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Introductory Statements

The following introductory statements are to assist readers to understand the context and key messages contained in this plan.

- Living next to the river, farmers and residents are aware of the risk from flooding. These people have lived with this risk for a long period of time and to some degree there is some acceptance of this risk. Some landowners currently have a high risk of flooding for their property and will continue to do so.

- This document is a Draft Floodplain Management Plan (FMP) for consultation purposes, to obtain feedback on the proposed approach to floodplain management for the Waiohine River. The document will be finalised in response to this feedback.

- The 1 in 50 and 1 in 100 year flood hazards used in this Draft FMP include an allowance for the effects of climate change. This allowance for climate change results in an increase in the size of flood from that estimated for the present day. This allowance has only been added to the 1 in 50 and 1 in 100 year return period events.

- Greater Wellington Regional Council (GWRC) is fully supportive of access for residents along its stopbanks, but GWRC accepts landowners’ rights in these matters. If all the landowners were in agreement in providing access, then access would be available for residents.

- Indications of the rating cost for Greytown residents will be made available as part of the consultation process, but this information is not included in this draft FMP document.

- The river is to be managed within a defined design channel alignment. We are taking steps to reduce the impact of instream bulldozer work, but we will continue to use bulldozers in the active river channel.

- The Apple Barrel Floodway will still operate but only in larger than 1 in 50 year flood events. This is an improvement on the existing lower than 1 in 20 year event operation of the floodway. Some minor upgrading work will be completed along the southern side of the Apple Barrel to manage the effects of a 50 to 100 year flood.
Executive Summary

In severe rainfall events, the Waiohine River floods, which can cause major environmental and emergency management issues for residents living on and around its floodplain. The results of flooding can be devastating and cause damage to property and community assets in the area.

This Floodplain Management Plan (FMP) represents many years of investigating the most appropriate comprehensive and long-term approach for managing the flood and erosion risks to both rural and urban land on the Waiohine River floodplain. This process has involved the assessment of various options based on practicality, cost, environmental impact, views/needs of the community and legislative and policy requirements.

This FMP has been released as a “draft” version in order to allow the community and key stakeholders to make final comments before formal adoption of the Plan. Once adopted, the document is the “blueprint” for the ongoing and future flood and erosion works on the Waiohine River.

The primary measures contained within this FMP are a package of river channel management, structural works, non-structural measures and emergency management responses. This plan has been put together by Greater Wellington Regional Council (GWRC) working with South Wairarapa District Council (SWDC) and Carterton District Council (CDC), and in consultation with Ngāti Kahungunu ki Wairarapa and Rangitāne ō Wairarapa, and the wider community.

The day to day management of the river channel will be done by using a combination of tried and tested measures, including using vegetative buffers and placing gravel to control erosion and manage alignment within a river design fairway.

However, the FMP also promotes changes to some sections of the river by building more permanent rock structures and establishing larger vegetated buffers in order to reduce the need to frequently use smaller rock or have a bulldozer often working in the river channel.

The structural works proposed in the FMP are designed to provide for a level of protection against a flood event of 1 in 100 year for the majority of the urban areas in Greytown (the current level is 1 in 20 year protection) and to provide a varying level of protection to the rural community. The FMP uses a combination of existing structures, but also introduces new stopbank structures to be built by GWRC in order to focus protection on key flooding areas around Greytown. Most new stopbanks are already designated in the Wairarapa Combined District Plan (WCDP) enabling their construction.

The existing stopbank on the true left (north) bank (TLB) upstream of the State Highway 2 Bridge presents a management challenge. The FMP process has identified that this stopbank would be vulnerable and potentially inadequate in a serious flooding event or series of events and this, coupled with increasing maintenance costs, mean that it eventually may be retreated. While this FMP puts in place plans to remove the existing houses on the inside of Fuller’s Bend and build a new section of stopbank behind the former locality of those houses, it is recognised that the remaining lengths of stopbank are not in an ideal location due to the risk from erosion. Because of this, this FMP proposes that a future designation is recognised within the WCDP to allow for the rest of the TLB stopbank to be realigned.

A range of non-structural measures are also proposed to guide the long-term management of the floodplain. This FMP puts forward a future direction for refining the land use planning controls of the WCDP in areas at risk from flooding and erosion. Other non-structural measures include:

- Working with infrastructure/utility providers to ensure that, as a minimum, critical infrastructure or vulnerable development should be avoided in certain parts of the floodplain;
- Using managed retreat in vulnerable parts of the river bank, for example the purchase of properties at Fuller’s Bend;
- Providing a hazard advice service to residents, District Councils and others to help them make informed decisions about risk;
- Maintaining the river to support its environmental quality.

The emergency management component of this FMP will follow what is already in place relating to the role of Civil Defence, emergency management programmes, preparedness etc, but also seeks to develop improved flood warning systems and update and improve the existing emergency planning in the area.

An environmental strategy will be prepared to provide a masterplan for the enhancement of the Waiohine from the rail bridge to the confluence with the Ruamāhanga River. The strategy will be a blueprint that is implemented by a range of organisations and the community.

This FMP is intended to be a long term plan and living statement of the approach to flood management on the Waiohine floodplain. It will be reviewed and refined during its lifetime to ensure that it remains fit-for-purpose and relevant.
At a glance – what is proposed?

The Waiohine River has been broken into five separate reaches which allows the existing conditions and problems to be isolated into specific geographic locations. This FMP looks at these reaches and introduces a specific “design standard” for each reach that involves river management works (such as moving gravel within the river) and a mix of specific structural flood protection works (such as rock bank protection) and non-structural measures (such as vegetative buffers). The proposed works are summarised as follows (further details are contained in Section 6 of this document):

Reach A - Waiohine Gorge to the Rail Bridge
The primary works within this reach are expanded vegetative buffers on both banks. Minimal in-stream channel alignment work, as well as minimal rock edge protection is proposed. Rather than introducing new structural measures, the existing small stopbank that sits within the design channel on the true left bank (currently used for river alignment training bank purposes) will continue to be managed as a river alignment measure. The existing true right stopbank will also be maintained for the time being, however at some point in the future, the on-going maintenance of this structure will be reconsidered.

The works will continue to provide a 20 year flood protection level of service to land behind vegetative buffers.

Reach B - Rail Bridge to the end of Kuratawhiti Street
The key aim within this reach is to continue the existing long-term programme of river design though the use of vegetation buffers and to expand these along the full length of both sides of the river. Notwithstanding this buffer expansion, in some parts of the river, vegetative buffers alone are not always effective, for example, where there are high/steep banks. If the vegetative buffer is not fully effective, in-stream channel work (cross blading) and light rock protection (rock rip-rap or small specification rock groynes) will be implemented along with managed, sustainable gravel extraction to control erosion.

The main physical work in Reach B is a new 100 year stopbank on the true right bank. This new stopbank would extend 2.5km in length from the end of the existing stopbank at the end of Wood Street downstream to The Wire Shed.

Reach C - Kuratawhiti Street to State Highway 2 Bridge
The intention in this part of the river is to ensure that the vegetative buffer along both sides of the river is achieved as planned in the river design that has been in place for over 10 years. It is considered that a focus on fostering vegetative buffers in this reach will provide the most sustainable and appropriate long-term management approach. Nevertheless, it is recognised that in some parts of the river, vegetative buffers alone are not always effective, for example, where there are high/steep banks. If the vegetative buffer is not fully effective in Reach C, in-stream channel work (cross blading) and light rock protection (rock rip-rap or small specification rock groynes) will be implemented along with managed, sustainable gravel extraction to control erosion.

Fuller’s Bend is a particularly challenging area of Reach C. In the long-term, it has been identified that the entire (existing) TLB stopbank will need to be realigned further back from the river edge to provide an increased level of security. To do this, a new designation would need to be included in the WCDP to recognise these future works. The commitment to a future designation is a key initiative of this FMP. In the meantime however, the existing stopbank will continue to be maintained for as long as this is considered to be a sustainable option.

To address the flood and erosion risks at Fuller’s Bend, a mix of measures are proposed:

1. Vegetation buffer widening that would involve the removal of three existing houses on the TLB to allow for a future (to-be-designated) stopbank to be built as and when required. The increased buffer will increase flood flow capacity and significantly relieve flood and erosion pressure on the TRB.

2. Additional property purchase on the TLB at Fuller’s Bend to allow for the re-alignment of a short section of stopbank.

3. New rock protection may be required on the current TLB. This would only be carried out if the existing TLB required additional defence as part of its on-going maintenance. The existing stopbank on the true left bank will not be raised.

4. Rock protection will be carried out on the TRB to enhance the protection of the 100-year stopbank. This rock protection would involve building a berm out into the river. This berm would bury the existing rail fence and would consist of a 20 tonne per linear metre rock revetment for about 500m along the river bank.

5. A new 50 year stopbank on the TRB which would extend from The Wire Shed and connect to the existing Fuller’s Bend stopbank (1.5km in length). The stopbank would be approximately 165m from the river edge for the majority of its footprint with a tapered alignment approaching a more narrow alignment. This allows it to join with the Fuller’s Bend stopbank, which ranges from 15 to 30 metres from the river design channel edge.

In-stream channel works in the form of gravel extraction and cross blading would continue in order to manage localised river bank erosion threats.

Drainage improvement works would be carried out to the west of the urupā site, adjacent to State Highway 2. This drain would not reduce flooding, but would improve the speed and efficiency of drainage from this important cultural site.
Reach D – State Highway 2 Bridge to Ruamāhanga Confluence

No major rock protection works are proposed, however small specification rock groynes may be used where appropriate to strengthen the vegetative buffers. Work will focus on continuing the vegetation edge protection, while also widening the channel to the intended channel design width adopted in the early 2000s. This will involve vegetation removal to increase the channel capacity. To achieve this, vegetative buffers will be retained and expanded (i.e. river retreat) at various locations along this reach. In addition, gravel extraction is proposed throughout this reach to maintain channel capacity. Gravel extraction demand will be directed to this reach whenever possible due to the challenges of sustainable extraction in upstream reaches.

The culvert and floodgate at the Muhunoa Stream outlet is currently performing well but may be a maintenance cost in the future, as it may be vulnerable to rust and failure. The performance of these structures will be monitored as part of the day to day maintenance operations.

A significant re-positioning of the TLB stopbank is proposed in this reach to relieve overtopping and failure risk to this structure. This is also expected to relieve overflow potential of the TRB. In addition, the stopbank on the TRB will have a sill overflow installed to minimise damage to the stopbank during overtopping flood events.

Mangatarere Stream and tributaries

For the majority of the Mangatarere, Enaki, and Kaipatangata River sections of the scheme there will be no change to the status quo management that has occurred. This involves:

- Vegetative buffers will be used as the primary tool to control river alignment.
- No major rock protection works are proposed, however small specification rock groynes may be used where appropriate to strengthen the vegetative buffers.
- Drainage improvement works will be carried out to the west of the urupā site, adjacent to State Highway 2. This drainage work would not reduce flooding, but would improve the speed and efficiency of drainage from this important cultural site.
- Gravel extraction may be used in this reach, where sustainable, to maintain channel capacity.
- Wet gravel extraction from the Kaipatangata River at the Dalefield Road bridge will continue in order to maintain channel capacity.

Near the Waiohine confluence and State Highway 2 area, works within the Mangatarere Stream and Beef Creek will focus on in-stream channel works (channel dredging and berm lowering) and river edge works in the form of vegetation removal. These works would be carried out on an ‘as needed’ basis to maintain channel capacity and reduce nuisance flooding in the Matarawa Road area. These works are not proposed to provide any significant drainage improvements in large flood events (over 20-year events).

No other structural measures, such as new or upgraded stopbanks, are proposed.

There are some significant issues in this reach that have not been the focus of this FMP. It is intended to address these issues with further investigations and either a Mangatarere specific FMP or an amendment to this FMP.
What is proposed at a glance

- **Proposed Repositioning of Stopbank**
- **Proposed Property Purchase and House Removal**
- **Proposed New 100 Year Stopbank**
- **Proposed New 50 Year Stopbank**
- **Proposed New Rock Protection**
- **Proposed Sill Overflow Installed to Existing Stopbank**
- **Maintain and Expand Vegetation Buffers**
- **Proposed Property Purchase and House Removal**
- **Existing Small Stopbank to be Maintained for Time Being, but Reconsider in Future**

**Key**
- Reach Boundary
- Buffer Corridor (proposed)
- Stopbank (proposed)
- Stopbank (existing)
- River Channel

**Legend**
- Flood Hazard (proposed)
- Ponding
- Residual Ponding
- Overflow Path
- Residual Overflow
- River Corridor
1. Introduction

Known in te reo Māori as Wai o Hine Wairaka, which translates as “water for his woman”, the impressive Waiohine River is a large waterway that begins its route to the Waiohine Plains in the main mountain range in the lower North Island — the Tararua Ranges.

From its tussock topped headwaters beginning at Arete Peak at an elevation of 1505m, the Waiohine River makes its journey in a south easterly direction through the Tararua Forest Park flowing through predominately narrow gorges with podocarp bush clad sides. The confined nature of the rock gorges in these upper parts of the catchment means that the gradient of the river is steep and fast for much of its time in the Tararua Forest Park, although it does have spells of calm in the sections of floodplain opening into valleys with beech forest and grassy clearings (in particular Totara Flats). The river emerges out of the Tararua Forest Park through the Waiohine Gorge, where it reaches the alluvial gravel deposits of the Wairarapa Plains farm land. It is at this point that the flow of the river changes to a lower gradient as the river spreads out and winds its way through the flat expanse of the floodplain farm land.

Upon reaching the Wairarapa Plains, the Waiohine River is also joined by a major tributary, the Mangatarere Stream, which is sourced in the foothills of the Tararua Ranges and has a catchment of 157 sq km providing considerable movement of water into the Waiohine flow. Another notable tributary is the spring-fed Muhnua Stream and the smaller Beef Creek. By the time the Waiohine River reaches its confluence with the Ruamāhanga River, it has flowed through several hydraulic regimes and travelled a distance of about 44km with a total catchment area of 378 sq km.

It is this lower part of the Waiohine River catchment, between Greytown and Carterton, with its characteristic semi-braded river channel, gravel beaches and large river stones, that most people recognise as the “Waiohine River” and connect with. It is also this part of the river catchment with expansive floodplains that has experienced the most change over time through rural activities and urban settlement. Consequently, these changes have increased the risks to people and property from flooding events and therefore it is the Waiohine River and Mangatarere Stream catchments that are the focus of this Floodplain Management Plan.

River alignment and flooding

The Waiohine River has naturally flooded for many thousand years forming its own river bed by depositing its own sediment and forming the broad flat plains. But since the early settlement of the area, the natural flooding behaviour of the river has become an issue for the human inhabitants of the floodplain. There are many reasons why the river floods, but it is the combination of three main factors that cause this to happen: heavy rain, river alignment and vegetation/debris constriction within the river channel.

The amount of water that the Waiohine River receives is heavily influenced by the weather hitting the upper catchment of the river in the Tararua Ranges. During storm events, rain can come from large trough (frontal) systems, north Tasman Sea depressions and ex-tropical cyclones. Also, westerly winds can result in intense rainfall in the mountain range. These intense rainfall events result in rising river levels causing down-stream flooding in the Wairarapa Plains.

In terms of river alignment, the channel width and shape of the Waiohine River is influenced by changeable hydraulic regimes located at various places along the length of the waterway. As with many rivers of this type and scale, historic data shows that the Waiohine has flowed along many different alignments, migrating extensively across the floodplain over time. Records show that at one stage the river path ran directly through the northern part of what was to become Greytown. Since 1880 the river has remained close to its current alignment, thanks to a reasonably settled river channel and active intervention through river management.

It is known that the river’s alignment and flooding behaviour has also been influenced in the past by earthquake activity, notably the Wairarapa earthquake of 1855 which resulted in a long spell of unsettled alignment and flooding, with flood and erosion protection works beginning on the river as early as 1877. Other notable flood history includes a series of floods in the 1950s when the Waiohine River and nearby Mangatarere Stream burst their banks and caused widespread damage, including the 1955 inundation of the main street of Greytown. A further series of floods took place in the 1980s which saw the Apple Barrel Floodway inundated and flowing, with additional flooding to a number of farm houses.
Living on the floodplain

Although flooding can have devastating impacts on people and property, from a geological perspective, one of the positive consequences of many thousands of years of flooding has been the Quaternary alluvial gravel deposits. These deposits have resulted in floodplain ground made up of fine sandy loam and silt loam soils making the area ideal for agricultural purposes. Agricultural use of the floodplain land has been a strong theme since early human contact.

Looking back to early tangata whenua activity in the area, it is evident that Ngāti Kahungunu ki Wairarapa traditionally used the soil, vegetation cover, and river channel of the Waiohine floodplain to support settlement and life. Pāpāwai Marae near the confluence of the Waiohine River and the Ruamāhanga River has been the home to Wairarapa Māori for hundreds of years. This Marae is significant for a number of reasons, including as the seat of the first Māori Parliament.

The value of these natural resources were realised centuries later by European settlers in the 1850s who cleared the plains of the native podocarp/beech forest vegetation. Then they used the underlying fertile soils for horticulture, market gardening and farming activities. Naturally following after the establishment of rural communities, were the supporting urban settlements of Greytown and Carterton.

These days the floodplains continue to be influenced by the interaction between the natural and physical resources and human activities and are seen as an important asset to the Wairarapa region. Indeed, rural character, amenity values and productive use of rural land resources (i.e. the Waiohine floodplain) help underpin the social, economic, and cultural wellbeing of the region.

While rural activity dominates the Waiohine floodplain, changes to the urban community of Greytown also had ramifications for the long-term floodplain management planning of Waiohine River. The Greytown community has gradually changed over the years from a rural township to one with a growing emphasis on weekend, lifestyle and retirement living. The development of Greytown within the last 20 years has resulted in an increase in potential damage from flooding.

The river is well used for recreational purposes, although access is limited in places. Watersport activities such as white water rafting and kayaking occur, generally in the upper reaches above the Rail Bridge. Further down the river is popular for swimming where there is public access. The Waiohine River has good values for anglers, particularly in the upper reaches. Walking along the river banks is also popular where public access is available.

As mentioned above, local tangata whenua also have an important association with the Waiohine River. The iwi authorities of Ngāti Kahungunu ki Wairarapa (Ngāti Kahungunu) and Ngāti Rangitāne o Wairarapa (Ngāti Rangitāne) represent these Māori interests. Māori view river systems as being vital to people’s existence. In the traditional sense rivers in general provided food and a means of transport, but they were viewed as ‘the blood veins of Papatuanuku’, which gave life and sustenance to all. In the Wairarapa, tangata whenua continue to be the holders of traditional knowledge and practices that are based on a special relationship with rivers and the Waiohine is no exception. Customarily, Ngāti Kahungunu have viewed the major flooding events of the Waiohine River as an opportunity to develop aquaculture and work wetlands for trading and gifting purposes. Today, this iwi continue to view the river holistically and act as kaitiaki of this tribal area and therefore have provided input and cultural guidance to this Flood Management Plan.

To help FMP users understand some of the terms used and described in this document, a glossary has been provided in Appendix 1. Likewise, a considerable number of technical documents have informed the content of this FMP and they are listed in a bibliography contained in Appendix 2.

1.1 What is the Waiohine Floodplain Management Plan?

The Waiohine Floodplain Management Plan (FMP) applies to the section of the Waiohine River and Mangatāreere Stream that flow across the Wairarapa Plains. The Wairarapa Plains are in the lower half of the catchment at the point where the river exits the Tararua Ranges through the Waiohine Gorge, approximately 6km northwest of Greytown. This part of the Waiohine River catchment is jointly managed by Greater Wellington Regional Council (GWRC), South Wairarapa District Council (SWDC) whose jurisdiction is to the south of the river, and Carterton District Council (CDC) whose jurisdiction is located to the north. The District Councils manage floodplain land use, while GWRC manages the river channel and stopbanks.

This FMP represents a long term approach to floodplain management planning within the Waiohine River catchment. It contains information about the river and its tributaries (including the Mangatāreere Stream confluence), the risk of flooding and erosion, and what has been done to manage the risk so far. It also sets out what the Councils are planning to do and what communities can do to minimise risk in the event of a flood. In addition, this FMP outlines potential environmental, cultural and recreational values in the floodplain and how work can improve these values.

This plan sets out the outcomes the community would like to see achieved in the floodplain. Different local, regional and national perspectives from a range of parties have been taken into account in developing this FMP. Relevant parties have included, the Regional and District Councils, iwi, government agencies, infrastructure providers, community groups and private land and business owners, all of which have to consider the consequences of flooding, including the resilience and vulnerability of communities and infrastructure and the risk to life and property.

Importantly, a stakeholder representation group – the Waiohine River Floodplain Management Plan Advisory Committee (WRFMPC ‘the Committee’) has acted as a focus and governance group to help with the different phases of this work. The Committee comprises over 30 individuals, including potentially affected residents, rural ratepayers, local authority representatives and key stakeholders. In floodplain management planning terms, four main components make up how the river can be managed. These are grouped as:

- River channel management
- Structural works
- Non-structural measures
- Emergency management

It is important to emphasise that this document will ultimately be the primary document for guiding floodplain management that landowners, government agencies, the community and decision makers use when considering the future planning and administration of the Waiohine River and its floodplain. As this is a living document it will need to be updated in the future. All of the interested stakeholders will continue to be consulted to provide input into the long-term management of the river.
1.2 What is the main goal of floodplain management of the Waiohine River?

The purpose of this Waiohine FMP is to establish a framework that helps keep people and property safe by proactively managing the river channel of the Waiohine River, as well as providing protection measures. The idea behind this is to support the continued appropriate use of both rural and urban land and resources in potential flooding areas. With this in mind, the overarching goal of this FMP is:

**To proactively manage the flood and erosion risk to people and property on the Waiohine River Floodplain.**

This main goal is supported by some common underlying themes, including the desire to:

- Avoid flood risk
- Reduce the flood risk to people and property
- Support a resilient local economy and a scheme that is affordable and fairly funded
- Work with district councils to coordinate long term planning outcomes
- Recognise the role of tangata whenua and their cultural values
- Recognise environmental matters
- Provide for recreational opportunities

The interrelated nature of the overarching goal with these other themes means that they all need to be considered holistically in order to meet statutory responsibilities and long-term and annual funding commitments. This concept is called integrated management. The wheel below shows how integrated management is dependent on all themes working together so that the overarching goal can be realised.
2. Statutory Obligations

2.1 Higher Order legislation

In New Zealand there are two main pieces of legislation for floodplain management planning and decision making namely; the Resource Management Act 1991 (RMA) and the Soil Conservation and Rivers Control Act 1941. Under the RMA, GWRC, CDC and SWDC have statutory responsibilities for the management of flood and erosion risk from the Waiohine River; this main function being to avoid or mitigate against flooding and erosion. Under the Soil Conservation and Rivers Control Act, GWWR has a statutory responsibility to prevent damage by erosion from rivers and protect property from damage by floods.

Because flood management can cover a broad range of issues such as flood and erosion risks, management and funding, flood emergency response and recovery, and flood protection insurance, there are a number of other pieces of legislation that have different roles. These include:

- The Local Government Act 2002
- Land Drainage Act 1908
- Rivers Board Act 1908
- Local Government Official Information and Meetings Act 1987
- Earthquake Commission Act 1993
- Environment Act 1986
- Local Government (Rating Act) 2002

Examples of how some of these statutes apply are:

| Hazard control measures like stop banks, river channel maintenance and clearance, dams etc | Local Government Act 2002; Soil Conservation and Rivers Control Act 1941, Rivers Board Act 1908. |
| Drainage schemes involving draining waterlogged land or modifying flood events | Land Drainage Act 1908 |
| Flooding information used for site specific flooding information and Land Information Memorandums (LIMs) | Local Government Official Information and Meetings Act 1987 |
| Flood hazard preparedness, response and recovery | Civil Defence Emergency Management Act 2002 |
| Flood loss insurance | Earthquake Commission Act 1993 |

But for the most part, decisions made about flood risk management are made under the RMA and at a regional governance level. In the case of the Waiohine, these decisions are made by Greater Wellington Regional Council.

2.2 Flood Risk Management – The role of Greater Wellington Regional Council

Resource Management Act 1991

Under Section 30 of the RMA, GWRC is required to control the use of land and rivers and under Sections 63-68 has responsibilities for avoiding or mitigating natural hazards through regional plans and rules.

Under the RMA, the GWRC has prepared a Regional Policy Statement (RPS) which identifies river flooding as one of the three most significant natural hazards in the region. Under this RPS, territorial authorities are required to address how flood management will be dealt with at a district level and also decide what matters are to be incorporated into District Plans.

Also of relevance is the Natural Resources Plan (NRP) for the Wellington Region, particularly the role of Whaitua Committees. Whaitua Committees are tasked with developing catchment-specific objectives and methods for future inclusion in the NRP. Whaitua Committees are made up of various people who have an interest in land and water management issues. The Waiohine River falls under the Ruamāhanga Whaitua Committee and therefore its outcomes will affect how water is managed in this river in the future.

Soil Conservation and Rivers Control Act 1941

The overriding purpose of the Soil Conservation and Rivers Control Act 1941 is to make provision for the conservation of soil resources and the prevention of damage by erosion, and to make better provision for the protection of property from damage by floods.

The Act provides for the creation of separately rated river schemes on a catchment-by-catchment basis. The purpose of these schemes is to provide flood protection, river control and some drainage and flood pumping within the scheme’s catchment areas. Working under the general supervision of GWRC, the Waiohine River Floodplain Management Plan Advisory Committee (WRFMPAC) helps manage decisions on how flooding and erosion in the Waiohine River can be managed in the future.

Local Government Act 2002

Under the Local Government Act 2002, GWRC must prepare a Long-Term Plan (LTP) every 10 years which outlines the key outcomes anticipated and services to be provided in that 10 year period. Flood protection is a key activity in ensuring quality outcomes for the community and therefore is identified in the LTP. The LTP sets out the funding and expenditure for flood protection works, including special purpose and regional rates for river mitigation, flood mitigation, flood warning and emergency management activities.

GWRC also needs to ensure that Asset Management Plans provide for the management of flood protection schemes which have physical/structural assets (such as stopbanks) through servicing and funding. When new assets are built, GWRC must update the relevant Asset Management Plan.
2.3 Flood Risk Management – The role of District Councils

The Waiohine River forms the boundary between Carterton District Council (CDC) and South Wairarapa District Council (SWDC). Both CDC and SWDC have a role in flood and erosion management including: controlling land uses through legislation; carrying out bridge maintenance or raising; funding some floodplain management planning methods through local rates; and emergency management. The main ways in which District Councils manage flood risk is described below:

Waipara Combined District Plan (WCDP)
Both CDC and SWDC use the WCDP as their key land use planning rule book. Specifically concerning flooding matters, the WCDP follows the directives of the GWRC RPS and contains flood hazard objectives and policies covering the topics of freshwater management, natural hazards and subdivision, land development and urban growth. These objectives and policies weigh up the effects of new activities and whether they impact on the:

- likelihood of flooding and/or erosion, or increase in its magnitude, including to other properties
- Risks to people and property
- Mitigation measures to manage the risks from flooding or erosion.

The Waiohine River has been mapped in the WCDP as a “Significant Waterbody” together with a “Flood Hazard Area” and a “Flood Alert Area” which identifies land within the floodplain as susceptible to flooding. These maps translate into minimum building and earthworks setbacks from the river, together with flooding rules relating to land and activities identified within the Flood Hazard Area. Restrictions have also been put in place for activities within the Flood Hazard Area, especially subdivision, construction or alteration to both habitable and non-habitable buildings, and earthworks.

The WCDP also contains a number of GWRC designations that provide for existing and proposed stopbanks. An additional designation is proposed under this FMP for a future stopbank retreat.

Building Act 2004 and Building Regulations (Building Code) 1992
Both CDC and SWDC have obligations under the Building Act 2004 and Building Code 1992. If a site is prone to flooding, decisions must be made about:

- whether the site is safe to build on
- where to locate a building on the site
- the finished floor level – the council may have specific requirements under section 72 of the Building Act 2004
- landscaping and drainage

There is provision under section 72 of the Building Act 2004 for Councils to refuse to grant a building consent if the land is at risk of a natural hazard, such as erosion or flooding, or if the building work itself is likely to accelerate the problem.

It is important to note that the RMA can set higher standards and requirements over and above the Building Act to avoid or mitigate the effects of natural hazards on new land-use activities.
3. Background

3.1 Waiohine Catchment

The Waiohine River (and the Mangatarere Stream) is one of the major tributaries of the Ruamāhanga River. The river rises in the eastern Tararua Range near Mt Arête and exits the range through Waiohine Gorge approximately 6 km north-west of Greytown. It then flows across the Wairarapa Plains for 20 km to its confluence with the Ruamāhanga River. The river’s total length is approximately 44km. It has a relatively long, narrow catchment with an area of 378km², about half of which is within the Tararua Range.

When the river reaches the Wairarapa Plains, the Waiohine River can be generally described as being “semi-braided”, although in some places it does have reasonably straight channels and flows in a single body of water. In the parts where the river is braided, it flows in split channels around gravel bars and islands.

The river has important ecological, cultural and economic values. As well as providing water for the towns of Greytown and Featherston, the Moroa Water Race and rural irrigation, the Waiohine River is popular for recreational activities such as swimming and fishing. The river supports a wide range of fish species, provides regionally significant trout habitat, and holds many important values for Māori particularly relating to mauri, waahi tapu and mahinga kai.

In terms of population, approximately 2500 people usually live within the floodplain, with this figure including the urban settlement of Greytown and rural dwellers. In the rural environment, not only is there considerable investment in terms of property and stock, but there is also a substantial amount of buildings and equipment, such as packing and processing sheds, milking sheds, depots and rural contractors’ yards. Infrastructural and other industrial-type activities are also present in the floodplain.

The Waiohine River has been broken into four separate reaches plus the Mangatarere Stream and its tributaries. This approach allows existing conditions and problems to be isolated into specific geographic locations. The reaches are based on areas of the river in which the constraints or hydraulic regime are significantly different to each other. To help orientate plan users, the map following shows the location of these reaches as well as identifying a number of important locations.

The characteristics of these reaches can be described as follows:

Reach A - Gorge to Rail Bridge
Here the river channel undergoes a gradual transition from confined single thread form at the Gorge (width 30m) to a semi-braided form at the Rail Bridge (width 140m).

Reach B – Rail Bridge to end of Kuratawhiti Street
In this part of the river, the channel is mostly semi-braided with an active channel width varying from 100m to 140m.

Reach C – From the end of Kuratawhiti Street to State Highway 2 Bridge
Here the channel is semi-braided over the majority of this reach with active channel width varying from 100m to 140m.

Reach D – State Highway 2 Bridge to Ruamāhanga Confluence
The channel is of single thread form and the active channel width reduces from 70m at the State Highway to 60m at the confluence. The channel is in the early stage of developing a meandering planform with gravel beaches evident at the inside of bends.

Mangatarere Stream and Beef Creek
These tributaries are small gravel-bed waterways. The Mangatarere Stream has a catchment of 157km². Rising in the foothills of the Tararua Range, the stream flows for some 31km before its confluence with the Waiohine River at State Highway 2.

In terms of river management and flood protection, each of the reaches described above have their own pressure points which create challenges in looking after the river and ensuring the flood and erosion risk to people and property is reduced.
### 3.2 Catchment values

In preparing this FMP, a number of important values have been identified for consideration. These values are summarised as follows:

#### Human Values

The rural environment of the Waiohine floodplain has been, and continues to be, used in many different ways to support and provide for those living in this part of the Wairarapa. This community contains a high level of personal and business investment in land, buildings, businesses and utilities all of which form a major component of the regional economy. The predominant rural activity in the floodplain is pastoral farming, although its ties with its horticultural beginnings remains strong and is still a highly valued part of local industry and rural identity.

Aside from rural based activities, Greytown or ‘Te Hupenui’ accommodates a population of 2,202 with 930 dwellings occupied (2013 Census). The town has a proud history and is considered to have one of the most complete main streets of Victorian architecture in New Zealand. It has played on these assets, creating a revival largely based on its townscape. Greytown is a popular weekend and holiday destination, especially with the Main Street which has a number of antique shops, gift shops and cafes. It has a variety of social and recreational infrastructure, including two schools and several churches.

In terms of recreation, the middle reaches of the river are well used by the public, although access in places can be a problem due to much of the riverside land being in private ownership. Watersport activities are popular, as well as swimming (especially at the end of Kuratawhiti Street). Dog walkers and people exercising enjoy walking along parts of the river, with an easily accessible route around the Wire Shed and Kuratawhiti Street area. The river has good values for anglers especially in the upper reaches for wilderness fishing (brown and rainbow trout). The quality of the angling decreases in the lower reaches of the river, and is dependent on the proximity of deep pools to the banks and vegetative cover.

There is also significant infrastructure investment in the Waiohine floodplain supporting and servicing the local and wider Wairarapa community. This infrastructure includes the Greytown water supply intake and treatment plant on the upper plains, Moroa water race intake and network, Wairarapa railway line (including bridge over the Waiohine River), State Highway 2 (including bridge over the Waiohine River) and local road network, and various telecommunications and electricity networks.

#### Cultural Values

The tangata whenua of the area are Ngāti Kahungunu and Ngāti Rangitāne. Ngāti Kahungunu have provided cultural input into this FMP. A key issue for Ngāti Kahungunu people is that the floodplain land of the Waiohine River is in private ownership which means local Māori have little direct input into the control of the environment. By working at many levels, including on this FMP, Māori want to show how they can enhance the Waiohine floodplain environment. A key part of this is ensuring that this FMP recognises the areas of mauri in the river and the mauri of the land, and working out how this can be taken into account when considering floodplain management planning and any potential impacts on indigenous fauna and indigenous flora.

Aside from the importance of the Waiohine River itself, specific sites that have been identified as important to Ngāti Kahungunu include Pāpāwai marae which is located just to the south of Greytown. Its meeting house, named Hikurangi, dates from 1888 and has been identified as the most important Māori dwelling in the European settlement period (this meeting house is unique in that the magnificent carved ancestors that surround the pā face inward). Other important sites include Te Ahkouka (mahianga kai gathering/harvesting), Hupenui (memorial place), urupā (between the river and Beef Creek just upstream of the State Highway), Kuratawhiti (marae) and Pukengaki (cultivated hill).

#### Natural Values

Because the river has its origins in the Tararua Ranges and flows through thick vegetation before reaching the Wairarapa Plains, the quality of water is high in the upper reaches of the catchment. However, once the river reaches its confluence with the Mangatarere Stream the water quality deteriorates. Phosphorus and nitrogen tend to be the main problem with water quality in this part of the river, which is strongly linked to the wet seasons and heavy rainfall events. Bacterial counts (E. coli and faecal coliform) can also be a problem.

In terms of ecology, only small pockets of indigenous vegetation or habitat remain once the river reaches the floodplain, although indigenous animal species (birds, lizards, indigenous freshwater species) are present in the catchment. Areas of particular ecological importance include indigenous forest, scrub and shrubland, river gravel and boulderbank habitats, and wetlands. Both the Waiohine and Mangatarere waterways are key habitats for indigenous fish species and trout.

The FMP has considered these natural values and seeks to maintain the natural values of the river while balancing the other management objectives desired by the community.
3.3 Flood history and response

In extreme weather events, heavy rain rushes down the Waiohine River from the Tararua Ranges causing flooding in the floodplain. During the time that the river is within the Tararua Forest Park, the high floodwaters travel at a swift pace, contained within the steep sides of the river bank. Flood damages in this upper catchment is mostly from fallen vegetation, earth and rock debris being swept along by the fast flowing water. It is when the river reaches the Wairarapa Plains and where the surrounding land use is dominated by pastoral farming that damage is caused to property by the river flooding and erosion of river banks.

There have been a number of key dates in the flooding history of the river which have impacted on the Wairarapa Plains’ land use, activities and the people who live there.

The first major known flood event was related to New Zealand’s largest recorded earthquake which occurred in 1855 along the Wairarapa fault. This caused a large sideways ground movement and off-set stream and river channels flowing from the Tararua Ranges by at least 18m. The area was quite unsettled with aftershocks for a number of years which contributed to the Waiohine forming new channels as well as experiencing an increased build-up of rock and debris inevitably resulting in a series of large scale floods. As early as 1874, attempts at river control works started on the river.

In 1942, the Wairarapa experienced another sequence of earthquakes which increased sediment loading within the river and flooding episodes. By this stage the floodplain had become more populated with people and property, meaning damages from flooding began to have more of an economic impact.

Widespread damage occurred in the 1955 when flood water broke a southern stopbank and travelled down a channel into Greytown seeing flood waters reaching the main street of Greytown. Flood protection works started in earnest after this event, including the 1957 Scheme Control Plan which primarily sought to protect Greytown, State Highway 2 and the rural housing areas. Surrounding farm land and the Apple Barrel Floodway were reserved for overflows. Protection works included wire groynes, stopbanks and in-channel river management.

A further series of floods took place in the 1980s which saw the Apple Barrel Floodway flooded with a number of farm houses affected. In 1990, the water crossed the road at the floodway which saw families evacuated in preparation at Ahikouka and a civil defence emergency declared. Other flooding events have occurred in 1994, 2004 and 2008.

Structural measures in response to flooding in the last 15 years have included:

- The construction of a stopbank on the right bank running from the railway line in a downstream direction for approximately 1.4km. This stopbank was primarily put in place to prevent flood breakout at the bend in the river at this location, and thus partially mitigated the flood risk to the Greytown urban area.
- Reconstruction of the State Highway 2 bridge in 2005-2006. The bridge was built at a higher level to increase capacity and reduce potential for flood debris getting caught under the old bridge structure. This upgrade was viewed as a major step in alleviating a major flooding pinch point along the river.
### 3.4 The impact of flooding and erosion

Within the Waiohine floodplain, there are a considerable number of economic assets which are critical to the functioning of the Wairarapa region.

Greytown represents an important urban area which has the dual role of providing goods and services to support the effective functioning of farming and community activities, as well providing the setting for holidaymakers and boutique shoppers. Greytown has a strong sense of place and identity, which includes out-of-town investment in property and businesses, and would face serious disruption in a major flood.

In terms of utilities and infrastructure, Greytown is serviced by a separated system of stormwater and sanitary sewer pipe systems, and a water supply system fed from an intake in the Waiohine River, upstream of the railway bridge. State Highway 2 runs through the town and crosses the Waiohine River. This bridge also carries the Chorus fibre optic cable (which runs through Greytown on SH2 and follows the road to the bridge). The Wairarapa rail line, which crosses the Waiohine River to the north by Woodside Station, also carries a Vodafone fibre cable.

A large flood to Greytown would cause physical damage and disruption to homes, schools, workplaces, community facilities (such as public halls and clubrooms), essential services and emergency services. Utilities such as electricity, water supply and telecommunications could all be affected. The impact would be felt far and wide, with damage to buildings and roads potentially taking many months to repair, impacting on Featherston, Carterton, Masterton and the regional economy as a whole.

The flood damage assessment undertaken in Phase 1 shows a direct flood estimate in a 1 in 100 year return period flood of $54 million in (2009 dollars). This flood damage is calculated at $65 million (when indexed to 2016). This figure represents direct damages to property and assets, but real damage to the community could be of the order of $100 million.

Focusing on the rural environment surrounding the Waiohine River, this area represents an asset-rich floodplain that has built up over time, often through generations of family investment. Historically the predominant activity in the floodplain has been horticulture and agriculture, however, the nature of this activity has changed, notably the conversion of dry stock land into dairy farms. The changing nature of farming practice combined with the urban expansion of Greytown has resulted in changes to the scale and nature of the risk associated with flooding and erosion.

**FLOOD DAMAGE IN A 1 IN 100 YEAR RETURN PERIOD FLOOD (IN 2016 DOLLARS)**

<table>
<thead>
<tr>
<th>Estimated Damages</th>
<th>RESIDENTIAL Damages</th>
<th>RURAL Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Wairarapa District</td>
<td>$57.5 million</td>
<td>$4.0 million</td>
</tr>
<tr>
<td>Carterton District</td>
<td>$1.5 million</td>
<td>$2.0 million</td>
</tr>
</tbody>
</table>

Supporting this primary farming activity are a variety of other land based primary production activities including mixed stock farming, cropping, orchards, small niche primary production land uses and rural service activities. These primary production activities typically have an assortment of buildings and equipment, such as packing and processing sheds, milking sheds, depots and rural contractors’ yards. Infrastructural and other industrial-type activities also occur in the floodplain, such as network utility facilities (i.e. transmission lines, road and rail) aggregate processing and gravel extraction.

Given these assets, a large flood over the Waiohine floodplain would have wide-ranging social and psychological impacts on the rural community. There would be physical damage and disruption to pastoral land, homes, workplaces and rural infrastructure. There could also be loss of stock through animals being caught in flood waters as well as a significant safety risk to farmers moving stock during these times. The potential for land to be washed away from erosion of river banks also represents a significant risk to land. The associated disruption would have an enormous impact on the regional economy, but would also likely cause considerable stress and trauma for land owners.

**How can we reduce these potentially devastating impacts?**

The Greater Wellington Regional Council with input from the Waiohine River Floodplain Management Planning Advisory Committee (WRFMPAC) and in consultation with Carterton District Council and South Wairarapa District Council have responded to this threat to produce this FMP.

The Plan presents a “tool box” approach to managing flood risk where different measures are used to manage or defend different parts of the area. This involves continued proactive river management; structural measures and non-structural measures. By moving away from the traditional approach of reacting after something happens to managing flood risk, the Plan gives more certainty to rural land owners and residents of Greytown about the long-term and sustainable management of flooding and erosion. The Plan puts in place the tools to improve the community’s resilience to flooding.
3.5 Current River Management

River management refers to works within the bed of the river and on the river banks, and the maintenance of stopbanks. The current Waiohine River management scheme uses a river design alignment as a management tool. The aim is to keep the river’s active channel within a design alignment and plant the edges each side of the river in appropriately wide vegetated buffer strips to enable maintenance of the active channel over time. Willow trees are the preferred type of vegetation used in the buffer strips because of their vigorous growth and ability to resist erosion. The principle is that the buffers perform the bulk of the erosion protection and allow the scheme managers to manage any break-outs of the river alignment before they damage assets and productive land located behind the buffer strips and stopbanks. Generally, the level of service is not significantly compromised while break-outs are being repaired.

Other complementary river management tools used in the Waiohine River include gravel extraction, cross blading/beach recontouring (moving gravel within the river bed), rock rip-rap (placement of large rocks along the edge/bank of the river), rock groynes (placement of rock built out from the river edge/bank) and vegetation clearance to prevent the build-up of islands in the design channel. This type of work involves using machinery like diggers and bulldozers on the edges of the river or sometimes in the wetted river channel. In some locations, for example high banks, vegetative buffers alone are not effective and other tools are required.

Gravel extraction is an important river management tool and will continue on the Waiohine River as long as it is sustainable. Extracting gravel increases the capacity of the river channel to handle floods. In addition, extracted gravel is a valuable resource used for a number of purposes throughout the region. Over the last 25 years there has been a measured decline in the mean river bed levels in the river reaches between the two bridges (rail and SH2) of up to 1.5m. While these lower river bed levels have reduced the flood risk, they do pose a number of issues, such as river bank edges becoming steeper and more unstable resulting in increased erosion risk, and potential scouring and undermining of structures (e.g. bridges and rock protection).

How can we enhance river management on the Waiohine River?

Fundamentally river management methods that have been used on the Waiohine River have performed well over the years and in the most part have meet the needs of the community. However, in more recent times there have been some emerging issues that have meant that the current river management techniques have been re-examined to see if improvements can be made. In addition, GWRC is seeking to apply a more consistent approach to river management across the whole region.

The long-term sustainability of works in river beds, and community and environmental considerations, influence the type of river management techniques that can be used in the Waiohine and how they are undertaken. This FMP needs to consider the long term sustainability of the current type of river management tools that have been applied. Particular types of works and their considerations are:

• Works within the river channel
  • The impact of cross blading and working with machinery in the wetted portion of the river channel and how this is impacting on environmental, cultural and recreational values
  • Gaps in vegetation buffers

• On the whole, most land bordering the river has already been set aside as a buffer strip, but there are a few locations along the river where landowners farm up to the edge of the current river channel, meaning that there are gaps in the buffer strip. Not only does this compromise the effectiveness of the buffer strips, it also means that in-stream management protection works are used as a way of defending such farmland.

• With the aim of enhancing environmental, cultural and recreational values, this FMP seeks to encourage all landowners to accept buffer planting (where it is an effective tool) so that collectively all properties bordering the river receive the benefits of edge protection provided by the scheme river management activities.

• Sustainability of gravel extraction
  • Gravel extraction in some parts of the river is impacting in the ability to manage localised river bank erosion risks. Conversely, gravel aggregation in other parts of the river can impact on the capacity of the design channel.

• Larger groynes
  • In some parts of the river, building groynes from boulders sourced from within the river has proven to be unsustainable as these groynes have been susceptible to washouts. Larger boulders (sourced from outside of the river) are required to address this issue.

The way in which these issues are to be addressed are discussed in more detail in Section 6 of this FMP. However, in summary, the FMP supports the philosophy of an “enabling” document aimed at providing future proofed directions that:

• Provides a consistent approach to river management that is in line with regional policy directions
• Reduces the amount of in-stream machinery work as a way to help safeguard other important ecological, recreational and cultural values
• Continues to maintain and expand vegetation buffer strips along the river edge. Where there are gaps in the buffers, encourage and work with landowners to establish buffer planting on properties boarding the river edge.
• Sustainably manages gravel extraction and aggradation
• Encourages the use of larger boulder groynes where appropriate
• Promotes sustainable use of resources
• Supports a resilient rural economy
• Recognises the unique relationship that tangata whenua have with the Waiohine River and the effect of their kaitiaki role in sustaining this resource.
4. Waiohine Floodplain Management Planning Process

4.1 Preparing the Waiohine Floodplain Management Plan

Floodplain management planning is the process which aims to keep people and property safe from floodwaters, but at the same time puts in place steps to prepare people for coping with a flood when it occurs. Specifically, the FMP process involves recognising the necessity to manage risks to life and property, and the economic effect of flooding on the community. It also recognises the impacts of river management practices on environmental, cultural, and social values.

In the early to mid-1990s scheme investigations work (not strictly adhering to typical FMP process) was completed to identify the flood risks and identify structural options to mitigate it. This work culminated in the construction of a new stopbank on the right bank of the State Highway 2 Waiohine bridge which was to reduce potential for flood debris blockage and increase passage of flood flows from a 1-in-100 year flood event.

Building on this work, the FMP process officially began January 2009. Originally this followed a five-phase process, but to ensure consistency with the Risk Management Standard AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines, the FMP process officially began January 2009. Originally this followed a five-phase process, but to ensure consistency with the Risk Management Standard AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines, the development of the Waiohine FMP was adapted to a 3 phase process that has involved the following steps:

- **Phase 1: Identify the flooding problem**
  - Evaluate the range of options to manage the flooding problem
  - Selection of an option to put into work programme

- **Phase 2: Plan the study work programme**
  - Research the selected option
  - Bring together in a guiding document to action the selected option

- **Phase 3: Manage the implementation**
  - Prepare FMP December 2015 – looking ahead

**Planning and Investigations Jan 2009 to April 2012**

The first phase of work involved establishing and understanding the flood problem and collecting the data. In the case of the Waiohine River, the flooding problem that was identified was the risk to Greytown and surrounding rural land, including the Matarawa Road area in Carterton District, from flooding of the Waiohine River and the Lower Mangatarere Stream.

On a technical level this involved hydrological / climatic assessment through to hydraulic modelling and flood hazard mapping, flood damage assessment, implications for existing zoning, etc, to help establish the flood risk. Contact and briefing with affected parties and the community was also carried out to understand community desires for flood risk management, and to establish timeframes and deliverables.

Importantly, Waiohine River Floodplain Management Plan Advisory Committee stakeholder representation group was established. This group was set up as a focus and governance group to help with the different phases of this work.

**Phase 2 Options Development April 2012 to May 2013, Options Assessment May 2013 to Feb 2015**

This part of the FMP process has seen detailed information gathering and considerable consultation with interested parties and stakeholders. In terms of technical studies and referenced documents, some 45 reports and other documents have informed decisions, as well as provided evidence-based conclusions on how the river can best be managed to control the risks associated with flooding and erosion. The consultation steps are detailed in section 4.2 of the FMP, but in summary has involved extensive opportunities through numerous meetings, open days, letters, feedback sessions etc; to gather feedback from the relevant parties.

The technical studies and consultation investigations helped identify and inform mitigation options to consider. In this process a series of structural and non-structural options were evaluated, with the process and outcome being focussed on reducing the potential for flood and erosion risk to life, flood losses and disruption.

Seven individual options were assessed based on practicality, cost, environmental impact, views/needs of the community, consents and planning requirements. These refined options were consulted on and a preferred option was identified.

Following changes to ensure that the design would result in a sustainable outcome for the FMP, the WRFMPAC recommended that Option 7 would be the preferred and most suitable option for the floodplain. Targeted consultation was also carried out with those landowners who were adversely impacted by the selected option.

The endorsement of Option 7 has meant that it is now incorporated into this FMP. The FMP has been released as draft version in order to allow the community and key stakeholders to make final comments before formal adoption of the Plan. Once adopted, the document is the “blueprint” for the ongoing and future works on the Waiohine River. The document has no fixed end date as such, but will be subject to periodic reviews (for example every 20 years or after a major flooding event) to ensure that it is kept up to date.

Section 7.2 of this FMP, sets out the planned implementation and priorities for individual works and for the river on a prioritised basis, taking into consideration the change in natural processes and best practices.
4.2 Consultation and key milestones

One of the key parts of this FMP process has been talking to the community and getting interested people or those that may live or own flood prone land to be involved with the decision making process. The Waiohine Floodplain Management Plan brings together seven years of intensive work by:

- Key stakeholders and affected parties
- The rural community located within the Waiohine River floodplain
- The urban community of Greytown
- The Waiohine River Floodplain Management Plan Advisory Committee (WRFMPAC)
- Greater Wellington Regional Council, Carterton District Council and South Wairarapa District Council
- Ngāti Kahungunu ki Wairarapa and Ngāti Rangitāne o Wairarapa
- Various interest groups, public agencies and businesses.

As part of this work, the WRFMPAC has been a crucial component of consultation on the future management of the river, has made decisions on detailed technical investigations, and endorsed a preferred option for addressing the flood and erosion risks. These decisions form the basis of this FMP.

Running in tandem with the WRFMPAC participation has been the valuable input and guidance of iwi, community groups, public agencies, business and the wider community. Forms of engagement have involved radio coverage, newsletters, drop-in sessions, workshops and presentations. This has involved both targeted contact with directly affected parties, as well as open community engagement for interested parties.

Key milestones in this consultation and decision making process are detailed in the following table:

<table>
<thead>
<tr>
<th>DATE</th>
<th>ACTION</th>
<th>PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early 2008</td>
<td>The Waiohine/Mangatarere River Management Scheme Advisory Committee and the Waiohine River Floodplain Management Planning Advisory Committee (WRFMPAC) was formed</td>
<td>Phase 1 Describing the flood issues</td>
</tr>
<tr>
<td>Jan 2009</td>
<td>GWRC discussions with affected parties to establish timeframes and deliverables</td>
<td>Phase 1 Identifying and describing the Flood hazard</td>
</tr>
<tr>
<td>July 2009</td>
<td>Draft Flood Hazard Map produced and community newsletter 1 explaining the flood hazard and how to get involved</td>
<td>Phase 1 Identifying and describing the Flood hazard</td>
</tr>
<tr>
<td>June – July 2011</td>
<td>Media coverage calling for views on managing flood hazard and values of the river. Community newsletter 2 released and drop in sessions held for the general public to discuss their views</td>
<td>Phase 1 Collecting information and describing elements at risk</td>
</tr>
<tr>
<td>April 2012</td>
<td>The flood hazard options and suggestions were investigated by GWRC and presented to the WRFMPAC</td>
<td>Phase 2 Identify management options</td>
</tr>
<tr>
<td>June - Sept 2012</td>
<td>GWRC and WRFMPAC carried out a Multi Criteria Analysis to test and rank the costs and benefits of 7 different river management options. This involved a series of workshops, meetings and telephone calls.</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>November 2012</td>
<td>WRFMPAC recommended that the costs and practicalities of Option 4 and Option 7 be further investigated</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>December 2012</td>
<td>Community newsletter 3 released updating community on progress</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>January 2013</td>
<td>Workshop 1 – Attended by 34 individuals who were likely to be affected by the proposed options. Consultation sessions were held to gauge the opinions of those likely to be affected and opinions from the wider community.</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>March 2013</td>
<td>Workshop 2 – Attended by same parties described above. This workshop focused on detailed information that had been supplied by the consultants, especially in matters relating to planning restrictions and the projected implementation costs.</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>April – May 2013</td>
<td>Further presentations and discussions with WRFMPAC. Option 7 was endorsed as the preferred option.</td>
<td>Phase 2 Assess and select management options</td>
</tr>
<tr>
<td>May 2013 – December 2015</td>
<td>Further refinement of Option 7, including contact with WRFMPAC through workshop sessions and meetings.</td>
<td>Phase 3 Prepare FMP</td>
</tr>
<tr>
<td>May - June 2014</td>
<td>Wider community consultation through targeted letters detailing investigations carried out for Option 7. This information was reported back to GWRC Councillors and WRFMPAC</td>
<td>Phase 3 Prepare FMP</td>
</tr>
</tbody>
</table>
5. Objectives for the Waiohine Floodplain Management Plan

The overarching goal of this FMP is to:

To proactively manage the flood and erosion risk to people and property on the Waiohine River floodplain.

In order to make sure that the overarching goal is realised, the following objectives set the course of action for implementation:

Avoid flood risk by:
- Providing advice on flood risk so that people can make appropriate decisions about land use and property
- Further developing controls in the District Plan through a plan change so that development continues to be appropriate to the level of hazard

Reduce the flood risk to people and property by:
- Designing and maintaining flood protection assets so they perform in line with agreed levels of service
- Managing the river channel to a design alignment
- Maintaining the capacity of the river channel
- Helping the community and emergency services to plan for and respond to flood events

Support sustainable economic development by:
- Protecting people, property and infrastructure to agreed standards
- Helping asset owners to manage flood risks to existing or new infrastructure
- Mitigating the impacts of works proposed in this FMP
- Incorporating climate change projections into design and planning
- Seeking an affordable scheme that is funded fairly, with those who benefit most paying a greater proportion of the costs
- Developing a governance arrangement appropriate for spending large sums of public money

Take an integrated approach to the work by:
- Working with District Councils to line up their development and planning with the implementation of this FMP
- Seeking long-term resource consents for operational works
- Developing a governance arrangement that is representative of the whole community and the wider values of the river

Provide for recreation and access to the river by:
- Working with landowners and the community to improve public access to the Waiohine River
- Taking recreational values into account in the design and implementation of physical works and at least maintaining these

Improve the environment quality of the river by:
- Identifying opportunities to enhance the river environment
- Spending a proportion of the value of structural works on environmental enhancement projects in line with GWRC policy (currently up to 5%)
- Recognising environmental values and opportunities, and continuing to improve our work practices to protect and enhance these values
- Raising public awareness of the environmental values of the river

Recognise the relationship of tangata whenua with the Waiohine catchment through:
- Maintaining contact and communication with tangata whenua and acknowledging their role as kaitiaki
- Drainage improvements at the urupā site
- Recognise tangata whenua values and concepts such as mauri, and recognise that Flood Protection works can impact on these values
- Continue to improve our work practices to protect and enhance these values
- Explore opportunities for cultural enhancement as part of environmental enhancement
- Recognising river confluences as places of particular significance
- Encouraging identification of wahi tapu sites

*This advice is provided on request by Greater Wellington Regional Council Flood Protection staff based in Masterton (see www.gw.govt.nz or phone 0800 496 734)
6. Flood Protection – What needs to be done?

When planning for flood protection, there is a need to consider the overall approach to managing flood risk from the wader day to day floods through to the biggest flood imaginable. This is called the ‘design standard’, or design flood. The return period measures the chance of a flood occurring in any year (for example, a 100-year return period flood).

An important part of this process is the standard to which new and upgraded structural mitigation measures will be built. This is called the ‘design standard’, or design flood. The return period measures the chance of a flood occurring in any year (for example, a 100-year return period flood).

The design standard not only gives GWRC an indication of the maximum protection that the structural flood protection system can provide, but it also influences the non-structural measures that may be appropriate.

At present, flooding in the Waiohine affects surrounding pastoral lands in less than annual events in some areas. Flooding poses a flood risk to Greytown when floods exceed a 5% or 20-year event and spill down the Apple Barrel Floodway.

The Design Standard for the Waiohine River

As set out in Section 5 of the FMP, the FMP process for the Waiohine River has selected an approach where different design standards apply depending on the flood risks and consequences. This means areas with greater risks and consequences have a higher standard than areas with lower risks and consequences. The level of protection is mainly based on:

- Potential damage costs
- Area and number of people affected
- Vulnerability to flooding and erosion

Following an evaluation of the options, the following design standards have been selected for the river management and new structural works for the Waiohine River:

- 100-year event including an allowance for the effects of Climate Change: Greytown urban area.
- 20-year event: Extensively farmed and low level of occupation in rural areas

The Apple Barrel Floodway is designed to provide a 1 in 50-year level of protection. In addition, this is the Minimum Area able to contain the long term protection and maintenance of the stopbank. Where GWRC already owns such land, it generally leases the land to adjoining property owners so the land can be used as part of a productive farming unit. In some other circumstances, landowners may prefer to retain ownership of the land and this may be appropriate. In these cases, GWRC would secure an easement and/or designation in the District Plan to provide for the construction, operation and maintenance of the stopbank. These projects are specific and landowner preferences are always taken into account.

The terms “design channel” and “river corridor” are also used when describing structural measures and river management. The river corridor includes land immediately next to the river and is the minimum area able to contain a major flood and allow the water to pass safely to the downstream catchment, for example, the Lower Ruamāhanga in this case. Because of its location, the river corridor represents a significant flooding and erosion hazard to people and structures, including flood defences, sited in the corridor. The depth and speed of flood waters are such that existing development on the corridor could result in major damage to property.

The design channel is where GWRC aims to keep the river channel in normal circumstances. At all times, the river may erode into the buffer areas.

6.1 River Management

R’iver management’ refers to works within the bank of river or on the river banks. All river management works must be undertaken in accordance with GWRC’s ‘River Management Code of Practice’ and any resource consents required. Typical types of ‘river management’ include gravel extraction, cross bedding/clearing and planting of vegetation on river bank (sometimes called ‘vegetable buffers’).

For the Waiohine River, a combination of gravel extraction, rock rip-rap, rock groynes and clearing/ planting of vegetation on the river bank is proposed. The details of the proposed river management works are outlined below for each reach (section) of river.

6.2 Structural Measures

‘Structural measures’ are physical structures or works designed to protect people and assets (e.g. property, buildings) from flooding up to a specific flood design standard (e.g. 1 in 100 year flood). Typical types of structural measures are floodways (e.g. Apple Barrel Floodway), stopbanks (earth embankments), flood walls, detention dams or floodgates.

For the Waiohine River, stopbanks are the only type of new structural flood protection measure proposed. The details of the proposed stopbanks are outlined below for each reach (section) of river.

While structural measures and river management activities are distinct activities, they can be interdependent and/or related works. For example, rock groynes or rock rip-rap can be used to protect stopbanks, and the location of stopbanks can limit river management options. In addition, the structural measures and river management activities are physical works in the river environment. For the purposes of the FMP, these two types of measures are outlined together.

It is important to note that in most cases the stopbanks which are used as structural measures for the Waiohine River are on privately owned land which is most commonly used as farmland. Private ownership of these assets can sometimes cause problems for GWRC in terms of gaining access to the structures for maintenance purposes. GWRC preferences is to own the footprint of stopbanks, as Council ownership provides the greatest level of security in terms of the long term protection and maintenance of the stopbank. Where GWRC already owns such land, it generally leaves the land to adjoining property owners so the land can be used as part of a productive farming unit. In some other circumstances, landowners may prefer to retain ownership of the land and this may be appropriate. In these cases, GWRC would secure an easement and/or designation in the District Plan to provide for the construction, operation and maintenance of the stopbank. These projects are specific and landowner preferences are always taken into account.

The terms “design channel” and “river corridor” are also used when describing structural measures and river management. The river corridor includes land immediately next to the river and is the minimum area able to contain a major flood and allow the water to pass safely to the downstream catchment, for example, the Lower Ruamāhanga in this case. Because of its location, the river corridor represents a significant flooding and erosion hazard to people and structures, including flood defences, sited in the corridor. The depth and speed of flood waters are such that existing development on the corridor could result in major damage to property.

The design channel is where GWRC aims to keep the river channel in normal circumstances. At all times, the river may erode into the buffer areas.
### Proposed Works

A key proposed work within the reach is to continue to provide a 20 year level of erosion protection necessary to the banks of the river. This is achieved through the design channel to the existing buffers on both banks. Manual in-channel erosion control works, as well as minimal river edge protection is proposed. On the TLB, there is an existing small stopbank type structure on the edge of the river that may not be required in the long term depending on the river. This structure is proposed to be maintained or altered to accommodate river realignment issues.

#### Table: Proposed Management Measures for Reach A

<table>
<thead>
<tr>
<th>Reference</th>
<th>Proposed Management Measure</th>
<th>Current Level of Service</th>
<th>Proposed Level of Service</th>
<th>Primary Reason for Proposed Management Measure</th>
<th>Responsibility</th>
<th>Priority</th>
<th>Cost and Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>In-channel erosion control</td>
<td>1 in 20 year erosion protection</td>
<td>1 in 20 year erosion protection</td>
<td>To protect rail bridge Kiwirail</td>
<td>GWRC</td>
<td>As and when determined</td>
<td>To be completed as part of the operational programme and budget</td>
</tr>
<tr>
<td>27</td>
<td>Vegetative buffer realignment on Woodside Railway</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year erosion protection</td>
<td>To protect rail bridge Kiwirail</td>
<td>Kiwirail</td>
<td>As and when required</td>
<td>Costs borne by Kiwirail.</td>
</tr>
<tr>
<td>28</td>
<td>Vegetative buffer realignment on TLB</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year erosion protection</td>
<td>To protect rail bridge Kiwirail</td>
<td>GWRC</td>
<td>As and when required</td>
<td>To be completed as part of the operational programme and budget</td>
</tr>
<tr>
<td>29</td>
<td>Vegetative buffer realignment</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year erosion protection</td>
<td>To protect farmland adjacent to river</td>
<td>GWRC</td>
<td>As and when required</td>
<td>To be completed as part of the operational programme and budget</td>
</tr>
</tbody>
</table>

* The general focus of this reach is to provide for erosion protection. Therefore this work is not prioritised and will be undertaken as and when is necessary.

** For information purposes only. Kiwirail will maintain rock rip-rap protection of the Rail Bridge abutments.

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### Design Standard and Priorities for Reach A

#### 6.3 Reach A - Waiohine Gorge to the Rail Bridge

In this reach, the river channel configuration is a gradual transition from confined single thread form into the single thread of the Railway Bridge and on a bend away from the river to the Railway Bridge. The river channel is generally speaking straight with sharp bends and some meandering. The river is navigated through the Wairarapa District Council's Waiohine River realignment project. The river channel is relatively stable.

The gooseneck reaches, in particular being subject to shifts in channel position and channel width and buffer as designed and that will likely eliminate the need to take specific action to manage the river channel. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose.

The river channel width and buffer as designed and that will likely eliminate the need to take specific action to manage the river channel. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose.

The river channel width and buffer as designed and that will likely eliminate the need to take specific action to manage the river channel. The preferred approach over the long term is to develop the river corridor as a river alignment training bank and will be maintained for this purpose. The preferred approach over the long term is to develop the river channel as a river alignment "training bank" and will be maintained for this purpose.

Significant community infrastructural assets located within this reach are the Greytown water supply intake and Moroa Water Race intake. The FMP proposes to maintain the existing river alignment and maintain a sustainable river bed level to enable the ongoing operation of the water intake structures. If at some point the river alignment threatens such assets, it will become a scheme priority to work with the responsible authority (South Wairarapa District Council) to manage the river alignment issues.

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**Provision of structural protection to rail bridge abutments**

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**Vegetative buffer alignment**

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**Bankline protection**

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**Vegetation management**

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**River training bank**

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**In-channel erosion control**

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**Realignment**

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**Stopbank**

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**Design Channel**

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**Additional Buffer Area**

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**Proposed Management Measures for Reach A**

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**Proposed Structural Works**

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**FMP Proposed Management Plan**
6.4 Reach B: Rail Bridge to the end of Kuratawhiti Street

In Reach B, the river channel is mostly semi-braided with an active channel width from 150m to 250m. Most rock groyne development on the TRB including floodplain work has occurred in this reach. There is a major active channel that is highly unstable with a relatively narrow channel and high banks. The river is vulnerable to undermining of the bank erosion and floodwaters during small-scale floods.

Existing Works and Features

There is an existing stopbank on the TRB immediately below the Rail Bridge which was constructed in 1970. Further downstream there is a second stopbank on the TRB which is approximately 1.2km in length. There are a number of rock groynes within the reach, each end of the reach there on the TRB approximately 800m from the Rail Bridge and from Kuratawhiti Street.

The second main physical work in Reach B is a new 100 year stopbank on the TRB. This realignment is generally 165m from the river edge. The height of this stopbank will depend on localised ground levels. A number of matters will be considered in the realignment of this stopbank, including the following:

- The proposed alignment of this new stopbank is within the designation in the District Plan. This alignment is generally 165m from the river edge. The height of this stopbank will depend on localised ground levels.
- The new stopbank would extend from the end of the existing stopbank at the end of Wood Street downstream to The Wire Shed (2.5km in length).
- The alignment in the long term.
- The proposed works alignment and setting back of the majority of the TCL and TMD in this reach.

Proposed Works

A key proposed work within this reach is maintaining and developing the vegetative buffer along both the TRB and the THB. The proposed works include developing a robust vegetative buffer along the full length of this reach. Vegetative buffers alone are not effective at islands in this reach. The vegetation management of these islands would be critical to their effectiveness. The vegetation management of these islands would be critical to their effectiveness.

Vegetative buffers will extend along the full length of this reach and be 40m-150m in width varying from 100 metres to 250 metres, but on the whole the river has a relatively stable alignment. The TRB has a wide vegetative buffer and a high natural terrace located behind the buffer. Vegetation edge protection is sparse along the majority of this reach.

Proposed structural works include:

1. **New 100 year stopbank**
   - 1 in 5 year flood protection
   - To protect Greytown urban area vulnerable to bank erosion.
   - To protect Greytown urban area from river bank greatly reducing flooding.
   - New stopbank setback due to new rock groyne.

2. **Extended New Stopbank**
   - 1 in 20 year flood protection
   - To protect farmland adjacent to the Wire Shed.

3. **New Stopbank behind Railway**
   - 1 in 10 year flood protection
   - To be completed as part of the operational programme and budget.

4. **TMLC**
   - Low priority
   - Operational and maintenance costs not to exceed $5,000 per annum.

5. **Vegetation management**
   - Low priority
   - To be completed as part of the operational programme and budget.

6. **Rock groyne**
   - 1 in 20 year erosion protection
   - To protect farmland adjacent to the Wire Shed.

**Operational and Maintenance Costs:**

- Initial capital costs: $2,540,303 (this includes consenting requirements on top of professional fees and $50,000)
- Operational and maintenance costs: $371,000 (land purchase, $110,000)
- Consenting requirements: $3,000

**Key Aspects:**

- **Proposed Management Measure:** To be completed as part of the operational programme and budget.
- **Responsibility Priority Cost and Funding:** GWRC low priority.
- **Operational and Maintenance Costs:** To be completed as part of the operational programme and budget.

**Provisions Level of Service (PLOS):**

- **PLOS 1:**
  - High priority
  - Low priority
  - Operational and maintenance costs not to exceed $5,000 per annum.

**References:**

- **STOPBANK**
  - 1 in 5 year flood protection
  - To protect Greytown urban area.

- **VEGETATION BUFFER**
  - 1 in 20 year flood protection
  - To protect farmland adjacent to the Wire Shed.

- **STREET**
  - 1 in 10 year flood protection
  - To protect farmland adjacent to the Wire Shed.

- **STREET**
  - 1 in 20 year flood protection
  - To protect Greytown urban area.

- **STOPBANK BEHIND STREET**
  - 1 in 10 year flood protection
  - To protect Greytown urban area.

- **STOPBANK BEHIND STREET**
  - 1 in 20 year flood protection
  - To protect Greytown urban area.

- **STOPBANK BEHIND STREET**
  - 1 in 10 year flood protection
  - To protect Greytown urban area.

- **STOPBANK BEHIND STREET**
  - 1 in 20 year flood protection
  - To protect Greytown urban area.
6.5 Reach C - Kuratawhiti Street to State Highway 2 Bridge

In Reach C the channel is somewhat over the capacity of the height with channel actions varying from 150 to 180 m. Currently, there are three stopbanks in this reach due to the limited buffer with available, especially on the true left bank. To the right-hand floodplains not entirely covered by vegetation buffers, stopbanks and rock groynes can be seen. There are sign of not being fully effective, in-stream channel work (cross blading) and gravel extraction occur within this reach with high frequency to manage the vegetative buffers, in-stream channel works in the form of cross blading and stopbanks.

There are three stopbanks in this reach due to the limited buffer widths available, especially on the true left bank. To the right-hand floodplains not entirely covered by vegetation buffers, stopbanks and rock groynes can be seen. There are sign of not being fully effective, in-stream channel work (cross blading) and gravel extraction occur within this reach with high frequency to manage the vegetative buffers, in-stream channel works in the form of cross blading and stopbanks.

There is an existing stopbank on the TLB for the full length of this reach and it is 1–2m high. The TLB stopbank is closer to the true right edge along the majority of this reach, with a small section of the stopbank on the true left. There are two sections of this stopbank, one from the Wire Shed to State Highway 2 Bridge, which is approximately 300m in length and 1–1.2m high, and the other is closer to the true right edge from the Wire Shed to State Highway 2 Bridge, which is approximately 650m in length and 0.8–1.2m high. The construction of this stopbank was completed in the 1980s, and it is approximately 20 years old.

There are very limited vegetative buffers in this reach, in particular, on the true left bank. To the right-hand floodplains not entirely covered by vegetation buffers, stopbanks and rock groynes can be seen. There are sign of not being fully effective, in-stream channel work (cross blading) and gravel extraction occur within this reach with high frequency to manage the vegetative buffers, in-stream channel works in the form of cross blading and stopbanks.

There are very limited vegetative buffers in this reach, in particular, on the true left bank. To the right-hand floodplains not entirely covered by vegetation buffers, stopbanks and rock groynes can be seen. There are sign of not being fully effective, in-stream channel work (cross blading) and gravel extraction occur within this reach with high frequency to manage the vegetative buffers, in-stream channel works in the form of cross blading and stopbanks.

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There is an existing stopbank on the TLB for the full length of this reach and it is 1–2m high. The TLB stopbank is closer to the true right edge along the majority of this reach, with a small section of the stopbank on the true left. There are two sections of this stopbank, one from the Wire Shed to State Highway 2 Bridge, which is approximately 300m in length and 1–1.2m high, and the other is closer to the true right edge from the Wire Shed to State Highway 2 Bridge, which is approximately 650m in length and 0.8–1.2m high. The construction of this stopbank was completed in the 1980s, and it is approximately 20 years old.

There are very limited vegetative buffers in this reach, in particular, on the true left bank. To the right-hand floodplains not entirely covered by vegetation buffers, stopbanks and rock groynes can be seen. There are sign of not being fully effective, in-stream channel work (cross blading) and gravel extraction occur within this reach with high frequency to manage the vegetative buffers, in-stream channel works in the form of cross blading and stopbanks.
Draft Waiohine Floodplain Management Plan Final Draft

Design Standard and Priorities for Reach C

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>PROPOSED MANAGEMENT MEASURE</th>
<th>CURRENT LEVEL OF SERVICE</th>
<th>THREATS TO PHYSICAL LEVEL OF SERVICE</th>
<th>PROPOSED LEVEL OF SERVICE</th>
<th>PRIMARY REASON FOR PROPOSED MANAGEMENT MEASURE</th>
<th>RESPONSIBILITY</th>
<th>PRIORITY</th>
<th>COST AND FINANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>New stopbank TLB in 1 in 10 year protective section from and just above 100 year flood level on the approximate location at The Sheil Farm to be replacing existing on Platform Farm.</td>
<td>1 in 20 year flood</td>
<td>Vulnerable to bank erosion and undermining embankment.</td>
<td>1 in 100 year flood, spilling along the low relief section.</td>
<td>To protect dairy and cattle farm from overtopping and flooding flood risks.</td>
<td>GWRC High priority</td>
<td>Capital costs: $710,000 (loan, general and targeted rates).</td>
<td>Operational costs: $80,000 – $130,000 pa.</td>
</tr>
<tr>
<td>4</td>
<td>New riverine TLB platform cross-sections (10 – 20) to be built to the embankment of the bank of the embankment at the full floods of Fuller's Bend and bank protection from the spillway on Platform Farm and an existing embankment on Platform Farm</td>
<td>1 in 100 year flood</td>
<td>Vulnerable to bank erosion and undermining embankment.</td>
<td>1 in 100 year flood, spilling along the low relief section.</td>
<td>To protect dairy and cattle farm from overtopping and flooding flood risks.</td>
<td>GWRC High priority</td>
<td>Capital costs: $886,000 (general and targeted rates - estimated at this stage).</td>
<td>Operational costs: $90,000 – $130,000 pa.</td>
</tr>
</tbody>
</table>

5. **Vegetation Buffer and Rip-rap**

- **Stabilization Planting:** (0.7m average diameter)
- **Heavy Rock:**
- **River Channel:**
- **Existing House Locations:**
- **Stabilization Planting:**
- **Old Stopbank:**
- **New Stopbank:**

**Indicative cross-section of river showing rock rip-rap, vegetative buffer and stopbanks.**
6.6 Reach D – State Highway 2 Bridge to Ruamāhanga Confluence

In this part of the river the channel is a single thread and the active channel width varies from 150 metres at the State Highway to 40 metres at the confluence of developing a riparian vegetation buffer with great success and is planned to be continued in the future. The existing reach in the near future is characterised by building flood mitigation structures, including stopbanks, which have failed multiple times in recent years. The flood hazard in this reach is influenced by flooding in the Beef Creek, which discharges into the Waiohine River via Mangatarere Stream. SWDC are planning a wastewater treatment plant upgrade in this area. The existing Greytown Wastewater Treatment Plant is located near the Pāpāwai Drain, which is currently performing well but may become a maintenance issue. The Muhunoa Drain on the TRB is currently performing well but may become an operational issue. The maintenance of these structures will be monitored as part of the day-to-day operations.

The existing stopbank on the TLB upstream from the confluence with the Ruamāhanga River at Ahi Kouka is proposed to be realigned to reduce the vulnerability of this stopbank during overtopping flood events. In addition, repairs and maintenance to this stopbank are also proposed. The culvert and floodgate on the TLB extending upstream from the confluence with the Ruamāhanga River is performing well but may become an operational issue in the future. The maintenance operations.

To protect farmland adjacent to river edges, the floods exceed the current level of protection. GWRC and SWDC will work together on planning the floodplain for the future. The remainder of the existing stopbanks on the TRB are to be maintained at the current level of protection. GWRC and SWDC will work together on planning the floodplain for the future.

Design Standard and Priorities for Reach D

The remainder of the existing stopbanks on the TRB can be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.

For example, stopbank No. 2 on the TLB extending from the State Highway 2 Bridge to the Ruamāhanga Confluence. This stopbank is approximately 800m in length and is up to 1.5m in height. This stopbank is located very close to the river edge. The stopbank has failed multiple times in recent years. There are no vegetation buffers along the majority of this reach which are exacerbating the issue. Limited to absent, vegetation works are currently under consideration. GWRC are planning in a watershed treatment point upgrade in the near future.

Prospects for the immediate future include the following:

1. Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
2. Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
3. Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
4. Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
5. Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.

The proposed works in this reach are to develop a meandering planform with gravel beaches evident at the confluence with the Ruamāhanga River. The channel is in the early stage of developing a meandering planform with gravel beaches evident at the confluence with the Ruamāhanga River. The channel is in the early stage of developing a meandering planform with gravel beaches evident at the confluence with the Ruamāhanga River.

The problems identified in this reach are:

- Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
- Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
- Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.
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- Existing stopbanks are to be maintained at the current level of protection in accordance with GWRC’s River Management Code of Practice.

The proposed works in this reach are to develop a meandering planform with gravel beaches evident at the confluence with the Ruamāhanga River. The channel is in the early stage of developing a meandering planform with gravel beaches evident at the confluence with the Ruamāhanga River.
6.7 Mangatarere Stream and tributaries

Mangatarere Stream - confluence with the Waiohine River is a short distance upstream of the State Highway 2 Bridge. The Mangatarere Stream has a number of tributaries including Beef Creek, Enaki Stream and Kaipatangata Creek. The flood hazard in this area is primarily around State Highway 2 Bridge. No direct mitigation is proposed to the area between the proposed reach in 1 in 100 stopbank and the State Highway 2 Bridge.

Existing Works and Features

There are existing stopbanks on the TLB and TRB of the Mangatarere Stream. Near the Mangatarere Stream confluence with the Waiohine River and State Highway 2 area works within the stream and Beef Creek (including Matarawa Road area) will focus on in-stream channel works (channel dredging and berm lowering) and river edge works in the form of vegetation removal. The purpose of these works will be to maintain drainage capacity and reduce vegetation shading. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice. No other structural measures, such as new or upgraded stopbanks, are proposed.

No other structural measures, such as new or upgraded stopbanks, are proposed. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice. No other structural measures, such as new or upgraded stopbanks, are proposed. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice.

PROPOSED WORKS

The proposed works focus on retaining floodplains flooding from the Mangatarere Stream tributaries. The proposed works do not directly address the exacerbated flooding from the new 1 in 100 stopbank, but they will increase the capacity of drainage. The proposed works within the Mangatarere Stream and tributaries will focus on vegetation buffers as the primary tool to control new flows. No major new protection works are proposed. However, small-scale works may be carried out to maintain existing vegetation buffers. As in Reach C, drainage improvement works such as bunds and ditches may be carried out to improve the speed and efficiency of drainage. The proposed works within the Mangatarere Stream and Beef Creek (including Matarawa Road) will continue in order to maintain channel capacity.

There are some significant issues in this reach that have not been the focus of these works. GWRC is planning further land disposal works to be carried out west of the urupā site, adjacent to State Highway 2. This drainage work would not reduce flooding, but would improve the speed and efficiency of drainage. The proposed works within the Mangatarere Stream and Beef Creek, including Matarawa Road, will continue in order to maintain channel capacity.

No other structural measures, such as new or upgraded stopbanks, are proposed. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice. No other structural measures, such as new or upgraded stopbanks, are proposed. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice. No other structural measures, such as new or upgraded stopbanks, are proposed. These works will be carried out on an ‘as needed’ basis and would be carried out in accordance with GWRC’s River Management Code of Practice.

7.0 Mangatarere Stream - the Mangatarere Stream confluence with the Waiohine River is a short distance upstream of the State Highway 2 Bridge. The Mangatarere Stream has a number of tributaries including Beef Creek, Enaki Stream and Kaipatangata Creek. The flood hazard in this area is primarily around State Highway 2 Bridge. No direct mitigation is proposed to the area between the proposed reach in 1 in 100 stopbank and the State Highway 2 Bridge.
6.8 Non-Structural Measures

Land Use Limiting Controls

One of the most effective methods for floodplain management planning is the use of land use regulations. This tool is used to control the amount and location of development, and consequently the volume of floodwaters and the movement of floodwater, to protect human life and property. Development in flood-prone areas is categorised into five levels as follows (see the 'Flood Alert Area'.

- Residential Zone: These are areas that were previously categorized as an emergency floodplain but are not yet protected by a flood hazard map.
- Residual Floodplain: These are the areas that were previously categorized as a pending flood hazard but which are now protected by a defined level of protection by name form of mitigation (e.g., bank or embankment).
- Identified Flood Hazard Areas: These areas include floodplains that have already been identified as flood-prone areas and are subject to planning controls.
- Critical Infrastructure Zone: These areas are designated to protect critical infrastructure from flood damage.
- Non-Structural Measures: These areas are designated to implement non-structural measures to control land use to avoid flood risk. The planning maps that include land at risk from flood events with a projected 1 in 100 year return period and any other non-habitable buildings exceeding these thresholds requiring resource consent as a discretionary activity. The specific non-structural measures apply to the flood risk area.

Wairarapa District Councils, with the area to which the Waiohine FMP applies covers the administrative areas of the Masterton, Carterton and South Wairarapa Districts. The Waiohine FMP addresses floodplain management and associated planning controls.

River Corridor – This is the bank area closest to the river where the bulk of houses, structures and critical infrastructure are located in overflow paths, and that controls on large-scale earthworks could not be located in this area and controls on structural and non-structural measures are introduced to prevent effects on others. The 1 in 100 year return period floodwater event is considered as the design flood event for flood hazard determination provided by the Wairarapa District Councils.

1. River Corridor: This is the area closest to the river where the bulk of the water is flowing and usually deep.

This FMP recommends that this area is kept free from development, infrastructure and use, as any structure that is located in this area could cause flood risk.

2. Overflow Path – This area is where water is overflowing from the main river, usually fast flowing and may be deep. This FMP recommends that this area is kept free from development, infrastructure and use, as any structure that is located in this area could cause flood risk.

3. Flood Alert Area (existing): This is the area identified by the Waterways Trust as having areas at risk from flood events with a projected 1 in 50 year return period. This area is subject to planning controls and any development within this area is subject to resource consent as a discretionary activity. The specific non-structural measures apply to the flood risk area.

4. Flood Hazard Area (existing): This is the area identified by the Waterways Trust as having areas at risk from flood events with a projected 1 in 100 year return period. This area is subject to planning controls and any development within this area is subject to resource consent as a discretionary activity. The specific non-structural measures apply to the flood risk area.

5. Residual Floodplain – These are areas that were previously categorized as an emergency floodplain but are not yet protected by a flood hazard map.

6. Residual Floodplain: These are the areas that were previously categorized as a pending flood hazard but which are now protected by a defined level of protection by name form of mitigation (e.g., bank or embankment).

A consequence of the FMP process was that public infrastructure or vulnerable development could be located in residual floodplain areas on a case by case basis. After the flood event, and the identified Flood Alert Area. Future developments should be required to provide for safe access in case of flooding. This process has concluded that the field for approaches does allow, would not expect, for the future and allow for the flood hazard information to be revised in the future planning applications. Such changes would need to be made to the Waiohine FMP. There is a more noticeable change to the flood event risk area. The planning maps could be updated with the revised flood hazard information, without any need to change the underlying policies or rules. The timing of any review would need to be made to the Waiohine FMP. This process is known as a ‘Plan Change’. The specific non-structural measures apply to the flood risk area.

Introducing and mapping categories of hazard (most suitably by area of one or more floodplains). This FMP recommends that the flood alert area should be demarcated as the flood corridor and additional buffer areas, or critical infrastructure that doesn’t meet the flood alert criteria.

Reducing floodplain permeability areas is the flood corridor and additional buffer areas.

- Ensuring all new habitable buildings in Flood Alert and Residual Floodplains have adequate flood levels.
- Ensuring all new and existing habitable buildings are protected against ponding or flooding from water accumulating in roadside ditches, or critical infrastructure that doesn’t meet the flood alert criteria.

The current measures in the Waiohine FMP area also allows for a level of flexibility, with existing floodplain areas being protected by planning controls, and by non-structural measures.
Draft Waiohine Floodplain Management Plan Final Draft

Building Act 2004 and Building Regulations (Building Code) 1992
Both CDC and SWDC have obligations under the Building Act 2004 and Building Code 1992. If a site is prone to flooding or riverbank erosion, decisions must be made about:

• whether the site is safe to build on
• where to locate a building on the site
• the finished floor level – the council may have specific requirements under section 72 of the Building Act 2004
• landscaping and drainage

There is provision under section 72 of the Building Act 2004 for Councils to refuse to grant a building consent if the land is at risk of a natural hazard, such as erosion or flooding or if the building work itself is likely to accelerate the problem. Depending on the circumstances for the site and building (e.g. frequency and severity of flooding and vulnerability of the building), CDC and SWDC may refuse to grant consent or impose a minimum floor level when assessing new building work. The Building Code states that under the building the floor level has to be lifted above the 1 in 50 year flood level for flooding from stormwater.

Other Measures
Aside from planning controls in the District Plan, there are other planning measures that can be useful in managing flood hazard risk.

Managed retreat is an approach based around removing vulnerable assets from the floodplain to reduce the flood risk and is an important option to consider. In cases where flood risk, particularly risk to life, is high and the structural measures to protect assets is constrained, partial or full private property purchase can be considered under the Public Works Act. Managed retreat might also include rezoning land (for example rezoning as public open space to provide buffers for the higher risk areas). For the Waiohine River, three properties at Fuller’s Bend have been purchased as part of managed retreat in this area of the river.

Education and advocacy around flood hazards and land use is also a useful tool in raising the public awareness to flood risk in their area. Advice can be provided to landowners where structures or buildings may or may not be acceptable, as well as design advice on how existing structures or buildings can be upgraded in a way that lowers flood risk.

These other measures would be implemented as and when required for the Waiohine River as part of a Wairarapa wide response.

Advice available from both greater Wellington Regional Council (www.govt.nz, ph 06 378 2484) Carterton District Council (www.cartertondc.co.nz, 06 379 4030) or South Wairarapa District Council (www.swdc.govt.nz, ph 06 306 9611).
6.9 Emergency Management

Emergency management plays a very important role in floodplain management planning. Resilient communities are those that are well prepared and ready for emergencies and have the knowledge, skills, resources and relationships to respond to and recover from an emergency event. This can ultimately save lives. The information below explains how this is carried out.

Emergency Management Programmes and Procedures

When a flood emergency happens, how well a community copes depends entirely on how well prepared it is, and this includes emergency services, public agencies, utility services, businesses and ordinary residents. Emergency management targets landowners at risk from flooding, but also aims to build an environment of self-help and mutual support within the wider community so that people are better able to manage their own emergency response.

The procedures and programmes for dealing with flooding emergencies are based on the four Rs:

1. Reduction of Risk
2. Readiness
3. Response
4. Recovery

Emergency management programmes and procedures are undertaken by the Wellington Region Emergency Management Office (WREMO) on behalf of GWRC and the City/District Councils in the Wellington Region. Many of these programmes and procedures are developed and applied across the whole Wellington region, along with local initiatives. The details below outline the region-wide and local initiatives.

1 Reduction of Risk

This involves putting together a strategy to reduce the chances of a hazard occurring, or lessen the consequences when it does happen. Current risk reduction strategies include:

• flood hazard analysis
• flood modelling
• flood mapping
• economic assessments
• land-use measures (e.g. floor-level requirements for buildings)
• structural flood protection works
• hazard-related resource consent submissions
• disaster insurance (provided by EQC with additional insurance provided through private insurance companies).

How does this FMP fit into emergency risk reduction procedures?

Much of this Floodplain Management Plan relates to reducing risk in the Waiohine River Floodplain. This is done through identifying and understanding the flood hazard (Section 4) and undertaking structural, planning and maintenance measures (Sections 7 to 9) to reduce and manage this risk.

In terms of up-to-date information, this FMP will feed into emergency management plans for Greytown, Carterton and surrounding areas. To do this, GWRC will provide detailed mapping and other outputs from the flood model and can advise on flood hazards.

2 Readiness

Resilient communities are better able to respond to, and recover from, an emergency situation. The local community must be aware of the flood hazards posed by the Waiohine River and understand how they can personally respond to the risk of these hazards occurring. Strategies that prepare for emergency response include:

• school education programmes
• community response training
• public education through displays, presentations and media campaigns
• council emergency plans
• emergency services co-ordination meetings
• emergency radio communication networks
• weather warnings and monitoring equipment for rainfall river alert levels
• emergency resource databases

How does this FMP fit into emergency readiness procedures?

Improving flood warning systems/times has been a particular focus of this FMP. The current flood warnings based on flows at the lower Waiohine Gorge only provide 1-2 hours warning for many rural landowners and a longer warning time would reduce flood losses as well as reduce the risk to farmers moving stock. A longer warning time would also be valuable to emergency management/emergency services staff – particularly since a number of roads in the area are flood-prone, including State Highway 2.
This FMP puts in place mechanisms which will be delivered by GWRC to improve flood warning times and accuracy on the Waiohine River by:

- Reviewing the current flow based alarms on the Waiohine River and Mangatarere Stream to see if they can be updated and refined
- Reviewing the rain gauge network for the Waiohine catchment and adding an additional rain gauge further up the catchment if necessary (for a rainfall-based rather than river flow-based alarm)
- Reviewing how the flood warning contact database is managed and how it operates in practice
- Investigating a flood forecasting system, operating from detailed weather forecasts, that would provide at least 6-12 hours warning of a likely flood

3 Response

During an emergency, the WREMO can activate up to six Emergency Operations Centres. These are located in Wellington, Hutt City, Upper Hutt, Wairarapa (Masterton), Porirua and Kapiti.

The Masterton based Emergency Management Office manages all emergency events for all three district councils in the Wairarapa.

Emergency Operating Centre

The role of the Masterton Emergency Management Office is to gather information, organise the appropriate response, and disseminate information about the emergency back to the affected communities. Officers from all three district Councils are involved, and representatives from the essential response organisations such as the Police, Fire Service, utility companies and medical services may be present at the emergency operations centres to offer expert advice and updates on the situation. If it is a declared civil defence emergency, the response representatives will direct their organisations according to priorities set by the local civil defence organisation.

Response Team

Response teams are also an essential part of CDEM planning. Response Teams are groups of people from the community who volunteer their time in emergencies to help when the emergency services are overwhelmed. Response teams are part of the response to an emergency – their activities are coordinated through the Emergency Operations Centre (and in the case of the Waiohine River from the the Masterton Emergency Management Office). They are trained to professional standards as an emergency resource that can complement or support the emergency services, if the size of an incident or event is beyond what they can usually manage.

Civil Defence Centres

A flood event can become a civil defence emergency if:

- evacuations are required
- roads need to be closed
- the emergency services (Police, Fire Service) do not have enough resources to do the tasks that are required, or
- emergency housing and welfare are needed.

In a major event, Civil Defence Centres can be opened. People are able to go to these centres if they need help or information, or if they are able to offer assistance. The civil defence centres serving the Waiohine Floodplain are:

- Carterton – Carterton Events Centre, Holloway Street
- Greytown – Greytown Town Centre, 89 Main Street

How does this FMP fit into emergency response procedures?

This FMP provides the information on how flood waters are predicted to occur. This data can inform the emergency operations centre so that they can plan evacuations and where to concentrate any response efforts. Region-wide procedures would be applied for the Waiohine, with no specific response procedures proposed in this FMP.

4 Recovery

Recovery is the process of bringing the community back to how it was (or better than it was) prior to the emergency.

Recovery starts immediately (during the response phase) as key decisions during the response phase are likely to directly influence and shape recovery. Activities will address social, built, natural and economic needs of the community and also opportunities to reduce vulnerability to future hazard events.

How does this FMP fit into emergency recovery procedures?

Region-wide procedures would be applied for the Waiohine, with no specific recovery procedures proposed in this FMP.
6.10 Environmental Strategy

For the purposes of this FMP, the environmental strategy implementation refers to the riparian areas of the section of the river corridor managed under the scheme. It does not cover the wider river “environment” such as water quality.

An Environmental Strategy will be prepared as an outcome of this FMP.

The Environmental Strategy component of this FMP will include ecological and recreational aspects. For example, it would contain details on funds for new infrastructure such as new walking or access tracks, improvements for fish passage relating to the river management works, and picnic facilities etc. Funding comes from a variety of public and private sources and is undertaken by a range of parties that could include GWRC, District Councils, DOC, volunteer care groups and iwi.

The table below sets out the identified issues for the management of the Waiohine River system and identifies the general methods of action that can be taken to enhance the river environment.

<table>
<thead>
<tr>
<th>Environmental issues</th>
<th>Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access and private ownership</td>
<td>• Work with District Councils and support recreation opportunity improvements</td>
</tr>
<tr>
<td></td>
<td>• Support landowners who wish to retire farm land and advocate for improved recreational access</td>
</tr>
<tr>
<td>Crack Willow and Grey Poplar</td>
<td>• Reduce the presence of Crack Willow and to restore ecological value to the Mangatere Stream.</td>
</tr>
<tr>
<td></td>
<td>• Ensure that Grey Poplar is not used for flood protection purposes.</td>
</tr>
<tr>
<td></td>
<td>• Support private planting of natives outside of the willow buffer strips</td>
</tr>
<tr>
<td>Loss of diversity</td>
<td>• Improved buffer planting and widened strips will help improve diversity</td>
</tr>
<tr>
<td></td>
<td>• Support landowners who wish to retire farm land and carry out native planting. Provide information on how to access contestable funding on how to support these efforts.</td>
</tr>
<tr>
<td>Loss of mahinga kai</td>
<td>• Improved buffer planting and widened strips will help improve diversity</td>
</tr>
<tr>
<td></td>
<td>• Support community groups and landowners in fencing and planting programmes, especially through access to a contestable fund</td>
</tr>
<tr>
<td></td>
<td>• Support landowners who wish to retire farm land and carry out native planting. Provide information on how to access contestable funding to support these efforts.</td>
</tr>
<tr>
<td>River management</td>
<td>• Minimise impacts by undertaking works in accordance with Environmental Code of Practice</td>
</tr>
<tr>
<td></td>
<td>• Utilise other measures (structural measures) which require less regular and/or extensive river works.</td>
</tr>
</tbody>
</table>
River Management Works
The objectives of river alignment management will continue to be guided by a river corridor defined by engineered design lines. The river design lines proposed in this FMP are consistent with the design lines that have been in place for the past ten or more years. These design lines will be subject to changes as the design fairway is adjusted over time to take into account river behaviour. The gravel bed, or “fairway” space of the river channel is kept free from vegetation by maintenance operations and/or flood events. The margins on the right and left of this gravel bed “fairway” are known as the vegetative buffers. The fairway and buffers combined represent a designed optimum river width which is aimed at maximising natural processes within the river. Natural processes include flood flow conveyance, channel migration (within the design fairway) and pool/run/riffle formations, and in some cases erosion into the design river buffers. Vegetative buffers in the Waiohine River are managed with a combination of a “soft edge” and “hard edge” approach. “Soft edge” buffer management means that erosion will occur from time to time within the confines of the design buffer. Typical maintenance operations will involve replanting eroded areas once the active erosion has migrated (further downstream normally). Willow species are planted near the river and where possible native species are planted at a safe distance away from the river. “Hard edge” buffer management involves strengthening the buffer edges with erosion control structures (rock groyne or riprap typically).

This FMP proposes some key changes to channel maintenance operations in order to protect the ecological values of the river while maintaining the river corridor. These include:

- An increased emphasis on developing the vegetative buffers to the design widths. This may involve allowing some productive land to erode in some circumstances and then readapting vegetative buffers afterwards. Adequate buffer width is critical to provide operational decision makers a range of options and time to respond.
- Installing a higher, more robust standard of rock groyne or riprap structures. This will mean that less reactive maintenance work will be required to maintain these structures.
- Alignment with the Environmental Code of Practice and Environmental Monitoring Plan for Flood Protection Operations which aims to maximise the avoidance of environmental effects with values based decision making. This means that disturbing work in the wetted channel will be avoided wherever possible.
- Implementing an adaptive management practice where environmental trends made evident by the long-term monitoring of the environmental effects resulting from maintenance operations will guide future maintenance practices. The full width of vegetative buffers is also critical to this point as an increased management space will provide increased management options for future adaptations in maintenance methods.

Public Access
GWRC is supportive of new public access along its stopbanks, but respects the landowner rights in this matter. If in the future landowners agree to public access over their land, GWRC will be very supportive of putting public access in place.

Environmental Enhancement Fund
This FMP proposes that a contestable fund be established that could be accessed by private landowners, tangata whenua, restoration groups, the wider community and potentially DOC and Councils to fund environmental enhancement projects (including recreational, cultural and ecological values) associated with the Waiohine River. This fund would be administered by GWRC.

Applications to the fund would be for projects that are associated with the Waiohine River or associated waterways, including riparian planting (or potentially projects within the Waiohine Catchment) and can demonstrate one or more of the following:

- Community benefit (including recreational benefits)
- Ecological benefit
- Cultural benefit

Any projects funded through such a mechanism would have to deliver a measurable benefit or outcome and be assessed to ensure they do not conflict with council projects (e.g. implementation of the FMP).
7. Implementation

This section sets out how the flood protection and mitigation measures in the FMP will be implemented and funded. These measures will be implemented by a number 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 GWRC. These costs will be funded by GWRC through rates of various types.

7.1 Responsibilities

The following parties have direct or indirect roles in implementing the FMP:

**Governance Committee**

A committee must be established in a governance role to oversee and monitor the implementation of the FMP. This group would replace the existing Waiohine River Floodplain Management Planning Advisory Committee which was established for the development of the FMP, not the ongoing implementation of the FMP. The role of this committee is primarily to ensure the action plan in the FMP is further developed and implemented, including monitoring progress against actions. The committee would be established and serviced by GWRC with a Terms of Reference.

The exact form of this group has not yet been decided, and may depend on other factors such as ongoing discussions around local government in the Wellington Region. In principle, the committee should represent a wide range of interests that reflect the objectives of this FMP including: local landowners and community, local and regional councils, iwi and other stakeholders.

The Committee would also continue to act as a point of contact for members of the public, landowners and other stakeholders, for any issues they might have about the plan’s implementation. The Committee would be expected to make recommendations on implementing the FMP to GWRC and other organisations with responsibilities for its implementation.

**Greater Wellington Regional Council**

GWRC is responsible for the overall coordination and monitoring of the FMP, as well as relevant physical flood protection structures and works such as river management and stopbanks. In addition, it advises territorial authorities (based on the FMP) on flood hazard areas in order to inform the development of appropriate land use planning controls.

**District Councils (Carterton and South Wairarapa)**

Many of the land use planning control measures would be implemented by territorial authorities through their District Plans. Some environmental enhancements (e.g. walkways/cycleways on riverside reserves) would also be implemented by District Councils.

**Landowners**

Landowners in the floodplain are important parties for both implementing identified actions and being beneficiaries of successful implementation. Landowners may be required to work with the Regional Council for particular projects or works where it affects their land. For example, the final design of stopbanks and vegetative buffers. Landowners also play an ongoing role in maintaining projects or works (e.g. protecting stopbanks or riparian vegetative buffers from damage by machinery or stock).

**Community Groups and Other Parties**

Interest or community groups can be a valuable resource and may help to implement various actions. For example, community groups could assist and contribute to the work of other parties (e.g. Mangatarere Restoration Society planting and maintaining riparian vegetation on the Mangatarere Stream).

**NZ Transport Agency and Kiwirail**

NZ Transport Agency and Kiwirail are responsible for the maintenance and protection of the bridges which cross the Waiohine River.
### Recommended Floodplain Management Measures

#### Proposed Measures

<table>
<thead>
<tr>
<th>Reference</th>
<th>Area</th>
<th>Type</th>
<th>Location</th>
<th>Age</th>
<th>Description</th>
<th>Proposed by</th>
<th>Capital Costs</th>
<th>Operational Costs</th>
<th>Maintenance Costs</th>
<th>Primary Reason for Proposed Measure</th>
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### Floodplain Management Measures

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### Additional Measures

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### Other Measures

#### Proposed Measures

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<td>$5,000</td>
<td></td>
<td>Flood protection.</td>
</tr>
</tbody>
</table>

### Conclusion

The table above lists the flood management measures proposed in the FMP (ordered by river wide actions, followed by each reach).
<table>
<thead>
<tr>
<th>NUMBER</th>
<th>PROPOSED MANAGEMENT MEASURE</th>
<th>CURRENT LEVEL OF SERVICE</th>
<th>THREATS TO CURRENT LEVEL OF SERVICE</th>
<th>PROPOSED LEVEL OF SERVICE</th>
<th>PRIMARY REASON FOR PROPOSED MANAGEMENT MEASURE</th>
<th>RESPONSIBILITY</th>
<th>PRIORITY</th>
<th>COST AND FUNDING MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Houses removed on north side of Fuller’s Bend. The additional cost required for future TLB stopbank realignment at Fuller’s Bend is covered in Item 3 above.</td>
<td>1 in 5 year flood</td>
<td>Location is vulnerable to ongoing erosion and especially vulnerable to damage during floods.</td>
<td>1 in 100 year flood</td>
<td>To be more resilient to erosion and flood waters.</td>
<td>GWRC</td>
<td>Medium priority</td>
<td>Capital costs: $710,000 (local, general and targeted rates)</td>
</tr>
<tr>
<td>33</td>
<td>Vegetative buffer realignments – entire reach</td>
<td>1 in 20 year erosion protection</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year erosion protection</td>
<td>To protect farmland adjacent to river</td>
<td>GWRC</td>
<td>As and when required</td>
<td>To be completed as part of the operational programme and budget</td>
</tr>
<tr>
<td>7</td>
<td>Realignment of the Reach D TLB (cross sections 1-3)</td>
<td>1 in 20 year flood</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year flood</td>
<td>To be more resilient to erosion and flood waters.</td>
<td>GWRC</td>
<td>High priority</td>
<td>Capital costs: $1,200,000 (Operational and maintenance costs: $1,000)</td>
</tr>
<tr>
<td>8</td>
<td>Building a spillway in the existing Reach D TLB (cross sections 2-4)</td>
<td>1 in 20 year flood</td>
<td>Maintenance</td>
<td>1 in 20 year flood</td>
<td>To protect farmland</td>
<td>GWRC</td>
<td>Low priority</td>
<td>Capital costs: $1,200,000 (Operational and maintenance costs: $0)</td>
</tr>
<tr>
<td>34</td>
<td>Vegetative buffer realignments – entire reach</td>
<td>1 in 20 year erosion protection</td>
<td>Vulnerable to bank erosion</td>
<td>1 in 20 year erosion protection</td>
<td>To protect farmland adjacent to river</td>
<td>GWRC</td>
<td>As and when required</td>
<td>To be completed as part of the operational programme and budget</td>
</tr>
<tr>
<td>11</td>
<td>Channel improvement works on the Mangatarere Stream. Work to remove berms around the SH bridge and lower the bed of the stream.</td>
<td>1 in 20 year flood</td>
<td>Maintenance</td>
<td>1 in 20 year flood</td>
<td>To protect farmland</td>
<td>GWRC</td>
<td>High priority</td>
<td>Capital costs: $130,000 (Operational and maintenance costs: $25,000 pa)</td>
</tr>
<tr>
<td>35</td>
<td>Setting up of berms on lower Mangatarere Stream and vegetation removal.</td>
<td>1 in 20 year flood</td>
<td>Reduction in flood capacity</td>
<td>1 in 20 year flood</td>
<td>To protect farmland</td>
<td>GWRC</td>
<td>High priority</td>
<td>Ongoing Operational and Maintenance costs: $20,000 pa</td>
</tr>
<tr>
<td>21</td>
<td>Review of the Mangatarere scheme boundaries</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>To ensure an efficient and effective scheme operation.</td>
<td>GWRC</td>
<td>Medium priority</td>
<td>No direct costs to Waiohine FMP – part of overall Flood Protection budget</td>
</tr>
<tr>
<td>22</td>
<td>Re-design of the Mangatarere scheme design channel and embankment</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>To determine the design for future works.</td>
<td>GWRC</td>
<td>Medium priority</td>
<td>Capital costs: $190,000</td>
</tr>
<tr>
<td>19</td>
<td>Channel improvement works Beef Creek</td>
<td>1 in 20 year flood</td>
<td>Maintenance</td>
<td>1 in 20 year flood</td>
<td>To protect farmland</td>
<td>GWRC</td>
<td>As and when required</td>
<td>Capital Cost: $410,000 (Operational and maintenance costs: $3,000 pa (general rate))</td>
</tr>
</tbody>
</table>

### 7.3 Funding

Current Regional Council Funding Policy for Flood Protection

In short, the scheme is currently funded 52% by the Regional Council through rates collected across the whole region and 48% by local rates distributed across the areas covered by the scheme. Landowners pay their local contribution through a detailed benefit classification system that seeks to ensure that they pay in proportion to the amount of benefit that they receive.

The Regional Council, through rates, provides funding for implementing certain parts of the Plan. The Regional Council funding policy determines the proportion of rating available for flood protection. The current policy for implementing flood protection is:

- Up to 50 percent general rate from the regional community
- The balance from a special rates, a scheme rate, or funds directly contributed.

Current application of the funding policy provides 50 percent of the costs of providing flood protection to the Waiohine River works through a Regional Council general rate, and 50 percent of the costs through a special rates on the Waiohine River works through a Regional Council general rate, and 50 percent through a works and services rate levied on Carterton and South Wairarapa District Council areas.

Current Regional Council Funding Policy for Flood Protection

- The Regional Council, through rates, provides funding for implementing certain parts of the Plan. The Regional Council funding policy determines the proportion of rating available for flood protection. The current policy for implementing flood protection is:
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### What the Regional Council Will Fund

Based on the current funding policy (above), the Regional Council will fund the following:

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>REGIONAL COMPONENT</th>
<th>COMMUNITY COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPENSE</td>
<td>INVESTMENT</td>
<td>BENEFIT</td>
</tr>
<tr>
<td>Investigation, planning and monitoring</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Capital works (e.g. structural works and major river works)</td>
<td>Up to 50%</td>
<td>Not less than 50%</td>
</tr>
<tr>
<td>Ongoing maintenance (e.g. structural works and major river works)</td>
<td>50%</td>
<td>50%</td>
</tr>
</tbody>
</table>

The total capital works for the next 10 years is $5.9 million. Of this total, $6.3 million is for structural measures, $0.89 million for mitigation, $0.73 million for non-structural measures and $0.94 million for major river management works. The total maintenance budget for the next 10 years is $4.4 million, which includes $0.26 million per annum specified in the actions in Section 7.2.
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.

The Regional Council input for non-structural methods (e.g. land use planning controls and emergency management) will be funded from within the programmed budgets. The main input required will be staff time— supporting the District Councils to review the District Plan and maintaining community preparedness through Regional and Local Civil Defence.

**Flood Contingency Reserve Fund**

The GWRC has two reserve funds:

i. Flood Contingency Reserve: this fund is contributed across the whole region from general rates and is used for 5 - 25 year flood events

ii. Major Flood Damage Reserve: this fund is contributed across the region from general rates and is used for more than 25 year flood events.

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### 8. Monitoring and Review

Ongoing monitoring of this FMP will enable the outcomes to be regularly reviewed. This FMP is a living document so regular reviews means that the floodplain management planning process, and flood hazard mitigation measures, can be updated and changed where the need arises.

A comprehensive review of this Plan will be undertaken after 20 years, or earlier if the flood hazard is significantly altered by flooding, earthquakes or new information. Minor funding reviews will also be done yearly through the Regional Council’s annual plan process. The comprehensive review would involve re-modelling of the flood hazard. The table below summarises what will be reviewed and when:

<table>
<thead>
<tr>
<th>REVIEW TIMEFRAME</th>
<th>REVIEW SCOPE</th>
<th>REPORT TO WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every Year</td>
<td>Implementation programme</td>
<td>To GWRC and the WRFMPAC to meet annual plan time frames. The report would outline: What was proposed, What work was done, Why the difference, Proposals for next year, Summary of implementation status</td>
</tr>
<tr>
<td></td>
<td>Operational programme summary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Funding (through Annual Plan)</td>
<td></td>
</tr>
<tr>
<td>Every 3 years</td>
<td>Monitoring and implementation of actions</td>
<td>To GWRC, CDC, SWDC and the WRFMPAC to meet long term plan time frames. The report would outline: What was proposed, What work was done, Why the difference, Summary of implementation status, Updated costs and programme for FMP implementation</td>
</tr>
<tr>
<td></td>
<td>Priority and costs of works</td>
<td></td>
</tr>
<tr>
<td>Every 20 years</td>
<td>Processes for implementing the Plan</td>
<td>To GWRC, CDC, SWDC and the WRFMPAC as part of annual plan reporting. The report would outline: What was proposed, What work was done, Why the difference? Proposals for next year, Summary of implementation status</td>
</tr>
<tr>
<td></td>
<td>Effectiveness of the management measures implemented</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work methodology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non structural methods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Review of catchment hydrology, including determining the flood extent and river hydraulics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flood extent and damages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capital and operational expenditure budgets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prioritising and costing all outstanding works</td>
<td></td>
</tr>
</tbody>
</table>
IMPORTANT TRIGGERING EVENTS

- When the flood hazard is significantly changed by completing structural works
- Following a major flood
- Prior to review of the Regional Policy Statement, National Resources Plan and Wairarapa Combined District Plan, including plan changes
- When high priority results are not being met
Appendix 1: Glossary

100-year flood
A 100-year flood event has a 1% (one in 100) chance of being equaled or exceeded in any one year. On average, this is expected to occur once in 100 years, based on past flood records, though in reality it could happen at any time.

Aims
to provide the river with a channel structure that can withstand relatively stable flow

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. Adverse amenity effects occur when these values are impacted on in a negative way.

Asset management plans (AMP)
Plans that assist with the physical and financial management of a Council’s assets.

Breaching
Breaching occurs when flood waters attack and erode stopbanks and floodwalls, eventually breaking through to flow through previously protected floodplain areas.

Catchment
The land area draining through the mainstream, as well as tributary streams, to a particular site, it always relates to an area above a specific location.

Community preparedness
An appreciation of the likely effects of flooding and knowledge of the relevant emergency management readiness, flood response and recovery programmes and procedures. It ensures that the community has the ability to cope with a flood. People who are prepared will respond more appropriately to flood warnings (see non-structural measures).

Design channel
Aims to provide the river with a channel structure that can withstand relatively stable flow conditions without major aggradation or degradation.

Design standard
The standard of the flood management methods designed to contain a flood of a certain size (eg, the height of river stopbanks).

Development
Erecting a building, carrying out excavations, using land for a building, or subdividing land. Infill development refers to developing vacant blocks of land that are generally surrounded by developed properties. Greenfield development refers to developing properties in previously undeveloped areas, eg, the urban subdivision of an area previously used for rural purposes (see non-structural measures).

Designation
This is an ability to reserve land under the district plan, either to note a hazard or to note the location of a structure to provide protection from that hazard. There are generally strict rules which control what may happen in these areas and they can be used to reserve land for construction in the future.

Effects
See adverse effect or flood hazard effects.

Emergency management measures
See non-structural measures.

Flooding
A relatively high river flow that overtops (rises over the top of) the natural or artificial banks in any part of a watercourse

Flood defences
Physical structures that keep floodwater in the river corridor. They include stopbanks and flood walls (see structural measures).

Flood hazard
The potential for damage to property or people due to flooding and associated erosion.

Flood hazard effects
The negative impacts of flooding caused by fast-flowing or deep ponded flood waters. Fast-flowing or ponded flood waters are dangerous for people, because the floodwaters affect urban areas. These effects also include damage to the flood protection system, and other structures and buildings by water and debris, or by erosion.

Floodplain
The low-lying portion of a river valley, adjacent to the river corridor, which is covered with water when the river overflows during floods.

Flood risk
effects
The combination of the probability of a flood occurring multiplied by the consequence of the effects of that flood

Flood warning
The process used to warn a community of an impending flood. Warnings to the general public may be provided by methods such as local radio stations and telephone warning trees (see emergency management measures).

Geomorphology
The landform and landscape of a particular place, shaped by physical processes.

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

Hazard
A hazard refers to the potential for flooding and erosion to affect floodplain. See flood hazard effects.

House raising
The action of raising the floor level on existing houses to reduce potential flood damage.

Infrastructure
Networks, links and parts of facility systems, eg, transport infrastructure (roads, rail, parking) or water system infrastructure (pipes, pumps and treatment works).

Land information memorandum (LIM)
These contain a wide range of information about a chosen parcel of land, such as the presence of natural hazards, access easements, services such as stormwater drains, or resource consents issued on the property. Including all publicly available hazard information in a LIM or a PIM is a statutory requirement under section 31 of the Building Act, and section 44 of the Local Government and Official Information and Meetings Acts. Guidance may be given for the way this information is interpreted and presented.

Lifelines
Utilities and/or organisations that provide services essential for the ongoing functioning of a community during and following an emergency event. They include utility service providers (telecommunications, gas, electricity and water); and transportation network providers (for road, rail, port and airport services).

Mitigation
For this guideline, the act of moderating or reducing the effects of the flood hazard or flood protection works (see flood hazard effects and adverse effects).

Mauri
The life essence or special character of an entity.

Non-structural measures
Non-structural measures mainly deal with the residual risk of flooding. These measures keep people away from flood waters and help the community cope when flooding occurs. Land-use measures influence the way land is used and buildings are constructed. They include regulatory methods (policies and rules in district plans) and voluntary actions (information and advice to help people to make their own decisions). Emergency management measures seek to improve the community’s preparedness and response to flooding. Non-structural measures are the most cost-effective flood mitigation approach.

Overflow path
Overflow paths (also known as a flow paths) include areas in the river corridor and on the adjacent floodplain where a large volume of water could flow during a major event. They are often areas of land which lead fast-flowing water away from the river corridor and over the floodplain.

The depth and speed of flood waters are such that development could sustain major damage, and there may be danger to life. The rise of flood water may be rapid. Evacuation of people and their possessions would be dangerous and difficult, and social disruption and financial loss could be high. A blocked overflow path could potentially cause a significant redistribution of flood flows to other areas of the floodplain. Due to water depths and velocities, overflow paths are generally unsuitable for development, unless adequate flood avoidance and/or mitigation provisions are made.
Ponding area

Ponding areas are those areas where flood waters would inundate the land but are not as hazardous as Overflow Paths or River Corridor.

Generally, ponding areas are unsuitable for development, unless adequate avoidance and mitigation provisions are made (see flood hazard effects).

Residual risk

The risk of flooding that exists despite the protection provided by flood protection structures. In other words, it is the additional or "leftover" risk due to possible breaching and overtopping of structures such as stopbanks.

Riparian management

This is the management of the riparian zone, which 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.

Riverbed

Riverbed is defined in the Resource Management Act 1991 as: "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

Includes land immediately next to the river. It is the minimum area able to contain a major flood and allow the water to pass safely to the sea. Because of its location, the river corridor represents a significant flooding and erosion hazard to people and structures, including flood defences, situated in the corridor. The depth and speed of flood waters are such that existing development in the corridor could sustain major damage, and there is a potential danger to life. Water may rapidly rise, evacuation of people and their possessions would be extremely difficult, and social disruption and financial loss could be very high.

Risk

Risk is a combination of the chance of something happening and the impact if it did happen (likelihood x consequences).

Service

As a utility service, it is a system and its network infrastructure that supply a community need.

Stopbanks

Banks aligned beside the river to prevent floodwater flowing into floodplain areas. They are also known as flood defences or levees.

Structural measures

Structural measures are structures or other physical works designed to keep flood waters away from existing development. Stopbanks and floodwalls are obvious examples of structural works. Channel works include bank edge works and channel management. Rock linings, vegetation buffers and groynes are bank edge works, which protect flood defences like stopbanks and maintain the channel’s position. Other active channel management methods include bed and beach re-contouring and gravel extraction. They are used occasionally to reduce the opportunity for the river to erode its banks and damage structural works.

Sustainable management

As defined by section 5 of 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 avoiding, remediating, or mitigating any adverse effects of activities on the environment.

True left bank (TLB)

The left hand side of the direction in which the water is flowing (i.e. downstream).

True right bank (TRB)

The right hand side of the direction in which the water is flowing (i.e. downstream).

Vegetative Buffer

Areas of riverbank and berm planted with vegetation to control bank erosion.

Appendix 2: Bibliography and Referenced Documents

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