal solution). A similar approach can be taken in Masterton, with Public Health assisting in setting quality standards and monitoring regimes, rather than defining the technical options for treatment.
- RPH needs to provide greater continuing support to the health protection officer (HPO) in the Wairarapa. This could include hiring of a further senior HPO or ensuring the existing consultancy arrangement is improved (eg one consistent person from the consultancy would ensure greater continuity and support for the HPO). Another option would be for a senior HPO from RPH to spend at least 2 days/week in the Wairarapa. On the basis of health needs, one day per week of Medical Officer of Health (MOH) time should also be allocated to cover communicable disease and environmental health issues in the Wairarapa. The MOH needs to be physically present on a regular basis in order to provide a useful service.

**General recommendations to RPH:**

- Notification of potentially water-borne diseases is mandatory in NZ but under-reporting is well recognised.<sup>1</sup> Reporting should be encouraged as a potential tool for public health advocacy, and further work with primary care practitioners and laboratories is necessary to increase data quality. Public health needs to ensure timely, useful feedback to primary care.
- Public Health should use the annual plan process (written and oral submissions) of District and Regional Councils as an important opportunity for public health advocacy, as well as health protection.
- RPH needs to develop a pro-active, health promoting and enhancing framework for environmental health, rather than responding reactively when health has already been adversely affected. Given the importance and public concern about water quality in the region, RPH health protection staff should prioritise freshwater quality issues in their strategic planning over the next 3-5 years. Some key principles should be discussed and agreed on internally: for example, should RPH promote land-based sewerage discharge as an optimal solution across the region? If not, what does this mean for our relationship with iwi? Should RPH be more critical of council plans, rather than as is more common at present, supporting, or neither "supporting or opposing" them? How can we best use public health knowledge and health data (even when incomplete) to assist in enforcing existing consents, and in actively promoting health?

### **3.8 MONITORING**

**How will conditions be enforced?**

**Who/how will the impacts be monitored?**

**How will this be resourced?**

The responsibility for monitoring water quality lies with the District and Regional Councils, and resources are allocated and available for this. There is some community concern about the quality, reliability, frequency and sites at which monitoring occurs. Public health should support “monitoring for action” ie those options that will assist in enforcement of consents, and public health action to protect and promote health. The use of international effluent quality standards, such as the Tasmanian standards suggested for use in the Martinborough resource consent process should be carefully monitored to ensure that they provide the outcome in terms of water quality that the community aspires to.

Public Health’s responsibility remains in monitoring potentially water-borne infections, and monitoring Council’s interpretation and actions when water quality thresholds are exceeded. It is important that the primary care workforce is motivated to ensure notification is complete. The District Health Board plays a key oversight role, both in monitoring overall health status of their population (particularly those with poorer health outcomes), and in advocating “population approaches” to improve health. Regional Public Health can assist these actions by creating a health promoting environmental health framework within which Health Protection Officers and other staff can work.

### ***Audit and Critique of HIA***

#### **3.9 ENVIRONMENTAL AND HEALTH AUDITING, POST PROJECT EVALUATION**

**How well has the HIA process achieved its aim of protecting health?**

Given the apparent weaknesses described in section 3.4-8 above, this HIA process has also had strengths. In taking a “broad” holistic view of health, and focusing on health inequalities, it has clearly outlined some key environmental issues Public Health needs to resolve internally with respect to Treaty of Waitangi obligations and Maori aspirations. In taking a holistic view, it has allowed other “voices” and views to be heard that might be ignored if using a biomedical model of health. A formal qualitative research project might have yielded a more “evidence-based” report: the importance of valuing and recording the rich oral history around the river is a significant finding arising out of this project. However, an advantage of the HIA framework is that it is clearly a participatory process that is designed to enhance public health action, not merely generate academic findings.

The HIA process has generated ideas around building and supporting integrated approaches to environmental health issues, and the importance of public health advocacy in creating and developing community coalitions of interest. The process has also allowed Public Health to work more closely with other groups in the community who share common objectives about improving water quality of the Ruamahanga, both informally and in the resource consent application processes (Martinborough and Masterton). Important steps have

been made (at least by the South Wairarapa District Council) in recognising the need to improve sewerage treatment and establishing a timeframe for this. The WRC has acknowledged the value of Public Health's contribution to the debate.

Deficits in quantification, lack of knowledge about long-term effects, problems in measurement of social and psychological dimensions, and of the difficulty of addressing inequalities have been noted in many other HIAs. These weaknesses are evident even when the HIA has examined an area such as transport policies or alcohol use- where many of the direct health impacts can be measured and epidemiological data are readily available.<sup>52,53</sup> There is a need for better epidemiological evidence- including timescale of effects and interactions; but

*"...public health action (for example, the reduction of population exposure to a suspected hazard or even its elimination from the human environment) must often proceed even when scientific evidence is insufficient".<sup>54</sup>*

Where there is uncertainty, the precautionary principle should play a role.<sup>h</sup> Existing "evidence based" frameworks tend to rank randomised control trials and "hard" epidemiological data above other methods, especially opinions of community, and "control out" socio-economic factors and ethnicity. Yet in order to respond effectively to environmental health issues, we need to understand the complex interplay between the policy or intervention and the reality for different communities or populations, especially those that are marginalised or vulnerable. Different forms of evidence are required to answer different questions, and need to be combined to provide a more complete picture. It has been argued that "wider recognition must be achieved for evidence of different types, and their respective strengths and limitations must be better understood."<sup>55</sup>

Some of the other difficulties with HIA noted by researchers have also been observed in carrying out this project.<sup>56</sup> The HIA process is relatively time and resource-intensive. Obstacles around language, concepts and thinking-boundaries were evident (e.g. what has this got to do with health? what can we (health people) do about socio-economic or environmental determinants?). The perception that "we know all the priorities so why bother with assessment?" and tensions between technocratic versus participatory decision-making have been well illustrated in the Wairarapa. Key success factors in other HIA include keeping a focus on health outcomes, concentrating on areas where you might make a difference, involving key people early, and people with a wide range of expertise. A disadvantage in this context was the short-term nature (3 months) of the project, and the fact that I was an outsider to the community, based outside it – it takes time to establish networks and work with diverse groups within communities. This is true also of building relationships with tangata whenua structures, which are quite fragile in the Wairarapa.

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<sup>h</sup> "In order to protect the environment the precautionary approach should be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" Principle 15 of the Rio Declaration on Sustainable Development (UNEP, 1992)

More broadly, HIA frameworks need to consider global as well as local environmental changes that may increasingly impact on health.

*“...Longer-term changes in the structure and conditions of both the social and natural environments will affect the sustainability of good health within populations...global climate change, depletion of freshwater supplies, loss of biodiversity and the degradation of managed ecosystems- jeopardises the life-supporting capacity of the biosphere.”<sup>57</sup>*

Epidemiological analysis that is confined to studying “risk factor” differences in individuals is inadequate to face this challenge to health. There is a need to **anticipate** the influences on population health of socio-economic processes and systemic environmental disturbances. A different paradigm is required, which can incorporate the concept of human health as part of an integrated ecosystem, and link ecological and population health risks. Ecosystem health approaches which integrate ecological and health risk assessments begin to develop more comprehensive evaluations of health impact, although these still focus almost wholly on physical health.<sup>58,59,60,61</sup> The Maori world view of health and kaitiakitanga<sup>62,63,64</sup> is in this sense conceptually more advanced than traditional “scientific” models. The difficulty remains in developing measures and tools which can convince policy-makers and local authority politicians that environmental policies based on this holistic view of health and the environment are possible and in the long-term, cost-effective to implement.

## **ANNEX**

### **1.0 RECREATIONAL RIVER USE DATA**

#### **1.1 FISH AND GAME DATA (courtesy of Wellington Region Fish and Game NZ)**

Estimates of the total level of angler use of the Ruamahanga River derived from the 1994/95 National Angling Survey are as follows:

<b>Period</b>	<b>Angler days</b>
Oct – Nov	945 angler days
Dec – Jan	1951 angler days
Feb – Mar	2316 angler days
April – May	1035 angler days
June July	536 angler days
Aug Sept	602 angler days
<b>Total 1995</b>	<b>7386 angler days</b>

The estimate of 7386 angler days of fishing activity during the 1995 fishing season, rank the Ruamahanga as the third most important fishery in the Wellington Fish & Game Region behind the Hutt and Manawatu Rivers.

The report from which these figures have been extracted is:

Unwin, M. & S. Brown 1998 The Geography of Freshwater Angling in New Zealand: a summary of results from the 1994/96 National Angling Survey, NIWA Client Report No. CHC98/33 (unpublished).

#### **1.2 Canoeing and jet boating activity**

From 2001/2 season, based on data supplied by local operators (one did not respond).

<b>Activity</b>	<b>Nov 2001-Apr 2002</b>
Jet Boating	2040
Kayaking	3260
Trout Fishing	20

#### **1.3 Swimming data**

The only data available is that collected for a preliminary study looking at the feasibility of studying bathing-health effects in NZ freshwater in the summer of 1996.<sup>65</sup> It is likely given increased tourist numbers since then that the reported numbers underestimate the true situation.

Observations were made over several weekends in January/February 1996. The average estimated number at the sites (Morrison's Bush and The Cliffs) (mainly mid-afternoon) was 128. Morrison's Bush is a popular camping site, where people may stay for extended periods, and the river is used by some campers for drinking water. Regular visitors to both sites reported a decrease in water quality over time, including algal growth.

#### **1.4 TOURISM WAIRARAPA data**

Peak months are January and February, with peak quarters ending December and March. Feb 2002 is up by 3000 guest nights compared with Feb 2001.

<b>Year (ending)</b>	<b>Guest nights</b>	<b>Annual increase</b>	<b>% Annual increase</b>
Dec 1997	142,745	-	-
Dec 1998	155,849	+13,104	+9.2%
Dec 1999	163,347	+7,498	+4.8%
Dec 2000	178,341	+14,994	+9.2%
Dec 2001	197,927	+19,585	+11%

It's estimated that these figures cover about a quarter of all visitors, roughly another ¼ stay in "non-surveyed" accommodation (ie small farmstays, cottages etc which are not GST-registered businesses), ¼ with friends and family, and another ¼ are day trippers. Tourism Wairarapa book over \$600,000 of accommodation per year, which is only a small proportion of the total amount. The international visitor surveys suggest 18% of visitors are from overseas, and in some months this is as high as 30%.

## **2.0 BRIEF SYNOPSIS OF ENVIRONMENTAL AND HISTORICAL EVENTS- RUAMAHANGA<sup>66,67,68,69</sup>**

### **The environment**

The southern Wairarapa consists of three different zones- mountainous hinterland, a complex alluvial valley with river and lakes, and a narrow coastal platform. The Rimutaka consists of Jurassic greywackes, rising to 1000m on the west; to the east the Aorangi are a mixture of triassic greywackes and sand stones, lower Cretaceous rocks and Miocene mudstones. Until about 1500BC the Ruamahanga valley was estuarine, when it turned into the lacustrine complex of today (lakes and rivers). The forest varied from swamp kahikatea stands in the alluvial valley to mixed podocarp and beech in the mountains. Palliser Bay is a rich marine environment (fish, crayfish, shellfish, eels (lake Onoke) with soft unstable foreshores. The river and lakes enter the bay through a narrow channel in a gravel bar which separates Onoke from the sea. In dry weather when the water levels drop, or after southerly gales that build up the shingle, the channel was closed; in the spring or wet conditions the channel would open. The lake was an important eel catchery, especially at the mouth (Okourewa) when the outlet was closed.  
(see maps)

### **Human settlement**

Human settlement extends back to the visit of Kupe. There are two settlement patterns recognised-the first being early permanent settlement in Palliser Bay (seven communities have been identified in Palliser Bay AD 1000-1200) and seasonal occupation in the Ruamahanga valley (eg Moikau AD1180 site and Washpool valley AD1550).

Oral traditions refer to the migration of Ngati Kahungunu in the early 17<sup>th</sup> century; Tini-o-awa and Ngati Ira coexisted with Rangitane in the same area before this. From the time of occupation by Ngati Kahungunu, there was a different settlement pattern, based around the lakes (Wairarapa and Oneke). The population was highly mobile, with fishing rights on the coast, but didn't live permanently there. They have been described as "foraging horticulturists" –that is, they exploited the food resources of the river and streams, the forest zone and coastal flats.

There was substantial trade between Wairarapa and other areas, particularly of stone (chert from Tora, limestone from Hawkes' Bay and Wairarapa sites; obsidian from the north and Coromandel, nephrite from the West Coast of the South Island etc) and moa bone (from the South Island); it is likely there was also extensive trade in perishable items (dried eel, preserved birds etc) (see timeline).

There are 249 archaeological sites recorded in the south Wairarapa, including many middens, storage pits and stone wall complexes (outlining early gardens). There are also some pa (37), mostly along the coast north of Cape Palliser, burial sites and other specialised sites. Kumara and gourds would have been the major crops, although soil and climate conditions are only marginal, and during the periods AD1450-1500 and 1600-1800 with the glacial advances ("Little Ice Age") weather and season length would have been unpredictable. The coastal ecology was also affected by deforestation and erosion between the 12<sup>th</sup> and 16<sup>th</sup> centuries. Evidence from human skeletons

from this period show a high incidence of Harris lines in limb bones- the result of adverse economic conditions which cause periodic malnutrition. There was significant depopulation of the Palliser Bay area around this time (documented in oral tradition, of Rangitane leaving the area). Confronted by adverse conditions and incoming Kahungunu, Rangitane migrated south about AD1625, exchanging their land for canoes and weapons. However there was still a significant Rangitane presence in the north and many alliances and marriages between the two iwi.

Earliest migrations of Ngati Kahungunu were probably in the first half of 16<sup>th</sup> century; and to the Wairarapa from 1625. Due to climatic conditions, cultivations of kumara etc would have been difficult- and the major food resource was eels, and forest food resources. Periodic closures of lake Onoke facilitated enormous catches of eels (estimated at 10-30 tons), which were highly prized in trading exchanges.

Oral traditions suggest there was also migration of people, including that by Ngai Tuahuriri, headed by Turakautahi from Turanganui in Palliser Bay, as part of the "Ngai Tahu" migration to the South Island, about AD 1710. From the early 1700s, social upheaval and warfare were occurring as evident by the fortified stockades and pa sites that have been found from that era. At the time of Pakeha arrival (Cook arrived in Palliser Bay on February 9, 1770), Ngati Kahungunu was in effective control of the Wairarapa. But Te Rauparaha's drive south, with invasions by Te Ati Awa, Ngati Tama and Ngati Mutunga from the west, and visiting war parties from Ngapuhi, Ngati Whatua and Ngati Toa in the 1820s led, by 1833, to an exodus by Ngati Kahungunu back to Te Mahia.

Peace was agreed between Pehi Tu-te pakihi-rangi and Te Wharepori of Te Ati Awa; this along with the signing of the Treaty of Waitangi, and the subsequent acknowledgement of Ngati Kahungunu's land rights, led to most of these hapu returning by around 1842. Only three years later the first pakeha leaseholders arrived.

### **Pakeha settlement (see details in the Wairarapa report, ref 2)**

- 1844-8 The development of leasing land: Maori encouraged European settlement in order to benefit from trade etc; by the end of August 1848 100,011 acres were leased for 609 pounds.
- The Native Land Purchase Ordinance 1846-this legislation reaffirmed the Crown's right of pre-emption with regard to purchase of land. Private leasing agreements were made illegal. This forced Maori wanting to maintain interaction with Pakeha either to sell land, or to remain economically and socially isolated. However it was not enforced initially in the Wairarapa as the government did not want to alienate Maori or the "squatters".
- Early attempts at purchase- In 1846 Governor Grey waived the Crown pre-emption of purchase of Wairarapa land in favour of the New Zealand Company. Wairarapa was identified in 1845 as the site for the "Canterbury settlement" (organised colonisation, recreating a slice of English society in NZ). In 1847, Francis Dillon Bell was commissioned by the NZ Company to purchase lands for the scheme, but he met with "violent and decided an opposition", and no land was sold.

- Governor Grey wrote to Wairarapa Maori reiterating the threat of ending all leases, and put pressure to silence William Colenso (the local missionary), who had advised Maori not to sell and spoken out against unfair deals over leases.
- In 1848, despite heated opposition and divisions, it was agreed to sell 900,000 acres, initially for between 3-5000 pounds. However the 4000 pounds offered by the NZ Company in January 1849 was refused and Maori demanded 16000 pounds instead; negotiations lapsed. The NZ company had its charter withdrawn and collapsed in 1850. Donald McLean (formerly its agent) was retained by the Crown and given resident magistrate powers.
- Crown Purchases 1853-4: About 1.5 million acres of land was sold (nearly  $\frac{3}{4}$  of the total land area), in 41 deeds, for a total of 23,547 pounds. This proportion far exceeded that of any other group in the North Island, south of Auckland. An additional 5% of the proceeds, when the land was resold by the Crown, was promised in some cases. This was to provide hospitals, schools, mills etc and annuities for the Maori population.
- What were possible motivations for sales? Goldsmith postulates:
  - Maori gained cash payments and public works that were expected to follow further Pakeha settlement;
  - threats were made that leasing was no longer an option (and action taken by McLean to enforce this);
  - pressure from Governor Grey;
  - persuasion by influential Hawke's Bay chiefs;
  - individual personal gain and bribes to prominent chiefs to gain their support;
  - lack of counter advice;
  - a declining population from Pakeha-introduced illnesses (Colenso estimated that 1/13 of the population died in ten months to March 1850); and
  - breaking up of blocks (a "divide and rule" approach).
- Were the sales fair?
  - Issues of inadequate documentation (the majority of areas were not surveyed);
  - reserve areas were vague in extent as were continued rights of use retained in some deeds); and
  - lack of representation by some important chiefs amongst the sellers.
- 1854-1865 Further alienation. McLean returned in 1854 and 1855 and made further smaller purchases. Tensions arose over the conditions of sales, and the impact of the Kingitanga movement was also felt.
- By 1865 an estimated 80% of the land in Wairarapa had been sold- the largest remaining area was "Seventy Mile Bush" in the north (east of the Manawatu gorge). The government agent Searancke paid Rangitane from west of the Tararua (in direct opposition to resident Rangitane in the east) an advance for sale of over 100,000 acres at the Wairarapa end.
- 1865-1900 160,000 acres remaining; since 1900 some of the last 8% of land in Maori hands has been retained in Maori ownership, leased or

divided up and purchased by individual families. Debt was a crucial factor in some cases.

### **The impact of land sales on the lakes (Wairarapa and Onoke)**

- Issues persisted over the flood line and agreed boundary of the 1853-4 sales of land around the lakes; Maori said that land below the flood line had not been sold and did not cede adjacent land in order to protect the eel fishery.
- 1855 earthquake raised land previously submerged
- Increasing pressure by settlers to open the outlet of lake Onoke to the sea to prevent flooding, as the number of settlers and stock increased. Permission was given at times by Maori who had rights to the lakes, for a fee of 40 pounds. By 1872 settlers were applying political pressure and the government attempted to purchase the lakes.
- In 1876 a sale deed was obtained, but was only signed by two chiefs; later in the year a petition from Maori complaining that the lakes had been improperly purchased was forwarded to parliament. The Native Affairs Committee agreed and stated that the Native Land Court should have investigated title before sale.
- By 1886 Maori agreed to open the lake for two months; however in 1888 the Wairarapa South County Council declared the outlet a “public drain” and handed control over to the South Wairarapa River Board. After application to government, Cabinet agreed to opening the “drain”. Maori (under Piripi Te Maari) took their protest to the Supreme Court, which urged a parliamentary enquiry.
- In 1891 the Royal Commission’s report (“Claims of Natives to Wairarapa Lakes and Adjacent Lands”) stated that the flood line was the true boundary; that Maori were entitled to two months closure of the river; but that they were not justified in allowing land sold by them to be flooded.
- In 1892 the River Board authorised a contractor to open the outlet. A non-violent protest (Maori seized each shovel in order to obstruct the work) took place, and a prosecution for obstruction instituted. The trial took place in 1893, and the ruling found in favour of the River Board. Piripi Te Maari then gave notice of appeal to the Privy Council, and also petitioned the government. The Native Affairs Committee found in 1895 (just after Te Maari’s death) that “the Natives have been wronged”...and that grievances should be redressed.
- In 1896, the lakes were gifted to the Crown after an agreement was signed at Papawai. The government in return paid 2000 pounds for expenses, and purchased land in compensation. As land in the Wairarapa was found to be “too expensive”, finally in 1915 a large portion of the Pouakani block (including the present township of Mangakino) was gifted to Ngati Kahungunu. This land is well outside traditional Ngati Kahungunu tribal territory and they do not hold ancestral rights on Pouakani land, placing them in a difficult relationship with local tangata whenua.

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