THE COMMUNITY'S PLAN FOR THE WAIKANAE RIVER AND ITS ENVIRONMENT

Waikanae Floodplain Management Plan

The community's plan for the Waikanae River and its environment

Foreword

This Plan is the result of much hard work and commitment by people who live on, or have a connection with, the Waikanae floodplain.

I would like to take this opportunity, on behalf of the Regional Council, to thank all of these people for their input into the Plan, whether it was through attendance at community meetings or as a member of one of the groups involved in bringing the Plan together.

In a community effort such as this, every contribution is valued. The Waikanae Floodplain Management Plan has been over five years in the making, and has benefited from community involvement at every step.

From defining the flood problem, selecting the preferred options, looking at the environmental and economic impacts, through to preparing the Plan, the Waikanae River Communities have been fully involved and now have a stake in it.

The Plan, however, is a living document. It will change and be further developed over time. We can never be over prepared for a flood, and the landscape continues to change in response to far greater powers than ours. We must never let ourselves believe that we have been able to control the mighty forces of a river in flood. This is why your continuing involvement in the implementation of the Plan will keep it alive and will reflect the changing needs of the community as well as keeping you informed and prepared.

From here, we can now look to the outcomes of the Plan being implemented and the benefits being realised of a prepared community.

STUART MACASKILL
Chairperson
Wellington Regional Council

Acknowledgements

Major contributors to this Plan have been:

- Staff and elected representatives of the Wellington Regional Council
- Various Consultants
- Staff and elected representatives of the Kapiti Coast District Council
- Members of the Officials Liaison Group
- The people of Ati Awa ki Whakarongotai
- Members of the interested and responsible community who have made their contribution to the Kapiti Floodplain Management Committee and the Waikanae Resource Group.

The Wellington Regional Council thanks them all, past and present, and offers special acknowledgement of those who have passed on since the project began.

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[Dedication]

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Executive Summary

A major flood in the Waikanae River could cause millions of dollars worth of damage to property and community assets in the Waikanae area. The social and psychological costs, although difficult to quantify, add considerably to the devastating effect of such an event.

The Waikanae Floodplain Management Plan is the result of five years of work by the Waikanae River Communities, Ati Awa ki Whakarongotai, the Wellington Regional Council (The Council) and the Kapiti Coast District Council (KCDC). Essentially, the Plan provides a blueprint for management of the river and floodplain over the next 40 years.

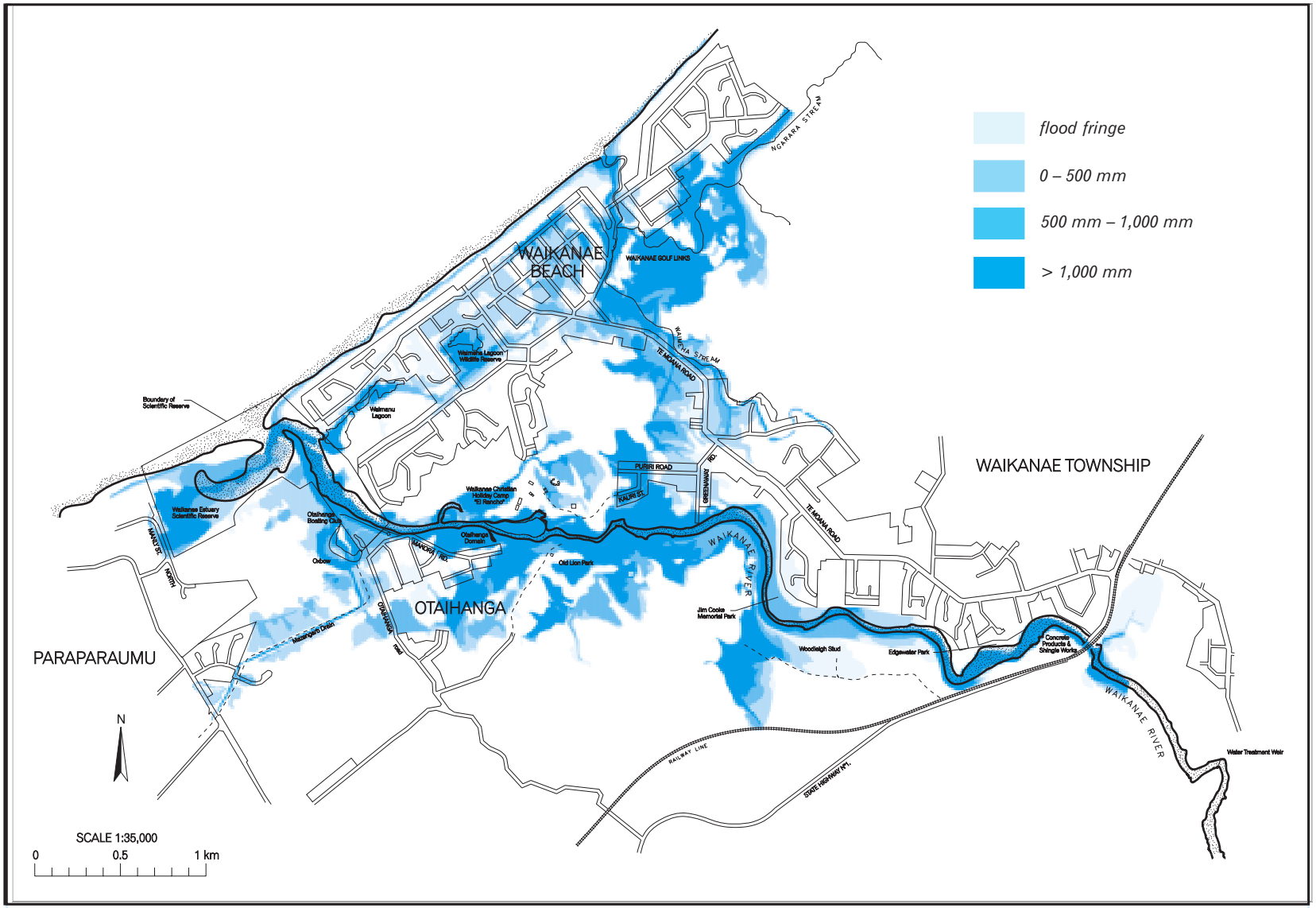
Human influences on the floodplain such as forest clearance, urban settlement and some river management practices have resulted in significant changes to the landscape of the floodplain. These changes, combined with natural floods have created a flood hazard. Even with the protection that was put in place between 1956 and 1964 following the large flood of 1955, medium-sized floods continue to cause damage, particularly as recent settlement has been located in areas susceptible to flooding.

Obviously the question uppermost in everyone's minds is whether they live in a floodable area. The following map shows the extent of flooding that can be expected in the Waikanae area as a result of a '100 year' flood. This is a major flood event estimated to have a 1% chance of occurring in any one year.

What is Going to be Done?

The Waikanae Community has developed a set of 'outcomes' as a result of examining various options for dealing with the flood problem. These outcomes are the tangible and practical results of the floodplain management process that will be put in place as the result of the five-year planning process. The implementation of the outcomes will take many years, depending on the Communities preparedness to pay.

There are three main categories of outcomes—non-structural, structural and river management.



Present Extent of Flooding in a 100 Year Flood

Non-structural Methods

These methods address land-use, building construction, community preparedness and emergency procedures. They are the most cost-effective methods of floodplain management reducing the cost of flood damage and guiding future development on the floodplain.

Flood Hazard Categories

Four flood hazard categories have been defined and are included in the KCDC District Plan, with appropriate land-uses defined for each. The Council will advise KCDC on subdivision and land-use applications to ensure that any new development or activity is appropriate to the flood hazard in that area.

Public Ownership of River Corridor

The River Corridor is the highest floodable area. One of the ultimate aims of the Plan is for the whole of the River Corridor to be held in public ownership for both safety and environmental reasons.

Community Preparedness

Flood hazard information	The Council will continue to provide up-to-date hazard information to Civil Defence agencies and and work to enhance co-operation between the various agencies involved.
Public education	The Council will support and assist KCDC in its education programmes to improve flood awareness.
Insurance	Individuals are encouraged to take out adequate insurance against flood damage.
Flood warning	The Council will consider ways of improving the current system.
Civil Defence	The Council will assist KCDC in updating its civil defence plan as required.
Disaster Recovery	Although KCDC takes the lead role, the Council will assist where appropriate.

Structural Methods

Structural methods are physical works such as stopbanks and road-raising. They protect existing development from floods. Agreed structural methods include:

Stopbanks

Designed to protect homes and properties from a 100 year flood. Annual surveys will determine maintenance and budget requirements. The designs allow for a 5 mm/year sea level rise as a result of climate change.

Kauri/Puriri Road	Completed in July 1997, providing protection for 450 properties.
Chillingworth	Completed in July 1997, providing protection for 50 properties.
61 Makora Road	A stopbank providing protection for one property.
Otaihanga Domain	Will provide protection for several properties in Otaihanga.
121 Otaihanga Road	A ring stopbank providing protection for one property.
Jim Cook Park	Existing stopbank will be reconstructed to give a better standard of protection. It currently has a high probability of failing in a major flood event. A retaining wall will be built at the upstream end of the stopbank.
Waikanae Beach	A stopbank will be built across the golf course providing protection for 400 properties.

Road Raising

The Council and KCDC will fund and implement road-raising at times that coincide with a road upgrading programme over the next four years. Funded by District, Regional and 'Works and Services' rate.

Greenaway Road	A portion has already been raised in association with the Kauri/Puriri Road stopbank.
Otaihanga Road	An 800 m section from the start of Makora Rd will be raised.
Makora Road	The sections between No. 2 and No. 20 will be raised.

House Raising

This applies to existing properties on flood-prone land. It will be funded by the WRC according to the funding policy at the time of the work. Individual owners will organise the work and ongoing maintenance. The houses to be raised to the 100 year level are 1–17 Makora Road 73 Makora Road and 11 and 13 Toroa Road.

Bridge Lengthening

The **Fieldway Bridge** causes severe flow constriction and will be lengthened to 18 m. Associated works such as channel widening will assist in improving performance. The costs will be shared between the Council and KCDC.

Building Relocation

Riverside Lodge	This property has been purchased by the Council and the house has been removed.

Services

The aim is to reduce the number of locations where river crossings are needed, by, for example, developing service strips along and across the river to rationalise the number of services in the River Corridor. The Council will facilitate utility service groups that will include utility authorities such as Transpower, Natural Gas Corporation, Tranz Rail, Transit, Electra and Telecom.

River Management Methods

These methods are the day-to-day activities that maintain the river in the preferred channel alignment and protect and maintain existing flood mitigation structures.

Gravel extraction	An annual average of 3,000 m^3 (reviewed annually) will be extracted from the Waikanae River in locations that provide the maximum benefit for river management purposes.
River mouth management	The river mouth will be periodically cut when trigger points are met. The existing groyne will be maintained and monitored.
River channel maintenance	The river will be kept in the preferred alignment by regular channel maintenance activities including repairs to and construction of bank protection (groynes and riprap), vegetation planting and berm maintenance.
Monitoring	Monitoring will assess the effectiveness of river management activities, river bed levels, conditions after floods and other natural hazards, and impacts of climate change. Annual reports will be produced and the accumulated knowledge applied to future assessments.

Development of the Waikanae Floodplain Management Plan

The Plan has taken five years to develop. Each step of the process is represented by a planning phase:

Phase One defined the flood problem, including physical, social and environmental issues. The investigations were reported in the Phase One Summary Report in 1992.

Phase Two, completed in August 1993, reported on the evaluation and selection of preferred options for managing the flood problem.

Phase Three refined the chosen options, taking into consideration an environmental impact assessment. Environmental and economic evaluations of structural, non-structural and river management methods were included in the report. This was completed in 1994.

Phase Four is the drafting of the Waikanae Floodplain Management Plan. It contains the outcomes of the planning process along with the issues that were considered in deciding the outcomes.

Phase Five will be the implementation of the outcomes. The major structural and river management works have been prioritised. The actual rate of implementation will depend on a number of factors and how they fit with the Council's 10 year plan, *Facing the Future*, and the Flood Protection Group's Business Plan. The Waikanae Floodplain Management Plan itself has no statutory status, but will guide Regional Plans and the Kapiti Coast District Plan in implementing the methods.

At all stages of the development of the Plan, the Waikanae River Communities have had a vital role in determining its content and will continue to be crucial to the implementation of the Plan.

Environmental Strategy

The River Corridor is a significant landscape and ecological feature of Waikanae. Some of the methods in the Plan have the potential to adversely affect the environment as do the activities of many other agencies in the Kapiti region. For this reason, the Plan proposed the preparation of an Environmental Strategy that will identify areas for special attention and provide an overall framework for environmental objectives for agencies and individuals involved in activities in the River Corridor.

If the river is managed effectively, environmental and landscape values should be enhanced. In any case, environmentally-friendly techniques are probably best suited to practical day-to-day river management.

1. Introduction

The Waikanae area, as evidenced by the rapid growth in population in recent years, is an extremely desirable place to live with its mild weather, beautiful setting and closeness to so many facilities. The Waikanae River is one of the distinctive natural features that makes up the beautiful setting and draws people to the area. It is highly valued by those who live in the area and is considered a great asset. As with all rivers, however, there are times when, as well as being a great asset, it can *flood*, causing considerable damage at a great cost to the community. This Plan is about how to minimise the damage costs from a flood and make the river a more valuable asset than it already is.

1.1 Why Should I Read This Plan?

To find out how to protect your assets from a flood:

A major flood in the Waikanae River could cause millions of dollars worth of damage to property and community assets in the Waikanae area.

If you own assets or have an interest in the area it is important that you read this Plan. It contains information about the river and the *floodplain*, the risk of flooding and what has been done to minimise its impact so far. It also sets out what *the Council* is intending to do in the future.

It tells you what you can do to minimise your losses in the event of a flood.

Helpful Flood Hints

- Have emergency water and food for at least three days
- Know how to turn off electricity, gas and water
- Keep a three day supply of essential and prescribed medicines
- Have a first-aid kit
- Have a transistor radio and batteries

To be informed about managing the Waikanae floodplain:

This Plan sets out the methods that the Waikanae River Community has chosen to manage the flood problem. See Section 3 for details.

If you were involved in this process, you will want to know that the decisions made are reflected in this document.

If you were not involved, you will want to know which mitigation methods were chosen and why. This Plan will give you the background (Section 2), what will be undertaken in the future to protect you from flooding (Section 3) and help you understand why particular methods were favoured (Section 4).

1.2 Some Frequently Asked Questions

You will probably have questions about floods, flooding and flood protection. Some examples of the most commonly asked questions are listed here. For further information, please look up specific subjects in the index.

Do I live in a Waikanae River flood-prone area?

For a map of potentially flood-prone areas, see Figure 3 (page 15).

What should I do if there is a flood?

Firstly, stay put, and if necessary, climb higher. Do not attempt to escape. Some more helpful hints in case of a flood are given below. You should also follow the directions for dealing with emergencies in the back of the Yellow Pages.

Figure 6 gives an indication of the effects of the depth and velocity of water on your ability to escape.

Also see Section 3.1.2 for ways in which the Wellington Regional Council (the Council), the Kapiti Coast District Council (KCDC) and the community, plan to increase public awareness so people are informed about the best way to remain prepared for a flood.

Am I in danger now?

Currently, some of the flood defences are capable of dealing with a 10 year flood but the community has agreed that it wants better protection than this. For details of the current situation, please read 'The Flood Problem' (Section 2.2); this will lead you to other references in the text.

What is being done about the flood risk?

A range of methods have been chosen by the community to minimise the impact of flooding. These are primarily outlined in Outcomes of the Process (Section 3).

Helpful Flood Hints

- Turn off electricity, gas and water
- Listen to Radio 2XX (frequency 1377AM 90.2FM) when sirens sound
- Move valuables, clothing, food, medicine and chemicals above flood water
- Prepare to climb into attic if necessary
- Do not enter flood waters if above the knee (nearly half of all flood related deaths occur in vehicles when people drive into low-lying flooded areas—Bibliography 4.23)
- Do not drink flood waters (they will be contaminated)
- Plastic rubbish bags are ideal for sewage waste or for insulation against the cold
- Never drive vehicles in flood waters
- People with special needs should plan before a flood for neighbours to assist

Can I build a house here?

If you own a section of bare land you are entitled to be able to build one house on the section, provided you take certain precautionary measures such as building the house above the 50 year flood level (defined in the Building Act). Kapiti Coast District Council have more detailed information on this aspect.

Can I subdivide in this area?

Generally, new subdivisions in flood-prone areas are not allowed under the proposed Kapiti Coast District Plan, unless each lot has a building site above the 1% flood level.

What land uses are compatible with the risk of flooding on my land?

Flood hazard categories have been identified which show flood risks in different parts of the floodplain. Figure 7 shows where these flood hazard categories occur. Some of the effects of these are detailed Section 3.1.1.2.

Who manages and implements the Plan?

The Council is responsible for managing and supporting the implementation of the Plan, in partnership with KCDC and the community, through its Annual Plan and Business Plan process.

Who will pay for the works?

Ultimately, the community will pay, although a significant proportion of the costs will be borne by the wider Wellington Region. Section 6 ('Implementation and Funding') gives you more details.

To find out what will happen next

Now that the Plan has been accepted by the community and formally adopted by the Council, work will begin on the implementation. Section 6 on Implementation and Funding sets out the detail on how the outcomes will be put in place. It will provide the basis for all future work but will be reviewed at regular intervals (see Section 2 for details).

To find out what has been done already

Because of the urgency for some structural flood mitigation works, and the timing of the production of the proposed Kapiti Coast District Plan, some of the outcomes of this floodplain management plan have already been implemented. For example, the Kauri/Puriri Road, Chillingworth stopbanks, Greenaway Road raising and the Waikanae River realigned adjacent to El Rancho have been completed. The flood

hazard maps (see Figure 7), River Corridor Zone and appropriate rules and standards (see Section 3.1.1.3) are contained in the proposed KCDC District Plan.

Implementation is also discussed in Section 6.

The priority of remaining structural measures is given in Table 3 and the criteria used to determine the order of priority are described in Appendix 11.4.

1.3 Who is responsible for making the Plan happen?

Three principal groups will be responsible for the implementation of the Plan. The following gives an indication of the roles to be played by these groups:

Waikanae River Communities

The Council acknowledges the vital role of the Waikanae River Communities. They have had a significant role in determining what appears in the Plan. Likewise, the communities have a crucial ongoing role in maintaining public awareness of the risks and potential impacts of flooding. The communities have roles in:

- Preparedness
- Funding
- Monitoring and review
- Ensuring private developments are compatible with the Plan

Kapiti Coast District Council

The KCDC have a role in:

- Controlling land uses through the District Plan
- Upgrading or raising roads and bridges
- Funding some methods through local rates
- Emergency management

Wellington Regional Council

The WRC have a role in:

- Regional Plans controls
- Funding through special purpose and regional rates
- River management
- Flood mitigation
- Flood prediction/warning
- Emergency management

Other agencies (listed in more detail Table 8) are involved in emergency management activities; broadly grouped as health, welfare, relief, law and order, and utilities (e.g., gas and electricity supplies).

The Plan has no statutory status, instead the Regional Plans (such as the Regional Freshwater, Soil, Coastal, Discharges to Land, Landscape and Air Quality Plans) and the Kapiti Coast District Plan are going to be used to implement the objectives of this Floodplain Management Plan. Appendix A: Legislative Framework, discusses this in more detail.

1.4 How do I find my way around the Plan?

Figure 1 shows a thumbnail sketch of what is contained in each section of the Plan.

1. Introduction	Why you should read this Plan and how to find your way around it.
2. Background	This 'sets the scene'. The geographical and geological features of the Waikanae floodplain are described briefly. The flood problem and the importance of floodplain management planning are explained. The various processes involved in managing the Waikanae floodplain are outlined.
3. Outcomes	What is going to be done and how. This Section explains what methods the Council will use to effectively manage the Waikanae floodplain. These methods have been chosen by the community. There are three main categories of methods—non-structural methods, structural methods, and river management methods (see Section 3 for definitions). Each category is discussed in some detail. The Section finishes off by introducing a proposed environmental strategy.
4. Considerations	This looks at the issues, objectives and policies that have led to the methods identified in Section 3. It explains why certain approaches were chosen, and it will give you an idea of the decision-making processes the community went through. It also details some guidelines to be followed when implementing the methods (these guidelines aim to ensure that concerns about possible environmental effects are mitigated or avoided).
5. Environmental Results	This will give you the good news for the environment. This Section lists the benefits to the natural environment and the community if the Plan is successfully implemented.
6. Implementation and Funding	This explains how the work is to be funded and carried out.
7. Monitoring and Review	This shows how the Council and the community will make sure the Plan stays effective and can meet the Region's changing needs.
8. Cross Boundary Issues	This sets out the different responsibilities of the various authorities, and outlines how the Council will co-ordinate these different interests.
9. Plan Changes	This Section is reserved for future Plan changes.
Glossary	This defines some of the more technical terms and concepts used in the Plan. Glossary terms are in blue italics in the text where they are used for the first time.
Bibliography	A list of the reports written for earlier phases of the Floodplain Management Planning process which provide background for this Plan.
Appendices	These give you more detailed information relating to some of the issues discussed in the text.

FIGURE 1: THUMBNAIL SKETCH OF THE WAIKANAE FLOODPLAIN MANAGEMENT PLAN

2. Background

2.1 The Waikanae Catchment

In a country like New Zealand, where flat land is at a premium, settlement of floodplains was inevitable. This settlement has permanently affected the natural river processes, resulting in irreversible changes to the character of rivers and their setting.

The Waikanae River flows from the western foothills of the Tararua Ranges, some 50 km north of Wellington. The upper *catchment*, to the water treatment plant, covers 125 km^2 square kilometres, with 60% covered in regenerating *native* bush and *indigenous* forest cover, and the remaining 40% in pasture. See Figure 2 for a map of the catchment.

Over its whole length, the Waikanae River *meander*s through a diverse landscape that has changed considerably over the many years of its existence. The floodplain itself has built up over 6,000 years from a combination of long-shore drift, and alluvial material (material deposited by the river) deposited from the surrounding hills.

Today, on the upper plain near the ranges, the river's course cuts through alluvial gravel before moving down, through coastal dunes and sand at Otaihanga and the estuary, to the sea.

Over the last 100 years, the landscape has changed significantly due to forest clearance on the coastal floodplain and in the upper catchment.

2.2 The Flood Problem

Natural floods, combined with human uses of the floodplain, have created a flood *hazard*. Early settlement of the area was generally in areas only marginally affected by floods, thereby minimising the hazard. Maori, for example, tended to move from settlements affected by flooding when the river shifted its course; and early European settlers, using local knowledge, selected sites that didn't flood.

More recent *development* has not been so appropriately located. Most flood free sites are already developed and new development has had to use the more marginal sites. Modern settlements are not easily moved, and are dependent on structural methods such as stopbanks for protection. Now a major flood could cause millions of dollars worth of damage.

The large February 1955 flood extensively damaged houses on the

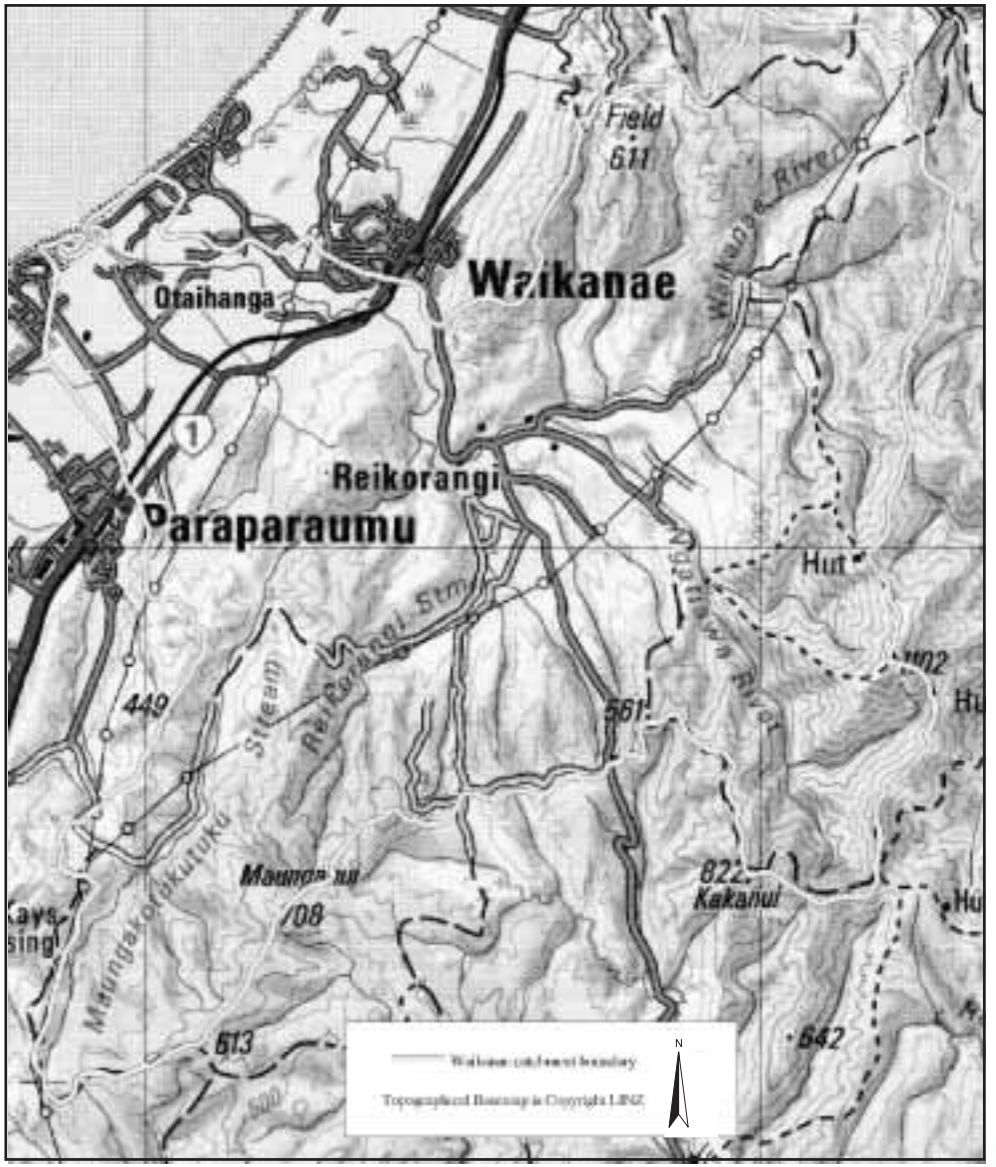
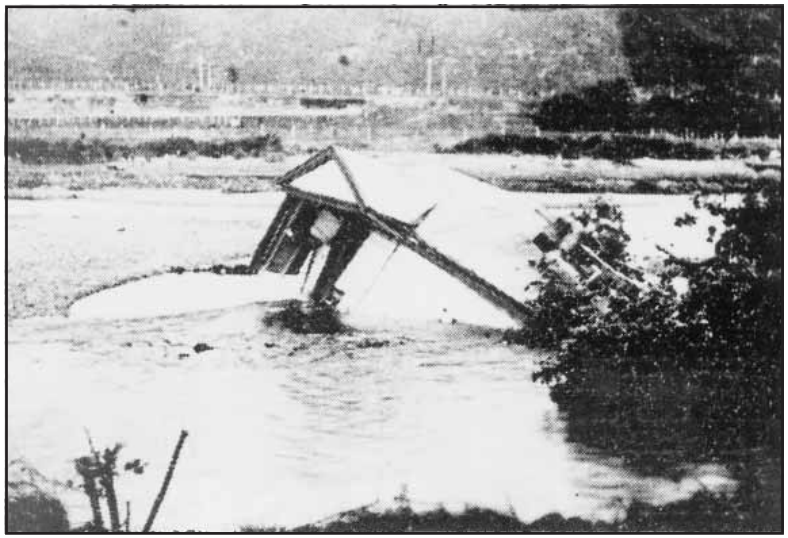


FIGURE 2: THE WAIKANAE CATCHMENT

PHOTOGRAPH 1: RIVER SCENE AT WAIKANAE, 1852 (NEAR PRESENT DAY OTAIHANGA)



PHOTOGRAPH 2: IN 1924 A FLOOD WASHED AWAY THE CREAMERY THAT STOOD ON THE SITE NOW OCCUPIED BY THE COUNTRY LIFE RESTAURANT

floodplain. Following the flood, an erosion and flood control scheme was built (from 1956-1964) which included stopbanks and erosion protection works. Despite this scheme, medium-sized floods (20 year floods) continue to cause damage.

Figure 3 shows the estimated extent of flooding in a *100 year flood*.

What is a 100 year flood?
The chance of a flood occurring is defined in the same way as any other statistical event. For example, a 100 year flood is one that is predicted to be equalled or exceeded, on average, once in a 100 years. This does not mean that if a 100 year flood occurs, it will not re-occur for another 100 years. Another way of explaining a 100 year flood is to say it has a 1% chance of being equalled or exceeded in any year or, to take another example, a 20 year flood is one that has a 5% chance of being equalled or exceeded in any one year.

The last significant floods were in December 1985 and March 1990, when flood waters entered several houses. These floods were approximately 10 year return period events. Now, with even more residential developments on the floodplain, damage from a large flood would be substantial and the costs enormous. Consequently, the whole issue of flooding must once again be addressed.

Annualised, flood damages are estimated to be $1 million (see Bibliography 3.5) and would remain at this level if no further flood mitigation methods were put in place. In addition to the financial costs of floods, there are intangible impacts such as social and environmental costs.

In order to analyse these various costs, we have to consider a number of factors. These include how often the floods occur, how quickly they develop, and the extent of the flood.

Human use of the floodplain can also alter a flood's impact. These uses are related to how well the flood risk is understood, and how well the community is organised and prepared for a flood.

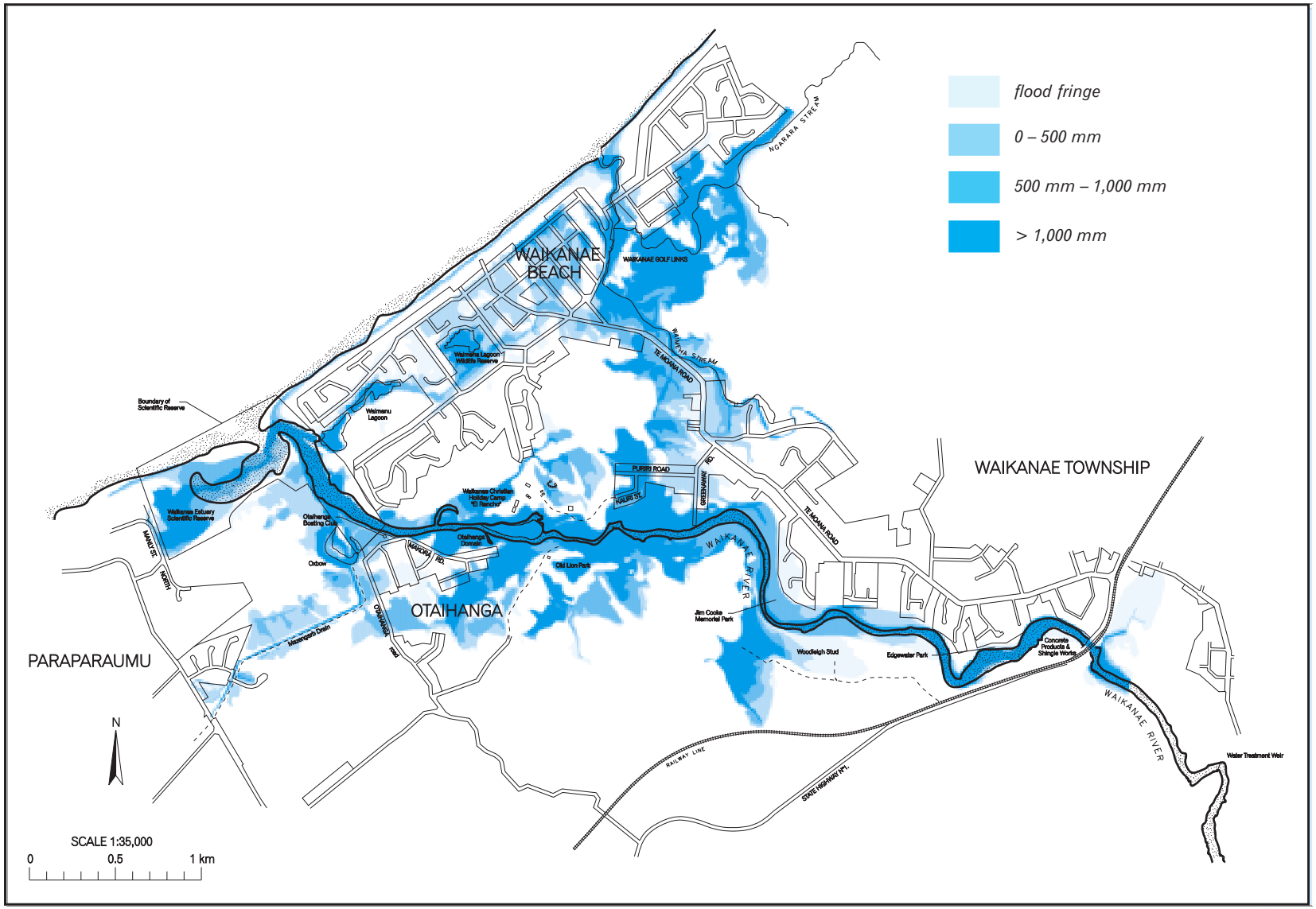


Figure 3 : Present Extent of Flooding in a 100 Year Flood

PHOTOGRAPH 3: FLOOD LEVELS FROM THE MARCH 1990 FLOOD ON THE BOATSHED AT EL RANCHO

2.3 Flooding and People

The social and psychological impacts of a major flood in an urban area can be wide-ranging and long-lasting. These impacts can result from damage to homes, places of employment, community facilities and essential services. Flooding in Waikanae could result in loss of life and significant social and psychological impacts. Recovery from these is likely to be slow and costs are likely to be high. In dollar terms, social and psychological impacts are estimated to cost at least as much as tangible losses.

A real risk to life exists immediately following a breach of a stopbank as waters rush from the River Corridor, along *overflow paths* at high velocities, and into *ponding* areas. Ponds could be deep enough to endanger anyone attempting to swim or wade to safety. Water as shallow as 0.5 m can be life-threatening. Data from the United States show that over half of all flood-related deaths occur in vehicles when people drive into low-lying flooded areas (Bibliography 4.23).

For most people, the loss of home and property is likely to be the most traumatic event experienced. Flooding results in considerable stress, especially when associated with financial concerns, and can have implications for human health. The 1984 Invercargill floods have been linked to a high incidence of marital breakdown and increased birth rates. Overseas studies, assessing the impact of flooding, found increases in mortality of up to 50% in the year following a disaster (Bibliography 4.12).

The loss of services, which these days are a major part of daily life, can be a major source of stress. Loss of services can also pose a serious threat to health. In Waikanae, flood waters and debris could make roads impassable and could disrupt rail, telephone, electricity and gas services.

2.4 Who will be most at risk?

The groups most vulnerable in floods are likely to be in one or more of the following categories:

- the elderly
- the disabled

- those on low incomes
- those in rental housing
- ethnic minorities for whom English is a second language
- children.

What is even worse is that most of the people particularly at risk in a flood will fit into one or more than one of these groups. As a rule of thumb, the more categories a person fits into, the more at risk they are likely to be. Waikanae has a high proportion of elderly (more than 40% of the population is over 60 years of age), and the elderly are particularly at risk from flooding.

Key factors in each category will influence how well a person will cope in a flood:

- the person's physical and mental health before the flood
- the strength of their social networks
- the soundness of their financial situation, including insurance cover, cash reserves, and access to compensation provisions
- how quickly they can restore their homes
- their ability to take quick action to save possessions and evacuate.

All of the disadvantaged groups share one important element: their limited access to the decision-making process. This may well mean that those most at risk could be in danger of being overlooked. The Council, therefore, has been very careful to involve the above people in all phases of the decision-making process.

2.5 Why Undertake Floodplain Management Planning?

Floodplain Management Planning is a process and philosophy that emphasises the need to keep people away from floodwaters, or, conversely, better prepare them to cope with flooding when it occurs. The process aims to ensure that any future development of the floodplain takes flood risk into account.

Floodplain Management Planning also attempts to match in a cost-effective way the public acceptance of flood risk against the dollars they wish to spend to alleviate that risk.

The outcome of the planning process is the Floodplain Management Plan. It describes how a particular area of land and river channel should be managed to achieve the following objectives:

- Minimising risks to life, health and safety
- Reducing severity of flood damage
- Promoting the sustainable use of flood-prone land.

These objectives are generally achieved in two ways:

- Using planning methods and community preparedness methods to ensure that flood-prone land is used appropriately in relation to the flood risk (the non-structural methods).
- By constructing flood and erosion mitigation works where development has already taken place to keep flood waters away from people and their assets (the structural methods).

The Plan provides a blueprint for how the Waikanae community and the Council agreed to manage the river and floodplain over the next 40 years. The Plan will also provide guidance to others involved in making decisions about the management of the river and floodplain.

The Council's responsibility, under the Resource Management Act (RMA), is to promote the *sustainable management* of natural and physical resources. The meaning of sustainable management includes, in section 5 of the Act, '. . . managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well being, and for their health and safety . . .' Under section 65 of the RMA the Council can prepare plans dealing with the mitigation of natural flooding and erosion hazard. Other responsibilities are detailed in Appendix Two: Legislative Framework.

Phase	Description	Current Status
One	Definition of the flood problem	August 1992
Two	Evaluation and selection of preferred options	August 1993
Three	Refinement of preferred options, environmental impact assessment and economic evaluation	December 1994
Four	Drafting of the Waikanae Floodplain Management Plan	October 1997
Five	Implementation of the Waikanae River Floodplain Management Plan and Environmental Strategy	Under way Reviewed every 10 years

Note: A more detailed breakdown of this table is included in Appendix Three: Phases of Floodplain Management Planning. Reports prepared at each phase are referenced in the Bibliography.

Table 1: Waikanae Floodplain Management Planning Process—Phases 1–5

2.6 Preparing a Floodplain Management Plan for Waikanae

The formulation and implementation of this Plan have been carried out in five phases, summarised in Table 1. One of the principal challenges of a Floodplain Management Plan for Waikanae was to develop a process to reconcile the two opposing demands:

- the demand for flat land
- the demand for areas secure from flooding. (Figure 3 shows how much of the lower catchment is either directly or indirectly affected by floods.)

This Plan is a living document that must adapt to the changing needs of each succeeding generation of people who live on the floodplain. Therefore, to be successful, the community needs to take ownership of the Plan.

The community response to the 1955 flood is a typical example of how the flooding problem was dealt with at that time. The Manawatu Catchment Board came up with a scheme focusing on keeping flood waters away from the people with stopbanks and river realignments.

Subsequent events have shown this approach needed reviewing. Hence, the current Plan.

2.7 The Community Objectives for the Floodplain Management Plan

The Kapiti Floodplain Management Committee (KFMC) is made up of local, district and regional representatives, and directed the overall process of developing the Plan (see Figure 4 for organisational structure). The preparation of this document has been undertaken by the Flood Protection Group of the Council. The objectives for the Plan agreed by the community are:

- To develop and implement a Floodplain Management Plan for the Waikanae River, acceptable to, and considered affordable by, the community.
- To ensure the Floodplain Management Plan satisfies legislative requirements, particularly those of the Resource Management Act 1991.

More about the KFMC and where they fit in is given in **Section 2.8**

Floodplain Management Planning Process **Section 2.4**

Legislative Framework **Appendix A**

- To ensure the traditional, spiritual and cultural values of the *tangata whenua* are adequately recognised in accordance with the principles of the Treaty of Waitangi.
- To ensure flood mitigation options for the specific parts of the floodplain or catchment be considered in terms of their effects on the entire floodplain.
- To ensure methods included in the Floodplain Management Plan preserve or enhance the environmental character of the river and floodplain.
- To ensure public access to the river is maintained so as to enhance its amenity value and use for recreational purposes.
- To ensure land use and activities on the floodplain are compatible with the potential level of risk from a flood.
- To ensure the cost effectiveness of preferred Floodplain Management Plan methods are acceptable to the Council.
- To ensure occupiers of the floodplain are made aware of the *residual risk* of flooding.
- To ensure the residual risks are acceptable to the community.
- To ensure development on the floodplain is not unduly delayed or subject to unreasonable conditions.

Not all of the objectives have been fully met, but through a process of consultation, negotiation and compromise, an agreed balance has been achieved.

2.8 Iwi

Settlement of the Waikanae area dates back several centuries to the early moa hunters. Since then much change and development has occurred. Today, Whakarongotai *Marae*, in the centre of the township, is the focus for the tangata whenua—*Ati Awa ki Whakarongotai*.

The Council commissioned Ati Awa ki Whakarongotai to prepare the *Tikanga Maori* investigation and report (see Bibliography 1.18). The commissioning recognises the considerable influence of Maori on the history of the floodplain, and the importance of Maori issues, now and in the future.

This report describes the location of sites of special value to:

- Ati Awa's past, present and future viewpoint on the river and floodplain
- water quality aspects as they affect Maori
- cultural and spiritual values with respect to the resources on/in the floodplain.

The Resource Management Act 1991 provides for the recognition of tangata whenua values in the management of New Zealand's resources:

- To promote sustainable management of the natural and physical resources so people and their communities can provide for their social, economic and cultural well-being, and their health and safety (Section 5).
- To recognise and provide for the relationship of Maori and their culture and traditions with their ancestral lands, waters, sites, *waahi tapu* and *taonga* (Section 6e).
- To have particular regard to *kaitiakitanga* (Section 7a).
- To take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) (Section 8).

Recognition of tangata whenua values requires understanding of these values, and consideration of how the values are to be included in the decision-making process. The Council and *iwi* have developed the Te Tutuohinga O Te Whakaaetanga (Charter of Understanding), which sets out the consultation procedures and practices ensuring there is recognition of these values and iwi right of inclusion in decision making.

2.9 Consultation

From the outset, the Council recognised that public involvement was critical in the development and implementation of the Plan. People living on the floodplain have a large amount of information on flooding. After taking advice from public meetings, community groups, KCDC

Human Environment **Section 4.3**
Floodplain Management Planning Process **Table 1**
Planning and Land Use **Section 4.7**
Ecology **Section 4.5**
Land Use Control Methods **Section 3.1.1**
Implementation and Funding **Section 6**
Community Preparedness **Section 3.1.2**
Floodplain Management Planning Process **Table 1**
Land Use Control Methods **Section 3.1.1**

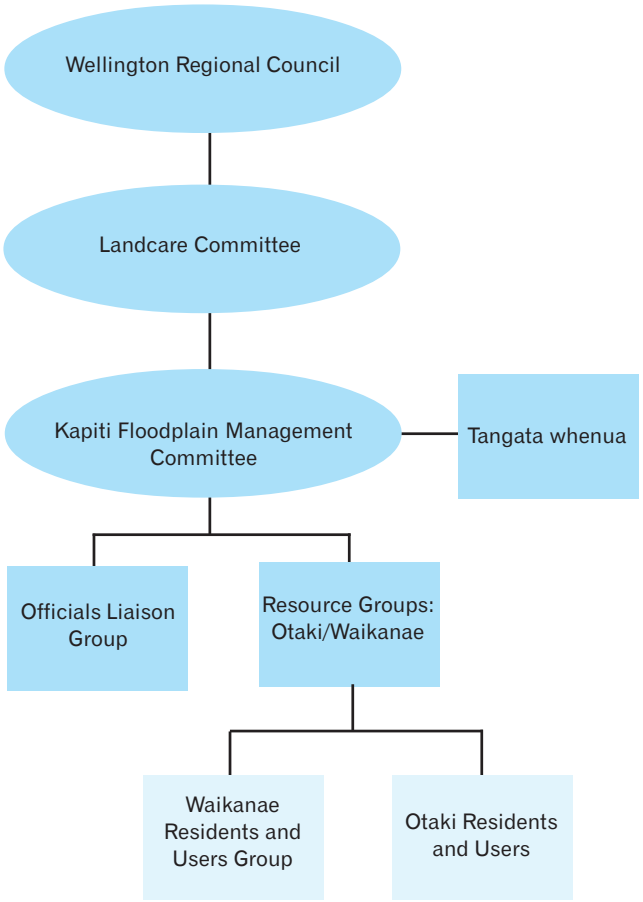


FIGURE 4: CONSULTATION ORGANISATIONAL STRUCTURE

and the Waikanae Community Board, a network of contacts with the potential to provide input was developed. See Figure 4.

This potential was realised in 1992 with the formation of two Resource Groups. These were the Residents Resource Group, representing floodplain dwellers on a geographic basis, and the Users Resource Group, representing floodplain users. The two groups merged into the Waikanae Resource Group in 1993. The group is directly represented on the Kapiti Floodplain Management Committee.

Starting with public meetings in Otaihanga and Waikanae, the Council has maintained consultation with interested and affected agencies, and the community, throughout the process.

Through the resource group and selected representatives at district and regional level, the community has guided the process.

The tangata whenua have been accorded appropriate status in the process. The Council works with the Marae committee as a whole and its appointed representatives. The iwi (Ati Awa ki Whakarongotai) has two representatives on the Kapiti Floodplain Management Committee.

Interested agencies, government departments and departments of the the Council and KCDC are represented on the Officials Liaison Group that operates in parallel with the Resource Groups. The Officials Liaison Group advocates to the Flood Protection Group (of the Council) and its inputs are reflected in Project Manager's reports to the Kapiti Floodplain Management Committee (KFMC).

The KFMC is a special-purpose committee that considers what has to be done in the floodplain management planning process. The KFMC makes recommendations to the Landcare Committee but is not involved in their implementation. The KFMC was established as a subcommittee of the Council's Landcare Committee. Meetings were publicly advertised.

The KFMC has three members from the Council, two from the KCDC, one each from the Otaki and Waikanae Community Boards, two representatives from each of the Waikanae and Otaki Resource Groups, and two representatives from each of Ngati Raukawa (the Otaki iwi) and Ati Awa ki Whakarongotai. The KFMC was chaired by an independent person appointed by the Council.

The Council's Landcare Committee is responsible for floodplain management. Recommendations made by the KFMC are considered from the regional perspective and consequent decisions made or recommendations made to the Council.

The KCDC has been involved continuously in discussions with staff and councillors through the Officials Liaison Group and the KFMC.

Section 3.5 describes the planned ongoing consultation that will be a critical part of this Plan's implementation.

3. Outcomes of the Process

The Waikanae River has had a major influence on the formation of the Waikanae landscape. Since the arrival of European settlers, the river has been confined and its natural processes have been modified. The physical processes that are part of the natural river system have now become a problem, because community assets and values are at risk from a major flood.

This Section outlines the outcomes of the Waikanae Floodplain Management Plan. It describes what is to be done to reduce the flood hazard. The principal methods are:

- Non-Structural (Section 3.1)
- Structural (Section 3.2)
- River Management (Section 3.3).

Implementation of the methods selected may take 30 years. Further details of implementation and funding will be established as time progresses, although some interim methods are outlined in Section 6.1. The very nature of funding processes for territorial local government means that the time-frame for implementation and funding policies will be constantly reviewed. This document identifies what needs to be done and the desired priority.

Non-Structural Methods are those related to controlling the ways land is used and buildings are constructed, and they also relate to issues of community awareness, preparedness, and emergency procedures. Their focus is to keep people away from flood waters or to help the community better cope when flooding occurs. They are the most cost-effective method of flood mitigation and their principles can be applied to minor and extreme flooding. However, because some floodable areas have already been developed, planning controls alone are insufficient. In this Plan, planning controls will tend to be primarily used to set parameters for future development. Bibliography 3.1 gives a detailed report on the non-structural options.

Structural Methods, such as stopbanking, are physical structures or works designed to protect people and assets from flooding up to a specific standard. They keep flood waters away from existing development. Non-structural methods may be required in some areas as well, in case the

structural methods fail or the flood event exceeds the *design standard* of the works. Bibliography 3.1 gives a detailed report on the design and location of the structural measures.

River Management Methods are a combination of those day-to-day activities that maintain flood mitigation structures or maintain the preferred channel alignment and identified river alignment improvements. Examples include bank protection works and maintenance of structures. Bibliography 3.3 gives a detailed description of the river management options considered and the estimates of costs.

The implementation of some structural and river management methods are constrained by certain *guidelines*. These guidelines have been devised for situations where mitigation methods have potentially adverse effects, especially with ecology, landscape, recreation and heritage considerations. In these instances the guidelines are given at the end of each relevant portion of text in Section 4, Considerations.

In addition to the selected flood mitigation methods detailed in Sections 3.1–3.3 and the guidelines contained in Section 4, one of the outcomes of the Floodplain Management planning process has been the recognition of environmental values and the need for an Environmental Strategy for the Waikanae River. This strategy will identify all the opportunities for environmental enhancement within the Waikanae River corridor (See Section 3.4 for details).

Consultation (see Section 3.5) has played, and will continue to play, a critical part in the management of the Waikanae River and floodplain. Section 3.5 outlines the consultation process that the Council will undertake to ensure that all the methods and guidelines detailed in this Plan are carried out.

3.1 Non-Structural Methods

Non-structural methods are those which ensure that land uses within flood-prone areas are appropriate and serve to increase community awareness and preparedness. Figure 5 shows how the different ways of keeping people away from flood waters and prepared for a flood relate to each other. They are dealt with in the subsequent text.

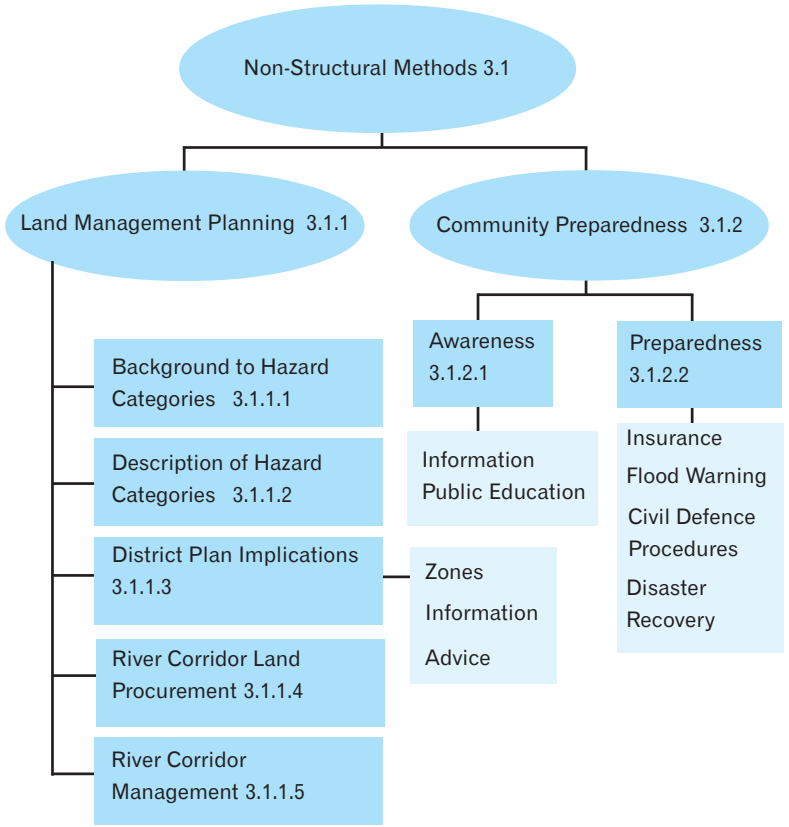


FIGURE 5: NON-STRUCTURAL METHODS

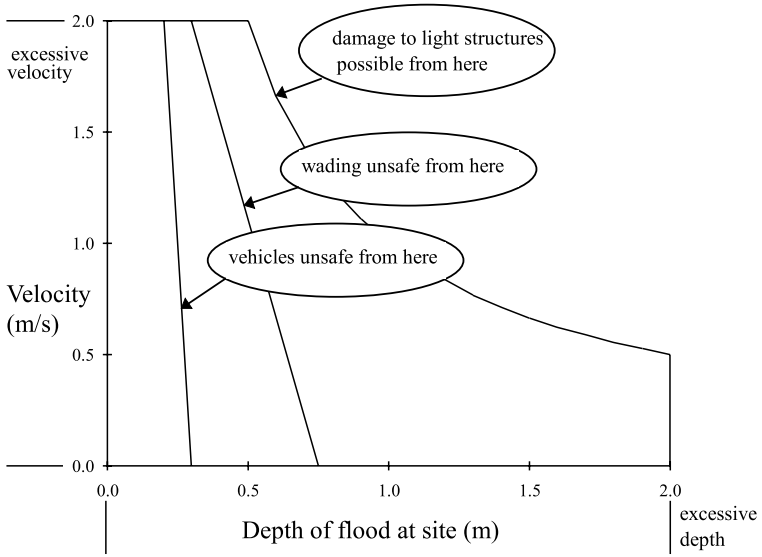


FIGURE 6: HAZARDS RELATED TO FLOOD DEPTH AND VELOCITY

For undeveloped land, management and planning measures (Section 3.1.1) are based upon a 100 year flood event in the Waikanae River in the same way as the structural and river management methods. The community has selected this as the most appropriate sized event to plan for.

The remaining community preparedness methods (Section 3.1.2) recognise that floods more severe than a 100 year event can occur, and that flood mitigation structures such as stopbanks can fail or breach, i.e., that there is a residual risk of flooding.

3.1.1 Land Management/Planning

3.1.1.1 Background to Hazard Categories

Four Flood Hazard Categories have been identified on the Waikanae floodplain for incorporation into the Kapiti Coast District Plan, River Corridor, Overflow Path, Ponding and *Fringe*.

The flood hazard categories were determined by taking into account the following factors:

- threat to life
- depth and velocity of flood waters
- difficulty and danger of evacuating people and their property
- residual risk from flooding
- potential for damage to property and social disruption.

Figure 6 shows the depths and velocities of flood waters that can cause different degrees of threat to life and property (Bibliography 4.14).

The land uses appropriate to each flood hazard category vary. For example, buildings and services that may be required in an emergency, e.g., hospitals, schools, community halls, police and fire stations (vital services) should not be sited in flood-prone land. Obviously, other developments and land uses could be compatible with a particular flood hazard. Whatever the case, any development within the floodplain should not adversely affect the existing flood risk and extent.

Figure 7 shows the four flood hazard categories on the Waikanae floodplain once all of the recommended structural measures have been

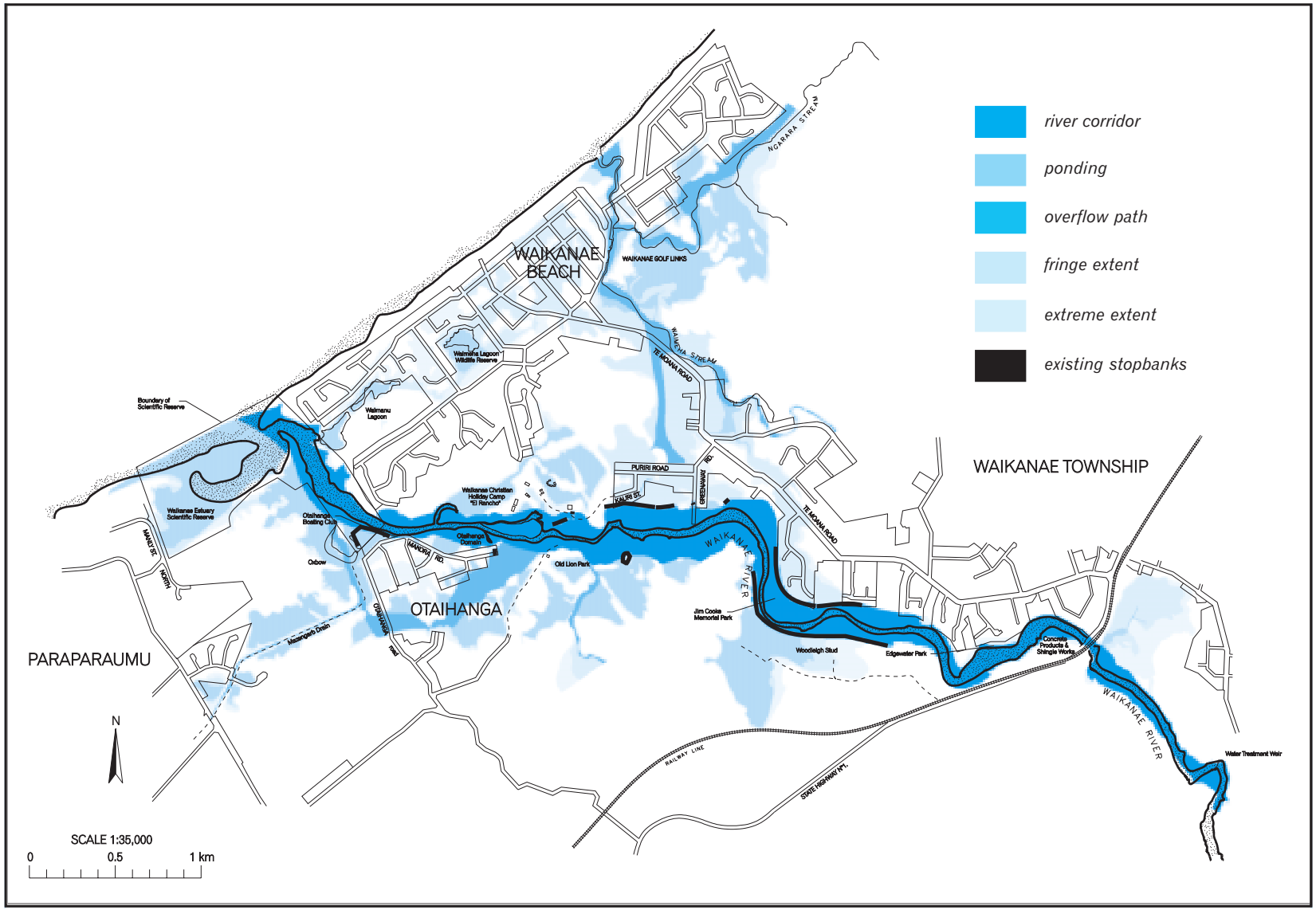


Figure 7: Flood Hazard Categories to be included in District Plan

	River Corridor	Overflow Path	Fringe Areas	Ponding
Development in Existing Residential Areas and Additions	*Minor additions* may be appropriate if there is little or no adverse effect on flood behaviour, and may be exempt from development conditions. Each case to be considered on its merits.	Development in existing residential areas and *major additions* may be appropriate subject to development conditions (see box). Minor development and additions that have little or no adverse effects on the flood hazard may be exempt from such conditions. Each case to be considered on its merits.	Development in existing residential areas and major additions may be appropriate subject to development conditions (see box). Minor additions that have little or no adverse effect on flood behaviour may be exempt from development conditions. Each case to be considered on its merits.	Development and additions will generally be appropriate if there is little or no adverse effect on flood behaviour, and may be exempt from development conditions. Each case to be considered on its merits.
Greenfield Development	Generally not compatible. Boundary changes only are appropriate. Where development is proposed conditions should apply (see below). Reserve contributions should be taken.	Generally not compatible unless adequate flood avoidance/mitigation provisions are made. Subdivision of areas previously zoned rural or large vacant residential areas would need to be considered on their merits. Habitable rooms should be effectively flood-free.	Generally unsuitable unless adequate flood avoidance/mitigation provisions are made. Subdivision of areas previously zoned rural or large vacant residential areas may be appropriate, each case to be considered on its merits. Habitable rooms should be effectively flood-free.	Generally acceptable, subject to conditions. Subdivision may be appropriate, each case being considered on its merits. Habitable rooms should be effectively flood-free.
Compatible Land Uses	Open space/ recreation, pastoral, rural. Fencing should allow stock access to higher ground.	Open space/ recreation, pastoral, rural. Fencing should allow stock access to higher ground.	Open space/ recreation, pastoral, rural. Fencing should allow stock access to higher ground	Open space/ recreation, pastoral, rural, some residential.
Incompatible Land Uses	Residential, industrial, commercial, vital services[1], forestry, some horticulture[2], hazardous substance storage, campsites and caravan grounds.	Residential, industrial, commercial, vital services[1], some horticulture[2], forestry, hazardous substance storage, caravan sites and camping grounds.	Vital services[1], some horticulture[2], hazardous substance storage, caravan sites and camping grounds.	Vital services[1], industrial, hazardous substance storage, caravan sites and camping grounds.

[1] Vital services include hospitals, schools, community halls, fire and police stations.

[2] Some horticultural crops such as lettuce and squash cannot withstand inundation. Each landowner will need to assess the flood risk. Other horticultural activities that either trap silt or debris (such as vine fruits) or alter flood flows (such as shelter belts) should be restricted.

TABLE 2: SUMMARY OF GUIDELINES FOR FUTURE DEVELOPMENT

implemented. The District Plan shows the current flood hazard categories. As progress towards Figure 7 is achieved, these changes will be reflected in the District Plan. Figure 7 also shows the extent of flooding in an *extreme event*. The categories are described in more detail at the end of this Section, see 3.1.1.2.

Some guidelines for future development in each flood hazard category area are given in Table 2.

3.1.1.2 Description of Hazard Categories for the Waikanae Floodplain

a) River Corridor

The River Corridor comprises the *riverbed* and adjacent *floodway*. It is the minimum area necessary to manage a major flood and let waters pass safely to the sea. In a flood, the depth and speed of waters in the River Corridor are such that any development is likely to sustain major damage, and the evacuation of people and their possessions would be extremely difficult. The rise of water may be rapid. There may be danger to life. Social disruption and financial loss could be very high.

Almost any development would worsen the impact of flooding on other nearby properties. The River Corridor is an area that, if only partially blocked, would cause a significant redistribution of flood flow. Therefore, appropriate land uses and development potential are extremely limited.

b) Overflow Path

Overflow paths are land areas (often immediately adjacent to a River Corridor) that would be inundated rapidly during a major flood. Very often, these paths lead fast-flowing water away from the River Corridor and over the floodplain.

The depth and speed of flood waters mean development could sustain major damage. Flood water may rise rapidly. Evacuation of people and their possessions would be dangerous and difficult. There may be danger to life. Social disruption and financial loss could be high. If an overflow path were blocked, flood waters could flow over other areas of the floodplain. Generally, overflow paths are unsuitable for development unless adequate flood avoidance and/or mitigation provisions are made.

Development Conditions

(a) Any approved development should not adversely affect existing flood mitigation structures.

(b) Structures that are permitted should be constructed to withstand the force of flood waters and debris or recognise that they will fail with no adverse consequences to the flood risk.

(c) Where development is proposed, the applicant is required to demonstrate to the consent authority that the development will not increase the flood hazard or damage to other properties or adversely affect flood behaviour.

(d) Building sites should be above 100 year flood level and capable of withstanding flood waters and debris.

(e) Further subdivision of lots will not generally be allowed where there is not a building site above the 100 year flood level, under the proposed Kapiti Coast District Plan.

PHOTOGRAPH 4: STOPBANK THROUGH JIM COOKE PARK

PHOTOGRAPH 5: WAIKANAE RIVER IN FLOOD, DECEMBER 1985

c) Ponding Area

Ponding areas are where waters settle either during or after a major flood. Ponding areas provide storage for flood waters; if a ponding area is filled it may cause flooding elsewhere on the floodplain. In a flood there is little or no flow of flood waters within ponding areas, although flood waters could reach substantial depths and levels, and could rise rapidly.

Hazards in ponding areas are different to those in overflow paths. Evacuation of people and possessions may be difficult, especially on foot, and may need to be by boat. There is a potential danger to life. Social disruption could be high.

d) Fringe Area

Fringe areas are those adjacent to overflow paths and ponding areas that could potentially be affected in a flood. Water depths are likely to be less than 0.5 m deep and with little or no flow. If needed, four-wheel drive vehicles would be used to move people and their possessions. Able-bodied adults would have little difficulty in wading to safe areas, and damage is likely to be low.

Development and subdivision within fringe areas are generally more acceptable than in overflow paths and ponding areas, provided the floors of habitable rooms are relatively flood free.

3.1.1.3 District Plan Implications

One of the most successful ways of ensuring that the community is aware of the flood hazard and makes appropriate decisions is by using the Kapiti Coast District Plan to, for example:

- Include, modify or change land use/*zoning* controls
- Include flood hazard maps in the District Plan
- Recognise the flood hazard and include conditions on subdivisions.

The preparation of the proposed District Plan before the completion of the Waikanae Floodplain Management Plan has meant that KCDC have already dealt with some of the Plan outcomes that follow:

(i) Zones, Rules and Standards

- *Request KCDC to include a River Corridor Zone in the District Plan as a Resource Management Zone, to ensure that all Resource Management Zones and associated Rules and Standards in the District Plan are appropriate to the identified flood hazard categories for the 100 year flood, and to include a map identifying these categories.*

  With time, it is likely that the extent and type of hazard identified in the District Plan will change, to reflect the improving situation as flood mitigation works are undertaken (see Structural Methods Section 3.2). The Council will implement these changes through revisions to the District Plan as structural works are completed. Figure 7 shows the hazard categories with all of the structural methods in place.

- *Encourage KCDC to Protect Upper and Middle Catchment*
  The protection of the upper and middle catchment from clearance, and the encouragement of reforestation is valuable in reducing the flood hazard and controlling sediment input. A forested area produces a more controlled environment. Therefore, the Council will encourage KCDC to preserve and protect areas of importance for flood mitigation and stabilisation, discourage subdivision which involves further clearance of the upper catchment which would have a destabilising effect upon the area, encourage the rejuvenation and *planting* of native bush in the upper catchment, and encourage *riparian management*.

(ii) Provide Up-to-Date Extreme Flood Event Hazard Maps and Other Information for Inclusion in the District Plan and Other Documents

Despite the protection afforded by structural methods, e.g., stopbanks, there is still a risk of flooding. This is because breaches, overtopping of stopbanks or failure of drainage outlets, could occur. This is most likely in floods larger than the 100 year standard (after all, structural methods have been designed for these sized floods). In order to maintain people's awareness of this risk, hazard maps depicting flooding (in larger than 100 year floods) are to be included in the Proposed Kapiti Coast District Plan. Figure 8 shows the extent of flooding in such an extreme event with all structural measures in place but with breaches.

The limited accuracy of modelling and the infrequency of these events has meant that this extreme flood extent is described for planning purposes only and there are no controls, as such, attached. There is currently no statutory requirement associated with this map, it is for information and education purposes only.

(iii) Advise KCDC on Conditions to be Applied on Subdivision and Land Use Consent Applications

When subdivision and land use applications are made, the Council will advise KCDC of conditions that could be applied, to ensure that any new development or activity is appropriate to the flood hazard in that area. Examples are:

- With new subdivisions, every lot should have a building site above the 100 year flood level.
- Developers will be encouraged to located buildings on sites that are relatively flood free.
- Development must not adversely affect existing flood mitigation structures.
- Structures must withstand the force of flood waters and debris, or recognise that they may fail with no adverse consequences to the flood risk.
- Demonstration that the development will not increase the flood hazard or flood damage to other properties, or adversely affect flood behaviour.
- Properties which are part of any new subdivision, of which all or part are within the area affected by flooding, must have this fact registered on their land titles.

KCDC (and if required, the Council) will consider each application on its merits and, as a consequence, development and activities may be exempt from such conditions.

3.1.1.4 Implement and Encourage River Corridor Land Procurement

It is proposed, long term, that the remaining 56 hectares of privately owned land in the River Corridor be brought into public use owner-

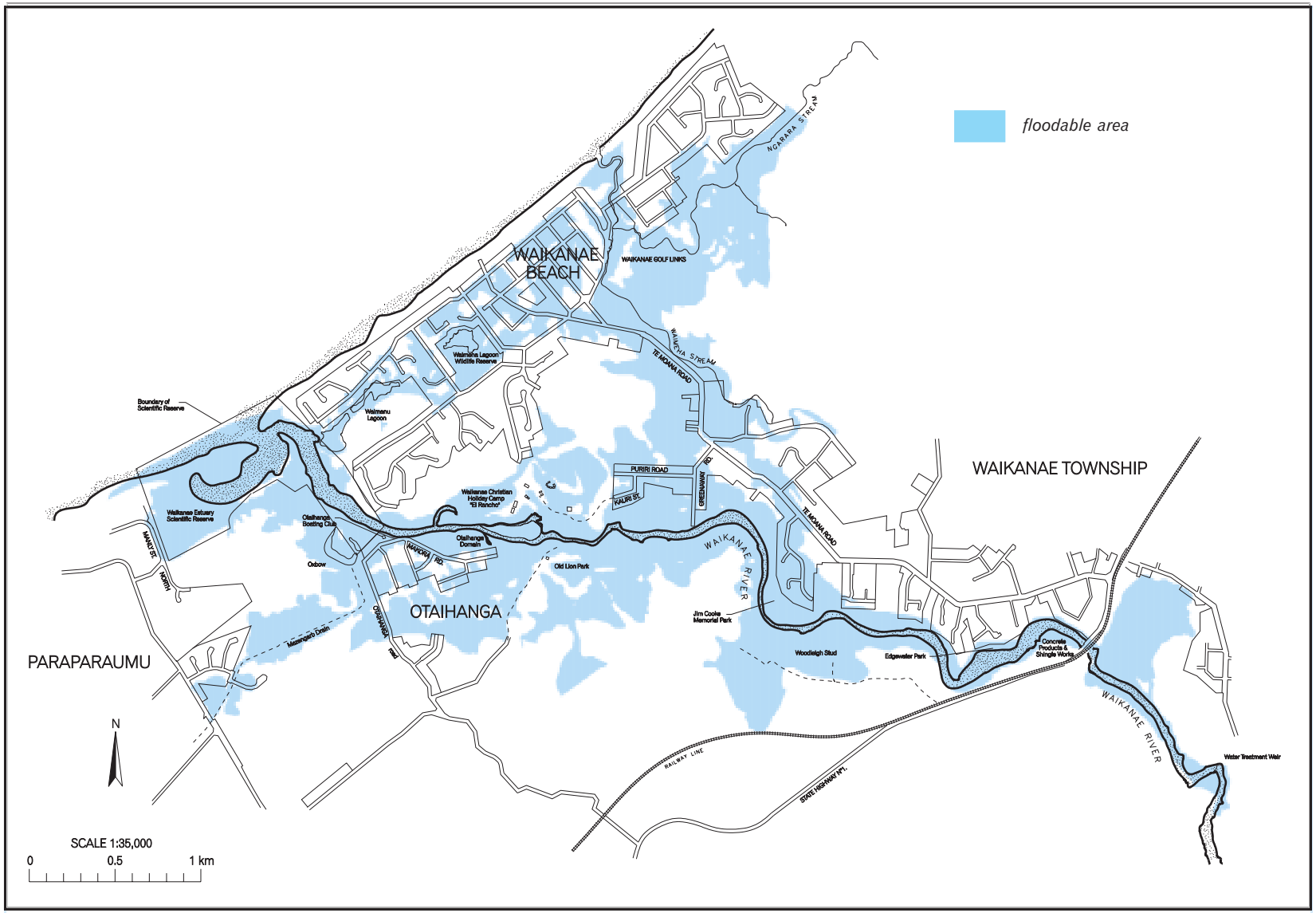


Figure 8: Extent of Flooding in Extreme Event

ship. Figure 9 shows the land currently in private ownership. There are a number of opportunities available for procuring this land including:

- land swap
- reserve contribution—as part of adjacent subdivisions
- reserve contribution—funding from pool
- purchase—the Crown, the Council, KCDC
- vesting.

Purchase of River Corridor land will be considered as a last resort. None of the public agencies are, at this stage, able to commit to the funding for any necessary land purchase, though they agree with the long-term strategy. Individual cases will have to be considered on their merits at the time the opportunity arises.

In the first instance, land occupied by structural flood mitigation methods, not already in public ownership, will generally be purchased by the Council. There may be some isolated instances where easements over private property, for construction and maintenance, will be sufficient.

As funding does become available, the preferred guidelines for the purchase of land, where part of the lot falls within the River Corridor, are:

(a) if the area of the lot encroaching onto the River Corridor is less than 0.2 hectares then it will not be purchased

(b) the lot would normally be purchased if more than 30% of the area is in the River Corridor, subject to (a) above

(c) the lot would normally be purchased if the major assets on the lot are within the River Corridor.

3.1.1.5 River Corridor Management

Facilitate Utility Services Groups

The Council will facilitate utility services groups to co-ordinate and rationalise utility services within the River Corridor.

This group will develop strategies for:

- A stormwater management plan, rationalising the number of outlets for now and the future.

PHOTOGRAPH 6: SANDBAGGING IN OTAIHANGA DURING THE MARCH 1990 FLOOD

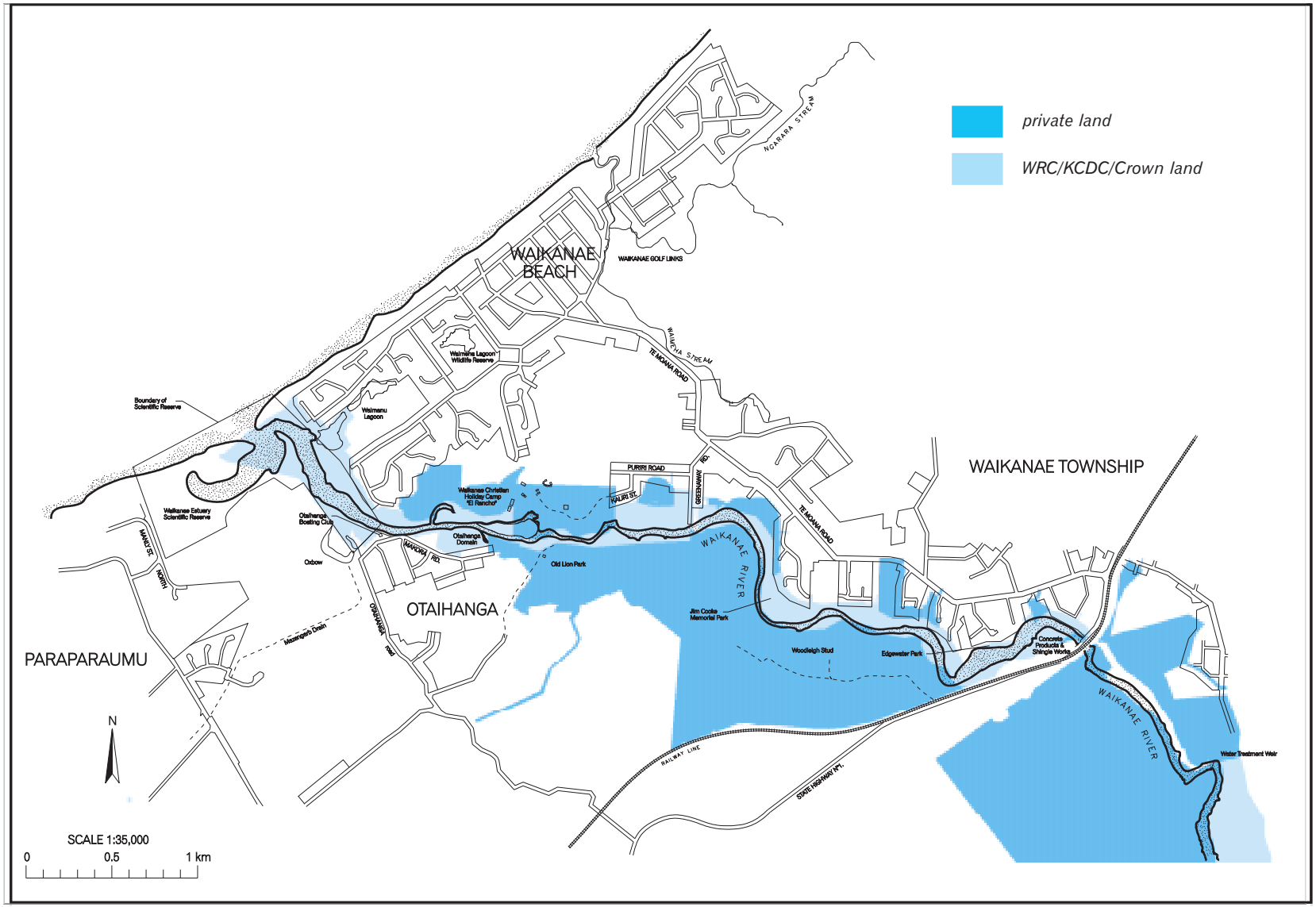


FIGURE 9: RIVER CORRIDOR LAND OWNERSHIP

- Identifying a service strip down the River Corridor if necessary.
- Identifying service crossing corridors.
- Specifying standards for installation at any crossing points.
- Developing a programme for rationalising the number of services in the River Corridor.
- Developing a programme for upgrading substandard facilities.
- As stopbanks are constructed or reconstructed, culvert outlets and floodgates will be rationalised and constructed to appropriate standards.

The group will be funded by those utility authorities with services in the River Corridor. The group will meet as and when required. It is anticipated that the Utility Services Group will include representatives from Transpower, Natural Gas Corporation, Tranz Rail, Transit NZ, KCDC, Electra, Telecom and the Council.

3.1.2 Community Preparedness

Effective community preparedness reduces the social disruption and damage caused by flood events. Community preparedness is dependent upon both *flood awareness* (*3.1.2.1*) and flood preparedness (*3.1.2.2*). Options for increasing community preparedness include:

- Providing information
- Public education
- Insurance on home and contents
- *Flood warning*
- Disaster response planning
- Disaster recovery planning

Awareness is the first step in community preparedness. A major factor in determining the degree of community awareness of flooding is recent personal experience of moderate to large floods. Awareness is the acknowledgement that flooding can occur and an understanding of the consequences of flooding. Not surprisingly, people living near the river, in areas where recent flooding has occurred and who experienced that flooding, are more aware of the flood risk than others who lack recent personal experience. Education can also increase awareness.

Flood preparedness is the next step, noting, however, that while preparedness requires awareness, awareness does not necessarily mean preparedness. A conscious effort must be made to educate people on how to prepare for a flood. Preparedness involves having a predetermined plan to deal with a flood and includes knowing what to do, where to go and what to take.

Those people who are better prepared will respond more effectively to flood warnings.

Flood warning systems are an important component of community preparedness. Early detection of a potential flood enables information to be disseminated to those who could be affected. So, the community is better prepared—removing key possessions, animals and people who may be affected. Damage and social disruption are thus reduced.

3.1.1.2 The Council Role in Flood Awareness

(i) Provide Up-to-Date Information

The Council will ensure that the most up-to-date information is readily available to all agencies involved in civil defence emergencies and to those communities affected by flooding.

The Council will organise an annual meeting with the civil defence staff of KCDC, to ensure continued co-operation and discussions and effective dissemination of information.

(ii) Assist KCDC in Public Education Programmes

KCDC already have a public education programme involving radio shows and mail drops. The Council will assist KCDC in their public education programme, by preparing information on the flood risk. This could take the form of booklets about what the flood risks are and what to do in a flood.

Education programmes will include routine civil defence procedures, survival kits, storing valuable assets above flood waters, obtaining communication updates, rehearsals for floods and appropriate action.

3.1.2.2 Flood Preparedness

(i) Insurance Against Flood Loss and Damage

The Council will encourage individuals and assist other agencies to encourage people to take out adequate house and contents insurance against flood loss. This will be done by including information and discussions in public education campaigns such as leaflets targeted at flood-prone areas, talk back radio shows, etc.

(ii) Flood Warning

The Council has an established flood warning system. A summary of the procedures followed in a flood is shown in Appendix F: Flood Warning System.

The Council will maintain and improve the flood warning system by:

- Implementing a real-time flood forecasting model
- Monitoring and, if necessary, changing alarm settings
- Installing a back-up rain gauge system
- Recommending to KCDC that more severe events are planned for (that is, more severe than a 100 year flood)
- Supporting other agencies in studies investigating ways in which forecasting can be improved.

(iii) The KCDC Civil Defence Plan

During an emergency, KCDC is responsible for co-ordinating disaster relief and planning in the Waikanae Floodplain. Appendix D: Kapiti Coast Disaster Response Procedures gives details of the existing procedures. To maintain and improve disaster response, the Council will assist KCDC in updating the Civil Defence Plan whenever necessary, to provide for pre-disaster mitigation, warning and emergency operations.

(iv) Disaster Recovery (After the Flood)

The Council will assist KCDC in the improvement of disaster recovery procedures. See Appendix E for details of existing procedures.

3.2 Structural Methods

Structural methods have been selected to protect existing development from floods (Bibliography 3.4). Generally, they are designed for a 100 year flood event. The structural methods selected are described in Sections 3.2.1–3.2.4, and summarised in Table 3. Figure 10 shows the location of the proposed works.

3.2.1 Road Raising

Road raising is to be undertaken by the Council and KCDC to coincide with the KCDC road upgrading programme. The cost of road raising will be split, with approximately 33% funded by the Council and 67% funded by the KCDC. The split generally reflects the additional costs that result from raising the road level versus the straight reconstruction costs. Each situation would be assessed for a funding split at the time of implementation. This split reflects the benefits accrued. Roads that require raising are Otaihanga Road south, Makora Road west and Makora Road (adjacent to the Otaihanga Domain)—see Figure 10. KCDC has programmed improvements to these roads over the next four years. The Council funding details still need confirmation.

3.2.2 Stopbanks

The stopbanks have been designed to protect homes and properties from a 100 year flood. The alignment of the stopbanks has been agreed in principle with the community, via the floodplain management planning process.

The stopbanks will be 4 m wide at the top, have 3.5:1 *batters* (3.5 times as wide as high), and have a 5 m access strip on either side. A well-maintained grass cover will be established over the stopbank and access

Helpful Flood Hints:

- Avoid flood water
- Climb higher rather than try to escape
- Plan an escape route.

Sections 1.1 and 1.2 give some other hints on what to do in a flood.

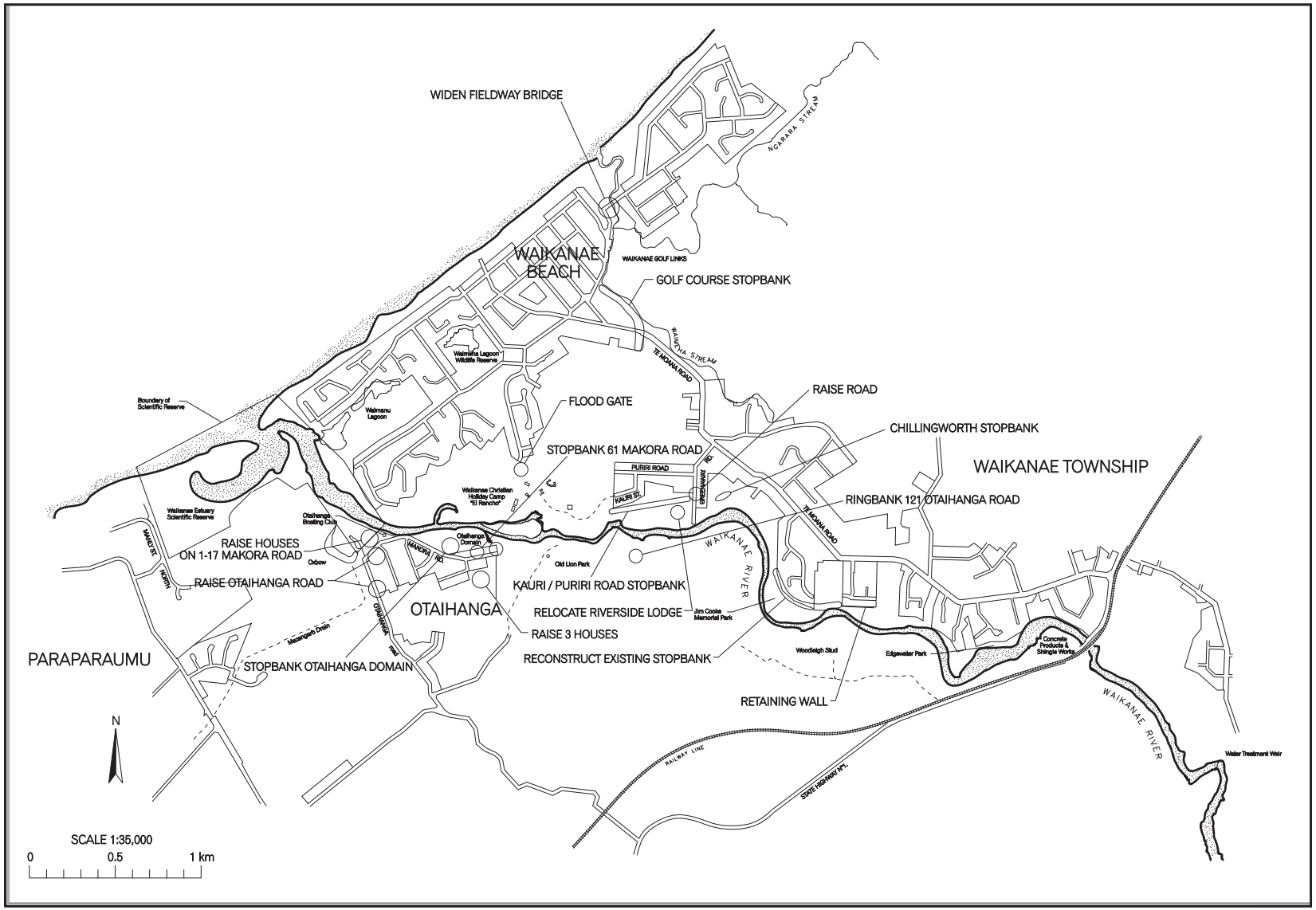


Figure 10: Location of Structural Methods

Area	Location	Construction Cost 1997 ($)
Kauri/Puriri Road	Stopbank*	894,000
Greenaway Road	Relocate Riverside Lodge*	124,000
Greenaway Road	Raise Road*	36,000
Chillingworth	Stopbank*	228,000
Waikanae Beach	Lengthen Fieldway Bridge	429,000
Otaihanga	Raise Otaihanga Road	140,000
	Otaihanga Domain Stopbank	184,000
Waikanae Beach	Golf Course Stopbank	715,000
Otaihanga	Raise 73 Makora Road and 11 and 13 Toroa Road	125,000
	Raise Houses on 1–17 Makora Road	400,000
	61 Makora Road Stopbank	14,000
Jim Cooke Park	Re-construct existing stopbank	143,000
	Retaining wall at the upstream end of stopbank	175,000
	Ringbank Lion Park	33,000
TOTAL		$3,640,000

Note:
The costs do not include the cost of land purchase.
These costs are included in River Management.
The criteria used for determining the priority of the above are given in Table 6.
* Denotes projects either completed or were in progress at the time of writing.

Table 3: Structural Methods Proposed as Part of the Waikanae Floodplain Management Plan in Priority Order

way. A paved walkway may need to be constructed along the crest if recreational use of the stopbank damages grass cover too much.

Stopbank maintenance and associated works will be undertaken as part of River Management activities. The stopbanks will be maintained so as to provide an adequate grass cover to protect the stopbank. An annual walk-over survey will determine maintenance works and budget requirements for the following year. All fences and gates will be maintained by the Council. The stopbanks that are regularly maintained by the Council are the Jim Cooke Park, Chillingworth, Kauri Puriri and Otaihanga stopbanks. The stopbanks on Woodleigh Stud are maintained by the land owner.

The stopbank design will allow for sea level rise of 5 mm/year due to climate change.

3.2.3 Bridge Lengthening

The Fieldway bridge needs lengthening to 18 m, the channel widened, debris arrestors put in place, and further channel realignment is needed at the Waimeha mouth. Funding will be shared between the Council and KCDC though no agreement has been reached to date. The timing of the work will depend on reaching agreement on the availability of funding and the apportionment of costs.

3.2.4 House Raising

House raising involves raising the sub-floor framing, at the underside of bearers, to the 100 year flood level, securing the building to withstand the forces of floodwater and sealing any services. Standards will be determined by KCDC and the Council. The Council has given a commitment to provide funding for house raising in accordance with the funding policy in place at the time that the works are to be undertaken. The work will be undertaken with the agreement of the land owner on a voluntary basis. Making sure the work and maintenance is done will be the responsibility of the individual owner, however.

This approach applies to those existing properties that have been identified as flood-prone and where raising was selected by the community as the preferred approach for flood mitigation.

For those properties unable to be raised, alternatives to house raising,

including flood-proofing and insurance, will be encouraged. New houses built in flood-prone areas, following the identification of houses requiring raising in 1993 as part of the Plan process, will not be eligible for any funding from the Council.

3.2.5 Priority

The structural methods listed in Table 3 are listed in order of priority, as agreed by the Kapiti Floodplain Management Committee and the community. The criteria used for the priority of works is detailed in Section 6.2.5.

3.2.6 Construction

Generally, construction of structural methods will be undertaken either by the Council or by private contractors on behalf of the Council. House raising would be undertaken by contractors engaged by the individual, to standards specified by the Council and KCDC. Road raising and bridge lengthening will be specified by and constructed by KCDC.

3.2.7 Services

Construction of new services across or along a stopbank will be controlled by the Council, either by giving approval as landowner, or through the consents process. Applications for additional services will have to include the justification for the service and a statement of how this service is related to others in the area. Prime concerns of the Council are whether the service needs to be in the River Corridor, whether rationalisation of services is possible, and construction standards.

Construction of new services must not reduce the security of flood mitigation structures. Services through the stopbank, including culverts, will be maintained to the specified standard by the authority or individual responsible for that service.

PHOTOGRAPH 7: UNDERMINED LEGS OF THE TRANSPOWER PYLON IN JIM COOK PARK

This photograph shows how the river has been eroding the base of a pylon. In a flood the pylon was in danger of being undermined and subsequently failing, causing disruptions to power supplies. This pylon has recently been removed from the River Corridor by Transpower. One more just downstream is programmed to be moved at its next major refurbishment.

3.3 River Management

3.3.1 Introduction

River Management Methods are the day-to-day activities undertaken by the Council to maintain the river within its preferred alignment and to protect and maintain existing flood mitigation structures. Overall, these methods aim to ensure that long-term maintenance of the river channel is undertaken efficiently.

Three aspects of river management were initially agreed. Firstly, the community decided that funding levels should be kept at approximately the same level as at present ($65,000 per year exclusive of overheads). This was on the basis that the current funding level was sufficient to maintain the current level of service. Secondly, they wanted the river maintained within a predetermined alignment. Thirdly, the community wanted the methods used to be similar to the ones already employed. This led to the following main outcomes:

- ***Expenditure***

  That the current level of operations expenditure of $65,000 is appropriate and should be maintained.

- ***Channel Alignment***

  That the river will be maintained within the preferred channel alignment shown in Figure 11 (Bibliography 3.2).

- ***River Training Methods***

  That current training practices will continue to be used to maintain the river within the preferred channel alignment, recognising that additional programmed major works will be required at the locations specified in Table 4. That in addition to channel maintenance works, a number of other specific activities are needed (detailed in 3.3.2–3.3.5).

3.3.2 River Channel Maintenance

3.3.2.1 Responsibility for Channel Maintenance

The Council is responsible for maintaining the reach of river from the mouth to the State Highway 1 bridge. The Council also undertakes works in the reach from the State Highway 1 Bridge to below the KCDC water treatment weir, in conjunction with land owners, when necessary to ensure the alignment of the river under the bridge is correct. The KCDC takes responsibility for maintaining the reach from just below the water treatment weir to 1 km above the plant. Individual land owners are responsible for undertaking works to protect land from erosion in the river beyond this point. The funding of works above the State Highway 1 bridge is treated on a case by case basis with the cost apportioned on the basis of benefit derived.

3.3.2.2 Preferred Channel Alignment

The preferred channel alignment is based upon the *threshold of motion regime*. This alignment consists of a 35 m wide design channel with a 20 m wide vegetative buffer on either side. The preferred channel alignment takes into account the existing geographical features and alignment as well as the location of existing development on the floodplain. Details on the determination of alignment and the alternatives considered are contained in Bibliography 3.2.

If the river meanders outside the design channel alignment, the regular channel maintenance activities will be used to put the river back into the preferred alignment.

3.3.2.3 Regular Channel Maintenance Activities

Maintaining the river channel alignment involves the following work:

- ***Repairs to existing bank protection work***
  Existing bank protection works will be repaired with similar materials to those used in the rest of the reach. For example, lost rock *riprap* in a length of work would be replaced with rock riprap.

- ***Tree clearing, willow layering and willow planting***
  Vegetation is a key method of river channel management on the Waikanae River. This involves planting new material and pruning or *layering* existing vegetation to control growth. Vegetation that could build up and impede or divert flood flows may be removed.

- ***Planting of native trees and shrubs***
  In keeping with current Council practice, existing willow planting is now being supplemented with planting native species. Approximately 10% of the current planting budget will be used for planting and maintaining native species.

- ***Cross-blading***
  Cross-blading is only rarely used in the Waikanae River because of the nature of the river and environmental concerns. Other solutions will be considered first, but there may be times when, for financial or security reasons, cross-blading will be necessary.
- ***Beach clearing/ripping***
  This work prevents excessive build-up and 'hardening' of gravel beaches that cause meanders to develop. Generally, clearing is done mechanically by ripping the surface to remove vegetation and loosen the gravel.
- ***Rock riprap protection***
  Where possible, rock riprap with planting is used as a permanent solution to bank erosion. Riprap will also be used as linings and in the form of *groynes*.
- ***Tree groynes***
  Tree groynes are a lighter protection and are used where the river has meandered outside the design channel alignment but there are no significant assets at immediate risk.
- ***Berm maintenance***
  Berms, stopbanks and strategic outlets will be maintained.
- ***Gravel extraction***
  See Section 3.3.4 for details.

3.3.2.4 Programmed Major Works

It will not be possible to achieve or maintain the preferred channel alignment through ongoing maintenance. Therefore a programme of major improvement works is required. Only three works, El Rancho, Jim Cooke Park and Kebbels, are included in the Priority List in Table 6 (page 74). There are five locations where major works have been programmed in order to achieve the preferred alignment. Between each of these named major works, numerous less substantial works have been identified as being necessary. The nature of these works is such that they can be undertaken over time as part of the ongoing maintenance work.

In all instances the works will involve:

- channel excavation
- rock riprap bank protection
- vegetative planting
- gravel extraction.

An indication of the extent of each of these items is shown in Figure 11 and listed in Table 4. These works are indicative only, and changes could be made at the detailed design stage before construction starts. A major flood may also influence the timing and the extent of works.

3.3.3 River Mouth Management

- Maintain the existing rock groyne at the mouth so that it continues to operate effectively.
- Manage the area between the groyne and the beach so that the sand level is generally below mean high water spring tide level.
- Periodically cut the mouth. Trigger points for cutting the mouth are set in the regional coastal plan. Generally, it will be when the exit to the sea has migrated more than 500 m to the south or 200 m north of the groyne, or when tide levels at Otaihanga rise to a point where they are 300 mm above normal sea levels.
- Monitor the mouth and its reaction to the works on an ongoing basis.
- Allow for a 5 mm/year rise in mean sea level in all design work affected by the tides.

3.3.4 Gravel Extraction

Gravel extraction is frequently used as a river management tool. The following conditions will be used as a guide for any gravel extraction:

- Allow the extraction of an average of 3,000 m^3 of gravel from the river annually, in locations that provide the maximum benefits to the river channel management, through consents applied for by the Council with private individuals undertaking the extraction.

No. on Fig. 11	Reach (metres upstream)	Named (major works)	Estimated Cost 1997 ($)
1	0000-0500	Mouth	363,000
	0500-2000	Otaihanga	414,000
2	2000-2600	El Rancho	570,000*
	2600-3900	Greenway Road	311,000
3	3900-4300	Jim Cooke Park	570,000
	4300-4900	River Glade	104,000
4	4900-5100	Kebbels	207,000
	5100-5700	Edgewater Park	104,000
5	5700-6100	State Highway 1	207,000
Grand Total			**2,850,000**

Notes:
Works are listed in order of increasing distance upstream.
See Bibliography 3.2 for details of the above works.
*Denotes works completed in April 1997.

TABLE 4: MAJOR WORKS

- Review the amount available for annual extraction on the basis of the results of the river cross-section surveys and inspection of river condition. (The amount of gravel extracted over the longer term, will depend on the findings of five yearly bed level analysis.) The aim is to ensure that the total gravel balance below the KCDC water treatment plant is maintained at the status quo.
- Identify and discuss, with affected parties, sites for gravel extraction.
- Charge a gravel user charge fee for any material extracted from the river from land owned or managed by the Council. Fees collected go towards Flood Protection Group monitoring (see Section 3.3.5 below) and resource consent costs.
- Gravel extraction to be managed by the Council to ensure that potential benefits for river management are maximised.

3.3.5 Monitor River Processes

The following monitoring activities will be undertaken.

- Each year, take vertical aerial photographs of the Waikanae River using a standard 35 mm camera.
- Undertake major reviews of river management practices at 15 year intervals.
- Undertake bed level surveys every five years or after a 20 year flood or greater.
- Analyse the data collected and update estimates of *aggradation*, *degradation* and river mouth movement, and recommend an annual extraction volume.
- Take high-level aerial photographs (rectified image or orthophotography) at five yearly intervals and after a 20 year flood or greater.
- Inspect structures and monitor catchment and channel condition after major earthquakes.
- Monitor annually, with surveys if necessary, the location of the river mouth and the level of sand build-up at the foredune.

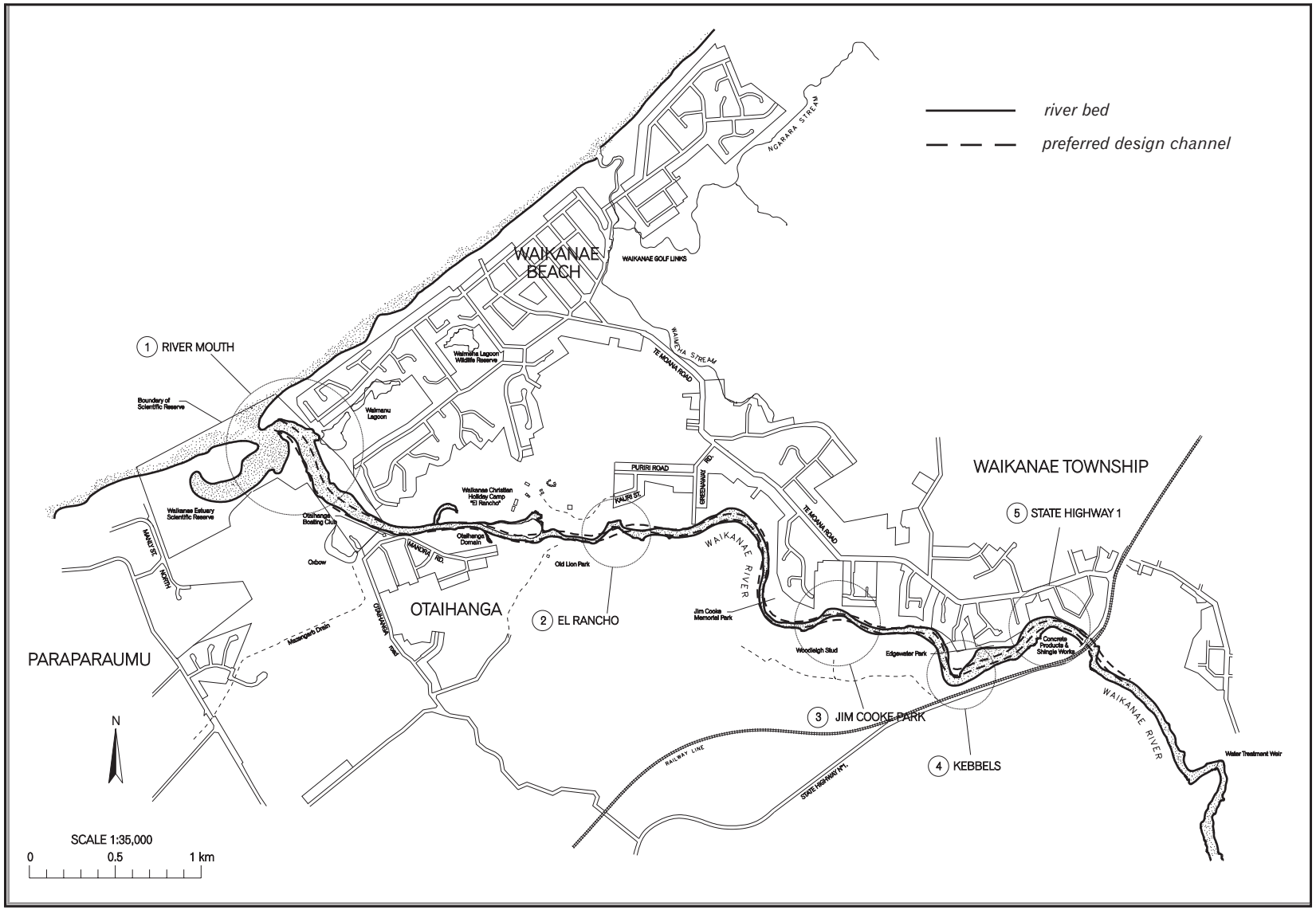


Figure 11: Channel Alignment and River Management Methods

Photograph 8: Cutting the Waikanae River Mouth, February 1995

- Prepare annual reports, recording the work done, with dates, location, type cost, etc. A record (in the form of flood damage reports) of how these works perform during subsequent floods is to be included. The information is to be easily accessible and linked to the aerial photography. These reports, which will be part of the asset management process, are important because they will provide information for future decision making.
- Review current knowledge on climate change every five years, and revise figures used for flood mitigation methods if appropriate.
- Based on information collected, assess the effect of increased knowledge gained from monitoring and determine any implications for the flood hazard in the Waikanae Floodplain.
- Review the effectiveness of flood mitigation works in light of information collected during monitoring.

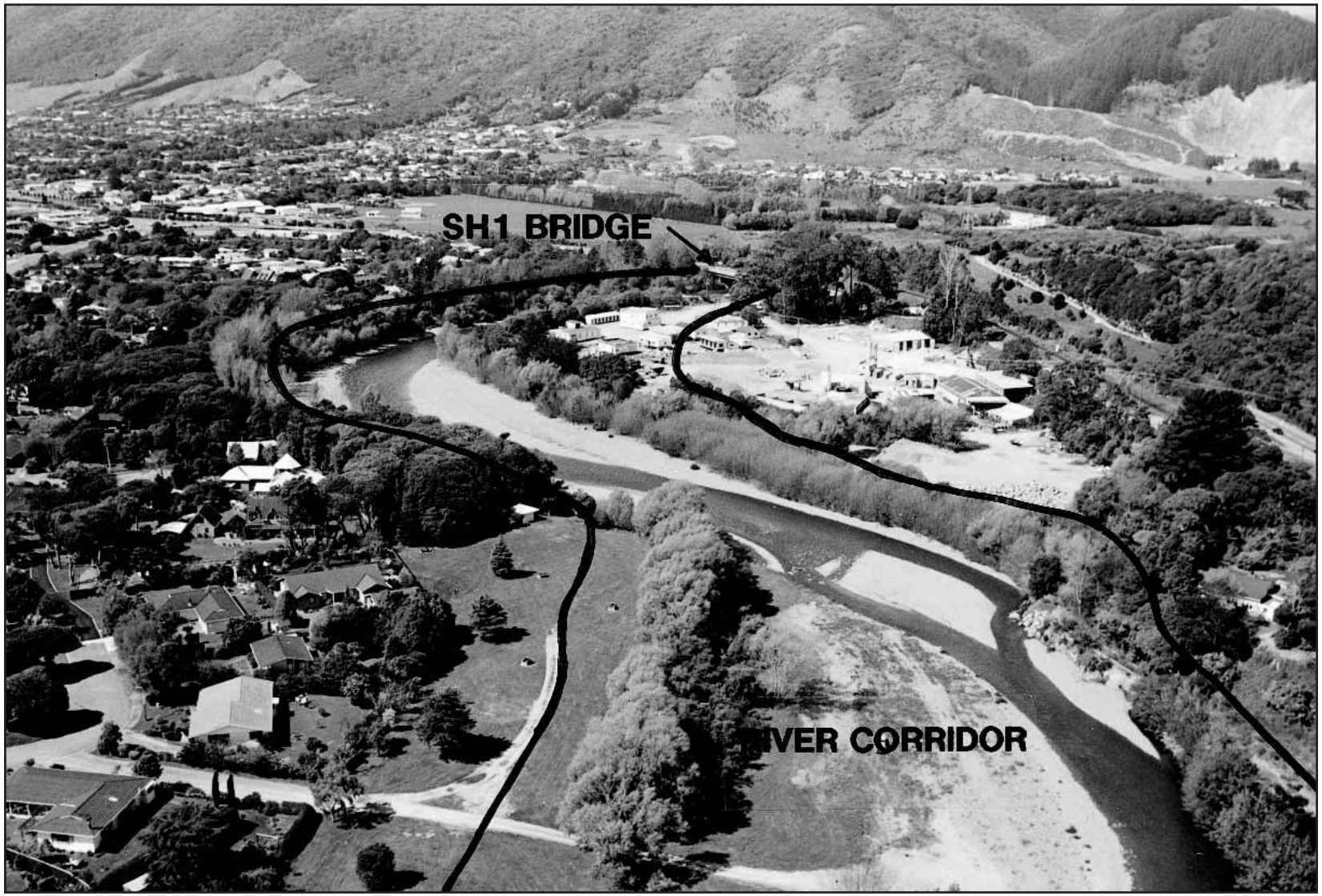
3.4 Prepare and Implement an Environmental Strategy

An Environmental Strategy is being prepared by the Council as part of the Floodplain Management Plan. Initially, it is intended to provide a draft document for discussion between all those parties who are responsible or involved in the management of the River Corridor.

The strategy will provide a master plan for enhancing the landscape and environmental values of the River Corridor below State Highway 1 to the river mouth. It is hoped that all agencies and individuals involved in environmental management will use the strategy to link their core functions and management plans into a joint management approach for the Waikanae River Corridor. It will identify specific areas where particular management or action is needed, and provide an overall framework for individual actions.

Appropriate management of the river should result in enhanced environmental and landscape values.

The Council will implement its responsibilities contained in the Environmental Strategy after discussions with other agencies involved in the management of the River Corridor. This helps ensure that other agencies 'buy in' and use the document when they undertake their own work.



Photograph 9: Aerial View of Waikanae River just below SH1 Bridge with the River Corridor marked

3.5 Consultation

All of the methods for sustainable management of the floodplain, and which are described in Section 3, have been agreed with the community during the consultation process of the Floodplain Management Plan. Further consultation will occur as the flood mitigation works are implemented through the normal statutory processes, including those for resource consents and the Council's Annual Plan process. The Flood Protection Group will:

- Meet annually with members of the 'Friends of the Waikanae River' (see Section 7.4), DOC, Fish & Game Council, and iwi, to make an inspection of the Waikanae River. This is to ensure everyone is thoroughly informed about any proposed works, and has enough time to air and discuss their concerns.
- At the initial planning stage, consult with individuals who will be directly affected by major works.

4. Considerations

4.1 Introduction

This Section looks at the issues and rationale behind Section 3 and outlines the guidelines that will be applied to ensure the outcomes are implemented to acceptable environmental standards.

The issues have been subdivided into physical environment, human environment, Maori, ecology, landscape/recreation/heritage, and planning/land use.

Each subsection explains the issues and lists the related objectives and guidelines. The objectives set out what the Council is trying to achieve with respect to the Waikanae River and Floodplain. These should be taken into account when assessing resource consent applications.

Specific policies and methods are discussed. The policies describe how the Council is going to achieve the long-term sustainable management of the Waikanae Floodplain. Each policy relates to an objective and, again, should be taken into account when assessing resource consent applications. The methods for resolving the issues and achieving the objectives and policies are, in most cases, described in Section 3. These methods describe actions which will help reduce the flood hazard within the Waikanae area.

For the ecology and the recreation/landscape/heritage subsections, many of the objectives and policies are to be met by applying or having regard for specific guidelines. This is because the methods themselves have the potential to adversely effect the value of the floodplain for wildlife and the community. The guidelines have been devised to avoid or minimise any such negative impacts.

4.2 Physical Environment

4.2.1 River Processes

4.2.1.1 Introduction

The Waikanae River catchment covers an area of the Tararua Ranges and terraced gravel deposits to the west (see Figure 2). The river follows a passage through the foothills of the ranges before flowing across a coastal plain. Behind the foothills, fault movement has given rise to an inland 'basin', and the watercourses that fan out across this basin are

tending to cut into gravel deposits laid down during earlier (glacial) periods. The steep land of the upper catchment still has forest cover so there is little catchment erosion.

The present Waikanae River is one of two channels that existed at the end of the last century. The general alignment of the Waikanae River channel has not been greatly altered, but since the river management scheme was implemented in the 1950s the channel has become more uniform and confined.

Historically, flooding has occurred over the floodplain via a series of old river channels and drainage paths, but channel works and stopbanking have modified these considerably. Much of the Waikanae Floodplain is at high risk of being inundated during a 100 year flood, as shown on Figure 3.

4.2.1.2 Issues

- *Flooding is a natural process. This only becomes a problem when inappropriate development and use of the floodplain occur and subsequently require protection.*

- *Flood mitigation methods have the potential to adversely effect the physical environment.*

  For example, stopbanks cutting across overflow paths can retain flood flows in the main river channel and increase flood levels downstream. Of the proposed stopbank works, only the Kauri and Puriri Road stopbank may do this. Computer modelling has shown that the increase in flood levels downstream, mainly in the Otaihanga area, is approximately 50–100 mm in a 100 year flood (an amount considered insignificant).

  Further, there is general agreement that the minor negative impacts are far outweighed by the positive effects. In practice, the increase in flood level has been taken into account when setting the house-raising levels described in Section 3.2.4.

- *The Waikanae River is continually migrating laterally.*

  Formation of a floodplain is a natural occurance resulting from a variety of *geomorphological* processes, and the river forms an integral part of this. These processes are continually occurring but can radically change during a single event.

  The river channel will generally only occupy a similar sized area of land. The problem is that this area may move over time, crossing land ownership boundaries. This creates gains and losses between individual owners, erosion and accretion and the short-term loss of productive land along the river channel. Today's community finds this meandering across boundaries unacceptable, and desires it be minimised. However, the community must accept that constraining these natural processes will have a cost.

- *There is limited understanding of the complex natural processes occurring in the Waikanae River.*

  Rivers respond unpredictably to natural events and human intervention. The lack of records makes it difficult to assess river responses to mitigation works. Developing a greater understanding of the river's long-term natural processes will assist in managing the river. Understanding these processes will take time and money.

4.2.1.3 Objectives

- *To manage meandering of the Waikanae River within a predetermined alignment.*
- *To gain a better understanding of the natural processes of the river and its response to physical works.*
- *To ensure the effective operation of existing flood mitigation works.*

4.2.1.4 Policies

- *To manage the Waikanae River within a preferred channel alignment.*
- *To maintain existing flood mitigation works, including vegetation, to the standards necessary to allow them to perform as designed.*
- *To set up systems that accurately monitor changes in the river, both as a result of natural events and physical works.*
- *To periodically review information collected from monitoring and review and revise the Waikanae Floodplain Management Plan as appropriate.*

Channel Alignment **Section 3.3**

Monitor River Processes **Section 3.3.5**

River Maintenance **Section 3.3**

- *To encourage conservation forestry in erosion-prone areas in the Waikanae Catchment through the Kapiti Coast District Plan.*
- *To place a high priority on protecting areas of river bank erosion below the water treatment weir.*
- *To encourage land owners and other users to minimise lateral erosion of river banks above the water treatment weir.*

4.2.1.5 Methods

Methods to achieve these policies are detailed in Section 3.3.

4.2.2 Gravel Management

4.2.2.1 Introduction

Most gravel bed material of the river system comes from river bank erosion and channel reworking. Landslides and debris avalanches, often triggered by severe earthquakes or extreme storms, do provide some gravel material but they are not the predominant source.

The bed material of the Waikanae River passes to the coastal system in slugs associated with large flood events. Between these events it aggrades along the river's lower reaches. Substantial gravel extraction in the past has lowered bed levels near the road bridge by over 2 m in the last 40 years.

Analysis of data indicates that the average annual supply of bed material to the downstream reaches is about 3,000 m^3. Without extraction there will generally be a steady build up of material within the channel, particularly around changes of grade in the riverbed and in the lower reaches below Greenaway Rd. However, there will still be areas of degradation upstream of the bridges and aggradation near the mouth.

4.2.2.2 Issues

- *Aggradation/degradation is a continuing process in the Waikanae River.*

  Gravel movement and aggradation can be managed but it cannot be stopped. The aggradation rate is influenced by catchment condition, river channel condition, and the number and nature of floods. Aggradation reduces channel capacity and increases the tendancy

Photograph 10: Erosion on the Banks of the Waikanae River. Note the bedrock material

River Mouth Management **Section 3.3.3**

Gravel Extraction **Section 3.3.4**

River Corridor **Section 3.1.1.5**

for the river to migrate. Neither effect is considered acceptable by the community. The concern is primarily due to the closeness of developments to the river and insufficient buffer widths.

The ideal way to deal with aggradation and degradation is to allow the river sufficient room to meander and transport or deposit gravel. Given the existing level of development, there is only limited opportunity for this to occur.

4.2.2.3 Objectives

- *To maintain bed levels at or about their current levels.*

4.2.2.4 Policies

- *To extract gravel at a rate approximately equal to the rate at which it is entering the river.*

4.2.2.5 Methods

Gravel management and aggradation are discussed Section 4.2.2.

4.2.3 River Mouth and Coastal Environment

4.2.3.1 Introduction

The coastal plain of the Waikanae River was built up from *longshore drift* over the past 6,000 years. A significant estuary with a marked spit exists at the river mouth.

4.2.3.2 Issues

- *The Waikanae River mouth is a particularly dynamic and sensitive area.*

  All land comprising the Waikanae River mouth is designated as a Scientific Reserve and managed by DOC. The river mouth is influenced by longshore drift from the north, causing the mouth to migrate southwards. A greater understanding of the area's ecology and interaction with the coastal processes is needed.

  Consideration of any options for stabilising the mouth must take the natural river and coastal processes into account. These processes are extremely complex, and the ways of assessing them are through computational or physical model studies. Currently, neither the financial resources nor the input data are available for this type of study. This in turn means that management strategies selected now must be able to be modified when further information on river mouth processes comes to hand. Information suitable for modelling must be collected now.

4.2.3.3 Objectives

- *To integrate the management of the mouth area for flood mitigation with the management practices for the scientific reserve.*

4.2.3.4 Policies

- *To continue managing the mouth area in the same way that it has been managed in the past 10 years.*
- *To gain better understanding of the river mouth migration, to enable more informed decision-making.*

4.2.3.5 Methods

River mouth management methods are described in Section 3.3.3.

4.2.4 Climate

4.2.4.1 Introduction

A moist and windy climate prevails, particularly over the ranges. Annual rainfall is regular and varies from 900 mm along the coast to around 3,500 mm in the ranges bordering the Waikanae catchment. The weather is often cloudy, especially about the ranges, but sunshine increases towards the sea, where an average of about 2,000 hours per year are recorded.

Evidence indicates that global sea level has risen by between 100 and 150 mm in the last 100 years. While there are no indications, at present, that this rise is accelerating due to climate warming, the local relative sea level rise at Wellington has increased from 1.6 mm/year to 2.3 mm/year. It is estimated that the rate of sea level rise will accelerate by a factor of 3–6 times, next century, as a result of the *greenhouse effect*. Although low when compared with early estimates, a rise in sea level of this magnitude may significantly effect the Kapiti Region. The most likely effects include:

- increased coastal erosion
- increased coastal inundation

- salt water intrusion into coastal ground water
- salt water intrusion into ecologically important *wetlands* and river mouths.

Changes to the rainfall patterns of the Kapiti area due the greenhouse effect could cause increased summer dryness and increased flooding due to:

- Increased frequency of high intensity rainfall. The interval between extreme events is likely to diminish. Each 1 °C rise in temperature moves the cyclone belt 500 km south, so tropical cyclones could become more frequent.
- Higher rainfall in the ranges. Increased erosion and sediment supply may lead to increased aggradation.

4.2.4.2 Issues

- *Changes in climate, rainfall patterns and sea level may have a significant effect on the Waikanae Floodplain.*

The frequency and magnitude of natural rainfall events in the Wellington Region may alter due to climate change. Warmer global temperatures may increase the Region's exposure to tropical cyclones, such as the Wahine storm. This would increase the frequency of major floods.

Predictions of the impact of long-term climate change are limited by the short period for which climate records have been collected. Nonetheless, some changes seem to be occurring which river management planning must take into account.

Over the next 100 years, global temperatures are considered likely to increase. This change will allow species from warmer climates in the north to spread further south. The effects of this are unclear; it may allow increased regeneration of floodplain forest trees, but it may also facilitate the spread of weeds now confined to more northerly locations, for example, Manchurian wild rice. Such aquatic weeds may cause a flood hazard by constricting the channel, thereby increasing flood levels.

4.2.4.3 Objectives

- *To plan for the effects of climate change.*

4.2.4.4 Policies

- *To gain an increased understanding of how climate change will effect rainfall patterns, and therefore the nature of floods, to enable informed planning decisions to be made.*
- *To remain up-to-date with research by others on the effect of climate change on rainfall patterns and sea level rise.*
- *To accommodate the latest estimates of sea level rise in all flood mitigation methods.*

4.2.4.5 Methods

Section 3.3.5 describes the methods chosen.

4.3 Human Environment

4.3.1 The Community

4.3.1.1 Introduction

There are three different communities within Waikanae: Waikanae Beach, Otaihanga and Waikanae Central. Interviews and public surveys show these communities have different concerns for the river and what needs to be done.

Waikanae Beach has a high proportion of holiday homes (35%) and a population in which the elderly and young are over-represented. Their physical distance from the river causes these people to feel in little danger from the river flooding, and they tend to use the river less than those in the other two communities.

Otaihanga residents have a demographic profile similar to that of the national average. They are vitally concerned with the flooding problem and have energy and ideas to contribute to the floodplain planning process. They have a particular affinity for the river environment in their area. There is a high proportion of adults in the labour force.

Waikanae Central community is significantly older, somewhat wealthier, and with a lower proportion of adults in the labour force than the New

Monitor River Processes **Section 3.3.5**

Allow for Sea Level Rise **Section 3.3.3**

Zealand average. Residents of those areas in central Waikanae prone to flooding tend to have very strong views about the need to protect their property.

Overall, the Waikanae community has a small proportion of Maori compared to the New Zealand average (4.3% compared to 12.8%).

The population in Waikanae is continuously changing, partly due to an unusually high proportion of transient holiday and weekend visitors.

The Waikanae area has one of the fastest residential growth rates in New Zealand (during 1980–1990). The risk of damage and social disruption from a flood is now quite large, and it will only continue to increase as development increases.

Surveys found that a large number of people in the Waikanae community place a high value on the river environment. Characteristics viewed as important included recreational opportunities, aesthetic attributes, a *habitat* for fauna and flora, and a place of peace and tranquillity. The majority of the community did not want large 'improvements' made to the river and its bank, as they appreciate the 'rural' feel. Access was felt to be vital to the continuing use of the River Corridor for recreation.

The pollution of Mazengarb Drain, caused mainly by the discharge of waste water from Paraparaumu, is of concern to the whole community. The poor water quality diminishes recreational and landscape values of the river downstream of the drain, and threatens the health and viability of the estuary.

Other concerns include:

- The lack of co-ordination between the agencies involved in managing the River Corridor.
- The lack of sufficient maintenance of the river, particularly gravel extraction to keep the bed levels down. The community perceives that gravel extraction will *mitigate* most of the flood problem.
- The high levels of residential development close to the river.
- The lack of consideration given to the communities' opinions and knowledge in the Floodplain Management Planning process.

4.3.1.2 Issues

- *The risk of damage and social disruption to the Waikanae community from a flood event is high. The hazard created by this flood risk is increasing as development increases.*
- *It is difficult to maintain an adequate level of awareness during the extended periods when moderate to major flooding does not occur, particularly with a changing population base.*

There is poor public understanding of the flood hazard. Flood mitigation structures have been in place for some time. Consequently, people have little experience of a serious flood, and this gives rise to the expectation that flooding will not occur. Problems caused by lack of preparedness can be compounded by the speed with which flooding can occur.

Regular public education is essential to maintain community awareness and preparedness. Education should focus on the best things people can do to maximise safety and reduce flood damage.

Public education campaigns can have a number of benefits:

- People gain an understanding of the flood hazard. Potentially, this can reduce the emotional, physical and sociological impacts of flooding.
- People learn techniques to save their belongings.
- People become better acquainted with their local authorities and tend to have greater confidence in their advice.

Information reinforced regularly is more likely to reach a wide cross-section of the community. Waikanae's constantly changing population means education must be undertaken continually, to ensure that all members of the community know what to do in a flood.

- *Communities and people within Waikanae and Otaihanga are inadequately prepared for a flood event that could occur with little or no warning.*

As flooding depends on rainfall, the frequency and extent of flooding can be extreme and variable. A lack of data makes it even harder to

predict floods. Because of Waikanae's geography, the warning time is probably going to be short.

Currently in Waikanae and Otaihanga, there is a low degree of flood awareness. It is likely (especially if warning times are short) that flood warnings may be ignored, or people may be confused about what they should do. Given the likely short warning times, it's extremely important to engender a high degree of community preparedness.

In a community with good flood preparedness, response to flood warnings is likely to be prompt. (Ideally, residents and property owners should have evacuation plans and be able to implement them rapidly when they receive a flood warning.)

- *There is uncertainty as to the responsibilities of KCDC and the Council with regard to flood preparedness and response.*

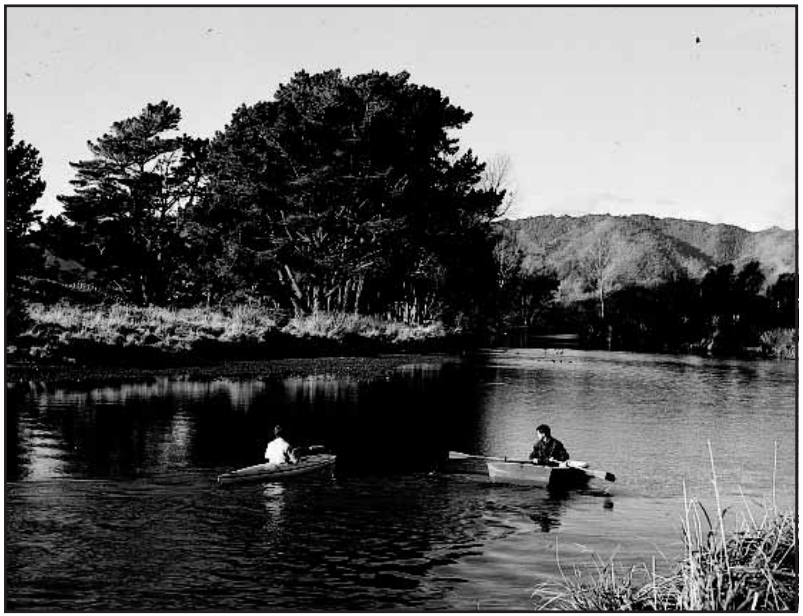
Presently, KCDC organises disaster response and recovery as part of the Civil Defence Plan (Appendix D) The Council is responsible for flood warning (Appendix F). This has led to community concern about a possible lack of co-ordination between agencies, and confusion as to which agency is responsible for the various aspects of flooding.

- *Stopbanks, although an efficient method of flood protection, can give a false sense of security as they can be overtopped or can fail in a flood.*

An understanding of how much protection a stopbank provides is a difficult concept to get across to the community. This is because a stopbank's level of protection can change over time (due to river aggradation, meander patterns, and as more historical rainfall information is collected). Poor understanding may lead to people making poor choices, and could actually worsen the impact of flooding.

- *House raising as an alternative method of flood mitigation in an area is not an option that can necessarily be undertaken by all those property owners in that area.*

Some people require ground floor access to living areas while other houses are already two storeys and cannot be easily modified to shift living areas upstairs.



PHOTOGRAPH 11: THE OTAIHANGA REACH OF THE WAIKANAE RIVER

Flood Mitigation Methods **Section 3.1.1**
Flood Mitigation Methods **Section 3.1.1**
Consultation **Section 3.5**
Floodplain Management Plan **Section 2.7**
Flood Awareness **Section 3.1.2**
Community Preparedness **Section 3.1.2**

4.3.1.3 Objectives

- *To minimise the risk to life, health and safety from a flood.*
- *To reduce the degree of damage resulting from a flood event.*
- *To minimise disturbance to the community during river management activities, the construction of flood mitigation works and other associated development.*
- *To achieve a consensus of opinion amongst the whole community as to the future management of the floodplain and the level of flood protection to be provided.*
- *To maintain a high level of public awareness as to the flood hazard.*
- *To ensure that the community is aware of the responsibilities of KCDC and the Council with regard to flood preparedness and recovery.*

4.3.1.4 Policies

- *To prepare a management strategy for the Waikanae Floodplain that will minimise the risk to life and property resulting from a flood, and ensure that the floodplain is used in a wise and rational way.*
- *To ensure the community recognises that flooding is a natural process that cannot always be prevented or controlled.*
- *To ensure careful planning and consultation with the community takes place before implementing flood mitigation methods.*
- *To reduce or avoid the adverse effects of flooding through careful management and timing of flood mitigation methods, minimising any resulting inconvenience to the community.*
- *To maintain awareness of the flood hazard throughout all sectors of the community, to enable people to better cope in a flood.*
- *To ensure that there is adequate flood warning of an impending event given to the community, and that an adequate back-up system is in place.*
- *To ensure the community has a clear flood response plan.*
- *To reduce social disruption and damage caused by flood events by improving and maintaining community preparedness.*

4.3.1.5 Methods

These policies will be achieved through the flood mitigation methods and consultation process described in Section 3.

4.3.2 Industrial/Commercial

4.3.2.1 Introduction

Waikanae has a commercial centre developed along State Highway 1 and some small shops at Waikanae Beach. Otherwise the floodplain itself has little commercial or retailing activity.

Residents from Otaihanga generally use the services of Paraparaumu because it has a larger retail, commercial and local government centre. There is a concrete plant and a house storage depot just below the State Highway 1 bridge. The concrete plant extracts some gravel from the river, at the direction of the Council, though their main source of aggregate is from a quarry further up the catchment.

There is a limited amount of farming, primarily grazing, on the south bank. The only commercial activity on the north bank is the Waikanae Christian Holiday Park opposite Otaihanga.

4.3.2.2 Issues

- *There is a commercial demand for gravel extracted from the Waikanae River.*
- *Extraction of gravel is used as a river management tool.*

There is a demand for gravel from the Waikanae River. This demand is variable and focused on localities with ready access, primarily by the State Highway 1 bridge. Gravel extraction for river management purposes tends to be for smaller quantities at many sites along the river.

Gravel extraction can cause adverse environmental effects, particularly on the in-stream habitat. If the extraction rate is greater than the natural rate of supply, artificial lowering of the bed can occur. Methods to reduce potential adverse effects are given in Section 4.5.

- *Flooding could cause disturbance and damage to the commercial sector.*

Flood loss or damage to places of employment are stressful for both owners and employees of businesses. There would be some economic

impact and possible unemployment. Within the Waikanae floodplain, however, few places provide paid employment.

4.3.2.3 Objectives

- *To maximise the benefits of gravel extraction for river management purposes. To allow for sustainable gravel extraction.*
- *To minimise the disturbance and damage to the commercial sector caused by flooding or flood mitigation methods.*

4.3.2.4 Policies

- *To ensure gravel is extracted at a rate no greater than the rate of gravel entering the river system.*
- *To ensure gravel is extracted in a way that minimises adverse environmental effects on the river.*
- *To ensure that extraction occurs at locations that maximise the benefits to the community by reducing the flood and erosion risk.*
- *To ensure the commercial sector is adequately protected from or prepared for flooding, whether by structural or non-structural methods.*

4.3.2.5 Methods

The above policies are to be achieved by undertaking the flood mitigation methods described in Section 3.

4.3.3 Infrastructure/Services

4.3.3.1 Introduction

Currently, the Waikanae River has one road, one rail and one footbridge crossing. There are three proposed new bridge crossing sites. A twin-pylon electricity transmission line crosses the river at the upstream end of Jim Cooke Park, Nimmo Avenue West. These pylons are in the River Corridor and create a hazard to the scheme's security. There are underground gas and telephone crossings near Otaihanga.

These services impact on the operation and maintenance of the Waikanae River but are an essential part of the community *infrastructure*.

4.3.3.2 Issues

- *There is a continuing demand for services to be placed across the Waikanae River or down the River Corridor.*

As development of the Kapiti Coast continues, there will be a need for more service crossings of the Waikanae River, and possibly others along the River Corridor. For example, the route of the proposed arterial road also crosses the river and floodplain near the El Rancho Christian holiday camp.

- *There is the potential for flooding to cause disturbance and damage to the infrastructure and services within the floodplain.*

The loss of services regarded as an integral part of people's daily lives can be a major source of stress. It can also seriously threaten public health. At present, any flood greater than a 15 year return period event will render some roads impassable due to water and debris. Flooding of Te Moana Road will isolate homes at Waikanae Beach from central Waikanae. Rail services could be disrupted by floodwater and/or damage sustained to the tracks.

- *The cost of river management partly covers the cost of protecting services in the River Corridor.*

4.3.3.3 Objectives

- *Locate new services so as to have little or no impact on the management of the Waikanae River channel.*
- *To minimise disturbance and damage to the infrastructure from flooding or flood mitigation methods.*
- *That some form of financial support is recovered from utility operators, e.g., Telecom, Electra, when river management works have to be designed around or protect services.*

4.3.3.4 Policies

- *To ensure services located in flood-prone areas are designed to withstand the effects of flooding.*
- *To ensure that essential services are located away from flood-prone areas.*

Gravel Extraction
Section 3.3.4

Land Use Methods
Section 3.1.1

Utility Services Group
Section 3.1.1.5

Land Use Methods
Section 3.1.1

PHOTOGRAPH 12: GRAVEL EXTRACTION OPERATION

- *To ensure that any new service crossings recognise the requirements of the Floodplain Management Plan and, in particular, the objectives of the River Corridor management.*
- *To ensure that existing services are relocated to more appropriate locations as they are upgraded.*
- *To keep the number of new service crossings to a minimum and reduce the number of existing service crossings.*
- *To take a more co-ordinated approach to the location and standard of installation of new services as well as upgrading the existing ones.*
- *To ensure that protection of existing services and infrastructure is provided for when considering future flood mitigation methods.*
- *To maintain a dialogue with utility and service providers to ensure efficient and effective protection of services.*

4.3.3.5 Methods

The above policies are to be achieved by undertaking the flood mitigation methods described in Section 3. The co-ordination of these methods, and any prioritising that needs to be done, will be the responsibility of the Utility Services (Section 3.1.1.5).

4.3.4 Economics

4.3.4.1 Introduction

In Waikanae Beach and Waikanae Central, a very high proportion of properties (compared to the national average) are mortgage-free. Otaihanga has a lower level of freehold properties and rented properties than the country as a whole.

4.3.4.2 Issues

- *There is a lack of adequate insurance cover against loss or damage by flood held by residents within the Waikanae River area.*

Insurance is often perceived as a high-cost option for lessening the impact of a flood. Few insurance companies appear to promote insurance against flooding in flood-prone areas. Yet insurance is a relatively low cost pre-flood method that spreads loss amongst all policy holders. Insurance can be crucial in alleviating financial costs of flooding, and

can provide a relatively cost-effective way for property owners and occupiers to hedge themselves against risk of flood damage.

The Council itself cannot take insurance cover as an option as the Council has no insurable interest in the property of its ratepayers. It is the responsibility of the individual property owner to effect insurance over their assets, including for flood risk.

- *Structural methods generally have a high cost.*

The cost for constructing structural methods is generally high. The alternatives for protecting existing development are, however, limited and can have other unacceptable costs. The impact on rates and how the costs of flood mitigation methods are equally divided between the local community and the wider region in line with the policy set out in Section 6. The benefits and costs of the methods also vary depending on what perspective is being taken—be it national, regional, local, or individual. Differing perspectives will also affect priority.

- *River management has significant ongoing costs.*

Currently $65,000 per year is spent on river management. The nature of river management means that this expenditure will at least continue and probably increase. It is not possible, without major adverse effects, to fix a reach of river channel 'once and for all' and so allowance must be made for ongoing works.

4.3.4.3 Objectives

- *To ensure individuals have sufficient insurance cover against loss or damage by flood.*
- *To ensure the costs for flood mitigation methods are within those that the community is prepared to pay.*
- *To ensure that the costs for river management methods that are undertaken are within those that the community is prepared to pay.*

4.3.4.4 Policies

- *To encourage individuals to take out insurance cover against loss or damage by flood.*
- *To ensure that flood mitigation and river management works are undertaken within the budgets agreed in this Plan and through the Annual Plan process.*
- *To ensure the preparedness to pay for flood mitigation and river management works is tested at each Plan review.*

4.3.4.5 Methods

The above policies are to be achieved by undertaking the flood preparedness methods described in Section 3.1.2.2, and completing flood mitigation methods within budget.

4.4 Maori

4.4.1 Introduction

Water is a very significant resource to Maori and plays a central role in both the spiritual and secular worlds. Water is an essential element to all life and expresses all dimensions: taha wairua (spiritual significance), taha hinengaro (intellectual dimensions), taha tinana (physical dimensions), and taha whanaunga (the social aspect).

Ati Awa ki Whakarongotai hold mana whenua over the Waikanae area and have been involved in the planning process, via consultation with the Council, since 1991. This has included:

- Representation at Regional level as well as on the KFMC.
- Discussions held with the iwi on how they were to be involved in the Floodplain Management Plan.
- A presentation made to the Marae Committee in July 1991.
- Representation made in October 1992.
- *Hui* to present the iwi perspective on Resource Management held in June 1993.
- Discussions as to the aspirations and preferences of the iwi held in July 1993.

There has also been extensive consultation regarding the Draft Regional Freshwater Plan for the Kapiti Coast area. The relationship between this Floodplain Management Plan and the Regional Freshwater Plan is discussed in Appendix A: Legislative Framework.

Insurance **Section 3.1.2.2**

Insurance **Section 3.1.2.2**

Floodplain Management Plan **Section 2.7**

As a consequence of the consultation process, iwi have aired the following concerns and points of view:

- That the course of the river should not be dredged or altered.
- The river is polluted and mismanaged. The Council needs to monitor the water for pollution frequently, and iwi need to be involved in that monitoring process. The Council needs to plan to reduce pollution.
- The Council needs to look at recognising *Rahui*, supporting the procedures for making the public aware of such Rahui, and being aware of the significance of a Rahui.
- The Council needs to be aware of the importance of iwi feelings when identifying waahi *tapu* sites, and needs to make sure that appropriate consultation occurs. Identified sites of importance are shown on Figure 12, but noting the existence of *silent files*.
- In line with the principles of the Treaty of Waitangi, tangata whenua need to be a part of any system involving management of the rivers.

4.4.2 Issues

- *The Council must ensure that the principles of the Treaty are taken into account in any evaluation and determination of flood mitigation options.*

The Resource Management Act 1991 obliges the Council to take the principles of the Treaty of Waitangi into account in the management of the natural and physical resources of the Region. These principles include:

- Partnership
- Active protection of Maori rights and interests
- Each partner acting in utmost good faith towards the other.
- *Iwi in the Region seek active protection of their interests in respect of watercourse and their management.*

Tangata whenua are concerned their role of kaitiakitanga over water bodies is not adequately recognised and that there are few opportunities to manage water bodies according to tikanga Maori. Tangata whenua have therefore indicated their desire to be involved in the decision-making process regarding the Region's watercourses.

Active protection has two aspects that must be considered. It requires:

- Active protection of Maori interests in resource management. This includes the continued traditional relationship between tangata whenua and resources of significance to them, which may include the principle of *tino rangatiratanga*.
- A responsibility to actively protect resources managed by the Council which are of significance to Maori.
- *Iwi in the Region seek active participation in the decision-making process.*

Consultation is a duty arising out of the Treaty principle of each partner acting in good faith towards the other. Council must ensure that:

- Consultation is active.
- Consultation is with the appropriate group. Notification of the appropriate iwi authority is not adequate in itself. It is necessary to make contact with the appropriate landowning *hapu*.
- Consultation must allow sufficient time for participation.
- Consultation must comprise supplying adequate information to the consulted party, so they can make intelligent and informed decisions.
- Treaty matters must be given genuine consideration along with other matters.
- *Tangata whenua are concerned that flood mitigation activities within watercourses will adversely affect the mauri of water bodies.*

The mauri, or life essence, of water bodies is adversely affected in many ways. Examples of particular relevance to flood mitigation include the following:

- Diverting or mixing water from one water body into the catchment or watercourses of another
- Damming or otherwise altering the natural flows and fluctuations of water bodies.

- *Flood mitigation works have the potential to adversely effect:*
  - Sites of special spiritual, historical or cultural value to tangata whenua, including mahinga kai and waahi tapu; and
  - Important values including the mana of iwi, hapu and whanau and the ability of the tangata whenua to provide manaakitanga.

Sites of special spiritual, historic or cultural value include waahi tapu, mahinga kai, and areas where pure water was used for ritual purposes. These sites may be adversely affected by flood mitigation works. In some cases, sites may have been destroyed or be no longer visible; nevertheless, tangata whenua still consider them to be waahi tapu. It is therefore important that the values and concerns of tangata whenua are included when working through options for flood mitigation works.

4.4.3 Objectives

- *To ensure the principles of the Treaty of Waitangi are taken into account when managing the Region's water bodies.*
- *To ensure the duty of consultation is fully carried out.*
- *To ensure the relationship of Maori, and their culture and traditions, with freshwater, ancestral sites, waahi tapu, and other taonga within the beds of rivers and lakes, is recognised and provided for in the assessment of flood mitigation options.*

4.4.4 Policies

- *To identify, in conjunction with the tangata whenua, sites of significant value to the tangata whenua in watercourses.*
- *To recognise the significance of sites currently identified by the tangata whenua as being of special value (Figure 12).*
- *To consult with tangata whenua in order to identify any silent files that may exist before working in the Waikanae River.*
- *To discuss protection of sites and access to sites with the iwi of the Region when evaluating options for flood mitigation.*
- *To have regard to the values, aspirations and customary knowledge of the tangata whenua when evaluating options for flood mitigation works.*

4.4.5 Methods

The Policies are to be achieved through the methods described in Section 3, and through established Council consultation practices—in terms of the resource consent process and the Te Tutuohinga O Te Whakaaetanga (Charter of Understanding). Protection of sites of importance to Maori is also afforded through the proposed Kapiti Coast District Plan and sites are identified on planning maps.

In addition, the Environmental Code of Practice will be used by Flood Protection Group staff and the following guidelines will be applied when undertaking any of the methods.

4.4.6 Guidelines

Guidelines recommended when implementing the above policies are:

- Ensure that lists and plans of identified significant sites are updated whenever new information is received.
- Maintain ongoing consultation with tangata whenua to ensure that sites of spiritual and historic importance are noted and evaluated in the assessment of options for flood mitigation works and other development.

In recognition of the Treaty of Waitangi and *Te Tutuohinga O Te Whakaaetanga* the Council has developed a relationship with tangata whenua in the Region. Understanding the Treaty is an ongoing process as is understanding its principles. The objectives, policies and methods recognise the principles of the Treaty, and the necessity to incorporate these principles within the process for assessing and carrying out flood mitigation works.

Meaningful consultation is an important part of partnership and ongoing communication. The process of consultation enables recognition of the local knowledge, values and experience of the tangata whenua. Consultation provides for the identification and protection of sites of special value to tangata whenua, and enables their cultural values to be recognised and provided for when assessing flood mitigation options.

Consultation
Section 3.5

Guidelines
Section 4.4.6

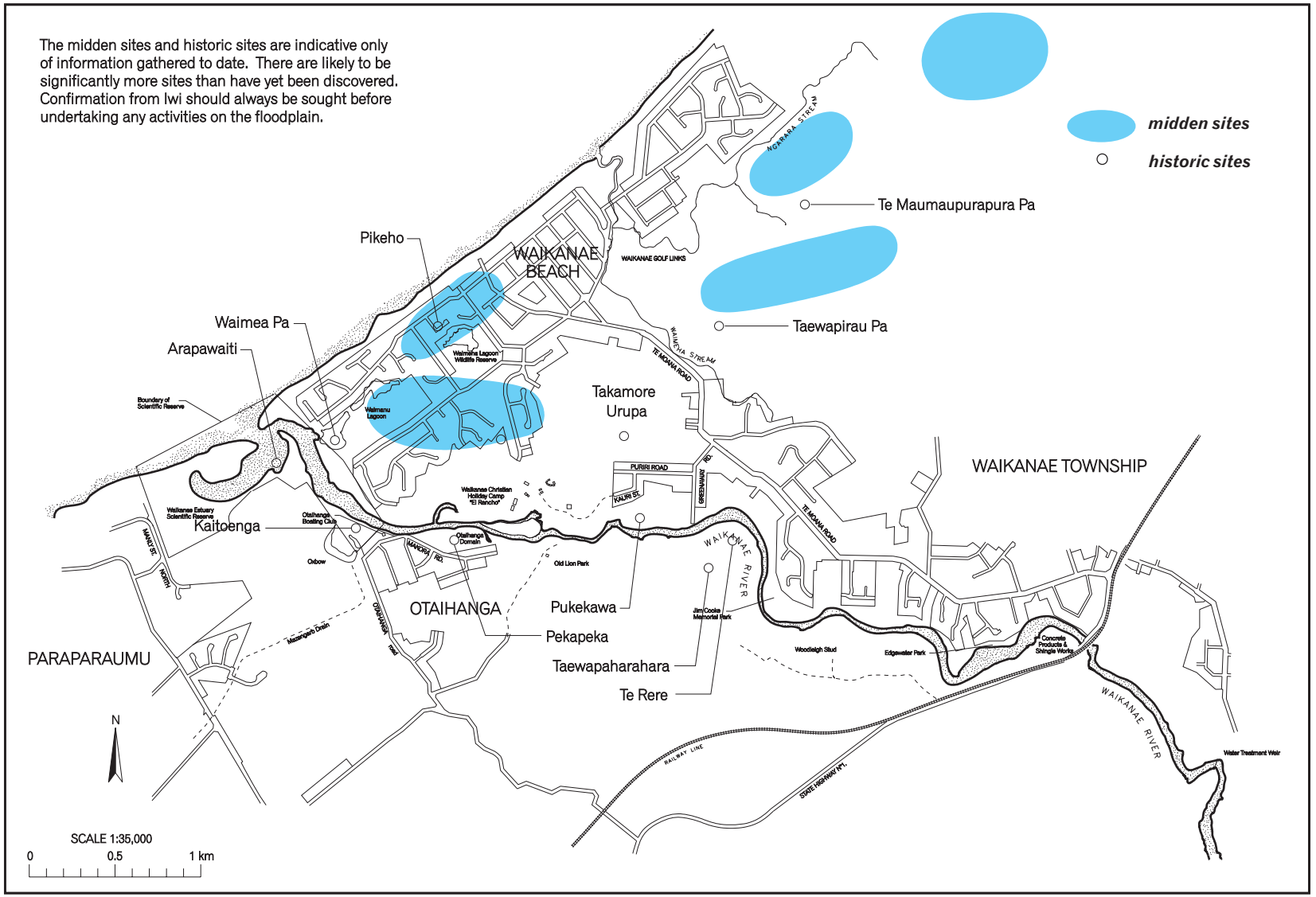


FIGURE 12 : SITES OF MAORI SIGNIFICANCE

4.5 Ecology

4.5.1 Introduction

The Waikanae floodplain environment is under constant pressure from development, due to a rapidly increasing population and the demand for flat land. Wetland habitats and species (some of the most sensitive to change) are particularly threatened by floodplain development. Wetlands are a rapidly diminishing resource, with only 10% of the Region's original wetlands remaining today. The complex relationships between factors that influence wetlands mean careful planning is crucial for the management and preservation of these habitats.

The reaches of the river between Otaihanga and the river mouth are a valuable and sensitive habitat. The Waikanae estuary and wetland are of national significance, with the Scientific Reserve supporting the only substantial population of the vulnerable plant *Leptinella dioica monoica* in New Zealand and two regionally rare *Carex* species. Outside the Reserve are three areas of wetland: the Otaihanga Wetlands, the Nga manu Sanctuary and the Te Harakeke Swamp, all of which support vulnerable species. Figure 13 shows sites of ecological importance.

Also, the river and estuary are ecologically important, providing habitats for indigenous fish species, some of which are threatened nationally, and a diverse range of bird species. The Waikanae Floodplain Management Plan recognises that developments and flood mitigation methods could cause significant damage to and destruction of these vulnerable species and habitats.

4.5.2 Issues

- *There is the potential for river management activities, flood mitigation works and other developments within the floodplain to adversely effect the ecology of the sensitive riparian environment.*

Any disturbance to the river can have a negative impact upon its ecology, with the extent and severity depending upon the particular activity and the sensitivity of the environment. Generally, river management works have minor, temporary impacts when compared to other works taking place in the River Corridor. However, river management occurs daily and can have significant cumulative effects.

Construction works within the River Corridor, whether part of flood mitigation works or other developments such as subdivision, may have significant adverse effects upon the ecology of the floodplain. These can be long-term, through loss or alteration of particular habitats, or short to medium-term, say, removing vegetation or discolouring of the water.

In many instances, the adverse effects that may result from river management or any other works within the floodplain can be avoided or mitigated. Sensitive design, identification and avoidance of particularly valuable or rare habitats and species, and careful implementation of works, can avoid or reduce negative impacts.

Significant improvements and enhancements can be made to the existing river environment during developments within the River Corridor. These could include creating new habitats, the extension and more appropriate management of existing ones, and using more native species in planting schemes. Opportunities such as these are identified in the Environmental Strategy (Section 3.4).

Non-structural options have little immediate effect on the ecology of the floodplain. The wise and rational use of flood-prone land is promoted and should prevent further habitat loss and deterioration in water quality. The effects of keeping development away from the River Corridor, overflow paths, and ponding areas will provide a series of linked habitats, supporting larger numbers and diversity of flora and fauna.

The River Corridor will provide a wildlife corridor linking the Tararua Ranges to the coast, across what is becoming an increasingly urbanised floodplain.

4.5.3 Objectives

- *To avoid, remedy or mitigate any potential adverse effects upon the ecology of the river and its floodplain.*

4.5.4 Policies

- *To protect habitats and species of high conservation value.*
- *To maintain habitat diversity and value.*

Environmental Strategy **Section 3.4**

Guidelines **Section 4.6.6**

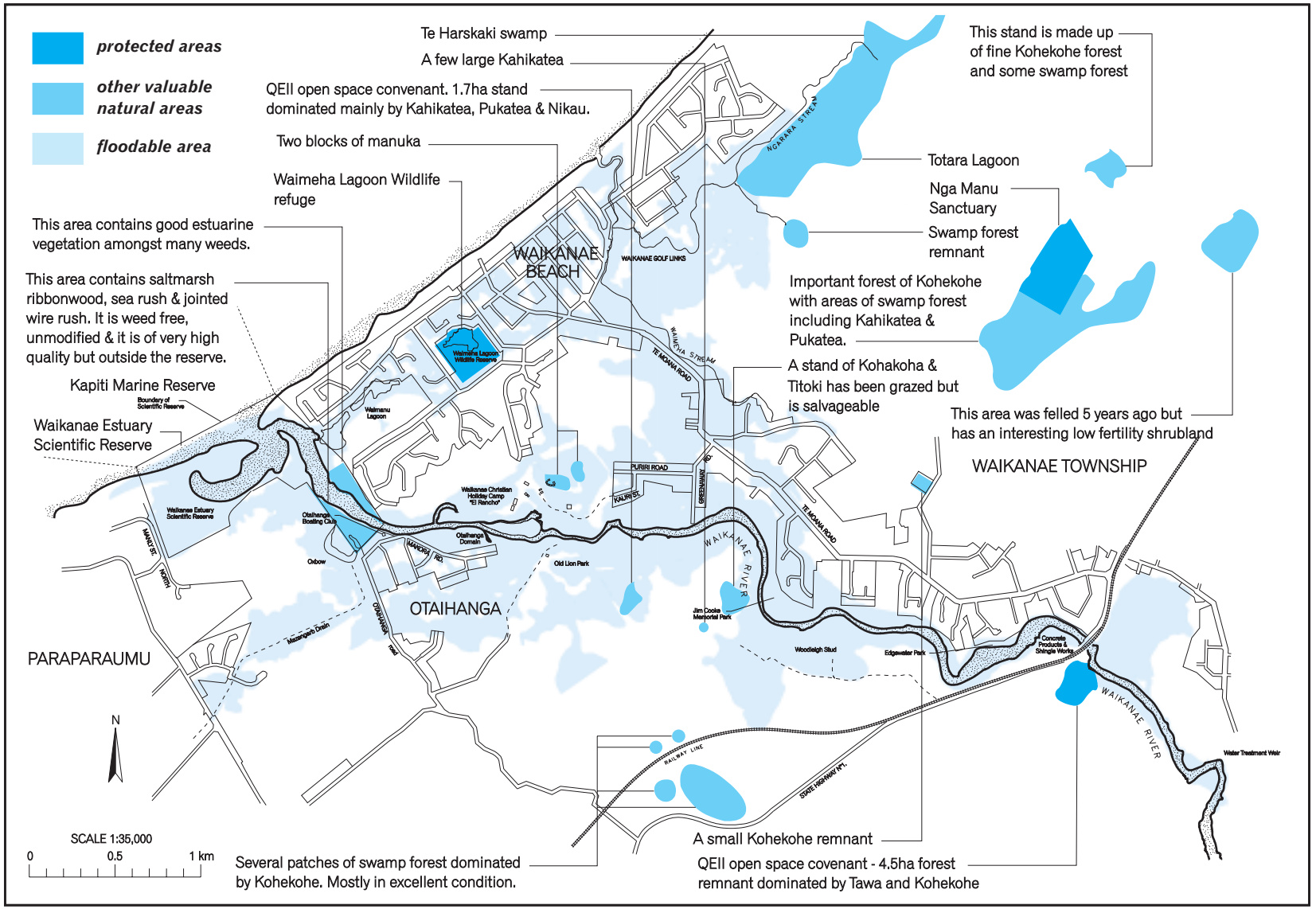


FIGURE 13 : SITES OF ECOLOGICAL SIGNIFICANCE

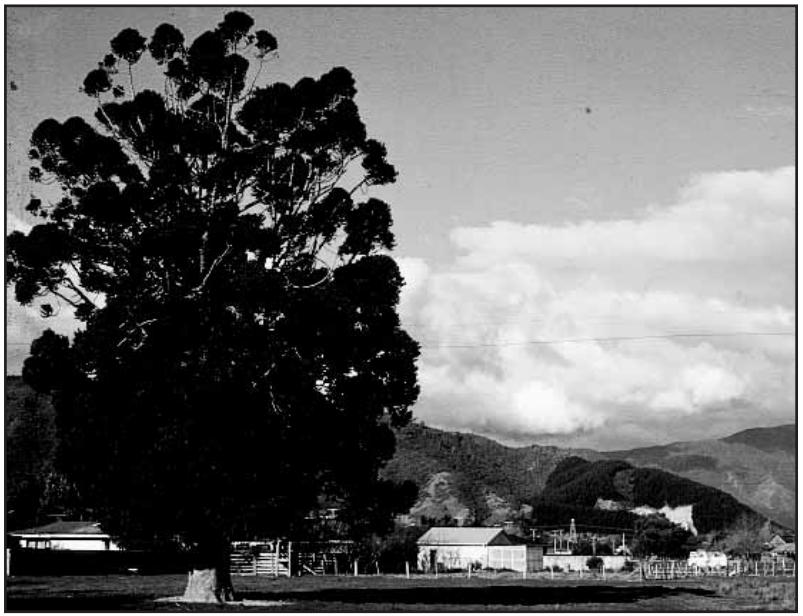
- *To minimise the disturbance and damage to habitats and species during river management activities, the construction of flood mitigation methods, and other developments.*
- *To enhance the riparian environment wherever possible.*

4.5.5 Methods

To achieve these policies, the following guidelines should be used when undertaking appropriate methods (see Section 3). Implementation of the Environmental Strategy (Section 3.4) also plays a major role in achieving these policies.

4.5.6 Guidelines

- Take into account habitat requirements of threatened species breeding in the area, such as Banded Dotterel, Variable Oystercatcher and Pied Stilt.
- Cut the river mouth in winter to avoid disrupting the breeding seasons of birds in the Scientific Reserve.
- Carry out works in the river and other watercourses, and on their banks, in winter. This avoids spawning and migratory periods of fish species, especially those that are nationally threatened.
- Avoid works that will significantly change habitats required by vulnerable plant species, for example, by altering water quality and



PHOTOGRAPH 13: WI PARATA'S TREE, A SITE OF IMPORTANCE TO MAORI

Photograph 14: Terns at the Waikanae Estuary

results in pools cut off from the main body of the river. Any trapped fish should be returned to the river.

- Unless necessary, leave debris, such as trees or logs, lying in the river, if it provides an obvious roost or in-stream habitat. Regular clearing of debris on banks, particularly after a flood, will decrease disturbance to habitats and roosting areas.
- Abide by the Flood Protection Group Environmental Code of Practice (in preparation) when undertaking any works within the River Corridor.
- Identify possible opportunities for habitat creation as part of river management, flood mitigation works and other developments within the River Corridor.
- Encourage establishment of native plants. This can be done by removing weeds, and by planting and managing appropriate natives. Native plants should be those occurring naturally in the area and those which are less likely to be stolen.
- Use gently sloping banks in tidal limits; this increases the area available for whitebait spawning. Plant with suitable grasses and herbs.
- As part of any realignment works, incorporate variations in the beds, banks and flows, to provide diverse habitats, e.g., pools and runs for fish and invertebrates. Where possible, sections of river bank should be left undisturbed.

4.6 Recreation/Landscape/Heritage

4.6.1 Introduction

The Waikanae River and floodplain are of great recreational, landscape and historical value. They are regionally significant as a recreational resource. The river is used for fishing and swimming, and the banks are ideal for walking, birdwatching, picnicking and horse riding. The recreational value of the river and floodplain is heightened by their closeness to residential areas. The natural setting of the river is important to its recreation value. Various river management activities and water pollution are seen as activities that interfere and detract from the enjoyment of recreational pursuits.

The Waikanae River, especially the lower reaches between Otaihanga and the river mouth, are of regional landscape importance. The diversity of landscapes with the estuary, beach, sand dunes, open watercourses, wetland areas and views of Kapiti Island, all increase the landscape values. The 'natural' appearance of the landscape is highly valued by the local community, and the whole river is recognised as being of regional significance in the draft regional Landscape Plan (Bibliography 4.19).

The landscape values, particularly of the lower reaches, are under great threat from development. In most instances, the adverse effects of flood mitigation works and other developments can be lessened over the long term. Most river management activities have minor, temporary effects upon the landscape.

The heritage value reflects the rich physical, cultural and spiritual history of the floodplain, both European and Maori. Figure 14 shows the location of sites of heritage value. Heritage is not only about precious buildings and artefacts but is also about living heritage—natural and cultural. There is a responsibility to safeguard the district's historic and cultural heritage for present and future generations. This recognition must be measured against a need to protect the community from the risk of flooding. A balance needs to be reached.

Development pressures on the Waikanae Floodplain are intense; consequently, recreation, landscape and heritage values are under constant threat. In an area that is undergoing significant development, the establishment of a River Corridor provides a buffer between residential areas—valuable in both landscape and recreational terms.

4.6.2 Issues

- *River management activities, flood mitigation works and other developments within the floodplain, could adversely affect the recreation, landscape and heritage value of the river and its banks to the community.*
- *Floods could cause destruction and damage to recreation, landscape and heritage resources.*

River management, flood mitigation and other development activities carried out in floodplain can disrupt and disturb the community's en-

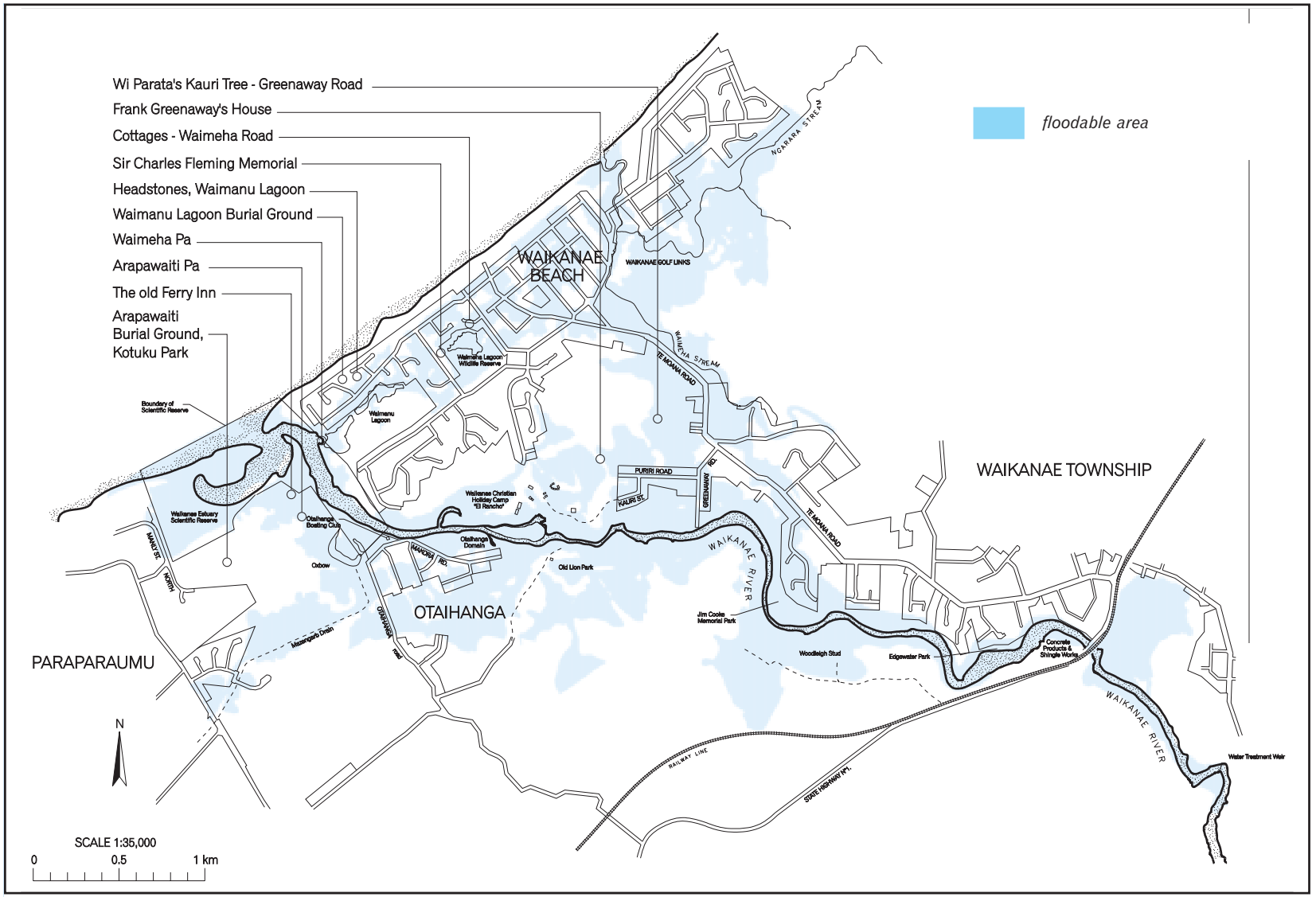


FIGURE 14: SITES OF HERITAGE VALUE

joyment of recreational opportunities—landscape and heritage. The impacts of such works can be long-term as well as being limited to the construction period. Examples are: restricted or altered access to the river or its banks for recreation, visual intrusion of construction activities or permanent alteration of the landscape, and the destruction or disturbance of sites or buildings of historic value.

Floods themselves affect recreation, landscape and heritage values on the floodplain. Serious flood events can limit the recreational use of the river and its banks. They can alter the landscape and may cause damage to historic sites and buildings.

4.6.3 Objectives

- *To maintain and, where possible, enhance the recreational, landscape and heritage values of the Waikanae Floodplain.*
- *To meet community expectations for recreational, landscape and heritage values.*

4.6.4 Policies

- *To identify and protect features and areas of significant landscape value.*
- *To identify and protect recreational resources of significant value.*
- *To minimise disturbance and damage to the recreational and landscape resources of the floodplain.*
- *To enhance the recreational and landscape values wherever possible.*
- *To maintain adequate knowledge of sites of historical importance to the local community.*
- *To include consideration of historic sites when evaluating flood mitigation options and other developments within the floodplain.*

4.6.5 Methods

- The policies in Section 4.6.4 are to be achieved by applying the following guidelines, when undertaking the methods in Section 3. The implementation of the Environmental Strategy (Section 3.4) will enhance the recreational, landscape and heritage values of the River Corridor.

4.6.6 Guidelines

- Have regard to the Draft Regional Landscape Plan.
- Identify landscape features and areas of particular value through consultation with KCDC, Resource Groups and individuals directly affected by major works. Protect such features and their settings from short and long-term alteration. For example, by retaining visually significant vegetation.
- Avoid river works designs that do not fit in with the existing landscape. For example, a regularly shaped, straight stopbank through Otaihanga Domain would be particularly intrusive and out of context.
- Mitigate temporary and long-term visual impacts of works through screening, retaining mature vegetation where possible, and replanting.
- Use suitable species in planting schemes. They may vary with location. For example, ornamentals would be more appropriate in Jim Cooke Park, and natives in more 'natural' areas.
- Involve local residents in landscape developments, particularly in locations where they have shown a keen interest in its appearance.
- Minimise cumulative effects of potentially visually intrusive features such as riprap. Sections of riprap should be no longer than 400 m, and an attempt should be made to achieve a 'natural' appearance by using local river boulders of differing size and shape, varying the slopes, and by encouraging revegetation. This is particularly important in the reaches between Otaihanga and the mouth which require extensive riprap protection.
- Identify areas of particular recreational value through consultation with KCDC, Fish & Game Council, Resource Groups, user groups and individuals directly affected by major works. Avoid disturbing or restricting access to these areas if possible.
- Adopt designs that take recreational needs into consideration. For example, by allowing access to the river by incorporating low platforms and flatter slopes at the ends of lengths of riprap.

River Corridor Procurement **Section 3.1.1.4**

Environmental Strategy **Section 3.4**

Guidelines **Section 4.6.6**

PHOTOGRAPH 15: TROUT FISHERMEN IN THE WAIKANAE RIVER, C. 1910

- Ensure that mitigation methods minimise the adverse effects of construction activities. For example, programme works to avoid periods of greatest recreational demand (generally summer), provide alternative access to and along the river as required, and use bunds and culverts to minimise water discoloration.
- Identify opportunities for recreation and landscape enhancement as part of river management, flood mitigation works and other developments within the River Corridor. For example, providing pools suitable for swimming as part of river realignment works, or improving the fish habitat and hence fishing.
- Extend access along the berms and to the river wherever possible.
- Maintain discussions with KCDC to ensure that any proposed works are located as far away as possible from sites of historic importance.
- Take account of the need to determine impacts and alternatives when considering the demolition, alteration, modification or removal of any heritage feature which is recorded in the KCDC heritage register and for which Resource consents are required.

4.7 Planning and Land Use

4.7.1 Introduction

The Waikanae River falls within the KCDC area. Before the local government reorganisation in 1989, the southern area was under Kapiti Borough and the northern area was under Horowhenua County and the river was the boundary between them. Relevant district planning schemes are the Kapiti Coast Proposed District Plan and the Kapiti Coast Transitional Plan (used until the proposed Plan is fully operational).

There are four KCDC planning zones within the floodplain:

- Rural—predominantly on the south bank, but with a small area in the vicinity of El Rancho on the north bank,
- Residential—mostly on the north bank with an area on the south bank at Otaihanga,

- Open Space—at the river mouth, the golf course, the KCDC reserve by Greenaway Road and Otaihanga Domain and
- River Corridor—includes the riverbed and the adjacent floodway.

Apart from the concrete products works and the residential areas at the mouth, land on the south bank is generally rural in character and use, supporting low intensity farming. However, subdivision and residential development, in particular close to the river mouth, has begun.

The River Corridor covers 160 hectares, of which 104 hectares are publicly owned (The Crown, the Council and KCDC). The remaining 56 hectares are privately owned— principally as large rural blocks along the south of the river. Figure 9 (page 32) shows the present ownership of the River Corridor.

Non-structural mitigation methods seek to promote wise use of flood-prone land (Section 3.1). The methods use tools that recognise the merits of certain uses on flood-prone land whilst recognising the limitations. Current use of flood-prone land has in some areas been inappropriate to the hazards and costs associated with flooding. Land use planning is one of the most effective ways of reducing flood damage.

The most successful method of controlling land uses within the River Corridor is for the land to be in public ownership. The concept of the River Corridor being in public ownership is a key component of this Plan (Figure 9). It will ensure effective land use control within the River Corridor, in an area where the adjacent land is under intense development pressure and where there is a significant flood hazard.

During production of the Proposed Kapiti Coast District Plan in 1995, the opportunity was taken to include the River Corridor Zone and land use controls. These controls included flood hazard categories, rules, and design standards (based on a 100 year flood with existing structural flood mitigation methods).

4.7.2 Issues

- *Stopbanks encourage further development behind them, and increase potential damages in the event of overtopping or failure.*

It is essential that non-structural methods are used in conjunction with structural methods and are supported by an increased level of aware-

Photograph 16: Canoeists on the Waimanu Lagoon

PHOTOGRAPH 17: WAIKANAE RIVER MOUTH SHOWING DEVELOPMENT ON BOTH BANKS, APRIL 1990. THESE AREAS USED TO BE A SERIES OF TIDAL LAGOONS

ness of the residual flood risk. This helps ensure stopbanks and river management methods are not construed as making Waikanae a completely flood-free area. Likewise, awareness will help make sure that structures and river management programmes are not placed at risk through ad hoc development.

- *Existing development within the River Corridor and on the floodplain are at risk and will continue to be at risk from flooding.*

Existing development located within the River Corridor and floodplain are at risk of flood damage. Correct siting and design can reduce such risks.

- *New development and inappropriate activities within the River Corridor and on the floodplain may increase the risk of flooding to the surrounding environment.*

The risk of flooding will increase when inappropriate structures and/or activities are located within the River Corridor or the floodplain. These present a risk avoidable to the community. Inappropriate use may change the shape of the river bed and floodplain, change hydraulic processes and alter the distribution of material that makes up the riverbed and floodplain. This may cause instability of river banks and cause a diversion of flood flows to other areas of the floodplain. The flood hazard or risk of flood damage to other properties may increase. Avoiding such development reduces social disruption and damage from floods.

Public ownership of the River Corridor allows it to be protected from inappropriate development. Reserve contributions, *esplanade reserves* or land or River Corridor purchase may be required along the river.

- *There will be ongoing pressure for further development of the floodplain as the population of Waikanae continues to expand.*

Further demand for development on the floodplain will inevitably occur due to population growth, but the flood risk must be recognised and taken account of.

- *Development and use of the River Corridor and floodplain may have an adverse effect on flood mitigation structures.*

Development and inappropriate use of the River Corridor and floodplain may have an adverse effect on structural flood mitigation methods, which

could lead to increased flood damage. Allowing development that might affect these structures could place the surrounding environment at risk.

- *Deforestation of the upper catchment can have significant adverse effects on flows, both flood peaks and low flows, and on aggradation.*

Deforestation of the catchment area exposes a large portion of otherwise covered sloped land to the elements. Rain falling onto an exposed area results in increased erosion, *run-off* and flow velocities.

4.7.3 Objectives

- *To promote wise and rational use of flood-prone land.*
- *To reduce the overall flood hazard on the floodplain by reducing flood risks to existing development and communities to an appropriate level.*
- *To ensure that construction of structural methods does not encourage further inappropriate development in the areas protected by those methods.*
- *To ensure new development on the floodplain is appropriately located and/or compatible with the flood hazard.*
- *To ensure the existing community and future developers are aware of the potential flood hazard.*
- *To ensure flood mitigation structures are protected from damage.*
- *To ensure a co-ordinated approach to flood mitigation is taken at a Regional, District and Individual level.*

4.7.4 Policies

- *To encourage the application of the open space provision in plans to preserve and protect areas of landscape and habitat importance.*
- *To encourage riparian management; and where land subdivision occurs, any land within the River Corridor should be included within any proposed reserve contributions or esplanade strips.*
- *To discourage subdivision involving further clearance of the upper catchment, and that may destabilise the area.*
- *To encourage reforestation of the upper and middle catchment through district and regional plans.*
- *To only use structural methods to protect existing development, and then only if justified on environmental grounds.*
- *To only use structural methods in conjunction with land use methods.*
- *To maintain uses of flood-prone land that are appropriate to the hazard and costs associated with flooding.*
- *To implement long-term means of land use planning to reduce the flood hazard and limit future growth in potential flood damages.*
- *To prevent the inappropriate development of the River Corridor and overflow path.*
- *To ensure that development does not adversely affect flood mitigation structures.*

4.7.5 Methods

The above policies are to be achieved through the river management, structural, and non-structural methods given in Section 3.

Land Use Methods
Section 3.1.1

Structural Methods
Section 3.2

Flood Awareness Methods
Section 3.1.2

5. Environmental Results Anticipated

5.1 Physical Environment

- Adverse environmental effects arising from floods are minimised as far as possible.
- Action taken to avoid or mitigate flood and erosion hazards and which recognise the natural physical processes acting on the area.
- The physical environment is protected through land use methods such as riparian management.
- An increased understanding is gained of how global climate changes could effect a flood.
- An increased understanding is gained of the natural river environment and how it is affected by human intervention, floods, and coastal processes.
- The financial cost of flood damages are reduced.

5.2 Human Environment

- A decrease in the risk of injury or death resulting from a flood.
- Potential social disruption from a flood is mitigated or avoided.
- Damage resulting from a flood is reduced or avoided.
- People and communities in the Waikanae area can cope better with a flood.
- People and communities are aware of the flood risk and consider this risk when making decisions regarding development or activities on the floodplain.
- Where existing development is at risk, methods are implemented to mitigate the effects of the natural hazard.

5.3 Maori

- The relationship of the Maori and their culture and traditions with freshwater is recognised and provided for.
- Maori involvement in the management of the Waikanae River is increased.

5.4 Ecology

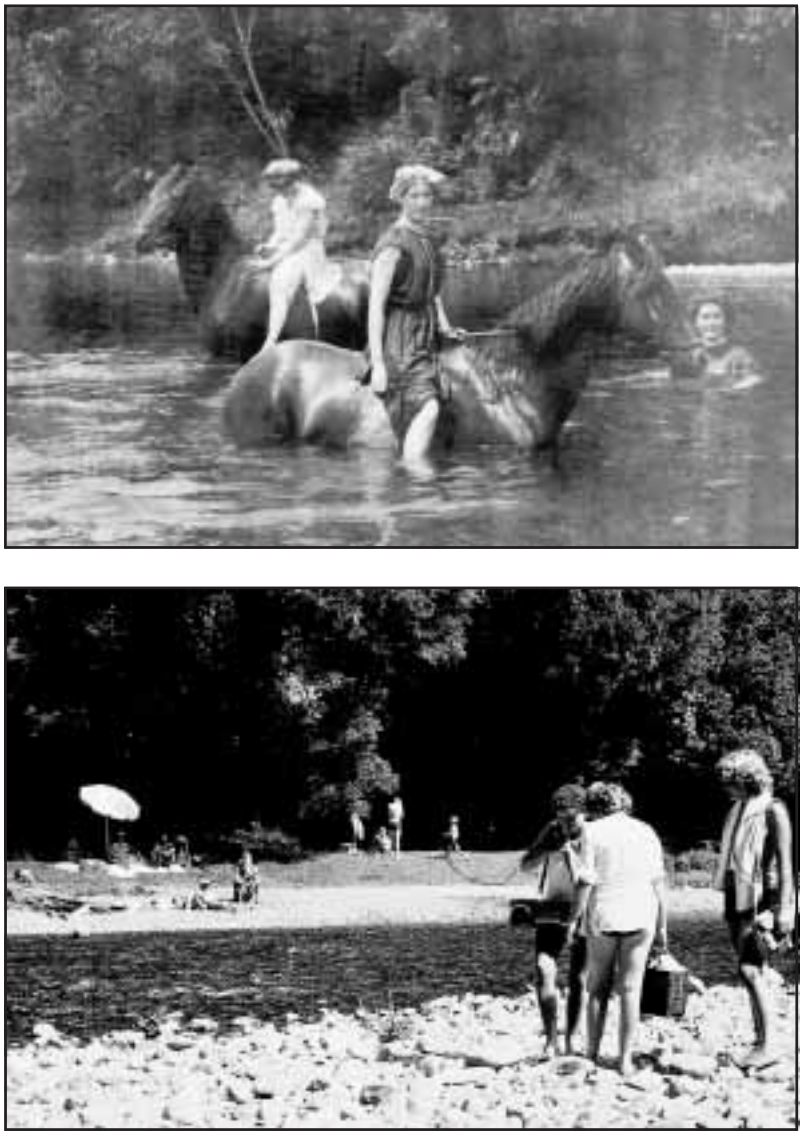
- Action taken to avoid or mitigate any natural hazard recognises and enhances the ecological habitats in the area.
- Planning for the ecological environment is included within the process for evaluating flood mitigation options.
- Areas of particular ecological significance are protected.
- Effects of flood mitigation methods on the natural environment are minimised.
- Where possible, the natural environment is enhanced.

5.5 Recreation/Landscape/Heritage

- Action taken to mitigate the effects of natural hazards on community *amenity values*.
- Action taken to preserve sites with historical and cultural significance to the community from natural hazards.

5.6 Land Use/Planning

- The risks to existing and planned development are identified and, where appropriate, mitigation methods implemented.
- Future development, where possible, avoids natural hazards.
- The value of the wise use of flood-prone land is recognised and promoted throughout the community.
- New development does not increase the flood hazard.



PHOTOGRAPH 18: LOVE'S CORNER IN THE 1900S AND 1985

6. Implementation and Funding

6.1 Introduction

There will be a range of methods implemented as part of the Waikanae Floodplain Management Plan. Implementation will also be carried out by a range of different authorities and individuals, and it is anticipated that implementation costs will generally remain where they fall. Most costs will be incurred through methods implemented by the Council and these will be funded by the Council, through rates of various types or direct contributions. KCDC will also fund a significant share of the implementation costs of non-structural methods proposed in the KCDC District Plan.

6.2 What the Wellington Regional Council will Fund

The Council, through its rating powers, will provide actual funding for implementing parts of the Waikanae Floodplain Management Plan. The source of rates for implementing each component of the Waikanae Floodplain Management Plan, will depend on Council policy at the time. The current Council policy on funding is summarised in Table 5, although this may be reviewed at any time.

6.2.1 Flood Contingency Reserve Policy

The Council has adopted the following policy to fund flood damage:

- One flood contingency fund has been established for the whole Region.
- An annual contribution of $200,000 is currently made from the Council general rate.
- When the flood contingency reserve is required to be drawn down for flood repairs, the community component of the funding will be drawn from the Kapiti River Rate Reserve.

6.2.2 Asset Management Plan

The Council has adopted the following principles for asset management.

- Maintaining existing works will normally have a higher priority than construction of new capital works.

- Adequate funding provision will be incorporated into the Council's business and annual plans, so as to achieve appropriate and timely maintenance and replacement programmes, as set out in Asset Management Plans.
- The Council's Flood Contingency Reserve Policy will be recognised in the asset management plan, and its adequacy addressed as part of the development process.
- Planned and contingent maintenance will be subject to annual reporting.
- River management and flood protection will be subject to peer review, including annual reciprocal reviews undertaken by registered engineers from each Division.
- Annual reports will be prepared which will document the financial expenditure for the year and the condition of the assets.

The Waikanae Asset Management Plan will be prepared in line with the outcomes of the Floodplain Management Plan. The Asset Management Plan will form the basis of all ongoing maintenance and renewal of assets. $261,000 has been allocated over the 10 years commencing 1997 to prepare and monitor this Plan.

6.2.3 River Management

The Council has programmed to spend $559,000, over the next 10 years commencing 1997, for some of the major river works identified in Table 4. This expenditure allows for the completion of the Kauri/ Puriri Flood Mitigation works and includes a component for the structural work required to achieve this (see 6.2.4). No budget is available for land purchase other than that required for major works.

The total maintenance budget for the next 10 years is $650,000.

Major works and land purchases which are not programmed will remain on hold until sufficient funding is available, or programmes may be brought forward if more financial input is available from the community.

Category	*Regional Component*	*Community Component*	*Budget in 1997 Business Plan*
1. Investigation, Planning and Monitoring	100%	0	$21,000/year
2. Capital works within scheme for structural and programmed major river works	Up to 50%	Not less than 50%	$1,284,000 this year and then $2,400,000 over the next 9 years
3. Ongoing maintenance works within the Waikanae River	50%	50%	$65,000/year

Note: The community component of capital works will be funded through a Council special rate over the Kapiti Coast District or by direct contribution. The regional component will be funded from the Council's general rate. Funding will be in line with the Local Government Amendment Act 1996 and Council policy at the time. This Act states that the users of services provided by local authorities shall, as far as possible, pay for those services in line with the benefits they receive.

TABLE 5: REGIONAL COUNCIL FUNDING POLICY (1 JULY 1997)

Priority	*Location/structure*	*Cnstrctn cost (1997 $)*	*Av. annual flood dmge saved*	*Financial BenefitCost Ratio*	*W V (60%)*	*Present level of protection (return period,yrs)*	*W V (10%)*	*Number of people directly affected*	*W V (10%)*	*Social & Envrnmt Benefits (%)*	*W V (20%)*	*Total Point Value (100%)*
1	Fieldway Bridge lengthening	$429,000	$204,000	4.9	0.60	15	0.09	500	0.10	100	0.20	**.99**
2	Jim Cooke Park realignment	$570,000	$78,000	1.4	0.17	50	0.05	240	0.05	70	0.14	**.41**
3	Otaihanga—raise roads	$434,000	$48,000	1.1	0.13	5	0.10	120	0.02	50	0.10	**0.35**
4	River Corridor land purchase	$500,000	$12,000	0.2	0.03	10	0.09	50	0.01	100	0.20	**.33**
5	Waimeha Golf Course stopbank	$715,000	$14,400	0.2	0.03	15	0.09	100	0.02	80	0.16	**0.29**
6	Otaihanga—raise floodable houses	$560,000	$48,000	0.9	0.10	10	0.09	70	0.01	30	0.06	**0.27**
7	Jim Cooke Park stopbank	$318,000	$12,000	0.4	0.05	100	0.00	240	0.05	70	0.14	**0.24**
8	Otaihanga to Mouth bank protection	$414,000	$20,000	0.5	0.06	15	0.09	40	0.01	30	0.06	**0.21**
9	Kebbles realignment	$207,000	$1,000	0.1	0.01	5	0.10	4	0.00	10	0.02	**0.12**
10	Lion Park Ringbank	$33,000	$500	0.2	0.02	30	0.07	4	0.00	12	0.02	**0.11**
TOTAL		$4,180,000	$437,900									

Notes:
Flood damages saved are based on:
(a) Waimeha Bridge lengthening being done before the Golf Course Stopbank,
(b) Jim Cooke river realignment being done before the Jim Cooke Stopbank, and
(c) house raising and road raising are independent.
Waimeha and Ngarara flows are the same as the equivalent Waikanae return period flow.
The average annual damages allow an additional 20% for damages to services. The number of people affected is based on the number of properties affected multiplied by 4. Damages assume no blockage of the Fieldway Bridge.
WV = Weighted Value

Table 6: Criteria for Priority List

6.2.4 Structural

The urgency of some structural methods has led to their planning and implementation ahead of the production of this Plan, for example, the Kauri/Puriri Road stopbank and river realignment improvements.

Council has made available sufficient funds to complete the Kauri/Puriri Flood Mitigation works in the 1997/98 financial year (see 6.2.3).

The remaining works will again, either have to remain on hold until sufficient Council funding is available, or be undertaken with greater community financial contribution.

6.2.5 Priority of Works

A priority list of outstanding river management and structure works has been created and is shown in Table 6. This list prioritises the outstanding works, taking into account the following attributes. These attributes and the weightings were developed after consultation with the community.

Financial benefit cost	60%
Present level of protection	10%
Number of people directly affected	10%
Social and environmental value	20%

6.2.6 Non-structural

The Council input for non-structural methods will be funded from within the programmed budgets. The main input required will be staff time—supporting KCDC to prepare its District Plan and maintaining community preparedness through Regional and Local Civil Defence.

The opportunity was taken to put interim planning methods in place during production of the KCDC Proposed District Plan in 1995. The land use controls and flood hazard categories incorporated into the Proposed District Plan were based upon the current flooding situation (that is, with structural methods, as at 1997, in place). Ultimately, land use controls and flood hazard categories will reflect the improved situation after construction of all the identified structural methods. These 'ultimate' flood hazard categories and land use controls are discussed in Section 3.1.1.

Review	***Elements to be Reviewed***
When the flood hazard is significantly altered by completion of a major structural work, or after a major flood, or prior to the approval of District and Regional Plans	• Land use control methods • Flood hazard maps • Advice given to KCDC
Every year (in line with Flood Protection Group Annual Plan)	• Programme by walkover survey • Priority of the works
Every 10 years	• Hydrology • Hydraulics • Processes monitored • Work methodology • Non-structural methods • Effectiveness of all methods • Capital and Operational expenditure budgets

Table 7: Elements to be Reviewed

6.2.7 Consultation

The cost of consultation with the community will remain where it falls, i.e., the Council will not fund individuals for their input into consultation. The Council will, however, cover costs of providing printed material and venues for meetings with Resource Groups and other interested community groups related to this Plan.

These latter costs will be funded through existing Flood Protection Group budgets and within the works budget for the major projects.

7. Monitoring and Review

7.1 Why Monitor and Review?

Monitoring (see Section 7.2) will be ongoing, and will enable the Plan to be reviewed in terms of desired outcomes. Regular reviews, in turn, mean that the floodplain management planning process can be updated and changed as necessary. Monitoring and Review of the Waikanae Floodplain Management Plan will be consistent with the intent of the Resource Management Act and will comprise two parts:

- The operational effectiveness of flood mitigation options to decrease the flood hazard risk
- The effectiveness of the Floodplain Management Plan in meeting its overall purpose.

7.2 Elements to be Monitored

The items listed below will be monitored under the asset management plan on an annual basis except for those in relation to the natural environment which will be monitored on a five yearly basis.

1.1 Community awareness.

1.2 Readiness of disaster agencies to respond.

1.3 Storm surge magnitude.

1.4 River bed levels.

1.5 Environmental quality (the normal Council Environmental Department monitoring).

1.6 New development in flood-prone areas.

1.7 Sea level rise.

1.8 Natural river and coastal processes and the effect of physical works.

2.1 Percentage of implementation complete.

2.2 Estimated value of assets at risk from a 100 year flood.

2.3 Effectiveness of the measures.

2.4 Work priority.

Items 1.1–1.8 will be monitored as part of the ongoing River Management undertaken by the Council. Items 2.1–2.4 will be monitored as part of the Asset Management Plan discussed in Section 6.2.2.

7.3 Elements to be Reviewed

The Floodplain Management Plan will be reviewed every 10 years or when the flood hazard is significantly altered. Table 7 summarises what will be reviewed and when. It is anticipated that a new Plan will be produced after 40 years, or earlier if required.

7.4 Future Role of the Waikanae River Communities

There will be a future role for the Waikanae River Communities in monitoring the achievement of the Plan.

An informal community group with links to the Council and KCDC will be set up. Flood Protection Group staff will be responsible for co-ordinating the group, with meetings being held on an agreed basis.

The purpose of the group will be to monitor implementation of the Waikanae Floodplain Management Plan. The role of the group will be purely advisory and will also be used for the dissemination of information between the community and the Council.

The first group will draw from members of the existing Resource Group and Floodplain Management Committee to take advantage of their knowledge and experience. The group will be reviewed and re-established every three years.

A chairperson will be elected from within the group every year, with additional members being co-opted, at the discretion of the group, from time to time.

The first group will be phased in after the formal adoption of the Waikanae Floodplain Management Plan by the Council.

8. Cross Boundary Issues

Cross boundary issues arise as a result of the administrative division of the floodplain, estuary and river. Under the Resource Management Act, KCDC is responsible for controlling the effects of land use, DOC for the Scientific Reserve and coastal marine area, and the Council for controlling the bed of the river upstream of the coastal marine area for a number of purposes including the avoidance and mitigation of natural hazards.

Natural processes, including those associated with the Waikanae River, continue regardless of these managerial distinctions. The river is constantly altering course and can threaten properties and infrastructure with erosion or flood damage. Equally, human activities on the floodplain can affect the natural processes, for example development that changes flow patterns in a way that increases the risk of flooding. The interrelationship between the floodplain, estuary and river must be recognised by all those involved in their management.

To promote the sustainable management of the Waikanae Floodplain, and to meet the objectives of this Plan, it is therefore necessary to establish procedures to be used to resolve cross boundary issues. The production of an agreed Environmental Strategy will go some way towards this.

This Floodplain Management Plan is itself a response by the Council to cross boundary issues raised in the Regional Freshwater Plan (Bibliography 4.6).

8.1 Issues

8.1.1 Issues Between the Council and KCDC

- Activities or processes occurring in or beside the river and above mean high water springs can adversely affect the way the river reacts in a flood.
- Natural processes of the river are continuously altering the floodplain environment, e.g., erosion, deposition and flooding.
- The implementation of flood mitigation methods may take place in areas or relate to functions outside the Council's jurisdiction, such as on the floodplain.

- The need to achieve consistency between the Floodplain Management Plan and the District Plan.

8.1.2 Issues Between the Council and DOC

- Natural processes of the river and human activity are continuously altering the estuarine and coastal environment.
- The need to achieve a consistent approach to the management of the river and estuary to ensure the respective management objectives are met.

8.2 Objectives

- To avoid the adverse effects of activities that cross the boundary between the river and estuary.
- To maintain a process sufficiently flexible for both the District and Regional Councils to administer their functions under the Resource Management Act and to react to the changing requirements of the river.
- To maintain communication on issues involving the jurisdiction of various bodies, such as DOC, District and Regional Councils and service authorities.

8.3 Policies

- When considering resource consent applications for activities located on the floodplain, take into account any provisions of this Plan, the District Plan, the Regional Policy Statement and the Regional Freshwater Plan, as they relate to flooding and flood risk.
- To provide input to the other agencies preparing management plans that cover areas of the floodplain.
- Maintain communication and co-ordination with DOC, regarding management of areas within the Department's jurisdiction, as it affects the Waikanae River.

8.4 Methods

8.4.1 Consistency of Approach

- Seek a consistent approach between plans dealing with the control of activities where activities themselves, or their effects, span boundaries or functions.
- Identify issues that cross district and regional boundaries or functions, and formulate joint responses between KCDC and the Council.

In terms of environmental enhancement the Environmental Strategy aims to do this.

8.4.2 Consultation

- Council to advocate for the inclusion of appropriate non-structural methods in the Kapiti Coast District Plan. This will help ensure consistency between the Waikanae Floodplain Management Plan, and the provisions in the District Plan for dealing with cross boundary issues, such as the River Corridor zone.
- Use joint hearings where resource consents concern the Waikanae River, and are required from both the KCDC and the Council.
- Identify issues that impinge on both the Regional Freshwater Plan and Floodplain Management Plan. Liaise with other Council departments to ensure a consistent approach between plans dealing with activities (and their effects) that span boundaries.
- Ensure effective consultation occurs with the KCDC and DOC regarding issuse, common interest and proposed works.
- Involve DOC early in the planning of any works that will affect an area under its management. This especially refers to the Scientific Reserve, the Coastal Marine Area and the Kapiti Marine Area.

9. Plan Changes

As reviews of the Waikanae Floodplain Management Plan are undertaken, aspects and details may change to reflect the changing needs and desires of the community. Any changes will be issued as addenda and inserted into this Section as and when they are approved.

Changes to the Plan will be by Council resolution and can be promoted in accordance with standard Council procedures. It is generally expected that changes to the Plan will be promoted through the Annual Plan process.

Glossary

100 year flood. A 100 year flood event has a 1% chance of being equalised or exceeded in any year. On average, one of these floods is expected, statistically, to occur once a century, based on past flood records.

aggradation. The build-up of gravels and other materials deposited by water action in the bed of a river.

amenity values. Those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness and aesthetic coherence, and its cultural and recreational attributes.

Ati Awa ki Whakarongatai. Tangata whenua and iwi of the area.

batter. The side slope of a stopbank.

beach clearing. This may involve the removal of flood debris, the spraying of weed growth on beaches, cutting and removing excess willow growth, and mechanical scalping or stripping of gravel beaches.

Flood debris is usually removed by hand; this maintains optimum flood capacity. Debris may include organic material such as logs, and inorganic material such as rubbish. Removal of live vegetation from gravel beaches is usually undertaken by mechanical clearing and occasional spraying. The aim is to prevent build-up of vegetation and, consequently, gravel. Gravel build-up can deflect flood flows, perhaps causing migration of the river channel (resulting in lateral erosion to the opposite bank). Beach clearing is undertaken above water level. Any disturbance to the channel and flowing water is, therefore, minimal.

berms. Low lying flat land adjacent to the river bank. Berms are a natural extension to the main channel and carry water during small floods.

bund. A ridge of material, usually gravel, placed parallel to the river bank, behind which works are undertaken. The purpose of bunds is to act as a buffer or filter to minimise any potential discharges of sediments released during the works to the flowing water.

catchment. The area draining to a site. It always relates to a particular location and may include the catchments of tributary streams as well as the main river.

the Council. Wellington Regional Council.

cross-blading. The moving of gravel that has built up on the inside of bends in the river to the outer eroding edge. A bulldozer or digger is usually used to push the gravel across the dry bed. This is a short-term cost-effective method of channel alignment. It is usually undertaken to support willow plantings and as a temporary emergency method. The river bed is disturbed as well as the banks, with a temporary loss of habitat and water quality. The normal management practice is to undertake this work when adverse effects will be minimised, i.e., outside fish spawning and migration periods.

cumec. A measurement of discharge, measured as cubic metres per second.

degradation. The lowering of a land surface (including river beds) by erosion.

design standard. The size or return period to which flood mitigation measures are built to contain (e.g., the discharge design standards for the Waikanae River is 415 m^3/s *(cumecs)*.

development. The erection of a building or the carrying out of work, or the use of land or of a building, or the subdivision of land. Infill development refers to developing vacant blocks of land that are generally surrounded by developed properties. Greenfield development refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes.

esplanade reserve or strip. Means a reserve within the meaning of the Reserves Act 1977: That is, either:

(a) A local purpose reserve within the meaning of S.23 of that Act, if vested in the territorial authority under S.239; or

(b) A reserve vested in the Crown or a regional council under S.237D; and

(2) which is vested in the territorial authority, regional council or the Crown for a purpose or purposes set out in S.229.

An esplanade reserve or an esplanade strip has one or more of the following purposes:

(1) To contribute to the protection of conservation values by, in particular:

(a) Maintaining or enhancing the natural functioning of the adjacent sea, river or lake; or

(b) Maintaining or enhancing water quality; or

(c) Maintaining or enhancing aquatic habitats; or

(d) Protecting the natural values associated with the esplanade reserve or strip; or

(e) Mitigating natural hazards; or

(2) To enable public access to or along any sea, river or lake; or

(3) To enable public recreational use of the esplanade reserve or strip and adjacent sea, river or lake, where the use is compatible with conservation values.

extreme event. This is a flood greater than the 100 year event. For Waikanae this has been taken to be the 700 year flood.

flood. A relatively high stream flow that overtops the natural or artificial banks in any part of a stream or river.

flood awareness. An appreciation of the likely effects of flooding and a knowledge of the relevant flood warning and evacuation procedures. The purpose is to ensure that the community has the ability to cope with a flood event. People who are prepared will respond more appropriately to flood warnings.

flood hazard. The potential for damage to property or persons due to flooding.

floodplain. The portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows during floods.

flood-prone. The land inundated during a 100 year flood.

flood warning. The warning given to the community of an impending flood.

floodway. The area where a lot of water flows during floods. It is often aligned with obvious naturally defined channels. Floodways, even if

partially blocked, would cause a significant redistribution of flood flow; this, in turn, could adversely affect other areas. They are often, but not necessarily, areas of deeper flow or areas where water flows faster. The floodway includes land adjacent to the riverbed, required to maintain an adequate corridor for the controlled passage of flood water.

fringe. The fringe includes areas adjacent to overflow and ponding areas that may be affected by a flood. Water depths would be less than 0.5 m deep. If necessary, people and possessions can be evacuated by four-wheel drive vehicles. Able-bodied adults would have little difficulty in wading to safe areas. Damage potential would be low. Development within fringe areas, resulting in minor or no adverse effect upon the flood hazard (and meeting certain requirements) could be undertaken as a controlled activity.

geomorphological. The physical processes which result in the landform and landscape of a particular place.

gravel extraction. The selective removal of surplus gravel has two main purposes. Firstly, maintaining bed levels within an optimum range; secondly, to correct misalignments and ease flow pressure against eroding banks. Extraction occurs on the beaches in the river bed and, excluding river crossings, does not involve work in flowing water.

greenfield development. See *development*.

greenhouse effect. A warming near the earth's surface that results when the earth's atmosphere traps the sun's heat. The atmosphere allows most of the sunlight that reaches it to pass through and heat the earth's surface. The earth sends the heat energy back into the atmosphere, but much of this heat doesn't pass freely back into space—because certain gases in the atmosphere absorb it. These gases grow warm and send heat energy back toward the earth, adding to its surface warming.

groynes. Normally constructed of rocks or trees, groynes are structures built perpendicular to the river bank to push the fast flowing water away from the bank edge. Their purpose is to halt erosion and maintain river alignment. Rock snub groynes are made of small boulders placed perpendicular to the flow. Typically, tree groynes are fallen trees with the butt end buried and anchored into the bank. Tree groynes are designed to be semi-permeable (allowing some water to flow through).

guidelines. Standards or conditions which should be adhered to when undertaking certain activities—these are defined in Section 4, Considerations.

habitat. The place or type of site where an organism or population normally occurs.

hapu. Sub-tribe.

hazard. A hazard is created when there is an interaction between a flood event and the human use and development on the floodplain.

hui. A meeting.

indigenous. Produced by or naturally belonging to a particular region or area.

infrastructure. Networks, links and parts of facility systems, as in transport infrastructure (roads, rail, parking, etc.) or water system infrastructure (the pipes, pumps and treatment works, etc.).

iwi. Tribe or people.

Kaitiakitanga. The exercise of guardianship. In relation to a resource this includes the ethic of stewardship based on the nature of the resource itself.

KCDC. Kapiti Coast District Council.

land. Includes land covered by water and the air space above land.

layering. Layering is when willows are partially cut through, then felled towards the river in a downstream direction. The tree is then wired to its stump to prevent breaking during a flood. The intent is to allow the willows to sucker from the branches lying on the ground that become covered in silt and gravel.

longshore drift. The transport of beach material along a coast by wave action.

major additions. Refers to the major ground floor extension of an existing building.

mahinga kai. An area where food is traditionally harvested.

manaakitanga. The practice of caring for others.

management plan. A document including, as appropriate, both written and diagrammatic information describing how a particular area of land is to be managed to achieve defined objectives. It may also include description and discussion of various issues, problems, special features and values of the area, the specific management methods that are to apply and the means and timing by which the plan will be implemented.

Marae. Traditionally, the central area of a village used for gatherings, councils, etc.

Mauri. The life-force present in all things.

meander. The natural wavelike pattern of a river on a floodplain.

minor additions. Refers to swimming pools, fencing, storage areas, sheds, carports, domestic garages, the repair of an existing structure or minor one-off additions to buildings.

mitigate. Reduce or make less severe.

m^3/s. A measurement of discharge. The volume of water (measured in cubic metres) that flows past a given point in one second. Also referred to as a cumec.

native (plants). Produced in or naturally belonging to a particular region or area.

overflow path. The overflow path includes areas adjacent to the River Corridor where a large volume of water would flow over a floodplain during a major event. The overflow paths are often areas of land which lead fast flowing waterway from the River Corridor and over the floodplain. The depth and speed of flood water are such that development could sustain major damage. The rise of flood water may be rapid. Evacuation of people and their possessions would be dangerous and difficult. There may be potential danger to life. Social disruption and financial loss could be high. If an overflow path were blocked this could potentially cause a significant redistribution of flood flows to other areas of the floodplain. Overflow paths are generally not suitable for development, unless adequate flood avoidance and/or mitigation provisions are made.

Overflow paths are generally not suitable for development because of the depth and speed of flood water. However:

- Additions to existing development may be acceptable subject to rules, e.g., the same standards as specified for the *River Corridor*. Where possible, a recommendation to establish a flood-free site above the 100 year flood level should be made.
- Land uses should not adversely affect flood flows. Examples of land uses generally compatible with the flood hazard include rural uses and open space/recreational development. Where proposed developments include clubhouses, fences, etc. there is a need to consider effects on the flood flow or behaviour. Where stock are grazed, fencing arrangements should enable stock to escape to higher ground.
- Low-density subdivision in existing residential and rural areas may be allowed. Each case is considered on its merits. Each subdivision lot should include a house site and access above the 100 year flood level.

planting. River management relies heavily on willow planting to maintain stable bank edges. Branch growth reduces flood velocities on berms and the willow's dense root mass binds the bank edge soils.

Planting is undertaken by willow poles being placed in furrows in the ground. Locations for planting are carefully chosen, with consideration given to the surrounding environment. Hybrid willows that are less susceptible to spreading are used. The willow stands down the banks are maintained by replanting areas where bank erosion has occurred, and periodically cutting and layering mature trees (this thickens stands and promotes new growth).

ponding. Ponding areas are those areas where flood waters would pond either during or after a major flood event. Fewer ponding areas may result in adverse effects elsewhere on the floodplain. Water speed is slow in ponds. However, water levels could rise rapidly. Evacuation of people and their possessions may be difficult, especially on foot, and may need to be by boat. There could be danger to life. Social disruption may be high. Generally, ponding areas are unsuitable for development, unless adequate avoidance and mitigation provisions are made.

rahui. A temporary protection or restriction placed upon anything.

Real Time Flood Forecasting Model. This is a computer model that uses data collected on rain as it falls, to predict flood flows in the river before the flows occur.

residual risk. This is the risk of flooding, despite the protection afforded by flood mitigation structures, due to possible breaches of stopbanks and overtopping by flood events greater than that for which the structures have been designed.

riparian management. This is the management of the riparian zone. The riparian zone consists of the berms and the floodway. The riparian zone is an important ecological link between the river and land-based ecosystems. Good riparian management is essential for minimising bank erosion, maintaining healthy ecosystems and ensuring good water quality, for example.

riprap. Large boulders placed directly onto the bank to prevent the river eroding the bank. Disturbance to the environment is minimised by separating the river flows from the work area with bunds (bund construction involves machinery working in flowing water for a short time).

Typical maintenance of rip-rap involves topping up and tidying the structure. Repairs are generally undertaken by a large hydraulic excavator, working from the adjacent bank, picking up and replacing rocks. Additional rock may be required, and is usually sourced from the same quarry as the original material. The repair work is usually able to be undertaken without diversion of the river flow.

riverbed. River bed is defined in the Resource Management Act 1991 *. . . In relation to any river, the space of land which the waters of the river cover at its fullest flow without overtopping the banks.*

River Corridor. The River Corridor comprises the riverbed and adjacent floodway. It is the minimum area able to contain a major flood and enable the water to pass safely to the sea. The outer limit of the River Corridor, where not adjacent to a ponding or overflow area, is the extent of a Q1% flood (including freeboard). In areas adjacent to a ponding or overflow areas, the boundary between the River Corridor and the adjacent area is defined by geographical features that control the flow, or at the point where the flow direction changes from down river to out over the floodplain.

The depth and speed of flood waters are such that existing development in the corridor could sustain major damage. Water may rise rapidly. Evacuation of people and their possessions would be extremely difficult. There is potential danger to life. Social disruption and financial loss could be very high. Most types of development would worsen the impact of flooding on other properties in the vicinity. Even a partially blocked River Corridor would cause a significant redistribution of flood flow, likely to adversely affect other areas. The River Corridor is generally not suitable for development. Appropriate land uses and development are as follows:

Open space, recreational and rural land uses such as pastoral farming are compatible. However, where developments include structures, fences, etc., their effects on the flood flow or behaviour need to be considered. Where stock are grazed, the fencing arrangements should allow stock to escape to higher ground.

Where development is proposed, the applicant must demonstrate to the consent authority that there will be no increase in the flood hazard or flood damage to other properties, or that flood behaviour would be adversely effected.

There should be no subdivision within the River Corridor except for boundary changes, unless lots including a portion of River Corridor have access and a house site in the portion that is outside the River Corridor. Where subdivision occurs, land within the River Corridor should be included in any proposed reserve contributions or esplanade reserve.

Minor additions to existing structures may be compatible if no increases in flooding or changes to the flooding pattern occur elsewhere as a result. Habitable floors should be above the 100 year flood level. Any such development should withstand both flood flows and debris, or should recognise that they will fail with no adverse consequences to the flood risk.

Residential, commercial and industrial development, forestry, caravan sites and camping grounds are not compatible. Some types of horticul-

ture that either cannot withstand inundation, or which trap silt or debris or alter flood flows, may not be appropriate either.

run-off. The amount rainfall that ends up as streamflow.

silent file. A restricted access file containing or referring to information that is of significant cultural, historical or spiritual importance to the tangata whenua. Disclosure of such information to the general public would likely cause offence or degradation of the importance of the sites referred to.

sustainable management. As defined in the Resource Management Act: 'managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well being and for their health and safety while:

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.'

tangata whenua. The iwi or hapu (sub-tribe) that holds customary authority over a particular area.

Taonga. Highly regarded physical or spiritual treasures or property.

Tapu. Temporary restriction or ban on use.

territorial authority. A city council or district council, in this case Kapiti Coast District Council.

tethering. Where significant erosion has occurred, willows are often re-established by tethering large willow trees with wire rope against the eroding bank and partially covering them with gravel. Anchors, such as driven railway irons and concrete block weights are frequently used to hold the trees in place. This technique enhances bank stability and is a very good way to re-establish willows.

Te Tutohinga O Te Whakaaetanga. The Charter of Understanding between the Council and the iwi in its area.

threshold of motion regime. The flow at which sediment transport commences.

Tikanga Maori. Maori customary values and practices.

tino rangatiratanga. Chieftainship, chiefly authority, full authority.

Urupa. A burial ground.

Waahi tapu. A sacred site, as defined by a hapu or iwi. Some waahi tapu are recognised and respected generally. Principally these are *urupa*, which are seldom interfered with, but this does not automatically occur, particularly if commercial interests clash with preservation. If the waahi tapu in question is not urupa, but it has other spiritual significance, recognition of its value is more difficult to establish. Not all restrictions are permanent. A tapu or rahui can be imposed for a period of time, following a death, for example.

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

zoning. The use of land use zones is not to unjustifiably restrict development within the floodplain. The zones are based on an objective assessment of flood hazard, environmental and other factors, such as:

- whether the land is in a high-risk area from flooding
- potential for future development to have an adverse effect on flood behaviour, and therefore on existing development
- whether adequate house sites and access are available during floods
- whether certain activities should be excluded because of risk to users, e.g., hospitals, schools, accommodation for the elderly, etc.

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Relevant Legislation

5.1 The Civil Defence Act 1983.

5.2 The Resource Management Act 1991.

5.3 The Soil Conservation and Rivers Control Act 1941.

5.4 The Water and Soil Conservation Act 1967.

5.5 The Building Act 1991.

5.6 The Local Government Amendment Act 1996.

Appendices

Appendix A: Legislative Framework

A.1 Resource Management Act 1991

The primary statute under which the natural and physical resources of the Region are managed is the Resource Management Act 1991, (the Act). The Act provides for the preparation of regional plans to assist the Council to carry out any of its functions in order to achieve the purpose of the Act. Regional Plans are to be prepared in a manner set out in the First Schedule of the Act.

The Council and KCDC both have as a function under the Act: the avoidance or mitigation of natural hazards.

The Council has numerous responsibilities under s.30 of the Act including:

(a) The establishment, implementation and review of objectives, policies and methods to achieve integrated management of the natural and physical resources of the region;

(b) The preparation of objectives and policies in relation to any actual or potential effects of the use, development, or protection of land which are of regional significance.

(c) The control of the use of land for the purpose of—

(iv) The avoidance or mitigation of natural hazards.

KCDC has responsibility under s.31 of the Act for:

(a) The establishment, implementation and review of objectives, policies and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district.

(b) The control of any actual or potential effects of the use, development, or protection of land, including for the purpose of the avoidance or mitigation of natural hazards . . .

The Department of Conservation (DOC) and the Council both have jurisdiction over the Coastal Marine Area. DOC, the Council and KCDC have jurisdiction over Local Purpose Reserves. The management of the areas must occur through a co-ordinated approach by all bodies with the interest of the particular environment at the centre of any decision.

Natural hazards are those naturally occurring events that threaten human life, property or other aspects of the environment. Section 2 of the Act defines natural hazards as:

any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property or other aspects of the environment.

The Act provides the framework for the management of the Region by integrated management and managing of effects.

Integrated management is the shared vision of how the nation's resources should be managed between and within agencies responsible for those natural resources. This management practice is in response to the recognition of the holistic nature of natural resources.

Managing effects, or potential effects, requires identifying activities having a significant effect on the environment. Activities that have an effect are those which have the potential to disturb the natural environment.

Part II of the Act contains a number of specific provisions that must be taken into account when considering the use, development or protection of the Region's water bodies and associated floodplains.

Section 5 states the purpose of the Act to be *to promote sustainable management of natural and physical resources.*

Section 6 of the Act identifies a number of matters of national importance the Council must recognise and provide for in managing the use, development and protection of the natural and physical resources. Included is the *protection of the natural character of wetlands, lakes and rivers and their margins.*

Section 7 of the Act identifies a number of additional matters the Council must have particular regard to in managing the use, development and protection of the natural and physical resources. Included is the *maintenance and enhancement of amenity values and intrinsic values of the ecosystems.*

Section 32 of the Act requires councils to be objective in preparing regional plans. In particular, when determining objectives, policies and

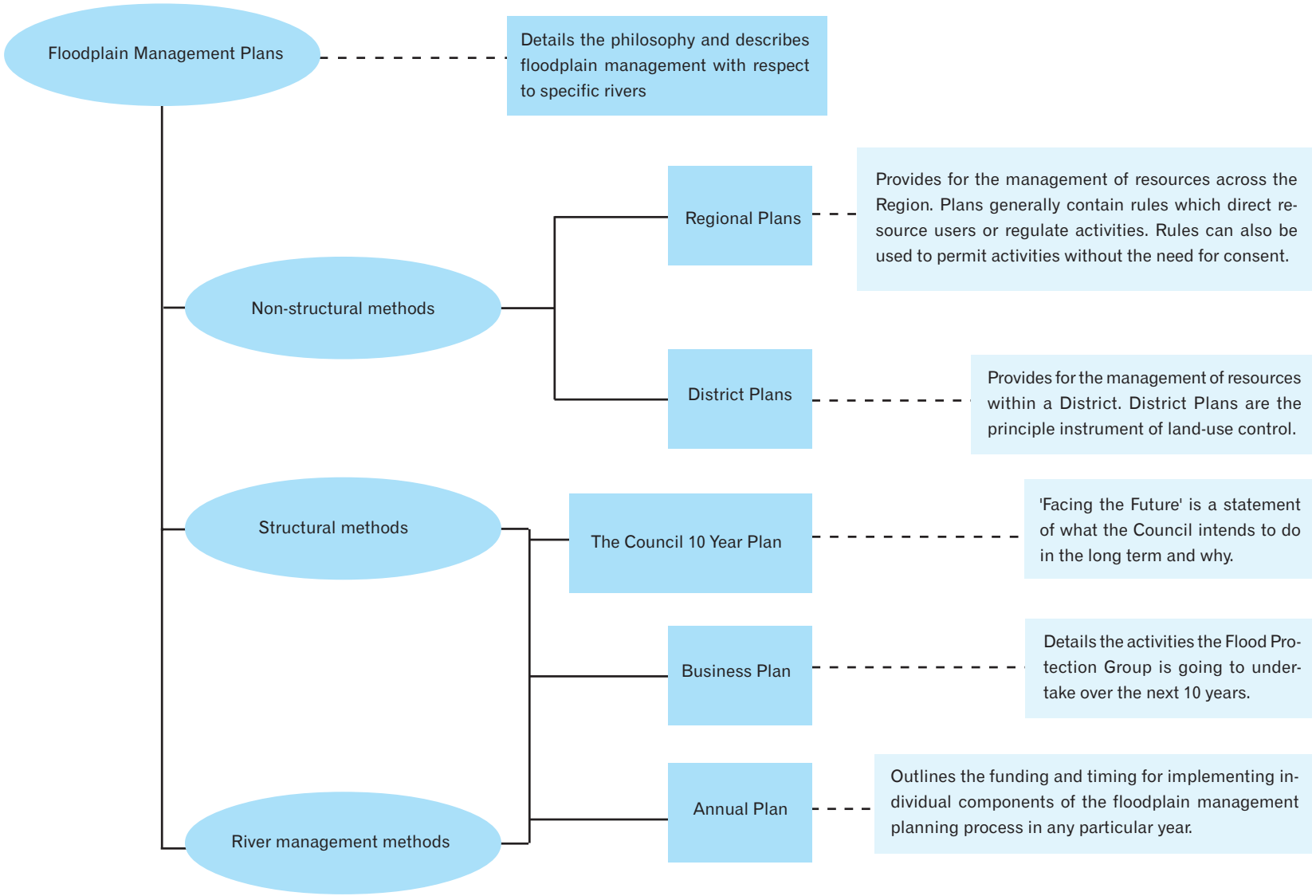

Figure 15: Where Floodplain Management Plans fit in Relation to Other Plans

methods, they must have regard to alternatives that may be available and the reasons for and against options, including their costs and benefits. In the preparation of this Plan, the various options have been discussed with members of the community, and the approach in the Plan is that preferred by the community as a whole.

A.2 Soil Conservation and Rivers Control Act 1941

The Soil Conservation and Rivers Control Act 1941 includes provisions '. . . for the prevention of damage by erosion . . . [and] . . . the protection of property from damage by floods'. Within the general powers (Section 126) of this Act the principal function of every Catchment Board is 'to minimise and prevent damage within its district by floods and by erosion'. These Catchment Boards, whose powers have now been assumed by Regional Councils, have wide powers in relation to watercourses for the purpose of their functions.

Section 126 : General Powers of Catchment Boards:

2. Each Board shall have all such powers, rights and privileges as may reasonably be necessary or expedient to enable it to carry out its functions, and in particular each Board shall have power to construct, reconstruct, alter, repair, and maintain all such works and do and execute all such other acts and deeds, including the breaching of any stopbank, as may in the opinion of the Board be necessary and expedient for—

(a) (Repealed)

(b) Controlling or regulating the flow of water in and from watercourses:

(c) Preventing or lessening any likelihood of the overflow or breaking of the banks or any watercourse:

(d) Preventing or lessening any damage which may be occasioned by any such overflow or breaking of the banks:

(e) Preventing or lessening erosion or the likelihood of erosion:

(f) Promoting soil conservation.

A.3 Building Act 1991

The Building Act 1991 and Building Regulations 1992 provide a performance-based building control system that applies to the construction, alteration, demolition and maintenance of most structures within the Waikanae area. The controls within the Building Act assist in ensuring development is compatible with the prevailing flood hazard, and that the overall level of flood damage will not be increased significantly. Types of controls available through the Act are, for example, setting of floor levels and filling of sites.

Recent case law has ruled that in certain instances the Act can override the Building Act.

A.4 Relationship of Floodplain Management Plans with the Regional Policy Statement and Plans

The Council made the decision that the Region's floodplain management plans would not be statutory documents in themselves. The approach was taken that Regional and District Plans would be used to ensure that the non-structural methods are achieved, and the Flood Protection Group Annual and Business Plans would be used for the structural and river management methods.

Figure 15 summarises the roles of the various Council Plans in implementing the Floodplain Management Plan outcomes:

Regional Policy Statement

The Regional Policy Statement provides an overview of the resource management issues and sets the policies and methods by which Wellington Regional Council seeks to achieve integrated management of the natural and physical resources of the Region. The Wellington Regional Policy Statement became operative on 15 May 1995. The Regional Policy Statement contains objectives, policies and methods covering a wide range of resource management issues, including the mitigation of natural hazards and the management of fresh water. Method 14 in the Natural Hazards chapter requires the Council to implement natural hazards policies through regional plans.

Facing the Future

Facing the Future is a 10 year action plan for the Council. It outlines:

- what the Council plans to do between 1997–2007
- why the Council is going to do it
- what it will cost, particularly the impact on rates
- how the community will benefit
- what challenges the Council will face.

Regarding flood protection, the 10 year action programme includes: the preparation of floodplain management plans, flood hazard assessments and scheme reviews; and the management and improvement of River Corridors, stopbanks and associated flood protection assets.

Flood Protection Group Business Plan

The Business Plan identifies the objectives, financial matters, performance targets and standards for 1995–2005. The objectives of the Flood Protection Group are:

- To promote integrated and sustainable management of rivers and floodplains and the mitigation of flood hazards
- To ensure the ongoing maintenance and effectiveness of waterways, land and assets
- To develop policies for effective river management and flood mitigation
- To implement Floodplain Management Plans and reduce flood risks
- To enable the community to respond to flood risk
- To provide timely flood warning and response
- To manage the Department cost-effectively.

The performance targets in the long term are:

- Floodplain management plans completed for all the major western rivers by 2001
- Flood hazard assessment completed for significant secondary streams by 2002
- Flood hazards reduced to acceptable levels
- Effectiveness of river assets is maintained
- Quality of riverside environments is perceived by the community to have improved
- Improved flood warning and response.

Annual Plan

The Annual Plan is prepared as required under the Local Government Amendment Act 1996. All local authorities must prepare an Annual Plan. The Annual Plan must outline the nature and scope of activities undertaken by the organisation over the financial year, along with the funds required to undertake these activities.

Floodplain Management Plans

Presently, the Council has resolved that Floodplain Management Plans should have no formal statutory basis; rather, they should be used as working guidance documents with respect to carrying out floodplain management, evaluating the options and establishing the overall outcome desired. These Plans are, therefore, non-statutory documents prepared in consultation with the community. In comparison to Regional Plans (that cover a diverse range of issues) the Waikanae Floodplain Management Plan specifically deals with management of the river and providing flood protection measures. At the same time the Plan provides the framework for guiding land use and development on the floodplain.

Regional Plans

The Proposed Regional Freshwater Plan includes objectives, policies and methods to promote the sustainable management of fresh water in the Region. The issue of flood mitigation is raised in Part 3 of the Plan and addresses two aspects of flood hazard:

- the actual and potential adverse effects of flooding as a natural hazard on human life, property or other aspects of the environment; and
- the actual and potential adverse effects that the use of the river and lake beds and the subdivision, use and development of land can have on flood flows.

Methods to overcome these aspects are based around the preparation of Floodplain Management Plans. Policies and methods are to be implemented through these Plans. Floodplain Management Plans will be used as the basis for the Council's approach to floodplain management.

Part 2 of Section 3 of the Proposed Regional Freshwater Plan also addresses the relationship of Maori with freshwater in the Kapiti Coast District. The specific activities and areas of concern are addressed in Part IV of the Freshwater Plan.

The Proposed Regional Coastal Plan deals with most aspects of managing the coastal marine area in the Wellington Region. The Proposed Coastal Plan indicates how the Council seeks to achieve sustainable management of the coastal marine area. For that purpose the Plan details a number of activities which Council considers could occur within the area, and addresses the issue of how appropriate the activities are to meet sustainable management. Several activities discussed are those which are undertaken by the Council for flood mitigation purposes and are therefore discussed in this Plan.

The Draft Regional Landscape Plan addresses landscapes of regional significance, and is concerned with the effects of human activities on these highly valued areas. It contains objectives and policies for managing the effects of use and development on these landscapes. The management of regionally significant landscapes is addressed, and includes both the Waikanae Estuary and River.

The Regional Discharges to Land Plan and Regional Air Quality Management Plan are intended to work in a complementary manner. Discharges to land, water and air may be used in the mitigation of floods. However, activities that would involve such a discharge are not included.

District Plans

Regard must be given to the extent to which the Floodplain Management Plans must be consistent with the Kapiti Coast District Plan. As the Act stipulates flood-hazard mitigation to be a responsibility of both Councils, the Plans must reflect a co-ordinated approach to mitigating the flood hazard.

In this regard the proposed Kapiti Coast District Plan includes restrictions and land use controls, in particular relating to building and subdivision, and maps and zones showing flood hazards. All of these assist in the avoidance and mitigation of the flood hazard.

Appendix B: Phases of Floodplain Management Planning

B.1 Phase One

Phase One definition of the flood problem. The nature, extent and severity of flood hazards were determined, and sociological values of the community, development and the area's environmental issues were recognised. Outcomes are reported in the Phase One summary document (Bibliography 1.13). This document draws together the findings of the detailed reports prepared as part of the documentation of Phase One investigations.

B.2 Phase Two

Phase Two evaluation of the effectiveness of all flood mitigation options. Evaluation included initial selection of some options (or a combination) and used technical, social and environmental databases established in the preceding phase. Factors considered included physical flood conditions, land requirements, costs, benefits and economic efficiency, visual impact, development pressure, and social/community values regarding perceived risk and level of protection. Mitigation methods are those that:

1. Modify the flood event—stopbanks, detention dams, channel improvements.
2. Modify damage susceptibility—zoning and building permit restrictions, flood proofing, flood warning and community preparedness.
3. Modify the flood loss burden—insurance, disaster relief, etc.

Options are described in the Phase Two Description of Options report, April 1993 (Bibliography 2.2). These options were then grouped into combinations of options, in the Combinations Discussion Document, July 1993 (Bibliography 2.5). The report formed the basis for the consultative process, enabling selection and recommendation of the preferred flood mitigation methods.

B.3 Phase Three

Phase Three refinement of the chosen options, taking into consideration an environmental impact assessment. Three reports were prepared which described the detailed investigations into the recommended River Management, Structural and Non-structural methods (Bibliography 3.2, 3.3 and 3.4). An environmental and economic evaluation of these methods was then undertaken (see Bibliography 3.5 and 3.6).

B.4 Phase Four

Phase Four is the drafting of the Waikanae Floodplain Management Plan.

B.5 Phase Five

Phase Five is the Plan's implementation. Theoretically, implementation will occur when the Plan is completed. In reality, the rate of implementation will depend on many factors including how these factors fit with the Council's rolling 10 year plan and the Flood Protection Group's Business Plan.

Certain aspects, such as some of the land use methods have already been incorporated into the Kapiti Coast District Plan. Preparation of the new District Plan was undertaken before the Plan's completion. However, Phase Three investigations had identified land use methods as appropriate, and missing this opportunity would have caused considerable delay in implementing any of the methods. Planning for constructing the Kauri Puriri Road stopbank has proceeded before completion of the Plan. Both stopbanking and land use methods have been identified as being particularly urgent, because of the high risk to a large section of the community.

Appendix C: Regional Civil Defence Operations

C.1 Roles and Responsibilities

The National Civil Defence Act 1983 requires the Wellington Regional Council to maintain a civil defence organisation for the region together with units and services necessary or desirable to enable an effective response to be carried out during a civil defence emergency. If there is a major flood, a regional headquarters will be activated. This will support local response operations in the Wellington Region. Headquarters will have the following purposes:

- To provide a central co-ordination point for regional response efforts in support of local government operations.
- To co-ordinate dissemination of public information.
- To provide a focal point for collecting operational intelligence and damage assessment information regarding the event.

The Regional Civil Defence Headquarters will be activated when it is clear a major flood event is about to or has actually happened, and it will serve as the primary direction and control facility for co-ordinating the regional response to the affected area.

In a flood disaster, Headquarters will provide the following services for the affected area:

- Collect, process and display operational information about the flood.
- Analyse the disaster situation.
- Initially, serve as the primary centre for receiving requests for national assistance.
- Establish regional response priorities and allocate resources within the affected area.
- Request necessary resources from within the Region, and where resources are not available, draw up resource requests for the Ministry of Civil Defence.
- Provide location for primary interaction with Central Government.
- Co-ordinate Wellington Regional Council operations within the region.
- Function as a central point for collecting and co-ordinating emergency public information.
- Co-ordinate the use and deployment of helicopters and planes.

C.2 Organisational Concept

- A large number of functions, organisations and departments will operate during a major disaster.

The National Civil Defence Plans identify a number of essential functions:

- Operations
- Intelligence
- Emergency Public Information
- Transport
- Welfare
- Communication
- Rescue
- Medical
- Public Health
- Energy
- Supply
- Warning Systems
- Law and Order.

Civil Defence operations are designed to clearly establish priorities for response, and to meet local government requirements for support in the most effective manner possible.

Some government agencies/organisations already have functioning emergency management systems and emergency operating centres. Some government agencies/organisations may elect to operate some of their co-ordination functions from their own facilities. However, because of the problems caused by a major flood, the involvement of many organi-

sations and the need to address lots of policy and priority issues and maximise co-ordination, it is vital to have all major emergency management functions at one location. The Regional Civil Defence Headquarters satisfies that function.

C.3 Priority Setting and Resource Allocation Decisions

A major flood in the Wellington Region will require resources to be used as effectively as possible. The potentially widespread effects of the flood may require prioritisation of resources to meet the most critical needs, so it may be some time before local operations are fully resourced.

The Regional Controller, Situations Manager (assisted by the Liaison Advisory team) will continually evaluate and establish response priorities and when necessary, determine local allocations. Allocation decisions about incoming resources and supplies will be made on the basis of the highest priority lifesaving needs. A 'first come, first served' philosophy will NOT be followed.

C.4 Region Action Planning

The Regional Controller, Situations Manager and Liaison Advisory Team should meet periodically for situation briefing, action planning and setting of overall response priorities.

At the end of each Planning meeting a time-frame for subsequent meetings and assigned tasks should be established.

Planning sessions should start with a brief situation summary from the Situations Manager. Major problems requiring regional support should be identified and response priorities established. Resource needs over and above those currently planned should be determined and persons/organisations allocated to secure those resources.

C.5 Disaster Intelligence and Situation Analysis

The Regional Headquarters is the primary point for receiving and analysing all incoming Disaster Reports from local Civil Defence Headquarters, Liaison/Advisory Team members and other reporting sources. Current information will be displayed in the operational area, reports will be prepared as required. Headquarters will summarise situation information on available committed resources.

Forecasts and projections will be developed to cover future requirements as determined by the Controller and the Planner.

C.6 Communications

How well the Regional Headquarters fulfils its mission depends on how well it communicates with its sub-area Headquarters and local Civil Defence organisations within the affected area.

In a very serious flood emergency some communication systems may be damaged or overloaded.

Regional communications will be immediately activated and begin the process of establishing functional communications utilising whatever means available.

The Regional Controller in conjunction with Telecom will draw up restoration priorities for non-operational systems.

C.7 Regional Headquarters Organisation and Staffing

The initial staff responding to and activating Regional Headquarters will consist of Regional Council staff available during the flood.

A staff roster system will be implemented as soon as is possible.

Additional personnel to augment the Regional Headquarters may be requested by the Controller, using the Commissioner support team system.

C.8 Public Information

The Media Liaison Officer reports to the Situations Manager and co-ordinates all aspects of the public information—to ensure the release of consistent and non-conflicting information. A joint information centre may be activated in co-operation with the Ministry of Civil Defence. Other public information activities may take place in the affected area.

C.9 Flood Protection Group

The Flood Protection Group will liaise with the Controller on the current situation and the relevant management strategies of the Flood Protection Group.

The Flood Protection Group will:

Agency	*Primary Task*
New Zealand Police	Standard Police Procedure.
Land Safety Transport Authority	Protection of motorists and other road users; defining alternative routes; controlling entry into affected areas.
New Zealand Fire Service	In the event of any alarm of fire or any fire happening within a Fire District, or within any area or concerning any property which the fire brigade is under an obligation to protect, the Chief Fire Officer, or in his absence the Deputy Chief Fire Officer, or, in the absence of both of them, the person for the time being in charge of the fire brigade, shall forthwith proceed himself, or direct some other member of the brigade to proceed, to the place to which the brigade has been called, and endeavour by all practicable means to extinguish and prevent the spread of the fire, and to save lives and property in danger.
Wellington Free Ambulance	Pre-hospital care and transport for sick and injured.
Life Flight Trust, Westpac Helicopter	Heavy lift, rescue, reconnaissance.
Electric Power Liaison	Make safe and restoration of power supply.
Gas Liaison	Make safe and restoration of gas supply.
Capital Coast Health	(1) Board Office: regional co-ordination of resources, Medical Officer of Health, Public Health, publicity and information to public, co-ordination with Regional Civil Defence. (2) West Coast: care for staff and patients in hospitals, Co-ordinate and maintain medical and surgical services, prepare for reception of casualties or patients relocated from other hospitals, maintain public health, co-ordinate with District Civil Defence.
Wellington Harbours Department	Positioning of afloat rescue craft.
Transit New Zealand	Assist Controller and determining priority restoration order of highways.
Housing New Zealand	Housing of displaced persons.
Insurance Council of New Zealand	To bring into operation the insurance emergency service plan into action.
Inter-church Trade & Industry Mission	To look after the welfare needs of Headquarters staff.
Plunket	Care and advice to the caregivers of children under 5 years.
Pollution Control, Waste Management & Consents & Investigations Depts. The Council	Assess pollution of natural waters.
Public Information/Media Liaison	Activate and run emergency Public Information Section.
NZ Red Cross	Supply emergency clothing/blankets. Provide a team of people trained in light rescue, first aid, emergency welfare and catering.
Flood Protection Group, The Council	**LEAD AGENCY**. Assess available information, make predictions, provide warnings to appropriate agencies.
GNS	Advise on seismology, earth deformation, land stability.
Salvation Army	The provision of catering services to civil defence personnel, displaced people, workers in the field, welfare centres.
SPCA	To co-ordinate the rescue of ALL animal/bird life and supply the necessary holding facilities.
Telecom	Provision of public telecommunications services.
The Council Operations	Bulk water, rural fire, flood protection, forestry.

Table 8: Civil Emergency Support Organisations

- Provide regular updates of current situation.
- Brief the Controller, Advisory/Liaison staff, and media as requested.
- Work with the Public Information Officer.

C.10 Purchase and Supply

The Purchase and Supply Section, staffed by Wellington Regional Council personnel, is responsible for obtaining resources that are not available from within those organisations/government departments assisting with the emergency. These would include, but are not limited to, bulk food supplies, petroleum fuels, heavy equipment and consumable supplies. This Section is also responsible for maintaining records of purchase/title.

Appendix D: Kapiti Coast Disaster Response Procedures

D.1 Civil Defence Plan

The objective of the Kapiti Coast Civil Defence Plan is . . . *to set out the prior arrangements to be made and the responsibilities to be exercised by or on behalf of the Kapiti Coast District during a state of National, Regional or District Civil Defence Emergency* . . .

The plan deals specifically with those actions necessary to . . . *reduce the loss of human life, to care for the injured and to help those in distress as a result of a disaster whilst a state of emergency continues* . . .

It identifies personnel authorised to declare a state of emergency, as well as the Civil Defence Controllers and their respective authorities and roles.

Civil Defence also gives information on:

- warning systems
- law and order
- the fire service
- medical and public health
- public information
- welfare
- transportation
- communications
- energy—gas and electricity
- supply
- requisition of property
- rescue procedures.

D.2 Civil Defence Standard Procedures Instruction Manual

This manual outlines the procedures for the Kapiti Coast Civil Defence Headquarters. It details the following:

- organisation
- activation procedures
- operational responsibilities
- communication facilities
- information management systems.

The functions of the District Civil Defence Headquarters are . . . *the collection and dissemination of information on the nature and extent of the emergency, and the co-ordination of the use of the local resources of government departments, other government agencies, liaison services and assistance from any other quarter in meeting a situation beyond local civil defence capabilities* . . .

The manual identifies and details the roles of all those council staff, staff from other agencies, and volunteers, who may be called upon during a Civil Defence emergency. Instructions on the procedures to be followed cover:

- casualty
- rescue
- Controller support
- chemical/dangerous goods
- tsunami warnings
- people and their animals
- neighbourhood support
- flooding and heavy rainfall warnings
- public information
- supply
- transport
- Commissioner's support teams
- finance and emergency expenditure
- evacuation principles and considerations.

D.3 Existing Civil Defence Procedures in the Event of a Flood

Disaster response and planning is currently organised on a geographical basis, with different groups operating in Waikanae and Otaihanga. This separation is for a number of reasons: physical separation of the floodplain caused by the river, separate communities of interest, and the differing networks that operate in each area.

KCDC has set up a network of 93 neighbourhood support groups, one designated person from each group being responsible for contacting the other members of the group in an emergency. The Civil Defence Network is responsible for co-ordinating responses to all types of disasters, and has methods in place to provide disaster response in the event of a flood (Figure 16).

Sirens are also located throughout Waikanae, at North Beach, Te Moana Road, the fire station, Otaihanga and across the State Highway 1. These sirens are for use in any civil emergency.

The Council has responsibility under the Civil Defence Act (1983), to co-ordinate and prioritise the use of resources and personnel made available from emergency services, government departments, private industry, and territorial authorities not involved in the emergency. This role is undertaken by the Civil Defence Controller.

The Council is responsible for co-ordinating the processing of disaster intelligence and the release of public information. A more detailed explanation of the roles, responsibilities and procedures is given in Appendix C: Regional Civil Defence Operations.

In a flood, the success of the disaster response methods depends greatly on the level of community support and awareness. Direct community involvement is therefore encouraged. To this end, KCDC, has enlisted the support of the existing network of community or neighbourhood support groups.

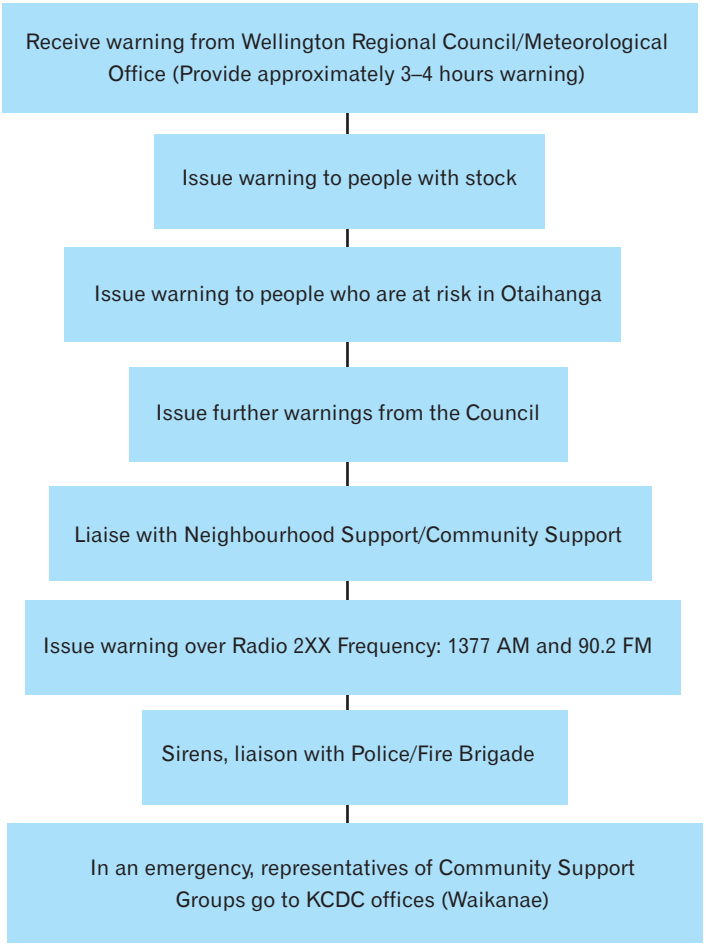

FIGURE 16 : CIVIL DEFENCE EMERGENCY PROCEDURES IN A FLOOD

D.4 Disaster Recovery

Part Two of the Civil Defence Plan addresses the issues related to recovery. The priorities for disaster recovery are:

- Safety of people
- Social restoration

- Economic restoration
- Physical restoration.

In line with the National Civil Defence Plan guidelines, KCDC is establishing a Kapiti Coast Emergency Relief Fund that is . . . *designed to act as the central focus for contributions made by the public to assist the victims of an emergency.* KCDC is also a member of the Local Authority Protection Plan (LAPP) which is a mutual scheme for local authorities, providing disaster funds for recovery and emergency financial relief.

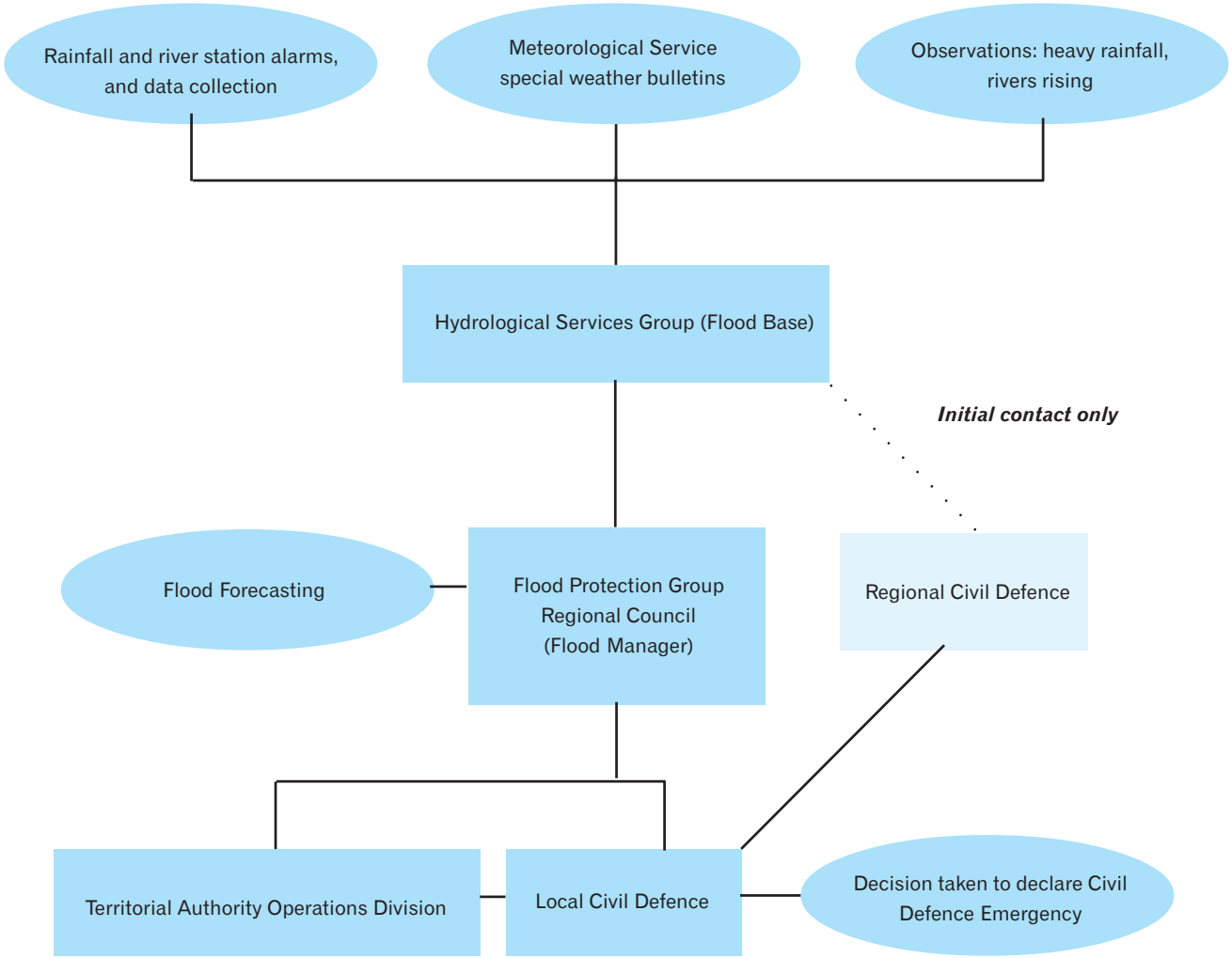

Figure 17: Overview of Flood Warning System

Appendix E: National Recovery Plan

E.1 Role of Central Government in Disaster Recovery

The purpose of the National Recovery Plan, 'Natural Disasters and Emergencies within New Zealand', is to help communities resume their normal activities. The role of Central Government is to supplement that of the Regional and Territorial Authorities, and is the minimum assistance required to restore the community capacity for self-help (Bibliography 4.13).

E.2 Principles of the National Recovery Plan

The emphasis of the Recovery Plan is that of Risk Management. The Regional and Territorial Authorities are encouraged to undertake risk assessments, asset management and to have financial provision in the event of natural disasters. The Government's financial assistance policy is primarily . . . *a mechanism for reimbursing and subsidising disaster recovery costs after the event* . . . (Bibliography 4.8 and 4.17). The main principles of the Recovery Plan are:

- Initial and primary responsibility rests with the local community.
- Individuals, businesses and local authorities must insure themselves and minimise the risk.
- Government has a role after major events.
- Government helps restore community capacity for self help.
- Government encourages proper management practices:
  - *insurance (community and individual assets)*
  - *reserve funds (businesses and local authorities)*
  - *mitigation methods.*

The role of local authorities is stressed, namely:

- Minimising the chance of an adverse event occurring, where possible, especially where natural disasters might trigger subsequent effects
- **Mitigating** the consequences of an event, should it occur, through sound engineering and construction, and careful maintenance
- **Managing** the risk with appropriate financial and operational provisions.

(Bibliography 4.8 and 4.13)

E.3 Conditions of Assistance

Central Government assistance will only be provided where:

- *there is a statutory requirement for action or a need to invoke a statute to achieve the desired ends; or*
- *recovery procedures cannot be carried out without Government assistance; or*
- *Central Government help will aid the co-ordination of the process significantly; or*
- *there are advantages of economies of scale.*

(Bibliography 4.8 and 4.13)

Assistance from Central Government is generally only given for the reinstatement of 'essential services', and even then only when it is not financially viable to insure those services. In these cases, Central Government will meet 60% of the costs once a threshold limit has been passed. The threshold is 0.002% of the equalised net capital value of the services and assets. In summary, financial assistance will only be given where it is considered appropriate that the taxpayers of New Zealand as a whole should contribute to the restoration of a community's capacity for self help.

E.4 Types of Central Government Assistance

Central Government assistance normally takes the form of:

- *emergency feeding, housing and welfare*
- *transport for evacuation*
- *restoration of Government services and facilities*
- *assistance with some other services and facilities if uninsurable or if urgently needed*
- *expert advice and temporary labour to speed clean-up*
- *co-ordination of response from Central Government and appointment of Recovery Co-ordinator.*

Appendix F: Flood Warning System

F.1 Summary of Existing Flood Warning System

The Data Collection Network records data in the field and transmits it to the flood base, at the Wellington Regional Council Centre, for flood forecasting. Forecasting begins before the flood and continues for its duration.

In a significant flood event, the Flood Manager disseminates information directly to the regional and local civil defence organisations. Other information pathways include radio, television, telephone and other public organisations, who, after receiving a flood forecast, disseminate flood warnings to people potentially affected. Those who receive flood warnings then determine the degree of response needed, and the actions and responses needed.

Public warnings are issued by:

- MET Office (Heavy Rain Forecast)
- Flood Protection Group, Wellington Regional Council (Flood Warning)
- Kapiti Coast District Council (Surface Flooding, Stormwater, Slips, etc.)
- Police (Road Closure, Delays etc.)

F.2 Flood Detection

Flood Detection starts with the detection of heavy rainfall capable of leading to an increase in river levels. Several methods are available to predict if and how river levels may react to a heavy rainfall event, such as manual estimations, computer modelling, and past experience. The Council currently uses telemetered river level recorders and telemetered rainfall information to provide the necessary data to predict river levels and hence a flood. The Council is in the process of implementing a *real time flood forecasting model*. Once this model has been validated it will provide more accurate computer-generated estimates.

F.3 Flood Warning Time

The warning time is how long a person subject to a flood has to react. The warning is determined by a combination of flood detection and recognition, plus the time taken to issue warnings and take action. The warning time in Waikanae is generally quite short (about two and half hours from when the alarms activate).

Improving warning times is difficult due to the nature of the Waikanae River Catchment. Consideration could be given to basing alarm settings on rainfalls over one hour's duration. Alarm settings are based on 15 mm/2 hours at Warwick's and Kapakapanui gauges. Changing alarm settings is currently being looked at by the Hydrological Services Group and Flood Protection Group.

F.4 Back-Up Systems

Two flood gauges do have separate communication systems but the possibility still exists that one or both of them could fail. If one gauge fails, information for the flood forecasting model is reduced, resulting in less precise information. If both gauges fail, rainfall information alarms may not be received. Installing a back-up rain gauge system is recommended to ensure flood warnings remain as accurate as possible.

Current forecasting is based on New Zealand Meteorological Service special weather bulletins, information from the Warwick's and Kapakapanui rain gauges and monitoring of the water levels at the treatment plant recorder. The Council then advises KCDC. These procedures currently work satisfactorily; however, planning for more severe events is recommended.

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