greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Code of Practice

For river management activities

Te Awa Kairangi/Wainuiomata Rivers consent version

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1. Introduction

1.1 Overview

The primary purpose of the Code of Practice (**Code**) is to coordinate the consistent implementation of all river management activities[1] undertaken by Greater Wellington Regional Council (**GWRC**) throughout the Wellington region. The Code applies to all river management activities irrespective of funding, location, or whether the activity requires resource consent.

River management activities are undertaken by GWRC to meet our statutory responsibilities for flood protection and erosion control, the avoidance or mitigation of flood hazards and to safeguard communities and related infrastructure.

Our approach

A river's inherent requirements, in terms of its ability to express its own character and identity (and in cultural terms, its mauri),[2] should be considered along with the community's needs in floodplain management planning. This is achieved by:

- Recognising the effect of river management decisions and activities on a river's natural character and other significant river values, at both broad (whole of river) scale and detailed (reach or specific site) scale
- Achieving consistency of river management practice across the rivers that GWRC administers and manages
- Applying good management practices in the delivery of river management activities
- Adapting river management practice to improve environmental outcomes.

How do we do this?

Floodplain Management Plans and the processes that are used to develop them, are the places where high level decisions are made about the direction of and priorities for flood protection services. These decisions in turn are key determinants of the future character of the river, the amount and type of intervention and on-going river management work that is needed to deliver on the agreed services. In addressing the environmental effects of this work, it is important that opportunities to bring about change through co-design with mana whenua are recognised and provided for and that mana whenua values are incorporated into ecological, social and the Floodplain Management Plan process (rather than after interventions to address flooding and erosion have been decided upon).

Floodplain Management Plan reviews are an opportunity to challenge past practices within the context of a sound understanding of river science and the guidance provided by the Code, in determining future pathway options for river development.

The Code describes the partnership GWRC has with mana whenua and relationships it has with stakeholders and sets out how important cultural, natural character, ecological, recreational, and amenity values are to be recognised and incorporated into river management planning and good management practices. The Code guides and facilitates river managers and river management planning, through systematic information collection and review.

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[1] See section 10 for the full list of river management activities covered by the Code.

[2] According to the Proposed Natural Resource Plans (**PNRP**) definition, mauri is an energy or life force that mana whenua consider exists in all things in the natural world.

The Code is primarily for GWRC staff, and particularly river management staff where it dedicates a section that comprehensively describes the river management practices commonly used.

Mana whenua and GWRC share a partnership of mutual benefit, as described in the Memorandum of Partnership. The Code adds context and meaning to this relationship in respect of river management by providing for mana whenua involvement and ensuring that mana whenua values and interests are recognised and provided for.

Stakeholders, such as the Department of Conservation, Wellington Fish and Game Council and the wider community will find it useful as a "one stop shop" for understanding how river management activities are carried out, and how they can be involved in planning and monitoring.

The river management practices, or good management practices, are the "tools of the trade" and give effect to the objectives of the various planning documents set out in section 5. Section 10 describes all river management methods that make up GWRC's river management 'toolbox' including the measures to be taken to avoid or mitigate the potential adverse effects of the activity. These have been developed over many years and are continually improved to address channel design challenges and evolving cultural and environmental standards and expectations.

The Code also sets out a regular review process of works programmes and monitoring results incorporating mana whenua input and the views of stakeholders. An Independent Review Panel is proposed to review annual reports against the Code's purposes and objectives. A regular but less frequent independent review of the Code is also proposed.

While the Code applies to all river management activities, resource consents will be required for most instream activities, significant earthworks, and the construction of stopbanks, associated channel works, and associated gravel extraction.

The rivers and watercourses that GWRC actively manages for flood protection are shown in **Appendix 1**. The framework, which supports the implementation of the Code, is set out at **Figure 1**. This Code replaces the Environmental Code of Practice dated March 1999.

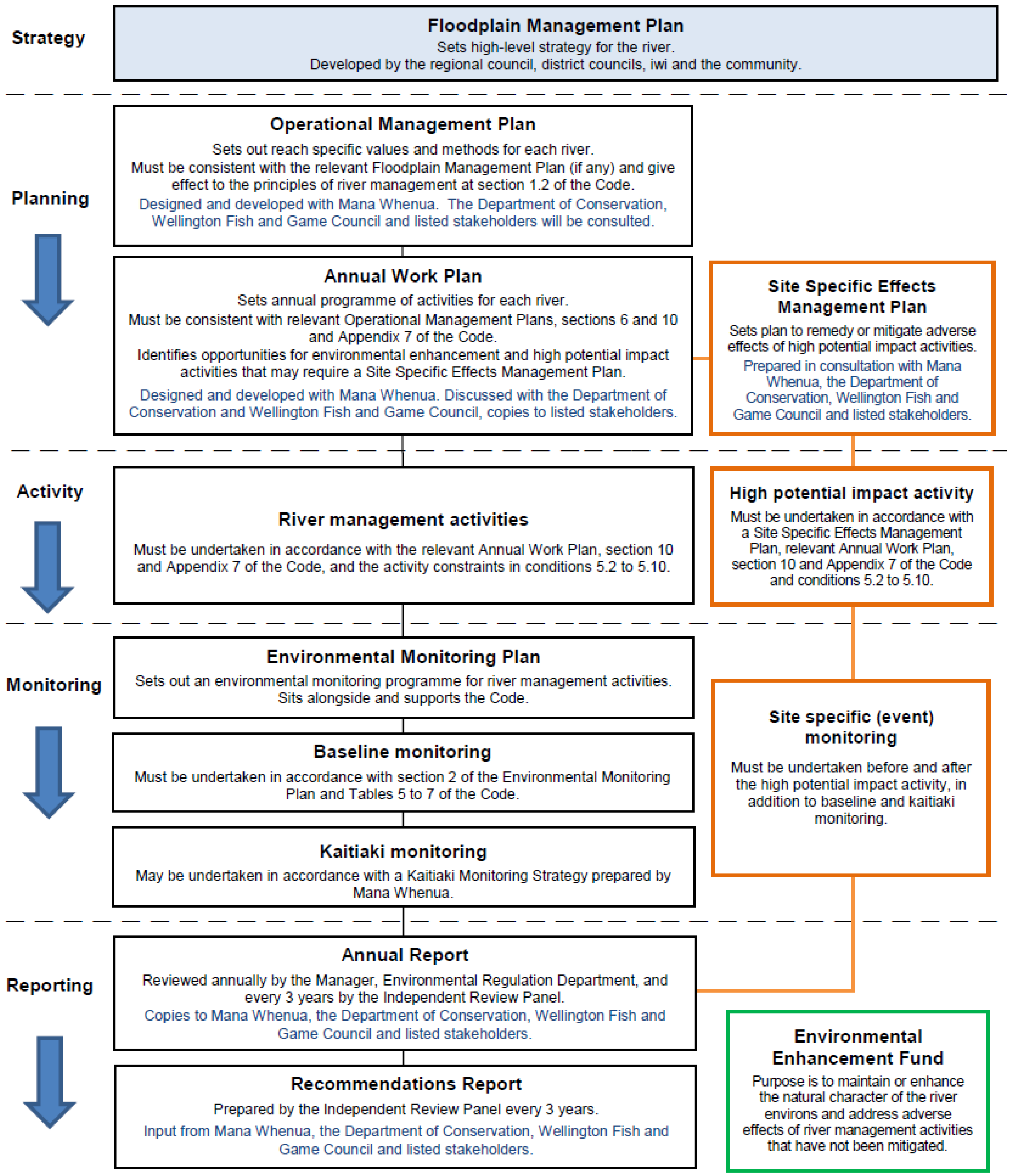
A complex legacy

The Greater Wellington region has five major river systems. These are a mix of gravel and silt bed rivers, and apart from the Ruamahānga mainstem, are relatively short with steep gradients and are prone to regular, and occasionally damaging, flooding.

Rivers are dynamic - constantly changing in response to the influences acting on them. The form and behaviour of the region's rivers to date has been shaped by the complex interactions of past geological, climatic and human influences that have acted on them and their catchments. This history, together with the needs of our communities and the river management decisions made to meet these needs, are key determinants of each river's current character, form, behaviour and ecology. They also determine the way these river features will evolve in the future.

Protecting the community's safety and well-being, and the sustainable economic use of river floodplains, while also safeguarding important river values, is a continual challenge for river managers. Instrumental to meeting this challenge are the planning processes described in the implementation framework at **Figure 1** and the good management practices used.

Figure 1: Implementation framework



1.2 Principles of river management

Sustainable and effective river management is based upon the following six key interrelating principles, which will be given effect to in the development and review of Floodplain Management Plans and Operational Management Plans:

1. <u>Rivers are dynamic</u>: They are constantly changing and at any time, are a physical expression of a combination of their physical, climatic and human processes (both past and present) at the catchment and reach level.

2. <u>Work with rivers and not against them</u>: Healthy rivers are diverse rivers. Diverse rivers have greater natural character, which provides for a greater expression of mauri and their inherent aquatic and riparian habitats, which in turn support greater species diversity.

3. <u>Rivers need room to move</u>: Rivers naturally meander, and the meander pattern will tend to migrate downstream over time. Central to this process is erosion and deposition of bed and bank material and the re-location of riparian margins.

4. <u>River management requires knowledge</u>: Understanding catchment specific river histories and bedload transport capacities is needed to predict reach specific future state, and what is realistically achievable.

5. <u>Rivers are managed for a range of flood flows</u>: Both flood and channel carrying capacities are managed to meet the community's expectations for protection, and the avoidance and/or mitigation of flood hazards.

6. <u>River management requires adaptability</u>: The unpredictability of dynamic rivers combined with fixed channel capacity constraints, means flexibility of management is important to achieve agreed outcomes.

1.3 Purposes of the Code

1. Guide the effective coordination, and consistent implementation, of all river management planning and practices.

2. Describe the good management practices, why they are used, the situations they are best suited to, impacts they can have, how these impacts can be avoided or mitigated, and a process for their continual improvement.

3. Guide the effective coordination and input of mana whenua.

4. Specify community, and stakeholder engagement into river management planning and methods.

5. Support a greater understanding amongst GWRC Flood Protection staff of the effect of river management decisions and works on a river's natural character and values at catchment (ki uta ki tai), reach, and site-specific scales.

6. Assist GWRC Flood Protection staff to carry out river management work in an environmentally sensitive manner that provides for mana whenua values, and to monitor and record their actions.

7. Guide personnel undertaking monitoring and reviews of river management work and detail how results can be incorporated into the Code and other river management planning processes.

2. GWRC's flood protection commitments

GWRC will:

1. Carry out ongoing liaison with mana whenua partners and undertake consultation, and review of the Code with stakeholders and the wider community.
2. Guide the effective coordination and input of mana whenua partners including, but not limited to, the co-design and development of Operational Management Plans and Annual Work Plans; the exchange of information; identification of mana whenua values and issues; the establishment of a Rōpū kaitiaki forum; a kaitiaki monitoring programme; river enhancement funding allocations; and mutually agreeable administrative matters (administrative support, meeting schedules and fees, staff attendances, annual reporting arrangements).
3. Ensure works carried out do not further detract from the mauri and the existing natural form and character of the region's rivers and streams.
4. Ensure its staff and contractors are properly qualified and resourced to achieve a high standard of works when implementing good management practices in the Code.
5. Ensure its staff and contractors understand the potential adverse effects of river management activities and are trained in how to recognise and provide for instream values, including mana whenua values.
6. Ensure river management activity records and monitoring information as specified in the Code, or as required by consent conditions, are accurately completed and maintained.[3]
7. Encourage and facilitate staff and contractors to continually improve the good management practices based on proven experience and innovation.
8. Support and facilitate monitoring programmes that improve GWRC's understanding of the rivers and streams dynamics and potential adverse effects of river management activities.
9. Ensure compliance with resource consent conditions.
10. Seek expert advice where required for works design, assessing the potential cultural and/or ecological effects of river management activities, and the monitoring of effects.

2.1 How will we do this?

GWRC will implement the Code by:

1. Appointing a person with responsibility for implementing the Code.
2. Establishing an implementation training programme (to be co-designed with mana whenua partners where it affects mana whenua values) following the commencement of the relevant resource consents.
3. Ensuring any review of a Floodplain Management Plan, or the development of an Operational Management Plan, adopts the principles and good management practices contained in the Code, and considers lessons learnt through the Kaitiaki Monitoring Programme and Environmental Monitoring Plan.

[3] See in particular, the Work Site Assessment Plan at **Appendix 4** and Habitat assessment template at **Appendix 5**.

4. Maintaining formal relationships with the Department of Conservation and Wellington Fish and Game Council.

5. Continuing to implement the Environmental Monitoring Plan, in conjunction with relevant GWRC staff and stakeholders.

6. Establishing an Independent Review Panel as required by the consent conditions.

7. Ensuring an Annual Report as defined in the Code is completed by 31 August each year as required by the consent conditions.

8. Annually review the performance of the good management practices, Environmental Monitoring Plan, any Site Specific Effects Management Plans (**SSEMPs**), and the Kaitiaki Monitoring Programme and incorporate annual review recommendations into these methods and plans.

9. Establishing a protocol for reviewing and amending the Code.

2.2 Document ownership and management

The Code has been created by GWRC for its own use. GWRC has sole responsibility for its administration.

Management of the Code is necessary to keep it up to date and to ensure that all staff and the public have access to the latest version. This will require:

- The appointment of a staff member who has primary responsibility for managing of the Code document.
- The establishment of a protocol around the management of the Code, including:
  - The master copy of the Code is held by GWRC, and this is the only copy to which approved amendments will be made.
  - GWRC is responsible for ensuring that updates to the Code are made as agreed by the parties to the Annual Review and the 10 yearly comprehensive review, and that updated copies of the Code are made available to all parties and posted on the GWRC website.

2.3 Distribution and availability

GWRC will ensure that:

- All staff have access to a copy of the Code and refer to the Code when designing and formulating plans for flood protection and erosion control work.
- All staff (including contractors) have access to a copy of the Code and should refer to it before undertaking any river management activities.
- The Code is available for public inspection on the GWRC website and (in hard copy) at all GWRC offices and depots.

3. Reporting and review

The establishment of reporting and reviewing procedures within the Code is one of its most important functions. There is currently a paucity of data on the extent and nature of river management activities. This has hindered improvements to river management planning, and the protection of cultural and ecological values.

For the Code to achieve its purposes, it must have explicit reporting and reviewing requirements, and incorporate:

- information gathered from monitoring in accordance with the Environmental Monitoring Plan, any SSEMPs, and any new method trials conducted in accordance with section 10.7
- feedback from staff involved in implementation of the Code
- input of mana whenua partners
- the views of stakeholders
- new information and research from other reputable sources
- changes in technology
- changes in river values.

3.1 Reporting

An Annual Report will be produced by GWRC and will address:

- whether recommendations from the previous years' Annual Reports were implemented, and if not, why not
- the relevance of any Floodplain Management Plan or Operational Management Plan completed or reviewed during the preceding year and whether change to the Code is necessary for it to remain compatible with these plans
- works completed during the previous 12 months, and the proposed work for the next 12 months for each river
- the performance of the good management practices and any SSEMPs and whether improvements to them are necessary
- compliance with consent conditions and a summary of any complaints received over the preceding 12 months
- the results and recommendations of monitoring undertaken for each river in accordance with an SSEMP, the Environmental Monitoring Plan, and the Kaitiaki Monitoring Programme
- applications made to the Ecological Enhancement Fund, and which projects were approved or declined and the rationale
- responses to recommendations received from mana whenua partners, the Independent Review Panel or independent experts over the preceding 12 months
- progress with the Natural Character Index/Habitat Quality Index and its implementation
- progress with the formation of Rōpū Kaitiaki.

3.2 Review

A review of Annual Reports will be carried out by the Manager, Environmental Regulation every year. This review, together with the relevant Annual Report, will be supplied to mana whenua, Department of Conservation, Wellington Fish and Game Council and any stakeholder groups as required under the conditions of consent.

An Independent Review Panel made up of technical and cultural experts will be appointed every 3 years to review the previous three Annual Reports, any SSEMPs, amended documents or plans and make recommendations for improvements to river management. The Independent Review Panel will invite input from mana whenua, the Department of Conservation and Wellington Fish and Game Council.

The purposes of the annual and three yearly reviews are to:

- ensure the Code's purposes in section 1.3 are being achieved
- ensure mana whenua values and interests in the management of, and decision-making regarding, river management are recognised and provided for
- identify modifications to good management practices described in the Code and any other amended documents or plans
- check the SSEMP process is being applied and SSEMPs are being completed according to their purposes and operating criteria, evaluate their effectiveness, and recommend changes where necessary
- track the progress of the Environmental Monitoring Plan
- assess whether observed changes to parameters being monitored (positive or negative) are attributable to river management activities, and recommend changes (if necessary)
- check if any 'triggers' in the data indicate the need for further investigation of individual practices or changes in work practices
- assess whether consent conditions for each river remain achievable
- consider new information (including cultural recommendations) affecting river management activities, including unforeseen issues to be resolved
- identify opportunities for applications to the Environmental Enhancement Fund.

Every 10 years a comprehensive review of the Code will be undertaken by an independent auditor appointed by GWRC to evaluate whether it remains relevant to river management generally, and specifically, that it is achieving its purposes.

4. Key elements of river management design

4.1 Design channel and buffers

To characterise the natural character of a river and determine the best management response, rivers are divided into reaches that exhibit similar channel form characteristics and physical processes (such as sediment transport).

Against this background, a favoured design channel (or fairway), and the placement and extent of its supporting buffer, within each reach is based on:

- An engineering assessment of river flow and velocity dynamics
- A scientific understanding of the river morphology for each reach type
- Existing structural elements in the river corridor (both natural and man-made)
- Sediment movement (sand, silt, and gravel)
- An ability to develop and maintain the dominant flow meander.

Buffer zones border the design channel and are intended to strengthen the banks during normal river flows. They act as a sacrificial erosion zone to help absorb the river's energy during floods.

When the design channel and buffer zones are compared with the existing river channel morphology and capacity the resultant information can be used to inform the floodplain management planning process to:

- identify changes that may be required if the river is to be given additional space to express its natural character, while achieving its flood design capacity
- identify structural and non-structural elements (i.e. improvement works such as stopbanks necessary to provide protection for a defined level of flood risk, within the context of the constraints imposed by GWRC flood risk management principles and policies, the Regional Policy Statement or community expectations)
- recognise where conflicts exist between the community's expectations for protection (against flooding) versus river values, to articulate the choices that the community must make.

NOTE: The design channel/fairway and buffer zones are intended to be flexible and not rigid lines that are maintained at all costs.

4.2 Design riverbed levels

The aim is to maintain riverbed levels within the bounds of defined minimum and maximum levels (referred to as a 'design envelope'). A design envelope has been developed for Te Awa Kairangi/Hutt River and is under development for Waikanae River, and will be developed for all actively managed rivers over time. Understanding channel capacity involves consideration of the river in both plan form and profile. The design channel and buffer are used to address the former, while profile is determined through survey of riverbed levels. Riverbed surveys are conducted on a five-yearly cycle and from this, patterns of sediment transport through the river system can be determined. This enables identification of reaches where aggradation and degradation are occurring, and this information is used to inform decisions about the need to maintain channel capacity.

4.3 Methods to maintain design channel, buffers and riverbed meander

Once the preferred design channel and its supporting buffers are established[4], the aim is to minimise interventions and allow the natural processes of bed scour/deposition and bank erosion/accretion associated with meander migration to take place. Where intervention is necessary to maintain a clear fairway and buffer, various good management practices will be used. These include:

- Recontouring and ripping of the channels and beaches and bars of the active river bed
- Clearance of vegetation and debris in the active river bed (mechanically or using agrichemicals)
- Recontouring or reinstatement of eroded bank edges
- Planting and rejuvenation of vegetative bank edge protection
- Installation and maintenance of erosion and bed control structures
- Gravel extraction to reduce aggradation of the bed or to assist with channel alignment.

[4] Note: These tools may not be applicable for all rivers.

5. Flood protection and erosion management planning

5.1 Overview

GWRC is responsible for the delivery of flood and erosion protection and uses various plans to establish what needs to be done, to what level, how it is to be coordinated between other agencies, and how to ensure the consistent implementation of good management practices.

GWRC principal functions for flood protection are to:

- Understand and communicate flood and erosion risk
- Improve security from flood and erosion hazards
- Establish and maintain flood protection and control works
- Improve assets and services which contribute to the protection or enhancement of river ecology or cultural use and values
- Enhance river amenity and recreational infrastructure or other services.

At the highest level, these functions are addressed in GWRC's Long Term Plan, which outlines the community outcomes and services to be provided over the next 10 years. The current strategic priorities[5] for the region are, "*Fresh water quality and biodiversity, water supply, regional resilience and public transport*". Flood protection is a key activity in achieving these strategic priorities.

Historically we have taken a strong engineering focus to flood management – diverting rivers, drainage and building on floodplains. Over recent decades our thinking has shifted, and we now take a wider view to assessing and responding to flood risks: natural solutions are considered, affected communities are closely involved and we manage the environmental effects of flood protection works to deliver holistic protection for communities. Looking to the future, we want to take this approach even further by working with iwi, communities and other councils to achieve greater social, economic and environmental outcomes from flood protection work. We will continue to look for innovative approaches to flood hazard management. As noted above, in addition to the more standard flood protection methods, such as building stopbanks and protecting against erosion, we continue to develop more sustainable flood protection methods[6].

Funding allocated by GWRC for flood protection work is prescribed in GWRC's Long Term Plan. In addition to GWRC's Long Term Plan is a hierarchy of other plans which further develop the GWRC functions and objectives for freshwater quality, biodiversity and regional resilience. These are discussed in further detail below.

5.2 Floodplain Management Plans

Floodplain Management Plans are overarching plans designed to provide a strategy for flood protection and erosion risk management. They have a life of up to 40 years and are reviewed every 10 to 20 years.

They "*maximise opportunities to work with natural processes and to deliver multiple benefits from flood risk management, including positive environmental, cultural, recreational, and economic outcomes*" (Guidelines for Floodplain Management Planning.

[5] As described in the Overview and Strategic Framework of GWRC's Long Term Plan 2018 -2028.
[6] GWRC's Long Term Plan 2018-2028 – Flood Protection and Control Works.

GWRC. June 2015). Future Floodplain Management Plans will include the river management principles outlined in section 1.2 above.

Floodplain Management Plans are developed through a consultative planning process, in which GWRC works with mana whenua, stakeholders, and the community within a river catchment to:

- investigate and understand the probability and likely extent of flooding, and the economic, social and cultural and environmental values within a defined catchment
- identify, evaluate and select a range of appropriate management options to reduce the probability and impact of the flood and erosion risk
- prescribe the management objectives to avoid and/or mitigate the risks
- consider alternative strategies to channel management for mitigating flood and erosion risk, such as land use change
- consider strategic options for the maintenance and enhancement of cultural, ecological, recreational, and amenity values
- quantify the agreed outcomes of flood protection, erosion control, and flood hazard management
- identify all significant improvement works (e.g. stopbanks), and other channel management works
- implement the preferred options for managing the flood risk in a way that ensures a coordinated response by relevant agencies and/or individuals.

Most managed rivers in the Greater Wellington Region either have an operative Floodplain Management Plan or have one under development. Where one is yet to be developed, the policy direction for river management work is based on the individual flood or erosion protection scheme objectives and the Asset Management Plan.

5.3 Asset Management Plan

GWRC's Asset Management Plan for flood protection provides more detail on the levels of services and strategies required to meet a defined level of risk management (as might be determined in a Floodplain Management Plan) on a sustainable and cost-effective basis, and the expenditure and funding needed to achieve this.

5.4 Operational Management Plans

Operational Management Plans will be developed and maintained for each river for which GWRC has resource consents to manage flood protection and/or erosion control. Operational Management Plans will enable alignment with Floodplain Management Plan directions (or flood protection scheme agreements where there is no Floodplain Management Plan) and require the consideration of important ecological recreational, cultural and social values in work planning, at a more detailed level.

Operational Management Plans will identify management reaches and the key river management elements within a river as a method of translating high-level directions into work programmes for each managed river. They contain detailed guidelines for the specific management of each reach, including advice on the most appropriate methods and tools to be used in each reach.

An Operational Management Plan must contain the following in respect of each reach of the river to which it relates:

- set out how it gives effect to the principles of river management at section 1.2 of the Code
- describe the design standard and reach characteristics, including the channel type key morphological characteristics and fish habitats, including spawning habitats (and overtime incorporate the outcomes of the Natural Character Index/Habitat Quality Index)
- identify management objectives as prescribed by a relevant Floodplain Management Plan and other relevant agreements
- contain the design channel and buffer zone as appropriate
- describe the bed level envelope and set minimum bed levels
- describe recreational values and identify any areas of safety concern
- identify any additional activities that require an SSEMP
- identify any areas with significant ecological or mana whenua values, including:
    - any indigenous ecosystems or significant indigenous biodiversity values
    - the mana whenua values of kaitiaki sites as specified in Schedule C of the Natural Resources Plan or provided by mana whenua
- describe the range of management methods which may be implemented, including any additional management practices to apply to the above areas to avoid, remedy or mitigate adverse effects.

5.5 Annual Work Plans

Annual Work Plans set the annual programme of river management activities to be undertaken within each river system. The development of Annual Work Plans must be consistent with the objectives of the relevant Operational Management Plans, sections 6 and 10 of the Code and the general activity constraints calendars in **Appendix 7**.

In particular, river managers must take account of:

- the necessity of intervention and the consequences of doing nothing, including applying the decision making framework set out in section 6
- the urgency of the work and consequences of not undertaking it at the proposed time
- the effectiveness of the proposed works to address the identified flood protection, erosion or hazard issue
- the environmental effects of the work and alternatives to achieving the desired outcomes
- the effects on mana whenua values and their aspirations for the river corridor and floodplain
- if the required works are allowed, either by rules in regional plans or by resource consents
- opportunities for environmental enhancement, as identified by a suitably qualified ecologist
- the availability of funding to achieve the proposed work.

The Annual Work Plan process is shown in **Figure 2**. Work planning and budgeting commences in January and is confirmed in August. Routine vegetative works on riverbanks (such as planting and willow layering) commence in winter; instream and bank edge works are generally undertaken in the spring and summer periods.

5.6 Site Specific Effects Management Plans

If a proposed activity or set of activities have the potential to generate significant adverse effects on the river environment at a specific site or within a specific reach, the activities may need to be conducted in accordance with a more detailed SSEMP, in addition to the good management practice methods. The purpose of an SSEMP is to gather information on high potential impact activities and activities in identified sensitive locations and seasons in order to limit, remedy or mitigate potential adverse effects.

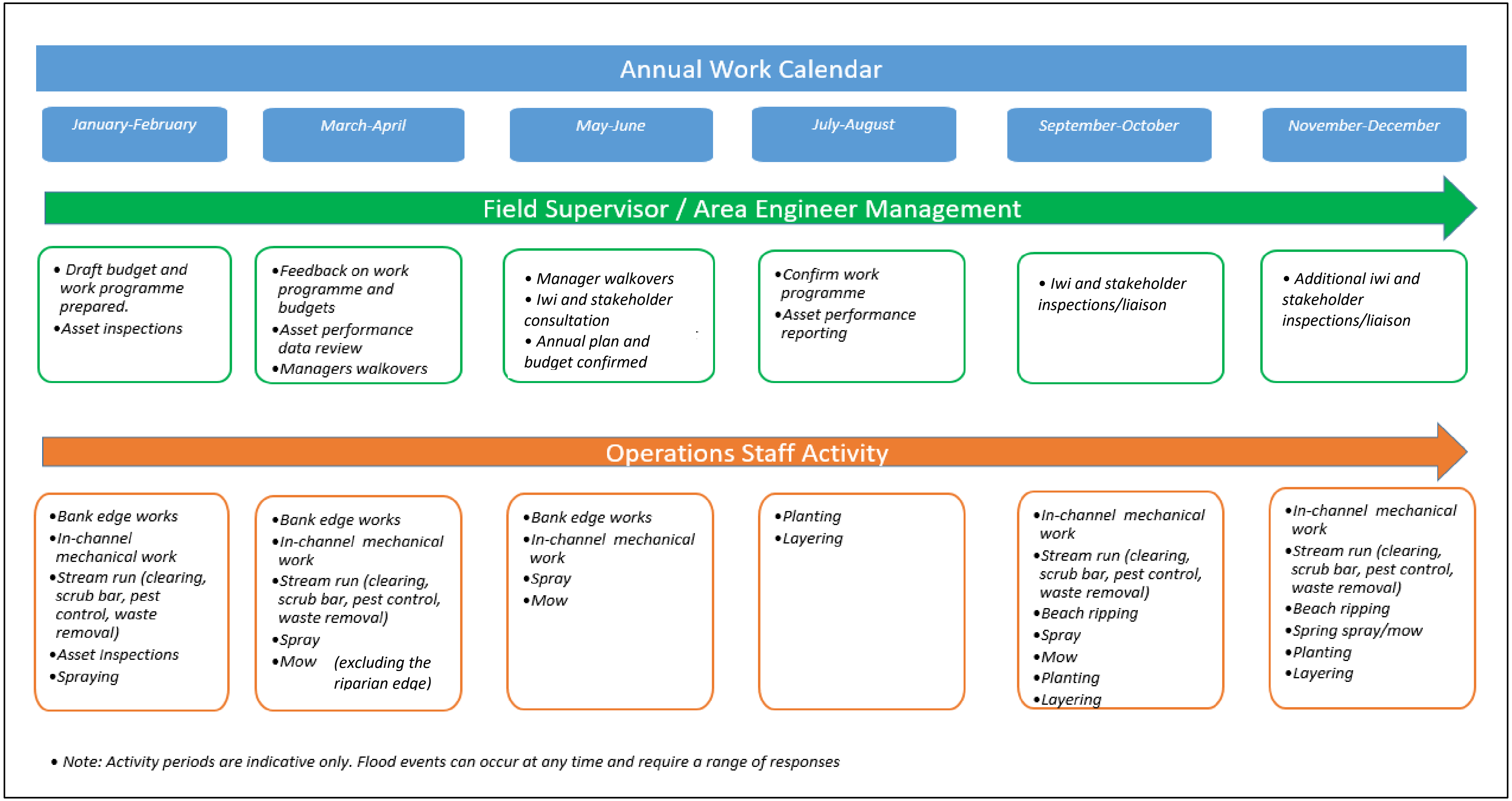
Appendix 2 outlines the process for determining when site specific effects management is necessary, and if required, what it should include. This process should be read in line with any relevant consent conditions.

There are two tests for a SSEMP, the first test involves a five step process and combines:

- The potential risk for adverse effects
- The sensitivity of the site
- Scale of the proposed works.

The second test relates to values and is determined by reviewing the activity constraints tables in the **Appendix 7** of the Code. This test covers timing and location of the activity to ensure that values are protected.

Figure 2: Annual work planning process[7]



[7] Specific dates maybe subject to change depending on availability of Council financial information and reporting requirements.

6. Decision making framework

The decision making framework for determining whether a river management activity should proceed is described in **Figure 3** and **Figure 4** below.

Figure 3 outlines the steps to be carried out at all levels of management planning to ensure that the effects of river management activities are appropriately considered and addressed.

Figure 3: Process for managing the effects of river management activities

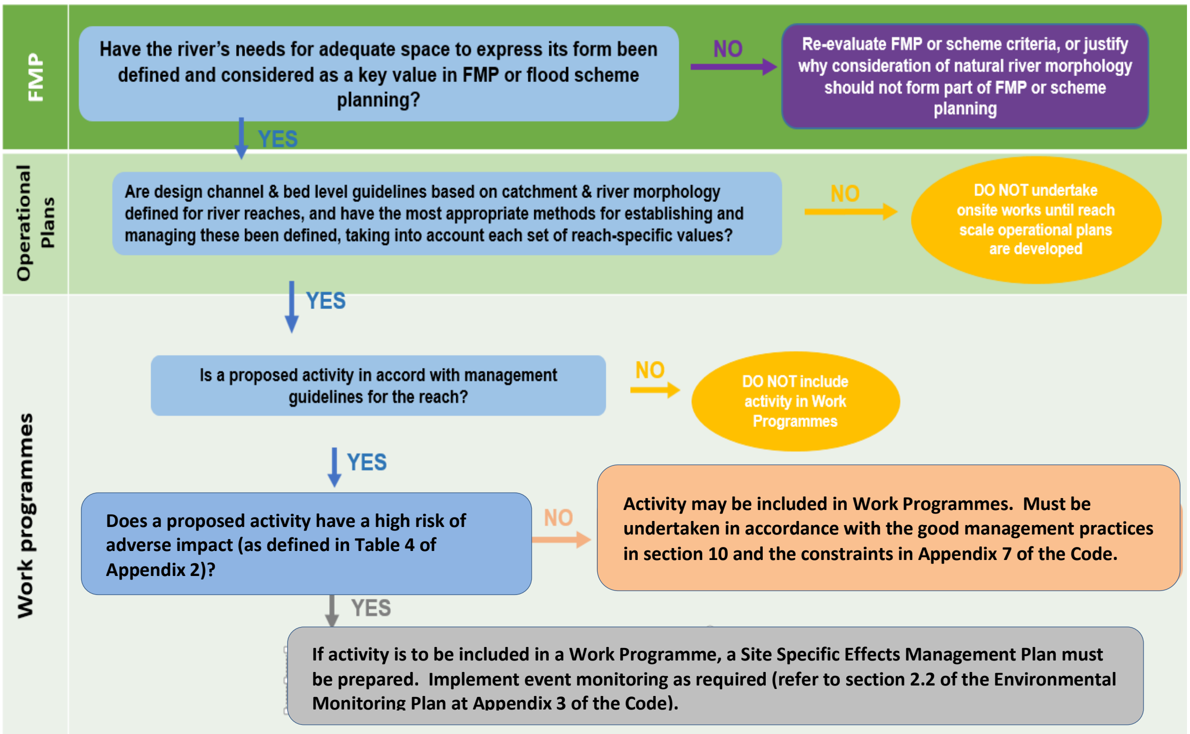
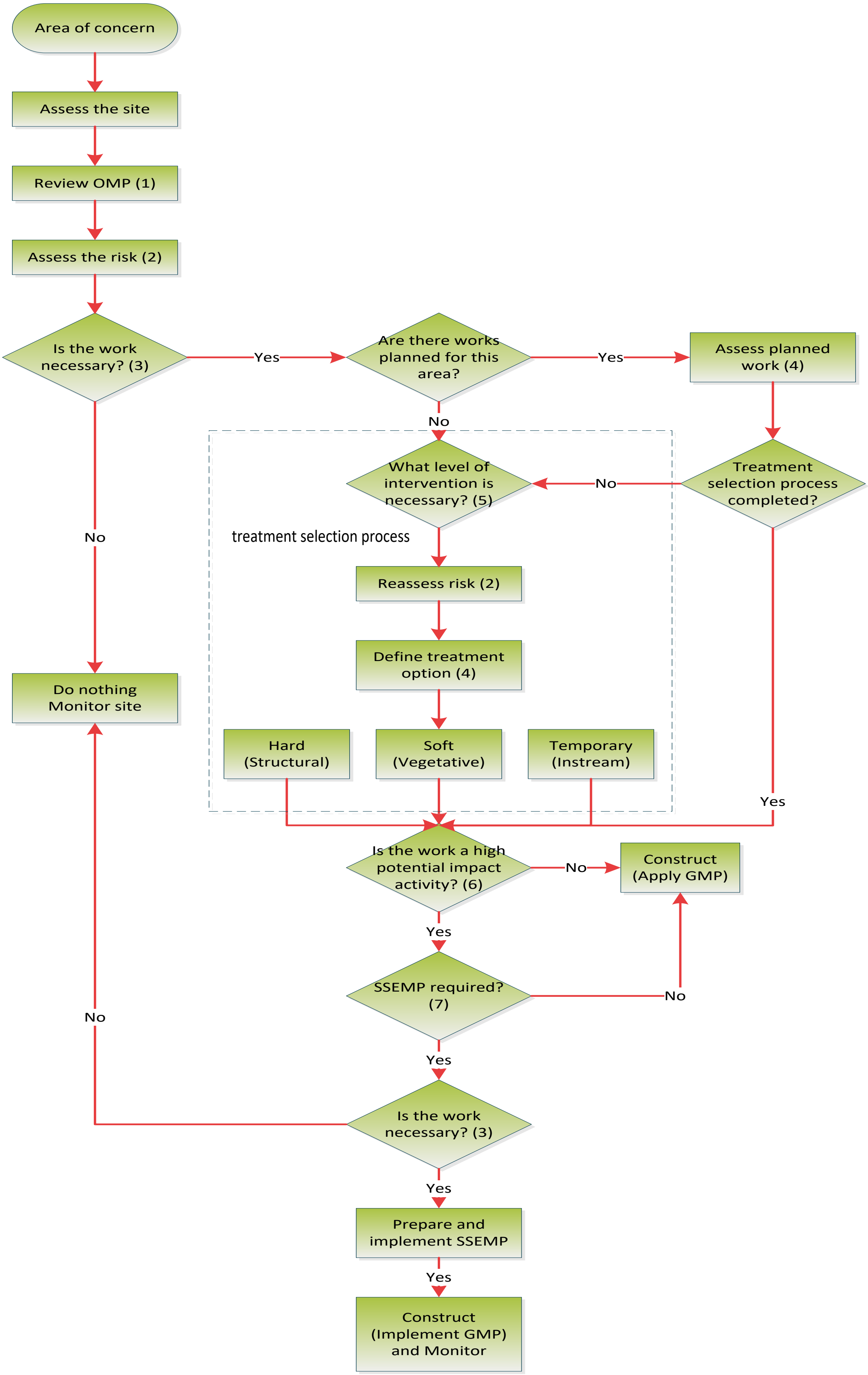


Figure 4 outlines the process that staff follow to decide whether work is necessary and, if so, which good management practices from section 10 are appropriate.

The first question that should always be asked is, is it necessary to do anything? Should we intervene? Can we avoid, remedy or mitigate the adverse effects of the proposed work? Finally, what will the knock on effects of that work be and therefore what is the appropriate response.

Figure 4: Decision making framework for planned and reactive maintenance



Notes for Figure 4:

(1) Review Operational Management Plans: Operational Management Plans will detail future work planned for the area and display constraints and values. The principles of river management at section 1.2 of the Code will be embedded into these Plans.

(2) Assess the risk: Need to determine what is at risk (people/infrastructure)? This is a judgment call based on experience and made within the context of information provided in the Operational Management Plans (constraints/values/planned works). Feeds into the treatment selection process at (5).

(3) Is the work necessary? What is the appropriate response (avoid/remedy/ mitigate)? Consider the potential knock on effects of the works.

(4) Assess planned work: It is important to note that budgeting processes must occur before any future planned works can be brought forward.

(5) Treatment selection process (shown within the dashed box): Includes a hierarchy of river engineering solutions (treatment options) that are available. Broadly these range from temporary (instream works) through to permanent (structural) methods. Permanent solutions then range from soft (vegetative) to hard (rock) methods. The **RISK** will determine the level of intervention and therefore the appropriate treatment option.

(6) High potential impact activities: are defined in Table 1, **Appendix 2** and include wet gravel extraction, bed recontouring, channel diversion cuts and ripping in the wet channel.

(7) The need for an SSEMP: undertake an assessment as per **Appendix 2** and the conditions of consent to determine whether an SSEMP is required before undertaking the works.

7. Mana whenua relationship and stakeholder consultation

Rivers are essential to a community's wellbeing. They provide a wide range of cultural, recreational, and aesthetic benefits and attractions. They are complex, fascinating, and diverse ecosystems harbouring and nurturing many aquatic and terrestrial species. Consequently, individuals and groups in the community take an active interest in river health and how this is managed. GWRC has well established relationships with mana whenua and interested groups. Opportunities for engagement are set out below.

7.1 Mana whenua relationship

Memorandum of Partnership

Formal interaction between tangata whenua and GWRC is currently based on a Memorandum of Partnership between the tangata whenua of Te Upoko o te Ika a Maui and Wellington Regional Council (2013). This agreement sets out the principles for conduct of the relationship between tangata whenua and GWRC that stems from the Treaty of Waitangi and is prescribed in legislation including the Treaty of Waitangi Act 1975 and the Resource Management Act 1991.

The tangata whenua tribes with mana whenua status in the Wellington Region are identified in the Memorandum of Partnership as:

- Taranaki Whānui ki te Upoko o te Ika a Maui, represented by Port Nicholson Block Settlement Trust
- Ngāti Toa Rangatira, represented by Te Rūnanga o Toa Rangātira Inc.
- Te Atiawa ki Whakarongotai, represented by Ati Awa ki Whakarongotai Charitable Trust
- Ngāti Raukawa ki te Tonga represented by Ngā Hapū o Ōtaki
- Ngāti Kahungunu ki Wairarapa, represented by Ngāti Kahungunu ki Wairarapa Trust
- Rangitāne o Wairarapa, represented by Rangitāne ō Wairarapa Inc.

The Memorandum of Partnership acknowledges that:

- GWRC and mana whenua have a common goal of supporting the environmental, social, cultural and economic wellbeing of the region for the benefit of the regional community, both now and in the future.
- The relationship between mana whenua and GWRC is long standing and ongoing. It operates concurrently at governance, executive and operational levels.
- The MOP states the partnership will manifest both on a one-to-one basis between mana whenua and GWRC and within the collective forum of all the parties (as identified above). The partnership between GWRC and individual mana whenua is the pre-eminent relationship.

National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management provides direction on how local authorities should carry out their responsibilities under the Resource Management Act 1991 for managing freshwater. The framework considers and recognises Te Mana o te Wai (the integrated and holistic well-being of a freshwater body) as an integral part of freshwater management. Upholding Te Mana o te Wai acknowledges and protects the mauri of the water.

Objective D1 requires GWRC to provide for the involvement of iwi and hapū, and to ensure that tangata whenua values and interests are identified and reflected in in the management of fresh water, and decision making regarding freshwater planning. In implementing this objective, Policy D1 requires GWRC to take reasonable steps to involve iwi and hapū in the management of fresh water and freshwater ecosystems in the region, work with iwi and hapū to identify tangata whenua values and reflect these values in its management and decision making regarding fresh water.

The implementation framework for flood protection in **Figure 1** achieves Objective D1 and Policy D1 by providing for mana whenua involvement throughout all areas of GWRC's flood protection work (strategy, planning, implementation, monitoring and reporting). The framework requires the identification of mana whenua values and kaitiaki sites through the Operational Management Plans and section 10.3.13 of the Code. All river management activities must be undertaken in a manner that reflects and incorporates mana whenua values in GWRC's flood protection management and decision making.

7.2 Working with mana whenua

The work planning and review processes defined in the Code outline how GWRC will engage directly with its mana whenua partners in river management generally, or specifically within rivers or river reaches of interest. These opportunities include:

- Floodplain Management Plan: Within 20 working days of GWRC deciding to complete a new Floodplain Management Plan, or review an existing one, mana whenua will be contacted, briefed on the process, and invited to co-design the relevant Floodplain Management Plan. The Hutt Valley Floodplain Management Plan sub-committee is responsible for the implementation of the Hutt Floodplain Management Plan. Te Kauru subcommittee is responsible for development of Te Kauru Floodplain Management Plan. Both of these sub-committees include mana whenua representation.
- Operational Management Plan and Annual Work Plan: Mana whenua will be invited to co-design and develop relevant Operational Management Plans and Annual Work Plans. Copies of the final Plans must be provided to mana whenua.
- Site Specific Effects Management Plan: When a SSEMP is required, mana whenua will be contacted for input to resolve the potential adverse effects on their values.
- Environmental Monitoring Plan: Mana whenua will be consulted on any proposed changes to this plan.
- Kaitiaki Monitoring Strategies: Mana whenua will develop and review these strategies and may undertake kaitiaki monitoring in accordance with the processes set out in the consent conditions.
- Annual Report: The Annual Report will be prepared with input from mana whenua and will be provided to mana whenua. Any matters of concern arising from the report are to be notified to GWRC in writing and these will be considered and responded to within 20 working days of being received. Mana whenua can also prepare their own report if they consider this is appropriate.

- Independent Review Panel: When the Independent Review Panel is convened, mana whenua will be informed and advised of the process and how they can contribute to the review.

7.3 Engagement with stakeholders

The work planning and review processes defined in the Code outline how GWRC will provide opportunities for stakeholders to engage with GWRC in river management generally, or specifically within rivers or river reaches of interest. These opportunities include:

- Floodplain Management Plan: Within 20 working days of GWRC deciding to complete a new Floodplain Management Plan, or review an existing one, stakeholders will be contacted, briefed on the process, and invited to participate.
- Operational Management Plan and Annual Work Plan: Stakeholders will be consulted on Operational Management Plans and will have an opportunity to discuss draft Annual Work Plans with GWRC. Copies of the final Plans must be provided to stakeholders listed in the conditions.
- Site Specific Effects Management Plan: When a SSEMP is required, stakeholders will be contacted for input to resolve the potential adverse effects on their values.
- Environmental Monitoring Plan: Stakeholders will be consulted on any proposed changes to this plan.
- Annual Report: The Annual Report will be prepared with input from stakeholders and the final report will be provided to them. Any matters of concern arising from the report are to be notified to GWRC in writing and these will be considered and responded to within 20 workings days of being received.
- Independent Review Panel: When the Independent Review Panel is convened, stakeholders will be informed and advised of the process and how they can contribute to the review.

8. Summary of river values, potential effects of river management activities, and where these are addressed

The rivers managed by GWRC have many values associated with them as set out in the Proposed Natural Resources Plan (mana whenua values, Schedules B and C; ecosystem values Schedule F1; contact recreation values Schedule H; and trout fishery and spawning values; Schedule I). These are summarised below.

Table 1: Summary of morphological features and habitats, and potential adverse effects associated with river management activities

Natural Character – includes aquatic and riparian habitat			
Morphological characteristics	**Riparian characteristics**	**Potential adverse effects of works in, or adjacent to, the active channel**	**Where addressed**
Meanders, bars, beaches, rapids, pools, riffles, runs, backwater, bed roughness, turbulence, instream cover.	Buffer widths and lengths, planting, shading.	• Accelerated storm runoff and increased water velocities • Excessive or inadequate gravel supply • Reduced or insufficient channel width and sinuosity • Reduction of existing morphological characteristics • Reduced or insufficient riparian or instream cover • Reduced or insufficient riparian buffers • Improper materials used in protection works	Floodplain Management Plan Operational Management Plan Consent conditions Constraints calendar SSEMP

Table 2: Summary of terrestrial species, their life history requirements, and potential adverse effects associated with river management activities

Birds	**Life history**	**Important life history requirements**	**Potential adverse effects of works in, or adjacent to, the active channel**	**Where addressed**
Banded and black fronted dotterel	Live in estuaries and riverbeds Some are migratory either from inland to estuaries (both species), or to Australia (Banded only).	Breeding on river beds August - January	• Physical disturbance and vegetation spraying of river beaches • Removal of river beaches	Annual Work Plan Environmental Monitoring Plan Consent conditions Constraints calendar SSEMP
Pied stilt	Live in estuaries, wetlands, riverbeds Non-migratory.	Breeding on river beds August - January		

Table 3: Summary of river aquatic species and their life history requirements, and potential adverse effects associated with river works

Native fish and trout	Life history	Important life history requirements	Potential adverse effects of works in, or adjacent to, the active channel	Where addressed
Galaxiids (except dwarf galaxias)	Adults spend their entire life in freshwater and spawn in autumn. . Newly hatched larvae are carried downstream to the sea in late autumn/ winter and return to freshwater as juveniles (whitebait) in spring.	Spawning habitat and spawning time in spring tide areas during autumn. Adult migration downstream in autumn and juvenile migration upstream in spring.	• Sediment settling on the bed infilling interstitial spaces in the gravels causing sub-lethal or lethal effects on aquatic fauna • Prolonged sediment in suspension impeding fish migrations and impairing feeding, and reducing the abundance and diversity of aquatic invertebrate communities • Bed disturbance and bed instability ruining instream habitat • Destruction or modification of spawning habitat and river and stream structure (meanders, pools, riffles etc.). • Increased water velocities • Increased water temperatures through the removal of riparian vegetation and pools • Dewatering the bed to minimise sediment effects • Discharge of toxic contaminants with lethal and/or sub-lethal effects on aquatic fauna	Annual Work Plan Environmental Monitoring Plan Consent conditions Constraints calendar SSEMP
Longfin and shortfin eels	Adults spend their entire adult life in freshwater and migrate in late summer - autumn to spawn at sea. Juveniles migrate back to freshwater in the spring. Longfin eel migrate well upstream.	Adult and juvenile migrations		
Bullies and Torrent fish	Adults live in freshwater. Upland and Crans bullies are non-migratory. Bluegill, redfin, common and giant bullies and Torrent fish are migratory as larvae are washed out to sea before returning to freshwater in the spring. All spawn in freshwater.	Torrent fish spawning late summer, early autumn likely in the lower reaches of streams. Juveniles migrate upstream spring/early summer.		
Common smelt and lamprey	Common smelt and lamprey spend their adult life at sea and migrate into freshwater to spawn. Lamprey migrate well upstream	Lamprey migrate upstream as adults in winter and spring. Lamprey spawn well upstream in small rocky, clear, forested streams.		
Brown and rainbow trout	Entire life spent in freshwater, although sometime may be spent in estuarine areas. Usually migrate upstream and into tributaries to spawn. Main stem spawning also common.	Spawning habitat. Upstream migration May/June. Spawning June/July. Fry hatching and emergence August/September		

Table 4: Recreational and amenity values, and potential adverse effects associated with river management activities

Activity	Known events	Potential adverse effects of works in, or adjacent to, the active channel	Where addressed
White baiting, trout fishing, walking, cycling, swimming, picnicking, kayaking, relaxation	White bait season 15 August to 30 November. Opening of trout fishing season 1 October –	• Discoloured water • Impeded access to rivers and streams • Noise and public safety	Annual Work Plan Environmental Monitoring Plan Consent conditions Constraints calendar SSEMP

There are a range of good management practices available to GWRC staff to establish and maintain channel capacities. With respect to cultural and environmental values, some of the good management practices are intrusive whereas others are benign and/or beneficial. Matching the correct good management practices to the management issue faced is critical to achieving durable flood protection and acceptable cultural and environmental outcomes.

A stepwise and iterative process is used to ensure the management issue is correctly identified, at what plan level the issue is best resolved, and what good management practices are suitable to correct the issue.

Adverse effects that are unavoidable, and that cannot be fully mitigated are to be offset using the Ecological Enhancement Fund, which aims to achieve real and meaningful environmental improvements in other parts of a river system, or other rivers in the region.

9. Environmental data collection and monitoring

The development and implementation of a programme of environmental data collection and monitoring is a key part of the Code,[8] as it informs the on-going understanding and management of adverse effects. The details of the data collection and monitoring programme are included in the Environmental Monitoring Plan (attached at **Appendix 3**).

Like the Code, the Environmental Monitoring Plan is intended to be a living document that is adapted over time to ensure it remains useful and relevant. The collected information will allow an objective assessment of the effects of river management activities, as per the specified defined review process. The annual review will consider the monitoring programmes efficacy and make recommendations for improvements, where necessary, to both the Environmental Monitoring Plan and the ways in which river management undertaken.

9.1 Baseline monitoring

Baseline monitoring enables the cumulative effects of river management activities to be taken into account so that actions can be taken to avoid, remedy or mitigate the adverse effects of river management activities on key habitats and populations. Triggers related to baseline monitoring are described in **Tables 5 to 7** below. These triggers may be amended in accordance with the process set out in the consent conditions.

If monitoring shows changes of significance in any of the parameters, further investigation must be undertaken to determine if the change can be clearly linked to the effects of river management activities. If so, changes to river management practices may be necessary. The triggers for each parameter and the appropriate response when those triggers are activated by survey findings, are listed in **Table 5**.

Table 5: Monitoring triggers and management responses

Parameter (as per section 2.2 of the EMP)	Trigger (activated by monitoring data)	Response or action
Deposited Sediment	Determination of an increasing trend of deposited fine sediment cover over any five year period.	In the event that the cause of the change is not obvious, the appropriate response would be to initiate a more targeted investigation into potential causes. If the recorded increase is, or is likely to be, attributable to river management activities, a modification of those activities via a review of the Code should be undertaken.
Riverbank Undercutting	More than a 20% decline in the average length of undercut bank over any five year period.	If the recorded decrease is, or is likely to be attributable to river management activities, then: a) restoration of that area or offsetting of the loss would be given priority under potential applications of the Environmental Enhancement Fund; and b) a review of the Code would be undertaken to

[8] At this stage, data collection is limited to physical and ecological parameters, however, expansion and linkages to cultural monitoring is envisaged in future as those methodologies are developed by GWRC and mana whenua.

Parameter (as per section 2.2 of the EMP)	Trigger (activated by monitoring data)	Response or action
		identify changes that could be made in future to avoid, mitigate or remedy the observed effects.
Trout abundance	A statistically significant decline in trout abundance, based on a comprehensive analysis of the long term (20 year) data record for brown trout.	An independent suitably qualified expert carries out a study and reports to GWRC within 3 months identifying the most likely causes of the decline. If the most likely cause is identified as river management activities, the report will recommend measures to avoid, mitigate or remedy the effects, which may include changes to the good management practices in the Code (as relevant) or applications of the Environmental Enhancement Fund. GWRC must implement those recommendations or explain in the Annual Report why implementation was not practicable. If river management activities are identified by the expert as part of a wider number of causes then GWRC must have regard to any recommendations in the report to avoid, mitigate or remedy the effect or river management activities on the remaining population.
River birds	For Te Awa Kairangi/Hutt, Ōtaki, Ruamahānga, Waingawa and Tauherenikau rivers: a decline in the average number of breeding pairs detected between one 3-year set of surveys and the next that exceeds any of the trigger values in **Table 6**.	An independent suitably qualified expert carries out a study and reports to GWRC within 3 months on the possible causes of the decline. If the most likely cause is identified as river management activities (e.g. a major increase in the proportion of dry gravel habitats being disturbed between August and February), the report will recommend measures to avoid, mitigate or remedy the effects, which may include changes to the good management practices in the Code (as relevant) or applications of the Environmental Enhancement Fund. GWRC must implement those recommendations or explain in the Annual Report why implementation was not practicable or achieved. If river management activities are identified by the expert as part of a wider number of causes then GWRC must have regard to any recommendations in the report to avoid, mitigate or remedy the effect or river management activities on the remaining population. If the cause of the river bird population decline is not apparent, an investigation to identify this cause must be initiated. If the cause is subsequently found to be linked to an activity, then a review of the Code will be triggered to identify changes that can be made to halt or reverse the observed population decline.
Aerial photography	Changes in actual channel alignment compared with the design channel alignment over a reach (of 10 cross sections or more) that give rise to significant channel distortions, and channel alignment that aggravates bank erosion and effects bed material processes.	Investigations of options to address changes, in the context of management objectives and river design philosophy. This may include re-alignment of the channel or widening of buffer zones. This would necessitate an update of the design guidelines in Operational Management Plans and a re-evaluation of these taking the significant values of the reach into account.

Parameter (as per section 2.2 of the EMP)	Trigger (activated by monitoring data)	Response or action
Pool and Riffle Counts	A decrease in the number of pool/riffle counts contained in **Table 7** between one survey and the next.	In the event that the cause of the change is not obvious, the appropriate response would be to initiate a more targeted investigation into potential causes .If the recorded decrease is or is likely to be attributable to river management activities, a modification of those activities via a review of the Code should be undertaken.
River Bed Levels	Changes in mean riverbed levels outside of design riverbed level envelopes over more than three consecutive cross sections.	The principal response would be to review the design bed level envelope and/or any gravel extraction programme (sites and volumes), taking into account both flood hazard risk and environmental implications.
Natural Character Index/Habitat Quality Index	Under development.	Under development.

Table 6: Birds - triggers for further investigative work

Species	Trigger level				
	Ōtaki River	**Te Awa Kairangi/Hutt River**	**Ruamahānga River**	**Waingawa River**	**Tauherenikau River**
Banded dotterel	25% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable	A 12% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 35% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (no banded dotterels were detected on this river during the 2010-2012 surveys).
Pied stilt	25% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	50% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 15% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 15% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (numbers of birds detected during the 2010-2012 surveys were too low to enable measurable trigger levels to be devised).

Black-fronted dotterel	50% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable	An 8% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 42% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (numbers of birds detected during the 2010-2012 surveys were too low to enable measurable trigger levels to be devised).

Table 7: Pools and riffles - triggers for further investigative work

River	Trigger level	
	No of pools	No. of riffles
Te Awa Kairangi/Hutt River	48	38
Waikanae River	17	25
Ōtaki River	22	17
Wainuiomata River	To be determined	To be determined
Ruamahānga River	To be determined	To be determined
Waingawa River	To be determined	To be determined
Waipoua River	To be determined	To be determined

9.2 Kaitiaki monitoring

Mana whenua may choose to work with GWRC to develop a Kaitiaki Monitoring Strategy for each river or do this independently in a manner that reflects their cultural uses and values, to monitor the effects of river management activities on these values. Any monitoring results will be included in the Annual Report.

9.3 Environmental Enhancement Fund

To address adverse effects associated with river management activities that cannot be avoided, remedied, or mitigated, GWRC will make available funding, via its Environmental Enhancement Fund, to undertake works that generate lasting benefits to cultural, natural character, ecological, and recreational values in the affected river system (in the first instance), or alternatively, in another river system.

Projects to receive this funding will be identified by GWRC in the Annual Reports, or recommended by mana whenua, the Independent Review Panel, an independent expert, or applied for by stakeholders or members of the community. Successful projects, and their progress, will be reported in the Annual Report.

10. Good management practice – river management methods

10.1 Definition of good management practice

Good management practice means:

- The planning, communication, execution, recording, and reviewing of all river management activities to achieve:
  - consistency of application and implementation in all these aspects across the Greater Wellington Region; and
  - compliance with all regulatory requirements.
- The continual development of river management methods to achieve improved outcomes for, cultural and environmental values.
- Encouraging and recognising staff innovation and excellence in carrying out river management activities.

10.2 Structure of this section

Section 10.3 contains a list of general good management practice river management methods that apply to all river management activities.

Section 10.4 describes the individual good management practice river management methods available to river managers from which a selection is made to fix the issue faced.

Section 10.5 covers agrichemical spraying.

Section 10.6 contains a protocol for urgent works.

Section 10.7 contains a protocol for trialling of new activities or methods of undertaking activities.

NOTE: the Code does not authorise any activity to be undertaken; rather, it describes how that activity should be undertaken. For ease of reference, some guidance is given as to whether individual activities can be undertaken without resource consent under current regional plans.

10.3 General good management practices

General good management practices, such as works planning and communication, will apply in every situation where river management activities are undertaken, and these are listed in **Table 8**.

Table 8: General good management practices

Work Phase	Section	Action/practice	Personnel responsible
Pre-works Planning	10.3.1	Work Plan communication	Area Engineer/Site supervisors
Works Implementation	10.3.2 and Appendix 4	Onsite works planning and checks	Area Engineer/Site supervisors
	10.3.3	Recording of complaints and concerns	
	10.3.4	Operation and maintenance of machinery	
	10.3.5	Construction material storage and stockpiling	
	10.3.6	Sediment control	
	10.3.7	Formation of access from the banks to the river bed	
	10.3.8	Management of noise, dust, odour and traffic	
	10.3.9	Management of safety	
	10.3.10	Maintenance and protection of ecological values	
	10.3.11	Opportunities for environmental enhancement	
	10.3.12	Maintenance and protection of recreational values and use	
	10.3.13	Maintenance and protection of mana whenua values	
	10.3.14	Discovery of artefacts or kōiwi (historic human remains)	

10.3.1 Work plan communication

Purpose

To ensure river management activities are undertaken on a “no surprises” basis.

Some works may be judged to exceed either regulatory requirements, or other formal understandings with stakeholders. Where this may occur, the following actions will be adhered to.

Actions

Weekly work plans

- Managers must produce a weekly work plan outlining scheduled works and affected areas/sites for the following week. This will be emailed to the Manager, GWRC Environmental Regulation Department, mana whenua and any stakeholders or interested parties prior to works scheduled for the following week. This notification must be posted on the GWRC website.
- Any significant changes or updates to the work plan made after notice has been given must be emailed to all parties and updated on the website as soon as possible.

Notice requirements

- Managers must provide advance notice of works to stakeholders, as appropriate.
- Where any works are judged to be non-compliant with regulatory requirements or other formal stakeholder understandings, the relevant stakeholder(s) will be contacted immediately.
- Managers must provide at least 10 working days' notice –
  - to Transpower (transmission.corridor@transpower.co.nz), prior to works commencing within 100m of any Transpower transmission lines; and
  - to the KiwiRail Wellington Metro Network Services Manager, prior to works commencing within 200m of a KiwiRail Bridge.
- If machinery and mobile plants are required to be operated within 8m of the rail corridor, the Manager must consult with KiwiRail Wellington Metro Services Manager to ensure safe access.
- All staff accessing private land should be appropriately identified.

Stakeholders may include:

- Regulators (e.g. GWRC Environmental Regulation Department, district councils)
- Other statutory bodies (e.g. the Department of Conservation, and Wellington Fish and Game Council– where the river is identified as having values for trout)
- Utility operators
- Landowners/land owner committees, scheme liaison committees
- Owners or occupiers of neighbouring properties
- Community groups, river care groups
- Owners or operators of infrastructure in the river corridors
- Recreational users
- Staff or consultants responsible for environmental monitoring associated with flood protection or other river work
- GWRC Biodiversity department staff (where works are within or adjacent to areas identified as having high biodiversity values)
- Any stakeholders listed in the conditions of consent

NOTE:
The form and content of notification and the length of advance notice that might be given will depend on the scale and nature of the works, whether the affected area is in public or private ownership, and any agreements that have been made with mana whenua and stakeholders.

GWRC staff will use their judgement to determine who should be notified prior to the undertaking of on-site works, taking into account both formal obligations and actions that would be expected of a good operator.

10.3.2 On-site works planning and checks

Purpose

Thorough works planning is necessary to ensure:

- the correct good management practices are used
- the correct location and values are identified
- potential adverse effects can be avoided or remedied and if not, mitigation steps are taken before works can start
- the correct work plan communication is undertaken
- the accurate recording of information.

Actions

Prior to any works commencing, the person responsible for supervising the on-site work must:

- Complete a "Work Site Assessment Plan" using the template at **Appendix 4**
- Ensure that any contractors involved in the work have been fully briefed and understand their obligations to act in accordance with section 10 of the Code.

10.3.3 Recording of complaints and concerns

Purpose

Recording complaints and concerns is necessary for:

- alerting staff to potential problems with work practices
- providing an opportunity to review practices where complaints and concerns have arisen
- annual reporting and review of the Code.

Actions

- All staff (both management and operational) must record all complaints and concerns received and ensure that the record is forwarded on to Environmental Regulation as soon as possible and appropriately filed.
- Staff will respond to complaints as appropriate, either directly or by elevation to a higher management level for response. In all cases, the intended action must be communicated to the complainant and appropriately recorded.
- Flood Protection Department managers will include a review of the records of complaints and concerns in regular internal management reviews of work practice and must ensure that this information is considered as part of any reviews of the Code.

10.3.4 Operation and maintenance of machinery and mitigating biosecurity risks

Purpose

- Preventing the accidental discharge of fuels and lubricants.
- Preventing the transfer of organisms and pest plants from the South Island or from catchment to catchment within the North Island.

Actions

The person responsible for supervising the on-site work must ensure that:

- all staff and contractors follow GWRC's biosecurity hygiene guidelines to mitigate biosecurity risks

Prior to Works Starting

- any contractor operating machinery in the river bed on behalf of GWRC is aware of the obligation on them to undertake the activities in accordance with section 10 of the Code
- any machinery, vehicles, equipment and clothing that has been transferred from a different waterway is delivered on-site in a clean condition, refer to the National Pest Control Agencies machinery hygiene guidelines (2013), which can be found at: http://www.waikatoregion.govt.nz/Documents/Keepitclean.pdf
- machinery, vehicles and equipment that has previously been used in South Island waterways is cleaned in accordance with the Ministry for Primary Industries' policy prior to use in another waterway. For details, refer to: www.biosecurity.govt.nz/pests/didymo/cleaning
- all machinery used for river management work is fit for purpose and well maintained
- all machinery is checked to ensure that there are no obvious oil, fuel or other leaks
- where works involve machinery that could cause a spill, spill kits are a mandatory requirement at the site.

During Works

- no equipment, vehicles or machinery is cleaned in a river or stream bed, or at a location where runoff from cleaning activities can enter a waterway
- no machinery is re-fuelled, within the river bed, on the foreshore or seabed, or within 10 metres of a waterway
- fuel is not stored at any location where it could enter a waterway
- all machinery is removed from the riverbed or foreshore at the end of each day and stored above the anticipated flood level when unattended, to avoid the possibility of floodwaters damaging and/or washing it away
- if a spill of fuel, hydraulic fluid or other potential liquid contaminants occurs, immediate steps are taken to contain the spilt contaminant. Where practicable, the spilt contaminants and any material used to contain it must be removed from the site and disposed of at an authorised landfill. A record must be kept of the spill and any actions taken in response to it.

Cleaning machinery in a wash bay

10.3.5 Construction material storage and stockpiling

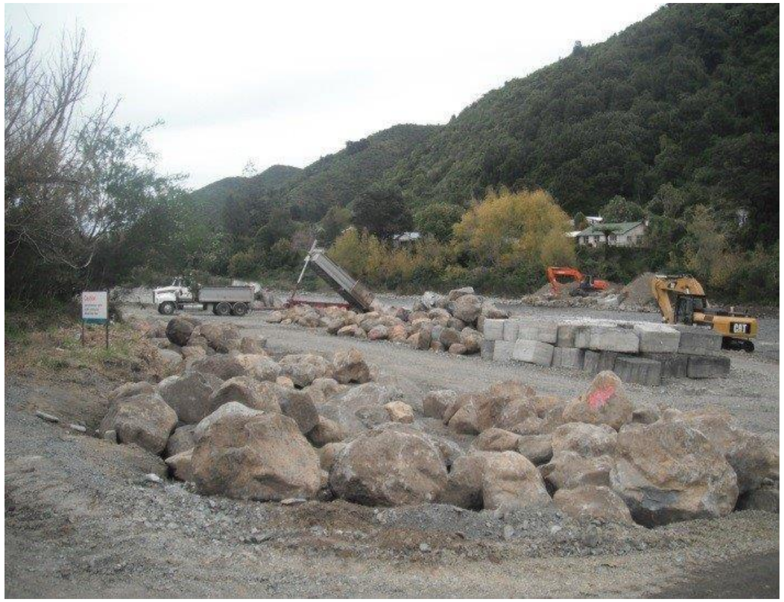
Purpose

Works material (e.g. rock) is stockpiled as close to a works site as is practicable while:

- minimising the danger to, and interference with, recreational users; and
- avoiding channel constriction and erosion of the river channel in the event of a flood.

Actions

- The person responsible for supervising construction work must ensure that:
    - stockpiles of construction materials used during active construction works are only located in the river bed for the duration of the work
    - stockpiles of construction materials must not constrict the capacity of the river channel or deflect the flow of the river and cause erosion problems further downstream
    - all materials associated with construction and maintenance of structures are removed from the river bed at the end of construction works and stored or disposed of at an appropriate site
    - stockpiles of construction materials on the river berms are maintained in a tidy state and are fenced or otherwise isolated, where necessary, to limit public access to them and to ensure public safety.
- Construction materials will generally be stored on the river berms. However, in the Western Rivers only, stockpiles of materials may be left on the river bed temporarily during physical construction until the works are complete (usually between 1-15 working days).



Good stockpile management during groyne construction

Restrictions

☒ No excavated material fill or construction material can be stockpiled or deposited under any Transpower transmission line, that reduces the conductor to ground clearance to less than 7.5 metres vertically for a 220kV line or 6.5m vertically for a 110kV line.

10.3.6 Sediment control

Purpose

Works causing sediment discharges must be managed to:

- comply with regulatory requirements; and
- discharge as little sediment as possible.

Actions

The person responsible for supervising the on-site work must:

In-river works

- review the weather forecast prior to the commencement of works and only undertake works during suitable weather and river flow conditions
- check, and comply with any relevant consent conditions. If sediment discharge limits are exceeded, stop work and report to Environmental Regulation immediately in order to work out a solution
- refer to factsheets on “How to manage sediment” and “Why sediment is harmful” and consider all options for minimising sediment discharges
- plan works to minimise the number of river crossings made by machinery and ensure that each river crossing has a single entry and exit point
- plan works to ensure that the amount of time machinery operates in the wet channel is minimised.

Out of river works

- review the weather forecast and undertake the work during suitable weather conditions, so that run-off from disturbed areas is minimised.
- minimise the amount of ground disturbance by ensuring that only the areas necessary for access and the work are cleared
- stage work to minimise the work area exposed to erosion. Rather than opening the whole site, it may be appropriate to work the site in smaller, discrete areas on a progressive basis
- apply appropriate erosion and sediment control measures suitable to the work and work location. This may include installing silt fencing and settling ponds to intercept runoff
- stabilise the site as soon as possible by applying mulch and/or reseeding/hydroseeding and/or replanting
- protect stormwater inlets by wrapping geotextile cloth around or across the sump grate. A coarse aggregate may be placed on top of the geotextile cloth to act as a filter and hold the geotextile in place. This is a secondary control measure and must be used in conjunction with other control measures, unless other options do not exist
- inspect sediment control measures regularly and after rain fall events to ensure their continued effectiveness until the site has been stabilised and revegetated
- in relation to berm-reduction earthworks, consider the formation of temporary gravel bunds at the river edge to act as a buffer to sediment runoff into the river, where it is practicable to do so.

Actions

Works which may generate sediment discharges shall be managed in accordance with the Erosion and Sediment Control Guidelines for the Wellington Region (GWRC 2002).

Silt fencing adjacent to earthworks on berm

Silt fencing and ground stabilisation around newly installed wingwall

10.3.7 Formation of access from the banks to the river bed

Purpose

To enable access to a site and/or to facilitate flood and erosion protection activities.

Actions

The person responsible for supervising the on-site work must:

- ensure that all machine operators use existing access points to the river bed wherever possible
- limit the creation of new access points, while considering whether this may lead to significant additional tracking in the river bed which could otherwise be avoided
- select the location of any new access points carefully, so as to limit the amount of disturbance to the river bed and banks
- note that where material is required to form access from the river bed to the bank it is preferable to source material from the local river bed, to avoid the introduction of foreign material to the river environment
- ensure that where foreign material is used to create an access way, it is clean and compatible with the river environment
- ensure that any access ways do not constrict the flow or capacity of the river channel
- limit the amount of any vegetation clearance to the minimum necessary, and in particular, avoid clearing high value riparian vegetation and vegetation adjacent to Key Native Ecosystems (as identified by GWRC's Key Native Ecosystems programme)
- undertake remedial or restoration treatment (re-forming or re-seeding/hydroseeding and/or replanting of any disturbed bank and berm areas following the completion of works particularly if the access point is not permanently required).

Temporary vehicle access track on river bed, formed by blading with a bulldozer

Site clearance for access – vegetation removal

10.3.8 Management of noise, dust, odour and traffic

Purpose

- Avoid or minimise noise, dust, unpleasant odours and unnecessary traffic at work sites to comply with regulatory requirements.
- Facilitate good relationships with regulators, landowners, and the community.

Actions

The person responsible for supervising the on-site work must:

- adopt a 'no surprises approach' – consider who is likely to be affected by the works and follow pre-works communication protocols. Liaise with GWRC's communication team to use the right channels to get the right messages out.
- consider the type of construction machinery to be used. Is a quieter machine available? Would muffling of machinery be appropriate?
- manage the movement of construction machinery on and off site, liaising with contractors as necessary. Are there sectors of the community that are more sensitive than others? Is there a school in the neighbourhood and do you need to avoid the use of public roads during school pick up and drop off? Is there recreational use of the area that needs special consideration?
- manage the hours of operation, including the start-up and close-down of machinery, taking account of the proximity of residential areas, any noise sensitive facilities, and the requirements of other users of the river corridor. Unless urgent:
  - Works conducted on weekdays must not start any earlier than 7.00am and must cease by 7.00 pm
  - Works conducted on Saturdays must not start any earlier than 8 am and must cease by 3.00 pm
  - Work must not be conducted on Sundays or public holidays.
- consider applying water to exposed surfaces during dry or windy conditions to manage dust. Exposed surfaces may include the work area, internal haul roads, and public roads.
- consider halting dust producing activities in dry or windy conditions such as stripping or spreading topsoil.

Restrictions

☒ Mitigation measures such as the use of water carts and/or hosing facilities to control dust emissions in the vicinity of transmission lines should be used where appropriate.

☒ Oil will not be used for dust control.

Watering road to minimise dust from truck movements

10.3.9 Management of safety

Purpose

To ensure the safety of GWRC staff, stakeholders, contractors and the public during river management activities and to ensure the integrity of existing structures.

Actions

- All Flood Protection Department staff must adhere to all GWRC Health and Safety Standard Operating Procedures when undertaking any river management activities or operations.
- The person responsible for supervising on-site work must ensure that:
  - all works comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZCEP34:2001) or any subsequent revision of that Code – in particular, Section 2 and the restrictions on earthworks, and Section 5 which relates to the maintenance of safe distances between mobile plant and electricity lines;
  - prior to undertaking any excavation works, a check is made for the presence of any underground services. This may involve the use of a service such as beforeudig.co.nz; and
  - where it is safe to do so, public access must be maintained for the duration of the work. Barriers and signage to advise the public of the work and direct them around the work area must be used as appropriate. If work is of such a scale to cause major disruption, advice must be sought from GWRC's communications team.
- Managers must ensure that if any structure becomes unsafe or poses a significant threat to public safety, it is made safe as soon as the hazard becomes known, and the structure is repaired or removed as soon as possible.

Actions – Te Awa Kairangi/Hutt River only

GWRC will work with Powerco to ensure the protection of its existing gas assets in Te Awa Kairangi/Hutt River as follows:

- Prior to undertaking any proposed excavation works in Te Awa Kairangi/Hutt River, the Manager must lodge a request to beforeudig.co.nz;
- If the response from beforeudig.co.nz shows that the proposed excavation work is to be undertaken –
  - within 1m of Powerco's strategic pipes (more than 700kPa of pressure), the Manager must consult Powerco and a Powerco representative must be present when the works are undertaken; or
  - within 500mm of Powerco's non-strategic pipes (less than 700kPa of pressure), the Manager must work with Powerco to agree an approach before the works are undertaken.

Restrictions

☒ GWRC staff must generally comply with the notice requirements in section 10.3.1 of the Code. However, in the case of urgent works, prior notification must be given to:
  - Transpower (transmission.corridor@transpower.co.nz) prior commencing works within 100m of a Transpower transmission line; or
  - the KiwiRail Wellington Metro Network Services Manager prior to commencing works within 200m of a KiwiRail bridge or if machinery and mobile plants are to be operated within 8m of the rail corridor.

☒ Any excavation or disturbance of the land around any Transpower transmission tower must not exceed a depth greater than 300mm within 6m of the outer edge of visible tower foundations, or exceed a depth greater than 3m between 6-12m of the outer edge of visible tower foundations, or destabilise the tower.

☒ Any excavation or disturbance of the land around any Transpower transmission pole must not exceed a depth greater than 300mm within 2.2m of the pole or stay wire, or exceed a depth greater than 750mm between 2.2 – 5m of the pole or stay wire, or destabilise the pole.

☒ All machinery and mobile plants must maintain a minimum clearance of 4m from any Transpower transmission lines at all times. Warning signs must be displayed on any mobile plant operating under any transmission lines – "WARNING, KEEP 4M MINIMUM CLEARANCE FROM TRANSMISSION LINES AT ALL TIMES".

☒ Transpower's access to any Transpower transmission lines for maintenance work (at all reasonable times) or emergency works (at all times) must not be adversely affected by river management activities.

Safety fencing around work site

10.3.10 Maintenance and protection of ecological values

Description

Instream fauna and habitat

Streams and rivers contain a variety of habitats, which provide shelter and sustenance for a wide variety of species at different stages of their life, including fish (both native and introduced) aquatic invertebrates, and aquatic plants. These habitats are closely linked to those on the riparian margin, and the vegetation surrounding a stream has a large impact and interaction with habitat diversity in-stream. Varying depths, velocities, and substrate sizes, turbulence, obstructions (logs), undercut banks and the root structures of large trees are essential requirements for healthy and diverse aquatic life. Overhanging riparian vegetation provides shade over the water (which helps to lower water temperatures) and contributes leaf and twig litter that is a food source for aquatic microbes and invertebrates. Woody material in a stream helps trap leaf and twig matter and provides shelter and spawning habitat for fish.

River management activities have the potential to alter ecosystems in a number of ways, including:

- Removal of vegetation from stream banks, which can lead to increased erosion, sedimentation, and increase the temperature of the stream by removing shade trees.
- Reducing the quality and quantity of the above essential requirements, all of which rely on a stable pool, riffle and run structure. Each of these habitat types is important for different species and different life stages;
- Changing the flow regime, which might restrict fish movement or habitat suitability for fish or invertebrates.
- Changing the substrate or material of the stream bed, either by direct disruption, compaction, or deposition of suspended sediment released from instream works further upstream. Different substrate types are important for different species and substrate changes can interfere with the ability of organisms within it to feed and reproduce.

Many New Zealand fish migrate between salt and freshwater environments at certain times of the year and are especially vulnerable to disturbance at these times. In addition, fish passage can be blocked by structures like culverts, weirs and fords. This may prevent them from breeding and feeding, which can lead to adverse impacts on population numbers. It is a legal responsibility to provide for fish passage under both the Conservation Act 1987 (Freshwater Fisheries Regulations 1983) and the Resource Management Act 1991 (sections 14 and 17), and this must be considered in planning for works involving the construction and maintenance of structures such as floodgates or culverts.

In-stream works are not generally undertaken in extreme low flow situations (i.e. when flows recede below the minimum flows specified in the PNRP Decisions Version), as this can place additional stress (e.g. from siltation, habitat removal) on aquatic ecosystems at a time when they are already under stress.

Birds and bird habitat

Beaches on the gravel beds provide potential habitat for riverbed nesting birds. Three species – banded dotterels, black-fronted dotterels and pied stilts – are particularly important in some rivers in the Wellington Region, notably the Ōtaki River and some Wairarapa rivers.

Studies to date have identified the timing of floods, invasion of woody weeds and the presence of predators as key factors that impact the nesting success of these birds. The effects of river management activities are less certain, but it is important that works involving the operation of machinery on river beds consider factors such as timing to avoid key breeding times and the maintenance of separation distances from any known nests. Scalping of beaches to keep them clear of vegetation contributes in a positive way to maintenance of bird habitat (provided it is not undertaken during the breeding season).

Lizards and geckos

Rivers and river margins are important undisturbed, remnant areas that have persisted relatively unchanged through decades of surrounding agricultural changes. This has allowed lizards and geckos to persist in this habitat, even as it has become increasingly weedy, and often retains little other ecological value. Because lizards and geckos are unable to disperse, disturbance of any kind can cause irreversible loss of populations.

Actions

River management activities must be undertaken in a manner that ensures that impacts on instream ecology are minimised and ecosystem diversity is maintained. To achieve this the person responsible for supervision of on-site works must:

- take all reasonable steps to minimise sediment loadings and increased turbidity during the implementation of all activities requiring excavation of the river bed
- use sediment and erosion control measures to make sure that impacts of work undertaken instream and on the river banks are contained within the work area as far as is practicable
- limit the amount of tracking of machinery in the wet channel and the number of times stream crossings are made. A single crossing point should be used where practicable
- manage hours of operation to ensure instream habitat has at least 12 hours of recovery time in every 24 hours, during which there is no in-river work. For work that extends over a longer timeframe, provide two consecutive work-free days in every seven to allow for ecosystem recovery wherever possible
- ensure that works do not result in a loss of key habitat types (including pools, riffles and bankside cover)
- retain vegetation cover and shading over streams as much as possible while not constraining the channel capacity by:
    - limiting the amount of trimming of riparian vegetation to the minimum necessary
    - rather than mowing river berms right to the bank edges, consider establishing appropriate vegetation on bank edges, or at least allow grass to grow longer at the bank edge
- bund any areas where pouring of concrete is undertaken to prevent any runoff containing cement entering the watercourse
- in soft-bedded streams where weed or silt removal is required; stagger the removal programme so as to maintain some areas of vegetation at intervals along the stream, or on one bank of a stream, so as to maintain a minimum level of fish habitat
- replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed
- ensure that there is adequate provision for fish passage at all times during construction and maintenance work. In particular:
    - in relation to culverts, it is important to ensure that there is continuous access up and down the culvert, and that water is of an adequate depth and of low velocity for fish to pass through
    - See the national fish passage guidelines at https://www.niwa.co.nz/freshwater-and-estuaries/research-projects/new-zealand-fish-passage-guidelines.
- any fish or kōura entrapped by works or needing to be relocated clear of works are placed into a clear flowing section of the watercourse upstream of the works as soon as practicable and within 8 hours. All fish are relocated using a soft meshed net or wet hands, and placed in a bucket for transportation.
- during any stream diversion or dewatering all practicable steps are taken to find, capture and relocate fish or kōura from the affected reach. This includes checking the stream channel, wetted banks and vegetation of the affected reach and then regular checks for a period of 2 hours following dewatering of the channel.

Restrictions

☒ Observe the constraints on works in the areas specified for individual rivers in **Appendix 7** and the activity constraints in the **conditions of consent**.

10.3.11 Opportunities for environmental enhancement

Description

River management activities enable enhancement of instream habitat and the adjacent river corridor to be undertaken in conjunction with river management activities. Any enhancement of the adjacent river corridor must be undertaken in the context of, and in accordance with, the objectives of any Floodplain Management Plan, Environmental Strategy or Operational Management Plan for the river or watercourse in question.

Actions

During works planning
Managers will consider opportunities for enhancement, during the design of all river management work programmes (taking into account any recommendations from the Independent Review Panel and mana whenua arising from the annual review process) and will incorporate these into the works programme and budget as appropriate.

This may include:

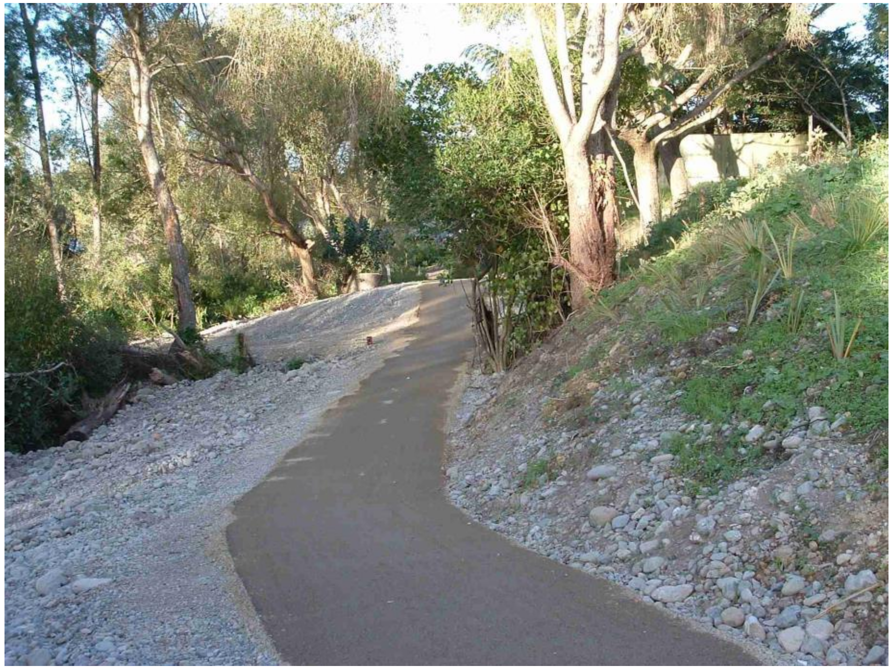
- increasing the width of buffer zones to give the river sufficient room to adequately express its natural form
- incorporating the creation of natural meander forms as appropriate to the specific river, in conjunction with in-channel works
- fencing of riparian margins to facilitate vegetation establishment
- native planting in the river corridor (in accordance with the directions of any Floodplain Management Plan, Ecological or Environmental Strategy or Operational Management Plan)
- the retention or enhancement of native vegetation adjacent to any identified Key Native Ecosystems (as identified by GWRC's Key Native Ecosystems programme), seeking advice from GWRC Biodiversity staff on appropriate species and location of planting where necessary
- track/trail development
- the provision of amenities and facilities (if appropriate).

During works
The person responsible for supervising on-site works must create opportunities for the maintenance of aquatic and terrestrial ecological habitats wherever possible. This may include:

- removing any barriers to fish passage (e.g. perched culverts) or enhancing fish passage (e.g. use of rock ramps)
- creating additional refuges for fish within rock lining
- leaving or creating backwater areas in the active river bed
- leaving woody debris in the river bed where it does not pose an undue flood risk
- riffle and pool creation (as appropriate for the river type and meander pattern).

Community planting on the banks of the Opahu Stream to re-establish inanga habitat

GWRC staff planting natives in Te Awa Kairangi/Hutt River corridor



Newly formed trail on Te Awa Kairangi/Hutt River

10.3.12 Maintenance and protection of recreational values and use

Description

Recreational users of the river and river edge environment include swimmers, rafters, anglers, walkers, cyclists and horse-riders.

River management activities have the potential to affect recreational values and recreational use in a number of ways.

The presence of machinery in or adjacent to the river can restrict other uses of the river and generate noise disturbance, which can interfere with recreational use of a site. Re-shaping and realignment of the channel can alter channel morphology and lead to a loss of recreational features such as rapids or pools, if not managed carefully.

Any works involving bed disturbance can increase turbidity in the water, which can reduce the quality of recreational enjoyment at a site.

Actions

River management activities must be undertaken in a manner that ensures that adverse effects on recreational users are avoided or minimised as much as is practicable. To achieve this, the person responsible for supervision of on-site works must:

- adopt a ‘no surprises approach’ – consider who is likely to be affected by the works and follow pre-works communication protocols. Liaise with GWRC’s communication team to use the right channels to get the right messages out.
- take all reasonable steps to minimise sediment loadings and increased turbidity during the implementation of all activities requiring excavation of the river bed
- only restrict access to the river or access along the flowing channel as necessary for public safety
- take account of any specific directions included in Operational Management Plans to maintain or protect recreational features and values.

Restrictions

☒ Avoid activities in the flowing channel or on berms on Saturdays, Sundays or public holidays during the summer months (December – February) as shown in **Appendix 7** and the **conditions of consent**.

10.3.13 Maintenance and protection of mana whenua values

Description

Mana whenua values as they pertain to a river environment are specific to that river and reflect the association of the iwi and hapū who have kaitiaki obligations and responsibilities over that river.

As such, it is important that the determination of:

- important mana whenua values relating to a river
- how these values will be recognised and provided for in river management activities,

is conducted in discussion with the relevant mana whenua group or groups, rather than being prescribed by Managers.

Mana whenua values arise from both the traditional and contemporary relationship mana whenua have to a river and may include special sites of occupation (e.g. pā, kainga, urupā, wāhi tapu), sites of historic incidents, and traditional uses and practices (e.g. mahinga kai). Some key concepts that underpin mana whenua values include:

Mauri: the life force that exists in all aspects of the natural world. It applies to both animate and inanimate objects; plants, rivers and mountains all have a life force, as well as people. Mauri is preserved and nurtured through customary concepts of whakapapa, tapu, and tikanga. When environmental health and natural balances are sustained, mauri is enhanced. When environmental degradation and destruction occurs in any form, mauri is weakened or extinguished. As tangata whenua or people of the land, Māori perceive themselves as part of the natural world, and hence the mauri of the people is inseparable from that of the environment.

Kaitiakitanga: this refers to guardianship, the primary objective of which is to protect and enhance mauri for environmental and cultural sustainability. Māori cultural sustainability includes the functionality and relationships between people and the environment. Kaitiaki have a duty to protect the interests of the river as well as the interests of the people. Kaitiaki must carefully consider how we fit into the river environment, and how the river fits within the human environment. Effective kaitiaki will provide benefits for both the river and the people. Kaitiakitanga encompasses a system of environmental management to ensure spiritual and physical wellbeing through the sustainable use of natural resources, and the protection of natural systems (including freshwater systems) and endemic wildlife species.

Wai ora: refers to water, both as a resource and as an essential part of the environment that provides sustenance for life. Māori regard freshwater systems as highly valued taonga, possessing individual mauri and often protected by ancestral guardians or taniwha. The welfare of the people is intimately connected to freshwater systems and their capacity to support life, cleanse, and provide for the renewal of life. Freshwater habitats provide vital breeding ground for native fish populations and bird populations in addition to many resources used for medicine, arts and construction.

Many of the practices relating to the protection of ecological values included in the good management practices and **Appendix 2** relating to site specific management of effects also provide for the maintenance and protection of mana whenua values.

However, mana whenua values can be provided for at a more detailed and comprehensive level through the use of Operational Management Plans which will identify all significant sites and values at a reach by reach scale and provide further specific guidance on appropriate ways (which may include restrictions on the use of certain methods) to address these values when conducting river management activities at or near these sites or in these reaches. This guidance will be developed by GWRC in discussion with mana whenua.

Actions

- Operational Management Plans must include all identified cultural sites and mana whenua values of significance and include guidance as to how these will be taken into consideration when undertaking river management activities.
- Managers and operational staff must take into account any specific directions included in Operational Management Plans to maintain or protect cultural sites, features and mana whenua values.

10.3.14 Discovery of artefacts or kōiwi (historic human remains)

Purpose

- To avoid the disturbance of archaeological sites.
- To prescribe what must happen should an archaeological site be accidentally disturbed by river management activities.

Actions

- Where river management activities are likely to affect a known historic or archaeological site, prior to any work commencing, Managers must seek advice from an appropriately qualified archaeologist.
- Site supervisors must ensure that in the event of finding any archaeological sites, artefacts, kōiwi, work affecting the area will cease immediately, and management staff will be informed.
- Management staff will ensure that where any archaeological site, artefact or kōiwi is discovered:
    - advice is sought from a suitably qualified archaeologist
    - notification is given, as appropriate to:
        - The Wellington Tenths Trust and the Port Nicholson Block Settlement Trust (in relation to Te Awa Kairangi/Hutt and Wainuiomata Rivers)
        - Te Rūnanga o Toa Rangatira (in relation to Te Awa Kairangi/Hutt, Wainuiomata River and Porirua Stream)
        - Te Rūnanga Ati Awa ki Whakarongotai Inc. (in relation to the Waikanae River)
        - Ngāti Raukawa - Ngā Hapū o Ōtaki (in relation to the Ōtaki River)
        - Kahungunu ki Wairarapa (in relation to the Wairarapa Rivers)
        - Rangitāne (in relation to the Wairarapa Rivers)
        - Heritage New Zealand
        - The NZ Police

Restrictions

☒ Work must not be re-commenced in the affected area until the appropriate group or groups have been consulted and a plan of action has been agreed.

10.4 Individual activity good management practices

The individual river management activities covered by the Code are listed in **Table 9** below. The practice applying to each is described in the corresponding good management practice section. Activities are primarily classified according to whether they occur in/on the riverbed, or outside the river bed, in order to align with the distinctions made between these activities in the Resource Management Act 1991 and the Wellington regional plans.

Table 9: Individual activity good management practices

Location	General activity type	Individual river management activities	Section
In or on the river bed	Construction and maintenance of "impermeable"[9] erosion protection structures	• Rock and block groynes • Gravel groynes • Rock lining (rockline, rip-rap, toe rock) • Gabion baskets, structures and reno mattresses • Grade control structures	10.4.1 10.4.2 10.4.3 10.4.4 10.4.5
	Construction and maintenance of "permeable" erosion protection	• Debris fences and permeable groynes • Debris arrester	10.4.6 10.4.7
	Demolition and removal of existing structures	• Impermeable and permeable structures	10.4.8
	Maintenance of existing outlet structures	Structural repairs to, cleaning and clearance of existing culverts and floodgate structures that discharge directly to the river/waterbody	10.4.9
	Channel shaping or realignment	Mechanical: • Beach ripping • Beach recontouring • Channel diversion cut • Ripping in the active (flowing) channel • Bed recontouring	 10.4.10 10.4.11 10.4.12 10.4.13 10.4.14
	Channel capacity maintenance	• Beach scalping • Removal of flood debris • Gravel extraction from 'dry' beaches • Gravel extraction from the active (flowing) channel • Mechanical clearing of 'drains' and highly modified rivers and streams • Mechanical clearing – Opahu Stream (Te Awa Kairangi/Hutt River) • Mechanical clearing – Chrystalls Lagoon	10.4.15 10.4.16 10.4.17 10.4.18 10.4.19 10.4.20 10.4.21

[9] Erosion protection structures are classified as either 'impermeable' and 'permeable', but this is largely arbitrary because some so-called 'impermeable' structures are not impermeable in the true sense of the word. 'Impermeable' structures are constructed of hard materials and are generally designed to give long-term protection to the riverbanks. Permeable structures are of lower structural strength than the 'impermeable' works and can be semi-permanent in nature or designed as temporary measures giving protection to willow plantings while they are established.

Location	General activity type	Individual river management activities	Section
	Planting	• Willow poles and stakes	10.4.22
	Construction and maintenance of vegetative structures	• Layered willows, tree groynes, tethered willows	10.4.23
	Maintenance of riparian vegetation	• Mechanical mowing of banks and berms from the river bed • Trimming and mulching of bankside vegetation (operating from the river bed)	10.4.24 10.4.25
Outside the river bed	Construction of structures and tracks on berms	Construction of: • Floodwalls • Footbridges • Fences • Access ways • Cycleways • Walkways and associated new stormwater drains and culverts	10.4.26
	Maintenance of berms, structures and tracks	Structural repairs to, and maintenance of: • Berms • Stopbanks and training banks • Floodwalls • Footbridges • Fences • Access ways, cycleways, walkways • Stormwater drains and culverts (including clearance of debris)	10.4.27
	Planting on berms	• Tree planting – natives and willows	10.4.28
	Maintenance of riparian vegetation	• Trimming and mulching of trees (from outside the river bed) • Removal of old trees • Mowing stopbanks and berms (not involving machinery in river bed)	10.4.29
River mouths and coastal marine area	Management of river mouths	• Excavation, disturbance of, and deposition on, beach areas above mean high water springs water level • Excavation of foreshore • Movement and re-deposition of excavated material onto the foreshore	10.4.30
	Maintenance of existing structures	• Repairs to groynes, rock lining, training walls, debris arrester	10.4.31
Waikanae Estuary Scientific Reserve	All river management activities		10.4.32
Wetlands	All river management activities		10.4.33

10.4.1 Construction and maintenance: Rock and block groynes

Purpose

To maintain channel alignment as determined by the relevant Operational Management Plan.

When used

For the prevention or remediation of bank erosion where softer methods such as layered or tethered willows are not effective or need to be supported with hard structural work.

Description

Groynes project out from the bank edge over the river bed to deflect the direction of the flow of water. They slow flow velocities and gravel movement in the vicinity of the river bank, thus reducing the erosive power of the water at the bank edge and/or encouraging gravel deposition. They can be constructed entirely from rock or have a gravel or concrete block core. Occasionally gravel may be used in conjunction with rock, particularly in situations where construction of the groyne is deemed to be relatively urgent and/or rock supply is limited.

Typical dimensions for concrete blocks used in such work are 1.6m x 0.8m x 1m, with a weight of approximately 3 tonnes. Groynes must not contain exposed reinforcing steel and have a cast-in lifting eye to allow them to be cabled together.

Construction typically involves using a hydraulic excavator to excavate a trench 1-3m deep. Rocks (and/or concrete blocks or gravel) are placed in the trench and keyed into the adjacent bank to form the base of the groyne. Additional rock is then placed as a capping to shape the groyne.

Generally an area of less than 100m² of river bed is disturbed in the construction of a groyne.

Preliminary activities, including formation of access to the river bed, diversion of the wet channel and bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of groyne construction works.

Maintenance will include repairs to any damage, top-up of capping rock or upgrading all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of impermeable erosion protection structures must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply, unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by the creation of scour pools and reduced and varied water velocities.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream

    - loss of riparian vegetation
    - disturbance of recreational use
    - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
    - restricted passage of fish and invertebrates.
- Long term:
    - Reduction and or modification of the natural form and character and its appearance, of the river corridor
    - Reduction in suitable habitat for fish and invertebrates.

Required Actions

- Prior to making a decision to undertake groyne construction, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
    - the state of the buffer zone, including its stability and the extent of any erosion
    - the stability and strength of the banks, including the severity of any undercutting
    - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to construction, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
    - they do not constrict flows or reduce the channel capacity
    - they do not cause changes in river hydraulics that may adversely affect fish passage
    - they are aligned with the design channel alignment. If a design channel alignment does not exist, then the structure is placed to fit the natural meander curvature of the channel
    - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
    - rock is suitably sized, founded and suitably keyed into bank edges to prevent the structure being outflanked by the river;
    - if a series of groynes is to be installed, the spacing is suitable for the site
    - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.
- Construction should be supervised by a suitably experienced person to ensure that:
    - works are undertaken in accordance with the actions and design requirements noted above
    - machinery is located and operated from the bank where practicable, or from a dry working platform formed on the river bed as far as possible
    - prior to creation of bunds in the river channel around the working area, an assessment is made of (a) the necessity of bunding, (b) the relative merits of full bunding vs bunding only on the upstream side of the works, (c) the effects associated with disturbance of the bed associated with bund creation vs the effects of operating machinery in the wet channel

    - any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10
    - areas used for stockpiling of construction materials are reinstated at the completion of works.

- Replanting any high value riparian vegetation removed, or where more than $100m^2$ of any other riparian vegetation is removed
- Annual/regular inspections of all groynes will be undertaken to check that the structures are performing their intended function and are well maintained.

Restrictions

☒ Concrete rubble will not be used to construct these structures.
☒ To protect aquatic ecology and habitat, works should not be undertaken in the actively flowing channel at the times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.
☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7** and the **conditions of consent**.

Other

See GWRC Flood Protection Department's Best Practice Guide for river erosion repair for further guidance.

Typical rock groyne – Ōtaki River

Groyne construction, showing use of bunding to protect works from flowing water and use of a formed working platform to elevate machinery out of flowing water

Foundation excavated and groyne core of concrete blocks placed out of flowing water

Groyne placement. Machinery working close to bank edge to minimise disturbance to the riverbed

Completed rock groynes – Waipoua River

10.4.2 Construction and maintenance: Gravel groynes

Purpose

To assist other methods in maintaining channel alignment as determined by the relevant Operational Management Plan.

When used

- To temporally reduce water velocities to support bed recontouring works to remediate river bank erosion and riverside plantings by acting as a sacrificial buffer.
- For storing excess gravel deposits in order to maintain channel capacity (particularly in Wairarapa Rivers in the latter case).

Description

Groynes are formed by using a bulldozer and/or excavator and truck to re-position bed material into a bank edge, or onto a beach, and shape it into the desired form and alignment. Gravel groynes are easier and less expensive to construct than groynes constructed from rock, but they provide a less permanent more short-term solution, as they are more likely to be eroded by floodwaters. Maintenance will include the mechanical re-shaping of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of impermeable erosion protection structures (including gravel groynes) requires resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply, unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Support the establishment of riverside planting
- Channel alignment is maintained
- Channel capacity is maintained
- If they become relatively permanent (not quickly removed by freshes/floods) they can contribute to localised channel scour and the creation of pools, adding to aquatic habitat diversity.

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment to the river
- Deposition of sediment downstream
- Disturbance of recreational use
- Reduction of the natural form and character and its appearance, of the river corridor
- Fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
- Restricted passage of fish and invertebrates.

Required Actions

- Prior to making a decision to undertake groyne construction, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it; and
    - the environmental effects of the work and available alternatives to achieving the desired outcomes.

- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
    - they do not constrict flows or reduce the channel capacity;
    - they do not cause changes in river hydraulics that may adversely affect fish passage;
    - they are aligned on the design channel alignment; and
    - they have a plan and cross-sectional profile suited to the natural form of the river.
- Any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10
- Construction must be supervised by a suitably experienced person to ensure that works are undertaken in accordance with the actions and design requirements noted above.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix** 7 and the **conditions of consent**.

Gravel groynes- Waingawa River

10.4.3 Construction and maintenance: Rock lining

Purpose

To maintain channel alignment as determined by the relevant Operational Management Plan.

When used

For the prevention or remediation of bank erosion in situations where important infrastructure (stopbanks, water supply or sewage pipes) require protection.

Description

Can also be referred to as rockline, revetment, rip rap or toe rock.

Rip-rap consists of large rocks that are placed against a section of river bank to form a longitudinal wall that armours and protects the softer bank material behind it from scouring and slumping.

Construction involves using hydraulic excavators to shape a section of river bank to a specified slope and to excavate a trench in the river bed to a design scour depth.

Filter cloth or a filter material (usually gravel sourced in-situ) can be placed on the prepared slope prior to placement of the rock in the trench and up the slope batter. A full rock wall typically extends up to a height equivalent to a 2 year return period flood.

Toe rock linings are constructed in a similar way but do not extend higher than approximately 1 m above low flow water levels.

Preliminary activities, including the formation of access to the river bed, diversion of the wet channel and minor bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of construction works.

Maintenance will include repairs to any damage, topping-up of rock or upgrading all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of rock lining must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply, unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River habitat stability and diversity may be enhanced if used in conjunction with riparian planting and if designed and constructed to create turbulence and niche habitat for fish within the large gaps between the rocks.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream
    - removal of riparian vegetation
    - disturbance of recreational use

  - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
  - restricted passage of fish and invertebrates.

- Long term:
  - Reduction of the natural form and character and its appearance, of the river corridor
  - separation of the channel from the floodplain, with consequent limited sediment supply from the banks
  - increased scouring of the adjacent river bed (as banks no longer absorb river energy)
  - reduction in riparian vegetation and habitat.

Required Actions

- Prior to making a decision to undertake rock line construction, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it
  - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - the state of the buffer zone, including its stability and the extent of any erosion
  - the stability and strength of the banks, including the severity of any undercutting
  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - the slope batter is suitable (generally 1.5:1 or 2:1)
  - they do not cause changes in river hydraulics that may adversely affect fish passage
  - they are aligned on the design channel alignment. If a design channel alignment does not exist, then the structure is placed to fit the natural meander curvature of the channel
  - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - rock is suitably sized, founded and keyed into bank edges to prevent undermining or outflanking
  - all linings to have rock returns (downstream end)
  - consideration is given to creating additional refuges for fish
  - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.
- Construction must be supervised by a suitably experienced person to ensure that:
  - works are undertaken in accordance with the design requirements and actions noted above
  - preparation of the batter, excavation of the foundation and placement of rock is done by a machine operating from the river bank, where practicable
  - areas used for stockpiling construction materials are reinstated at the completion of works
  - any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10.

- Replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed
- Annual/regular inspections of all rock lined areas will be undertaken to check that the structures are performing their intended functions and are well maintained.

Restrictions

☒ Concrete rubble will not be used to construct these structures.

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ New areas of rock lining must not be constructed in inanga spawning habitat.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7** and the **conditions of consent**.

Other

See GWRC Flood Protection Department's Best Practice Guide for river erosion repair for further guidance.

Battering of bank being done from the top of the bank edge

Excavating trench for foundation rock with machine located out of flowing water

Placement of rock; machine working from the bank

Maintenance – repairs to rock lining. Note platform formed in riverbed as machine is unable to work from the bank edge to rebuild this section of lining

10.4.4 Construction and maintenance: Gabion baskets, Gabion structures and reno mattresses

Purpose

To maintain channel alignment as determined by the relevant Operational Management Plan.

When used

Gabions are generally used to provide isolated protection for banks and services such as stormwater outlets, service crossings, bridge abutments or access tracks.

Description

Gabions are wire mesh baskets (typically 2m x 1m x 1m) filled with rock (either quarry rock or locally sourced river bed material) placed parallel to the existing river bank.

Gabion construction involves excavating a trench along the toe of the bank to a depth of one basket. Baskets are lowered into the trench and filled with rock. Empty baskets are then placed on top laced together and filled to form the required protection structure. Sometimes the baskets are anchored to driven railway irons concealed in the bank.

Construction is undertaken in the dry and thus preliminary activities, including the formation of access to the river bed, diversion of the wet channel and minor bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of construction works.

Gabion structures are formed using railway irons, wire cables and mesh, and are used to protect and stabilise bank edges. Willows are normally planted behind the back irons. Over time the willow roots extend through the structure and assist in binding it together, while the willows grow over the works and hide the irons and basket work.

Construction involves driving railway iron piles at a 1m spacing along the inner (river-side) edge of the structure. Typically an iron is also driven 1–1.5m behind these irons at a 3m spacing (to provide a back anchor). Piles normally only extend 1-1.5 m above low flow level. Longitudinal cables are strung along the piles to create a 'fence'. Gabion or chain link mesh is then laid behind the irons and wired to the longitudinal cables. A flap is left at the base to form the bottom of the basket work. Gravel is then placed in the baskets and mesh is usually placed to cap the structure. The main limitation of the work is the difficulty in founding to an adequate depth to avoid undermining.

Reno mattresses are wire mesh baskets that have wider and thinner dimensions than the blockier gabions. They are filled with stones generally derived from the in-situ bed material, but quarry rock may also be used. They can be used for both bank protection and channel linings. Construction generally requires the preparation of the ground surface, which may involve minor earthworks on berm areas, or minor excavation or recontouring of the river channel. In the latter case temporary diversion of the river flow may be required.

Maintenance to all the above structures will include repairs to any damage or upgrading all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of impermeable erosion protection structures must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River habitat diversity is generally enhanced by the creation of opportunities for riparian planting behind the lining.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream
    - removal of riparian vegetation
    - disturbance of recreational use
    - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
    - restricted passage of fish and invertebrates.
- Long term:
    - Reduction of the natural form and character and its appearance of the river corridor
    - reduction in riparian vegetation and habitat.

Required Actions

- Prior to deciding to undertake construction, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it; and
    - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
    - diversion works are undertaken as appropriate
    - they do not constrict flows or reduce the channel capacity;
    - the works do not cause changes in river hydraulics that may adversely affect fish passage
    - they are appropriately founded and keyed into the river bank
    - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
    - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.
- Construction should be supervised by a suitably experienced person to ensure that:
    - works are undertaken in accordance with the design requirements noted above
    - preparation of the bank, excavation of the foundation and placement of rock is done by a machine operating from the river bank, where practicable
    - any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10.

- Replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed

Restrictions

☒ Concrete rubble will not be used to construct these structures.
☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any

times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7** and the **conditions of consent**.

Formation of gabion structure; note separation of works from flowing channel and machine operating out of the water

10.4.5 Construction and maintenance: Grade control structures

Purpose

To maintain or re-establish river bed levels to reduce channel gradients and flow velocities as determined by the relevant Operational Management Plan.

When used

To prevent bed scour or encourage gravel deposition in areas where there is a need to protect infrastructure such as bridge piles and river management structures.

Description

Grade control structures are low rock, rock and concrete or concrete block barriers constructed across the width of a waterway. A deep trench is excavated within which large rocks or concrete blocks are placed. Grade control structures can vary in scale from major structures in large waterways, to a few blocks placed in the bed of small watercourses.

Maintenance includes repairs to any damage or upgrading all or part of the structures.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of impermeable structures in the river bed must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Bed erosion and scour is reduced or prevented, protecting the integrity of property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- In rivers, large “waves” of gravel migrating downstream can be split into fewer smaller “waves” spreading the deposition of gravel more evenly throughout the reach.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream
    - disturbance of recreational use
    - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
    - restricted passage of fish and invertebrates.

- Long term:
    - Reduction of the natural form and character and its appearance, of the river corridor
    - loss of amenity or recreational access
    - reduction or loss of fish passage may become a significant barrier across the watercourse if the sediment supply regime changes significantly, and structure becomes exposed
    - restricted passage of fish.

Required Actions

- Prior to making a decision to undertake construction of grade control structures, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the sediment transport regime in the river
    - the presence and severity of any existing bed scour
    - the environmental effects of the work and available alternatives to achieving the desired outcomes
    - discussions with the Department of Conservation.
- The construction of grade control structures will always require an SSEMP and site specific monitoring as per **Appendix 2** and the conditions of consent.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
    - the design is appropriate to the site and takes into account the fishery or recreational values of the river
    - diversion works are undertaken as appropriate
    - they do not constrict flows or reduce the cross sectional area of the channel
    - they do not cause changes in river hydraulics that may adversely affect fish passage
    - they are properly founded and keyed into the river bed and banks
    - construction materials are compatible with the river
    - environment and are clean and free of soil, mud, clay or other soluble debris
    - fish passage is maintained at all flows
    - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.
- Construction should be supervised by a suitably experienced person to ensure that works are undertaken in accordance with the design requirements noted above.
- Wherever possible, water should be temporarily diverted around the construction site to allow works to be undertaken in the dry.

Restrictions

☒ No concrete blocks, rails or timber are to be used in the construction of new grade control structures.

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7** and the **conditions of consent**.

10.4.6 Construction and maintenance: Permeable structures

Purpose

To maintain channel alignment as determined by the relevant Operational Management Plan.

When used

They are used to support the creation or re-establishment of a vegetated buffer zone along the edge of the river channel.

Description

Debris fences are iron and cable fences that extend from the bank into the river channel. Debris fences are interplanted with willows and afford protection to willows by trapping flood debris and slowing flows (and gravel movement). Willows planted in a river bed without debris fences are vulnerable to flood damage and may suffer more damage than those planted with debris fences, affecting overall establishment rates.

Debris fences are constructed by driving railway iron posts (or similar) into the river bed 3-5 metres apart in a series of discrete lines generally at a 45^{o} angle from the channel alignment. The posts stand approximately 1.2m above the bed. Three to four steel cables are strung through the posts to form the fence. Rock or concrete blocks may be placed at the tip for additional strength.

It is usually necessary to contour the site with a bulldozer to create a smooth construction platform and to divert the flowing channel away from the works site. The irons are driven with a hydraulic hammer mounted on a large excavator.

The placement of debris fences has, in some instances in the past, caused concern, particularly if vegetation fails to become properly established and the channel subsequently shifts so that the fence lies in the main river flow. In such cases, debris fences can pose a significant threat to rafters and canoeists in high flows.

Permeable groynes act in a similar way to debris fences but are more robust and give greater control of flow direction and edge protection. A variety of construction materials have been used in the past; either timber (post and rail) or a combination of rail irons and timber.

Maintenance will include the cleaning and removal of debris, repairs to any damage, or upgrading all or part of the structures.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of permeable erosion protection structures must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply, unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure.
- Channel alignment is maintained.
- River habitat diversity may be enhanced by the creation of scour pools and reduced and varied water velocities.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river

  - deposition of sediment downstream
  - loss of riparian vegetation
  - disturbance of recreational use
  - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
  - restricted passage of fish and invertebrates.

- Long term:
  - Reduction of the natural form and character and its appearance, of the river corridor
  - safety risks for river users, including rafters and canoeists
  - reduction in suitable habitat for fish and invertebrates at the bank edge.

Required Actions

- Prior to making a decision to undertake construction, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it; and
  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - diversion works are undertaken as appropriate
  - they do not constrict flows or reduce the channel capacity
  - they do not cause changes in river hydraulics that may adversely affect fish passage
  - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
  - the safety of recreational users is taken into account.
- Any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10
- Construction should be supervised by a suitably experienced person to ensure that works are undertaken in accordance with the design requirements and actions noted above.
- Debris fences will be maintained on a regular basis to ensure that they perform their intended function and do not create undue risks to the safety of recreational users. This may include:
  - structural maintenance, including tightening of cables, replacement of posts or cross members
  - replacement or replanting of willows associated with the debris fence
  - recontouring of the adjacent beach or river bed.
- Replanting any high value riparian vegetation removed, or where more than $100m^2$ of any other riparian vegetation is removed
- Where debris fences are continuously outflanked by the river, consideration will be given to their removal and adoption of a more permanent solution to maintaining the river alignment.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Debris fence construction (driving irons) – Ōtaki River

Repairs to timber permeable groynes on the Wainuiomata River. Note the separation of the work area from the wet channel through the use of bunding

Debris fences interplanted with willow poles - Ōtaki River

10.4.7 Construction and maintenance: Debris arrester

Purpose

To catch flood debris and prevent it from travelling downstream where it may cause damage to bridges or other structures.

Description

Debris arresters are more robust than a debris fence and can be constructed from railway irons, steel beams, or pipes that are driven into the bed and tied together with horizontal irons, or discrete concrete or wooden posts placed at intervals across the river bed.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the construction and maintenance of permeable erosion protection structures (including debris arresters) must be authorised by resource consent.

The PNRP Decisions Version requires that the construction and extension of new structures must be authorised by resource consent (Rule R129), unless it is permitted under Rule R117. The maintenance and use of an existing structure is a permitted activity under Rule R112, provided it complies with certain conditions outlined in the rule. Rule R112 will apply unless a resource consent provides for the maintenance of the structure. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefit

Protection of downstream structures from damage.

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - loss of riparian vegetation
  - disturbance of recreational use
  - fish stranding (e.g. if water is diverted around work site, or during digging out for the base of the structures)
  - restricted passage of fish and invertebrates.
- Long term:
  - reduction of the natural form and character and its appearance, of the river corridor
  - creation of navigational hazard to recreational users
  - reduction of channel capacity, disruption of channel alignment and ecological habitat if not designed properly or regularly clear of trapped debris
  - removal of material that provides food and habitat for aquatic organisms
  - restricted passage of fish and invertebrates.

Required Actions

- Prior to making a decision to undertake the construction of a debris arrester, managers will assess whether the work is necessary, taking into account:
  - the likely benefits of the work and the consequences of not undertaking it; and
  - the environmental effects of the work and available alternatives to achieving the desired outcome.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - they do not constrict flows or reduce the channel capacity

  - they do not cause changes in river hydraulics that may adversely affect fish passage
  - they are appropriately founded and keyed into the river bed
  - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.

- Any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10
- Construction should be supervised by a suitably experienced person to ensure that works are undertaken in accordance with the design requirements and actions noted above.
- Replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed
- Debris arresters must be regularly maintained and cleared of debris to ensure that they perform their intended function effectively and do not constrict the channel.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Debris arrester (timber poles) across Waimeha Stream

Debris arrester at Maoribank bend on Te Awa Kairangi/Hutt River

Debris arrester across Speedy's Stream

Debris arrester across the Porirua Stream

10.4.8 Demolition and removal: Existing structures

Purpose

- To prevent the creation or aggravation of erosion of adjacent river banks;
- To remove dangerous obstacles to river users; and
- Improve the appearance of the river corridor.

Description

Existing structures are most likely to be removed following partial or total failure, following a decision not to reconstruct the structure.

Preliminary works, including the creation of access to the site and/or formation of a suitable working platform for machinery may be required ahead of demolition works.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the demolition and removal of structures from the river bed must be authorised by resource consent.

According to the PNRP Decisions Version, small structures or parts of structures can be removed as a permitted activity (Rule R118). Generally however, the removal of flood and erosion protection structures must be authorised by resource consent (Rule R129). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of the channel carrying capacity
- Removal of potential hazard to navigation and recreational use
- Improvement to the natural form and character and its appearance, and amenity value, of the river bank and river corridor.

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment to the river
- Disturbance of recreational use.

Required Actions

- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.15) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- If an existing structure has become damaged or partially destroyed, and a decision is made that it will not be repaired, the structure must be removed from the waterway as soon as practicable.
- All material associated with the structure will be removed from the river or stream and disposed of or stockpiled at an appropriate location.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

10.4.9 Maintenance: Existing outlet structures

Description

The maintenance of existing outlet structures includes structural repairs to, and maintenance of existing head walls, wingwalls, culverts, and steel grilles, flap gates and any other features associated with outlet structures discharging to the river.

Maintenance can include upgrade part or all of the structure, clearance of debris, water blasting and painting.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the maintenance of structures in the river bed may need to be authorised by resource consent, depending on the extent of the proposed maintenance work.

According to the PNRP Decisions Version, the maintenance and repair of existing outlet structures is a permitted activity, provided it complies with certain conditions under Rule R112. If these conditions cannot be met, the work must be authorised by resource consent (Rule R129). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- The functionality of flood protection works is maintained
- Effective management of community flood protection assets and investment.

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment or other contaminants to the river
- Disturbance of recreational use.

Required Actions

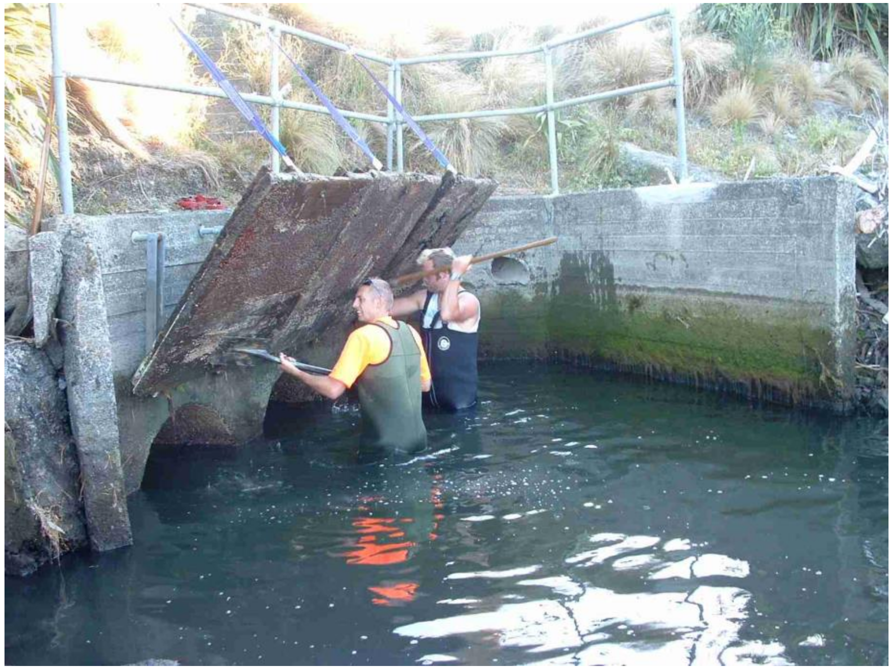
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Works must be undertaken from the bank, rather than from within the active channel wherever possible.
- Where work must be undertaken in the river, diversion works must be undertaken as appropriate
- Any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Repairs to floodgates



Repairs to floodgates

10.4.10 Channel shaping: Beach ripping

Purpose

To maintain channel alignment, flow capacities, and evenly distributed bed levels as determined by the relevant Operational Management Plan.

When used

Where beaches have become armoured and loosening the gravels will mobilise consistent movement of the bed material during freshes and floods to lessen the need for more extensive channel shaping works.

Description

Beach ripping involves dragging a tine behind a bulldozer or tractor to loosen the upper surface layer (armour) of the dry beach. In this way, ripping helps to prevent the formation of channel distortions and reduces lateral bank erosion.

Beach ripping may be undertaken as a discrete activity, or may be undertaken in conjunction with other activities, such as beach recontouring. Although beach ripping is undertaken outside of flowing water, the constraints of a site may require that machinery undertaking the work will need to enter the wetted channel to gain access to the site (and to turn around, for example), in order to complete the required work effectively.

Resource Management Act 1991

The disturbance of dry beaches is a permitted activity under the current Regional Freshwater Plan for the Wellington Region, provided it complies with the prescribed permitted activity conditions.

According to the PNRP Decisions Version, beach ripping is a permitted activity, provided it complies with certain conditions under Rule R119. If the conditions cannot be met, then the activity must be authorised by resource consent (Rule R129). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Prevention of the formation of an armoured top layer on the gravel bed
- Facilitation of gravel movement during floods
- Prevention of channel distortions and bank erosion
- Can reduce the need for more invasive bed recontouring

Key Potential Adverse Effects

- Temporary disturbance of bird nesting habitat
- Release of suspended sediment to the river in the first fresh following the work
- Temporary disturbance of recreational use
- Temporary reduction in amenity values.

Required Actions

- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Work is undertaken outside of the wetted channel. If any ripping work is to be undertaken in the wet, refer to section 10.4.13.
- A 5 m buffer strip should be left around the beach to avoid disturbance of the bank and the water edge.

Restrictions

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

☒ Avoid the creation of holes or depressions on the beach that could trap and strand fish following high flows.

Beach ripping – Te Awa Kairangi/Hutt River

10.4.11 Channel shaping: Beach recontouring

Purpose

To maintain channel alignment and flow capacities as determined by the relevant Operational Management Plan.

When used

Where beach obstructions to flow, usually excessive beach build up and the formation of islands, will likely create channel distortions and/or bank erosion during flood events.

Description

Beach recontouring involves the mechanical movement and redistribution of sands and gravels on areas of dry bed. It involves a level of disturbance of the bed that has more impact than ripping, but less effects than bed recontouring or cutting of diversion channels.

Beach recontouring can also be undertaken as part of site preparation associated with the establishment of structures or planting in conjunction with beach ripping or bed recontouring, or as a part of gravel extraction operations.

Although beach recontouring is an activity undertaken outside of flowing water, it should be noted that the constraints of a site may require that machinery undertaking recontouring work will need to enter the wetted channel to gain access to the site in order to undertake the required work effectively.

Resource Management Act 1991

Beach recontouring is a permitted activity under the current Regional Freshwater Plan for the Wellington Region, provided it complies with the prescribed permitted activity conditions.

According to the PNRP Decisions Version, beach recontouring is a permitted activity, provided it complies with certain conditions under Rule R119. If these conditions cannot be met, the activity must be authorised by resource consent (Rule R129). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Removes obstructions to flow
- Helps to maintain channel alignment, reduce bank erosion and prevents the river bed profile from being flattened out during floods
- Helps to reduce the need for bed recontouring in the wet channel
- Enhancement of bird nesting habitat on the river bed.

Key Potential Adverse Effects

- Reduction of the natural form and character and its appearance, of the river corridor
- Disturbance of bird nesting habitat
- Release of suspended sediment to the river in the first fresh following the works
- Disturbance of recreational use
- Temporary loss of amenity due to noise and dust.

Required Actions

- Prior to making a decision to undertake beach recontouring, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
    - the state of the buffer zone, including its stability and the extent of any erosion
    - the stability and strength of the banks, including the severity of any undercutting

  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- The works must be planned and approved by a suitably qualified person to ensure in particular that:
  - flows are not constricted, or the capacity of the channel reduced; and
  - the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan.
- Construction must be supervised by a suitably experienced person to ensure that works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above.
- A 5 m buffer strip should be left around the beach to avoid disturbance of the bank and the water edge.

Restrictions

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

☒ Avoid the creation of holes or depressions on the beach that could trap and strand fish following high flows.

10.4.12 Channel shaping: Channel diversion cut

Purpose

To maintain channel alignment and capacity as determined by the relevant Operational Management Plan.

When used

In braided river systems, diversion cuts may be used to assist the development of secondary braids to maintain channel capacity or to divert a dominant braid where it is eroding river banks and their associated buffer zone. They can also be used to isolate a work site as an alternate to bed recontouring.

Description

Establishing the diversion cut involves the mechanical excavation of a new channel on the desired new alignment through an area of the river bed outside the wet channel. The excavated material may be placed between the side of the newly created channel and the wet channel which is to be realigned, or it may be moved to another location in the river bed.

The excavation cut is bunded at the upstream and downstream ends while excavation work proceeds to minimise silt discharges. When the new channel is completed, the end bunds are removed to allow diversion of the wet channel into the newly formed channel (this may either be done immediately by mechanical means or naturally by the river over time). Bed recontouring, to push excavated material across the old channel alignment (if it is not to be retained as a backwater habitat area) will also be required to achieve the finished profile.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the cutting of channel diversions in the active river channel must be authorised by resource consent.

According to the PNRP Decisions Version, channel diversion cuts (involving both excavation of the bed and diversion of water) must be authorised by resource consent under Rule R129. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained or re-established
- Channel capacity is maintained
- The need for permanent structures may be reduced or avoided.

Key Potential Adverse Effects

- During construction:
    - disturbance of dry river bed habitat
    - release of suspended sediment to the river (once water is diverted into the completed channel)
    - deposition of sediment downstream
    - disturbance of recreational use
    - stranding of fish (if works result in dewatering of an existing wetted channel, side channel or backwaters)
- Long term: reduction of the natural form and character and its appearance, of the river corridor

Required Actions

- Prior to making a decision to form a diversion cut, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan

  - the state of the buffer zone, including its stability and the extent of any erosion
  - the stability and strength of the banks, including the severity of any undercutting
  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Diversion cuts must be planned and approved by a suitably qualified person to ensure in particular that:
  - flows are not constricted, or the capacity of the channel reduced
  - the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan
  - diversions do not permanently shorten the river channel; and
  - any fish or kōura rescue or relocation shall be undertaken in accordance with section 10.3.10.
- Construction must be supervised by a suitably experienced person to ensure that works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

10.4.13 Channel shaping: Ripping in active (flowing) channel

Purpose

To maintain channel alignment and a more regular channel meander pattern as determined by the relevant Operational Management Plan.

When used

To improve the low flow channel form and alignment through riffle zones to remove sharp directional changes in the channel.

Description

The activity involves dragging a tine that is mounted on a bulldozer or excavator through riffle sections of the wet channel to loosen the bed material and encourage its mobility.

Although the activity involves the mechanical disturbance of the bed (including any associated aquatic habitat disturbance and the temporary release of sediment to the water column), the activity is less invasive and less extensive than bed recontouring and has a smaller scale of effects.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, disturbance of the active river channel must be authorised by resource consent.

According to the PNRP Decisions Version, ripping in the wet channel must be authorised by resource consent under Rule R129. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained
- The need for more invasive and extensive bed recontouring may be reduced or avoided

Key Potential Adverse Effects

- Disturbance of fish and river bed habitat
- Release of suspended sediment to the river
- Disturbance of recreational use

Required Actions

- Prior to making a decision to undertake ripping in the wet channel, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
    - the environmental effects of the work and available alternatives to achieving the desired outcomes
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Work must be planned and approved by a suitably qualified person to ensure in particular that:
    - flows are not constricted, or the capacity of the channel reduced
    - the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan

    - works do not result in a loss of key habitat types (including pools, riffles and bankside cover).
- Construction must be supervised by a suitably experienced person to ensure that works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above.
- Ripping must be undertaken to exclude a 10 metre strip along the water edge to allow for easier access to the water.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

10.4.14 Channel shaping: Bed recontouring

Purpose

To maintain channel alignment and capacity as determined by the relevant Operational Management Plan.

When used

Where channel realignment cannot be effectively achieved by a diversion cut or in-river ripping of riffles, and as an alternative or temporary measure to the construction of permanent protection structures.

Description

Bed recontouring (formerly referred to as 'cross-blading') involves the mechanical shaping or realignment of a section of the active bed by pushing material from dry beaches across the wet channel, and/or pushing material from the wet channel onto beaches to achieve a new channel form (including the wet channel). It may also include recontouring of the bank. It is another tool used to manage the channel form to establish preconditions to effectively accommodate future flood events and reduce the amount of future remedial work.

Bed recontouring may be undertaken as a discrete activity for these purposes but may also be undertaken as part of preparation of the river bed for construction works or in association with 'wet' gravel extraction.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, recontouring of the active river channel must be authorised by resource consent.

According to the PNRP Decisions Version, bed recontouring (involving both disturbance of the bed and diversion of water) must be authorised by resource consent under Rule R129. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained or re-established
- The need for permanent structures may be reduced or avoided.

Key Potential Adverse Effects

- During construction:
    - major reduction of the natural form and character and its appearance, of the river reach
    - significant local disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream
    - accidental fish mortality
    - loss of riparian vegetation
    - disturbance of recreational use
- Long term:
    - reduction of the natural form and character and its appearance, of the river corridor

Required Actions

- Prior to making a decision to undertake bed recontouring, managers will assess whether the work is necessary, taking into account:
    - the urgency of the work and consequences of not undertaking it
    - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
    - the state of the buffer zone, including its stability and the extent of any erosion
    - the stability and strength of the banks, including the severity of any undercutting

  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- The person responsible for on-site supervision must ensure that:
  - the minimum amount of bed recontouring necessary is undertaken
  - bed recontouring generally proceeds in an upstream direction from the downstream end of the reach being worked to allow fish disturbed by the activity to escape downstream. However, any filling in of old channels cut off as a result of the works should proceed from the upstream end in a downstream direction, for the same reason
  - at the completion of bed recontouring, work flows are not constricted, or channel capacity is not reduced
  - the works are undertaken in accordance with any design alignment, channel plan form and finished bed profile requirements as set out in the relevant Operational Management Plan
  - future maintenance and access requirements are considered with a view to minimising the on-going disturbance of the river bank and riparian zone
  - any fish, kōura or kakahi rescue or relocation shall be undertaken in accordance with section 10.3.10.
- Replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed
- If repeated bed recontouring is required at a particular site, consideration must be given to a more permanent solution, such as the use of groynes or rock lining.

Restrictions

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Bed recontouring in Ōtaki River – Upper Wallaces (XS 750 -780 approx.)

Bed recontouring in Waikanae River – Blakes corner XS 220

Bed recontouring in Te Awa Kairangi/Hutt River – near Bridge Road

Bed recontouring in Wainuiomata River – near Wood Street

10.4.15 Channel maintenance: Beach scalping

Purpose

To maintain channel alignment and capacity as determined by the relevant Operational Management Plan.

When used

Where vegetation has established within the active channel and can cause channel distortions and bank erosion.

Description

Beach scalping involves the mechanical clearance of woody and herbaceous weeds and grasses from gravel beaches.

Mechanical clearance is typically performed using a bulldozer, large excavator or front end loader to strip the vegetation and loosen the armouring layer. The vegetation is crushed and left to break down or become light flood debris. The activity involves the excavation or disturbance of bed material but does not typically result in a discharge of sediment to the flowing channel.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region the removal of vegetation from the river bed is a permitted activity, provided that the activity complies with the prescribed permitted activity conditions.

According to the PNRP Decisions Version, removal of vegetation from the river bed is a permitted activity under Rule R122, provided certain conditions relating to fish protection and relocation are complied with. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained
- Channel capacity is maintained
- Reduces potential for gravel and sediment aggradation
- Habitat for river bed nesting birds is maintained or improved

Key Potential Adverse Effects

- Disturbance of bird nesting activity
- Disturbance of recreational use

Required Actions

- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- In order to minimise disturbance of the river bed, beach scalping must be undertaken at the same time as other activities such as beach ripping, where practicable.
- A 5 m buffer strip must be left at the bank edge to avoid disturbance of the bank and any riparian vegetation.

Restrictions

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

10.4.16 Channel maintenance: Removal of flood debris

Purpose

To prevent blockages that reduce the channel cross-sectional area causing bank lateral erosion in higher flood levels.

Description

Flood debris is defined in the RFP as 'material deposited on the river bed as a result of wreckage or destruction resulting from flooding'. Flood debris may include trees, slip debris, collapsed banks, the remains of structures, and other foreign material including abandoned vehicles, but does not include the normal fluvial build-up of gravel.

This activity covers only the minimal amount of work needed to clear the bed or structures within the bed of flood debris. Any beach or bed contouring completed at a location where debris removal occurs is accounted for as beach or bed recontouring.

It is important to note that flood debris in the channel can provide and enhance the variety of available aquatic habitat for macroinvertebrates and fish. Debris should therefore only be removed where necessary to manage flood or erosion risks.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region the removal of flood debris from the river bed is a permitted activity, provided that the activity complies with the prescribed permitted activity conditions.

According to the PNRP Decisions Version, removal of flood debris is a permitted activity, provided the activity complies with certain conditions under Rule R119. If these conditions cannot be met, the activity must be authorised by resource consent (Rule R129). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Channel capacity is maintained
- The risk of erosion is reduced
- Risks to the safety of recreational users are reduced
- The amenity value of the river is maintained

Key Potential Adverse Effects

- Loss of shelter or spawning sites for fish or aquatic invertebrates
- A reduction of woody material and dissolved organic carbon reaching downstream reaches and the estuary and marine area adjacent to the river mouth

Required Actions

- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- In order to provide for maintenance of aquatic habitat for fish and invertebrates, large logs or other debris must not be removed from the channel unless necessary to maintain channel capacity. Flood debris should only be removed where it presents an unacceptable risk to structures or public safety.
- If large logs are to be removed from the channel, and where it is appropriate to do so (i.e. land is not in private ownership), iwi are to be notified, to allow for potential use of those logs.

Restrictions

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

10.4.17 Channel maintenance: Gravel extraction from beaches (dry extraction)

Purpose

To maintain channel alignment and capacity as determined by the relevant Operational Management Plan.

When used

Where localised gravel build-ups confine and direct the channel into river banks causing them to erode.

Description

Extraction is usually carried out using either hydraulic excavators or front-end loaders which load gravel onto trucks (either road trucks or large off-road dumpers). Extraction proceeds in uniform strips parallel to the river channel, to a depth no lower than 0.2 m above the normal level of the adjacent flow. Stockpiles of the extracted gravel may be formed on a daily basis but are not normally left in the floodway for longer than the working day. The extracted gravel is transported to stockpile or to the processing plant using existing access tracks and/or public roads wherever possible. For remote beaches, trucks may need to travel along the dry river bed and may need to cross the river. Such crossings should be kept to a minimum and restricted to a single point of entry and exit.

At the end of extraction, beaches are to be left with an even surface and profile sloping down towards the channel, to ensure that there are no major discontinuities that could divert future floodwaters. The next flood will then re-work the bed to a more natural form.

Material can be excavated from both the beaches (i.e. above the flowing channel) and/or from the flowing channel within the river bed, depending on the management objectives for the particular river and river reaches in question. Removal of gravel from beaches above the normal low flow water level, where there is no extraction activity in the flowing channel, is referred to as **dry extraction**. In this case, works are undertaken outside of running water, except for any river crossings for access purposes or to transport extracted gravel and minor shaping of the beach at the water's edge to ensure a smooth profile.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region gravel extraction requires resource consent.

According to the PNRP Decisions Version, any gravel extraction from the river bed for river management purposes must be authorised by resource consent under Rule R129. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of the channel alignment and optimum bed levels set out in the relevant Operational Management Plan
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- During the activity:
    - Disturbance of river bed nesting birds and bird nesting habitat
    - Temporary disturbance of recreational access and use
    - Impacts on river morphology
    - Increased fine deposited and suspended sediment.
    - Changes in habitat structures, including fish and invertebrate communities.
- Short to medium term: Reduction of the natural form and character and its appearance, of the river corridor

Required Actions

- Prior to the commencement of a gravel extraction programme, managers will assess whether the work is necessary, taking into account:
  - the results of the most recent bed level surveys and gravel analyses
  - available information on short and long term trends in aggradation and degradation in the river bed
  - any other available information on factors affecting the long term sediment supply; such as changes in catchment hydrology, land cover and slope stability etc.
  - the environmental effects of the work and available alternatives to achieving the desired outcomes.
- Gravel extraction work plans must be planned and approved by a suitably qualified person to ensure in particular that:
  - the works are undertaken in accordance with any design envelope and design alignment requirements as set out in the relevant Operational Management Plan
  - all contractors undertaking gravel extraction work for GWRC are appropriately briefed and have a proven track record of undertaking works in accordance with the requirements of this Code.
- Prior to the commencement of works, the need for a SSEMP and any site specific environmental monitoring as per **Appendix 2** must be assessed, and if necessary, actioned.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Excavation must not be undertaken lower than 0.2 m above the adjacent water level.
- A 5 m buffer strip must be left at the bank edge to avoid disturbance of the bank and any riparian vegetation.
- Extraction works must be supervised by a suitably experienced person to ensure that:
  - works are undertaken in accordance with the design requirements and actions noted above
  - access to beaches is via single entry and exit points
  - tracking of machinery in the river is kept to a minimum
  - the final surface of the beach is left in a tidy state and with a profile suited to the design objectives for the channel (which may include a smooth profile at the water’s edge).

Restrictions

☒ In any one financial year (1 July – 30 June), the amount of gravel extracted must not exceed that required to maintain the flood carrying capacity of the channel. This volume must be determined by regular bed level surveys and gravel volume assessments. Where a design envelope has been developed for a river, the amount of gravel extracted will be in accordance with maintenance of river bed levels within this envelope.

☒ Gravel must only be taken from beaches where it is aggrading, and extraction must not target gravel of a particular size range.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Dry gravel extraction – Waikanae River

Dry gravel extraction – Te Awa Kairangi/Hutt River

10.4.18 Channel maintenance: Gravel extraction from the flowing channel (wet extraction)

Purpose

To maintain channel alignment and capacity as determined by the relevant Operational Management Plan.

When used

Where localised gravel build-ups confine and direct the channel into river banks causing them to erode and where aggradation cannot be managed effectively by dry extraction alone.

Description

Material can be excavated from both the beaches (i.e. above the flowing channel) and/or from the flowing channel within the river bed, depending on the management objectives for the river and river reaches in question. Removal of gravel from the flowing channel is referred to as **wet extraction**. In this case, machinery is required to work in the water to remove gravel from the channel onto the adjacent beaches, from where it can be extracted.

Although wet gravel extraction involves short-term disturbance to the river bed habitat, it also affords more opportunities than dry extraction to establish and maintain a well-defined low flow channel with a 'natural' slope up to the beach, and to enhance the meander pattern of the river channel.

Where possible, gravel extraction operations should be combined with any programmed channel alignment activities for efficient and effective river management, and to minimise the overall disturbance of the ecology and ecological habitat at the affected site.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region gravel extraction requires resource consent.

According to the PNRP Decisions Version, any gravel extraction from the river bed for river management purposes must be authorised by resource consent under Rule R129. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of the channel alignment and optimum bed level set out in the relevant Operational Management Plan
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- During the activity:
    - Short term reduction in water quality due to release of sediment
    - Alteration of downstream habitat due to sedimentation
    - Short-term loss of invertebrate habitat and invertebrate populations;
    - Accidental fish mortality
    - Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
    - Removal of habitat and food sources for fish, which may result in population decline
    - Temporary disturbance of recreational access and use;
    - Impacts on river morphology
    - Loss of fish habitat
    - Increased fine deposited and suspended sediment
    - Changes in habitat structures, including fish and invertebrate communities

- Long term: reduction of the natural form and character and its appearance, of the river reach.

Required Actions

- Prior to the commencement of a gravel extraction programme, managers will assess whether the work is necessary, taking into account:
  - the results of the most recent bed level surveys and gravel volume analyses
  - available information on short and long term trends in aggradation and degradation in the river bed
  - any other available information on factors affecting the long term sediment supply, such as changes in catchment hydrology, land cover and slope stability etc.
  - the environmental effects of the work and available alternatives to achieving the desired outcome.
- Wet gravel extraction will always require an SSEMP and site specific monitoring as per **Appendix 2** and the conditions of consent**.**
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Gravel extraction work plans must be planned and approved by a suitably qualified person to ensure in particular that:
  - the works are undertaken in accordance with any design envelope and design alignment (including design meander and pool-run-riffle sequence) requirements as set out in the relevant Operational Management Plan
  - the works are undertaken in accordance with the methodology detailed below.
- All contractors undertaking work for GWRC must be appropriately briefed and have a proven track record of undertaking works in accordance with the requirements of this Code.
- Construction must be supervised by a suitably experienced person to ensure that:
  - works are undertaken in accordance with the design requirements and actions noted above
  - works are undertaken in accordance with the work methodology described below
  - appropriate communication is undertaken with personnel responsible for management of any environmental monitoring associated with the work.

Restrictions

☒ In any one financial year (1 July – 30 June) the amount of gravel extracted must not exceed that required to maintain the flood carrying capacity of the channel. This volume must be determined by regular bed level surveys and gravel volume assessments. Where a design envelope has been developed for a river, the amount of gravel extracted will be in accordance with maintenance of river bed levels within this envelope.

☒ Gravel must only be taken from aggrading reaches and extraction must not target gravel of a particular size range.

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in **Appendix 7**, and the **conditions of consent**.

Wet Gravel Extraction Methodology

A methodology to undertake both wet and dry extraction is included, however the Code does not prescribe which extraction method (wet or dry) to use. Instead, the Code allows for practices to adapt over time as information on environmental effects is gathered (through SSEMPs and other monitoring) so that the most appropriate extraction method can be determined.

<u>Preparatory works</u>

Prior to the commencement of works, the person responsible for the design and approval of the gravel extraction work plan must refer to the Environmental Monitoring Plan to ensure that any monitoring requirements, communication or other actions relating to the activity are incorporated into the work plan as appropriate.

The most recent cross section surveys must be compared with the design profile and cross sections to determine the cut and fill depths and to accurately calculate available gravel volumes (see **Figure 5**). From this, a detailed extraction plan will be prepared for use by the operator(s) – see **Figure 6**. This plan will show the extent of the works for each operational stage, and the finished form of the river channel, including the low flow channel centre line (thalweg) and an indicative active channel width. The beach edge and active channel centre line will to be marked with either a green waratah (beach edge) or red waratah (thalweg) on -site.

In addition to the extraction plan, the gravel extraction work plan must also identify specific actions that will be undertaken to minimise the time that operations in the active channel will occur, and to avoid other adverse effects as far as practicable. In particular, and will include items such as:

- The extraction methods to be used
- The machinery to be used
- Operation timing, taking account of any requirements to manage noise and effect on recreational use
- Access routes to be used
- Requirements around plant condition
- Requirements around repairs and refuelling of machinery
- Health and safety requirements, including management of public health and safety
- A complaints procedure

<u>In-channel works</u>

The low flow channel is deepened by pushing gravel material from the low flow channel up onto the adjacent beach, to form a temporary stockpile. This work is carried out by one or more D9 bulldozers, depending on the size of the beaches. At some smaller beaches where the low flow channel is relatively deeper and well-defined (generally in the downstream end of the reach) an excavator located on the beach, rather than in the channel, can be used. In some instances, it may be necessary to cut a new channel through an existing beach to achieve the design meander pattern.

Work commences at the downstream end of each beach with a lowering and re-shaping of the riffle; the machine will then continue shaping the low flow channel, moving in an upstream direction to create a lowered pool.

Upon completion of the pool deepening, some re-shaping of the riffle may be required to ensure the desired crossover has been achieved.

As the river reworks the altered meander pattern and lowered riverbed, the adjoining willow stands, and bank edges may become exposed and vulnerable to erosion. This may require further re-shaping of riffles (either by re-contouring or ripping) and re-establishment of the beach shape to maintain the design meander, which in turn protects the willows and bank edge. This additional channel shaping is most likely to happen after a flood. It may also be necessary to use additional vegetative protection measures (e.g. willow layering, tree groynes and tethered willows) to protect the most vulnerable willow stands and bank edges.

Gravel removal

The temporary gravel stockpiles are allowed to drain sufficiently before gravel removal commences. The raised beach can then be lowered progressively by the contractor.

Work commences at the downstream end of the beach and proceeds upstream. Gravel is extracted in strips parallel to the river flow, working from the front of the beach to the rear. This stage of the operation takes place above normal water levels, and no further re-working of the low flow channel is required. The raised beach also remains largely intact during flood events.

A front end loader is used to load the gravel onto either road trucks or large off-road dump trucks, which then transport it offsite via existing haul roads for processing (see photograph).

Beach re-contouring

At the completion of the gravel extraction operation, the remaining beach may be re-contoured to give a smooth profile, with a central rise, downward slope to the low flow channel, and a well-defined water edge (where possible). Where the low flow channel is shaped with a bulldozer, there may be the need to further shape the beach edge with an excavator to achieve this. The purpose of this is to ensure a minimum of re-working by the river is required to re-establish a 'natural' channel form and shape.

Front-end loader loading an off-road dumper truck

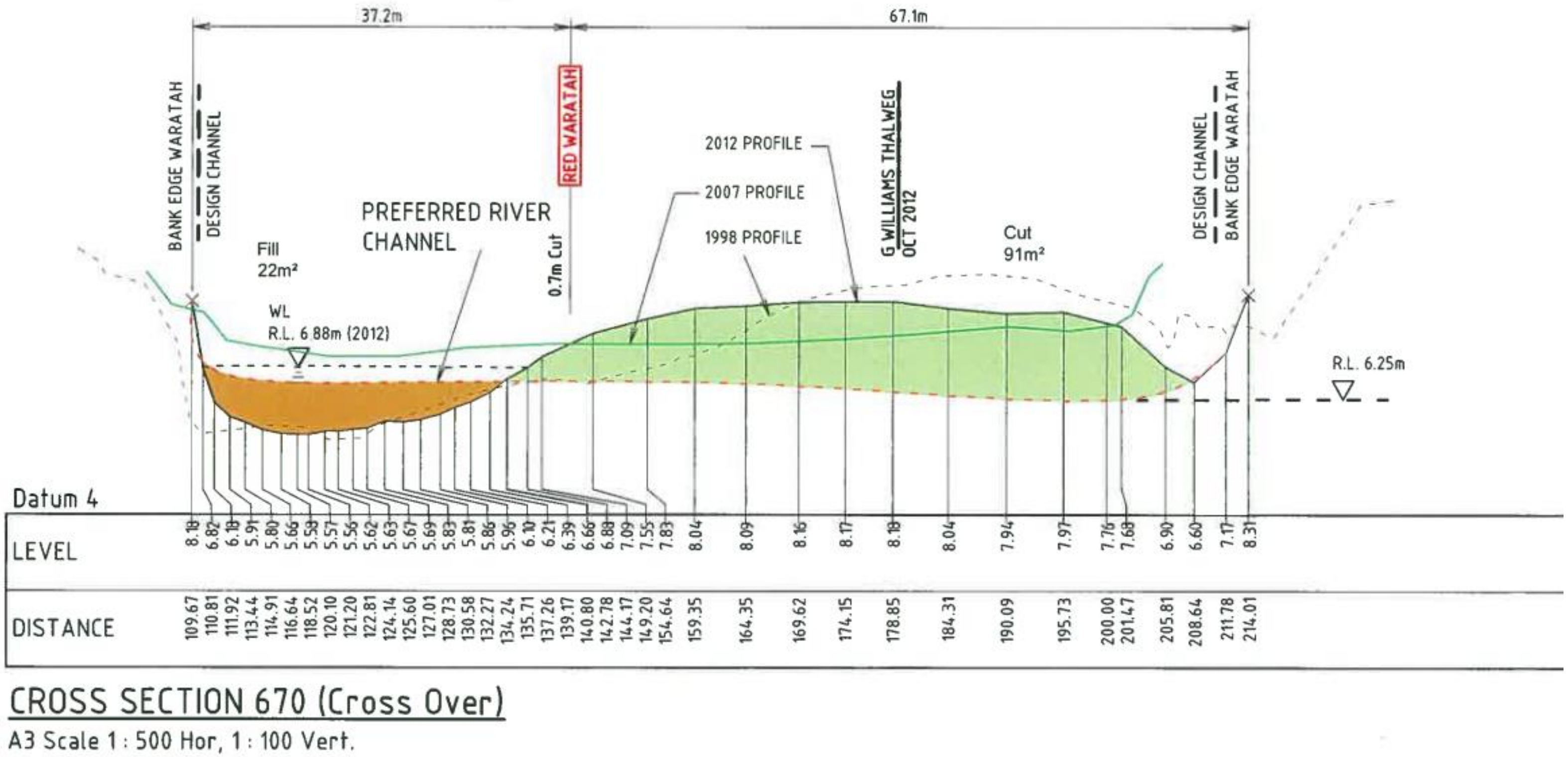


Figure 5: A typical channel cross section

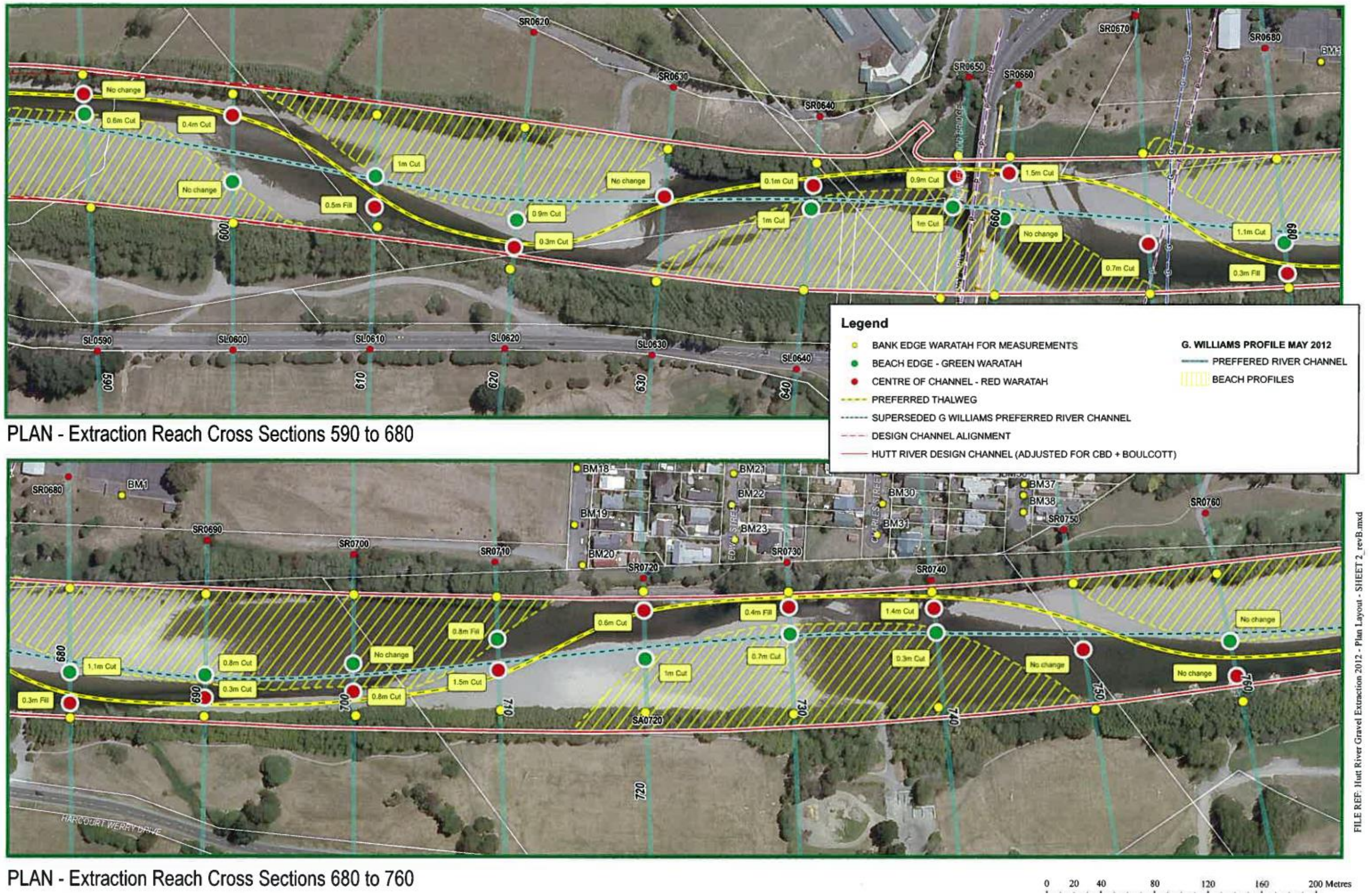


Figure 6: A typical gravel extraction plan

10.4.19 Channel maintenance: Mechanical clearing of minor watercourses and drains

Purpose

To maintain bed levels and flood carrying capacity while avoiding undermining banks and deepening and widening the channel.

Description

Minor watercourses may include highly modified rivers and streams and waterways referred to colloquially as drains. They also include minor channels constructed across berms for the purpose of carrying intermittent stormwater flows, which are defined as drains in the PNRP.

The activity involves mechanical excavation using a cleaning bucket mounted on a hydraulic excavator. The excavator operates from the river bank, and excavated material is placed on the bank where it cannot re-enter the channel or may be removed from the site altogether.

GWRC do not intend to deepen or widen drains and will look for opportunities to reduce the frequency of mechanical clearance (e.g. through riparian management).

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region removal of vegetation and associated disturbance of the river bed is generally a permitted activity, while the extraction of sediment from the river bed, particularly from the wet channel, generally requires resource consent.

In the PNRP Decisions Version, the clearance of vegetation and sediment from drains and highly modified rivers and streams is likely to require a resource consent. However, these rules are currently under appeal and may change. In all other minor watercourses, the removal of weed and sediment must be authorised by a resource consent. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of effective land drainage, productivity and use of adjacent land
- Protection of infrastructure and assets on adjacent land
- Enhancement of aquatic habitat by an improvement in oxygen levels and the control of pest plants

Key Potential Adverse Effects

- Short term reduction in water quality due to release of sediment
- Loss of vegetation cover and spawning vegetation for fish, freshwater crayfish and freshwater mussels and invertebrates
- Accidental fish and kōura mortality
- Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
- Removal of habitat and food sources for benthic invertebrates and fish
- Short-term reduction in visual/amenity values and unpleasant odour effects

Required Actions

- The mechanical clearance of bottom rooted plant community in low gradient streams will always require an SSEMP and site specific monitoring as per **Appendix 2** and the conditions of consent**.** This includes activities that disturb the bottom of the stream but excludes the use of weed boats.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the activity constraints in the **conditions of consent.**
- The frequency of clearance is no more than is required to maintain flows and flood conveyance capacity.

- Works should be supervised by a suitably experienced person to ensure that:
  - machinery is operated from the side of the watercourse, rather than from within it wherever possible
  - disturbance to banks is limited to one side of the waterway (although this may vary from side to side)
  - works proceed from the upstream end of the reach to the downstream end, to minimise the release of sediment and debris downstream
  - measures, such as sediment traps, are used to minimise the release of sediment and debris downstream
  - a self-draining ‘weed bucket’, that permits easy drainage of water and any entrapped fish back into the watercourse, is used in gravel bedded waterways
  - a conventional bucket, rather than a ‘weed bucket’, is used where large amounts of sediment are present
  - when fish are observed in the extraction area, the digger operator keeps the bucket submerged at the end of each cut to give fish an opportunity to escape
  - any fish exhibiting obvious signs of distress (e.g. surface breathing, loss of equilibrium from the channel) will be recovered and relocated by the operator to clear water upstream of the works
  - at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating trapped fish
  - excavated material is examined and any fish or kōura trapped by the works are recovered and relocated to clear water upstream of the works
  - in general, 10% of the aquatic vegetation within the cleared watercourse is retained to assist re-colonisation of aquatic organisms and plants and to provide refuge for aquatic fauna
  - any significant patches of native or valued (e.g. watercress) macrophytes are identified and included within the 10% of aquatic vegetation retained
  - selected ecological refuge areas are left in the channel at intervals to assist re-colonisation of the invertebrate and fish populations present in the watercourse
  - in-stream woody debris are not removed, except where they pose a flood or erosion risk, or a hazard to recreational users;
  - any bare earth on the banks that is exposed during maintenance activities is revegetated as soon as possible to reduce soil loss into the waterway
  - any excavated material is placed an appropriate distance from the waterway to ensure sediment is not able to wash back into the waterway and, if necessary, stranded fish are able to make their way back to the waterway
  - part of the waterway is left un-cleared each year (for instance, divide the watercourse into areas A, B and C; clear area A in year 1, area B in year and area C in year 3).

Restrictions

☒ Machinery will not be operated in stream channels unless absolutely necessary.

☒ To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

Channel clearance - Pahiko Drain (Ōtaki)

10.4.20 Channel maintenance: Mechanical clearing – Opahu Stream (Te Awa Kairangi/Hutt River)

Purpose

- To maintain bed levels and flood carrying capacity while avoiding undermining banks; and
- Remove unsightly debris.

Description

The lower Opahu Stream channel forms an isolated arm, 750 m long, on the true left bank of Te Awa Kairangi/Hutt River, downstream of the Ava Rail Bridge. The arm forms a sheltered low energy environment alongside the main channel of Te Awa Kairangi/Hutt River, and the riparian vegetation established within it provides inanga spawning habitat. Silt and tidal debris are washed into this channel, and needs to be removed periodically, principally for aesthetic reasons.

This work is undertaken by a long reach excavator operated from the river bank. The excavated silts and organic debris are loaded onto trucks for disposal off site. The channel adjacent to the training bank requires maintenance dredging over the full 750 m length approximately every 5 years.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region this activity requires resource consent. The activity is authorised under the granted resource consent for river management activities held by GWRC for Te Awa Kairangi/Hutt River.

According to the PNRP Decisions Version, excavation of sediment from the bed of a river must be authorised by a resource consent. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Protection of infrastructure and assets on adjacent land
- Enhancement of aquatic habitat by improvement of oxygen levels, provision of suitable spawning habitat for inanga and other fish species

Key Potential Adverse Effects

- Short term reduction in water quality due to release of sediment
- Loss of vegetation cover and spawning vegetation for fish and invertebrates
- Accidental fish and kōura mortality
- Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
- Removal of habitat and food sources for benthic invertebrates and fish, and inanga spawning habitat.

Required Actions

- The mechanical clearance of bottom rooted plant community in low gradient streams will always require an SSEMP and site specific monitoring as per **Appendix 2** and the conditions of consent**.** This includes activities that disturb the bottom of the steam but excludes the use of weed boats. **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the activity constraints in the **conditions of consent.**
- The frequency of clearance is no more than is required to maintain design flows and water levels.
- Works must be supervised by a suitably experienced person to ensure that:
    - wherever possible, machinery is operated from the side of the watercourse, rather than from within it
    - disturbance to banks is limited to one side of the waterway only

  - works proceed from the upstream end of the reach to the downstream end, to minimise the release of sediment and debris downstream
  - measures, such as sediment traps, are used to minimise the release of sediment and debris downstream
  - a self-draining ‘weed bucket’, that permits easy drainage of water and any entrapped fish back into the watercourse, is used in gravel bedded waterways
  - a conventional bucket, rather than a ‘weed bucket’, is used where large amounts of sediment are present
  - when fish are observed in the extraction area, the digger operator keeps the bucket submerged at the end of each cut to give fish an opportunity to escape
  - any fish exhibiting obvious signs of distress (e.g. surface breathing, loss of equilibrium from the channel) are recovered and relocated to clear water upstream of the works
  - examination of excavated material is undertaken and any fish or kōura removed from the stream by the works are recovered and relocated to clear water upstream of the works
  - at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating of trapped fish.
- If macrophytes are present –
  - In general 10% of the aquatic vegetation within the cleared watercourse is retained to assist the recolonisation of aquatic organisms
  - additionally, where practicable, selected ecological refuge areas are left in the channel at intervals to assist the recolonization of the invertebrate populations present in the watercourse
  - any significant patches of native macrophytes are identified and included in the 10% of aquatic vegetation retained.

Restrictions

☒ Work is not to be undertaken during inanga spawning periods – refer to **Appendix 7**.

☒ No removal of riparian vegetation.

10.4.21 Channel maintenance: Mechanical clearing – Chystalls Lagoon (Ōtaki River)

Purpose

- To remove sediment (silt) build-up to maintain the wetland values of Chystalls Lagoon; and
- To maintain bed levels and flood carrying capacity while avoiding undermining banks of Waimanu Stream, downstream of Chystalls Lagoon.

Description

The Waimanu Stream drains an area of foothills and river terrace lying in the vicinity of Rahui Rd, on the eastern side of the Ōtaki River upstream of SH1. In its lower reaches the stream flows through Chystalls Lagoon on the true right bank of the river within the floodplain in an area known as Chystalls Bend. The lagoon is a man-made structure formed during construction of river management activities at Chystalls Bend. Waimanu Stream flows for a further 200 m (approximately) after exiting the lagoon before entering the main channel of the Ōtaki River at the downstream end of the bend.

Silt transported by the Waimanu Stream, and also carried into the lagoon during higher flows in the Ōtaki River is trapped by weed within the lagoon. This results in a gradual in filling of the lagoon, and period excavation of silt is required approximately every 5 years in order to maintain it.

Diversion of Waimanu Stream and draining of the lagoon is necessary prior to excavation operations. Excavation is undertaken by a large excavator, and silt is loaded onto dumper trucks for transport to an off-site location for disposal. Due to the width of Chrystalls Lagoon, machinery will need to operate within the bed of the lagoon.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region this activity requires resource consent. The activity is authorised under the granted resource consent for river management activities held by GWRC for the Ōtaki River. Under the PNRP Decisions Version, this activity would require resource consent. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of the aquatic habitat within the lagoon
- Maintenance of the amenity and wetland values associated with the lagoon

Key Potential Adverse Effects

- Short term loss of aquatic habitat by reduction of water levels and removal of substrate
- Removal of habitat and food sources for benthic invertebrates and fish
- Loss of vegetation cover and spawning vegetation for fish and invertebrates
- Accidental fish and kōura mortality
- Potential for release of nutrients trapped in sediment, resulting in adverse effects on water quality

Required Actions

- The mechanical clearance of bottom rooted plant community in Chrystalls Lagoon will require an SSEMP and site specific monitoring as per **Appendix 2** and the conditions of consent.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the activity constraints in the **conditions of consent.**
- The frequency of clearance is no more than is required to maintain the lagoon.
- Works must be supervised by a suitably experienced person to ensure that:

- diversion works ensure that the Waimanu Stream cannot enter the lagoon while excavation works are in progress, in order to minimise the release of sediment and debris downstream
- measures, such as sediment traps, are used to minimise the release of sediment and debris downstream
- a self-draining 'weed bucket', that permits easy drainage of water and any entrapped fish back into the watercourse, is used in gravel bedded waterways
- a conventional bucket, rather than a 'weed bucket', is used where large amounts of sediment are present
- fish removal and relocation is undertaken immediately prior to excavation works to remove as many fish as possible before disturbance occurs
- at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating trapped fish
- examination of excavated material is undertaken and any fish or kōura trapped by the works are recovered and relocated to clear water upstream of the works
-
- suspended sediment in the excavated pond is allowed to settle before the diversion of the Waimanu Stream through the lagoon is reinstated.

Restrictions

☒ To minimise adverse effects on fish, works should not be undertaken at any times restricted by **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

Silt excavation in Chystalls Lagoon. Note use of self-draining weed bucket

10.4.22 Planting in the river bed: Willow poles and stakes

Purpose

To maintain channel alignment as determined by the relevant Operational Management Plan.

When used

Within the prescribed buffer adjacent to the design channel and often in association with other structural works (groynes or debris fences) to further reinforce these works.

Description

Planting is generally carried out between June and September. Four planting methods are used:

- By hand, using a crow bar. Willow stakes are cuttings 1 – 1.5 m long and approximately 2.5 cm in diameter. Stakes or poles (i.e. large cuttings more than 3 m long) are usually cut from existing stands.
- 'Rip planting' using an excavator or planting tine. The tine is dragged through the river bed at up to 1 m depth and the stakes/poles or rooted stock planted behind the moving tine. This is most commonly used where large areas of planting are required.
- 'Trench planting' using a digger. Willow poles are planted in a trench dug and backfilled by the excavator. This method is used where willows are planted in very dry areas or immediately adjacent to fast flowing water.
- Planting using a mechanical auger to prepare holes for stakes or poles.

Currently willow trees are the species considered most suitable for 'front-line' river edge river management. Willow planting therefore forms an essential part of current river protection work nationwide. Willows are easy to establish, grow rapidly and form an intricate root system that is ideal for binding and strengthening river banks and structural measures such as permeable groynes and debris fences. They can also be 'layered' (i.e. cut and anchored in place on the river bank where they will re-grow). Generally, the same results cannot be achieved using native species. This means the most realistic alternatives to willows are likely to be structural works (e.g. rock lining), which involves higher costs and arguably increased environmental impact.

GWRC will continue to manage existing crack/grey willow which is located predominantly in the Eastern Rivers but will not introduce or use crack or grey willows in other areas.

Biosecurity Act 1993

Crack and grey willow are unwanted organisms under the Biosecurity Act 1993 and any planting is a breach of that Act.

Key Potential Benefits

- Improved stability and strength of buffer zone adjacent to active channels
- Maintenance of stable channel alignment
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- Disturbance of river bed nesting birds and bird nesting habitat
- Temporary disturbance of recreational access and use
- The spread of unwanted organisms and the effects of these on significant habitats

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7**, and the **conditions of consent.**
- Sterile cultivars are to be used in all rivers.

- Planting works must be supervised by a suitably experienced person to ensure that:
    - the spacing and alignment of plantings is appropriate for the specific river and site
    - a smooth river bed profile is left following planting, to ensure that flood flows are not constricted.

Restrictions

☒ Planting works must not be undertaken in the wet channel. However, on occasion, planting may occur in areas of the river bed that are covered with water by seepage and/or back flow. If work is undertaken in such wet areas, measures must be taken to minimise sediment entering the wet channel).

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in **Appendix 7** and the **conditions of consent**.

Willow poles and stakes and layered willows – Te Awa Kairangi/Hutt River

Trench planting – Te Awa Kairangi/Hutt River

10.4.23 Construction and maintenance: Vegetative structures

Purpose

To maintain river alignment as determined by the relevant Operational Management Plan.

When used

Where more durable (and expensive) bank protection work (e.g. groynes) is unnecessary.

Description

Vegetative structures include:

- Layered willows
- Tree groynes or 'clumps', which project out from the bank
- Tethered willows placed along a bank edge.

Willow layering involves felling willows growing at the river edge (or bending and snapping using a digger) so that they lie obliquely towards the river in a downstream direction. The intent is to allow the willows to sucker from branches on the ground once they are covered in silt and gravel. The tree is wired to its stump to prevent it breaking off in a flood.

Tree groynes perform the same purpose as layered willows but are constructed where there are no available trees at the bank edge. In this case, large willow or poplar trees are cut from a nearby source and placed in a shallow trench that has been excavated at the desired location. The trees are bundled with wire rope and securely fixed to driven railway irons and/or buried concrete block weights. The base of the trees are covered with gravel to encourage root growth, and willow poles are planted between the groynes.

Tethered willows are similar to tree groynes but are placed alongside the bank edge to be protected, rather than jutting out into the river channel. Again, they may be held in place with wire ropes and concrete blocks.

Some initial site preparation is usually associated with the construction of vegetative structures. Typically, it may involve some excavation and/or mechanical disturbance of the river bed and bank, to provide access to the working area and to facilitate construction works.

Willow poles would normally be planted behind the tethered willows to facilitate the establishment of the buffer layer.

Layering is normally completed in the August – December period following completion of planting work.

Maintenance of existing layered and tethered trees usually involves strengthening by cabling-in additional tree material, and inter-planting with additional poles.

If existing vegetative structures (cabled willows and tree groynes) start to show signs of failure, they can be removed to reduce the potential for them to create a hazard during future floods. This would involve excavation using a hydraulic excavator and removing them from the river bed.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the layering and tethering of willows is a permitted activity, provided that it:

'(1) is not in a river, or part of a river, identified by Policy 4.2.10 (Appendix 2); and

(2) extends into the available river bed width from the bank no more than whichever is the lesser of:

- 10% of the width of the water body; or
- 5 metres; and

(3) does not use crack willow, Salix fragilis, or grey willow, Salix cinerea, except on the margins of rivers where they are already predominant'

<u>and</u> complies with the prescribed permitted activity conditions. Any work not complying with these requirements requires resource consent.

Under the PNRP Decisions Version, the placement and maintenance of structures associated with vegetative bank edge protection is a permitted activity, provided that prescribed permitted activity conditions (Rules R112 and R117) are complied with. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Bank stability is enhanced, erosion risk is reduced, and adjacent property and infrastructure is protected
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity is enhanced by shading, woody inputs to the stream, and niche instream habitat provided by tree roots.

Key Potential Adverse Effects

- During construction:
    - disturbance of river bed habitat
    - release of suspended sediment to the river
    - deposition of sediment downstream
    - temporary loss of riparian vegetation
    - disturbance of recreational use
- Long term:
    - cumulative effect of reduction in the overall natural appearance of the river bank and river corridor associated with willow use
    - the spread of unwanted organisms and the effects of these on significant habitats

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- The person responsible for supervising on-site works must ensure that:
    - all staff are aware of the risks involved in this work and the safety practices that must be observed
    - only the minimum area needed to complete the work is disturbed
    - tether anchors are tied with wire rope extending in a downstream direction (as this prevents willows from shifting; if ties are placed extending in an upstream direction there is the potential for slack in the tie to remain).
- Hybrid stock will be planted in areas where crack willows are removed, to provide sterile stock for future use.

Restrictions

☒ Crack willows and grey willows must not be used in areas where they do not already occur.

☒ To protect aquatic ecology and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in **Appendix 7**, and must comply with the activity constraints in the **conditions of consent**.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in **Appendix 7** and the **conditions of consent**.

Tethered willows and tree groynes – Te Awa Kairangi/Hutt River

Tethered willows and tree groynes – Te Awa Kairangi/Hutt River

10.4.24 Maintenance of riparian vegetation: Mowing from the river bed

Purpose

To maintain the aesthetic appeal and public amenity and recreational uses associated with the river berms.

Description

Mowing of river berms is generally done from the bank and does not require the operation of machinery in the river bed. However, in a few places where access is restricted, mowing of the river berms may need to be undertaken from the river bed. In such instances, it may also be necessary to gain site access via the river bed – refer to section 10.3.7.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, entry or passage across the river bed is a permitted activity.

Under the PNRP Decisions Version, entry or passage across the river bed is a permitted activity provided that the prescribed permitted activity conditions are complied with (Rule 124). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Channel capacity is maintained
- Amenity values and recreational access is maintained

Key Potential Adverse Effects

- Mortality of fish and invertebrates
- Disturbance of river bed and river bed habitat
- Reduction or removal of bankside vegetation providing shade to the adjacent aquatic habitat and inanga spawning habitat
- Minor release of suspended sediment to the river
- Disturbance of recreational use

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the **conditions of consent.**
- Only a rubber-tyred machine may be used, to minimise disturbance of the stream bed.
- Managers must consider ways to enhance habitat.

Restrictions

☒ Mowing from the stream channel will only be done in the following locations:
  - Stokes Valley Stream; and
  - Porirua Stream.

☒ To protect inanga spawning habitat, works must comply with the restrictions specified in **Appendix 7**.

Mowing – Stokes Valley Stream

10.4.25 Maintenance of riparian vegetation: Trimming and mulching of bankside vegetation from the river bed

Purpose

To maintain:

- channel capacity as determined by the relevant Operational Management Plan
- public amenity and recreational uses associated with the river berms
- clear survey sight lines

Description

Mulching of standing willows in the buffer zone may be used as an alternative to layering, to prevent the trees becoming too large and unstable. Although initially this may be visually unsightly, the effects are short-lived as willow rejuvenation proceeds. Mulching is also used to prepare areas for planting.

Clearance may be done by a mower/mulcher mounted on an excavator and/or by hand.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, entry or passage across the river bed, and removal of vegetation from the river bed are permitted activities.

Under the PNRP Decisions Version, entry or passage across the river bed and removal of vegetation from the river bed are permitted activities provided the prescribed permitted activity conditions are complied with (Rule 122). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Channel capacity is maintained
- Bank stability is maintained
- Accurate survey of the bank edges is facilitated
- Access for recreation is maintained

Key Potential Adverse Effects

- Loss of riparian vegetation and consequently, inputs of woody material, leaves and insects to the aquatic environment
- Reduction in riparian shading of the river
- Loss of shelter or spawning sites for fish or aquatic invertebrates
- Disturbance of recreational use
- Reduction in amenity values until vegetation re-grows

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Ideally mulching should be undertaken when trees are dormant (i.e. before spring growth is occurring).
- Wherever possible, works should be undertaken from the bank, or from dry beaches, rather than from within the active channel.
- Trimmed vegetation should be mulched on-site or disposed of in a suitable location away from the river, where it will not be washed into the channel and create obstructions downstream.
- Tree stumps and snags must not be removed from the bed of the waterway, unless they will cause erosion or obstructions (as they provide good habitat for freshwater species).

Restrictions

☒ The removal of native trees and vegetation, and trees used by roosting birds must generally be avoided.

☒ The removal of large sections of vegetation from a reach or stream without leaving sufficient areas for existing fish to recover is to be avoided.

☒ To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in **Appendix 7** and the **conditions of consent**.

10.4.26 Construction of structures and tracks on berms

Purpose

- To maintain stormwater capacities to the river.
- To enhance the public appreciation and safe use of the river corridor.

Description

This includes the development of river trails and the implementation of works on the river berms and stopbanks in accordance with specific environmental strategies for each river as well as minor works associated with the management or improvement of the riparian margins, including the erection of footbridges or boundary fences.

There may also be a requirement for new stormwater culverts under trails, and drainage channels constructed across the river berms to carry stormwater to the river.

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.

The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed.

Under the PNRP Decisions Version, disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Access for recreation or other purposes is improved
- Amenity values are improved

Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff
- Reduction in the natural appearance of the river corridor

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Structures must be designed and approved by a suitably qualified and experienced person to ensure in particular that:
    - the works are in accordance with any Floodplain Management Plan, Environmental or Ecological Strategy, or Operational Management Plan
    - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris that could be washed into the river
    - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone.
- A suitably experienced person must supervise construction and ensure that works are undertaken in accordance with the design requirements noted above.

Constructing fences on Te Awa Kairangi/Hutt River berm

10.4.27 Maintenance of berms, stopbanks, structures and tracks on berms

Purpose

To ensure the integrity and continued functioning of flood protection assets.

Description

This activity includes:

- the reinstatement of damage to stopbanks and berms that may have been caused by flooding, rainfall runoff or vandalism. The intention of this work is to reinstate the berm or stop bank to its original height/profile
- tree and stump removal from stopbanks
- minor repairs to and general maintenance of footbridges, fences, culverts and other minor structures
- mechanical cleaning of stormwater channels.

Generally, repairs of berms or stopbanks will involve the placement of suitable fill in layers. Fill may be sourced either from beaches on the river bed or from elsewhere, depending on design requirements. The intention is to reconstruct the stopbank and/or berm to a similar height and alignment prior to the damage or erosion. Following reconstruction, the berm will be replanted as appropriate, and stopbanks will be top soiled and re-grassed. This also applies to the holes left in stopbanks from trees and/or stumps.

Resource Management Act 1991

The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed. Under the PNRP Decisions Version, disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Flood protection assets are maintained in good order
- The risks of damage to berms and stopbanks from storm events are reduced
- Amenity values are maintained

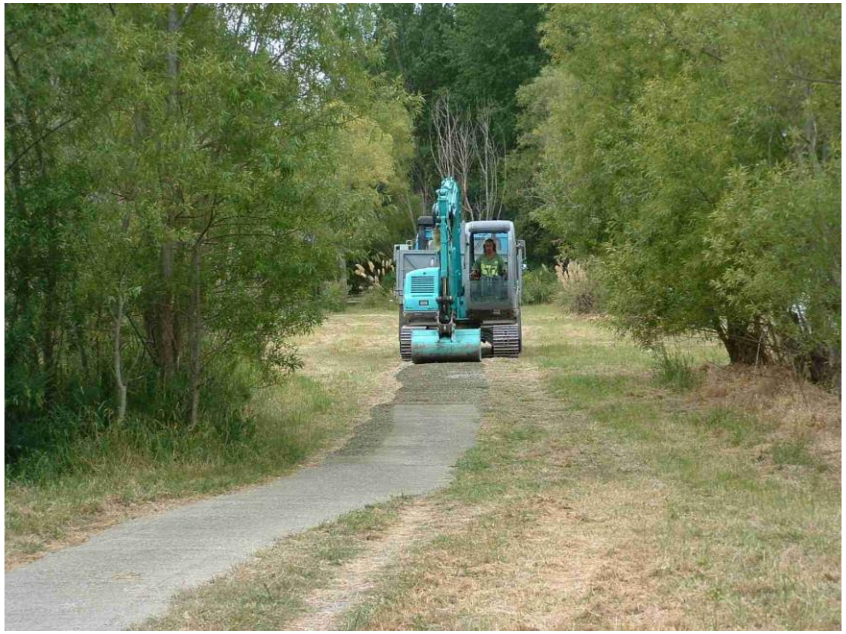
Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff
- Discharges of contaminants from cleaning of stormwater channels

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Works must be supervised by a suitably experienced person to ensure that:
  - works are undertaken in accordance with any specific design requirements (where repairs involving earthworks are to be undertaken)
  - sediment and erosion control measures are put in place where earthworks are to be undertaken
  - any trimmed vegetation is mulched on-site or disposed of away from the river to ensure it cannot be carried away by future flooding
  - stormwater drains are cleared when dry, wherever possible, to minimise discharges of sediment to the river, and

measures, such as sediment traps, are used if necessary to minimise the release of sediment and debris downstream.



Grading river trail – Te Awa Kairangi/Hutt River

Stormwater channel clearance – Te Awa Kairangi/Hutt River

10.4.28 Planting on berms

Purpose

To undertake river berm planting to complement erosion protection structures, enhance existing river edge plantings, and to establish a suitable vegetative buffer to support bank edges and assist in the maintenance of a stable river alignment.

Description

Generally, willows will only be used within the 20-30 m wide buffer zone closest to the river. Behind this buffer, native trees can also be used on a site by site basis in accordance with the relevant Operational Management Plan.

Planting is generally carried out between June and September. For willows, four planting methods are used:

- By hand, using a crow bar
- 'Rip planting' using an excavator or planting tine. The tine is dragged through the river bed at up to 1 m depth and the stock planted behind the moving tine. This is most commonly used where large areas of planting are required
- 'Trench planting' using a digger. Willow poles or rooted plant stock are planted in a trench dug and backfilled by the excavator
- Planting using a mechanical auger to prepare holes for stakes/poles or rooted stock.

Native trees are planted either by hand using a spade, or mechanically, with the use of a small digger – depending on plant size. Site preparation, in the form of spraying or mulching may also be required.

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.

The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed.

Under the PNRP Decisions Version, the disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99). See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- Improved stability and strength of berms
- Maintenance of stable channel alignment
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- Temporary disturbance of recreational access and use
- Reduction in natural biodiversity associated with use of willow

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Prior to the approval of any planting plan, managers or site supervisors should assess both the necessity for the planting and the suitability of the proposed plant types in relation to the objectives and directions of any relevant Floodplain Management Plan, Environmental or Ecological Strategy, or Operational Management Plan for both the river corridor and the affected site.
- Restrict willow planting to the buffer zone at the river edge. This is generally 20 – 30 m wide.
- Only use sterile willow cultivars for willow planting.

- Consider the use of native trees behind frontline plantings wherever practicable. Assessment of practicability includes consideration of:
    - the availability of a care group to assist with establishment of the plantings
    - the need for spray release of native plants, and the cost of this work
    - the availability of suitable stock (plants in keeping with any ecological objectives for the river corridor and eco-sourced)
    - the need for fencing.
- Construction must be supervised by a suitably experienced person to ensure that works are undertaken in accordance with the design requirements noted above.

Planted willows above river bed – Waikanae River

Rip planting on berm – Te Awa Kairangi/Hutt River

Trench planting on berm – Wainuiomata River

Planting willow poles in buffer zone; native planting in foreground

School children planting native trees

10.4.29 Maintenance of riparian vegetation

Description

This activity includes the mulching of vegetation, removal of damaged or dead trees, and mowing of berms, where machinery is operated on the banks, away from the river bed.

Also see the relevant good practice section for Agricultural Chemical Spraying (section 10.5).

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.

The Regional Soil Plan for the Wellington Region applies to the removal of vegetation from areas lying outside of the river bed. In this situation, the activities are generally permitted, provided the total amount of vegetation removed falls within the limits prescribed.

Under the PNRP Decisions Version, the clearance of vegetation is a permitted activity, provided that prescribed permitted activity conditions are complied with. See **Appendix 6** for a list of existing consents held by GWRC. For spraying refer to Section 10.5.

Key Potential Benefits

- Flood protection assets are maintained in good order
- Amenity values are maintained in the longer term

Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff
- Short-term reduction in visual amenity

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**

Mulching scrubby vegetation

Mowing of berms – Te Awa Kairangi/Hutt River

10.4.30 River mouth cutting

Purpose

To maintain channel capacity by facilitating the discharge of flood waters at river mouths as determined by the relevant Operational Management Plan.

Description

River mouth cutting involves the periodic cutting of a new opening at the mouth of a river and includes the excavation and redistribution of sand on the foreshore and seabed (i.e. within the coastal marine area). Areas of beach (i.e. above the Mean High Water Spring level, and thus outside the coastal marine area) may also be disturbed, both by vehicle tracking, excavation and the redistribution of sand.

Resource Management Act 1991

River mouth cutting is permitted by the PNRP Decisions Version provided that it is undertaken in accordance with conditions outlined in Rule 193 and conditions specified in Section 5.7.2 and the trigger levels which are defined in Schedule U (river mouth cutting), for the following rivers and lakes:

- Waitohu Stream
- Ōtaki River
- Mangaone Stream
- Hadfield Drain
- Waimeha Stream
- Tikotu Stream
- Wharemauku Stream
- Whareroa stream
- Wainui Stream
- Waikakariki Stream
- Makara Stream
- Unnamed Stream, approximately 190 m south of the seaward end of Sunrise Way, Riversdale
- Unnamed Stream, approximately 145 m north of the seaward end of Sunrise Way, Riversdale
- Unnamed Stream at the seaward end of Karaka Drive, Riversdale
- Motuwaireka Stream
- Castlepoint Stream
- Whakataki River
- Lake Kohangapiripiri
- Lake Kohangatera
- Lake Onoke

GWRC currently holds a resource consent for river mouth cutting in the Waikanae River under the operative Regional Coastal Plan. See **Appendix 6** for a list of existing consents held by GWRC.

Reaching the prescribed trigger level as defined in Schedule U of the PNRP Decisions Version does not in itself mean that the river mouth will be cut. The effects of and cost to cut the mouth can be significant, depending on the length of the cut and volume of material that needs to be removed. This can be a significant proportion of the annual budget for managing risk from the river, so the mouth is only cut as a last resort and then only to avoid flooding and erosion risk to residential homes. The success of the 'cutting' work can be affected by large flood events, high seas, large tides and natural processes.

When a cut is deemed necessary, several factors will guide the timing:

- Avoiding white baiting season where possible
- Height of the fore dune (sand build up)
- Tide times and heights
- Available daylight hours
- Sea conditions
- Height of flood waters
- Availability of earthmoving equipment
- Complying with the relevant Regional Plan

Key Potential Benefits

- River mouth alignment is maintained
- Capacity to safely convey flood waters is maintained or improved
- Assets, infrastructure and property adjacent to the river mouth are protected from erosion

Key Potential Adverse Effects

- Short-term disturbance of foreshore and seabed and associated habitat
- Short-term reduction in visual clarity in adjacent coastal water due to entrained fine sediment
- Short-term reduction in recreational access
- Short-term reduction of estuarine habitat and associated ecological values
- The stranding of fish and invertebrates (where cutting results in dewatering of parts of the channel or associated backwaters and mudflats)

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Any fish or kōura at risk of stranding shall be recovered and relocated without delay.
- Works must be undertaken in accordance with the methodology described below.

Restrictions

☒ Work must not be undertaken during the inanga spawning period – refer to **Appendix 7**.

☒ No sand or other material is to be removed from beach or foreshore areas or the sea bed.

Methodology

- The new alignment is marked out on site. A trench is excavated to form a pilot channel, and the excavated sand is used to block off the wet channel. The pilot channel is not connected to the main channel at this stage. This work is undertaken at low tide when the sand is firmer, and the machinery does not need to work in water.
- Water ponds in the upstream channel until the following low tide, when the block in the pilot channel is removed, releasing the ponded water upstream into the new channel. The new channel is then deepened and widened naturally by the river flow.
- The material excavated during the cutting of the new channel is to be spread on the foreshore to assist in the realignment of the river outlet and/or erosion control at the outlet.
- Generally, the work will involve the use of hydraulic excavators, loaders and a dump truck.
- Ideally, the operation should be undertaken during low flows and at spring tides when tidal variation is largest. The operation should be completed over a single 24 hour period.

Ōtaki River mouth – pilot channel formation

Ōtaki River mouth – releasing bund

Ōtaki River mouth – cut under construction

Ōtaki River – Cut completed

Waimeha Stream mouth – formation of bund to block mouth

Waimeha Stream mouth – completed channel, diversion open

Waimeha Stream mouth – pilot channel under construction

Waikanae River mouth cut

10.4.31 Maintenance of structures in the coastal marine area

Description

This may involve repairs to:

- rock groynes
- rock lining
- training walls; and
- the clearance and repair of debris arresters,

which are located in the coastal marine area at the mouths of rivers.

Typically, the works involve the replacement of rock that has been moved or eroded out by flood action. Such work can generally be undertaken without the need to operate machinery in the flowing channel. Occasionally structures may need to be partially reconstructed, which may require more extensive work, including the operation of machinery in the flowing channel.

Resource Management Act 1991

Under the current Regional Coastal Plan, minor repairs, maintenance or alteration to existing structures in the coastal marine area, and the demolition of structures are permitted activities, subject to prescribed permitted activity conditions. Resource consent is required for more extensive repairs and maintenance that cannot comply with the permitted activity conditions.

Under the PNRP Decisions Version, minor repairs, maintenance or alteration to existing structures in the coastal marine area and the demolition of structures are permitted activities, subject to prescribed permitted activity conditions. Resource consent is required for more extensive repairs and maintenance that cannot comply with the permitted activity conditions. See **Appendix 6** for a list of existing consents held by GWRC.

Key Potential Benefits

- River mouth alignment is maintained
- Capacity to safely convey flood waters is maintained or improved
- Assets, infrastructure and property adjacent to the river mouth are protected from erosion

Key Potential Adverse Effects

- Short-term reduction in recreational access
- If machinery is operated in the flowing channel:
    - disturbance of foreshore and seabed and associated habitat
    - reduction in visual clarity in adjacent coastal water due to entrained fine sediment
    - loss of riparian vegetation and associated habitat.

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Construction materials used in repairs must be compatible with the existing structure.
- Replanting any high value riparian vegetation removed, or where more than 100m^2 of any other riparian vegetation is removed
- All surplus materials must be removed from the site at the end of works, and the structure and works area left in a tidy and safe state.

Restrictions

☒ Any in-river works must comply with the restrictions noted in **Appendix 7** and the **conditions of consent**.

10.4.32 Activities within the Waikanae Estuary Scientific Reserve

Purpose

To protect the values of the Waikanae Estuary Scientific Reserve.

Description

The Waikanae Estuary Scientific Reserve covers approximately 60 hectares of land at the mouth of the Waikanae River. The Reserve is administered by the Department of Conservation as a scientific reserve under the Reserves Act 1977.

Reserves Act 1977

Section 21 of the Reserves Act 1977 requires scientific reserves to be managed "for the purpose of protecting and preserving in perpetuity for scientific study, research, education, and the benefit of the country, ecological associations, plant or animal communities, types of soil, geomorphological phenomena, and like matters of special interest".

Required Actions

- Any activity proposed to be undertaken within the Waikanae Estuary Scientific Reserve will require an SSEMP and site-specific monitoring as per the conditions of consent.
- Before the commencement of any activities within the Waikanae Estuary Scientific Reserve, GWRC will request and obtain the necessary authorisations under the Reserves Act 1977.
- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7.**

Restrictions

☒ No river management activity may be carried out within the Waikanae Estuary Scientific Reserve unless authorised under the Reserves Act 1977.

☒ Urgent works (section 10.8) must not be carried out within the Waikanae Estuary Scientific Reserve.

10.4.33 Activities in wetlands

Purpose

To protect the values of wetlands in the region.

Description

A wetland can be a swamp, bog, or a river or lake margin. Water in wetlands may be freshwater, seawater or brackish water. Wetlands provide many ecological benefits and functions, including filtering sediment, absorbing water during rain, reducing the energy of waves or other erosive forces, and provide habitat for many types of flora and fauna.

The PNRP Decisions Version describes a significant natural wetland as a natural wetland that meets one or more of criteria (a) to (d) in Policy 23 of the Regional Policy Statement 2013 being: representativeness; rarity; diversity; ecological context. (Note - Schedule F3 lists identified significant natural wetlands to manage livestock exclusion under Rule R97).

Note that, because of the rarity of wetlands in the Wellington Region, all natural wetlands will meet the representativeness and rarity criteria listed in Policy 23 of the Regional Policy Statement 2013 and therefore meet the definition of significant natural wetland in the PNRP Decisions Version.

The PNRP Decisions Version set out Rules for undertaking work in the wetlands. Section 5.5.2 identifies permitted activity conditions for activities in significant natural wetlands and outstanding natural wetlands.

The following rules and their conditions will be relevant to any activities proposed in Wetlands:

- Rule R104 Structures in significant natural wetlands - permitted activity: Conditions include use of hand held machinery, new structures cannot be located in Schedule C (Mana Whenua) areas and need to be less than $10m^2$ and comply with general conditions. Refer to the rule for further information.
- Rule R105 Planting and pest plant control in significant and outstanding natural wetlands – permitted activity. This does not include the planting of willows, refer to the rule for further information.
- Rule R105A Removal of wetland plants for Māori customary use or the use of an individual – permitted activity.
- Rule R106 Restoration of significant natural wetlands and outstanding natural wetlands – controlled activity.
- Rule R107 Activities in significant natural wetlands - discretionary activity: Including the placement of new structures over $10m^2$, discharge of water or containments not already permitted by R42, the clearance of indigenous vegetation and activities not meeting conditions of R104, 105 and 105A.
- Rule R108 Activities in significant natural wetlands – non-complying activity, including taking of water in, within and from and within 50m, land disturbance including excavation and deposition and reclamation.
- Rule R109: Activities in outstanding natural wetlands – discretionary activity including maintenance and repair, replacement of existing structures, removal of existing structures and removal of pest plants not permitted by Rule R105.
- Rule R110: Activities in outstanding natural wetlands – non-complying activity including taking of water in, within and from and within 50m, land disturbance including excavation and deposition and reclamation and vegetation clearance.
- Rule R111: Reclamation or drainage of outstanding natural wetlands – prohibited activity. Refer to Schedule A3 (outstanding wetlands).

Required Actions

- Wetlands within an area where an activity is proposed to be undertaken will be identified and the full extent of the wetland area avoided.

Restrictions

- Any works within a wetland, where required, will require separate resource consents, pursuant to the PNRP Decisions Version.

10.5 Agricultural chemical spraying

Purpose

To manage weed infestations and other unwanted vegetation on river beds, banks and berms to maintain channel capacity.

Description

Spraying with agricultural chemicals (agrichemicals) is a selective and site-specific method to manage weeds inexpensively and where mechanical access is difficult.

Key Potential Benefits

- The capacity of the river corridor to safely convey flood waters is maintained or improved
- Control of weeds facilitates access to, and maintenance of, river management assets and infrastructure
- Control of weeds contributes to a reduction in the costs, nuisance and problems of weed invasion on privately owned property adjacent to the river

Key Potential Adverse Effects

- Short-term reduction in recreational access while spraying is occurring
- Possible adverse effects on aquatic ecology if not effectively managed

Resource Management Act 1991

Weed control on river banks, berms, and areas of river bed by agrichemical spraying has the potential to release droplets to the air which can affect human and aquatic ecosystem health and surface water quality.

The controls on this activity required to manage such adverse effects are included in the both the operative Regional Air Quality Management Plan (**AQMP**) and the PNRP Decisions Version, as summarised below.

AQMP

The AQMP defines agrichemicals as "*any substance, whether inorganic or organic, manufactured or naturally occurring, modified or in its original state, that is used in any agriculture, horticulture, forestry, management of public amenity areas, or related activity, to eradicate, or control flora or fauna. Fertilisers are explicitly excluded from this definition*."

The relevant requirements are set out in Rule 1 of the AQMP. According to Rule 1, the discharge of contaminants into air in connection with land-based application of agrichemical spray and powder by various methods, outside of adjacent private properties and areas of public assembly, are permitted activities, subject to the conditions set out below.

Rule 1 sets out eleven conditions ((i)-(xi)), which apply according to each of four defined methods for land-based agrichemical application, as follows:

1) application with a hand operated and manually pumped knapsack containing < 20 litres: *Conditions (i)-(vi)*
2) application with anything other than (1), and where the site is not located within 50 metres of adjacent property or places of common public assembly: *Conditions (i)-(vi)*
3) application with anything other than (1), and where the site is located within 50 metres of adjacent property or places of common public assembly: *Conditions (i)-(viii)*
4) application by any method in public areas and along public roadways: *Conditions (i)-(vi), and (ix)-(xi)*

Method 1) is often used in river management in the western part of Wellington Region; whereas Method 3) is used for the majority of all river and drainage scheme spray maintenance work in eastern parts of the Region. In these circumstances, agrichemical is applied with a hand-held hose and nozzle applicator supplied from a vehicle-mounted spray container of about 350 litre capacity. Method 4), also more common in eastern areas, is used where segments of drainage schemes lie adjacent to public roadways.

Note: the AQMP was developed before the National Environmental Standards for Air Quality came into effect in 2004, and prior to development of industry best practice guidelines relating to the use of agrichemicals.

PNRP Decisions Version

The PNRP Decisions Version defines Agrichemical as:

> *"Any substance, whether inorganic or organic, human-made or naturally occurring, modified or in its original state, that is used in agriculture, horticulture or related activity to eradicate, modify or control flora and fauna. It excludes fertilisers, vertebrate pest control products, ethylene dibromide, ethylene oxide, methyl bromide, hydrogen cyanide, phosphine or chloropicrin and oral nutrition compounds."*

The relevant Rules are:

- Rule R36A Handheld discharge of agrichemicals – permitted activity, subject to general conditions in Section 5.1.13 for clarification refer to the Rule prior to undertaking this activity.
- Rule R36B Motorised and aerial discharge of agrichemicals – permitted activity subject to general conditions in Section 5.1.13 and conditions in the R3BA, including keeping of records, preparing spray plans and notification. Refer to the Rule prior to undertaking this activity.
- Rule R38 Agrichemicals not permitted – restricted discretionary activity. The discharge of agrichemicals into air or onto or into land where it may enter water or into water that is not permitted by Rule R36A or Rule R36B7, is a restricted discretionary activity. The matters for discretion are set out in R38.

Required Actions

- **Managers and on-site works supervisors must implement all general good management practices (sections 10.3.1 to 10.3.14) and comply with the restrictions in Appendix 7** and the activity constraints in the **conditions of consent.**
- Works must be undertaken in accordance with the methodology described below.

Methodology

In general, river management spraying activities must be aligned with industry best practice, as documented in NZS 8409:2004 Management of Agrichemicals and prescribed in **Flood Protection Department's SOP 16 - Agrichemical Spraying.**

10.6 Urgent works

Urgent works are river management activities undertaken –

- to address an immediate river management issue or problem where erosion or flooding is placing flood protection structures, other infrastructure or property under direct threat of damage; and/or
- in response to a flood or emergency situation that may need to be undertaken outside regular methodologies or operating conditions.

Given the nature of urgent works, GWRC recognise that it may not be possible for staff to adhere to all of the good management practices in section 10 and restrictions in **Appendix 7** of the Code.

However, at a minimum, GWRC staff must:

- notify iwi and ensure appropriate action is taken as soon as possible if sites of significance to them are affected;
- use construction works that are compatible with the environment (i.e. no concrete rubble or car bodies or other foreign material); and
- comply with the good management practices in sections 10.3.4 (operation of machinery) and 10.3.9 (management of safety) of the Code. This includes the requirement to give prior notice to Transpower and KiwiRail in the circumstances provided and undertake the process set out for proposed excavation works in Te Awa Kairangi/Hutt River.

10.7 New method trials

- GWRC will trial new methods, activities or strategies for river management from time to time as those methods are developed.
- Before any new method or activity is considered for inclusion in the Code of Practice, it will undergo a full appraisal and reporting by GWRC via an established process agreed in advance with the Environmental Regulation Department, GWRC. The appraisal process may include on-site trials of the new method or activity.
- Prior to undertaking any trial of a new method or activity, GWRC will determine:
    - The purpose of the trial
    - The site or sites at which the trial will be undertaken
    - The times when the trial will be undertaken, and the total length of time expected to undertake the trial
    - The expected effects or outcomes of the trial
    - The parameters by which any outcomes of the trial will be measured
    - Any environmental monitoring that will be required to measure the progress or success of the trial
    - The people who will be responsible for evaluating the trial and any specialist expertise that may be required
    - The results of any new method or activity trials will be included in the Annual Review process (see section 3), and any decision to include the new method or activity in the Code will be made according to that review process.

11. Glossary

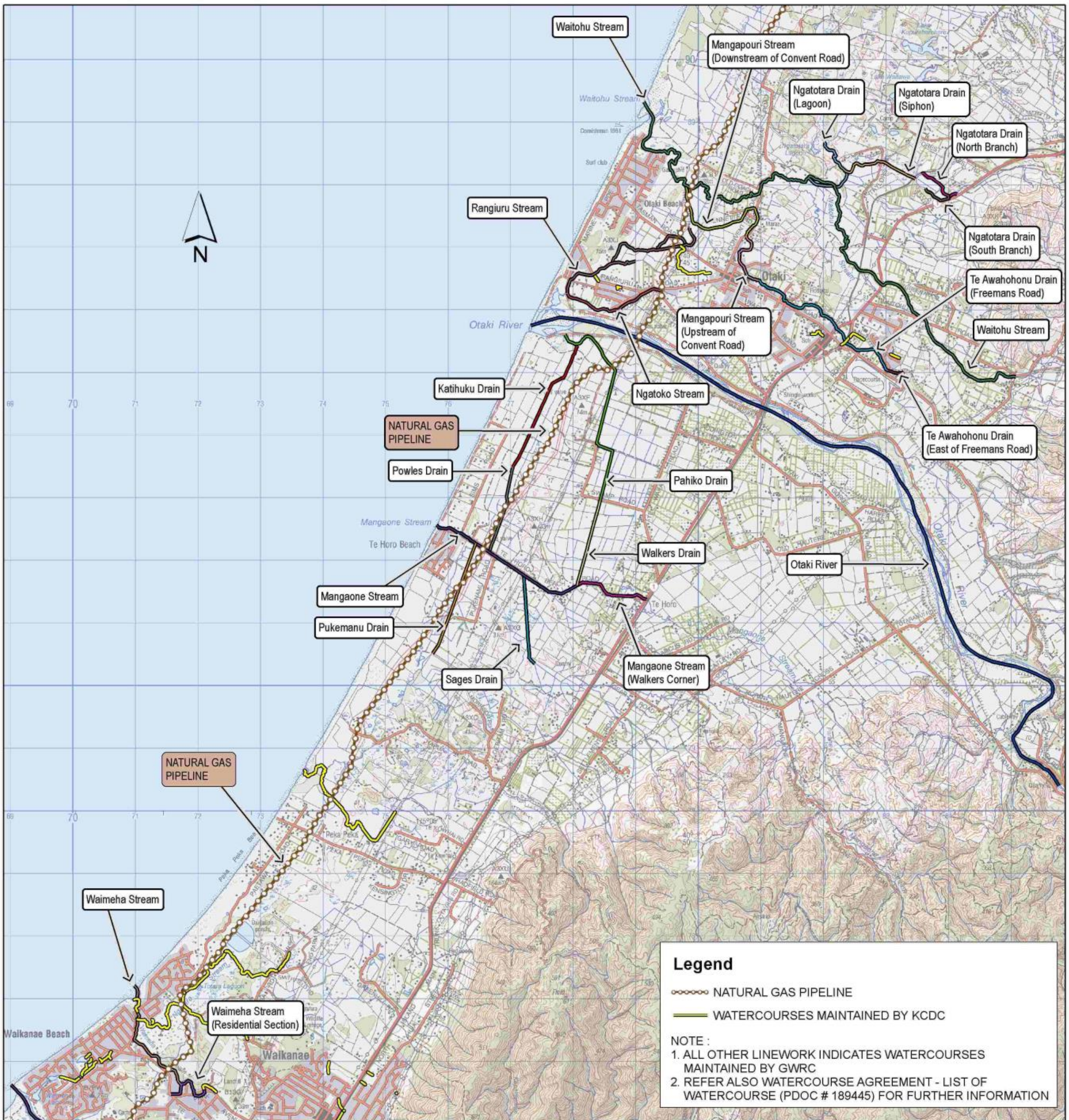
Active bed	A geomorphological term referring to the area of river channel which is affected by the river processes of flows, sediment transport and the alteration of bed form during flood events. Outside of flood events, the active bed of a gravel bedded river is normally only partially covered by flowing water. In rivers with soft sediment beds, the active bed may be covered by water most of the time.
Accretion	A deposition of material on the river bed or adjacent berm land, caused by the movement of bed material by river flows, or from the settling out of material suspended in flood flows.
Aggradation	An increase in the general level of the active river bed through a build-up of bed material sediments. This may arise because a pulse of bed material is moving through a reach or due to changes in river processes affecting the transport of bed material.
Armouring	A surface layer of larger sized particles within the active bed which arises from the selective transport and deposition of bed material on the recession of flood events. This surface layer is packed in a downstream direction and is more resistant to removal and entrainment by subsequent flood flows.
Bank	A defined feature at the edge of the active bed, generally with a steep slope.
Bar	An elevated area of bed material that is formed from sediment deposition and movement. It may be a point bar formed by progressive deposition on the inside of a bend, or a lateral bar formed along the channel by downstream deposition.
Beach	A general term for areas of deposited bed material within the active bed that are relatively clear of vegetation, often lying between the low flow channel(s) and the banks.
Baseflow channel	The deeper channel or channels within the overall active bed, that contain the low river flows occurring during fine weather, between freshes and flood events.
Bed/river bed	The RMA defines a river bed as 'The space of land which the waters of the river cover at its fullest flow without overtopping its banks'. Often the horizontal extent of a river bed defined thus corresponds to the extent of the active bed.
Berm	An area of relatively low lying land within a waterway beyond the active channel or bed areas, and generally from a bank landwards to a higher natural feature, or flood-containing stop bank. Berms generally have some form of vegetative cover. They are flooded relatively frequently and provide additional flood capacity, while accommodating erosion embayment and active channel migration.
Braided river	A gravel bed river which has multiple channels in the active bed area that continually shift and re-form in flood events. The channels in this type of river are generally shallow and highly mobile, and hence the active river bed area is kept relatively clear of vegetation.
Buffer	A term referring to a defined area along the margin of the river that is used for river management purposes. It provides for diffuse containment of flood flows and allows for some movement of the active bed as scour and deposition take place during flood events. The inner edge of the buffer is a

	flexible boundary of the design channel, allowing a give and take of the bed as the actual channel or channels within the bed meander and migrate, and express their natural character. The width of the buffer is determined from scientific and engineering principles and is based on an understanding of river behaviour. Buffers may be strengthened by the construction of various erosion mitigation measures (groynes, debris fences, riprap, toe rock, layered vegetation or planting) depending on management objectives at each particular reach or site. Buffers planted with vegetation to control bank erosion are called **vegetated buffers**.
Channel	A channel is a topographic feature that contains, or has contained, flowing water. The term can be used in a variety of ways depending on context; channels can exist within the active bed of a river or may refer to the entire active bed. Flood flow channels may also exist on berms outside the active bed. The **wetted channel** is a term used to refer to the area within the active bed currently containing flowing water.
Channel distortion	A tight or contorted channel form associated with disrupted sediment transport, caused by constrictions, sharp deflections and compressed meandering from natural features or human constructions.
Cross-over	Generally a riffle or run area, where the low flow channel crosses over from one side of a channel to the other. When the channel is narrow or constraining this crossing over can be at a sharp angle to the channel banks.
Degradation	A decrease in the general level of the active river bed through a removal of bed material sediments. This may arise because a pulse of bed material has moved through a reach or due to changes in river processes affecting the transport of bed material.
Design channel	A management term referring to a defined alignment and width for the active bed of a river reach. The design channel width is derived from an understanding of the particular form and behaviour of the river along a given reach. It is based on the actual form and behaviour of the reach over time, and relationships between flood flows, channel slope and bed material size. The layout of a design channel within a river corridor is guided by an understanding of channel migration and meander wave forms, taking account of natural and artificial controls and constraints on the existing (actual) bed width and alignment. The outer boundaries of the design channel are intended to provide a guideline for management of the river, while allowing for changes in the river bed from actual channel migration and meandering. The term fairway is used when flow channels can migrate, split and re-form within the defined active bed area. Generally, braided and semi-braided river reaches would have design fairways, while meandering and alternating bar reaches would have design channels. The design width and alignment should be re-examined if there are significant changes to the river form following flood events.
Dominant flood flow	A flood flow used in meander formulae as a representative flow for the power of flood events. The 2 year return period flood flow is generally used for this flood flow.
Dominant flow meander	Meanders arising from the action of flood flows when the bed material is fully activated by these flood flows. Within the area of these meanders, smaller channels are normally present, that relate to threshold of motion meanders (see below). These smaller channels are formed when the bed material is not

	fully activated by flood flows, and they form and migrate within the wider dominant flow meanders at lower flows on the recession of flood events.
Erosion	The removal of material from channels, banks and berm land due to river processes during flood events.
Erosion embayment	An erosion bay carved out of a channel bank or berm by the erosive action of flood flows.
Flooding/Flood	Inundation of an area outside the active bed and/or banks of a river, due to runoff from a rainfall event or events.
Floodplain	The low lying, flat or gently sloping land adjacent to a river channel that is covered by water during floods.
Fresh	An elevated river flow, which inundates areas of the active bed outside the baseflow channel or channels that occur in response to runoff from a rainfall event or events. Freshes are smaller in size than the annual flood flow and are generally contained within the river banks.
Good management practices	The good management practice – river management methods set out at section 10 of the Code. All river management activities must be undertaken in accordance with the good management practices.
High value riparian vegetation	Riparian vegetation identified in the Operational Management Plan, the Operative Natural Resources Plan, GWRC's Key Native Ecosystems and Wetland Programmes, or by flood protection surveys as having significant indigenous biodiversity values
Hydromorphology	The study of river form and behaviour, involving consideration of both hydrology and geomorphology of the river and its catchment. The hydromorphology of a river at any particular time represents the legacy of past interactions of geological, climatic and human influences on the river and its catchment, as well as the current climatic and landscape conditions and human land uses and infrastructure. River ecology depends on and is related to the hydromorphological characteristics of river reaches, and the maintenance or enhancement of river habitats is informed by an understanding of both the hydrology and geomorphology of rivers.
Inanga spawning habitat	Includes the inanga spawning habitats listed in Schedule F1(b) of the Proposed Natural Resources Plan for the Wellington Region as amended from time to time and additional inanga spawning habitats identified in relevant spawning surveys.
Management intervention	Deliberate actions taken to change some aspect of the form, structure or vegetative cover of river channels, bed and berm areas or buffer zones for the purposes of achieving defined and agreed objectives.
Meander	A curved river channel, in planform, that has a wave form and moves as a whole due to the processes of flood flows, sediment transport and the associated scour and deposition of the channel bed and banks.
Meandering river	A river that has a single channel with a meandering form, which moves as a whole in a downstream direction over time.
Natural character	The form and behaviour of a river reach that arise from the dynamic interaction of the physical and biological processes of waterway systems. Natural character is influenced by the physical form of the river bed and channels, the nature of the sediments making up the bed and banks, the hydrological regime, and the riparian and aquatic ecology associated with the river or river reach. Natural character is not fixed, but varies over time and

	space, as the influencing factors and their patterns of interaction change.
Pool	An area of the low flow channel where the depth is relatively greater, and the velocity of the flow is lower than in the surrounding parts of the river.
Reach	A length or section of a river that has a uniformity or consistency in terms of its physical and biological characteristics or is delineated by specific river features.
Riffle	An area of the low flow channel that is shallow and steep with higher flow velocities and unbroken standing waves over the bed material of the river. The flow in a rapid is more turbulent, with steep broken standing waves.
River corridor	A management term referring to the space that is set aside within the floodplain for the river to move with the minimum practical intervention. It is generally defined by reference to the natural character of the river reaches and the natural processes that give rise to changes in river beds and their migration over time. The outer boundary of the river corridor defines the separation between the assets and activities of people and the forms and behaviour of the river. It includes the design channel, buffers and reserve areas to accommodate bed widening over time due to changing circumstances. The bed form and river type may change over climatic and sediment supply cycles, and then management practices within the corridor must change in response.
River bed level envelope	A management term referring to an area between defined limits within which the measured height of the river bed is allowed to vary, with a minimum of management intervention.
River envelope	A management term referring to an area between defined limits within which the outer edge of the design channel is allowed to migrate into the buffer under different flow conditions, with a minimum of management intervention.
Run	An area of the low flow channel with a relatively fast consistent flow and shallow depths. Runs form downstream of riffles or between pools.
Semi-braided river	A gravel bed river that has a generally defined main channel but also secondary channels that migrate in flood events within the area of gravel bars/beaches and islands. Flows into side or back channels can activate these areas and alter the area of activity and relatively clear gravel bed. The lateral extent of the active bed of this type of river is often difficult to exactly define, due to the variability and types of vegetation on the river bed and adjacent berm land.
Threshold of motion meander	The smallest meandering channels of a gravel-bed river, which form the low flow channels within the wider channel or bed area of the dominant flow meanders (see above). They are formed by the interaction of flood flows with the bed material and are present where the resistance to movement of the bed material prevents full mobilisation of the bed. They may be the main form of the river channel that migrates slowly in most flood events, or form on the recession of flood events that have fully activated the river bed.
Thalweg	The line of deepest flow along the length of a channel or river bed. It is defined by drawing a line between the lowest points of successive cross-sections along a river channel.

Appendix 1: Watercourses maintained by GWRC



The Following drawings are for reference to general longsection / cross section Information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Avaliable
Katihuku Drain	Otaki River Scheme	2293	O-215, Mn-6/1 & 2, O-138/29 & W-58/15 (NGC Gas Crossing)
Mangaone Stream	Mangaone Drainage Scheme	2638	Mn-4/2, Mn-24/1-3, 2001 Cross Section Survey (Spreadsheet Data) & W-58/15 (NGC Gas Crossing)
Mangaone Stream - Walkers Corner	Mangaone Drainage Scheme	1259	Mn-4/2, Mn-24/1-3, 2001 Cross Section Survey (Spreadsheet Data)
Mangapouri Stream - Downstream of Convent Road	Otaki River Scheme	2320	Mp-2, Mp-4/3, Mp-6 & Mp-16/1-11 & O-40/1 (NGC Gas Crossing)
Mangapouri Stream - Upstream of Convent Road	Otaki River Scheme	1075	Mp-12, Mp-4/1, Mp-6 & Mp-16/1-11
Ngatoko Stream	Otaki River Scheme	1702	R-4, R-8/1-4
Ngatotara Drain - Lagoon	Otaki River Scheme	1533	Wt-4, Wt-14 & O-76/2
Ngatotara Drain - North Branch	Otaki River Scheme	764	Wt-4, Wt-14, Wt-16 & O-76/2
Ngatotara Drain - Siphon	Otaki River Scheme	1323	Wt-26/1-3
Ngatotara Drain - South Branch	Otaki River Scheme	512	Wt-4
Otaki River	Otaki River Scheme	13299	1974 - 2011 Cross Section Survey (Spreadsheet & dwgs), O-49/1-19 & O-96/1-90 + O-40/1 & /2 (NGC Gas Crossing)
Pahiko Drain	Otaki River Scheme	3887	Mn-8/1-3 + W-58/15 (NGC Gas Crossing)
Powles Drain	Mangaone Drainage Scheme	1413	(Also Known As Katihiku Drain) Mn-2/9, Mn-4/3, Mn-6/1, O-215, O-138/29 & W-58/15 (NGC Gas Crossing)
Pukemanu Drain	Mangaone Drainage Scheme	1891	Mn-2/10 & Mn-4/4-7 & W-58/15 (NGC Gas Crossing)
Rangiuru Stream	Otaki River Scheme	3940	O-76/1, R-6/2 & O-40/1 (NGC Gas Crossing)
Sages Drain	Mangaone Drainage Scheme	1465	Mn-2/7, Mn-2/12, Mn-4/6 & Mn-4/8
Te Awahohonu Drain - East of Freemans Road	Otaki River Scheme	277	Mp-12
Te Awahohonu Drain - Freemans Road	Otaki River Scheme	2897	Mp-12
Waikanae River	Waikanae River Scheme	5959	1974 - 2010 Cross Section Survey (Spreadsheet & dwgs), W-48/1-12, W-57/1-12 & W-132/1-35 & W-58/17, /18 & /22 (NGC Gas Crossing)
Waimeha Stream	Waikanae River Scheme	2104	Wm-2, Wm-8/2 & Wm-18/1&2 & W-58/17 (NGC Gas Crossing)
Waimeha Stream - Residential Section	Waikanae River Scheme	1254	Wm-2, Wm-8/2 & Wm-18/1&2 & W-58/17 (NGC Gas Crossing)
Waitohu Stream	Otaki River Scheme	11168	1978 - 2011 Cross Section Survey (Spreadsheet & dwgs), Wt-10/1-10,Wt-36/1-27 & Wt-46/1-26 & O-40/1 (NGC Gas Crossing)
Walkers Drain (Swamp Road Drain)	Mangaone Drainage Scheme	1038	O-215 & Mn-2/ & 11 + W-58/15 (NGC Gas Crossing)

KAPITI MINOR WATERCOURSES MAINTAINED BY GWRC

DWG File Ref : O-214-01.mxd

A3 Scale 1 : 60,000 — 0 0.45 0.9 1.8 Kilometers

greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
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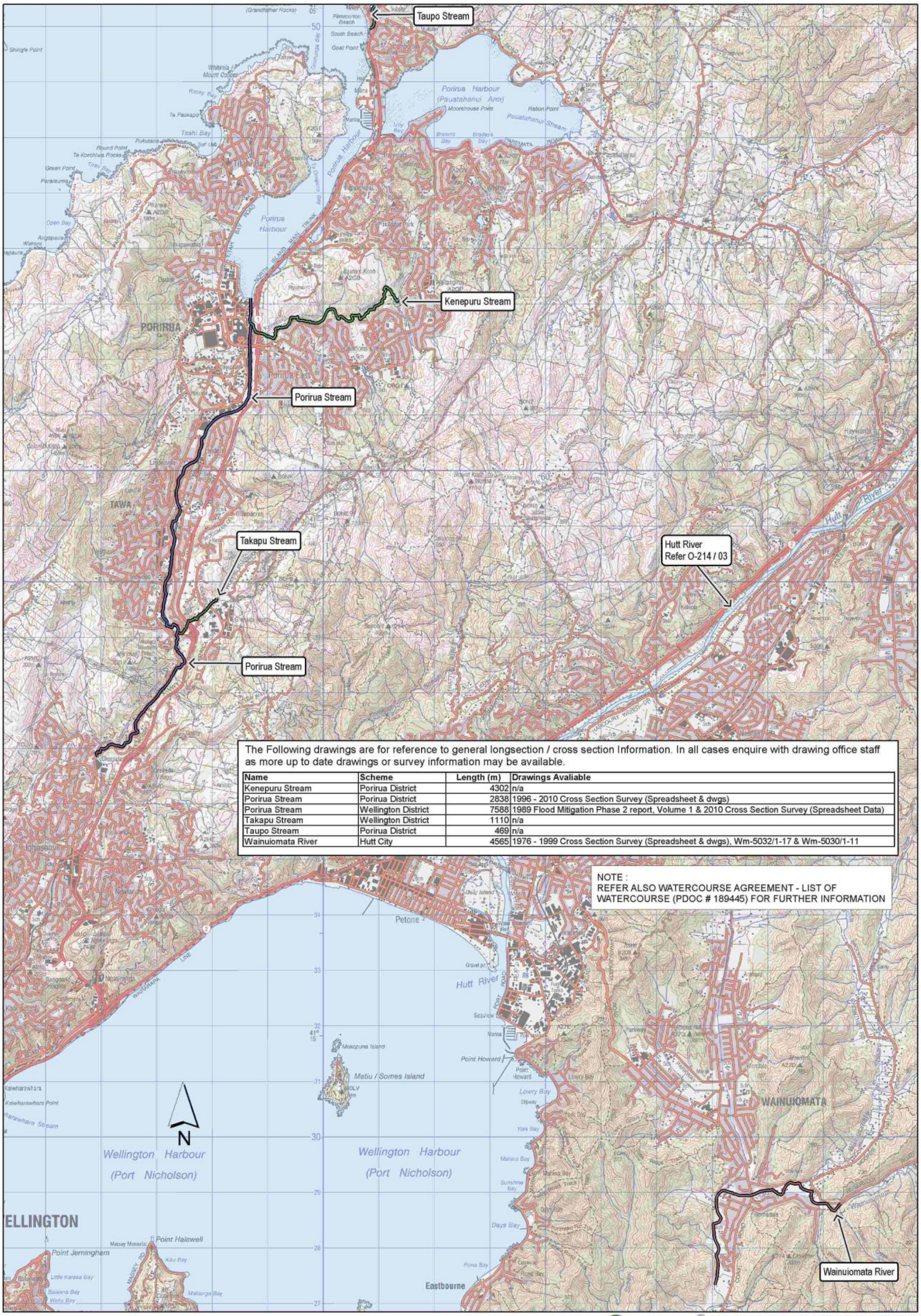
DRAWING No. O-214 / 01



The Following drawings are for reference to general longsection / cross section Information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Avaliable
Kenepuru Stream	Porirua District	4302	n/a
Porirua Stream	Porirua District	2838	1996 - 2010 Cross Section Survey (Spreadsheet & dwgs)
Porirua Stream	Wellington District	7588	1989 Flood Mitigation Phase 2 report, Volume 1 & 2010 Cross Section Survey (Spreadsheet Data)
Takapu Stream	Wellington District	1110	n/a
Taupo Stream	Porirua District	469	n/a
Wainuiomata River	Hutt City	4565	1976 - 1999 Cross Section Survey (Spreadsheet & dwgs), Wm-5032/1-17 & Wm-5030/1-11

NOTE :
REFER ALSO WATERCOURSE AGREEMENT - LIST OF WATERCOURSE (PDOC # 189445) FOR FURTHER INFORMATION

WELLINGTON MINOR WATERCOURSES MAINTAINED BY GWRC

PORIRUA / WAINUIOMATA

DWG File Ref : O-214-02.mxd
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greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
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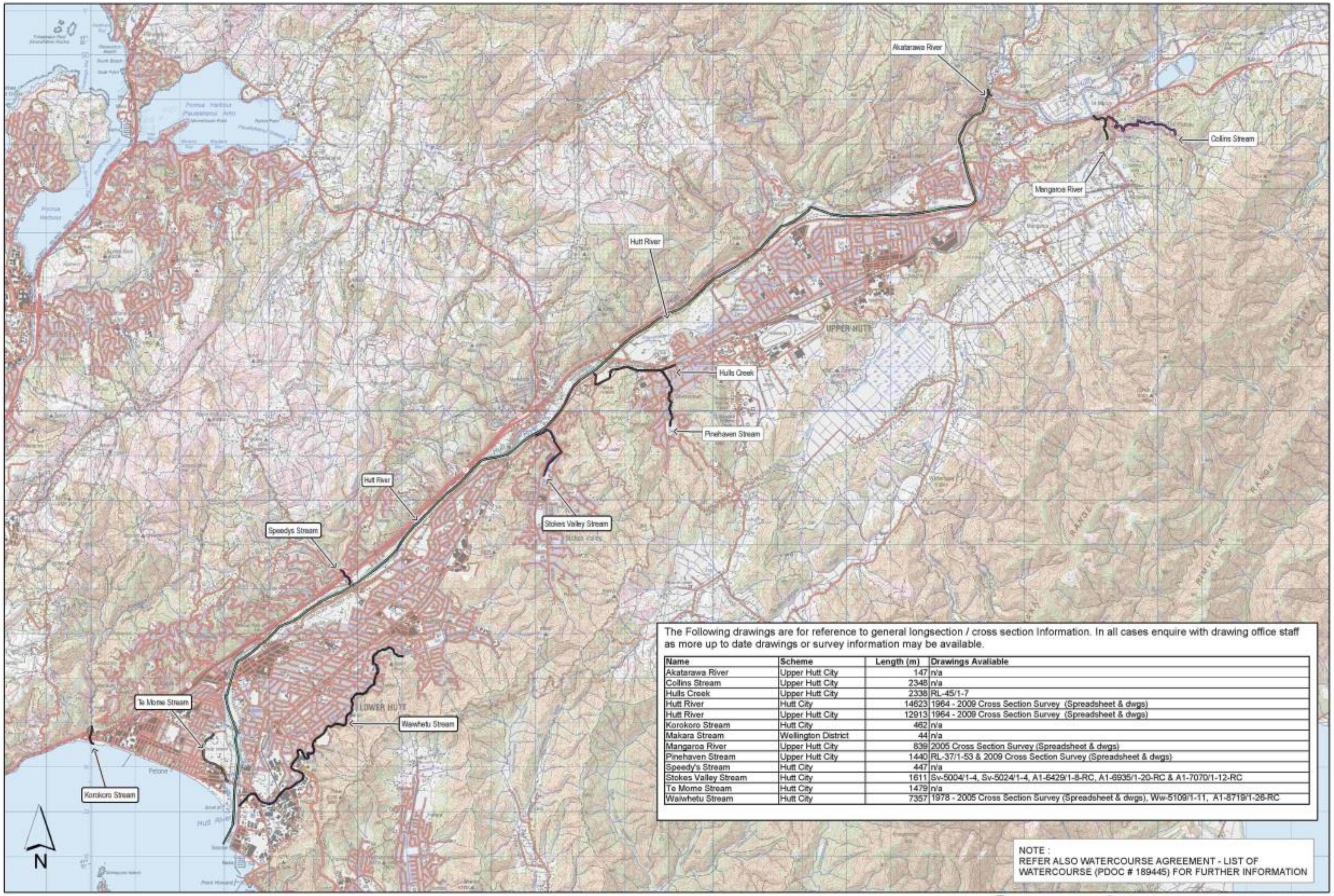
DRAWING No. O-214 / 02



The Following drawings are for reference to general longsection / cross section Information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Avaliable
Akatarawa River	Upper Hutt City	147	n/a
Collins Stream	Upper Hutt City	2348	n/a
Hulls Creek	Upper Hutt City	2338	RL-45/1-7
Hutt River	Hutt City	14623	1964 - 2009 Cross Section Survey (Spreadsheet & dwgs)
Hutt River	Upper Hutt City	12913	1964 - 2009 Cross Section Survey (Spreadsheet & dwgs)
Korokoro Stream	Hutt City	462	n/a
Makara Stream	Wellington District	44	n/a
Mangaroa River	Upper Hutt City	839	2005 Cross Section Survey (Spreadsheet & dwgs)
Pinehaven Stream	Upper Hutt City	1440	RL-37/1-53 & 2009 Cross Section Survey (Spreadsheet & dwgs)
Speedy's Stream	Hutt City	447	n/a
Stokes Valley Stream	Hutt City	1611	Sv-5004/1-4, Sv-5024/1-4, A1-6429/1-8-RC, A1-6935/1-20-RC & A1-7070/1-12-RC
Te Mome Stream	Hutt City	1479	n/a
Waiwhetu Stream	Hutt City	7357	1978 - 2005 Cross Section Survey (Spreadsheet & dwgs), Ww-5109/1-11, A1-8719/1-26-RC

NOTE :
REFER ALSO WATERCOURSE AGREEMENT - LIST OF WATERCOURSE (PDOC # 189445) FOR FURTHER INFORMATION

WELLINGTON MINOR WATERCOURSES MAINTAINED BY GWRC

HUTT VALLEY

DWG File Ref : O-214-03.mxd

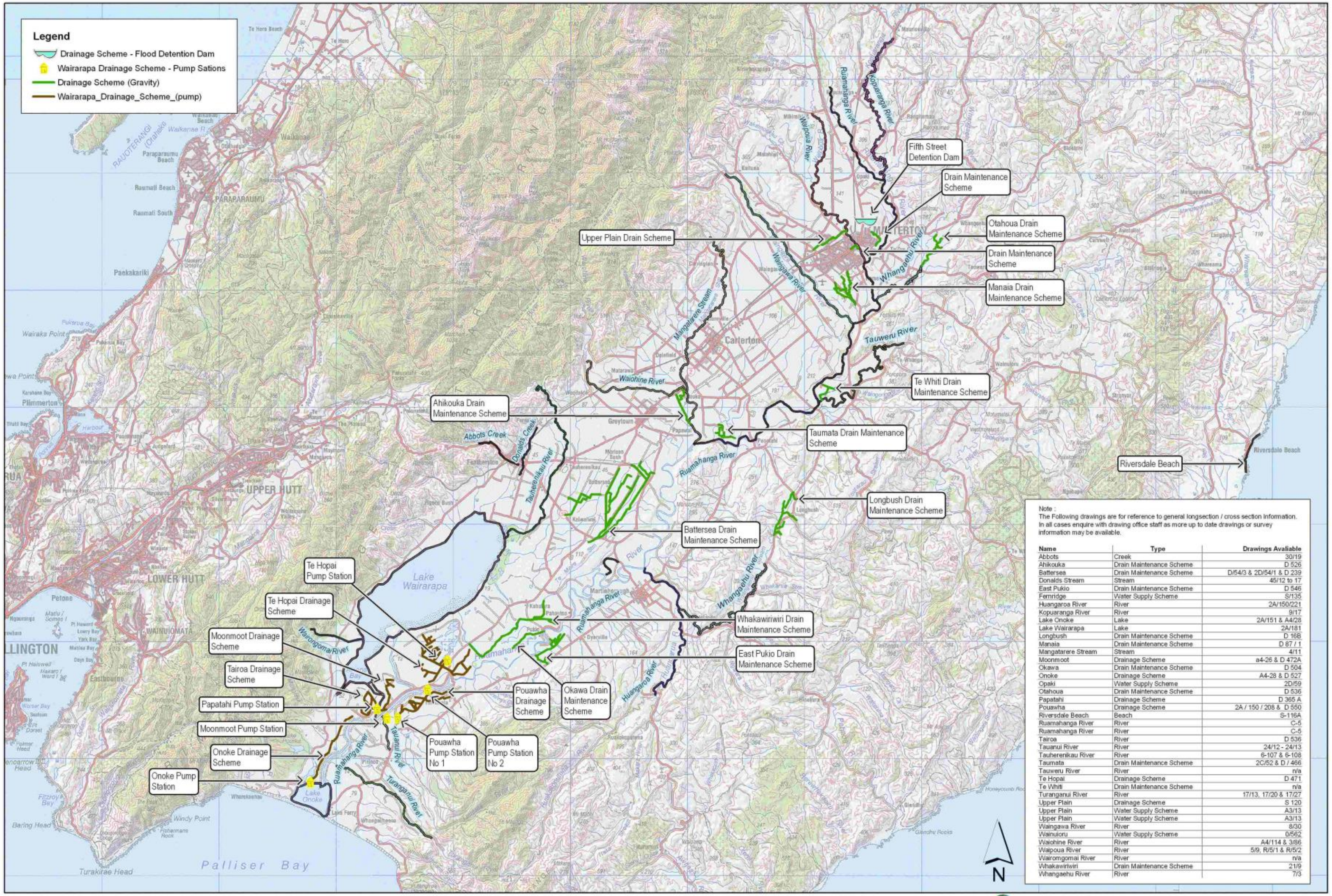
0 1 2 4 Kilometers

A3 Scale 1 : 75,000

greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
DOC # 681583

DRAWING No. **O-214 / 03**



Note :
The Following drawings are for reference to general longsection / cross section information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Type	Drawings Avaliable
Abbots	Creek	30/19
Ahikouka	Drain Maintenance Scheme	D 526
Battersea	Drain Maintenance Scheme	D/54/3 & 2D/54/1 & D 239
Donalds Stream	Stream	45/12 to 17
East Pukio	Drain Maintenance Scheme	D 546
Fernridge	Water Supply Scheme	S/135
Huangaroa River	River	2A/150/221
Kopuaranga River	River	9/17
Lake Onoke	Lake	2A/151 & A4/28
Lake Wairarapa	Lake	2A/181
Longbush	Drain Maintenance Scheme	D 16B
Manaia	Drain Maintenance Scheme	D 87 / 1
Mangatarere Stream	Stream	4/11
Moonmoot	Drainage Scheme	a4-26 & D 472A
Okawa	Drain Maintenance Scheme	D 504
Onoke	Drainage Scheme	A4-28 & D 527
Opaki	Water Supply Scheme	2D/59
Otahoua	Drain Maintenance Scheme	D 536
Papatahi	Drainage Scheme	D 365 A
Pouawha	Drainage Scheme	2A / 150 / 208 & D 550
Riversdale Beach	Beach	S-116A
Ruamahanga River	River	C-5
Ruamahanga River	River	C-5
Tairoa	River	D 536
Tauanui River	River	24/12 - 24/13
Tauherenikau River	River	6-107 & 6-108
Taumata	Drain Maintenance Scheme	2C/52 & D / 466
Tauweru River	River	n/a
Te Hopai	Drainage Scheme	D 471
Te Whiti	Drain Maintenance Scheme	n/a
Turanganui River	River	17/13, 17/20 & 17/27
Upper Plain	Drainage Scheme	S 120
Upper Plain	Water Supply Scheme	A3/13
Upper Plain	Water Supply Scheme	A3/13
Waingawa River	River	8/30
Wainuioru	Water Supply Scheme	0/562
Waiohine River	River	A4/114 & 3/86
Waipoua River	River	5/9, R/5/1 & R/5/2
Wairomgomai River	River	n/a
Whakawiriwiri	Drain Maintenance Scheme	21/9
Whangaehu River	River	7/3

WAIRARAPA RIVERS & DRAINAGE SCHEMES MAINTAINED BY WRC

DWG File Ref : O-214-04.mxd

0 5 10 20 Kilometres

A3 Scale 1 : 280,000

greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
DOC # 681583
DRAWING No. O-214 / 04

Appendix 2: Site Specific Effects Management

Site Specific Effects Management

Many river management activities have the potential for some short-term adverse impacts, but the significance of this needs to be considered in the context of the naturally dynamic river environment (where form and habitat are constantly changing and re-forming). The significance of effects also depends on factors such as the scale of disturbance, the values of a particular site, their sensitivity, and the time for recovery to pre-disturbance levels.

If a proposed activity or set of activities have the potential to generate significant adverse effects on the river environment at a specific site or within a specific reach, the activities may need to be conducted in accordance with a more detailed, Site Specific Effects Management Plan (SSEMP), in addition to the good management practices in section 10 of the Code.

The following activities, or activities within the following locations, will require an SSEMP to be prepared prior to any works, as set out in the conditions of the consent.

- **Construction of grade control structures**: the construction of grade control structures will require an SSEMP, regardless of the time of year, or projected level of disturbance.
- **Wet gravel extraction**: all wet gravel extraction will require an SSEMP, regardless of the time of year, or projected level of disturbance.
- **Mechanical clearance of bottom rooted plant community in low gradient streams**: will require an SSEMP. This includes activities that disturb the bottom of the steam but excludes the use of weed boats.
- **Waikanae Estuary Scientific Reserve:** all river management activities proposed to be undertaken within the Reserve will require an SSEMP.
- **Clearance of riparian vegetation with high ecological values:** the clearance of $100m^2$ or more of high value riparian vegetation identified in the Operative Natural Resources Plan, GWRC's Key Native Ecosystems and Wetland Programmes, or by flood protection surveys as having significant indigenous biodiversity values will require an SSEMP.
- **Additional activities identified in an OMP**

For other activities, the method set out below outlines the process for determining when an SSEMP and site specific effects management is necessary, and if required, what it should include. This process should be read in conjunction with the relevant consent conditions.

Process for determining when site specific effects management is required

The five step process below combines:

- the potential risk for adverse effect;
- the scale of the proposed work; and
- the sensitivity of the site,

to determine whether site specific effects management is required to undertake an activity.

Step 1 – Identify activities with high potential for adverse impact

Activities classified as having a high potential for adverse impact are those where it is recognised that recovery of river habitat that is altered by those activities may take months or possibly years (or possibly not at all). These include activities that cause extensive mechanical disturbance of the wetted riverbed, as listed in **Table 1**.

Table 1: High potential impact activities

High potential impact activities (wet channel)
• bed recontouring • channel diversion cuts • ripping in the wet channel • construction and repair of impermeable structures

Step 2 – Assign a magnitude to the proposed disturbance

For activities identified in Step 1, **Table 2** assigns a magnitude to the proposed disturbance, based on the length of riverbed affected and/or the amount of time involved.

Table 2: Scale of activity disturbance

Amount of proposed disturbance	Magnitude
• > 800m wetted riverbed length; and/or • > 80 hours in river works or >150 hours per 10 km reach.	**Large**
• 175m - 800m wetted riverbed length; and/or • 30 - 80 hours in river works or no more than 150 hours per 10 km reach.	**Moderate**
• < 175m wetted riverbed length; and/or • no more than 30 hours in river works or 150 hours per 10 km reach.	**Small**

Step 3 – Define sensitivity of habitat

Important habitats in terms of river ecology are defined as:

- inanga spawning habitat on the banks only from 1 January to 28 February (i.e. in the months prior to inanga spawning season) and on the banks and beds from 1 March to 31 May (i.e. during inanga spawning season);
- trout spawning habitat from 1 May to 31 October (i.e. during trout spawning season);
- native fish migration routes, particularly between 1 August and 31 December; and
- instream ecology in the actively flowing channel at times when river flows recedes below the minimum flows identified in the Operative Natural Resources Plan.

Table 3 assigns a relative sensitivity to disturbance ranking to these habitats.

The locations of these habitats in each river system are found in the 'affected area' columns in **Appendix 7**.

Table 3: Habitat sensitivity

Habitat type	Sensitivity
• inanga spawning habitat on the banks only from 1 January to 28 February • inanga spawning habitat on the banks and bed from 1 March to 31 May • trout spawning habitat from 1 May to 31 October • actively flowing channels during minimum flows	**Most**
• inanga spawning habitat from 1 June to 31 December • wetted channel utilised by migrating fish from 1 August to 31 December	**Intermediate**
• other instream habitats	**Least**

Step 4 – Determine risk of adverse impact

Table 4 can be used to determine the level of risk of adverse impact (high, medium or low) arising from river management activities at a specific site, based on a combination of the magnitude of disturbance proposed (determined from **Table 2**) and from the relative sensitivity of the work site (determined from **Table 3**).

Table 4: Risk of adverse impact of high potential impact activities

		Habitat sensitivity (from Table 3)		
Magnitude of disturbance (from Table 2)		**Most** • inanga spawning habitat on the banks only from 1 January to 28 February • inanga spawning habitat on the banks and bed from 1 March to 31 May • trout spawning habitat from 1 May to 31 October • actively flowing channels during minimum flows	**Intermediate** • inanga spawning habitat from 1 June to 31 December • the wetted channel utilised by migrating fish from 1 August to 31 December	**Least** • other instream habitats
	Large • > 800m wetted riverbed length; and/or • > 80 hours in river works or >150 hours per 10 km reach.	***High***	***High***	***High***
	Moderate • 175m - 800m wetted riverbed length; and/or • 30 - 80 hours of in-river works or no more than 150 hours per 10 km reach.	***High***	***Medium***	***Low***
	Small • < 175m wetted riverbed length; and/or • no more than 30 hours in-river works or 150 hours per 10 km reach.	***High***	***Low***	***Low***

Step 5 – Determine response based on risk of adverse impact

Table 5 below summarises the appropriate management responses applying according to the determined risk of adverse impact in **Table 4**.

Table 5: Required management responses based on risk of adverse impact

	Risk of adverse impact (from Table 4)		
	High	**Medium**	**Low**

Management Response	• A site specific before/after habitat assessment must be undertaken at each work site by the operations supervisor using the template at **Appendix 5**; • Preparation of a SSEMP; and • Works to follow all good management practices at section 10 of the Code (unless otherwise prescribed in the SSEMP).	• Works to follow all the good management practices at section 10 of the Code; and • A site specific before/after habitat assessment must be undertaken at each work site by the operations supervisor using the template at **Appendix 5**.	• No specific site management over and above the need for works to follow all the good management practices at section 10 of the Code.

Scope of SSEMPs

Each SSEMP must cover the following matters:

- describe the works proposed, including methodology and timing, noting that any changes must be discussed with all parties involved in the SSEMP preparation
- describe the necessity of the work (noting that necessity will usually be addressed at the Annual Work Plan stage – the Annual Work Plan must be consistent with the decision making framework at section 6 of the Code)
- include an assessment of the various options considered and reasons why undertaking the proposed activities is preferred
- include an assessment as to why the proposed activities are to be undertaken during the period specified and within that habitat, as applicable, and specific measures to remedy or mitigate effects of the proposed activities
- describe the site specific (event) monitoring that will be undertaken
- set out communication requirements with mana whenua, the Department of Conservation, Wellington Fish and Game Council and stakeholder groups specified in the consent conditions
- describe how the design channel and bed levels will be maintained
- describe how the mana whenua values of any kaitiaki sites have been taken into account
- include reporting requirements and site management responsibilities. It is expected that the various expert reports will inform the SSEMP
- include a suitably qualified expert's opinion of how appropriate steps will be taken to avoid, remedy or mitigate adverse effects.

SSEMPs will be prepared by Flood Protection staff and must include communication with relevant parties (who will be dependent on the particular values identified for the site) and certified by the Manager, Environment Regulation before work can commence. Advice will also be sought from a suitably qualified expert. The scope of site specific (event) monitoring is described at section 3 of the Environmental Monitoring Plan at **Appendix 3**.

Appendix 3: Environmental Monitoring Plan

Environmental Monitoring Plan

For river management activities

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1 Introduction

This Environmental Monitoring Plan sits alongside and supports GWRC's Code of Practice for river management activities. It proposes a programme of environmental monitoring, involving collection of a range of physical parameters that reflect aspects of river natural character and processes, and which can be used as indicators of the effects of river management activities on selected environmental values. This information forms a valuable database against which the appropriateness of river management activities, in terms of their environmental effects, may be evaluated. This knowledge can be used to inform changes to river management practice (as outlined in the Code), to allow the Code to evolve and improve in terms of environmental outcomes over time.

This Environmental Monitoring Plan includes:

- Definition of the components that should be included in a regular baseline environmental monitoring, to build a general understanding of ecological resources and the condition of river reaches managed by GWRC, and to allow assessment of the cumulative effects of river management activities over time.
- Description of the methodologies to be used in the collection of baseline data.
- An overview of the approach proposed for site specific monitoring for engineering activities that will potentially generate significant adverse effects in the river environment.

The analysis of monitoring information and consideration of findings that arise from it, will be conducted according to defined review, reporting and feedback processes that are outlined in the Code.

Like the Code, the Environmental Monitoring Plan is intended to be a living document that is adapted over time to ensure it remains useful and relevant. Hence it is important that monitoring effort concentrates on areas or issues of importance, and that methodologies are robust and well-designed so that they deliver good quality information. The regular analysis of monitoring information noted above must also consider the overall effectiveness of the monitoring programme and make recommendations for improvements as appropriate.

The Environmental Monitoring Plan will be supported by development of a GIS mapping tool[10] that includes an **Activity** layer which records the location, extent, timing and duration of all 'high disturbance' river management activities. It would also include an **Ecological values** layer that would record information on the location of sensitive habitats and species, and would identify management reaches with high, moderate and low sensitivity to disturbance by river management activities. These layers could be overlayed to produce a map of river reaches with a low to high risk of adverse effects which would be used to guide overall work planning. That assessment would also be used to identify activities that need a SSEMP to manage effects (as described in the Code), and a site-specific monitoring plan (**Section 3** below).

As described in the Code, each of the rivers managed by GWRC will be divided into a series of management reaches with similar morphological characteristics. This will allow a more detailed approach to selection of appropriate management techniques and methods, taking into account the specific characteristics and values of each reach (as opposed to a broad-brush 'whole of river' approach). The management reach framework will also inform the establishment of baseline monitoring sites and will facilitate targeting of environmental monitoring to deliver the most effective outcomes in terms of the need for knowledge on the effects of specific activities on key values. Management reaches have been defined for Te Awa Kairangi/Hutt, Waikanae and Ōtaki Rivers and will also be defined for GWRC managed rivers in the Wairarapa valley.

[10] Currently under development by GWRC.

2 Baseline monitoring

2.1 Overview of programme development

Development of an effective baseline monitoring programme includes the following steps:

a) Standardisation of record keeping for high disturbance river management activities (bed recontouring, gravel extraction, ripping in the active channel, channel diversion cut, mechanical clearance of minor watercourses) to include the date, location, extent and type of works undertaken. [This is currently under development by GWRC].

b) Incorporation of this activity information into a regularly updated GIS map (showing the location, timing, extent, type and frequency of high disturbance works) and a summary table. [This is currently under development by GWRC].

c) Development of this information into a tool to predict where large scale or frequent riverbed disturbance activities are likely to be undertaken, and where cumulative effects are most likely to occur. [This is currently under development by GWRC].

d) Identification of river management reaches for each of the major river systems. Management reaches and baseline monitoring sites for Te Awa Kairangi/Hutt, Waikanae and Ōtaki Rivers have been defined and are shown in **Table 2-1**. Management reaches for rivers in the Wairarapa Valley have yet to be developed.

e) Use of the activity tool to inform the establishment of baseline monitoring sites, targeting reaches where bed disturbance activities occur frequently, and cumulative effects are most likely to occur. [This will follow once (c) above has been achieved].

f) Undertake monitoring of the specific parameters of the baseline programme outlined in **Section 2.2**. [This is already underway].

g) Review and evaluation of monitoring information over time according to the review processes defined in the Code, and feedback of any changes in monitoring needs into the monitoring programme. [This work will follow once the review process in the Code commences, following grant of resource consents].

Table 2-1: Location of management reaches* and proposed baseline monitoring sites (shaded) for Te Awa Kairangi/Hutt, Waikanae and Ōtaki rivers:

River	Management reach		Cross sections (XS)		Baseline monitoring site ('Reference' or 'Disturbed')
	Code	Name	Start	Finish	
Te Awa Kairangi/Hutt	H1	Te Marua	2830	2780	-
	H2	Akatarawa	2780	2550	-
	H3	Birchville	2400	2270	Reference
	H4	Totara park	2260	1920	Reference
	H5	Whakatiki	1920	1630	-
	H6	Heretaunga	1630	1350	-
	H7	Silverstream	1340	1090	Disturbed
	H8	Pomare	1090	850	
	H9	Avalon	840	510	Disturbed
	H10	Melling	510	360	Disturbed
	H11	Ava	360	210	-
	H12	Estuary	210	100	-
Waikanae	W1	WTP	550	430	Reference
	W2	Edgewater	430	350	-
	W3	Jim Cooke	345	310	Disturbed
	W4	Jim Cooke lower	300	240	Disturbed
	W5	Pukekawa	240	175	-
	W6	Otaihanga	175	80	-
	W7	Estuary	80	20	-
Ōtaki	O1	Lower Gorge	1180	1020	-
	O2	Rahui Rd	1020	860	Reference
	O3		860	720	-
	O4		720	600	
	O5	Chystalls	600	490	Disturbed
	O6		490	370	-
	O7	Batching	290	220	Disturbed
	O8		220	120	-
	O9	Estuary	120	20	-

*Note: Management reaches are the same as those defined in Operational Management Plans. Management reaches for the Wainuiomata River and the Wairarapa Rivers will be included in Table 2-1 once these have been established.

2.2 Baseline monitoring parameters

The specific parameters chosen for baseline monitoring and included in the Environmental Monitoring Plan at any one time, depend on which values are considered to be the most appropriate for particular attention at that time.

The individual parameters to be monitored as part of the programme of baseline monitoring are described in **Table 2-2**, along with the proposed monitoring frequency, the reason for their inclusion in the programme, the information they will deliver to the review process and relevant triggers and management responses that apply to each.

Table 2-2: Baseline monitoring – key details

Parameter	Monitoring frequency	What will be monitored and data output	Who will undertake monitoring	Reasons for monitoring
Hydrological information	Continuous	Flow regime, flood and low flow summary data for each river	GWRC	Provides context for analysis of other monitoring data. This information is collected routinely as part of GWRC's river monitoring network.
Aerial photography	Aerial photography mosaics will be produced at least once every three years	Managed reaches of Te Awa Kairangi/Hutt, Ōtaki, Waikanae, Wainuiomata, Ruamahānga, Waiohine, Waipoua, and Waingawa Rivers.	Aerial survey specialist	Provides a range of river morphology information including meander forms, sinuosity, extent of braiding, percent pools, active channel width, bar location and area, etc. This information is: • Included in the Operational Management Plan when describing the channel type and key morphological characteristics. • Made available to the Independent Review Panel • Potentially one of several inputs to the NCI/HQI as a measure of cumulative and/or event-based change.
Pool and riffle counts	At least once every three years	Each river management reach in the Ōtaki, Waikanae, Te Awa Kairangi/Hutt, Ruamahānga, Waiohine, Waipoua, and Waingawa Rivers.	Wellington Fish and Game Council and GWRC	The number of pools and riffles is one measure of the diversity of aquatic habitat and morphological complexity of a river, which in turn can be used as an indicator of the overall ecological health of the river (particularly when considered in conjunction with other aquatic survey data). Information included in annual surveys will:

Parameter	Monitoring frequency	What will be monitored and data output	Who will undertake monitoring	Reasons for monitoring
				• Be assessed against triggers included in Table 7 of the Code, potentially triggering a management response as detailed in Table 5 of the Code. • Made available to the Independent Review Panel • Potentially be one of several inputs to NCI/HQI as a measure of cumulative and/or event-based change.
River bed levels	At least once every five years	Te Awa Kairangi/Hutt, Waikanae, Ōtaki, Ruamahānga, Waiohine, Waipoua, and Waingawa Rivers; the Wainuiomata River. Minor watercourses are excluded from these surveys.	Surveyor and GWRC river engineer	Monitoring of riverbed levels is important due to their impact on flood capacity and channel stability. Survey data are used to analyse trends in gravel movement and to determine river management policies for the next five-year period. This information is: • Included in the Operational Management Plan when describing the channel type and key morphological characteristics. • Made available to the Independent Review Panel
Deposited sediment	Annually at baseline monitoring sites	Baseline monitoring sites are established for the Ōtaki, Waikanae and Te Awa Kairangi/Hutt Rivers (**Table 2-1**). It is proposed that FP management reaches, and baseline monitoring sites will also be established for the Ruamahānga, Waiohine, Waipoua, and Waingawa Rivers. The results of the deposited sediment monitoring will be summarised in an annual report produced by the survey authors.	Aquatic ecologist	The amount of deposited sediment on the river bed is used as an indicator of aquatic habitat quality; changes can be used to indicate changes in habitat quality over time. Information included in annual surveys will: • Be assessed against triggers included in Table 5 of the Code, potentially triggering a management response as detailed in that table. • Made available to the Independent Review Panel • Potentially one of several inputs to NCI/ HQI as a measure of cumulative and/or event-based change.
Riverbank	Annually at baseline	Length of riverbank under-cutting and	Aquatic ecologist	River bank undercutting and overhanging

Parameter	Monitoring frequency	What will be monitored and data output	Who will undertake monitoring	Reasons for monitoring
undercutting and overhanging vegetation	monitoring sites	overhanging vegetation will be assessed annually at the baseline monitoring sites listed in **Table 2-1**. The measurements would be undertaken at 3x 200m long survey reaches (on both banks) to be established at each monitoring site. It is anticipated that FP management reaches, and baseline monitoring sites would also be established in the Ruamahānga, Waiohine, Waipoua, and Waingawa Rivers. Results will be summarised in an annual report produced by survey authors.		vegetation provide opportunities for aquatic habitat diversity, which in turn may contribute to overall aquatic ecological health. Information included in annual surveys will: • Be assessed against triggers included in Table 5 of the Code, potentially triggering a management response as detailed in that table. • Be made available to the Independent Review Panel • Potentially one of several inputs to HQI as a measure of cumulative and/or event-based change.
Trout abundance	Annual surveys until end of 2018-19	Drift dives in reaches of Te Awa Kairangi/Hutt and Waikanae Rivers as listed in **Table 2-3**. Annual report on survey, and 20-year summary report.	Wellington Fish and Game Council and Aquatic ecologist	To identify trends in population numbers and distribution, and to investigate the effects of river management activities in both the short and longer term. Information included in an in-depth assessment to be conducted after the 2018/19 summer survey will be: • Assessed against triggers included in Table 5 of the COP, potentially triggering a management response as detailed in that table. • Made available to the Independent Review Panel.
Native fish communities	Each site will be surveyed at three-yearly intervals	Backpack electric fishing, trapping and spotlighting, as appropriate. Surveys will be undertaken in: • each of the watercourses listed in **Table 2-4**, at locations frequently disturbed by flood protection activities and at relatively undisturbed reference sites. • perennial streams listed in **Table 2-5** that are mechanical cleared of aquatic	Aquatic ecologist	To provide quantitative data on populations and distribution of native fish species. This information will be: • Incorporated into the Ecological Values GIS layer, • Included and taken account of in Operational Management Plans. • Made available to the Independent Review Panel • Assist in the assessment of cumulative

Parameter	Monitoring frequency	What will be monitored and data output	Who will undertake monitoring	Reasons for monitoring
		weeds.		effects of river management activities over time.
Bluegill bully spawning habitat	One-off study in Te Awa Kairangi/Hutt River	Study of bluegill bully spawning habitat.	Aquatic ecologist	To provide information on the location and type of habitat utilised by bluegill bullies for spawning.
Freshwater mussels	On-off study in the Rangiuru and Waimeha Streams	Study of freshwater mussel distribution	Aquatic ecologist	To provide information on the presence and distribution of freshwater mussels.
Riparian vegetation	Te Awa Kairangi/Hutt, Waikanae, Ōtaki and Wainuiomata Rivers: within 3 years of consent granting, and 10-yearly thereafter Upper Ruamahānga River system (where already mapped): 10 yearly cycle Other Wairarapa rivers: within 3 years of consent granting, and 10-yearly thereafter	Vegetation types on the riparian margins; mapped using high resolution aerial photography, compiled in GIS, and ground-truthed at accessible, randomly chosen locations to confirm interpretation.	GIS mapping specialist with assistance from Botanist/Ecologist	Maps of vegetation types on the riparian margins will: • Be incorporated into the Ecological Values GIS layer. • Be included and taken account of in Operational Management Plans. • Be made available to an Independent Review Panel • Identify candidates for environmental enhancement programme. • Potentially be one of several inputs to NCI/HQI as a measure of cumulative change.
River birds	Ongoing annual surveys on a 'three-year on three-year off' cycle, alternating between the western rivers and the Wairarapa rivers. Baseline river bird monitoring has been completed over three consecutive summers on the Ruamahānga, Waingawa, Tauherenikau, Te Awa	Three shorebird species: • banded dotterel, • pied stilt and • black-fronted dotterel A summary report would be produced at Years 1 and 2. At Year 3 the report would include a detailed analysis of population status	GWRC ornithologist or alternative suitably trained person	Information obtained in river bird surveys will: • Be assessed against triggers included in Table 6 of the Code, potentially triggering a management response as detailed in Table 5 of the Code. • Be made available to an Independent Review Panel • Be incorporated into the Ecological Values GIS layer • Be included and taken account of in Operational Management Plans, • Allow assessment and quantification of

Parameter	Monitoring frequency	What will be monitored and data output	Who will undertake monitoring	Reasons for monitoring
	Kairangi/Hutt, Waikanae and Ōtaki rivers (McArthur et al, 2013, 2015, and 2018).			the impacts of river management activities on river nesting bird populations
Inanga spawning habitat	At least once every 10 years in tidal parts of identified waterways	On-ground mapping in Te Awa Kairangi/Hutt River, Opahu Stream, Korokoro Stream, Porirua Stream, Kenepuru Stream, Taupo Stream, Waikanae River, Waimeha Stream, Ōtaki River, Rangiuru/Ngatoko Stream, Pahiko/Katihiku Drains, Waitohu Stream, Ruamahānga River, Pounui Stream and Lake Onoke.	GWRC aquatic ecologist or alternative suitably qualified aquatic specialist	Identified spawning would be: • Incorporated into the Ecological Values GIS • Included and taken account of in Operational Management Plans, • Made available to an Independent Review Panel • A candidate for inclusion in the environmental enhancement programme.
Natural Character Index or Habitat Quality Index	Once every three years	A combination of reach scale geomorphological characteristics (including sinuosity, braiding, percent pools, active channel width, bank-full channel width and floodplain channel width) to provide an index for each management reach.	Geomorphologist/Aquatic ecologist	The NCI/HQI is under development as a tool to measure relative change in selected geomorphological characteristics and habitat quality. The output of this assessment would: • Be used to assess the cumulative effect of river management activities • Be made available to an Independent Review Panel

2.3 Survey methodologies

Further details on individual survey methodologies are given below.

2.3.1 Deposited sediment

Deposited sediment measurements will include assessment of fine sediment cover by instream visual assessment (SAM2), and substrate grain size by Wolman pebble count (SAM3), and measurement of re-suspendible sediment using the shuffle index (SAM5) in accordance with the Clappcott et al (2011). Monitoring will be conducted in run habitat, which is intermediary between riffle and pools and therefore provides an average measure for the stream reach, replicated across three runs in each baseline monitoring site.

The Wolman pebble count is based on at least 100 particle measurements (B-axis) using a gravelometer or ruled rod. Results are recorded in particle size classes on a modified Wentworth scale (Clapcott, et al., 2011).

The shuffle index is a rapid qualitative assessment of the amount of total suspendible solids deposited on the streambed (refer Clapcott, 2011). A white tile (10 x 10cm) is placed on the streambed in a run at a water depth of 20 to 50cm, where the flow is between 0.2 and 0.6 m/sec. The assessor, standing 3m upstream of the tile, disturbs the bed by moving feet vigorously for 5 seconds. A score from 1 – 5 is assigned where:

Score 1: No or small plume

Score 2: Plume briefly reduces visibility of tile

Score 3: Plume partially obscures tile but quickly clears

Score 4: Plume partially - fully obscures tile but slowly clears

Score 5: Plume fully obscures tile and persists even when tile clears

2.3.2 Riverbank undercutting and overhanging vegetation

Length of riverbank under-cutting and overhanging vegetation are assessed on both banks over a river length of 200m at three separate locations within a 1000m river length at each baseline monitoring site. The GPS coordinates at the beginning and end of each 200m reach are recorded to allow repeat surveys at the same locations.

Lineal lengths of bank undercutting and overhanging vegetation are recorded both in metres and as a percentage of the total bank length surveyed at each site.

2.3.3 Trout abundance

Annual monitoring of trout abundance (brown trout >200mm) has been undertaken in Te Awa Kairangi/Hutt and Waikanae Rivers since 1999, and more recently in the Ōtaki River, using a standard method for counting trout in rivers (Jowett, 1990; Teirney and Jowett, 1990). These surveys have been conducted in accordance with a Memorandum of Understanding between Fish and Game NZ and GWRC[11] at the reaches in **Table 2-3**. The primary objective of this monitoring has been to provide information to allow exploration of the relationship between trout abundance and variables such as the timing and magnitude of flood events, and the timing and location of FP activities. A preliminary analysis shows considerable year by year variation in trout abundance and indicates that the severity of floods between August and November is a primary cause (Hayes, 1995; Pilkington, 2014).

[11] This Memorandum of Understanding expired in December 2013. GWRC intends to renew this.

It is proposed that annual monitoring of trout abundance, according to the methodology described in the Fish and Game NZ reports will continue by agreement between Fish and Game NZ and GWRC at least until 2018/19 to provide a 20-year monitoring record.

Table 2-3: Location of Fish and Game NZ drift dive reaches

River	FP Management Reach		FP cross sections (XS)		FandG Drift Dive Reaches	
	Code	Name	Start	Finish	Start	Finish
Te Awa Kairangi/ Hutt	-	Kaitoke	Upstream of FP scheme		-	-
	-	Te Marua	Upstream of FP scheme		-	-
	H3	Birchville	2400	2270	2550	2440
	H5	Whakatiki	1920	1630	1920	1810
	H6	Heretaunga	1630	1350	1730	1560
	H7	Silverstream	1340	1090	1350	1240
	H9	Avalon	850	510	980	740
	H10	Melling	510	360	540	410
Waikanae	-	Upstream WTP	Upstream of FP scheme		-	-
	W1	WTP	550	430	550	420
	W3	Jim Cooke	345	310	340	260
Ōtaki	O5	Chystalls	600	490	610	511
	O7	Batching	290	220	290	220

2.3.4 Native fish communities in gravel bed rivers

The New Zealand Freshwater Fish Database contains a significant amount of information about freshwater fish communities in the Wellington Region, which can be supplemented by predictions of fish species occurrence from the Freshwater Ecosystems of NZ database (Leathwick, et al., 2010) based on geographical locations and physical attributes of the watercourse. Further survey work is necessary to characterise fish populations in managed river reaches to a level sufficient to allow for comprehensive understanding of the effects of river management on those populations. This particularly includes fish in larger rivers which are difficult to survey by electric fishing methods and so are not well represented in the New Zealand Freshwater Fish Database.

The aim of this programme of baseline monitoring is to ensure that the fish fauna is adequately characterised in habitats potentially affected by river management activities. Baseline monitoring is not designed to assess the effects of individual river management activities on fish populations, but over time will contribute to understanding the cumulative effect of multiple activities. A more rigorous site-specific B-A-C-I design is required for the assessment of individual river management activities, as discussed in **Section 3**.

It is proposed that baseline fish surveys will be undertaken on a regular basis at the monitoring reaches listed in **Table 2-4** at locations frequently disturbed by flood protection activities as well as relatively undisturbed reference sites. As most of these river reaches have a wetted width greater than 12m and a water depth greater than 0.6m over more than 5% of the survey reach, the surveys will be conducted by a combination of electrofishing and trapping, and in some cases also spotlighting, using a modification of the methods proposed by Joy et al (2013). In general these surveys would be conducted in the following order:

a) Arrive on site in the afternoon to mark out the 150m survey reach that has no tributaries or major impediments. Obtain GPS points for the top and bottom of the site. Identify areas which are unfishable by electrofishing, which will be the focus for trapping surveys;

b) Measure and record water clarity, dissolved oxygen, temperature and conductivity on the fish collection form;

c) Deploy fish traps in general accordance with the following;

- o Mark out the centre point of the reach and place 2 fyke nets upstream and 2 downstream of this point. Try to stagger the nets over the 75m above and below the centre points but keeping to deep pools and deep runs where they exist.
- o Place the fyke nets with openings facing downstream to avoid debris being trapped. Use stakes at either end or tie to bank vegetation to keep the lead and main body of the net taut.
- o If the stream flow permits place the trap at an angle across the stream as much as possible.
- o Place two GMTs within 5 m of every fyke and tie off to the bank vegetation or to a stake in the bank.
- o Record the time that the traps were set and leave in overnight.

d) If spot-lighting is to be conducted, return to the site at least 45-minutes after sunset.

- o Commence walking along the bank and/or in wadeable parts of the river in an upstream direction scanning the beam approximately 1-2m upstream.
- o Make an effort to capture fish that cannot be identified in situ. Capture a few different fish early on in the sampling and estimate their length prior to measuring. This is done to calibrate length estimates.
- o Survey as much of the river as can be safely accessed in this manner.

e) Return to site the following morning to retrieve all nets and traps one at a time to identify, measure and release trapped fish (release fish downstream of the 150m survey reach).

f) Conduct a single pass electrofishing survey throughout wadeable areas of the 150m reach, in general accordance with the following:

- o Optimise Electric Fishing Machine settings for conditions at the site.
- o Identify the areas of riffle within the survey reach and fish that entire area.
- o Fish an area of run equal to the area of riffle already fished.
- o Fish all areas of backwater and overhanging vegetation where accessible.

The first round of surveys is programmed to be completed within the first three years of the resource consent, and each site will be re-surveyed at three-yearly intervals thereafter (or until modified through the review of this Environmental Monitoring Plan).

Table 2-4: Location of fish monitoring reaches

River	FP Management Reach		FP cross sections (XS)		Monitoring Site Type	Initial survey
	Code	Name	Start	Finish		
Hutt	H3	Birchville	2400	2270	Reference	2017/18
Hutt	H4	Totara park	2260	1920	Reference	2017/18
Hutt	H7	Silverstream	1340	1090	Disturbed	2017/18
Hutt	H9	Avalon	840	510	Disturbed	2012, 2015/16
Hutt	H10	Melling	510	360	Disturbed	2017/18
Waikanae	W1	WTP	550	430	Reference	2017/18
Waikanae	W3	Jim Cooke	345	310	Disturbed	2017/18
Waikanae	W4	Jim Cooke lower	300	240	Disturbed	2017/18
Ōtaki	O2	Rahui Rd	1020	860	Reference	2018/19

Ōtaki	O5	Chystalls	600	490	Disturbed	2018/19
Ōtaki	O7	Batching	290	220	Disturbed	2018/19
Wairarapa Valley	-	-	-	-	-	To be determined

2.3.5 Native fish communities in low gradient watercourses

Clearance of aquatic weeds from some low gradient watercourses is undertaken to maintain channel capacity and to reduce the risk of flooding. Some of these watercourses are known to support diverse native fish populations and are highly valued, while in others the native fish values are not known.

During the first three-year period under the new consents, fish surveys will be undertaken in the perennial watercourses listed in **Table 2-5**. Fish surveys will be undertaken by backpack electric fishing, and where appropriate by trapping and/or spotlighting. The need for further monitoring of fish populations in these watercourses will be determined during the annual review.

Table 2-5: Location of fish monitoring reaches in mechanically cleared soft bottom streams

Watercourse	Mechanically cleared length (m)	Number of survey sites	Initial survey
Rangiuru Stream	3,940 (weed boat)	2	2017/18
Waimeha	2,104 (weed boat)	2	2017/18
Ngatoko Stream	1,702 (weed boat)	1	2019/20
Ngatotara Drain	4,132	2	2019/20
Katihuku Drain	2,293	1	2019/20
Pahiko Drain	3,887	2	2019/20
Mangaone Stream	3,897 (weed boat)	2	2020/21
Powles Drain	1,413	1	2020/21
Walkers Drain	1,038	1	2020/21

2.3.6 Bluegill bully spawning habitat

The bluegill bully (*Gobiomorphus hubbsi*) is part of the core fish community of the Hutt River and is abundant in the reaches managed by GWRC FP. Currently, however, there is very little information on the early life stages of the bluegill bully in the Hutt River.

Jarvis *et al* (2017) conducted a study of the spawning and early life history of the bluegill bully on the Waianakarua River, north of Dunedin, which showed that bluegill bully spawning sites were predominantly located in the lower reaches of the stream (<2-5km stream distance from the sea) on the undersides of flat, unimbedded cobbles lying in shallow broken water. High densities of nests were found at sites located furthest downstream, where egg plaques were found on the underside of nearly every suitable cobble. The authors concluded that while some reproduction does occur > 10 km inland, these fish contribute little to the overall reproductive output of the system.

The extent to which the Waianakarua River study results are transferrable to the Hutt River is not known and, given the importance of bluegill bully the fish community of the Hutt River, the GWRC will conduct a one-off study on bluegill spawning behaviour in the Hutt River, to be conducted within two years of the commencement of the new consent.

2.3.7 Freshwater mussels

GWRC will conduct a one-off study to determine the presence and distribution of the freshwater mussel (*Echyridella menziesii*) or kakahi in the Rangiuru and Waimeha streams in Ōtaki and Waikanae, respectively. Although this species has not been reported in either watercourse to date, no focused investigation has been conducted and based on current information its presence cannot be ruled out.

2.3.8 Coastal monitoring

GWRC will analyse beach profile cross sections 460, 450, 440, 430 and 420 between Ōtaki Beach and Te Horo that are surveyed biennially by Kāpiti Coast District Council for any long-term changes in the volume of the beach and position of the Mean High Water Spring. If a persistent trend of landward retreat of the shoreline becomes apparent (i.e., over more that years or more) a review will be undertaken to assess what effects gravel extraction activities may be having on the shoreline trend.

2.3.9 Riparian vegetation

Vegetation types have recently been mapped on the riparian margins of the Ruamahānga River system as part of the development of the Floodplain Management Plan for the Upper Wairarapa Valley. Vegetation was broadly mapped using high resolution aerial photography, compiled in GIS, and ground-truthed at accessible, randomly chosen locations to confirm interpretation. The survey boundary was the 50-year ARI flood extent or 50m from the river centreline, whichever was the greater. It is intended that similar surveys would be conducted within the riparian margins of Te Awa Kairangi/Hutt, Wainuiomata, Waikanae and Ōtaki rivers.

2.3.10 River birds

The methodology to be used is described in McArthur, Small, and Govella, Baseline (2015).

A three-year on, three-year off cycle of surveys is considered to be an appropriate survey frequency, given the focus on the three shorebird species (banded dotterel, pied stilt and black-fronted dotterel), because each of these species is relatively long-lived (with an average lifespan of 10-15 years) and census counts generated from the 2012-2015 surveys suggests that local population sizes are relatively stable from one year to the next (McArthur et al, 2015). A small number of consecutive annual counts are necessary to estimate a mean population size for each species (smoothing out any inter-annual variation in numbers caused double-counting, or the non-detection of birds during each survey), however ongoing annual counts will be unlikely to provide additional useful information given the apparently stable populations from one year to the next. A gap of three years in between each series of three consecutive annual counts will allow an assessment of trends in local shorebird population sizes 3-4 times per generation, providing the Flood Protection department with the ability to detect any decline in local shorebird numbers relatively quickly in relation to the average life-span of these shorebirds.

2.3.11 Aerial photography

Colour Aerial Photography is flown with 80% forward and 60% side overlap and provided digitally. Fly height suitable to provide 0.15m - 0.2m GSD imagery (1:250 scale). Aerials are best flown mid-day, mid-summer with low wind, no cloud and low-flow river levels so minimal shadow or water reflection is visible in the imagery.

Georeferencing of the new imagery is carried out using 'Agisoft Photoscan Professional'. The ground control used in this georeferencing process is captured using GIS and high resolution Ortho imagery and Lidar, where a minimum of 5 control points per image is recommended (4 corners and centre of image). Ground control comprises road markings, hydrants, manholes and other distinguishable 'ground level' features.

2.3.12 Pool and riffle counts

The counts will be undertaken by representatives of Wellington Fish and Game Council and GWRC according to an agreed methodology[12], using high resolution aerial photography mosaics (or similar) flown no more than 12 months prior to the count. Emerging technologies such as water penetrating LiDAR and aerial drones have the potential to improve existing methods and should be considered.

2.3.13 River bed levels

A number of rivers and streams throughout the Wellington region contain standard cross-sections with maintained benchmarks and cut lines. These cross-sections are located at various spacing along the length of managed floodways. GWRC maintains an ongoing historical database of this important past bed-level data, which is currently housed within an in-house GIS environment.

GWRC will continue to contract suitably qualified surveyors to produce topographical surveys of standard cross-sections. These surveys will be carried out on a scheduled basis, with each river's survey repeating on an average 5 yearly basis.

Profile data for each survey will be processed using the Hilltop Hydro software package, which results in mean bed levels at each cross-section. These mean bed levels are reported and used to inform recommendations for gravel management through a regular gravel analysis program.

The technology for capturing topographical data, such as cross section points, is quickly evolving – with methods such as LiDAR becoming a valued data collection technique. New technologies and collection methods will be managed in parallel with traditional survey methods until such time that older data collection methods become obsolete.

2.3.14 Inanga spawning habitat

GWRC commissioned a comprehensive survey of inanga spawning habitat in tidal reaches of 33 rivers in the Wellington Region during 2000, 2001 & 2002 (Taylor and Kelly 2001; 2003) and repeated the survey in 2016 (Taylor & Marshall, 2016). Inanga spawning habitat that may potentially be affected by flood protection activities has been identified on Te Awa Kairangi/Hutt River, Opahu Stream, Korokoro Stream, Porirua Stream, Kenepuru Stream, Taupo Stream, Waikanae River, Waimeha Stream, Ōtaki River, Rangiuru/Ngatoko Stream, Pahiko/Katihiku Drains, Waitohu Stream, Ruamahānga River, Pounui Stream and Lake Onoke. It is proposed that an inanga habitat survey be conducted on these watercourses at least once every 10 years.

Inanga spawning habitat surveys of these watercourses should follow a methodology that is generally consistent with the earlier surveys referenced above, and:

- At a minimum collect the necessary information at each site to meet the data and information requirements for NZ's National Inanga Spawning Habitat Database;
- Include appropriate documentation of methodology and the extent of the surveys/sites assessments so that surveys can be repeated at a later date;
- Evaluate the extent and quality of spawning habitat at each site and any limitations of the survey at each site;
- For sites that have been assessed previously consider the results of those previous surveys while in the field to ensure that, as far as is possible, adequate information is collected to allow an assessment of changes (in habitat extent or quality, etc.) between the two surveys.
- Identify generic and site-specific management issues and restoration opportunities and provide recommendations where appropriate (especially in relation current river management practices)
- Identify further monitoring requirements to better inform management of habitat, and future monitoring surveys.

[12] To be defined. Will be included as part of the Memorandum of Understanding renewal.

2.3.15 Natural Character Index/Habitat Quality Index

As part of its assessment into the environmental effects of its river management work, GWRC is investigating the use of a Natural Character Index/Habitat Quality Index, developed by Massey University researchers (Death, et al, 2016). The Natural Character Index/Habitat Quality Index is a quantified assessment of the relative change in selected geomorphic characteristics and habitat quality between successive phases of human intervention. This approach simply compares the test condition with a reference condition at the same point in space and time for each characteristic as a ratio; the closer the value is to unity the less it has altered.

Two potential applications of the Natural Character Index/Habitat Quality Index are under development. The first is an overall Natural Character Index/Habitat Quality Index which measures change against an historic reference state. The second application would be based on habitat quality measurements before and after an individual engineering activity (at the works site and at an upstream reference site) where Natural Character Index/Habitat Quality Index is used to assess the level of change resulting from the engineering activity.

GWRC will establish a working group to develop Natural Character Index/Habitat Quality Index for use in the cumulative effects of river management practices. It will establish a Natural Character Index/Habitat Quality Index in order to:

- assess the existing morphological states of the rivers including, but not limited to, meander forms, sinuosity, extent of braiding, percent pools, active channel width, bar location and area;
- assess the quality of selected habitat features including, but not limited to, pools, instream cover, bed roughness and riparian cover within each reach identified in an OMP; and
- describe the methods and frequency for monitoring the change of these features and characteristics over time.

2.3.16 Waikanae Estuary Scientific Reserve

[Placeholder: survey methodologies and an implementation timeframe to be inserted in accordance with the conditions of consent]

3 Event monitoring

If a proposed event involving an activity or set of activities is likely to generate significant adverse effects in the river environment it may be necessary to be conducted in accordance with a more detailed SSEMP in addition to following general good practice methods.

A method to determine when a SSEMP is required is described in Appendix 2 of the Code. The Code also prescribes matters to be covered in a SSEMP, and who is involved in its preparation.

A SSEMP will generally require site specific monitoring. This will need to be designed specifically for the event or events in question, taking into account the specific values and issues of relevance to the affected site or reach.

Where appropriate, site monitoring associated with a SSEMP would be based on a before/after/control/impact design and will include some or all of the following (depending on the ecological values known, or likely to be present, at the site):

- Water quality monitoring (suspended solids, turbidity, Total-Nitrogen, Total-Phosphorus)
- Deposited sediment monitoring (sediment cover and substrate size)
- Habitat mapping at impact and reference sites
- Macroinvertebrate re-colonisation
- Survey of fish populations

- Fine scale monitoring of physical, chemical and biological indicators in estuarine environments (where applicable)
- HQI calculated for the works and upstream reaches (i.e. to produce a 'works reach' HQI and an 'upstream reach' N).

4 Auditing

An App currently under development will enable the habitat assessment forms included in **Appendix 5** of the Code to be done on a handheld device. All medium and high-risk activities (as defined in **Table 4** of **Appendix 2** of the Code) will have a habitat assessment form completed so that each piece of work can be assigned a number. Several pieces of work will be selected on a random basis to audit, to ensure that the processes in the Environmental Monitoring Plan and Code have been applied.

5 Reporting

The methods and results of monitoring conducted under this Environmental Monitoring Plan be included in a technical report prepared by the person or organisation commissioned to undertake the monitoring. A summary of results and any recommendation will include an Annual Report prepared by GWRC as described in section 3 of the Code.

References

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Death, R., Fuller, I., & Death, A. (2016). *A technique to assess river habitat change - the missing dimension for water resource management.*

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Joy, M., David, B, & Lake, M. (2013). *New Zealand Freshwater Fish Sampling Protocols: Wadeable rivers and streams.* Massey University.

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Taylor, & Kelly. (2001). *Inanga spawning habitats in the greater Wellington Region.* Report prepared for Greater Wellington Regional Council.

Taylor, M., & Marshall, W. (2016). *Inanga Spawning Habitats and their remediation and management in the Greater Wellington Regional Council.* Report Prepared for Greater Wellington Regional Council.

Appendix 4: Work Site Assessment Plan

WORKS SITE ASSESSMENT PLAN

Date			Location	
Issue				
Pre-Works Assessment				
Wetted channel	Length(m)	Width(m)	Volume to be extracted	
Dry channel	Length(m)	Width(m)	Volume to be extracted	
Known values				
Will works comply with all regulatory conditions and stakeholder agreements?		Yes…..No. If no, what action is proposed?		
Has all machinery been checked for leaks and plant material?			Yes…..No	
Sediment control – are measures necessary, and if so, are preparations completed?			Yes No NA.	
Access to site – are preparations completed?			Yes…..No	
Noise, dust, odour and traffic control – are preparations completed?			Yes…..No……NA	
Safety management – are preparations completed?			Yes…..No	
Communications completed			Yes…..No	
Photos taken			Yes…..No	
Post Works Results				
GMP used	Number/Length/Width/ Area/Volume		Duration of works	Duration of sediment discharge >30% change
Was a SSEMP required?	Yes/No		If yes, who completed it?	
List actions taken to minimise or mitigate cultural and/or environmental effects				
Briefly describe any habitat enhancement work undertaken				
List suggestions for improvements to GMP(s) used				

Appendix 5: Habitat assessment template

Habitat Assessment Template for River Maintenance Activity requiring between 3 and 6 days' work in the wetted river channel

Applicable consent	
◻ WGNxxx – Wainuiomata River	◻ WGNxxx – Te Awa Kairangi/Hutt River
◻ WGNxxx – Waikanae River	◻ WGNxxx – Ōtaki River
◻ WGNxxx – Upper Ruamahānga	
Type of work proposed	
◻ Bed re-contouring; lineal meters _________(m)	◻ Repair of impermeable structures; area ________(m^2)
◻ Channel diversion cut; lineal meters _________(m)	◻ Ripping in wet channel; lineal meters ________(m)

Pre-works assessment date:		Assessor:	
Date of work:		Landowner:	

Location of assessment:

River Cross Section: XS_________; +______ (m) to XS_________; +______(m)

◻Right Bank ◻Left Bank ◻Mid Channel

PRE-WORKS HABITAT ASSESSMENT

Date of pre-works assessment:			Date of pre-works photographic record:		
Length of assessment site					
Wet channel width (m)	1:	2:	3:	4:	5:
Dry channel width (m)	1:	2:	3:	4:	5:
Instream					
River flow (L/s)	From GWRC website:				
Habitat type area (m^2)	Rapid: Riffle:		Shallow run: Deep run:	Pool:	Backwater:
Maximum depth within assessment site	Max depth m		Lineal length distance of max depth run________m		
Channel, Bank, Shade					
Channel shape	◻Artificially channelised	◻ Straight		◻ Weakly sinuous	◻ Strongly sinuous
Channel type	◻ Single thread channel		◻Split channel		◻ Braided channel
Wetted bank habitat	Total length of wetted habitat against bank_____________m				
Overhanging vegetation	Total length of overhanging vegetation _____________m				
Bank undercut	Total length of undercut _____________m				
Pre-work aerial perspective of site:					

POST-WORKS HABITAT ASSESSMENT					
Date of post-works assessment:			Date of pre-works photographic record:		
Length of assessment site					
Wet channel width (m)	1:	2:	3:	4:	5:
Dry channel width (m)	1:	2:	3:	4:	5:
Instream					
Flow conditions	□ Low flow		□Base flow		□ Low flow
Habitat type area (m^2)	Rapid:	Riffle:	Shallow run: Deep run:	Pool:	Backwater:
Maximum depth within assessment site	Max depth__________m		Lineal length distance of max depth run________m		
Channel, Bank, Shade					
Channel shape	□Artificially channelised	□ Straight	□ Weakly sinuous		□ Strongly sinuous
Channel type	□ Single thread channel		□Split channel		□ Braided channel
Wetted bank habitat	Total length of wetted habitat against bank__________m				
Overhanging vegetation	Total length of overhanging vegetations __________m				
Bank undercut	Total length of undercut __________m				
Post-works aerial perspective of works site:					
Flow path					
Has the flow trajectory been changed in such a way that it will affect downstream habitat by: Reducing the length of wetted bank habitat? □yes □no. Reducing the area of riffle □yes □no. Reducing the area of pools □yes □no. Other:					
Habitat change					
Has existing pool, riffle or backwater habitat at this work site been affected by the works: □yes □no. Has new pool, riffle or backwater habitat been created at the works site? □yes □no. If yes provide details:					

Definitions:

Site length is the length of the area being assessed. The area affected by works may be less.	**Wet channel width & dry channel width** is measured at 5 locations at 50m intervals.
Flow conditions are generalized as low, base or high. For accurate measurement refer to GWRC record on the date of assessment	**Rapid habitat** is an area of fast moving broken white water
Deep run is deeper than 0.6m (thigh high)	**Riffle habitat** is an area of fast moving turbulent water
Wetted bank habitat is the total length of wetted channel against a bank edge. This may be greater than the assessment site length (e.g. if wetted bank is on both sides of the site or on an island)	

Appendix 6: Existing resource consents held by GWRC for river management activities

[Note: list of existing consents held by GWRC for river management activities to be inserted].

Appendix 7: General activity constraints calendars

<table>
<tr><th colspan="14">General Activity Constraints Calendar – Te Awa Kairangi/Hutt River (including parts of the Akatarawa River, Stokes Valley, Speedy's and Te Mome Streams)</th></tr>
<tr><th rowspan="2">Value to be protected</th><th rowspan="2">Affected areas</th><th colspan="3">Summer</th><th colspan="3">Autumn</th><th colspan="3">Winter</th><th colspan="3">Spring</th></tr>
<tr><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th></tr>
<tr><td>Inanga spawning (refer section 10.3.10)</td><td>Tidally inundated riparian vegetation on:
• Te Awa Kairangi/Hutt River between XS100 and XS210.</td><td>Follow general good practice and requirements for site specific effects management as per Appendix 2.</td><td colspan="2">Key sensitivity period – banks only
1 January to 28 February
Preferably <u>avoid</u> disturbance of vegetation on bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td><td colspan="3">Key sensitivity period - bed and banks
1 March to 31 May
Preferably <u>avoid</u> disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td><td colspan="3">Follow general good practice and requirements for site specific effects management as per Appendix 2.</td><td colspan="3">Follow general good practice and requirements for site specific effects management as per Appendix 2.
Whitebait fishing season – 15 August to 30 November</td></tr>
<tr><td>Trout spawning (refer section 10.3.10)</td><td>Actively flowing channel of:
• Akatarawa River</td><td colspan="5">Follow general good practice</td><td colspan="6">Key sensitivity period
1 May to 31 October
Preferably <u>avoid</u> disturbance of the bed at these times, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td><td>Follow general good practice</td></tr>
<tr><td>Peak native fish migration (refer section 10.3.10)</td><td>Actively flowing channel</td><td></td><td colspan="7">Follow general good practice</td><td colspan="4">Key sensitivity period
1 August to 31 December
<u>Avoid</u> the mechanical clearance of silt and weed from low gradient waterways. <u>Limit</u> activities that disturb the wetted channel at these times to <u>no more than</u> 30 hours of in river works or 150 hours per 10 km reach. If these activities are unavoidable, follow requirements for site specific effects management as per Appendix 2.</td></tr>
<tr><td>Instream ecology at times of low flow (refer section 10.3.10)</td><td>Actively flowing channel</td><td colspan="12">As far as is practicable <u>avoid</u> work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td></tr>
<tr><td>River bird nesting (refer section 10.3.10)</td><td>Dry beaches of Te Awa Kairangi/Hutt River between:
• XS310 and XS2270; and
• XS2731 and XS2900.</td><td colspan="3"></td><td colspan="5">Follow general good practice</td><td colspan="4">Key sensitivity period (nesting)
1 August to 28 February
Preferably <u>avoid</u> work on dry gravel beaches at these times, but if urgent works are required, works should be preceded by a survey carried out by a suitably qualified ecologist to identify the presence of banded dotterel, pied stilt and black-fronted dotterel nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction). Vehicles must not be operated within 25m of any nests and chicks and the birds and nests should not be disturbed.</td></tr>
<tr><td>Lizards and geckos (refer section 10.3.10)</td><td>River terrace manuka or kanuka scrub
Native grassland
Scree or boulder fields</td><td colspan="12">If more than 100 m² of habitat type noted is to be disturbed, or if lizards and/or geckos are known or likely to be present at the site, a suitably qualified herpetologist <u>MUST</u> undertake a prior works survey to check for the presence of lizards and geckos within the affected site. IF any lizard or gecko species is identified in the survey, works must not proceed until Wildlife Act 1953 permits have been issued to distrub wildlife and a detailed plan is in place to avoid or mitigate any adverse effects of the works. (NB: it is a legal requirement to obtain a wildlife permit from the Department of Conservation before lizards and/or geckos are disturbed.)</td></tr>
<tr><td>Safe machine operation (refer sections 10.3.4, 10.3.6 and 10.3.9)</td><td>Actively flowing channel and berms</td><td colspan="6">For safety, activities in the actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable.</td><td colspan="3">Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons and control of sediment in runoff.</td><td colspan="3"></td></tr>
<tr><td>Peak instream recreational use (refer section 10.3.12)</td><td>Active bed and berms</td><td colspan="3">Key sensitivity period
1 December to 28 February
<u>Avoid</u> activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times.</td><td colspan="9">Follow general good practice</td></tr>
<tr><td>Significant mana whenua values (Refer section 10.3.13)</td><td>River corridor</td><td colspan="12">Operational Management Plans must identify significant mana whenua values and sites to be taken into account in work planning and method selection for each management reach.</td></tr>
</table>

General Activity Constraints Calendar – Wainuiomata River and other watercourses not specifically identified Appendix 7

Value to be protected	Affected areas	Summer			Autumn			Winter			Spring		
		Dec	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
Inanga spawning (refer section 10.3.10)	Tidally inundated riparian vegetation	*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*	**Key sensitivity period – banks only** **1 January to 28 February** Preferably **avoid** disturbance of vegetation on bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.		**Key sensitivity period - bed and banks** **1 March to 31 May** Preferably **avoid** disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.			*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*		*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.* Whitebait fishing season – 15 August to 30 November			
Trout spawning (refer section 10.3.10)	Spawning habitat in the actively flowing channel	*Follow general good practice*					**Key sensitivity period** **1 May to 31 October** Preferably **avoid** disturbance of the bed at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2.**						*Follow general good practice*
Peak native fish migration (refer section 10.3.10)	Actively flowing channel		*Follow general good practice*							**Key sensitivity period** **1 August to 31 December** **Avoid** the mechanical clearance of silt and weed from low gradient waterways. **Limit** activities that disturb the wetted channel at these times to no more than 30 hours of in river works or 150 hours per 10 km reach. If these activities are unavoidable, follow requirements for site specific effects management as per **Appendix 2.**			
Instream ecology at times of low flow (refer section 10.3.10)	Actively flowing channel	As far as is practicable **avoid** work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2.**											
River bird nesting (refer section 10.3.10)	Dry beaches				*Follow general good practice*					**Key sensitivity period (nesting)** **1 August to 28 February** Preferably **avoid** work on dry gravel beaches at these times, but if urgent works are required, works should be preceded by a survey carried out by a suitably qualified ecologist to identify the presence of banded dotterel, pied stilt and black-fronted dotterel nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction). Vehicles must not be operated within 25m of any nests and chicks and the birds and nests should not be disturbed.			
Lizards and geckos (refer section 10.3.10)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m² of habitat type noted is to be disturbed, or if lizards and/or geckos are known or likely to be present at the site, a suitably qualified herpetologist **MUST** undertake a prior works survey to check for the presence of lizards and geckos within the affected site. IF any lizard or gecko species is identified in the survey, works must not proceed until Wildlife Act 1953 permits have been issued to distrub wildlife and a detailed plan is in place to avoid or mitigate any adverse effects of the works. (NB: it is a legal requirement to obtain a wildlife permit from the Department of Conservation before lizards and/or geckos are disturbed.)											
Safe machine operation (refer sections 10.3.4, 10.3.6 and 10.3.9)	Actively flowing channel and berms	For safety, activities in the actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable.						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons and control of sediment in runoff.					
Peak instream recreational use (refer section 10.3.12)	Active bed and berms	**Key sensitivity period** **1 December to 28 February** **Avoid** activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times.			*Follow general good practice*								
Significant mana whenua values (Refer section 10.3.13)	River corridor	Operational Management Plans must identify significant mana whenua values and sites to be taken into account in work planning and method selection for each management reach.											

General Activity Constraints Calendar – Waikanae River (including parts of Waimeha and Ngarara Streams)

Value to be protected	Affected areas	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Inanga spawning (refer section 10.3.10)	Tidally inundated riparian vegetation: • Waikanae River XS20 to XS110 and Waimeha Stream downstream of Ngarara Stream	*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*	**Key sensitivity period – banks only 1 January to 28 February** Preferably **avoid** disturbance of vegetation on bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.		**Key sensitivity period - bed and banks 1 March to 31 May** Preferably **avoid** disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.			*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*		*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.* Whitebait fishing season – 15 August to 30 November			
Trout spawning (refer section 10.3.10)	Areas of trout spawning habitat in actively flowing channels	*Follow general good practice*					**Key sensitivity period 1 May to 31 October** Preferably **avoid** disturbance of the bed at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2.**						*Follow general good practice*
Peak native fish migration (refer section 10.3.10)	Actively flowing channel		*Follow general good practice*							**Key sensitivity period 1 August to 31 December** **Avoid** the mechanical clearance of silt and weed from low gradient waterways. **Limit** activities that disturb the wetted channel at these times to no more than 30 hours of in river works or 150 hours per 10 km reach. If these activities are unavoidable, follow requirements for site specific effects management as per **Appendix 2.**			
Instream ecology at times of low flow (refer section 10.3.10)	Actively flowing channel	As far as is practicable **avoid** work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2.**											
River bird nesting (refer section 10.3.10)	Dry beaches				*Follow general good practice*					**Key sensitivity period (nesting) 1 August to 28 February** Preferably **avoid** work on dry gravel beaches at these times, but if urgent works are required, works should be preceded by a survey carried out by a suitably qualified ecologist to identify the presence of banded dotterel, pied stilt and black-fronted dotterel nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction). Vehicles must not be operated within 25m of any nests and chicks and the birds and nests should not be disturbed.			
Lizards and geckos (refer section 10.3.10)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m² of habitat type noted is to be disturbed, or if lizards and/or geckos are known or likely to be present at the site, a suitably qualified herpetologist **MUST** undertake a prior works survey to check for the presence of lizards and geckos within the affected site. IF any lizard or gecko species is identified in the survey, works must not proceed until Wildlife Act 1953 permits have been issued to distrub wildlife and a detailed plan is in place to avoid or mitigate any adverse effects of the works. (NB: it is a legal requirement to obtain a wildlife permit from the Department of Conservation before lizards and/or geckos are disturbed.)											
Safe machine operation (refer sections 10.3.4, 10.3.6 and 10.3.9)	Actively flowing channel and berms	For safety, activities in the actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable.						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons and control of sediment in runoff.					
Peak instream recreational use (refer section 10.3.12)	Active bed and berms	**Key sensitivity period 1 December to 28 February** **Avoid** activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times.			*Follow general good practice*								
Significant mana whenua values (Refer section 10.3.13)	River corridor	Operational Management Plans must identify significant mana whenua values and sites to be taken into account in work planning and method selection for each management reach.											

General Activity Constraints Calendar – Ōtaki River (including Rangiuru/Ngatoko Streams and Katihiku/Pahiko Drains)

Value to be protected	Affected areas	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Inanga spawning (refer section 10.3.10)	Tidally inundated riparian vegetation on: • Ōtaki River XS20 to XS120, • Rangiuru/Ngatoko Streams, and • Katihiku/Pahiko Drains)	*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*	**Key sensitivity period – banks only** **1 January to 28 February** Preferably **avoid** disturbance of vegetation on bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.		**Key sensitivity period - bed and banks** **1 March to 31 May** Preferably **avoid** disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per **Appendix 2**.			*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.*		*Follow general good practice and requirements for site specific effects management as per **Appendix 2**.* Whitebait fishing season – 15 August to 30 November			
Peak native fish migration (refer section 10.3.10)	Actively flowing channel		*Follow general good practice*							**Key sensitivity period** **1 August to 31 December** **Avoid** the mechanical clearance of silt and weed from low gradient waterways. **Limit** activities that disturb the wetted channel at these times to no more than 30 hours of in river works or 150 hours per 10 km reach. If these activities are unavoidable, follow requirements for site specific effects management as per **Appendix 2.**			
Instream ecology at times of low flow (refer section 10.3.10)	Actively flowing channel	As far as is practicable **avoid** work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan, or if unavoidable, follow requirements for site-specific effects management as per **Appendix 2.**											
River bird nesting (refer section 10.3.10)	Dry beaches				*Follow general good practice*					**Key sensitivity period (nesting)** **1 August to 28 February** Preferably **avoid** work on dry gravel beaches at these times, but if urgent works are required, works should be preceded by a survey carried out by a suitably qualified ecologist to identify the presence of banded dotterel, pied stilt and black-fronted dotterel nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction). Vehicles must not be operated within 25m of any nests and chicks and the birds and nests should not be disturbed.			
Lizards and geckos (refer section 10.3.10)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m² of habitat type noted is to be disturbed, or if lizards and/or geckos are known or likely to be present at the site, a suitably qualified herpetologist **MUST** undertake a prior works survey to check for the presence of lizards and geckos within the affected site. IF any lizard or gecko species is identified in the survey, works must not proceed until Wildlife Act 1953 permits have been issued to distrub wildlife and a detailed plan is in place to avoid or mitigate any adverse effects of the works. (NB: it is a legal requirement to obtain a wildlife permit from the Department of Conservation before lizards and/or geckos are disturbed.)											
Safe machine operation (refer sections 10.3.4, 10.3.6 and 10.3.9)	Actively flowing channel and berms	For safety, activities in the actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable.						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons and control of sediment in runoff.					
Peak instream recreational use (refer section 10.3.12)	Active bed and berms	**Key sensitivity period** **1 December to 28 February** **Avoid** activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times.			*Follow general good practice*								
Significant mana whenua values (Refer section 10.3.13)	River corridor	Operational Management Plans must identify significant mana whenua values and sites to be taken into account in work planning and method selection for each management reach.											

<table>
<tr><th colspan="14">General Activity Constraints Calendar – Rivers in the Wairarapa Valley</th></tr>
<tr><th rowspan="2">Value to be protected</th><th rowspan="2">Affected areas</th><th colspan="3">Summer</th><th colspan="3">Autumn</th><th colspan="3">Winter</th><th colspan="3">Spring</th></tr>
<tr><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th></tr>
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Preferably <u>avoid</u> disturbance of vegetation on bank edges at these times, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td><td colspan="3">Key sensitivity period - bed and banks
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Whitebait fishing season – 15 August to 30 November</td></tr>
<tr><td>Trout spawning (refer section 10.3.10)</td><td>Actively flowing channels of the:
• Mangatarere,
• Kaipatangata,
• Enaki,
• Waipoua,
• Kopuaranga,
• Huangarua
• Tauherenikau rivers</td><td colspan="5">Follow general good practice</td><td colspan="6">Key sensitivity period
1 May to 31 October
Preferably <u>avoid</u> disturbance of the bed at these times, or if unavoidable, follow requirements for site specific effects management as per Appendix 2.</td><td>Follow general good practice</td></tr>
<tr><td>Peak native fish migration (refer section 10.3.10)</td><td>Actively flowing channel</td><td></td><td colspan="7">Follow general good practice</td><td colspan="4">Key sensitivity period
1 August to 31 December
<u>Avoid</u> the mechanical clearance of silt and weed from low gradient waterways. <u>Limit</u> activities that disturb the wetted channel at these times to <u>no more than</u> 30 hours of in river works or 150 hours per 10 km reach. If these activities are unavoidable, follow requirements for site specific effects management as per Appendix 2.</td></tr>
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Preferably <u>avoid</u> work on dry gravel beaches at these times, but if urgent works are required, works should be preceded by a survey carried out by a suitably qualified ecologist to identify the presence of banded dotterel, pied stilt and black-fronted dotterel nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction). Vehicles must not be operated within 25m of any nests and chicks and the birds and nests should not be disturbed.</td></tr>
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<u>Avoid</u> activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times.</td><td colspan="9">Follow general good practice</td></tr>
<tr><td>Significant mana whenua values (Refer section 10.3.13)</td><td>River corridor</td><td colspan="12">Operational Management Plans must identify significant mana whenua values and sites to be taken into account in work planning and method selection for each management reach.</td></tr>
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