Environmental Code of Practice for River Works

To Meet Requirements of Rule 16-13 of The One Plan

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1. Introduction

1.1 Purpose of the Environmental Code of Practice for River Works

Horizons Regional Council (HRC) has embarked on a process to consolidate its environmental plans and policies (including the Regional Policy Statement and Regional Plan) into a single planning document referred to as the One Plan. One of the underlying principles of the One Plan is that a permissive approach to resource use will be taken where the activity is undertaken in accordance with recognised Good Practice Standards or a Code of Practice. That is, resource consents should not be required, if the activities concerned occur within a Good Practice Standards or Code of Practice regime that will avoid, remedy or mitigate any adverse environmental impacts on the environment.

Currently, the Operations Group of HRC is required to obtain resource consents to undertake a large number of its river management activities. This adds considerable costs, and imposes time constraints on the works programme. Furthermore it results in a very large number of consents, with a plethora of different conditions and resulting compliance difficulties. To simplify this process the Operations Group has been applying for consents for river management and gravel extraction activities that cover entire scheme areas. A River Works Code of Practice, setting out the various Good Practice Standards and how they would be applied, is expected to obviate the need for further consents for most activities whilst ensuring that river values in scheme areas are maintained.

The purpose of the Code of Practice is to set out environmental standards of good practice that will apply to all river and drainage works, regardless of whether an activity requires a consent or not. In addition, the Code of Practice sets out the procedures for notification and reporting that will apply for all works, unless there is a conflict with any specific consent conditions. The demonstration of good river works practices that avoid, mitigate or minimise adverse environmental impacts, will streamline regulatory requirements leading to improved efficiencies in the delivery of services and better environmental outcomes.

The Code of Practice will:

- List and describe the activities carried out by the Operations Group;
- List best practice standards to avoid, mitigate and minimise an activity's effect on the environment;
- List the principles that have been used to set up the standards for good practice for each activity;
- List the procedures for consultation and notification, monitoring and reporting;
- Identify a self-monitoring process.
- Ensure works undertaken under the Code of Practice will acknowledge waterbody values and work in a way that does not adversely impact on those values.

Good practice standards involve using today's best river engineering methods to achieve an acceptable environmental outcome when undertaking any activity.

1.2 Horizons Regional Council's Responsibility to Undertake River Works

The Operations Group of Horizons Regional Council is committed to providing affordable flood and erosion protection works that ensure community safety and well-being, and allow for sustainable economic development without compromising environmental values. The activities undertaken to achieve this are underpinned by the following statutory framework and principles:

- Local Government Act 2002.
- Resource Management Act 1991.
- Orders in Council for Local Government Reorganisation 9 June 1989.
- Civil Defence Act 1983.
- Public Works Act 1981.
- Soil Conservation and Rivers Control Act 1941.
- Land Drainage Act 1908.

It is important to note that the principles of the above Acts are subject to the purpose and principles of the Resource Management Act, and Horizons Regional Council's One Resource Management Plan which includes the Regional Policy Statement.

1.3 Scope of the Code of Practice

This Code of Practice applies only to drainage and river schemes works areas as delineated on the maps included in the Code. This Code does not apply within the Coastal Marine Area. Nor does it apply to any activities carried out by the Operations Group outside of the areas delineated in the maps such as environmental grant work. Such work must either comply with the permitted activity rules within the One Plan or resource consent conditions. The standards to be met in the Code do not supersede any consent condition. On the contrary, existing consent conditions take precedence over standards in the Code.

The Operations Group of Horizons Regional Council undertake river and drainage activities to deliver a desired level of service to the community in the following areas:

River Management

Includes the management of gravel and vegetation within river channels to enhance channel stability and reduce the risk of flooding and erosion.

Flood Protection

Includes the construction, operation and maintenance of stopbanks, floodgates, spillways and pumpstations to protect property from flooding and to safeguard communities.

Erosion Control

Includes construction and maintenance of erosion mitigation protection works to protect adjoining property assets and infrastructure from damage.

Drainage Management

Includes the construction, operation and maintenance of drainage channels, floodgates and pumpstations to enhance the state of productive land and the economic well-being of the community.

In performing the above functions, the Operations Group undertake the following activities:

A. River Management Activities

1. Bank shaping; including bank battering and slump reinstatement.
2. Beach Raking.
3. Gravel Extraction.
4. Gravel Management, including channel realignment, diversions and gravel relocation.
5. Channel Clearance, including vegetation clearance and herbicide control of vegetation on riverbanks, beds and berms.

B. Activities that Establish and Maintain Flood Protection, Erosion Control and Drainage Assets

1. Lateral Walls – Concrete Block, Timber, Sheet Piling, Gabions
2. Concrete Rip Rap
3. Culverts
4. Detention Dam Maintenance
5. Drainage Channels/Modified Streams – Mechanical Cleaning
6. Drainage Channels/Modified Streams – Weed control by herbicide application
7. Grade Controls/Bed Control Structures/Weirs
8. Groynes – Impermeable and Permeable
9. Permeable Mesh Units
10. Rock Linings
11. Stopbanks
12. Tied Tree Edge Protection

13. Edge Vegetation Management – Layering, Lopping, Removal
14. Tree Planting

Detailed descriptions and Good Practice Standards for each of these activities are set out in Part Two.

2. Operations Group Activities

2.1 The Manawatu-Wanganui Region

Horizons Regional Council's region stretches from Mount Ruapehu on the volcanic plateau in the north to the fertile Horowhenua plains in the south, and from the sandy western dunes bordering the Tasman Sea to the wild rocky bays on the Pacific Ocean to the east. At 22,215 square kilometres, the Region covers 8.1% of New Zealand and includes a variety of landscapes and climates.

From the earliest settlement of the Region, rivers and lakes have been modified. Maori constructed islands in lakes and eel weirs/traps in streams, and even constructed canals between wetlands and lakes to improve the eel and native fishery. As towns and farmlands alongside waterways developed, so did the demand for flood and erosion control to protect this investment. The last 150 years of development within the Region has had a major impact on the Region's waterways. Few waterways remain in an original condition, with those waterways on the Manawatu Plains and in urban centres having experienced the greatest level of modification. This modification has largely been an inevitable part of the settlement and economic development of the Region.

The period of widespread and extensive waterway modification is behind us. Today, river works are generally small in nature, aimed at maintaining or enhancing the level of erosion control and flood protection offered to communities. Although these activities have an environmental impact, they tend to be temporary and of short duration, and their effects tend to be considerably less than the impacts of the original works, and significantly less than the impacts of the extreme natural events such as the February 2004 storm.

Horizons Regional Council manages 15 river and erosion control schemes that provide protection from flooding, riverbank erosion, and channel migration to 71,000 hectares of land and 10 towns. These schemes facilitate full utilisation of, and capital investment on, river margins. Horizons Regional Council also manages 14 drainage schemes to increase production potential across 62,000 hectares by lowering soil water levels and speeding up runoff removal. The schemes are primarily funded by rates collected from those rural and urban property owners who benefit either directly or indirectly from the schemes. There is also some financial assistance provided to the schemes from the general rate in recognition of wider regional benefits.

The total present replacement value of scheme assets is $233 million. Management of these Assets is undertaken in accordance with Scheme asset management plans.

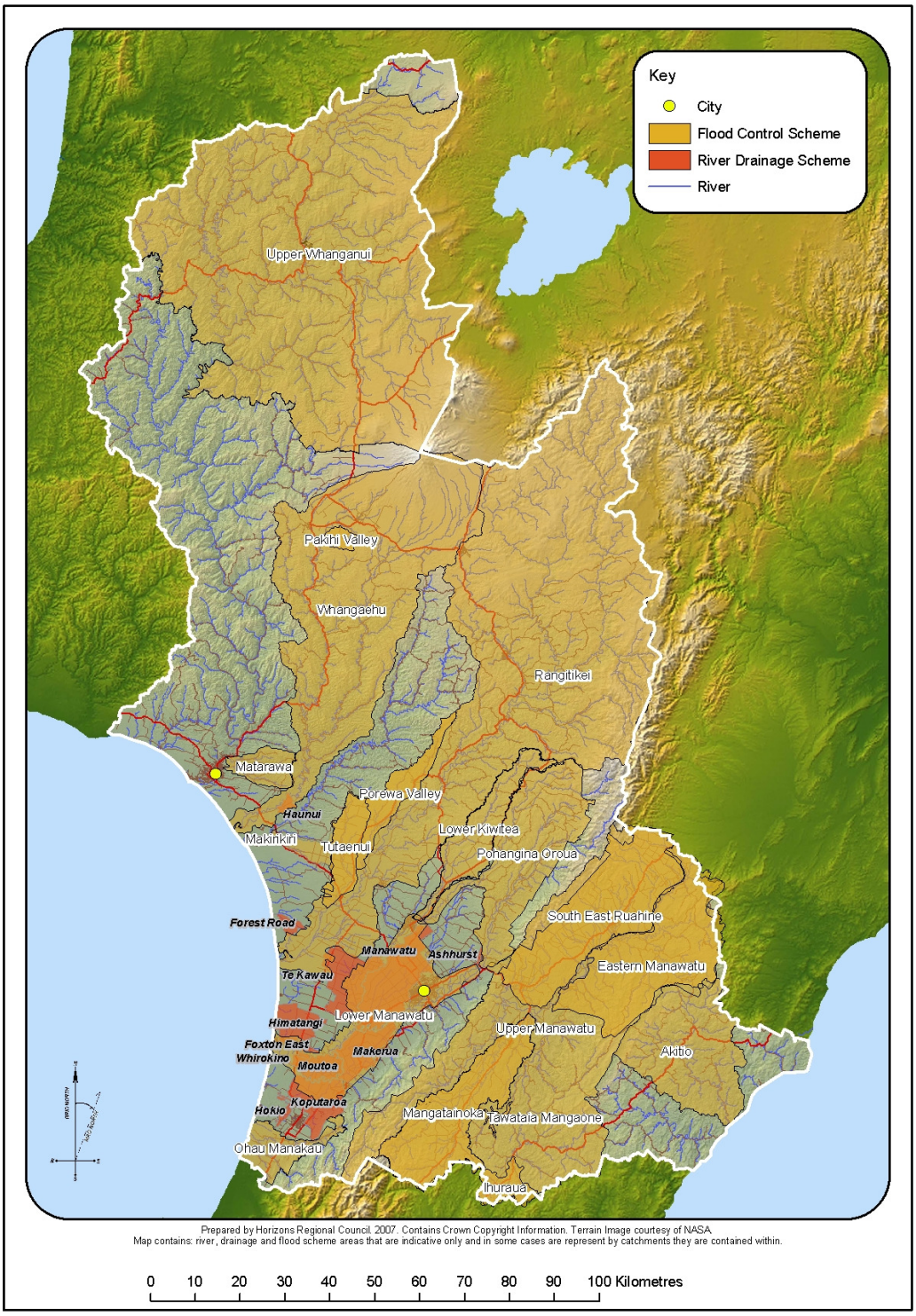
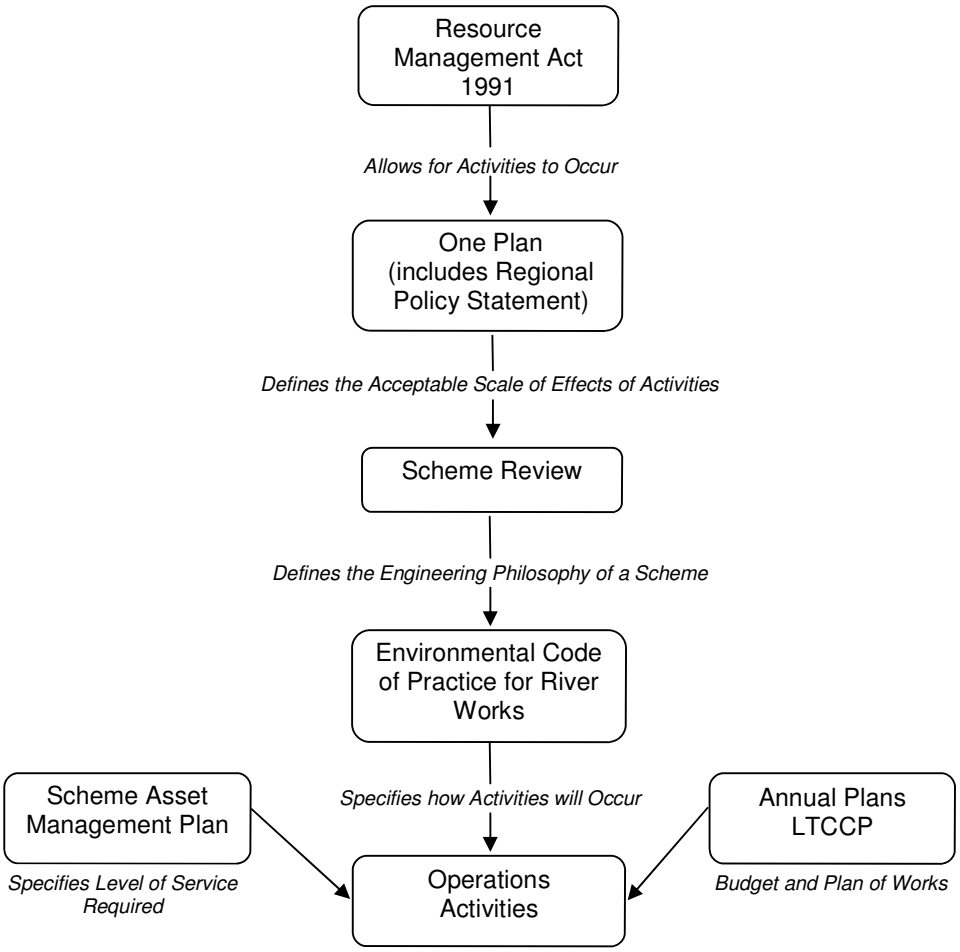


Figure 1 River and Drainage Scheme Rating Areas

2.2 Relationship with Other Relevant Documentation

The Code of Practice is one of a suite of documents that provides guidance, planning and standards for activities undertaken by Horizons Regional Council in rivers. The flowchart below shows how the Environmental Code of Practice for River Works fits into the planning framework.



Relationship of Code of Practice with other Council Plans

2.3 Measurable Objectives for Environmental Performance

Measurable objectives for environmental performance for a particular river or drainage scheme will be included in the next revision of the asset management plans for all schemes. Scheme asset management plans define:

- the objectives and performance standards of a particular river and drainage scheme;
- the service level for the scheme;
- the expenditure needed to retain operating and service capacity of the schemes' assets; and
- the monitoring and reporting requirements for each scheme.

Each scheme has its own unique asset management plan. Each plan is reviewed, updated and audited by NZ Audit every three years.

The current edition of the plans pledge that the scheme will encourage recreational access and environmental enhancement of the river corridor. Consultation for the next revision of the plans will begin in 2008. One of the improvements that will be implemented will be the inclusion of measurable performance targets for environmental objectives, similar to the measurable performance targets already in place for infrastructural asset management.

Typical examples are the planting of native species and willow combinations in riparian margins and the enhancement of existing river access points.

2.4 The Operations Group Pledge

The Operations Group of Horizons Regional Council is committed to:

1. Protecting the various communities throughout the region from flooding and erosion hazards through the provision of affordable river management measures, and maintaining the economic well-being of communities through the maintenance of effective drainage systems.
2. At all times undertaking activities in accordance with the Good Practice Standards set out in this code, with the objective of preserving the ecosystem and recreational values of the region's river and drainage systems as far as practicable.
3. Consulting with all stakeholders to ensure an appropriate balance between community safety, economic and environmental outcomes is achieved.
4. Avoiding the progressive narrowing or straightening of active river channels.

2.5 Hierarchy of Objectives

River works, by their very nature, will at times alter the natural environment and affect the ecology of the river. The following hierarchy of objectives is useful for resolving conflicts regarding the various competing expectations for the use of the river and drainage systems in the region.

1. The protection of human life and property through the appropriate design and efficient operation of river and drainage works.
2. The maintenance and protection of existing or agreed environmental values including the preservation of the natural character.
3. The acknowledgement of the principles of the Treaty of Waitangi
4. The avoidance of health and safety risks to all stakeholders.
5. The facilitation of public access to the region's rivers for recreational purposes, where such access does not conflict with the above objectives.

3. Environmental Values

Rivers have many environmental values and characteristics that combined comprise their life supporting capacity and are valued by Maori and non-Maori for cultural, spiritual, aesthetic and recreational reasons.

The preservation of a river's natural character is a matter of national importance under Section 6 of the RMA. For the purposes of this code, the natural character relates to the morphological characteristics of a river, such as bars, pools, runs and riffles, active channel width and channel sinuosity.

The rivers, drains and lakes, to which the activities of this code relate, shall be managed recognising and providing for the Water Management Values in Schedule Ba of the One Plan, and summarised in Table 3.1 of this code.

3.1 Water Management Values and Purposes

Value Group	Individual Value	Management Objectives	Where it Applies
Ecosystem Values	Natural State	The waterbody is maintained in its natural state.	Conservation Land
	Life-Supporting Capacity	The waterbody supports healthy aquatic life / ecosystems.	All natural waterbodies (Rivers, Drains and Lakes)
	Sites of Significance-Aquatic	Sites of significance for native aquatic biodiversity are maintained or improved.	Specified Sites/Reaches
	Sites of Significance-Riparian	Sites of significance for native riparian biodiversity are maintained or improved.	Specified Sites/Reaches
	Inanga Spawning	The waterbody sustains healthy inanga spawning and egg development.	Specified Sites/Reaches
	Whitebait Migration	The waterbody is maintained or improved to provide the safe passage of inwardly migrating juvenile native fish known collectively as whitebait.	Specified Sites/Reaches
Recreational and Cultural Values	Contact Recreation	The waterbody is suitable for contact recreation.	All natural waterbodies (Rivers, Drains and Lakes)
	Amenity	The amenity values of the waterbodies and their margins are maintained or improved.	Specified Sites/Reaches
	Mauri	The Mauri of the waterbody is maintained or improved.	All natural waterbodies (Rivers, Drains and Lakes)
	Sites of Significance-Cultural	Sites of significance for cultural values are maintained.	To be Defined
	Trout Fishery	The waterbody sustains healthy Rainbow and/or Brown Trout fisheries.	Specified Zones/Reaches
	Trout Spawning	The waterbody meets the requirements of Rainbow and Brown Trout spawning, larval and fry development.	Specified Sites/Reaches
	Aesthetics	The aesthetic values of the waterbody and its margins are maintained or improved.	Specified Sites/Reaches

Value Group	Individual Value	Management Objectives	Where it Applies
Water Use	Water Supply	The waterbody is suitable as a raw drinking water source for human consumption.	Catchments above surface water takes for community water supply.
	Industrial Abstraction	The waterbody is suitable as a water source for industrial abstraction.	All natural waterbodies except those classified as Natural State and those covered by National Water Conservation Order.
	Irrigation	The waterbody is suitable as a water source for irrigation.	All natural waterbodies except those classified as Natural State and those covered by National Water Conservation Order.
	Stockwater	The waterbody is suitable as a supply of drinking water for livestock.	All waterbodies including artificial.
Social /Economic Values	Capacity to Assimilate Pollution	The capacity of a waterbody to assimilate pollution is not exceeded.	All natural waterbodies except NS, lakes and wetlands.
	Flood Control and Drainage	The integrity of existing flood and riverbank erosion protection and existing drainage structures is not compromised.	Existing flood/erosion control and drainage schemes.
	Existing Infrastructure	The integrity of existing infrastructure shall not be compromised.	Drainage Scheme Areas.

4. Standards of Good Practice for Activities

Good Practice Standards have been developed for each of the activities undertaken by the Operations Group of Horizons Regional Council and are presented in Part Two of this Code.

The standards are based on extensive practical experience in undertaking river engineering activities in a variety of rivers throughout New Zealand. The standards recognise the issues and concerns that have traditionally been raised by those stakeholders who have a particular interest in maintaining and enhancing the river environment, and that are reflected in conditions attached to the many consents currently held by the Operations Group of Horizons Regional Council.

The standards will facilitate the execution of necessary river works, while at the same time mitigating, remedying and where possible, avoiding adverse environmental effects.

The following principles have been used to establish the standards for good practice:

1. The standards shall identify practices that will avoid, remedy or mitigate the adverse environmental effects of undertaking river works by:

    a. considering habitat and morphological diversity

    b. minimising in-stream works

    c. avoiding discharges of sediment into water

    d. avoiding or mitigating effects of activities on fish passage

    e. isolating the works site to avoid adverse off-site effects

    f. avoiding the discharge of contaminants

    g. critically assessing operational methodology

    h. planning riparian planting carefully

    i. avoiding archaeological or historic sites

    j. maintaining ecological values

    k. maintaining works to an appropriate standard

    l. considering emergency contingencies

    m. avoiding the transfer of aquatic pests

2. The standards shall take into account the location, timing, the duration and the scale of the works by:

    a. minimising the extent, frequency and duration of the activity

3. The standards shall be practicable and affordable while achieving a sustainable and effective river protection and environmental outcome.

4. The standards shall be based on established good engineering practice.

5. The standards shall generally reflect the requirements of recently awarded consent conditions.

4.1 Maintenance

Maintenance of works in the long term needs to be considered at all times. All works will require some degree of maintenance.

Good planning and increased expenditure on initial capital works may result in lower maintenance costs for the life of the works and therefore less disruption to the environment through repeated activities.

The Operations Group's aim is to disturb the river as little as possible by ensuring works are durable and of a high standard that will require little future maintenance.

All river and drainage scheme assets shall be inspected and maintained in accordance with the relevant Asset Management Plan. Redundant assets shall be removed to avoid adverse environmental affects and/or potential hazards.

5. Recreational Values

There is an increasing expectation from the community that better recreational access to the river will be available at an increasing number of locations. Considerable improvements in recreational access and use of the river and its berms have been achieved through flood protection upgrade works, however, further opportunities will arise in future flood protection works and to ensure these opportunities are realised, the Operations Group will:

- Consider opportunities for improved recreational access in relation to all upgrade proposals;
- Ensure river access opportunities are considered in collaboration with District and City Councils, Fish and Game and landowners, and in relation to river enhancement initiatives;
- Avoid the use of concrete riprap at sites that have public access or that are readily visible from public roads or reserves.
- Ensure works do not permanently compromise legal access and public foot access that is generally available.

6. Consultation, Continuous Improvement and Reporting

6.1 Consultation and Notification Procedures

Consultation with Fish & Game Council, Department of Conservation and Environmental Compliance Manager Horizons Regional Council

Before the end of September each year, the Operations Group shall discuss its intended work programme for all scheme activities for the current financial year with the Regional Council's Environmental Compliance Manager, Fish and Game New Zealand (Wellington, Auckland or Taranaki Region, as appropriate) and Department of Conservation. In particular, the annual works programme shall identify:

- Sites of anticipated significant bed disturbance arising from the removal or movement of gravel or the clearance of vegetation;
- Channel realignment works with a linear length in excess of 20 metres; and
- The proposed location, duration and timing of these works.

The purpose of these discussions will be to inform stakeholders of scheduled significant works activities and to agree appropriate methods for reinstating ecological values where they are compromised.

Notification of significant works that become necessary following preparation of annual programmes shall be given, five days prior to works commencing, to the Regional Council's Environmental Compliance Manager, Fish and Game New Zealand (Wellington, Auckland or Taranaki Region, as appropriate) and Department of Conservation.

It is not practicable to monitor the effects of all river works. Nevertheless specific monitoring programmes, such as the ones already in place on the Makino and Oroua Rivers, will provide valuable information that will guide reviews of the Code of Practice. Information arising from monitoring programmes shall be the subject of regular consultation with affected stakeholders.

6.1.1 Consultation with Tangata Whenua

When operating on Maori land or near a marae or where iwi, marae or hapu take an active management interest, consultation will be undertaken with the appropriate tangata whenua. Consultation will be carried out through the existing forum of Liaison Committees, where that committee has an iwi representative. Alternatively, the iwi contacts database will be used to find the appropriate iwi contact. Consultation will normally clarify the process of notification prior to the commencement of works.

6.1.2 Consultation with / notification to Landowners

Landowners will either be consulted or notified when works are proposed on their property or on rivers adjoining their property, or when access is required through their property. Land entry agreements shall be completed where appropriate.

6.2 Continuous Improvement

The Operations Group is committed to a programme of continuous improvement with respect to its river works practices. To this end, the following measures shall be implemented.

6.2.1 Environmental Education

Staff in the Operations Group already have a thorough understanding of the environmental effects of their works. However, there are always opportunities to improve methodologies to further avoid or minimise any adverse effects from their work. The Operations Group undertake to enthusiastically trial any new methods that might practicably achieve its environmental pledge, and to regularly interact with those stakeholder groups that particularly represent environmental interests and can provide training where appropriate, eg. it is intended that the Group be trained to undertake its own habitat surveys.

Horizons Regional Council are promoting guidelines that set out responsible berm and stopbank grazing management practices for landowners. Uncontrolled grazing of a stopbank or river berm can cause significant damage, raising the risk of failure of the stopbank in a flood event, and lowering the water quality through sediment release from exposed banks.

6.2.2 Opportunities for Environmental Mitigation

Opportunities for environmental mitigation will be detailed in the scheme asset management plans. However, there may be opportunities for environmental mitigation during the works, such as appropriate revegetation of the stream margins, which will provide multiple benefits.

Rivers are corridors of riparian and aquatic habitat, along which animals and birds move between suitable or preferred areas. River works can improve this value through incorporating suitable species planting along the margins, enhancing instream habitat or by considering ecological linkages in scheme planning.

Works shall be planned and implemented so that adverse effects on ecological and recreational values are avoided, remedied or mitigated. The protection of wetlands, riparian margins, aquatic and terrestrial habitats documented in the One Plan and in Part Three of this Code of Practice will maintain the diversity of native species and communities of scheme areas. Due to their indigenous biodiversity value, native plants and animals must generally have higher conservation priority than introduced ones.

6.2.3 Review and Development of Best Practices

Staff of the Operations Group will continue to collaborate with their peers within HRC, in other regional councils, and with special interest groups to share information and experience in the ongoing development of best practices. Collaboration opportunities will include exchange visits and annual works programme consultation sessions.

6.2.4 Complaints Register

Each Operations Group Area Engineer shall maintain a register of all complaints relating to environmental effects of river and drainage works. Information to be recorded in the complaints register shall include, but not be limited to:

- Name and address of the complainant (if given);
- Name of contractor;
- The date and time the incident was detected;
- The location where the incident was detected;
- The likely cause of the incident detected; and
- The measures taken to respond to the incident, including any habitat rehabilitation.

The complaints register shall be available to Horizons Regional Council Compliance Staff upon request and shall be included in the respective Annual Scheme Reports.

6.2.5 Self Monitoring and Reporting

A process of self-monitoring will be implemented to ensure that works are carried out in accordance with the Code of Practice. Self-monitoring and reporting requirements for specific activities are included in the Good Practice Standards for the respective activities. Generic monitoring and reporting will include:

1. The Site Start Up form included in Part Four of this Code shall be completed for each activity at a site or group of sites. This form will show that the works supervisor has identified the environmental values for a site, and detail the methods that will be employed to avoid, mitigate or minimise potential adverse effects.

2. Submission of an annual works programme that will identify:
    - Sites of anticipated significant bed disturbance arising from the removal or movement of gravel or the clearance of vegetation;
    - Channel realignment works with a linear length in excess of 20 metres; and
    - The proposed location, duration and timing of these works.

3. Completion of the Works Completed Form included in Part Four of this Code for nominated sites and activities.

4. Inspections and works undertaken on scheme assets are recorded in the Asset Management System, with photographs, times, notes and GPS coordinates typically appended to the record.

5. Reporting on the Works Completed Form will be included in the Operations Group Annual Scheme Reports, providing a formal process of continuous improvement. The Operations Group Annual Scheme Reports also include:

   - works undertaken for the year including location and cost;
   - detailed reports on major works completed; and
   - asset management compliance.

6. Self improvement collaboration opportunities with other Regional Councils, which will include exchange visits, will be taken annually to test staff knowledge against their peers.

7. Operations will randomly select eight sites per year, two for the northern, southern, eastern and central areas respectively, for self monitoring of environmental compliance with the Code. Audits will be undertaken by an engineer who has no management responsibility for the scheme.

8. If a standard is impractical, staff will assess and document using a Non Practicable Standards Form (refer to Part Four, Form Two), the reasons why the activity should proceed. This form will be submitted to the scheme manager at the completion of the works and will form part of the annual scheme report.

9. Issues arising from self monitoring will be included in the annual scheme reports, and will feed continuous improvement initiatives.

10. Compliance with the Code of Practice shall be reported on in the three yearly reviews of the asset management plans, which are subject to external audit.

11. A formal review of the Code of Practice will be undertaken in conjunction with the One Plan review.

12. The length of the following works shall be recorded in the Annual Scheme Reports and any increase/decrease from previous years shall be noted:

    - Riparian vegetation (tied tree works, protection planting and erosion protection reserves)
    - Stopbanks
    - Drainage channels
    - Drainage channels cleaned

13. Aerial photography is obtained on the Rangitikei and Lower Manawatu river schemes, the frequency is dictated by changes in the river system rather than on a regular basis. Operations will notify Manager Science

and Manager Catchment Information when aerial photography has been taken. This information is available to stakeholders for analysis for potential environmental effects. Operations shall measure and report on any increase/decrease in fairway width at existing cross sections from these aerial photographs. The locations of cross sections are currently being determined to provide a historic record of cross sectional channel change.

7. Good Practice Standards

There are three levels of standards in this Code. If any of the applicable standards cannot be met, a resource consent shall be sought.

7.1 Generic Standards

Generic standards apply to all activities in all locations and are listed in Part One of this code. They constitute the environmental bottom line, by which all activities will be undertaken.

7.2 Activity Standards

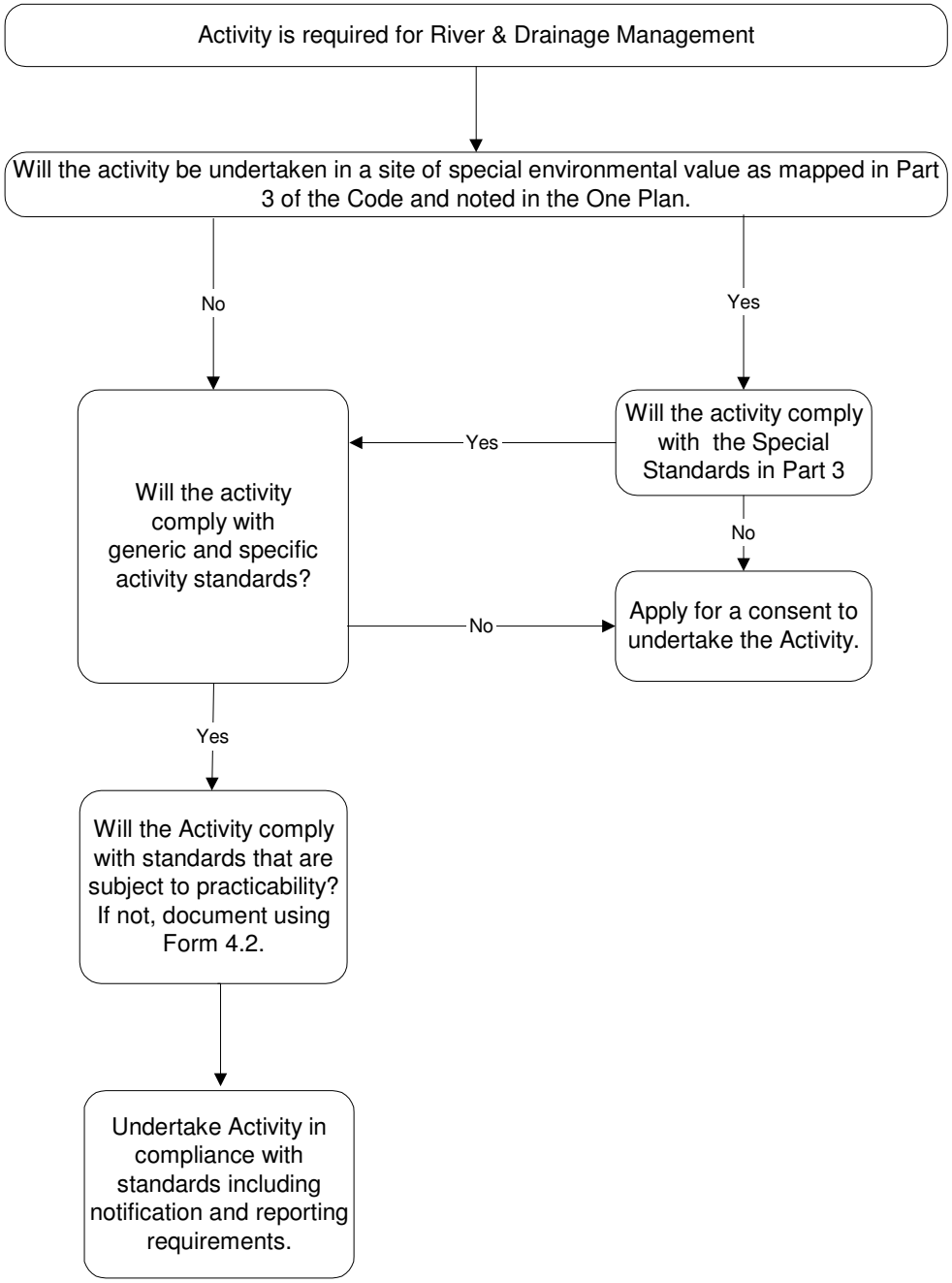
Activity standards apply to specific activities in all locations and are listed in Part Two of this code. They constitute the best methods to reduce or avoid the adverse effects from a specific activity.

7.3 Special Standards

Special standards apply to all activities undertaken in a specific location and are listed in Part Three of this code. They constitute the best methods to reduce or avoid the adverse effects of activities to protect the values of waterbodies defined in the One Plan.

The following flow chart sets out the procedure for determining the standards that will be used for a particular activity in a specific location.

7.4 Process for Determining Appropriate Standards



horizons
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PART ONE

Generic Standards for Good Practice

1. Generic Good Practice Standards

There are a number of Good Practice Standards that apply to all essential river and drainage works activities. These have been categorised under Planning, Management and Implementation.

1.1 Planning

Good planning will ensure that the timing of the activity will minimise the frequency and duration of habitat disturbance and the environmental impacts of the works.

The objective of planning will be that all activities that can be practicably completed in a particular construction season within a given reach of the river are undertaken concurrently.

A. All river and drainage works activities shall be planned and scheduled to take account of:

- The likelihood of suitable weather and river flow conditions.
- The spawning and migration seasons and locations of native and introduced fish.
- The nesting season and location of native birds.
- Recreational interests and amenity (including contact recreation).
- The need to minimise duration and frequency of activity.
- Farming and other activities on adjoining properties.
- The availability of suitable plant to undertake the works.
- Access into the work site.
- Safety on and around the work site.
- The impact of traffic, dust and noise on the environment.
- Consented Discharges that require a specified river flow to allow reasonable mixing.

B. River and drainage designs shall take into account:

- The need to maintain flood carrying capacity of the river/drain.
- The durability and robustness of works to minimise river intervention.
- The balance between effectiveness and affordability.
- Opportunities to enhance channel stability.
- The avoidance of navigation hazards.
- The maintenance of aesthetic values.
- Existing assets.

- The need to avoid river shortening, resulting from channel realignment.
- The need to maintain harmony with river processes and natural character by providing morphological diversity.
- Incorporation of recreational access and environmental enhancements where possible.
- The ability of the works to facilitate on going maintenance and to accommodate future engineering improvements.
- The need to maintain critical low flows.

C. All significant works in any one reach shall be planned and scheduled for completion in one operation, and repeated intervention shall be avoided.

1.2 Morphological Characteristics

The current number of pools and riffles in the following rivers will be **maintained** subject to the agreement below:

- Lower Kiwitea
- Mangatainoka
- Ohau
- Oroua (Pohangina/Oroua scheme)
- Pohangina
- Rangitikei
- Upper Manawatu
- Lower Manawatu

It is agreed that:

- This standard will only apply to the gravel-bed reaches of the above rivers.
- The number of pools and riffles , average active channel widths and average channel sinuosity's to be maintained will be established by counts and measurements on each of the above rivers', scheme works areas (as detailed in the Code's maps), to be carried out using aerial photography of suitable quality and scale, and will be completed by June 30, 2011. Counts, and measurements using the same method, will be repeated on each river every 3-5 years. Fish and Game and the Department of Conservation will be invited by the Scheme manager to assist with the pools and riffles counts.
- The reporting of the results will be to an appropriate reporting standard.
- In comparing pool counts channel widths, and sinuosity's, from different surveys, account will be taken of non-river management activities, such as other consented activities and floods.
- Where a decrease in pool count is attributable to river management activities, an immediate informal review of river management practices for the affected reach of that river will be undertaken, in consultation with Fish and Game and the Department of Conservation with the objective

of identifying and implementing changes that will redress the loss of pools and/or riffles and any reduction in active channel width and sinuosity. Also to be considered are implications of future river management practices.

Any '**significant shortage'** of pools and riffles, or 'significant decrease' in channel width and sinuosity identified in the surveys described above, will be specifically addressed in the subsequent Scheme review process.

'Significance' in this context will be where all three indicators of morphological change show a decreasing trend in their respective parameters.

It is agreed that:

- The pool/riffle counts obtained from the surveys described above will be expressed for each river in relation to the average channel width for that river
- A 'significant shortage' for any river will be judged against the ratio of the frequency with which a pool occurs to the average width of the bed, averaged across all rivers. For the avoidance of doubt, refer to the following example:
    - Length of river managed by the Scheme is 20km;
    - The number of pools counted from the aerial photography is 200, which means that there is one pool per 100 m;
    - The bed width is measured at regular intervals from the aerial photography, producing say, an average bed width for the river of 50 m. Therefore there is one pool every two times the average bed width.
- Where a 'significant shortage' is identified, then that will be included as a specific issue to be addressed in the next scheduled engineering review of the scheme concerned. Where the shortage or decrease in the morphological characteristics is serious, a formal engineering review will be considered where these cannot be rectified under the "immediate informal review".
- The engineering review will consider alternative management practices with the express objective of redressing the shortage or decrease and reinstating pools and/or riffles, and active channel width and channel sinuosity.
- Fish and Game and the Department of Conservation will be identified as a key stakeholders in the review consultation process.
- The active channel width is defined as the distance, perpendicular to the flow, between lines of permanent vegetation on either side of the river. The average width will be calculated from a minimum of 30 randomly selected measurements over the scheme works area.
- Channel sinuosity is defined as the ratio of the linear length of the thalweg line divided by the straight line distance over a given reach within the scheme works area. The number and length of reaches to be measured will vary and will be identified in consultation with Fish and Game and the Department of Conservation.

1.3 Management

All river and drainage works shall be supervised by a suitably qualified or experienced Horizons Regional Council river/drainage engineering practitioner as determined by the Area Engineer Operations or Group Manager Operations. The supervising engineer shall be responsible for ensuring the standards in this Code of Practice are complied with.

1.4 Implementation

The chosen methodology for the activity, including machinery used, shall minimise as far a practicable any potential adverse environmental effects.

1.4.1 Assessing Practicability

Some standards are subject to practicability, for instance the standard may state that the machine operating area shall be bunded off where practicable. In this case, the standard has taken into account that in certain circumstances, such as high river flows, the environmental effects of constructing, maintaining and removing a temporary bund may be greater than undertaking the activity itself. The following factors will be taken into account when deciding if complying with the standard is practicable:

1. Increased environmental impacts: The methodology proposed in the code of practice may increase the environmental impact of the activity in certain locations, eg. bunding around an activity may release more sediment than undertaking the activity itself.

2. Timing: The conditions assume that the activity is undertaken during favourable weather conditions. Adverse weather conditions may compromise the mitigation methodology, eg. revegetation.

3. Safety constraints: The site may have particular physical constraints that will compromise the condition, eg. there may be insufficient space to safely operate machinery.

4. Cost constraints: The cost of providing the mitigation makes the activity unviable.

5. Frequency and Extent: The standard may increase the extent or the frequency, and therefore the environmental impact, of the activity.

6. Critical Activity: The activity must be undertaken immediately to address a major infrastructural vulnerability, in order to prevent significant river works at a later date, eg. such as undermining of a bridge, pumpstation or stopbank.

7. Environmental Consequences: Assess whether the activity can proceed if the mitigation measures are not practicable. Assess the environmental consequences of not undertaking the mitigation measures, due to issues of practicability, and justify why the activity should still be undertaken.

If one of the above is deemed to be a reason why a condition is impractical, an assessment will be documented using a Non Practicable Standards From (refer to Part Four, Form Two), and will specify the reasons why the activity

should still proceed. This form will be submitted to the Scheme Manager and Manager Environmental Compliance for their information at the completion of the works and will form part of the annual scheme report.

1.4.2 Generic Standards

1. Only contractors approved through the annual Plant Hire Register or through the formal contractor tendering process, and with a track record of using well maintained machinery, shall be engaged in river and drainage works.

2. Machinery shall be kept out of water to the extent possible. Where this is unavoidable all measures shall be taken to minimise bed disturbance and release of sediment (eg. use only one crossing point typically upstream of riffles, sediment control or minimisation measures).

3. Appropriate machinery shall be used to ensure effective and efficient operations with minimal environmental impact.

4. Machine refuelling and fuel storage shall occur where no fuel can enter a waterbody in the event of a spillage.

5. All machinery, equipment and material shall be stored above the anticipated flood level at the end of working day or when the site is unattended.

6. Machinery leaking fuel, lubricants, hydraulic fluids or solvents shall not work within a waterbody.

7. On completion of activity or in the event of anticipated extended suspension of works, all disturbed areas and access tracks, including public and recreational points, that have the potential to release sediment to water shall be reinstated.

8. All spray and fuel containers shall be safely disposed of at an authorised landfill site or re-used.

9. On the completion of works all surplus vegetative material shall be either removed from the site or disposed of either by burying or burning as soon as material and weather conditions allow.

10. Burning on public land shall be supervised at all times and fire control equipment shall be available at the site.

11. On the completion of works all surplus construction material shall be removed from the site.

12. Debris that have the potential to increase the risk of flooding or erosion will be cleared as soon as conditions allow and if possible in conjunction with programmed activities, to minimise the frequency of river intervention.

13. On completion of the works all surplus excavated bed material shall be spread evenly leaving beaches well shaped and tapering uniformly from the water's edge to the riverbank.

14. All stock animals shall be excluded from works area until vegetation is well established.

15. Fish passage shall be maintained in rivers at all flows during the execution of in-channel works.

16. Risk management procedures shall be in place on all work sites to minimise the potential for damage arising from inclement weather/elevated river levels during the course of work.

17. In case of flood or other emergency while works are underway, matters such as resilience and the consequences of failure of the partially completed works, access to the site, notification of appropriate personnel, security of vehicles, gear and equipment, shall be considered and actions taken as appropriate.

18. All works shall be undertaken in accordance with approved Hazard Management Plans and relevant Codes of Practice (eg. Traffic Management Plans, Tree Works Code of Practice).

19. Where the activity poses, or is likely to pose a risk to the public, the contractor shall erect warning signs adjacent to the site. These signs will be removed when the activities on the site are no longer a danger to the public.

20. Activities shall not use any material that has a significant ecological effect on the environment.

21. Activities shall comply with the New Zealand Electrical Code of Practice for Electrical Safe Distance NZECP 34:2001.

22. Trees and vegetation planted shall comply with the Electricity (Hazards from Trees) Regulations 2003.

23. Machinery and plant shall maintain a minimum clearance distance of 4 metres from the transmission line conductors at all times.

24. The objectionable effect from the deposition of dust on neighbouring properties when undertaking activities shall be minimised by water spraying.

25. Concrete shall only be poured in a bunded area to prevent cement entering the watercourse.

26. Activities will comply with Horizons Regional Council current Didymo action plan.

27. In the event that human remains or artefacts are uncovered during any river and drainage activity, works shall cease immediately and Horizons Regional Council Environmental Compliance Manager and the relevant iwi as noted it the council database will be informed and will subsequently advise when the activity may recommence.

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PART TWO

Good Practice Standards for Activities

1. Bank Shaping

Activity

The purpose of this activity is to prevent lateral erosion through the regrading of over-steep banks and the establishment of protective ground cover.

The natural process of bank erosion creates small vertical "cliffs" along the stream or drain banks that will undermine banks and contribute to more rapid erosion.

Protective ground cover can be more readily established on battered banks. Geotextiles are occasionally used and are placed to manufacturers' standards and planting is undertaken to a prepared planting plan for the site in accordance with the tree planting activity standards.

This activity involves minor earthworks to shape the bank to create an appropriate alignment and batter shape.

Resource Management Act 1991

These works are covered under s.9 (use of land) and s.13 (structures in the bed of a river) RMA.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Sediment discharged during high flow events is reduced.
- Stable channel alignment is maintained.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Opportunities for upper bank and bank toe (depending on materials used) habitat enhancement such as riparian planting.
- Visual enhancement of the riverbank.
- Establishment of vegetative corridor.

Potential adverse effects

- Bank material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Temporary loss of amenity – dust/noise impact during construction.

- Short term increased erosion potential prior to vegetation reestablishment.
- Temporary disruption of vegetated banks.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.
2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.
3. The bank shall be excavated to a grade appropriate to the soil conditions to minimise the need for additional intervention and to facilitate planting.
4. Geotextile layers shall be used where necessary to hold soil in place and reduce erosion and silt-laden run-off.
5. Bank battering shall be appropriately transitioned into upstream and downstream bank alignment and slopes.
6. All exposed areas that have the potential to release sediment shall be revegetated as soon as practicable following shaping.
7. Bank shaping shall only be undertaken above the water line and machinery shall only operate from on top of the bank.
8. Alignment should be on a curvature that fits the natural meander curvature of the river channel.

2. Beach Raking

Activity

The purpose of this activity is to enhance the mobility of the bed with the objective of maintaining flood carrying capacity and reducing lateral erosion.

This activity is conducted outside the wetted perimeter and typically involves the use of large wheeled or tracked machinery pulling tines. The objective is to loosen the top layer of gravel, which tends to have an armouring effect, and to encourage the movement of gravel through the system. Control of light vegetation, such as lupin, broom and gorse is included in this activity. Beach raking is designed to simulate the processes a river bed experiences in a major flood event.

Beach raking can also be used to control lateral erosion of the riverbanks, while at the same time encouraging a degree of natural bedload movement through the river system during flood conditions, with minimal adverse effects. The desired result is to have the bedload moving at a managed flow down the river channel and not aggrading in particular areas and forming exceptionally high beaches, which force water flow against adjacent riverbanks and aggravate erosion problems.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance of a riverbed), and s.15 RMA (potential discharge of sediment or vegetation into water).

Potential beneficial effects

- Channel capacity is increased and flood levels lowered.
- Some bird nesting habitat is enhanced by removal of beach vegetation.
- Stable channel alignment is maintained.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Beach build-up is managed and lateral erosion is arrested – adjoining property and infrastructure is protected.
- Sediment discharge during high flow events is reduced.
- Creation of a mobile, open gravel matrix that is beneficial for some fish habitat.

Potential adverse effects

- Beach material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Temporary loss of amenity – dust/noise impact during construction.

- Gravel beaches disturbed – bird nesting disrupted.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Machinery used for beach management shall not enter the active flowing river channel other than to gain access to the beach being raked.

4. Raking activity shall not be undertaken in flowing water.

5. Raking activity shall not be undertaken within 100 metres of a consented water intake without prior approval of the owner of the intake.

3. Gravel Extraction

Activity

The purpose of this activity is to maintain the flood carrying capacity of the channel and maintain the effectiveness of lateral erosion protection works by removing localised gravel build-ups that confine and direct the river channel.

Relatively small quantities of gravel extracted above the water level and not covered by a global consent will be undertaken under the standards set out below.

Gravel excavated below the water level will be carried out under a global consent that will generally dictate annual and long term extraction quantities, specific locations and conditions specific to a particular river.

In all instances gravel extractions are approved in terms of sites and quantities by a suitably qualified or experienced engineer.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance of a riverbed), and s.15 RMA (potential discharge of sediment or vegetation into water).

Potential beneficial effects

- Channel capacity increased, flood levels lowered, concentration of flow against riverbanks and resultant lateral erosion avoided, localised bed scour avoided.
- Stable channel alignment and optimum bed level is maintained.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Open gravel beaches can provide good habitat for some birds.

Potential adverse effects

- Gravel beaches disturbed – bird nesting disrupted.
- Accidental discharge of fuels and lubricants from machinery.
- Disturbance of the natural meander pattern.
- Overall degradation of the river bed to realise localised river management benefits.
- Bed material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Temporary reduction in recreation access.
- Mauri of the river affected.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. On completion of the works, the beach shall be left well shaped, tapering uniformly from the water's edge to the riverbank.

4. On the completion of works, all surplus material, including vegetation, debris and excavated gravel shall be removed from the site and not stockpiled within the flood channel.

5. The Scheme Manager shall keep records for the financial year of the quantity and location of all gravel removed from above the water level, which shall be submitted to Regional Council's Environmental Compliance Manager by 31 December.

6. The excavation site shall be rehabilitated so that it complements the existing landscape, aesthetic and amenity values of the surrounding area.

7. Where crossing of the river to access the site is unavoidable, a single crossing point shall be established, typically upstream of a riffle, to access the site.

8. Gravel shall only be excavated from dry gravel beaches and shall not reduce the gravel beach to less than 0.3 metres above the water level in the adjoining river at the time the excavation is being carried out.

9. Gravel extraction from the beach shall be undertaken in such a way that there will be no sediment released into the watercourse for the duration of the activity unless:

   - it is sediment released from vehicles accessing the site; or
   - as a result of natural fluctuations in water levels that may occur during the work period.

10. Excavation shall be in strips not exceeding 3 metres in width aligned parallel to the main flow of the river.

11. Machinery used to excavate gravel shall not operate on the parts of the riverbed that are covered by water.

12. Where gravel is to be extracted and the width of the channel is less than 25 metres in the vicinity of any part of that beach, no more than 1,000 cubic metres from any gravel beach, and no more than 3,000 cubic metres for the entire river shall be excavated when the quantity is aggregated with the gravel excavated during the previous 12 months.

13. Where gravel is to be extracted and the width of the channel is equal to or greater than 25 metres in the vicinity of any part of that beach, no more than 2,500 cubic metres from any gravel beach, and no more than 7,500 cubic metres for the entire river shall be excavated when the

quantity is aggregated with the gravel excavated during the previous 12 months.

4. Gravel Management

Includes Channel Realignment and Diversions

Activity

The purpose of this activity is to achieve improved channel alignment by repositioning gravel within the channel.

The activity involves work in the bed of the stream to:

- achieve a natural meander pattern, ie. one that is harmonious with natural processes; and
- maintain design channel capacity and mitigate lateral erosion.

Also included in this activity are the minor channel widening and diversions that are often required in conjunction with erosion protection work. This involves pulling back beaches that have migrated towards an eroding bank. The effect of the minor channel widening and diversion work is that pressure is kept off the eroding bank to allow protection works and vegetation to establish.

This activity would be limited to diversions less than seven times the width of the channel and a lateral offset three times the width of the channel. The activity is not to permanently shorten the channel or to cut off meanders.

Diversions or cut offs would usually be commenced at the downstream end. Gravel is moved within the channel by excavation machinery sited on the riverbank or in the waterway. The works would be of short duration, typically less than two (2) days work in water at any site.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance of a riverbed), and s.15 RMA (potential discharge of sediment or vegetation into water).

Potential beneficial effects

- Channel capacity maintained or increased, flood levels lowered, flow deflection and resultant lateral erosion avoided, localised bed scour reduced.
- Stable channel alignment and meander pattern, bed level is maintained.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Associated vegetation removal can provide good habitat for some birds.
- Stable channel alignment is maintained enhancing river bed habitat, for trout spawning.
- Lateral erosion is arrested – adjoining property and infrastructure is protected.

- Sediment discharge during high flow events is reduced.
- The open gravel matrix left is beneficial for fish and encourages migration of mobile gravel bars.

Potential adverse effects

- Bed material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.
- Gravel beaches disturbed – bird nesting disrupted.
- Accidental discharge of fuels and lubricants from machinery.
- Short term disturbance of pool-run-riffle sequence.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. The activity shall be undertaken so as to minimise bed disturbance and the release of sediment. Bunds shall be constructed where practicable to separate works from flowing water. Realigned channels alignment will be on a curvature that fits the natural meander curvature of the channel.

4. Bed material shall not be bulldozed across any actively flowing channel. Bed material shall be picked up and moved across an actively flowing channel through the use of a digger, front-end loader, motor scraper or other similar machinery.

5. Gravel movement on beaches shall be in strips not exceeding 3 metres in width aligned parallel to the main flow of the river, commencing from the downstream end of the work area and moving upstream.

6. On completion of the works, the beach shall be left well shaped, tapering uniformly from the water's edge to the riverbank.

7. The number of pools in any reach to be disturbed shall be recorded before work commences. On completion of works, there shall be no reduction in the total number of pools or pool-run-riffle sequences within that reach.

8. The activity includes temporary diversions that would be, at any one time, limited to a length of less than seven times the bed width and a lateral offset of three times the bed width.

5. Channel Clearance

Activity

The purpose of this activity is to maintain clear channels for the efficient conveyance of flood flows; to prevent flow irregularities that could cause erosion; and to remove hazards to recreational users.

The activity typically involves the clearance of vegetation and debris from within the wetted channel, gravel beaches, riverbanks, bridges, and erosion protection structures (such as logs, cars, rubbish and other material of a similar nature). Vegetation is controlled on existing assets through the application of herbicides on the riverbanks and immediate berm areas of the channel. There is also an added purpose of eradicating undesirable plant pests, which are listed in part five of this code.

Application of the chemical herbicide is either by spray gun or boom. This activity is normally carried out on an annual basis, and is most likely to be carried out in either the autumn or spring when vegetation is most receptive to chemical ingestion.

The clearance of vegetation and debris from within the wetted channel invariably involves the operation of machinery within, and the disturbance of, the bed of the river.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance of a riverbed), s.15 RMA (potential discharge of sediment or vegetation into water and discharge of contaminant onto land where it may enter water).

Potential beneficial effects

- Obstructions to flow are removed – Channel capacity increased, flood levels lowered, flow deflection and resultant lateral erosion avoided, localised bed scour avoided.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Gravel beaches are maintained clear of vegetation - natural meander migration and pool/riffle development facilitated.
- Hazards to recreational users are removed.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Removal of undesirable plant species – improved habitat for native species.
- The removal of vegetation has benefits for birds nesting on gravel beaches.

- Prevents the deterioration of bank protection assets through the unwanted growth of vegetation.
- Vegetation removal promotes the natural movement of gravel and minimises the uncontrolled build-up of sediment.

Potential adverse effects

- Spraying may be non-selective – desirable plant species may be eliminated.
- Deterioration of water quality as a consequence of decomposing weed (reduction in dissolved oxygen, increase of pH levels).
- Loss of vegetation as a habitat for aquatic life
- Deterioration of water quality as a consequence of the removal of vegetation that strip nutrients from surface run-off.
- Accidental discharge of herbicides.
- Bed material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.
- Gravel beaches disturbed – bird nesting disrupted.
- Accidental discharge of fuels and lubricants from machinery.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Spraying shall not be carried out within any Rare or Threatened Habitat or At Risk Habitat as defined in the One Plan, except for the purposes of plant pest control.

4. Spraying shall be undertaken in accordance with all mandatory requirements set out in the "NZS 8409:2004 Management of Agrichemicals".

5. Notification of spraying activities to be undertaken on public land shall be in local newspapers before the end of September each year for activities planned for the following 12 months.

6. Notification by letter shall be given before the end of September each year, to every holder of a resource consent for the taking of water for public or domestic water supply purposes, within 1 km downstream of spraying activities planned for the following 12 months.

7. A single crossing point, typically upstream of a riffle, shall be used where a river channel must be crossed to remove a channel obstruction.

8. A vegetated buffer strip shall be retained immediately adjacent to the waterbody where practicable, to reduce the potential for sediment discharge into the watercourse.

9. Spraying shall not be undertaken in weather conditions that will reduce the effectiveness of the chemical or that will increase the risk of spray drift onto non-target areas.

10. All operations shall be carried out by herbicide applicators who hold the appropriate Growsafe Certificate or equivalent qualification.

11. The mixing of sprays shall not be carried out where contaminants could enter a waterbody in the event of a spillage.

12. Spraying the same riverbank shall not occur more than twice within any calendar year.

13. Spraying shall use an adjuvant (such as surfactant, wetter, sticker or filler) to reduce spray drift and enhance effectiveness of herbicide.

14. All spray containers shall be safely disposed of at an authorised landfill site or re-used.

15. There shall be no removal of instream woody debris unless this is required to reduce the risk of flooding or erosion or to remove a hazard to recreational use.

6. Lateral Walls

Activity

The purpose of this activity is to prevent lateral erosion by the placement of rigid structures along the lower section of riverbanks. Lateral walls are often used where there is insufficient space to place rock or concrete rubble and where live edge protection works will not give the desired level of protection to the bank. These structures will be designed by a suitably qualified or experienced engineer. Considerations in the choice of lateral wall type include cost benefit, minimising the disruption to the environment, aesthetic and recreational impacts, practical construction constraints and future maintenance.

Timber Walls

Timber walls are designed to provide lateral erosion protection, and may include rock riprap at the toe and extremities, and a variety of 'upper bank' treatments.

This activity typically involves earthworks to shape the bank to create an appropriate alignment and batter slope. A toe trench is excavated in the stream bed into which timber posts, railway irons or similar supports are driven. Supports are typically tied back to an anchor. Horizontal boards are fixed to the supports and backfilled between the wall and the stream bank with gravel or other suitable material. Rock is often placed on the river side toe of the lateral wall to protect against under scour and loss of backfill.

Concrete Walls

Concrete walls provide lateral erosion protection, and may be constructed using pre-cast panels, poured in situ structures, or specialist pre-cast blocks such as Mass Blocs. Concrete block walls may incorporate additional soil stabilisation works such as synthetic geogrids.

This activity typically involves earthworks to shape the bank to create an appropriate alignment and batter shape. For concrete block construction, a toe trench is excavated in the stream bed which is either compacted or a concrete pad established to provide a solid foundation for the wall. If poured concrete is used in the works a small bund will be constructed to prevent cement entering into the water. The blocks are placed on top of one another and backfilled between the wall and the stream bank with gravel or other suitable fill material compacted in thin layers to achieve specific designed criteria.

Sheet Piling Walls

Interlocking sheet piles are driven into the bed of the river along the bank to provide erosion protection.

These walls are expensive and aesthetically undesirable and are not commonly used by the Operations Group. There may however be specific site conditions which dictate their use.

Either a crane or large excavator fitted with a driving dolly is used to drive the sheet piling deep into the riverbed to prevent undermining. This type of work requires detailed design both for horizontal and vertical alignment profiles. Once the sheetpiling is established it would normally be backfilled and capped in some manner.

Gabion Baskets

Gabion baskets are wire mesh units filled with graded rock for placement along the bank toe to provide erosion protection. Gabion baskets are not used extensively on account of relatively high cost, limited life and questionable aesthetics.

This activity typically involves earthworks to shape the bank to create an appropriate alignment and batter shape. A toe trench is excavated in the stream bed into which the gabion baskets are founded. Completed structures are typically backfilled and a variety of upper-bank treatments may be added.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected, hazards to recreational users avoided.
- Sediment discharged during high flow events is reduced.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Stable channel alignment is maintained enhancing river bed habitat.
- Opportunities for upper bank and bank toe (depending on materials used) habitat enhancement, such as riparian planting.
- Gravel beaches are maintained clear of vegetation – natural meander migration and pool/riffle development facilitated.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Robust structures – durability results in reduced intervention.

Potential adverse effects

- Bed/bank material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.

- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access.
- Loss of habitat against smooth bank lining.
- Temporary loss of amenity – dust/noise impact during construction.
- Bankside water velocity may increase which can impede habitat utilisation by fish.
- Aesthetic appeal and natural character can be reduced.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Gabion baskets shall be manufactured from proven durable proprietary products.

4. 'Hard' lateral walls shall only be used where specific site conditions or constraints preclude the use of 'softer measures' or where close proximity of buildings or infrastructure dictates a high protection standard.

5. Material selection and design detail shall take account of aesthetic and habitat values.

6. A primary design consideration shall be to achieve a high structural standard such that future maintenance and associated channel disturbance is minimised.

7. Specific design shall take particular account of transition effects both upstream and downstream of the structure.

8. The height of the wall shall be no greater than is necessary to ensure structural integrity. Softer upper-bank treatments shall be incorporated in the design and may include battering back and planting, or using a soil retaining textile and planting small shrub species that will cascade over and eventually cover sections of the structure.

9. Foundation excavation will typically necessitate operation of machinery within the watercourse. Where practicable, the machinery operation area shall be bunded off from the stream flow to minimise sediment discharge.

10. Health and safety issues in relation to height will be considered.

11. Lateral walls shall be designed by an appropriately qualified design engineer.

12. Alignment will be on a curvature that fits the natural meander curvature of the channel.

7. Concrete Rip Rap

Activity

The purpose of this activity is to provide protection against lateral erosion through the placement of concrete rubble, usually sourced from demolition sites, directly against the lower section of a riverbank. Concrete rip rap has been commonly used in the past as a less costly alternative to rock linings in situations where softer erosion protection measures are not effective. However aesthetic considerations have dictated some restrictions on the use of demolition concrete in recent years. Concrete rip rap does not in general provide protection that is as effective as rock rip rap on account of the difficulty of achieving an appropriate grading of particle sizes.

Nevertheless, properly constructed rubble rip rap linings can provide cost effective erosion protection. The rubble is able to settle as the channel bed degrades. The rubble rip rap also provides immediate protection compared to vegetation based protection measures that take time to establish. Maintenance will include ongoing topping up of the concrete rubble as it settles, debris clearance and vegetation control.

This activity involves minor earthworks to shape the bank to create an appropriate alignment and batter slope. A toe trench is excavated in the stream bed into which the concrete rubble is founded and then additional concrete rubble is carefully placed along the bank until the design height is achieved. Concrete rubble is usually stockpiled adjacent to the site prior to and during the works. Reinstatement of the stockpile site will be undertaken as part of this activity.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected, hazards to recreational users avoided.
- Sediment discharged during high flow events is reduced.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Opportunities for upper bank and bank toe (depending on materials used) habitat enhancement such as riparian planting.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Generally robust structures – durability results in reduced intervention.

Potential adverse effects

- Bed/bank material is disturbed – Short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access or pose safety issues.
- Can impact on natural character and aesthetic values.
- Long term stability cannot always be assured – particles may wash downstream.
- Temporary loss of amenity – dust/noise impact during construction

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Concrete rip rap linings shall generally be used only in situations where alternative 'softer' measures will not provide an appropriate standard of protection, or where immediate protection is required and rock is not reasonably available, or as a backfill or foundation to rock linings.

4. Concrete rip rap linings shall not be constructed in locations that are utilised for or are readily accessible for recreational purposes or are readily visible from public roads or reserves, except as a temporary emergency protection measure that will be replaced by an appropriate protection structure as soon as practicable. Site specific details will be logged on the Practicable Form.

5. Concrete rip rap material used shall be clean, stable material, not readily broken down, and free of protruding steel, soil, mud, clay, contaminants, or any soluble material.

6. Any demolition material having exposed reinforcing steel shall be separated at the demolition site and not carted to stockpile at a river works site.

7. The size of individual rubble particles shall be such that they are able to be placed to produce an interlocking rip rap lining having uniform cross section and profile without projections greater than 1 metre. No individual piece of rip rap shall be less than 0.025 cubic metre.

8. All rip rap linings shall be designed by a suitably qualified or experienced engineer. Particular attention shall be given to batter slope, founding depth, rip rap size, and alignment and transitional measures.

9. The height of rip rap linings shall be no greater than is necessary to ensure structural integrity. Softer upper-bank treatments shall be incorporated in the design and may include battering back and planting,

or using a soil retaining textile and planting small shrub species that will cascade over and eventually cover sections of the structure.

10. In designing rip rap linings, consideration shall be given to incorporating enhanced recreational access to the river.

11. Concrete rip rap design shall include future maintenance requirements and frequency. Note: Linings can settle as a result of post-construction toe scour and 'topping up' may be required. Clear access to the top of the lining is required for that purpose.

12. Concrete rip rap shall be carefully placed and interlocked to minimise the potential for subsequent dislodgment of smaller concrete particles. Any particles capable of being displaced by river flow, eg. large thin slabs or particles shall be placed deep in the lining and well covered to prevent displacement.

13. Batter preparation, foundation excavation and rock placement shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the watercourse, measures shall be taken to minimise temporary adverse effects such as temporary diversions, bunding off sections of the work and temporary causeways to elevate machinery above the water surface.

14. Excavation and placement operations shall be planned over one continuous works sequence to restrict the timing and frequency of river disturbance. This will include but not be limited to planning to stockpile a large proportion of required material at the site prior to the commencement of works.

15. In selecting stockpile sites and access to them, consideration shall be given to minimising aesthetic, recreational and environmental impacts, eg. dust.

16. On completion of placement, silt material locally sourced shall be placed over the upper bank section of rip rap, appropriate vegetation established and 'topping-up' material left in a tidy appropriately sited stockpile.

17. Alignment will be on a curvature that fits the natural meander curvature of the channel.

8. Culverts

Activity

The purpose of this activity is to provide for permanent access across drains and natural watercourses, without either obstructing water flows or impeding fish passage, by the installation of culvert structures. Floodgated culverts are excluded from this activity.

Installation, maintenance and replacement of culverts would typically involve localised excavation, foundation works, installation of pre-cast concrete units and the construction of headwall structures in the watercourse. Bed armouring is often constructed to reduce the risk of scour at culvert outlets.

The activity would typically involve machinery working adjacent to the watercourse, and temporary damming and diversion of the watercourse. Any pouring of concrete would be carried out in the dry bunded area.

Resource Management Act 1991

These works are covered under s.13 RMA, disturbance and placement of a structure on the bed of a river.

Potential beneficial effects

- Prevents stock and vehicles from disturbing the bed of the channel when crossing, thereby preventing sediment and pollutants from being released into the waterway.
- Properly designed culverts will have no impact on the movement of fish upstream and may improve upstream fish access if properly constructed and maintained.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access or pose safety issues, eg. navigation.
- Temporary loss of amenity – dust/noise impact during construction.
- May cause local flooding upstream of the culvert due to the culvert restricting the flow of water or debris accumulating at culvert inlets.
- Temporary loss of fish passage during construction and long term loss of fish passage in a poorly designed or maintained culvert.
- Discharge of contaminants such as concrete during the construction of the headwalls.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Culvert installation shall be designed by suitably qualified or experienced engineering staff.

4. Matters to be considered in the design shall include:

    - Flow capacity in accordance with scheme design parameters – a conservative design is preferable.
    - Culvert length – shall be no less than the average channel width at the top of the channel and no more than 20m in length.
    - Ability to pass debris, eg. single barrel is preferable.
    - Culvert gradient – shall match the channel bed gradient.
    - Culvert invert – shall be no less than 50 mm below bed invert.
    - Inlet and outlet headwalls – shall ensure integrity of the culvert and also facilitate smooth flow transition from open channel to structure and structure to open channel.
    - Provision of an overflow spillway section with appropriate armouring.

5. Bed armouring shall be placed to the design engineers specification to prevent channel scour at the culvert outlet, potential risk of structural failure and maintain fish passage. Only clean rock or concrete rubble shall be used for this purpose.

6. Stream or drainage channel flows shall be temporarily dammed or diverted away from the site for the duration of culvert construction where practicable. Where this is not possible, the work shall be planned to ensure that the duration of in-flow works activity is kept to a minimum.

7. All culverts shall be installed with respect to bedding, cover and compaction to either the manufacture's or the design engineer's specification.

8. All new designs shall provide for fish passage.

9. Detention Dam Maintenance

Activity

The purpose of this activity is to maintain the structural integrity of the detention dam to design specifications. The activity primarily involves the clearance of accumulated sediment and the shaping of the ponding area to restore the dam to its original design capacity. Also includes repair of erosion sometimes involving reforming of dam batters.

The activity involves the excavation of material from a dry ponding area using a hydraulic excavator.

Material removed from the dam is disposed of in a manner that ensures it neither re-enters the channel nor impedes surface drainage.

The locations of the detention dams maintained by Horizons Regional Council are included in Part Three of this code.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Adjoining property and infrastructure is protected from flooding.
- Peak flows are controlled to prevent scour and erosion downstream.

Potential adverse effects

- Accidental discharge of fuels and lubricants from machinery.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.
2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.
3. Excavated material shall be placed so that it does not re-enter the dam ponding area.
4. The design profile of the dam shall be maintained.
5. The site shall be monitored for post-excavation problems such as slump erosion.
6. Dam sides shall not be steepened nor undercut.

7. Spillways and inlet structures shall be maintained free of debris and obstructions to flows.

8. Disturbed ground shall be re-vegetated as soon as possible.

10. Drainage Channels/Modified Streams: Mechanical Cleaning

Activity

The purpose of this activity is to maintain effective drainage through the mechanical removal of weed and other materials that may reduce drainage channel efficiency or capacity. The activity primarily involves the clearance of vegetation and the eradication of undesirable plant pests, which are listed in part five of this code, which cannot be controlled through the application of herbicides. However, the removal of accumulated sediment and the shaping of drain banks is occasionally undertaken in order to restore drains to their original design capacity.

The activity involves the excavation of material from the drain using a hydraulic excavator with a cleaning bucket. A slotted, self-draining weed-cleaning bucket is normally used, although a solid bucket is used occasionally, particularly where accumulated sediment is to be removed from the bottom of the drain.

The excavator typically operates from one bank when cleaning a drain, although at times it may work from both banks for wider channels.

Material removed from the drain is disposed of in a manner that ensures it neither re-enters the channel nor impedes surface drainage.

Most drains are mechanically cleared at least once every five years, although some on the coastal sand country are more typically cleared once every 10 years. In drains subject to high silt or weed load and blockages, annual or even more frequent mechanical clearance may be necessary.

Resource Management Act 1991

There is potential for these works to be subject to s.15 RMA (discharge of potential contaminant into water). The works are carried out under the Land Drainage Act 1908, and the drains are not defined as rivers under the Resource Management Act 1991. However, there may be some situations where drain cleaning may require resource consent pursuant to s.15 discharge of contaminant (sediment) to water, in respect of the discharge at the outlet of the drainage system into a stream or modified watercourse. However, generally, the drainage areas where mechanical de-silting is undertaken are relatively closed systems, with little apparent discharge of contaminants into specific waterbodies.

Potential beneficial effects

- Maintenance of clear waterway – improved oxygen levels, improved drainage and flood carrying capacity, improved fish passage, and control of plant pests.
- Effective land drainage – improved productivity, diversification of land use, community well-being and safety.

- Removal of undesirable plant species – improved habitat for native species.
- Channel condition and stability are maintained.

Potential adverse effects

- Mechanical clearance is non-selective – desirable plant species may be eliminated.
- Short term deterioration of water quality from sediment release.
- Loss of cover and spawning vegetation for native fish and invertebrates.
- Deterioration of water quality as a consequence of the removal of vegetation that strip nutrients from surface run-off.
- Accidental discharge of fuels and lubricants from machinery.
- Short term adverse visual and odour impacts (silt and weed tailings).
- Removal of food source for bottom-living invertebrates.
- Accidental fish kill (removed from waterbody).
- Release of nutrients trapped within the sediment – downstream effect on water quality.
- Over draining of productive land, wetlands and swamps.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. All tailings shall be placed clear of the drainage channel to ensure that they do not re-enter the drain.

4. All drain clearing machinery shall be thoroughly cleaned of weed and silts before leaving any work site, in order to minimise the risk of spreading undesirable aquatic weeds.

5. Special care shall be taken to minimise disturbance to the bed of the drain during the mechanical removal of vegetation. The design profile of the channel shall be maintained. Note: In tidal areas, the grassed banks of the drains that flood at spring tide are important areas for fish spawning, and care shall be taken to preserve these sites during the works.

6. Shade shall be retained over the channel to help reduce weed growth where practicable.

7. The frequency of mechanical clearing of drains shall be no more than is needed to maintain design flows and water levels as determined by the scheme's asset management plan.

8. The mechanical cleaning of drains upstream or downstream of native fish habitats identified in the One Plan Schedule D, shall be scheduled to avoid fish spawning and to minimise impacts on fish migration.

9. Cleaned drains shall retain small imperfections on the bed to provide some habitat diversity while not compromising the hydraulic efficiency of the channel.

10. Drains shall be monitored for post-excavation problems such as stream bank and slump erosion.

11. Drain clearance will not affect the natural character or water level of any Site of Significance – Aquatic identified in the One Plan Schedule D.

11. Drainage Channels/Modified Streams: Weed Control by Herbicide Application

Activity

The purpose of this activity is to maintain effective drainage through the control of weed growth in drainage channels by the application of herbicides. The activity may also be undertaken with the express purpose of eradicating undesirable plant species, whether or not they are at the time restricting drainage.

Application of herbicide is either by spray gun or spray boom, and is carried out under the supervision of a certified Horizons Regional Council staff member or contractor. Certification shall entail the holding of the appropriate Growsafe or equivalent qualification.

Most drains are sprayed at least annually and in some cases two or three times a year. Often spraying is carried out in four out of every five years with the fifth year being reserved for mechanical clearance. Although weed clearance using herbicides can occur at any time of the year, most spraying is carried out in the autumn and spring when vegetation is most receptive to chemical ingestion.

Resource Management Act 1991

There is potential for these works to be subject to s.15 RMA (discharge of potential contaminant into water).

Potential beneficial effects

- Maintenance of clear waterway – improved oxygen levels, improved drainage and flood carrying capacity, improved fish passage, and control of plant pests.
- Effective land drainage – improved productivity, diversification of land use, community well-being and safety.
- Removal of undesirable plant species – improved habitat for native species and upstream fish passage.
- Channel condition and stability are maintained.

Potential adverse effects

- Spraying maybe non-selective – desirable plant species may be eliminated.
- Deterioration of water quality as a consequence of decomposing weed (reduction in dissolved oxygen, increase of pH levels).
- Loss of cover and spawning vegetation for native fish and invertebrates.
- Loss of vegetation as a habitat and food source for aquatic and bird life.

- Deterioration of water quality as a consequence of the removal of vegetation that strips nutrients from surface run-off.
- Accidental discharge of fuels and lubricants from machinery.
- Accidental discharge of herbicides.
- Short term undesirable visual and odour impacts (decomposing weed).

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Spraying shall not be carried out within any Rare or Threatened Habitat or At Risk Habitat as defined in the One Plan, except for the purposes of plant pest control.

4. Spraying shall be undertaken in accordance with all mandatory requirements set out in the "NZS 8409:2004 Management of Agrichemicals".

5. Notification of spraying activities to be undertaken on public land shall be in local newspapers before the end of September each year for activities planned for the following 12 months.

6. Notification by letter shall be given before the end of September each year to every holder of a resource consent for the taking of water for public or domestic water supply purposes, within 1 km downstream of spraying activities planned, for the following 12 months.

7. All herbicide application operations shall be carried out by applicators who hold the appropriate Growsafe or equivalent qualification.

8. All herbicides shall be applied in accordance with label requirements.

9. Spraying shall not be undertaken in weather conditions that will reduce the effectiveness of the chemical or that will increase the risk of spray drift onto non-target areas.

10. No mixing of sprays; fuel storage or machine refuelling; storage or mixing of chemicals, storage or transfer of fuels; or washing of machinery and equipment shall be undertaken in any location where there is a potential for contamination of the waterbody in the event of a spillage.

11. All spray containers shall be safely disposed of at an authorised landfill site or re-used.

12. Spraying shall where necessary use an adjuvant (such as surfactant, wetter, sticker or filler) to reduce spray drift and enhance effectiveness of herbicide.

13. Upper-bank vegetation shall be maintained to enhance bank stability where it has no effect on drainage channel efficiency.

14. A vegetated buffer strip shall be retained immediately adjacent to the waterbody were practicable to reduce the potential for sediment discharge into the watercourse.

12. Grade Control Structures

Activity

The purpose of this activity is to control the bed of the watercourse by the placement of a structure across the full width of a channel. These structures artificially raise the bed level and thereby reduce the channel gradient and flow velocity. A vertical drop is created and the energy arising from that drop is dissipated on a short section of armoured bed or 'scour apron'.

This activity involves excavation of bed material followed by the construction of a rigid structure across the channel. The structures will generally be formed from quarried rock or river boulders, however other materials such as timber or culvert pipes may be utilised. In some situations piles may be driven to assist in retaining rock and maintaining structural shape and integrity.

Resource Management Act 1991

These works are covered under s.13 RMA, disturbance and placement of a structure on the bed of a river.

Potential beneficial effects

- Lateral erosion is arrested through bed gradient control – adjoining property and infrastructure is protected, hazards to recreational users avoided.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Stable bed profile reduces risk to integrity of infrastructure such as bridges and utilities. Community well-being is preserved.
- Robust structures – durability results in reduced intervention.
- Create pools for fish habitat.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Permanent loss of amenity - may impede recreational access or pose safety issues, eg. navigation.
- Particles may be dislodged and deposited downstream.
- Temporary dust/noise impact during construction.
- Fish passage may be impeded in low flows.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Material used in new Grade Controls shall be clean, stable quarried rock, boulders, pre-cast concrete units or timber. Rubble shall not be used in new structures.

4. All Grade Controls shall be designed by a suitably qualified or experienced engineer. Design shall be specific to location within the river reach, crest height and profile, founding depth, material requirements, plunge pool effects, fish passage, bank erosion at the ends of the structures, as well as both upstream and downstream alignment and transitional measures.

5. In designing Grade Controls consideration shall be given to incorporating enhanced recreational access to the river, for example portage facility.

6. Grade Control design shall include maintenance requirements and frequency. Note: Grade Controls can settle as a result of plunge pool toe scour and 'topping up' may be required. Clear access to the structure is required for that purpose.

7. All material utilised in Grade Controls shall be carefully placed and interlocked to minimise the potential for subsequent dislodgment of smaller particles.

8. Batter preparation, foundation excavation and rock placement shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the watercourse, measures shall be taken to minimise temporary adverse effects such as temporary diversions, bunding off sections of the work and temporary causeways to elevate machinery above the water surface.

9. Grade Controls shall be constructed and designed in such a manner that fish passage is maintained at all flows, this may require the structure to be constructed in sections.

10. Excavation and placement operations shall be planned over one continuous works sequence to restrict the timing and frequency of river disturbance. This will include but not be limited to planning to stockpile a large proportion of required material at the site prior to the commencement of works.

11. New grade controls shall incorporate the recommendations of a suitably qualified fish habitat specialist to ensure fish passage is incorporated in the structure.

12. Grade controls shall be maintained to ensure that fish passage is maintained at all flows.

13. Groynes

Activity

The purpose of this activity is to modify channel alignment and mitigate lateral erosion through the placement of structures that protrude from riverbanks and reduce flow velocity immediately adjacent to those banks. Groynes may be classified as either permeable or impermeable and may take various forms and utilise a variety of materials.

The primary purpose of the works is to protect the adjoining riverbanks from erosion, shifting the higher velocities away from the riverbank and encouraging the deposition of silts and gravels within the embayments created by the groynes.

Permeable

Permeable groynes allow water to pass through them, which equalises the water pressure on both sides of the structure and minimises some of the scouring effect generally associated with groynes. When the flowing water passes through the permeable structures, the turbulence is reduced, the horizontal loading is reduced and bed load deposition occurs.

Permeable groynes are often utilised to re-establish a riparian margin that has been lost to lateral bank erosion. The main benefit of permeable groynes is the silting they encourage, which in turn facilitates planting and ultimate restoration of the bank alignment.

Permeable groynes are constructed by driving poles or railway irons into the bed of the river by a hydraulic excavator and threading wire ropes through them to form a fence like structure. Alternative permeable groyne structures may use driven poles with mesh attached to the wire ropes and willow poles stapled to the mesh, which grow to further secure the structure. Permeable groynes can also take the form of brushy trees laid in a trench and anchored to the riverbed.

Impermeable

Impermeable groynes do not allow water to pass through them and therefore have a more positive effect in terms of flow deflection. These structures are more robust and more expensive than permeable groynes.

Impermeable groynes are most commonly constructed from rock and must be specifically designed to withstand both over topping and localised bed scour. Well designed and constructed rock groynes may provide a more aesthetically acceptable solution than continuous rock lining, especially where long lengths of erosion require treatment.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Sediment discharged during high flow events is reduced enhancing river bed habitat.
- Scour pool development provides ideal fish habitat.
- Sheltered embayments created – facilitate vegetation establishment.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Rock groynes are very robust structures – durability results in reduced intervention.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access or pose safety issues.
- Particles may be dislodged and deposited downstream.
- Temporary loss of amenity – dust/noise impact during construction.
- May present hazards to navigation.
- Projecting groyne elements may be visually undesirable and may trap unsightly debris.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Specific groyne location and structural design shall be undertaken by a suitably qualified or experienced engineer.

4. A primary design objective shall be to achieve a high structural standard such that future maintenance and associated channel disturbance is minimised, in particular, account shall be taken of transitional effects

both upstream and downstream of the structure, as well as localised and general scour potential.

5. Material selection and design detail shall take account of aesthetic and habitat values. No material shall be used that results in contamination of the water.

6. Concrete rubble shall not be used in the construction of groynes.

7. Groyne construction will typically necessitate the operation of machinery within the active watercourse. Where practicable, the machinery operating area shall be bunded off from the stream flow to minimise sediment discharge.

8. Completed structures shall not present any significant hazard to navigation or other recreational users.

9. Vegetation shall be progressively established within the embayments between groynes as siltation occurs.

10. Annual inspections shall be undertaken to ensure that groyne heads do not present hazards to recreational users.

11. Redundant assets shall be removed to avoid adverse environmental affects, undesirable aesthetics and/or potential hazards.

12. Permeable groynes shall not be used at swimming spots.

13. Alignment will be on a curvature that fits the natural meander curvature of the channel.

14. Permeable Mesh Units

Activity

The purpose of this activity is to prevent erosion through the placement of prefabricated structural steel 'fence units' longitudinally along riverbanks. The activity includes the shaping of the riverbank and the establishment of vegetation behind the fences.

The mesh units initially encourage siltation and aid vegetation establishment but remain as an integral part of permanent edge protection.

The activity typically involves bed excavation to facilitate placement of mesh units below scour depth, driving rails, fixing of pre-fabricated mesh units, hauling and placement of tree material and back filling, battering of banks and planting vegetation. Mesh units may be used for minor channel realignment.

Upstream erosion protection works should be included to prevent outflanking of Permeable Mesh Units (PMU) and internal elements may be included to enhance structure stability and encourage silt deposition.

The activity often unavoidably involves the operation of machinery within the bed of the river. In such situations measures are taken to minimise discharge of sediment.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Sediment discharged during high flow events is reduced.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Opportunities for upper bank and bank toe (depending on materials used) habitat enhancement such as riparian planting.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.

- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access or pose safety issues.
- Temporary loss of amenity – dust/noise impact during construction.
- May present hazards to navigation.
- Negative long term impacts on natural character and aesthetic appeal.
- Progressive deterioration of material – visual and safety impacts.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. PMU structures shall only be used where a higher standard of protection than can be provided with standard tied tree bank protection is required.

4. Specific design shall be undertaken by a suitably qualified or experienced engineer.

5. A primary design consideration shall be to achieve a high structural standard such that future maintenance and associated channel disturbance is minimised.

6. The design shall include transitional effects both upstream and downstream of the structure, as well as localised and general scour surrounding the structure.

7. The height of PMUs shall be no greater than is necessary to ensure structural integrity. Softer upper-bank treatments shall be incorporated in the design and may include battering back and planting, or using a soil retaining textile and planting small shrub species that will cascade over and eventually cover sections of the structure.

8. Batter preparation and foundation excavation shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the watercourse, measures shall be taken to minimise temporary adverse effects such as temporary diversions, bunding off sections of the work and temporary causeways to elevate machinery above the water surface.

9. Annual inspections shall be undertaken to ensure that mesh units do not present hazards to recreational users.

10. Redundant assets shall be removed to avoid adverse environmental affects, undesirable aesthetics and/or potential hazards

11. Alignment will be on a curvature that fits the natural meander curvature of the channel.

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15. Rock Linings

Activity

The purpose of this activity is to provide protection against lateral erosion through the placement of rock directly against the lower sections of riverbanks. The use of rock to armour banks is common on rivers where there is little tolerance for erosion on account of the close proximity of buildings or infrastructure or where high erosive forces preclude the use of softer erosion protection measures.

The purpose of the work is to control lateral erosion of the banks, and rock linings work extremely well because they are well locked together and they are well shaped in relation to the flood reach of the river. The rock is able to settle as the channel bed degrades. The rock protection also provides immediate protection compared to vegetation based protection measures that take time to establish. Ongoing maintenance will include topping up of the rock as it settles, debris clearance and vegetation control.

This activity typically involves minor earthworks to shape the bank in order to create an appropriate alignment and batter shape. Where rock linings are used they shall be aligned along the natural meander pattern of the river channel. A toe trench is excavated in the stream bed into which the rock is founded and then additional rock is carefully placed along the bank until the designed height is achieved. Rock is usually stockpiled adjacent to the site prior to and during the works. Establishment and reinstatement of the stockpile site is part of this activity.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river), where work is undertaken on riverbanks or dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected, hazards to recreational users avoided.
- Sediment discharged during high flow events is reduced.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Opportunities for upper bank and bank toe (depending on materials used) habitat enhancement such as riparian planting.
- Threat of encroachment and ultimate collapse of adjoining infrastructure such as bridges is reduced. Community well-being is preserved.
- Very robust structures – durability results in reduced intervention.
- Visually desirable method of bank stabilisation.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- May impede recreational access or pose safety issues.
- Small particle may be dislodged and deposited downstream.
- Temporary loss of amenity – dust/noise impact during construction.
- Permanent preclusion of riparian vegetation or bank shading.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. Long continuous rock linings shall only be used where necessary for the protection of flood protection works and infrastructure.

4. Rock material used shall be sound, clean quarry spalls ex-face or other suitable material, eg. boulders which are free of soil, clay or other soluble debris.

5. All rock linings shall be designed by a suitably qualified or experienced engineer. Design shall include: batter slope, founding depth, rock grading and alignment and transitional measures.

6. The height of rock linings shall be no greater than is necessary to ensure structural integrity. Softer upper-bank treatments shall be incorporated in the design and may include battering back and planting or using a soil retaining textile and planting small shrub species that will cascade over and eventually cover sections of the structure.

7. In designing rock linings, consideration shall be given to incorporating enhanced recreational access to the river, eg. launching of kayaks.

8. Rock lining design shall include future maintenance requirements and frequency. Note: Linings can settle as a result of post-construction toe scour and 'topping up' may be required. Clear access to the top of the lining is required for that purpose.

9. Rock shall be carefully placed and interlocked to minimise the potential for subsequent dislodgment of smaller rock particles.

10. Batter preparation, foundation excavation and rock placement shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the watercourse, measures shall be taken to minimise temporary adverse effects such as temporary diversions, bunding off sections of the work and temporary causeways to elevate machinery above the water surface.

11. Excavation and placement operations shall be planned such that the duration of river disturbance is minimised. This will typically require stockpiling a large proportion of required rock in close proximity to the placement site, prior to the commencement of works.

12. In selecting stockpile sites and access to them, consideration shall be given to minimising aesthetic, recreational and environmental impacts, eg. dust.

13. Immediately upon the completion of placement works, all disturbed areas shall be levelled and grassed, debris burned or buried and 'topping-up' rock left in a tidy appropriately sited stockpile.

14. Alignment will be on a curvature that fits the natural meander curvature of the channel.

16. Stopbanks

Activity

The purpose of this activity is to provide flood protection through the construction of earth embankments or other flood retaining structures. Stopbanking is the most effective and economical structural method of flood control for many New Zealand rivers. The stopbank activity includes building new or upgrading existing structures. Upgrading can include raising, widening, improving the structural integrity of, or relocating an existing structure. Stopbanks are major assets with a high capital value and their location and design is undertaken by a suitably qualified or experienced engineer.

The activity typically involves stripping vegetation and topsoil from affected areas, importation and placement of fill material, compaction, shaping, trimming, top soiling and re-grassing. All stopbank works are subjected to testing to ensure that compaction and permeability standards are achieved. Borrow areas are subjected to final shaping and top soiling and grass seeding.

Where stopbanks cross water courses or where drainage outlet is required, floodgated culverts are installed through the embankment. This activity has the potential to cause a piping failure of the stopbank if not carried out properly, and therefore requires detailed design.

Resource Management Act 1991

These works are covered under s.13 RMA (disturbance and placement of a structure on the bed of a river) where work is undertaken on riverbanks or dry river bed areas, and s.9 RMA (use of land).

Potential beneficial effects

- Adjoining property and infrastructure is protected from flooding.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Reduces the river's capacity to spread and meander.
- Creates a barrier for ecosystems between the river corridor and the surrounding environment.
- Changes the pattern of bank overflows and floodable areas.
- Temporary reduction in flood protection during construction.
- Creates a barrier to overland flow paths and surface drainage, mitigated by floodgated culverts.

- Floodgates restrict the passage of fish and invertebrate.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. All stopbank design shall be undertaken by a suitable qualified or experienced engineer.

4. Specific design issues to be addressed shall include:

    - Potential social and economic impacts on flood plain (positive and negative);
    - Residual risk and mitigation measures;
    - Recreational access, aesthetic impacts and mitigation measures; and
    - Habitat impacts and mitigation measures.

5. All borrow areas shall be worked and fill material placed in a manner that prevents sediment entry to water and minimises dust discharge to the atmosphere. Vegetated buffer strips shall, where practicable, be maintained between borrow areas and channel edges to reduce the potential for sediment discharge into the watercourse.

6. Stopbank crest levels shall be maintained at pre-construction levels throughout construction, unless a suitably qualified or experienced engineer's approval is obtained.

7. Adequate machinery shall be maintained on site at all times during construction to respond to flood emergencies.

8. All stopbank construction including vegetation reestablishment shall be programmed for expeditious completion.

9. Specific design issues to be considered for floodgate structures shall include:

    - Seepage control along outside of pipe (bedding, backfill, filter material, compaction standard, preventing expansion of pressurised pipes, pipe jointing).
    - Scour protection (headwalls, scour apron).
    - Floodgate (strength, top hung or side hung, fish passage, reliability of closure, debris passage, maintenance access).

10. Where 'hard' structures (eg. concrete, sheet piling or timber walls) are incorporated in earth embankments, particular attention shall be given to transitional, seepage and safety issues.

11. Conclusive evidence shall be presented that shows there shall be no measurable adverse flood impacts on the adjoining floodplain or upstream or downstream areas, that cannot be mitigated.

    This shall be equivalent to a "*de minimis non curat lax*" standard. Impacts to be considered include:

    - change in flood levels;
    - velocity; and
    - duration of flooding

17. Tied Tree Edge Protection

Trenched Willows, Anchored Willows

Activity

The purpose of this activity is to prevent lateral erosion of the riverbank and maintain river alignment, by providing relatively heavy vegetative protection, developing strong root systems, and encouraging the deposition of sediment at the toe of the banks. Tied tree edge protection is the most common method of riverbank erosion control utilised throughout the region.

This activity involves the burying and anchoring of willow tree trunks into the riverbanks to stabilise and protect the banks from lateral erosion. Minor earthworks to shape the bank to create an appropriate alignment and batter shape may be required before the trees are placed. Appropriately sized trees for the size of channel are utilised and anchored in place with wire rope and either driven railway irons or concrete anchors to form a continuous protective live vegetation structure to buffer flows along the riverbank. A hydraulic excavator is used to shape the bank, place the trees and anchors and drive the rails. Training groynes may also be used (refer other relevant references), often in conjunction with the trenched/anchored willows. Follow up planting is always carried out.

Resource Management Act 1991

These works are covered under s.9 (use of land) and s.13 (structures in the bed of a river) RMA.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Sediment discharged during high flow events is reduced.
- Bed sedimentation is reduced, enhancing river bed habitat for some fish species.
- Vegetated cover at water surface provides ideal fish habitat.
- Stable channel alignment is maintained, enhancing river bed habitat.
- Establishment of ‘natural’ front-line live edge protection – visually appealing.
- Establishment of vegetative corridor.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.

- Temporary loss of amenity – dust/noise impact during construction.
- May present hazards to navigation if not maintained.
- Exposure or dislodgment of anchoring material due to damage.
- Periodic intervention for maintenance purposes.
- Short term visual impacts during establishment phase.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. All operations shall be undertaken in accordance with the Approved Code of Practice for Health and Safety in Tree Work; Part Three; River and Stream Operations, developed in collaboration with Regional Council and issued by the Department of Labour.

4. All tied tree works shall be designed by a suitably qualified or experienced engineering practitioner. Particular attention shall be given to flow velocity, the founding depth, material requirements, localised and general scour potential, as well as both upstream and downstream alignment and transitional measures.

5. The design of tied tree works must take account of future maintenance requirements. Tied tree works, once established require maintenance works including layering and placing additional trees. Clear access to the works is required for that purpose.

6. Batter preparation, foundation excavation and tied tree placement shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the water course, measures shall be taken to minimise temporary adverse effects. These include temporary diversions, bunding off sections of the work, temporary causeways to elevate machinery above the water surface.

7. To assist with minimising the period of riverbank disturbance, as much material as possible shall be stock piled prior to commencement of works.

8. Alignment will be on a curvature that fits the natural meander curvature of the channel.

18. Edge Vegetation Management

Tree Layering and Removal

Activity

The purpose of this activity is to prevent lateral erosion of the riverbank and maintain river alignment, by developing and maintaining trees and other vegetation on channel banks. Tree planting will also provide tree material for subsequent layering or use in heavy tied tree erosion protection works.

This activity involves the on-going maintenance of protection plantings on riverbanks, and includes layering, lopping and trimming, including mulching, and removal.

Tree lopping or layering is undertaken to increase the density of the existing live edge protection, and thus increase its effectiveness. Existing live edge protection trees are felled to the ground while maintaining an adequate connection with the stump such that vigorous re-growth is encouraged at bank level where it is most useful. The root system is the primary method of bank protection, rather than the trunk and timber. The objective is to develop uniform vigorous low growth and prevent trees from becoming large such that they obstruct flows or destabilise banks.

Trees used for layering are cut so that they fall and lie downstream of the cut stump. To avoid the layered trees being swept away in floods, a minimum connection of 25% of the trees circumference shall remain uncut once the tree is felled. In many situations the connection is strengthened by way of mechanical (rope) attachment.

When trees are either diseased, or too large, or are growing in inappropriate locations so that they are reducing the channel capacity, or are undesirable species such as grey or crack willow, or where layering has resulted in channel narrowing, it is necessary to remove them.

Tree removal is usually carried out from the dry berm area, not the active river channel. Trees that are felled into the river channel shall be quickly removed. Usually, the root systems of felled trees are retained to retain bank stability.

Trees that are removed shall be stockpiled clear of floodplains either to decompose or for subsequent burning or off-site removal.

Resource Management Act 1991

These works are covered under s.9 RMA (use of land), and s.13 RMA (planting, removal of vegetation, or disturbance in the bed of a river), where work may be undertaken on riverbanks or dry riverbed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Stable channel alignment resulting in improved water quality through reduced sediment discharge.
- Improved water quality through the filtering of overland flow by ground vegetation in riparian margins.
- Vegetated cover at water surface provides ideal fish habitat through the provision of shade, litter, and habitat.
- Visual enhancement of the riverbank.
- Establishment of vegetative corridor.
- Planting and maintenance of suitable species will reduce the potential for the riparian margins to become havens for plant pests, possums, and sawfly.
- Removal of large trees that may fall into the channel causing bank erosion, flow deflection, localised bed scour and increased sediment discharge.
- Removal of constrictions on the floodway capacity.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Temporary loss of amenity – dust/noise impact during construction.
- May present hazards to navigation if not maintained.
- Exposure or dislodgment of anchoring material due to damage.
- Periodic intervention for maintenance purposes.
- Creates a barrier for recreation access to the river and could become a hazard for recreational use of the river, e.g Canoeists.
- Layering reduces channel shading for fish and invertebrates over large reaches.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Part One.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. All operations shall follow the Approved Code of Practice for Health and Safety in Tree Work; Part Three; River and Stream Operations,

developed in collaboration with Regional Council and issued by the Department of Labour.

4. Trees shall be generally layered between 100 mm and 300 mm trunk diameter.

5. Layered trees shall be secured from floods by ensuring that a minimum connection of 25% of the tree diameter remains attached to the stump once the tree is felled.

6. Where less than 25% of the tree diameter is attached, mechanical anchoring of the tree to the main stump with Aquatech rope, wire rope or similar effective attachment, shall be undertaken.

7. Removal of native trees shall be avoided where practicable.

8. Tree layering operations shall be undertaken by machinery operating from the riverbank where practicable. Where machinery has to enter the water course, measures shall be taken to minimise temporary adverse effects. These include temporary diversions, bunding off sections of the work and temporary causeways to elevate machinery above the water surface.

9. On the completion of works all surplus vegetative material shall be either removed from the site or disposed of either by burying or burning as soon as practicable.

10. On the completion of tree removal activities, all disturbed areas shall be reinstated.

19. Tree Planting

Activity

The purpose of this activity is to prevent lateral erosion of the riverbank and maintain river alignment, by planting trees that develop strong root systems to stabilise the riverbank. Tree planting will also provide tree material for subsequent layering or use in heavy tied tree erosion protection works.

Willows continue to be the preferred species for primary erosion control immediately adjacent to the river channel. Willows are able to withstand the harsh environment of the river margins and may be specially bred so that they provide a good strong root system, do not spread readily, are not brittle, and are not readily palatable to stock and animal pests. In addition, the ability of the willow to be grown vegetatively from cut material means that it provides a potential resource, on site, for future protective works.

Outside a willow planting zone, native pioneer species or production species may be planted. This results in a multi-tiered vegetation regime that has good ground cover as well as shrubs and trees, which will help reduce the potential for undesirable weeds to establish.

It is important to note that it is extremely difficult to establish native vegetation in the harsh environment that typically exists directly on the riverbank.

Resource Management Act 1991

These works are covered under s.9 RMA (use of land), and s.13 RMA (planting in the bed of a river), where planting may be undertaken on dry river bed areas.

Potential beneficial effects

- Lateral erosion is arrested – adjoining property and infrastructure is protected.
- Stable channel alignment resulting in improved water quality through reduced sediment discharge.
- Vegetated cover at water surface provides ideal fish habitat through the provision of shade, litter, and habitat.
- Improved water quality through the filtering of overland flow by ground vegetation in riparian margins.
- Establishment of vegetative corridor.
- Planting and maintenance of suitable species will reduce the potential for the riparian margins to become havens for plant pests, possums, and sawfly.
- Willows provide food for birds, fish and insects, including bees and native bats, shelter and shade.

- Planting diversified tree species for bank protection works will spread the biodiversity risk, such as willow sawfly, and will enhance the aesthetics of a river.

Potential adverse effects

- Bed/bank material is disturbed – short term sediment discharge, increased turbidity, disturbance of habitat.
- Accidental discharge of fuels and lubricants from machinery.
- Smaller channels can be constricted, causing sediment retention which will affect the flood carrying capacity, and reduce the light reaching the water surface.
- Tree planting creates barriers for recreation access to the river and could become a hazard for recreational use of the river.
- Trees planted on inside bends can cause sediment retention and will affect the flood carrying capacity and will increase potential for erosion on the outside of the bend.
- Willow margin creates homogeneity of riparian habitat, reducing biodiversity and habitat value.

Standards for Good Practice

1. The specific Standards for Good Practice below shall be read in conjunction with the Generic Standards for Good Practice in Appendix B.

2. If the activity is undertaken in a site of special environmental value as listed in Part Three of this code, the activity shall comply with the special standards specified for that site.

3. All operations shall follow the Approved Code of Practice for Health and Safety in Tree Work; Part Three; River and Stream Operations, developed in collaboration with Regional Council and issued by the Department of Labour.

4. Edge protection plantings shall be fenced on their landward side if the area adjacent to them is used for stock grazing.

5. Specially bred willow/poplar species shall be planted that will not spread by seed and will not be prone to breakage.

6. Planting shall aim to produce a multi-tiered canopy consisting of ground cover, shrubs and trees that will reduce the opportunity for weeds to flourish.

7. Species planted for potential productive purposes (e.g for use in tied tree protection) shall be located so that harvesting operations can be undertaken with minimal environmental effects, including no discharge of sediment or debris into the watercourse.

8. Ecological characteristics and natural distribution factors shall be considered in selecting native species for riparian planting. Advice on

particular species shall be sought for individual site conditions and opportunities.

9. When considering a site for native tree planting refer to Part Five.

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PART THREE

Special Standards for Activities Undertaken in Sites of Special Environmental Value as Noted in the One Plan

1. Generic Special Standards

Where a river has a special environmental value and it is shown on the maps included in this part of the code, the following generic special standards will apply:

1.1 Trout Spawning

The use of mobile machinery that disturbs the wetted bed of the channel shall not take place in waterbodies valued for the spawning of trout between 1 May and 30 September.

1.2 Whitebait Migration

The following standards shall apply in waterbodies valued as whitebait migration:

1. The use of mobile machinery in the actively flowing channel of a river or lake in a manner that releases sediment shall not take place in waterbodies valued as whitebait migration between 15 August and 30 November. For the avoidance of doubt, machinery operating above the water level to place rock or drive piles into the bed of the river is permitted so long as there is no associated excavation or bank shaping below the water level and subsequent sediment release.

2. Drain clearance (either mechanical or herbicidal) in these sites shall be avoided between 1 August and 1 November.

1.3 Inanga Spawning Sites

1. New bank protection works that would preclude revegetation shall be designed to ensure that they are over topped at high spring tide level so that water can reach the riparian vegetation (grasses) above.

2. Bank Shaping activities shall not decrease the total length along the river of any areas that are over topped at high spring tide level so that water can reach the riparian vegetation (grasses) above in reaches that are valued for Inanga spawning.

3. Revegetation shall be done with reference to the Planting Guide in Part Five which are known to enhance Inanga spawning.

Tree clearance alongside Inanga Spawning Sites shall be undertaken to the following standards:

4. Other than removal of fallen or falling trees, tree removal shall not exceed 10 metres on any one bank per 1 km reach between 1 February and 1 May.

5. Tree layering shall not be undertaken between 1 February and 1 May.

6. Any cleared area shall be revegetated as soon as practicable.

7. Notwithstanding standards 1 and 2, tree removal is permitted immediately adjacent (not upstream or downstream) to serious lateral erosion sites to the extent necessary to facilitate reinstatement of live edge protection work.

8. Where tree material is required to reinstate erosion and no immediately adjacent material is available, it may selectively be sourced from non-frontline plantings either upstream or downstream of the erosion site.

9. This does not apply to removal of pest plants in accordance with the Pest Plant Management Strategy, an extract listing the plant pest to be controlled is included in part five of this code.

1.4 Swimming Spots

1. Activities shall not result in suspended sediment being conspicuous at swimming spots beaches during weekends and public holidays between 1 December and 28 February.

2. Horizons Regional Council Environmental Compliance Manager will be notified five working days prior to the commencement of works that will result in swimming spots beaches being unaccessible during weekends and public holidays between 1 December and 28 February.

1.5 Hydrological Sites

1. No work will be undertaken 500 metres upstream and 1,000 metres downstream of a hydrological site without the agreement of the Team Leader Hydrology or nominated deputy.

1.6 Tree clearance alongside Sites of Significance A1-A149

1. Bank protection works that would preclude revegetation shall be placed at or below the mean annual flood level.

Tree clearance alongside SOS-A shall be undertaken to the following standards:

2. Other than removal of fallen or falling trees, tree removal shall not exceed 10 metres on any one bank per 1 km reach between 1 April and 31 July.

3. Other than removal of fallen or falling trees, tree removal shall not exceed 100 metres on any one bank per 1 km reach within any 12 month period.

4. Tree layering shall not be undertaken between 1 April and 31 July.

5. Any cleared area shall be revegetated as soon as practicable.

6. Notwithstanding standards 1 and 2, tree removal is permitted immediately adjacent (not upstream or downstream) to serious lateral erosion sites to the extent necessary to facilitate reinstatement of live edge protection work.

7. Where tree material is required to reinstate erosion and no immediately adjacent material is available, it may selectively be sourced from non-frontline plantings either upstream or downstream of the erosion site.

8. This does not apply to removal of pest plants in accordance with the Pest Plant Management Strategy, an extract listing the plant pest to be controlled is included in part five of this code.

2. Site Specific Special Standards

Where sites are not listed in the table below but fall within a scheme rating area, the rules in the One Plan will apply.

In addition to the generic and activity standards listed in Part One and Two of this code, and the Generic Special Standards listed above, the following site specific special standards will apply to any activities undertaken at the sites listed below, and shown on the maps included in this part of the code.

Site Number	Scheme	Species	Special Standards for Good Practice
A41	Himatangi Scheme	Brown Mudfish	A consent will be required to undertake in-stream works (drain clearance) between 1 February and 30 April except for the reach upstream of State Highway 1.
A42, A43, A44	Lower Manawatu Scheme	Koaro	No permanent barriers for fish passage will be introduced into the Tokomaru River.
A45	Lower Manawatu Scheme – main stem of Tokomaru managed as far as State Highway.	Redfin Bully Koaro Banded Kokopu	A consent will be required to undertake in-stream works (excluding flood gate outlet clearance) between 1 July and 1 March (this includes anything that is carried out instream that could release sediment including but not limited to gravel extraction, channel clearance, instream vegetation or debris removal). In January and February instream works may be carried out for erosion protection if the discharge of sediment as a result of the works is for no more than 5 days and for more than 12 hours in any one of those 5 days. Flood gate outlet clearing within the exclusion time is allowed if work area bunded to stop release of sediment. (Note: the effects of clearing of drains that discharge into this area is considered minor and can be dealt with under generic standards in the Code of Practice).
A46	Makerua Wetland	Mudfish	A consent will be required to undertake in-stream works at this site.
A50	Koputaroa	Mudfish	A consent will be required to undertake in-steam works (drain clearance) between 1 February and 31 May.
A27, A28, A36, A40	Lower Manawatu Scheme	Various	A consent will be required to undertake in-stream works at these sites.
A37	Lower Manawatu Scheme	Brown Mudfish	A consent will be required to undertake drain clearance 200 metres upstream or downstream of this site between 1 February and 31 May.

Site Number	Scheme	Species	Special Standards for Good Practice
A47, A48, A49	Lower Manawatu Scheme	Redfin Bully	A consent will be required to undertake in-stream works upstream of the bridge. Works downstream of the bridge are permitted if carried out under Code of Practice standards.
A35	Lower Manawatu Scheme (Turitea)	Lamprey	Before starting work on a reach, record the number of pools and ensure that works do not reduce the total number of pools within that reach. Indigenous vegetation shall only be removed if it has fallen into the bed of the stream. Willows shall be selectively cleared in accordance with the Code of Practice downstream of State Highway 57 bridge (at Massey).
R18, R19	Lower Manawatu Scheme	Dotterels Waders	Mud and silt dredging shall only occur as an incidental part of gravel extraction. Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.
R9, R13	Lower Manawatu Scheme	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.

Site Number	Scheme	Species	Special Standards for Good Practice
R1 – R8	South East Ruahine, Eastern Manawatu, Mangatainoka, Upper Manawatu / Lower Mangahao Schemes	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days. The gravel extraction restrictions specified above do not apply at the gravel extraction sites listed in Table 3.1 where gravel extraction may be carried out at anytime 100 metres upstream and downstream in accordance with the Code of Practice.
A10, A11, A12, A13, A14, A15, A16, A17, A18, A19	Mangatainoka	Various	A consent will be required to undertake in-stream works at these sites.
A1	South East Ruahine	Koaro	A consent will be required to undertake instream works between 1 April and 1 June.
A2, A3, A4, A5, A6, A7, A8, A22	South East Ruahine	Dwarf Galaxid Shortjaw Kokopu in Manga Atua	A consent will be required to undertake instream works in Tamaki East between 1 May and 1 March. A consent will be required to undertake instream works in Kumeti site of significance between 1 September and 31 December. A consent will be required to undertake instream works in West Tamaki, Rokaiwhana, Mangapukakakahu, Otamarahu and Oruakeretaki site of significance's between 1 September and 31 December. Machinery used for planting and layering work will be driven up the dry bed of the river in accordance with the standards in the Code of Practice, crossing the wetted channel a minimum number of times. Avoid instream works in site of significance (A3) in Tamaki upstream of Top Grass Road between 1 September and 31 December where practicable. Where it is not practicable to avoid works, sediment from those works shall not discolour more than 25% of the width of the wetted channel at the works site and the reasons why works have been undertaken shall be documented in accordance with the Code of Practice reporting and monitoring standards.

Site Number	Scheme	Species	Special Standards for Good Practice
			No instream works in Mangatiwainui site of significance between 1 September and 31 December. No barriers for fish passage (temporary or permanent) will be introduced into the Manga Atua. A consent will be required to undertake instream works in the Manga Atua site of significance between 1 March and 30 June.
A147, A148	Ohau / Manakau Scheme	Shortjaw Kokopu Redfin Bully Koaro	A consent will be required to undertake instream works in Waikawa River upstream of where it is crossed by North Manakau Road. A consent will be required to undertake instream works in Waikawa River upstream of where it is crossed by State Highway 1 between 1 March and 30 June. A consent will be required to undertake instream works in the Waikawa River downstream of where it is crossed by State Highway 1 between 1 September and 1 November. Avoid instream works in the Waikawa River between 1 November and 1 March where practicable. Where it is not practicable to avoid works, sediment from those works shall not discolour more than 25% of the width of the wetted channel at the works site and the reasons why works have been undertaken shall be documented in accordance with the Code of Practice reporting and monitoring standards.
A129, A130	Ohau / Manakau Scheme	Redfin Bully Lamprey Shortjaw Banded Kokopu	A consent will be required to undertake in-stream works in Makirokio Stream (A130). A consent will be required to undertake in-stream works in unnamed Muhunoa East trout spawning tributary of the Ohau River. A consent will be required to undertake in-stream works in Ohau River or Tributaries between 1 September and 1 November. Avoid works instream between 1 November and 1 March where practicable. Where it is not practicable to avoid works, sediment from those works shall not discolour more than 25% of the width of the wetted channel at the works site and the reasons why works have been undertaken shall be documented in accordance with the Code of Practice reporting and monitoring standards.
A127, A128 A145, A146	Ohau / Manakau Scheme	Various	A consent will be required to undertake works at these sites.
R39, R42	Ohau / Manakau Scheme	Dotterels	Mud and silt dredging shall only occur as an incidental part of gravel extraction.

Site Number	Scheme	Species	Special Standards for Good Practice
		Waders	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches (beach raking) shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days. No removal of riparian vegetation downstream of confluence with Kuku stream.
A62	Porewa - Rangitikei	Redfin Bully	Avoid works instream between 1 November and 1 March where practicable. Where it is not practicable to avoid works, sediment from those works shall not discolour more than 25% of the width of the wetted channel at the works site and the reasons why works have been undertaken shall be documented in accordance with the Code of Practice reporting and monitoring standards.
A63	Tutaenui - Rangitikei	Brown Mudfish	A consent will be required to undertake works at this site.
A64	Forest Road and Rangitikei Schemes	Giant Kokopu	A consent will be required to undertake instream works (drain clearance) on the Amon Drain/Paranui No. 2 Drain between 15 August and 30 November. Drain spraying of the Forest Road Main Drain shall be undertaken when the drain is not flowing.
R24	Rangitikei Scheme	Dotterels Waders	Mud and silt dredging shall only occur as an incidental part of gravel extraction. Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.
R22, R23	Rangitikei Scheme	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to

Site Number	Scheme	Species	Special Standards for Good Practice
			1 August and has not been interrupted for more than 7 days.
R14, R15, R16	Lower Manawatu and Pohangina / Oroua Schemes (Oroua River)	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days. The gravel extraction restrictions specified above do not apply at the gravel extraction sites listed in Table 3.2, where gravel extraction may be carried out at anytime 50 metres upstream and downstream in accordance with the Code of Practice.
R10, R11, R12	Pohangina / Oroua (Pohangina River)	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.
A31, A33, A38	Pohangina / Oroua	Various Species	A consent will be required to undertake works at these sites.
A32	Pohangina Scheme	Koaro	No barriers to fish passage in the Pohangina River
A116-A121, A123-A125	Whangaehu Scheme	Whio	A consent will be required to undertake works at these sites.
A122	Whangaehu Scheme	Koaro	No barriers to fish passage in the Whangaehu River.
R30-R36	Whangaehu Scheme	Dotterels	Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.
R37	Whangaehu Scheme	Dotterels Waders	Mud and silt dredging shall only occur as an incidental part of gravel extraction.

Site Number	Scheme	Species	Special Standards for Good Practice
			Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days.
A136	Akitio Scheme	Banded Kokopu	A consent will be required to undertake works at this site.
A137	Akitio Scheme	Redfin Bully Banded Kokopu	A consent will be required to undertake works at this site.
A138, A139	Akitio Scheme	Redfin Bully	Avoid works instream between 1 November and 1 March where practicable. Where it is not practicable to avoid works, sediment from those works shall not discolour than 25% of the width of the wetted channel at the works site and the reasons why works have been undertaken shall be documented in accordance with the Code of Practice reporting and monitoring standards.
A65-A76 A80, A81, A82, A85, A105, A102, A103	Upper Whanganui Scheme	Blue Duck	Between 1 July and 1 March, works that disturb the bed or riparian margin shall only take place: • when an inspection of the site shows no blue ducks are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the works or disturbance commenced at the same location prior to 1 July and has not been interrupted for more than 7 days.
R28, R29	Upper Whanganui Scheme	Dotterels Waders	Mud and silt dredging shall only occur as an incidental part of bank stabilisation work. Between 1 August and 10 January, gravel extraction and bed disturbance on gravel beaches (beach raking) shall only take place: • when an inspection of the site shows no dotterel are present; or • within 7 days following a flood of the area of beach that is the subject of the activity; or • where the extraction or disturbance commenced at the same location prior to 1 August and has not been interrupted for more than 7 days. •

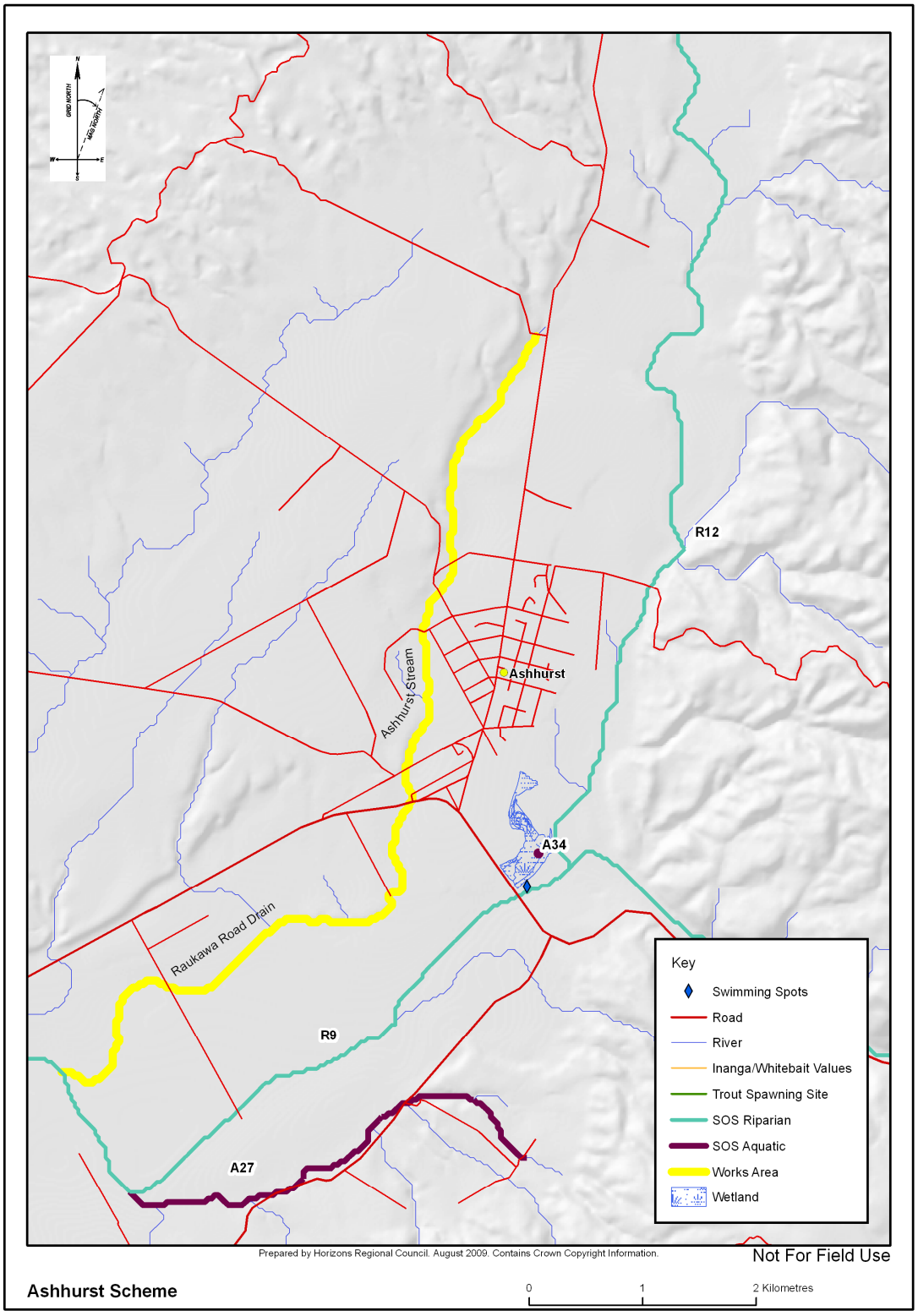
3. Scheme Maps Depicting the Works Area in relation to Site Specific Values

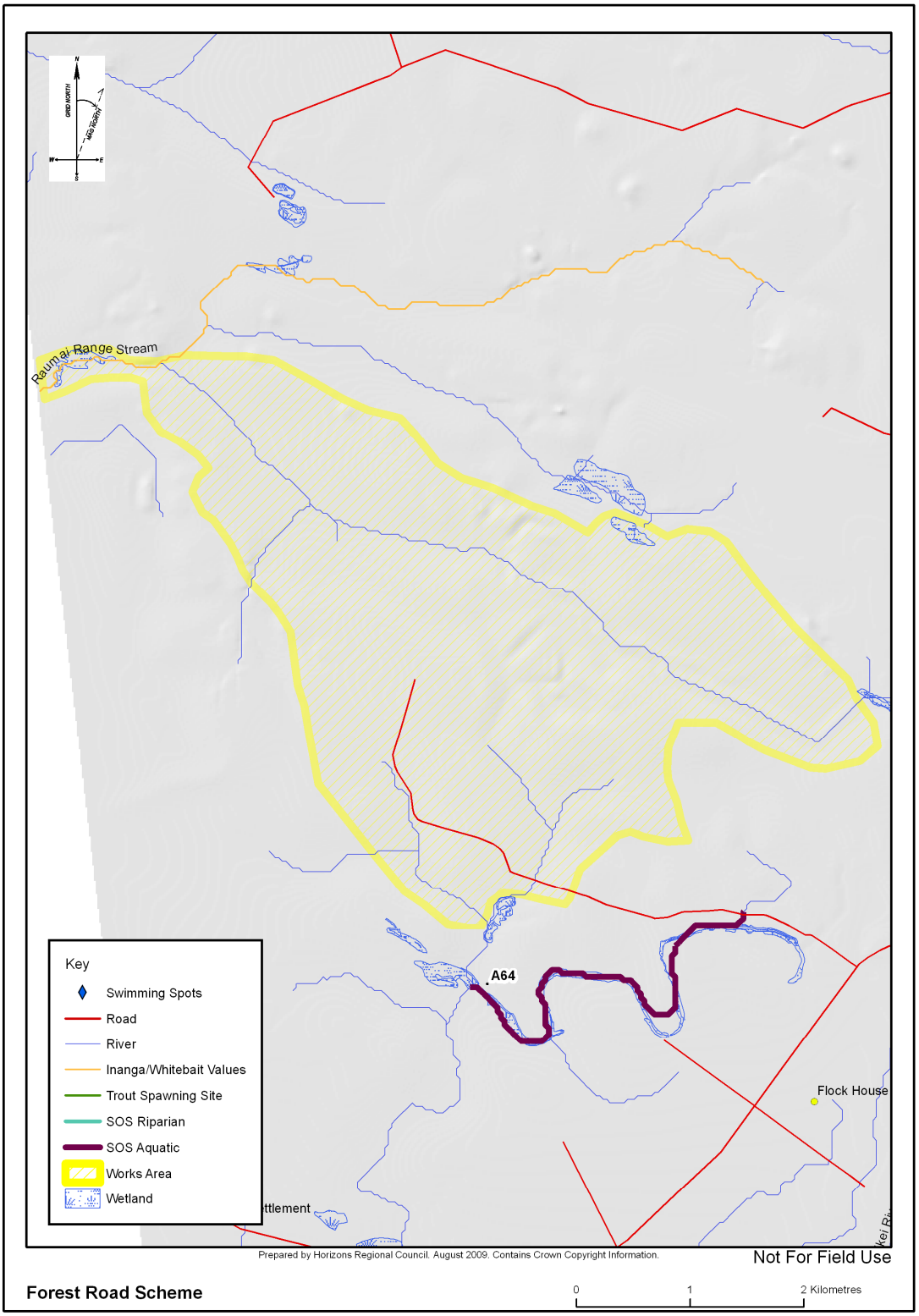
The following maps depict the Works Areas in relation to the values identified in the Generic Special Standards and the sites listed in the Site Specific Special Standards. Where necessary, maps are zoomed in to show the location of Inanga Spawning and Whitebait Migration as separate values.

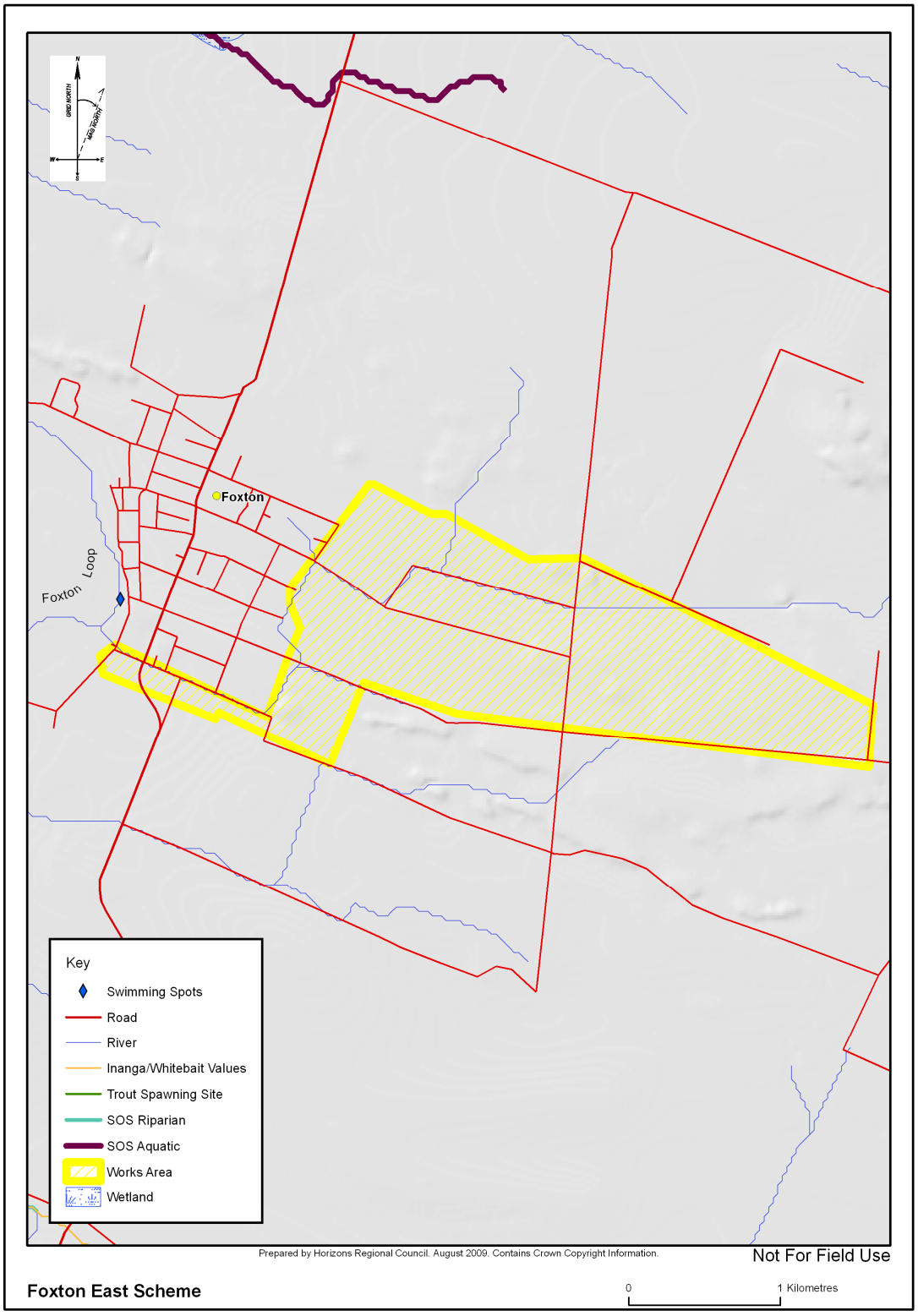
The first set of maps are the Drainage Schemes (in alphabetical order) depicting the Works Area as a zone. The exception to this is the Ashhurst Drainage Scheme which can readily be depicted as reaches.

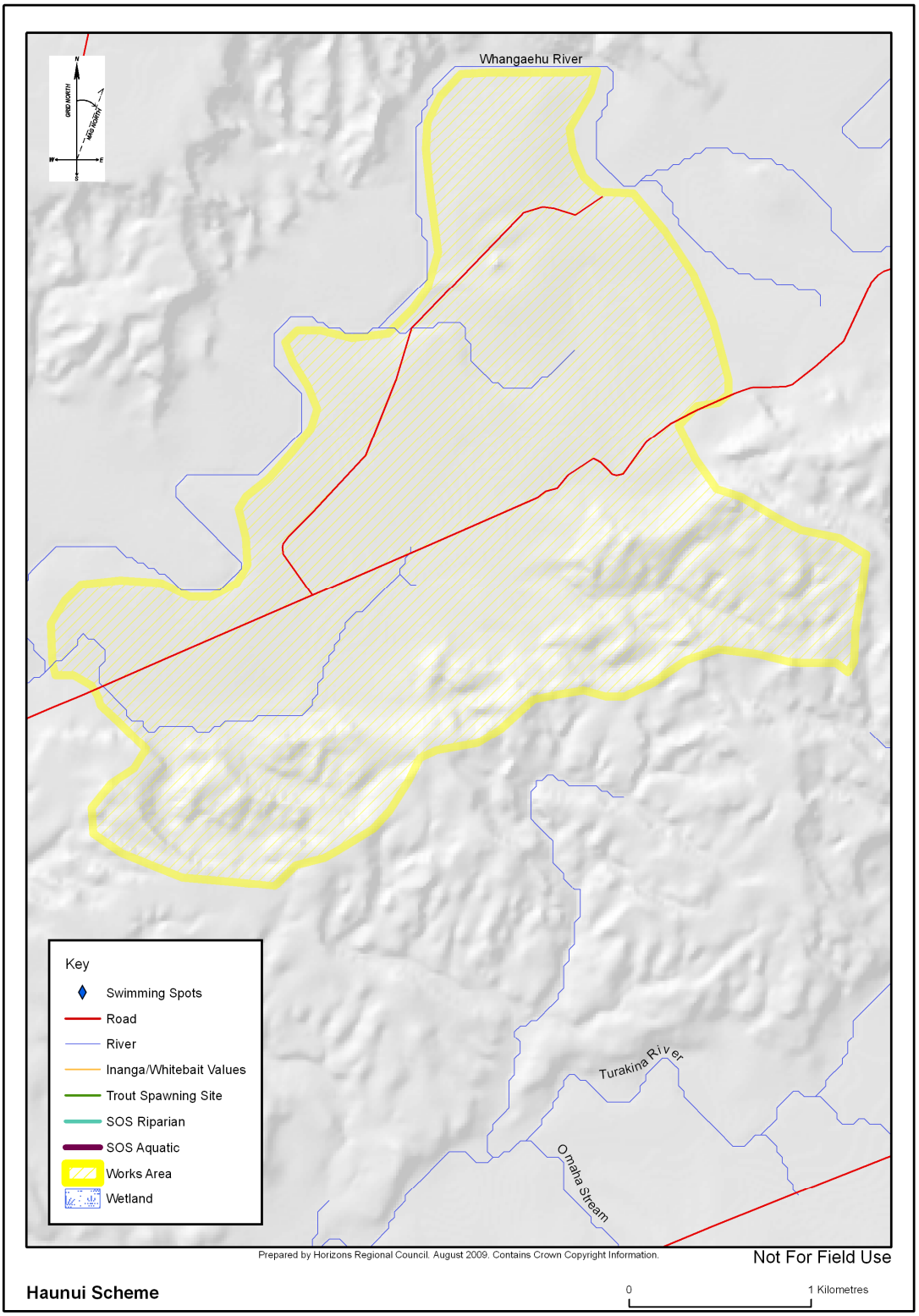
The second set of maps are the Flood Control Schemes (in alphabetical order) depicting the Works Area as reaches that are worked in. The exception is the South East Ruahine Scheme. As the activity in this scheme is extensive, the Works Area is best depicted as a zone.

A text description of the Works Areas can be found in Appendix One. This text should be used to determine whether an activity in any particular area is covered by the Scope of this Code.


GRID NORTH
MAGNETIC NORTH
R12
Ashhurst
Ashhurst Stream
A34
Raukawa Road Drain
R9
A27
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Ashhurst Scheme
0
1
2 Kilometres


Raumai Range Stream
A64
Flock House
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Forest Road Scheme
0
1
2 Kilometres


Foxton
Foxton Loop
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Foxton East Scheme
0
1 Kilometres


Whangaehu River
Turakina River
Omahia Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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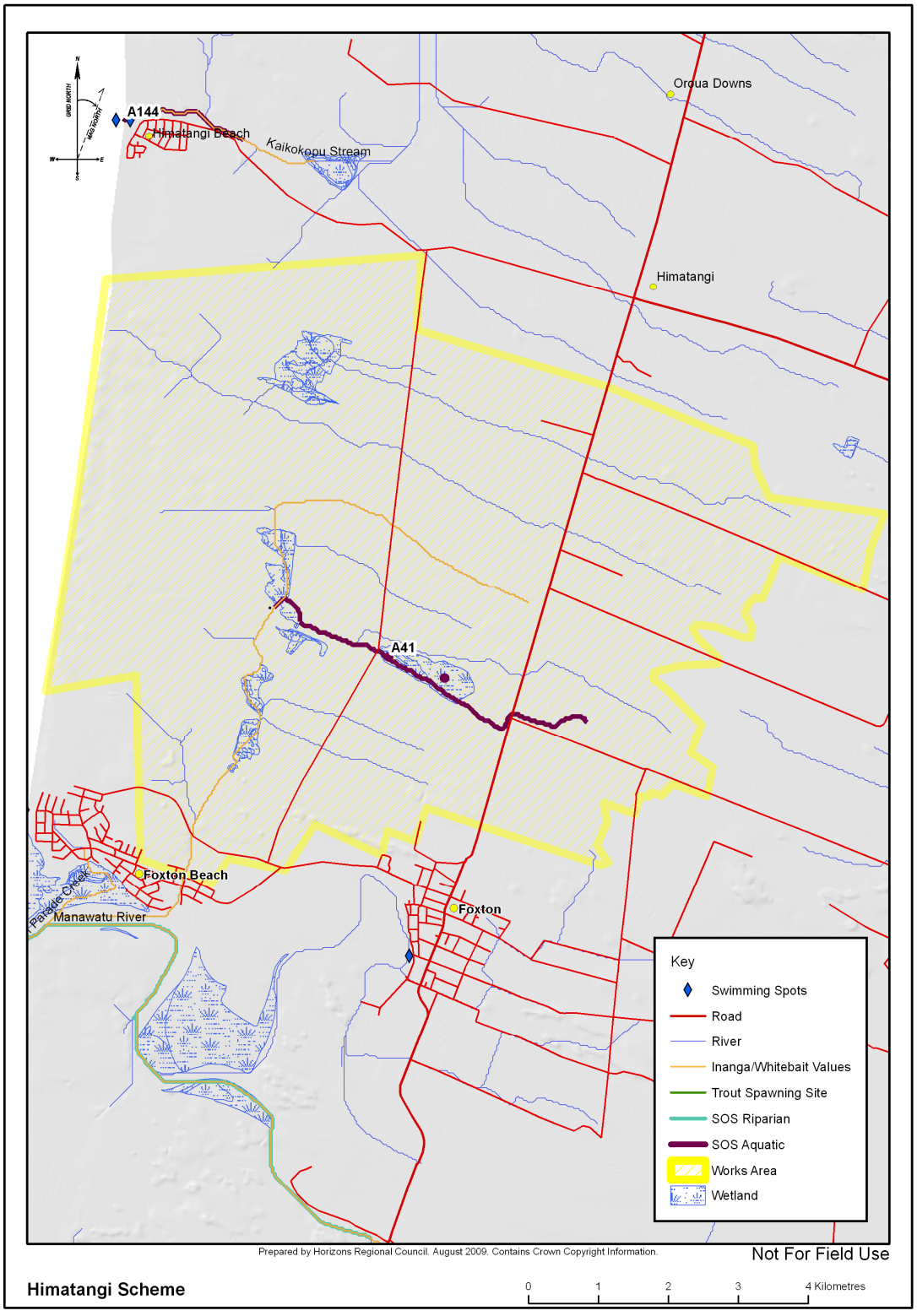
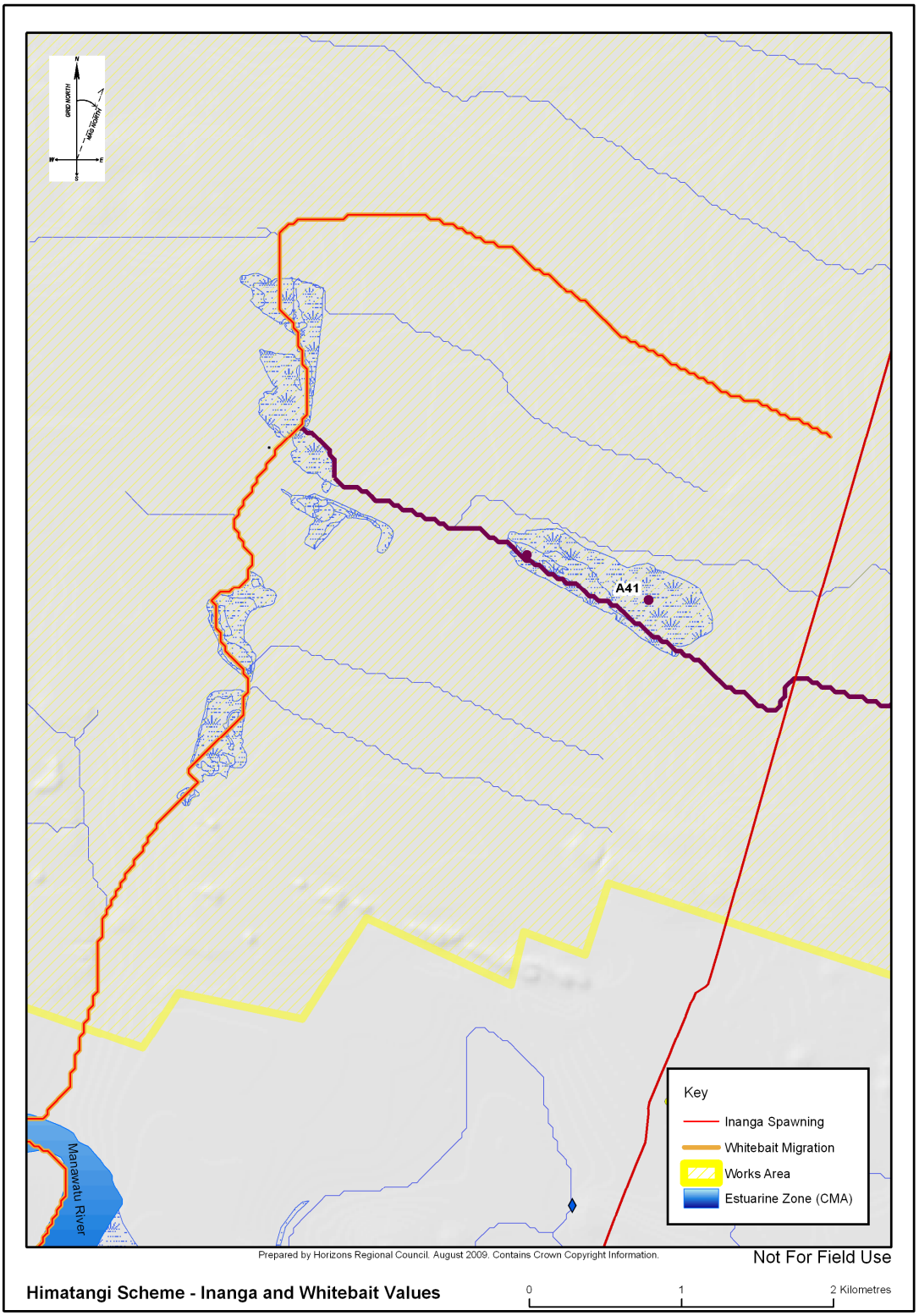
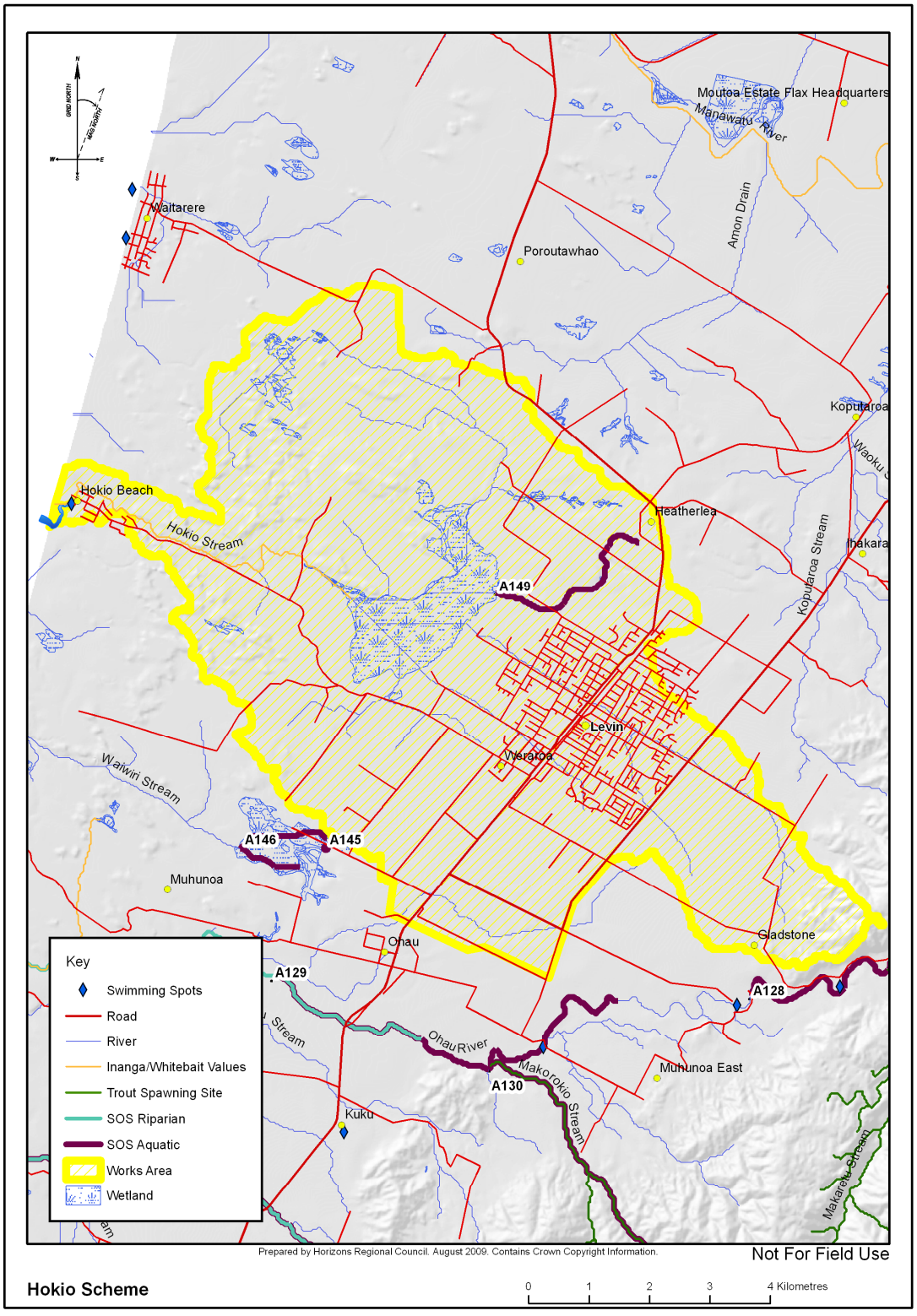
Not For Field Use
Haunui Scheme
0
1 Kilometres


A144
Himatangi Beach
Kaikokopu Stream
Oroua Downs
Himatangi
A41
Foxton Beach
Parade Creek
Manawatu River
Foxton
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Himatangi Scheme
0
1
2
3
4 Kilometres


GRID NORTH
MAG NORTH
A41
Manawatu River
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Himatangi Scheme - Inanga and Whitebait Values
0
1
2 Kilometres


Moutoa Estate Flax Headquarters
Manawatu River
Amon Drain
Waitarere
Poroutawhao
Koputaroa
Waoku S
Hokio Beach
Hokio Stream
Heatherlea
Ihakara
Koputaroa Stream
A149
Levin
Waiwiri Stream
A146
A145
Muhunoa
Ohau
Gladstone
A129
A128
Ohau River
Makorokio Stream
A130
Muhunoa East
Kuku
Makarewa Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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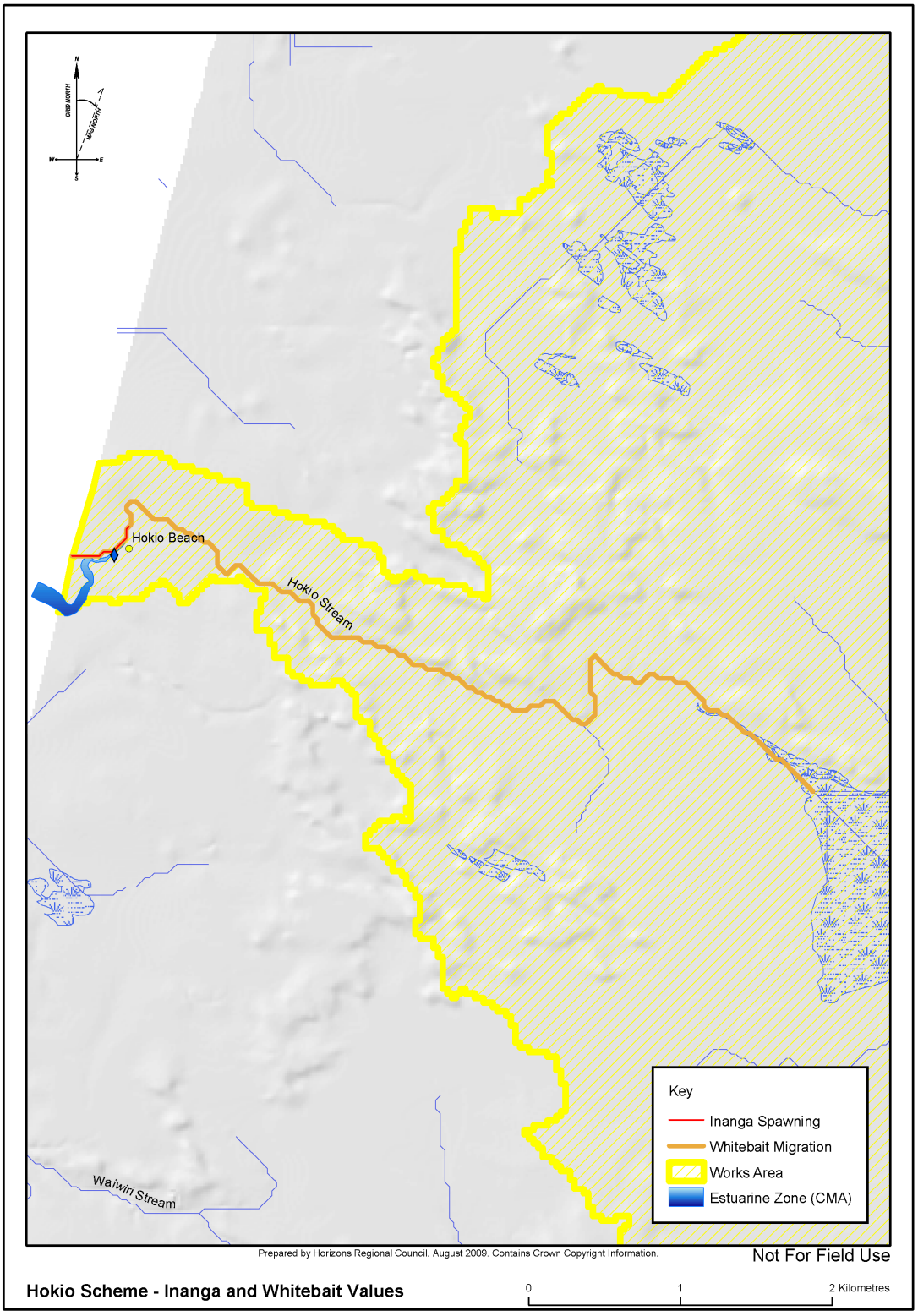
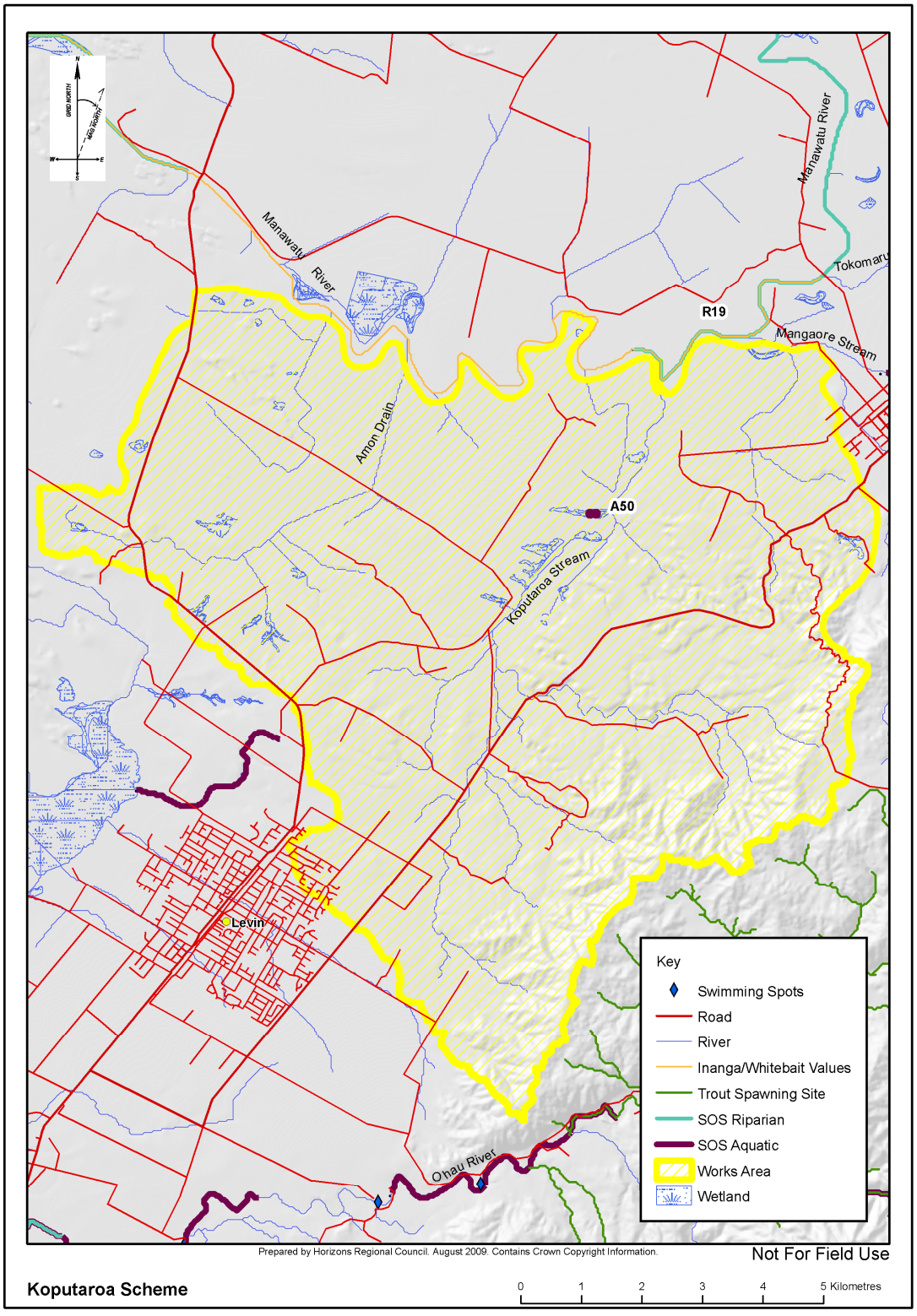
Not For Field Use
Hokio Scheme
0
1
2
3
4 Kilometres


GRID NORTH
MAG NORTH
Hokio Beach
Hokio Stream
Waiwiri Stream
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Hokio Scheme - Inanga and Whitebait Values
0
1
2 Kilometres


Manawatu River
Manawatu River
Tokomaru
R19
Mangaore Stream
Amon Drain
A50
Koputaroa Stream
Levin
Ohau River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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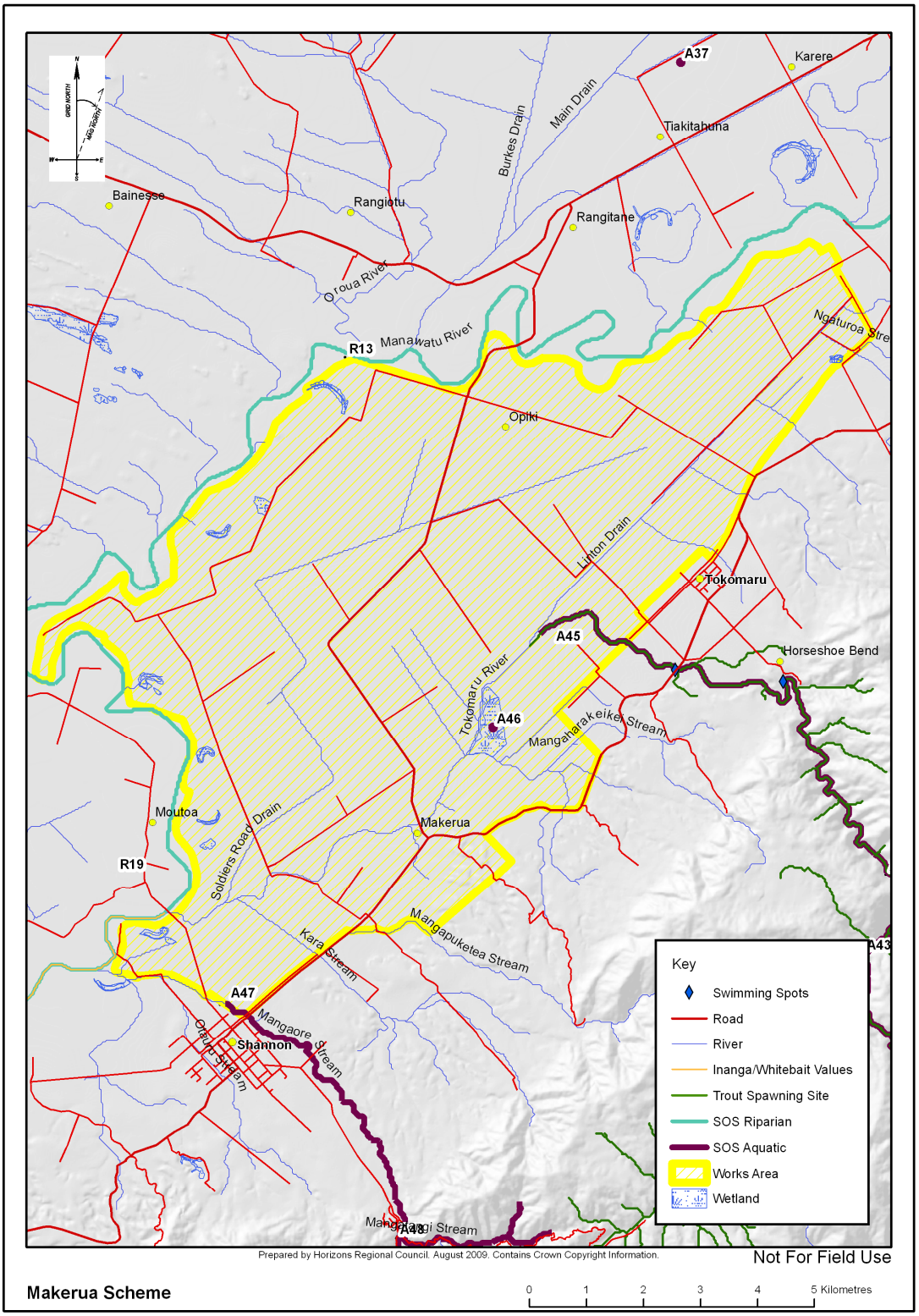
Not For Field Use
Koputaroa Scheme
0 1 2 3 4 5 Kilometres


A37
Karere
Burkes Drain
Main Drain
Tiakitahuna
Bainesse
Rangiotu
Rangitane
Oroua River
Manawatu River
R13
Ngaturoa Stre
Opiki
Lurlon Drain
Tokomaru
A45
Horseshoe Bend
Tokomaru River
A46
Mangaharakeiken Stream
Moutoa
Soldiers Road Drain
Makerua
R19
Mangapuketea Stream
Kara Stream
A47
Mangaore Stream
Shannon
Oturi Stream
A43
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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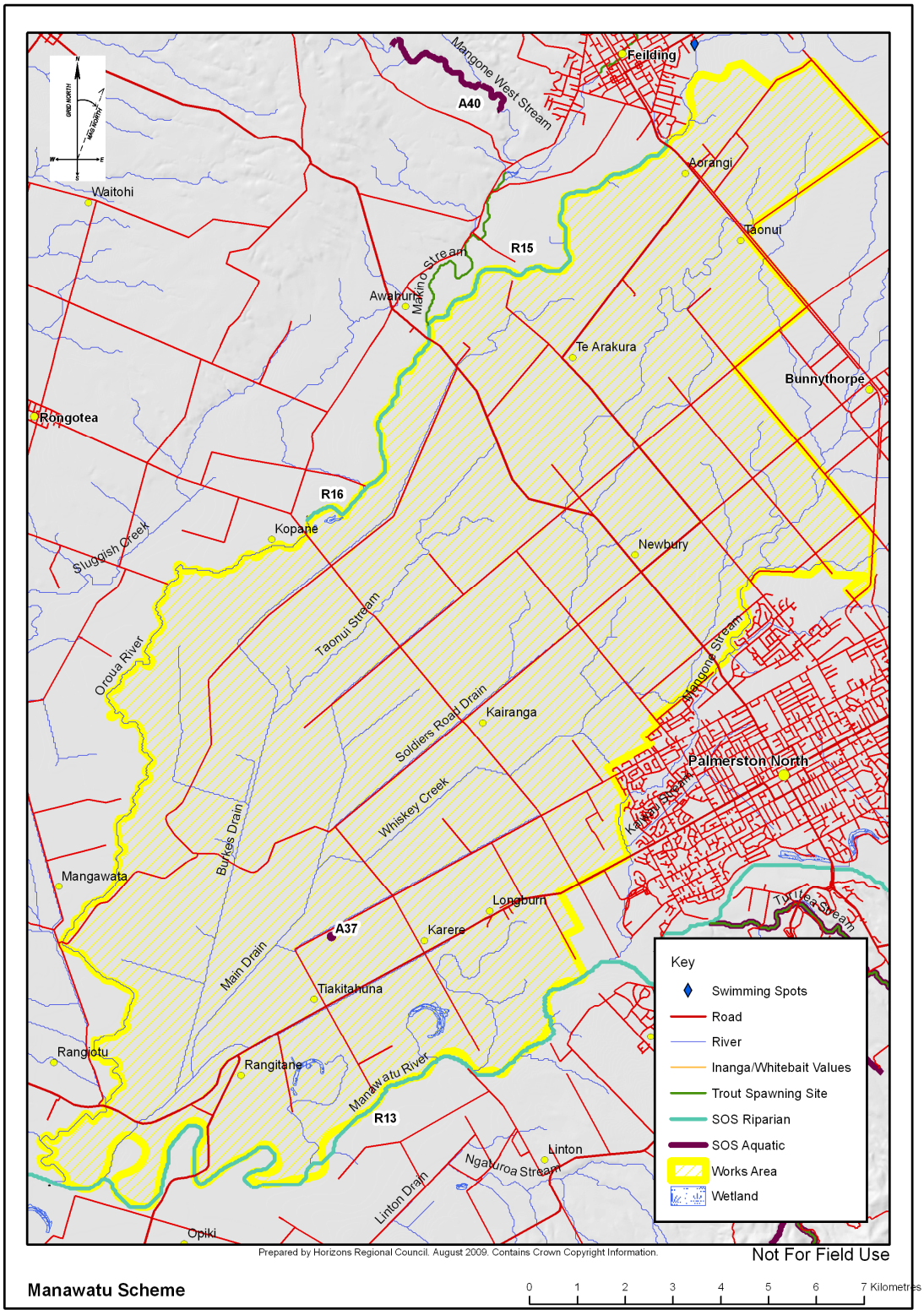
Not For Field Use
Makerua Scheme
0 1 2 3 4 5 Kilometres


Feilding
Mangone West Stream
A40
Aorangi
Waitohi
Taonui
R15
Makino Stream
Awahuri
Te Arakura
Bunnythorpe
Rongotea
R16
Kopane
Newbury
Sluggish Creek
Taonui Stream
Oroua River
Mangone Stream
Soldiers Road Drain
Kairanga
Palmerston North
Whiskey Creek
Kahuterawa Stream
Burkes Drain
Mangawata
Longburn
Tutaea Stream
A37
Karere
Main Drain
Tiakitahuna
Rangiotu
Rangitane
Manawatu River
R13
Linton
Ngaturoa Stream
Linton Drain
Opiki
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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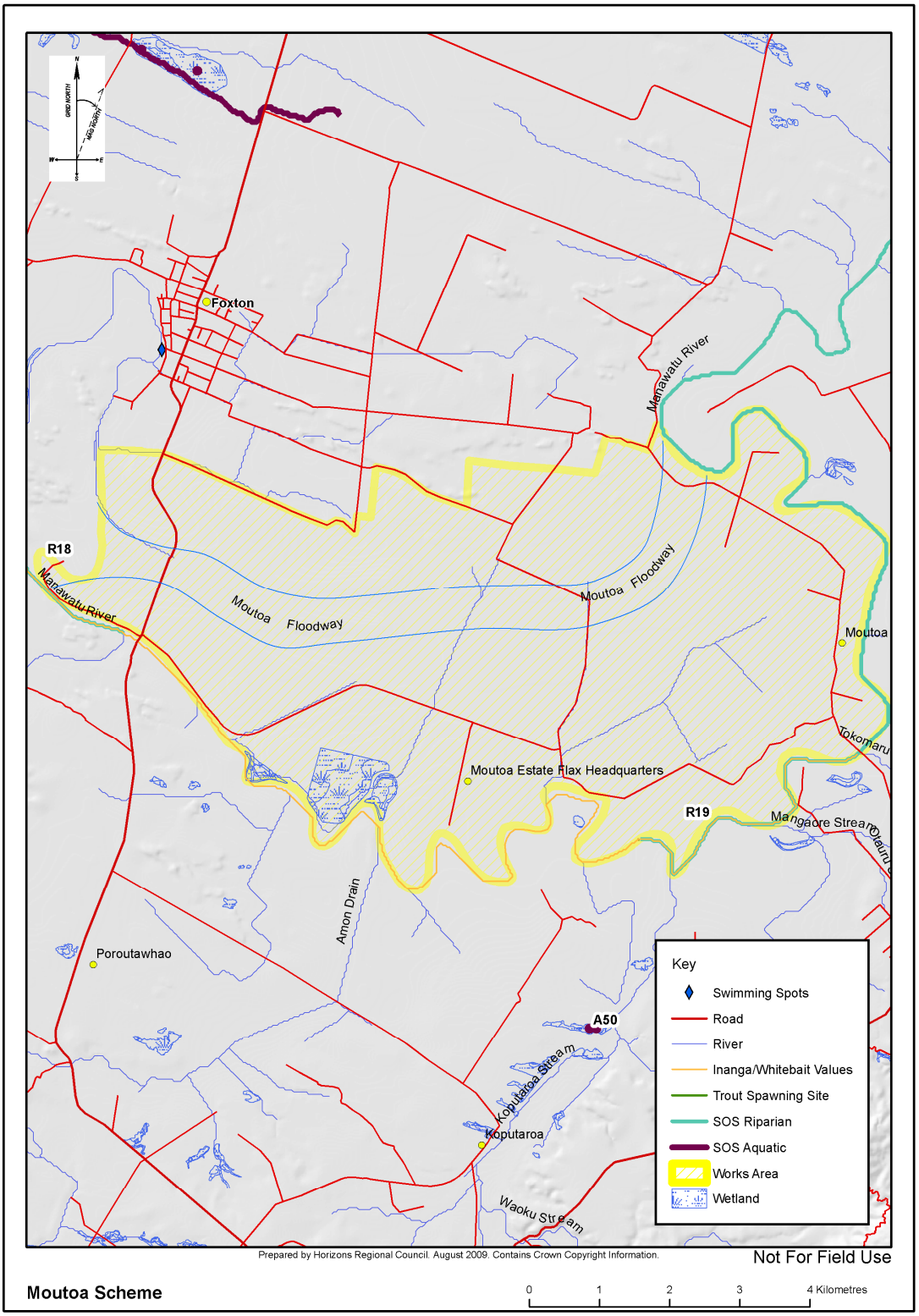
Not For Field Use
Manawatu Scheme
0 1 2 3 4 5 6 7 Kilometres


Foxton
Manawatu River
R18
Manawatu River
Moutoa Floodway
Moutoa Floodway
Moutoa
Tokomaru
Moutoa Estate Flax Headquarters
R19
Mangaore Stream
Oroua
Amon Drain
Poroutawhao
A50
Koputaroa Stream
Koputaroa
Waoku Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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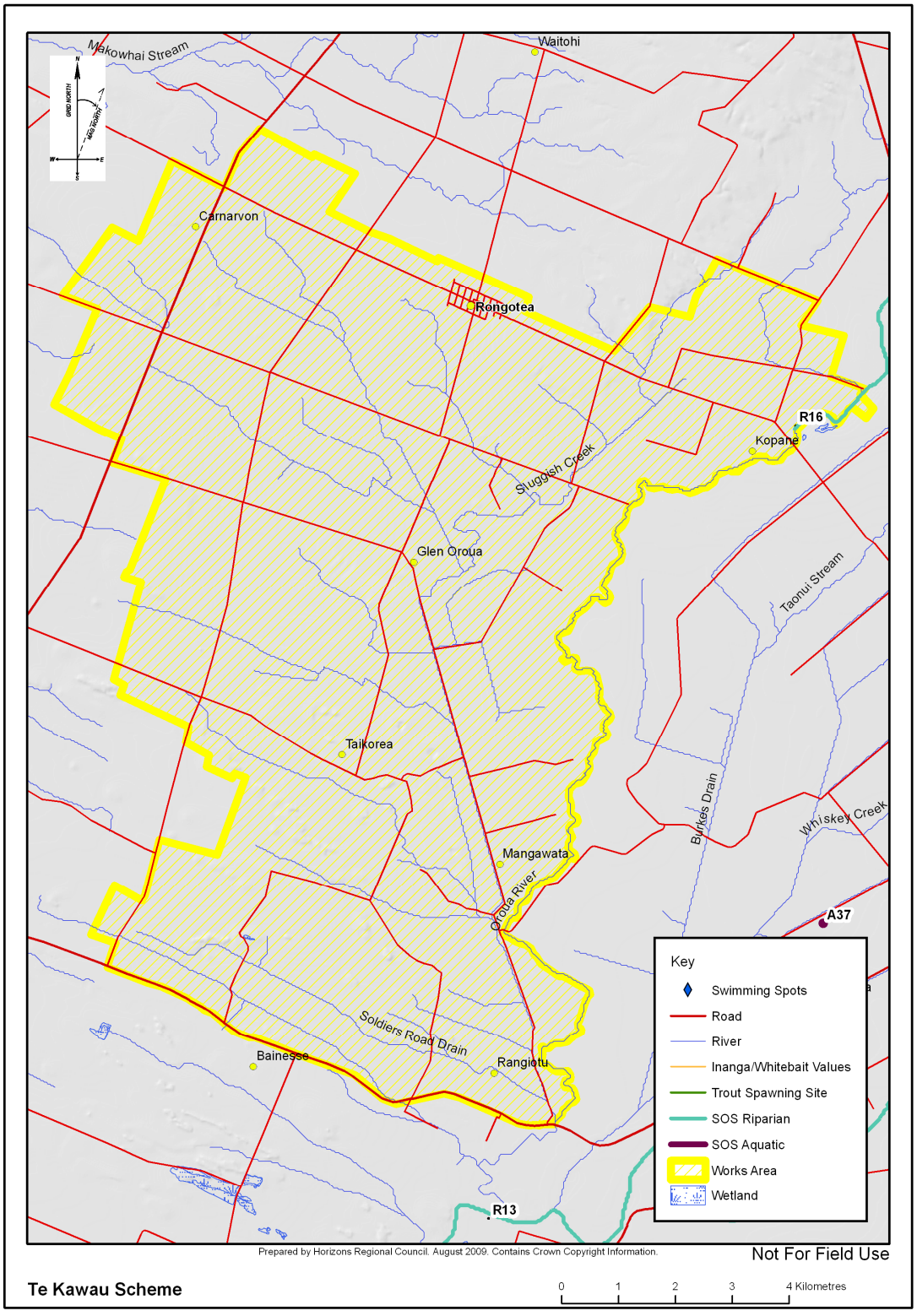
Not For Field Use
Moutoa Scheme
0
1
2
3
4 Kilometres


Makowhai Stream
Waitohi
Carnarvon
Rongotea
R16
Kopane
Sluggish Creek
Glen Oroua
Taonui Stream
Taikorea
Burkes Drain
Whiskey Creek
Mangawata
Oroua River
A37
Soldiers Road Drain
Bainesse
Rangiotu
R13
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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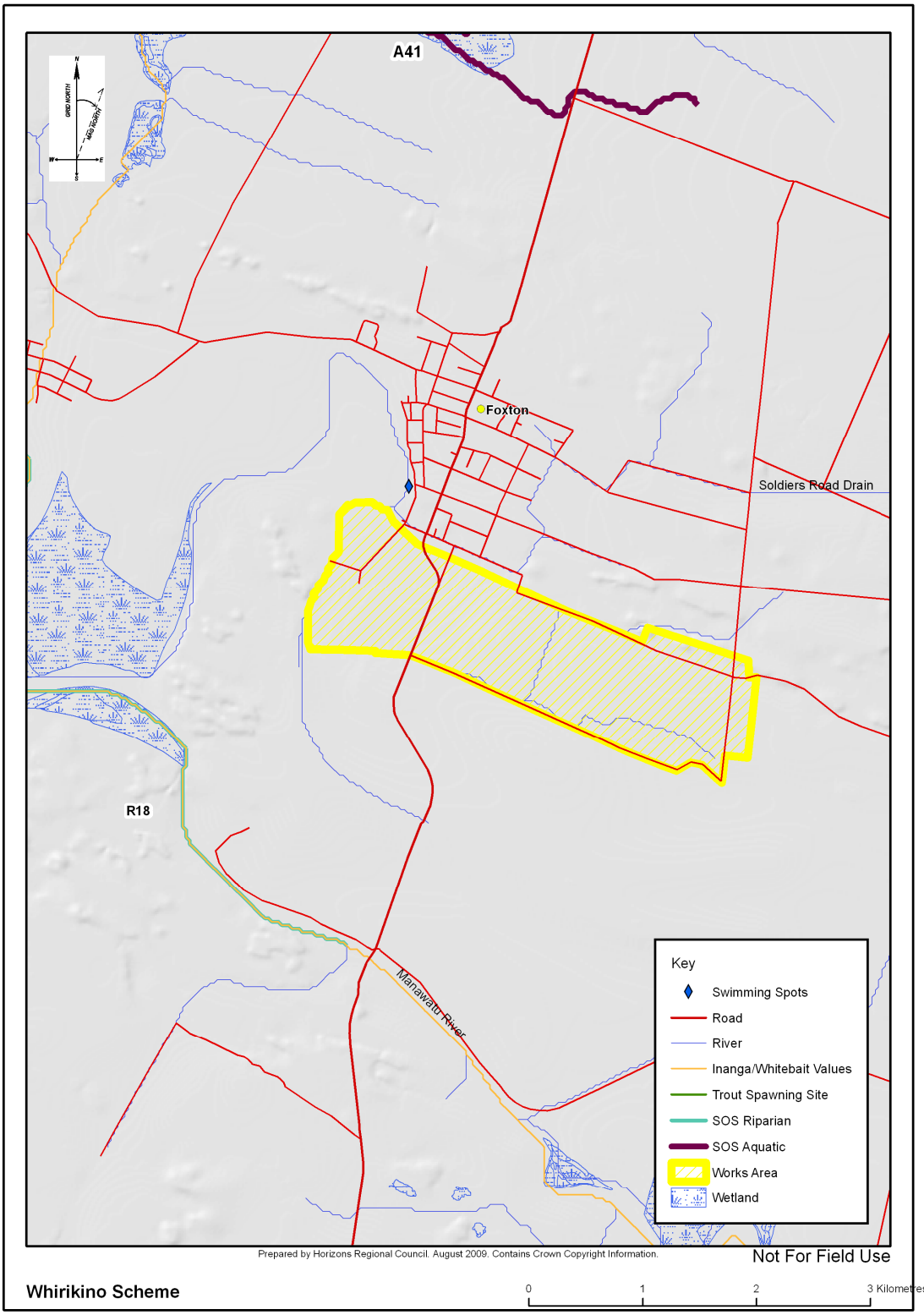
Not For Field Use
Te Kawau Scheme
0 1 2 3 4 Kilometres


A41
Foxton
Soldiers Road Drain
R18
Manawatu River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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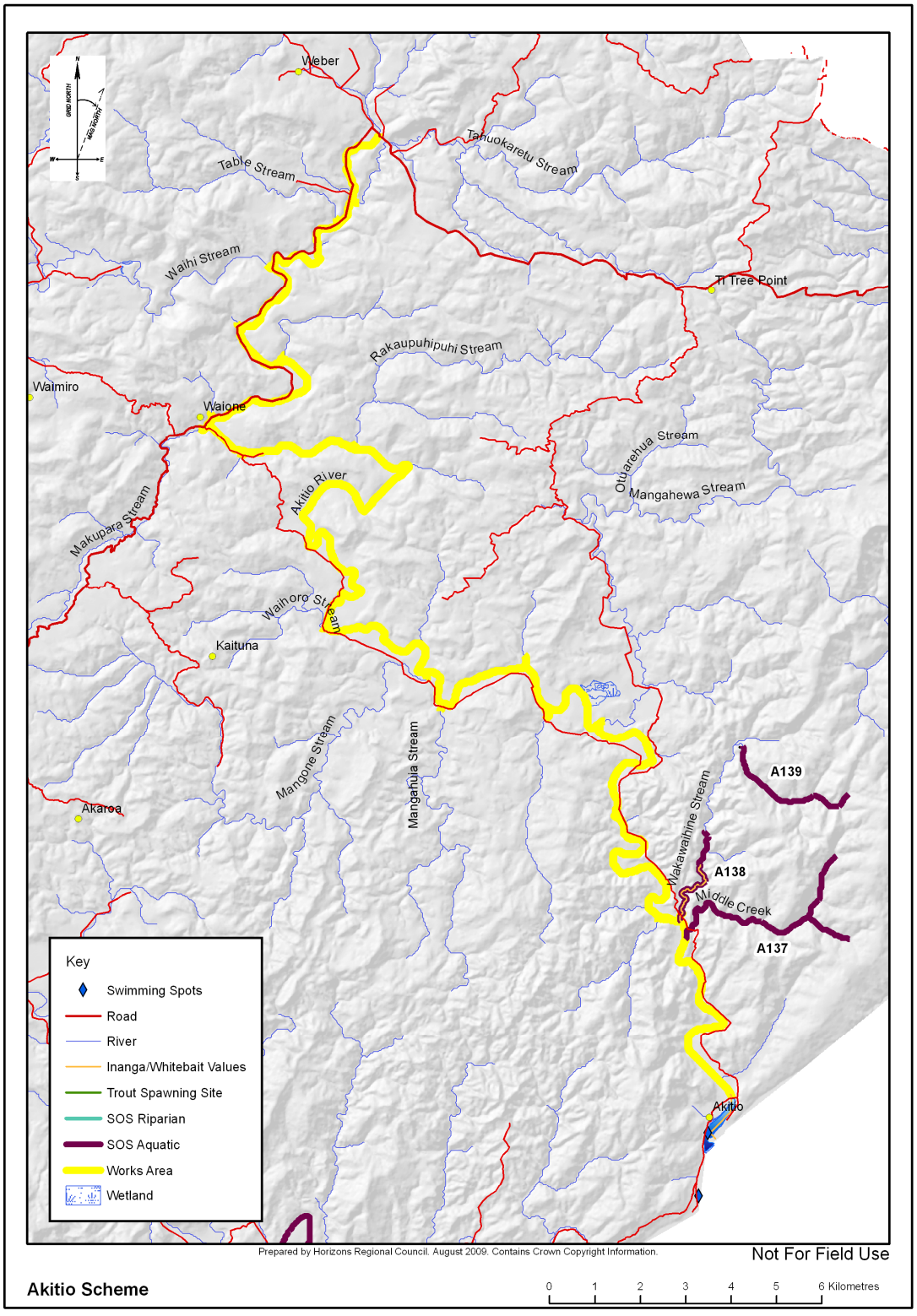
Not For Field Use
Whirikino Scheme
0
1
2
3 Kilometres


Weber
Table Stream
Tahuokaretu Stream
Waihi Stream
Ti Tree Point
Rakaupuhipuhi Stream
Waimiro
Waione
Otuarehua Stream
Mangahewa Stream
Akitio River
Makupara Stream
Waihoro Stream
Kaituna
Mangaohia Stream
Mangaonie Straam
Akaroa
A139
Wakawaihine Stream
A138
Middle Creek
A137
Akitio
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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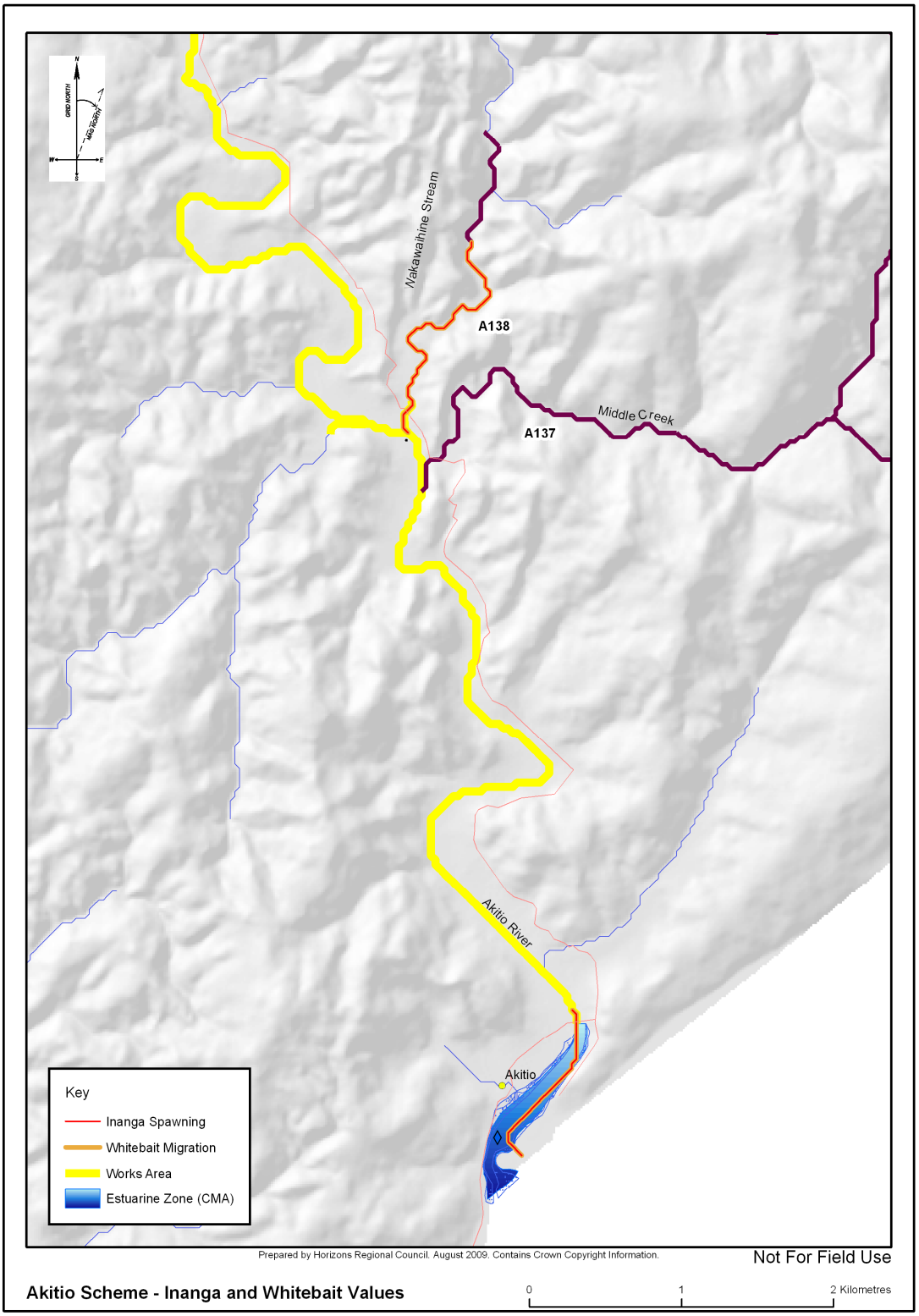
Not For Field Use
Akitio Scheme
0 1 2 3 4 5 6 Kilometres


Nakawaihine Stream
A138
Middle Creek
A137
Akitio River
Akitio
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
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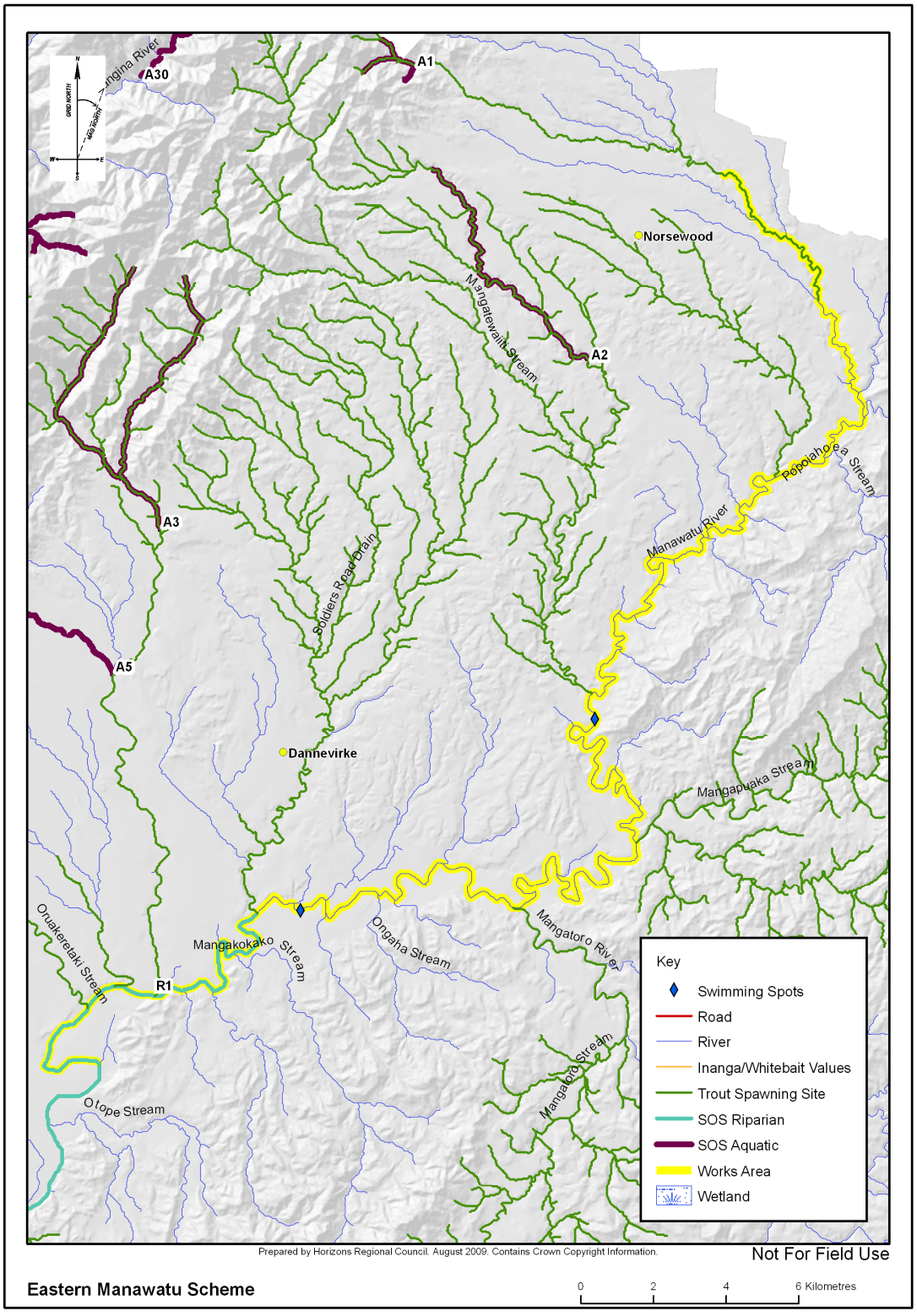
Not For Field Use
Akitio Scheme - Inanga and Whitebait Values
0
1
2 Kilometres


Inanga River
A30
A1
Norsewood
Mangatewaiiti Stream
A2
Popoiahoea Stream
A3
Manawatu River
Soldiers Road Drain
A5
Dannevirke
Mangapuaka Stream
Oruakeretaki Stream
Mangakokako Stream
R1
Ongana Stream
Mangatoro River
Mangatoro Stream
Otope Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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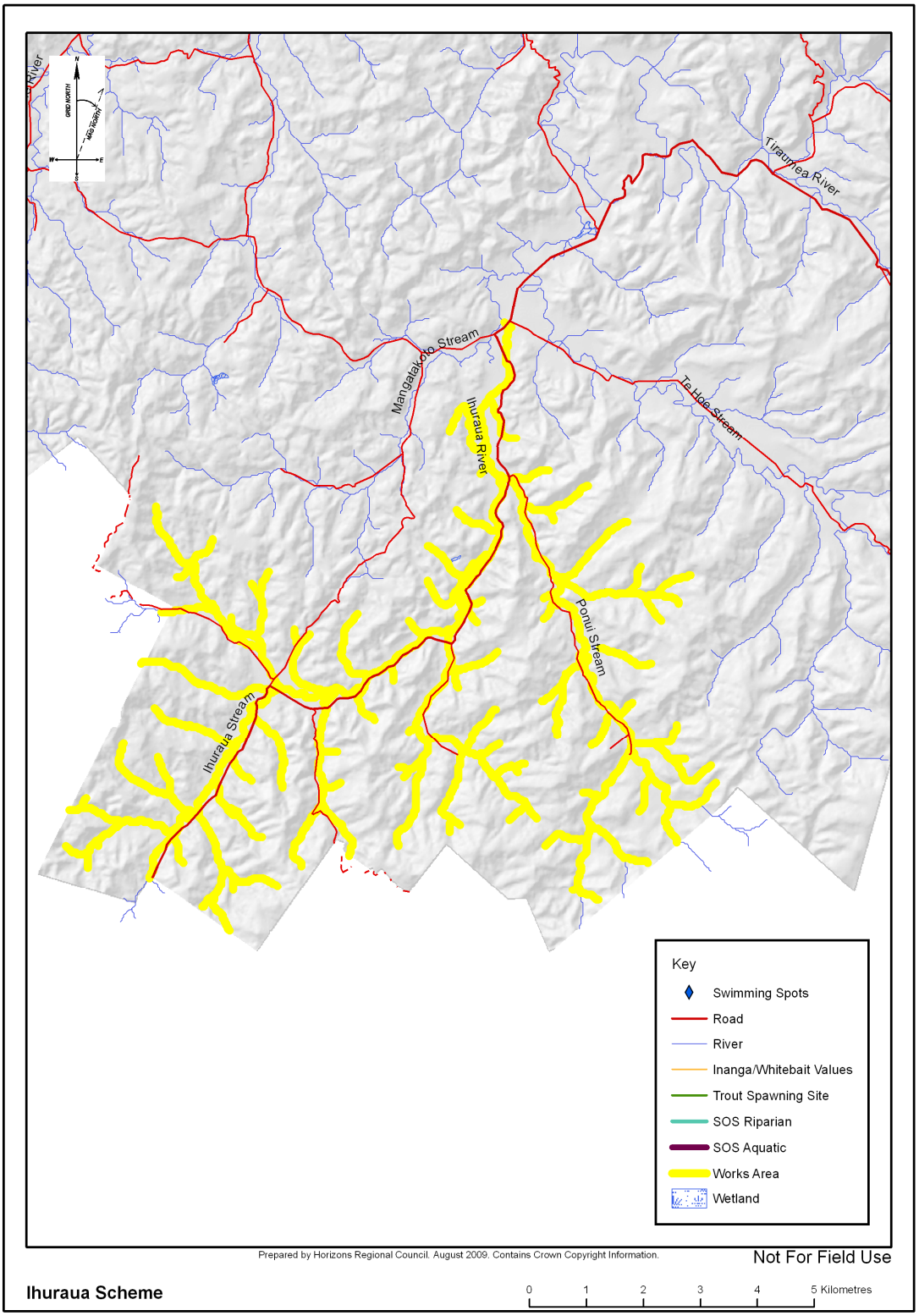
Not For Field Use
Eastern Manawatu Scheme
0
2
4
6 Kilometres


River
Tiraumea River
Mangatakoto Stream
Ihuraua River
Te Hoe Stream
Ponui Stream
Ihuraua Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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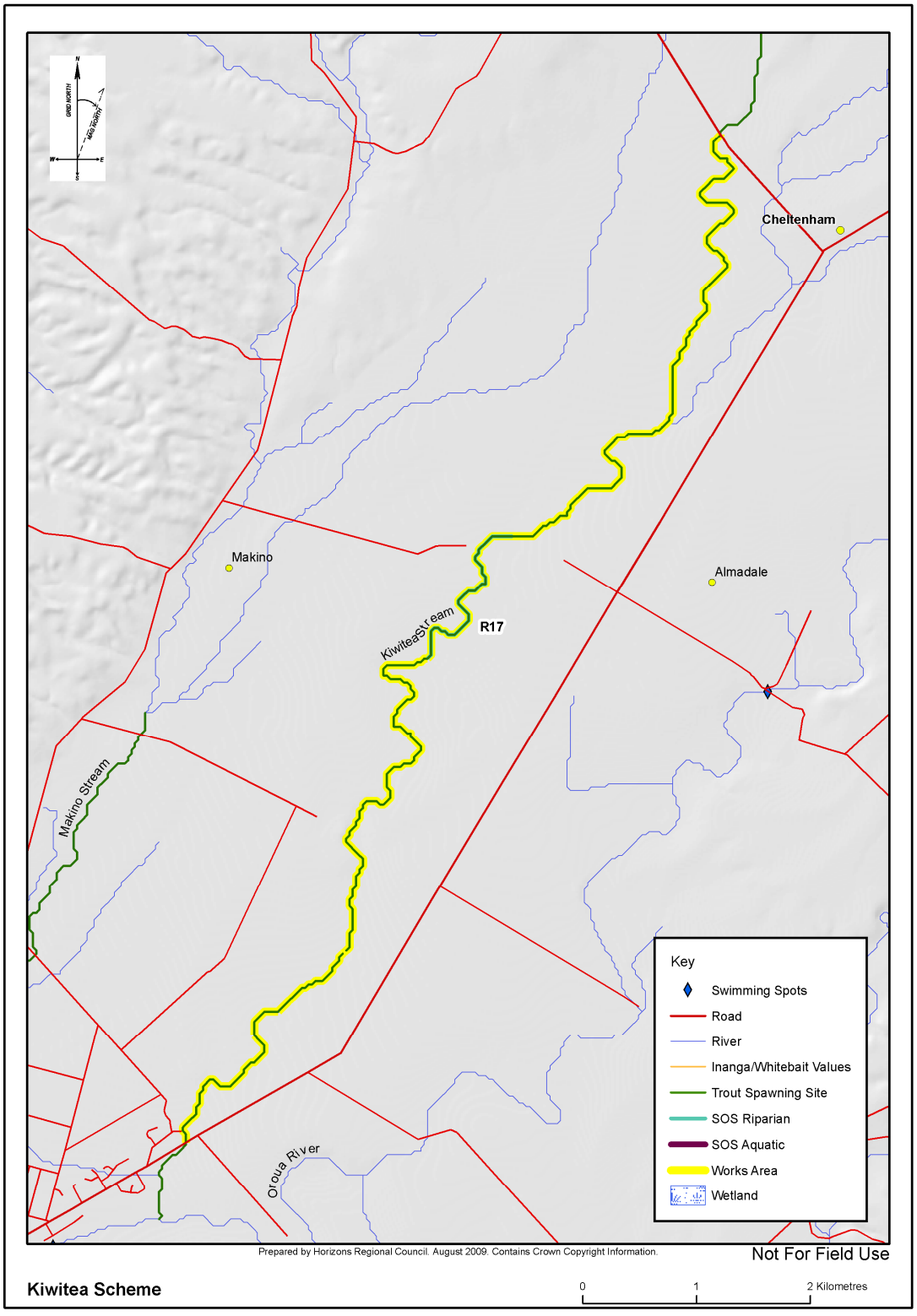
Not For Field Use
Ihuraua Scheme
0 1 2 3 4 5 Kilometres


Cheltenham
Makino
Almadale
Kiwitea Stream
R17
Makino Stream
Oroua River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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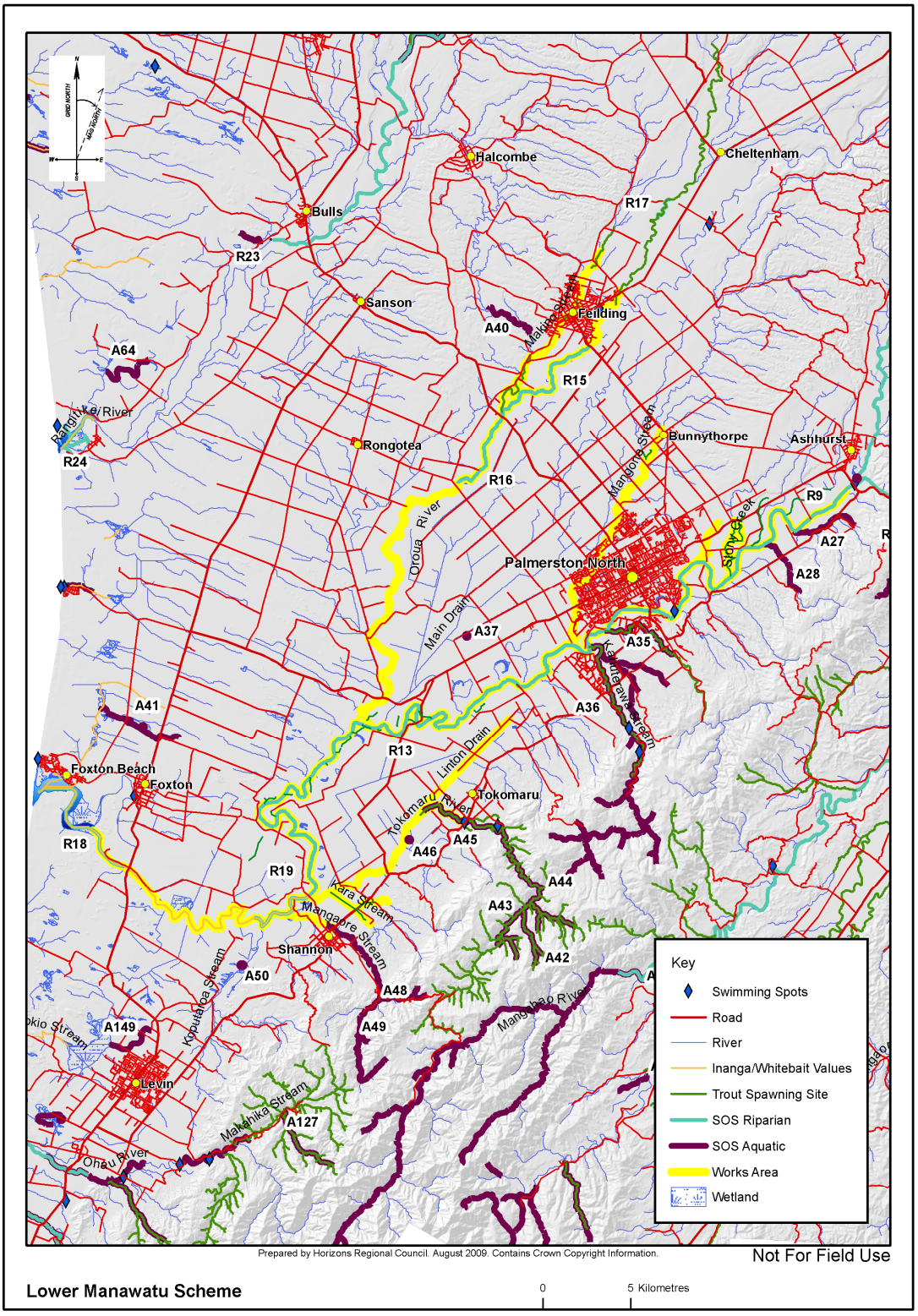
Not For Field Use
Kiwitea Scheme
0
1
2 Kilometres


Halcombe
Cheltenham
Bulls
R17
R23
Sanson
Feilding
A40
Makino Stream
A64
R15
Rangitikei River
Rongotea
Bunnythorpe
Ashhurst
R24
R16
Mangone Stream
R9
Oroua River
Stony Creek
A27
Palmerston North
A28
Main Drain
A37
A35
Kahuterawa Stream
A41
A36
R13
Linton Drain
Foxton Beach
Foxton
Tokomaru
Tokomaru River
R18
A46
A45
R19
A44
Kara Stream
A43
Mangaore Stream
Shannon
A42
A50
A48
Koputaroa Stream
A149
A49
Mangahao River
Levin
Mahanika Stream
A127
Ohau River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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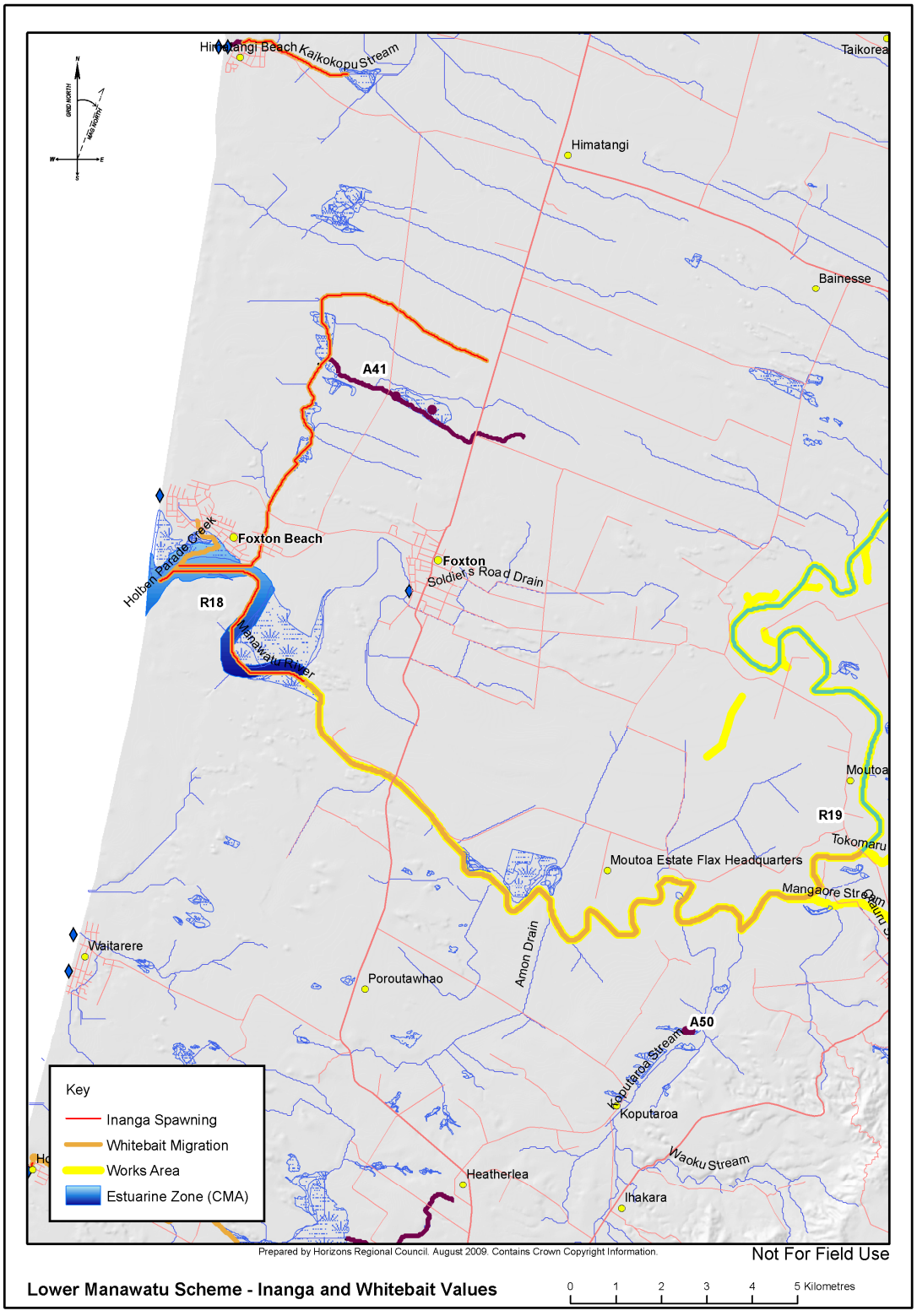
Not For Field Use
Lower Manawatu Scheme
0
5 Kilometres


Himatangi Beach
Kaikokopu Stream
Taikorea
Himatangi
Bainesse
A41
Foxton Beach
Holben Parade Creek
Foxton
Soldiers Road Drain
R18
Manawatu River
Moutoa
R19
Tokomaru
Moutoa Estate Flax Headquarters
Mangaore Stream
Waitarere
Poroutawhao
Amon Drain
A50
Koputaroa Stream
Koputaroa
Waoku Stream
Heatherlea
Ihakara
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
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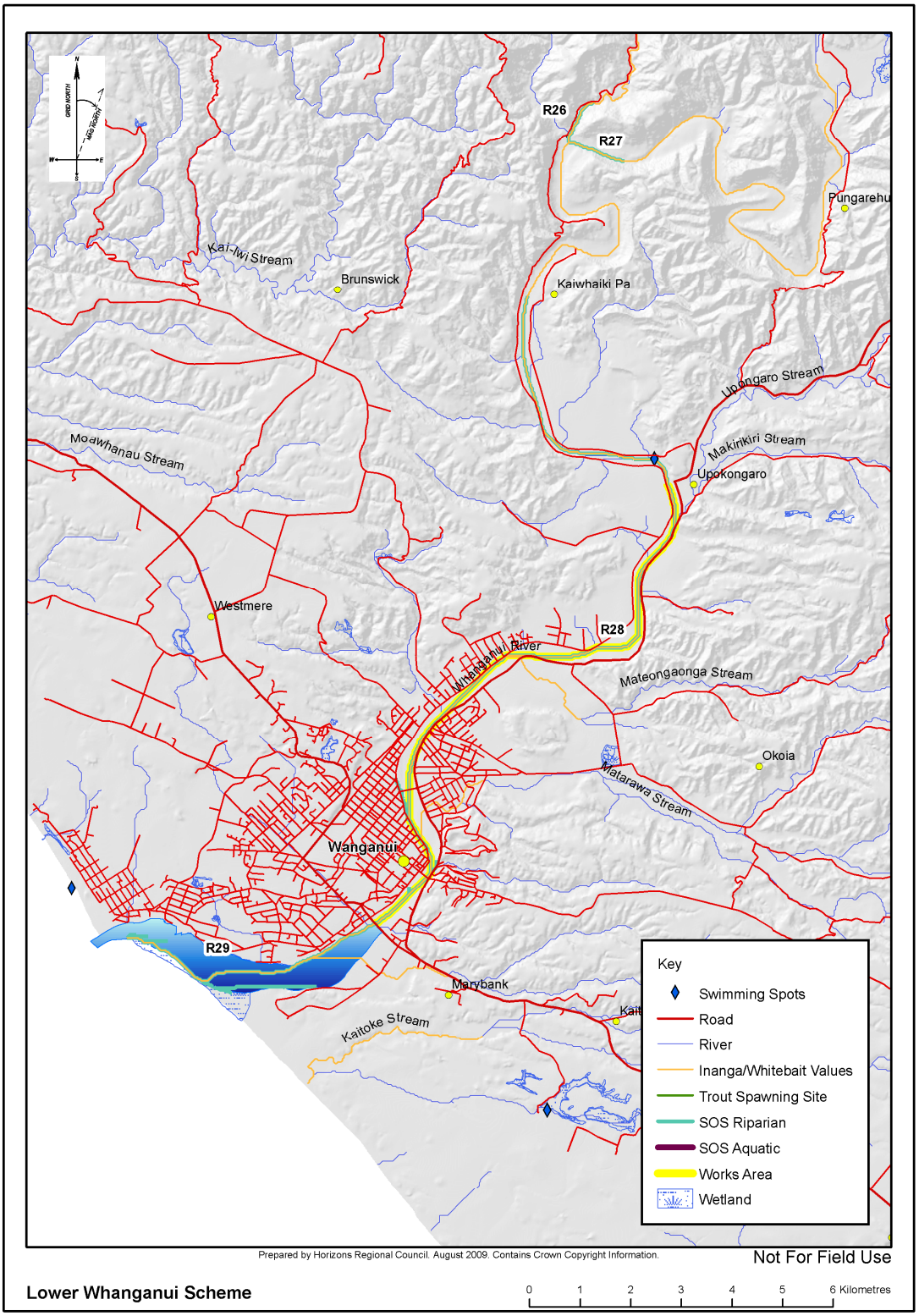
Not For Field Use
Lower Manawatu Scheme - Inanga and Whitebait Values
0 1 2 3 4 5 Kilometres


R26
R27
Pungarehu
Kai-Iwi Stream
Brunswick
Kaiwhaiki Pa
Upongaro Stream
Makirikiri Stream
Upokongaro
Moawhanau Stream
Westmere
R28
Whanganui River
Mateongaonga Stream
Okoia
Matarawa Stream
Wanganui
R29
Marybank
Kaitoke Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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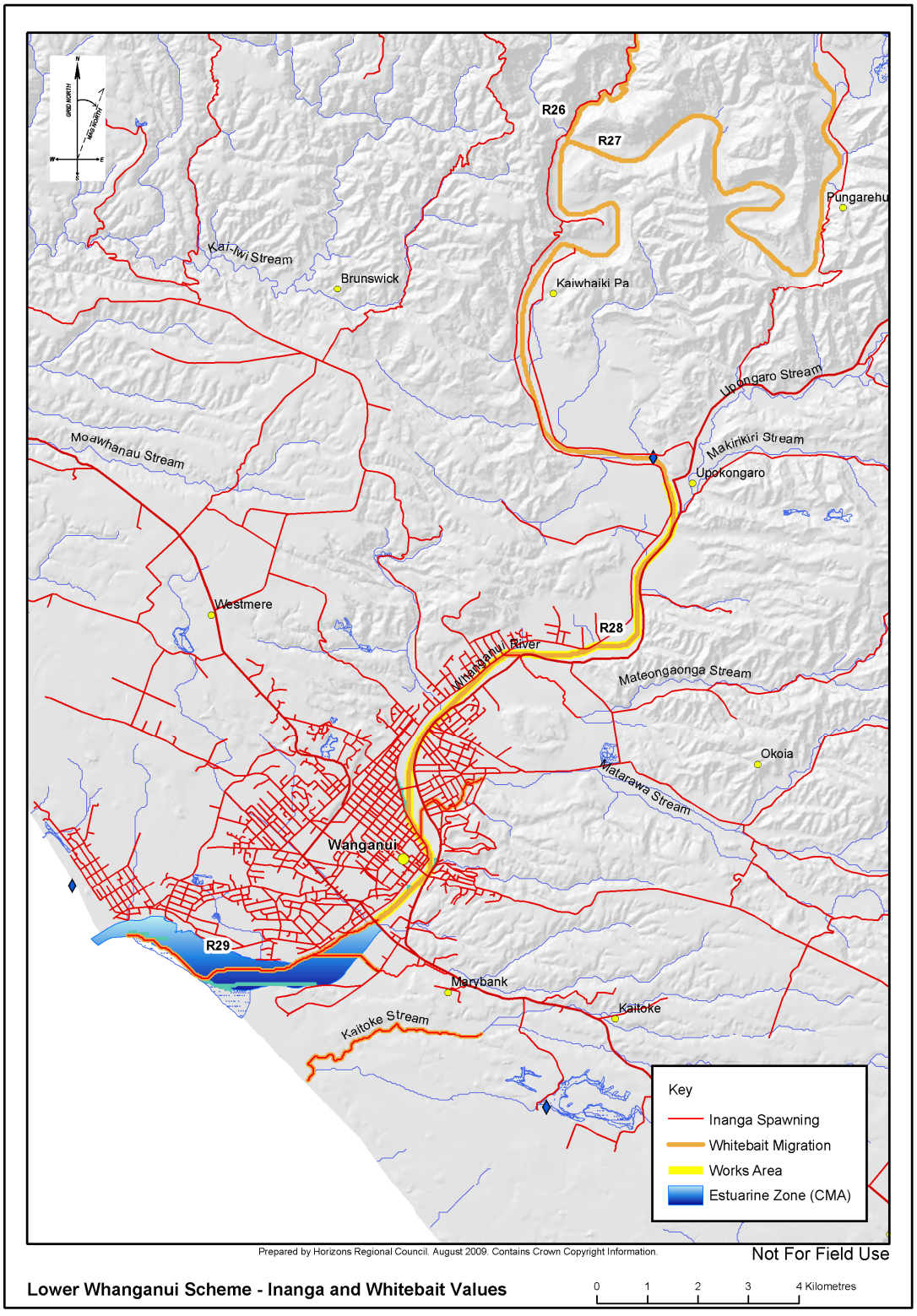
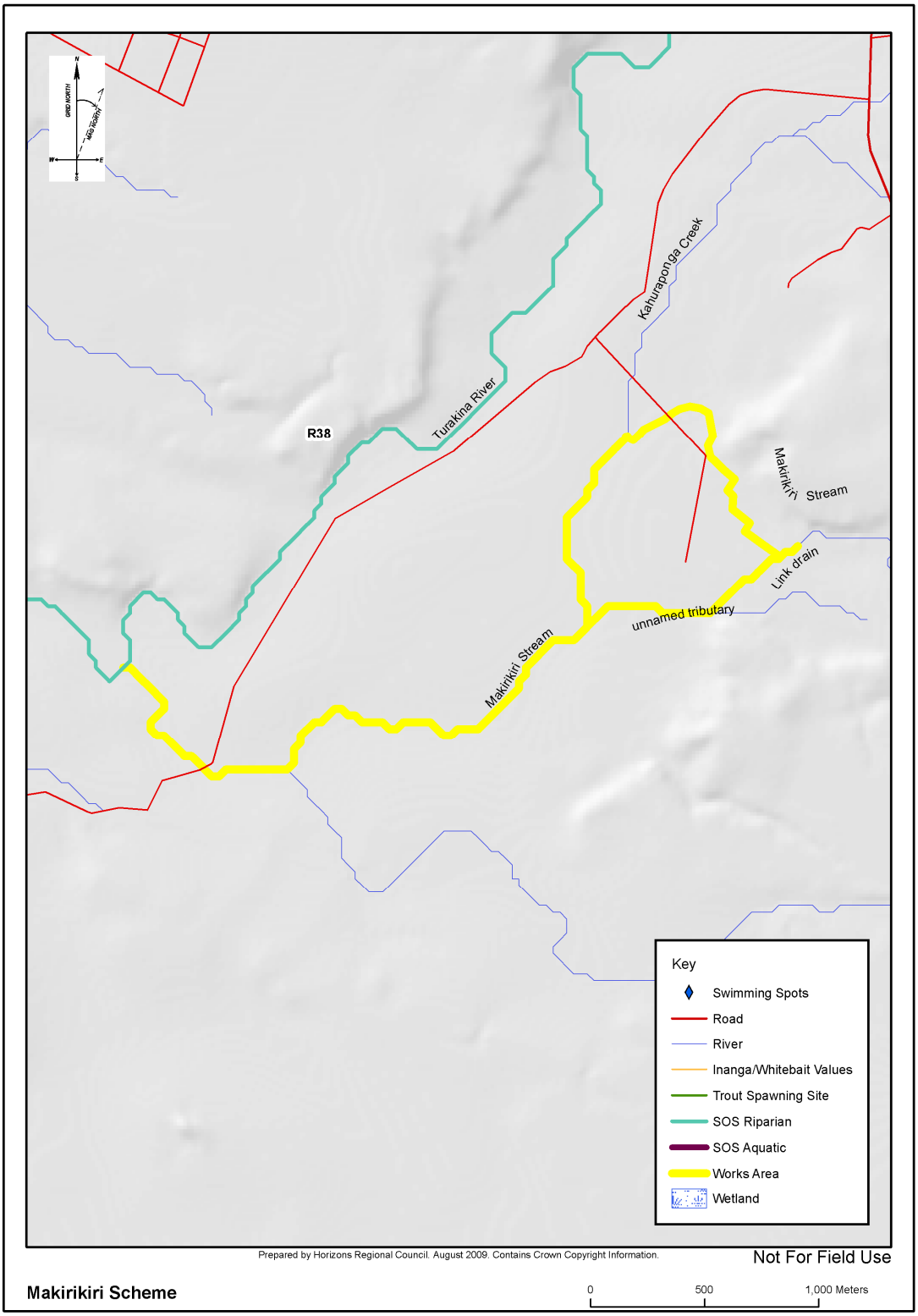
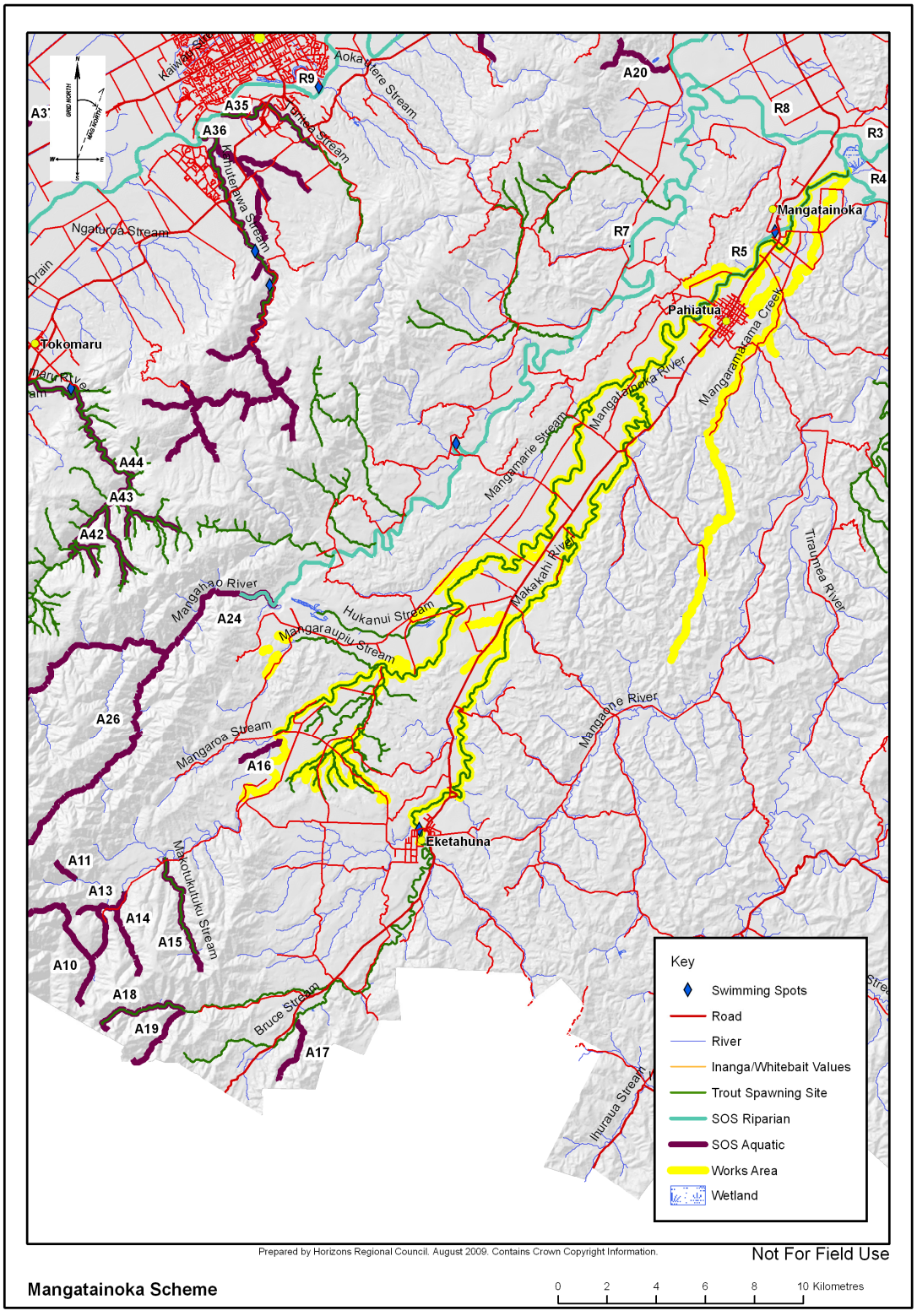
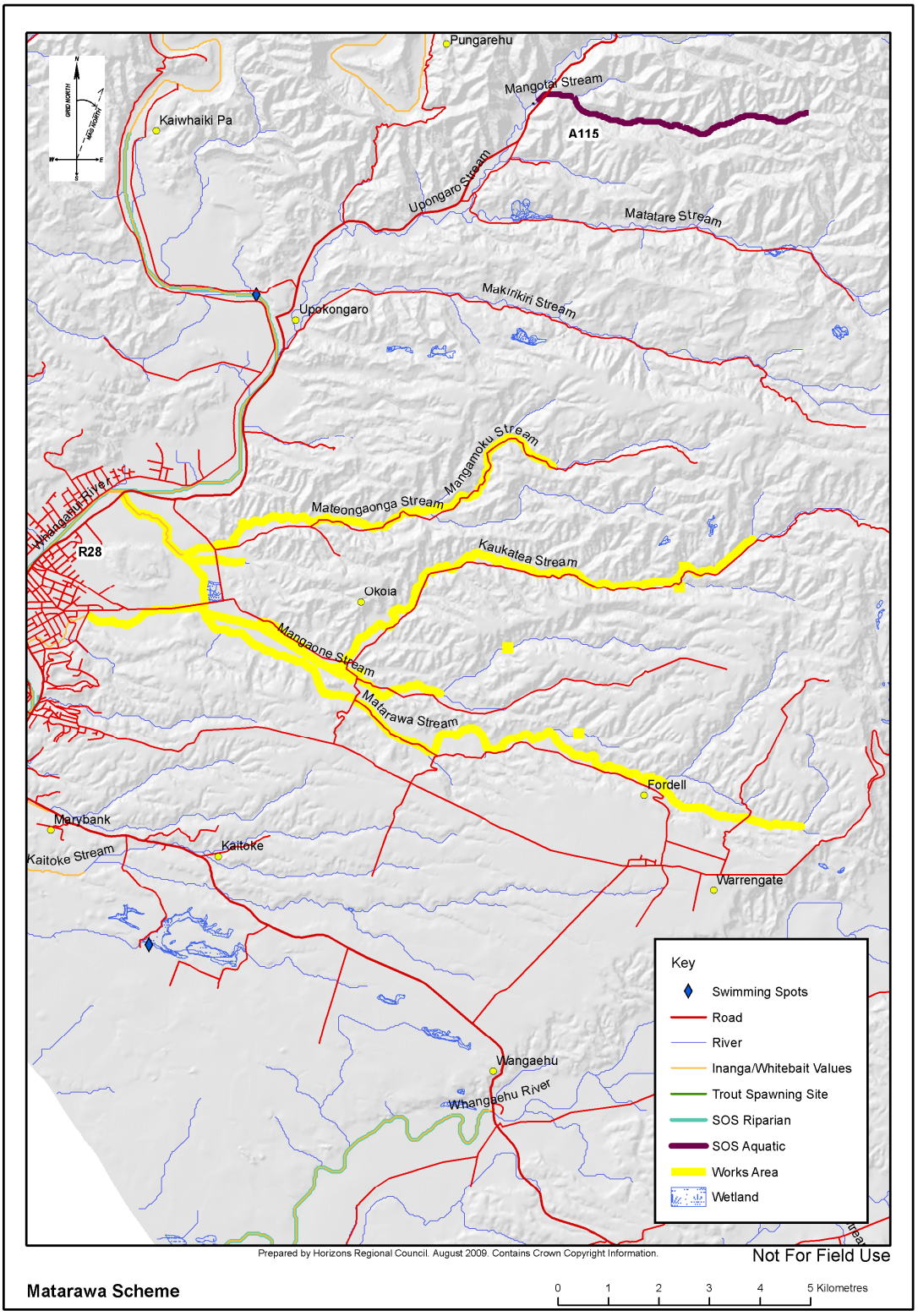
Not For Field Use
Lower Whanganui Scheme
0 1 2 3 4 5 6 Kilometres


R26
R27
Pungarehu
Kai-Iwi Stream
Brunswick
Kaiwhaiki Pa
Upokongaro Stream
Moawhanau Stream
Makirikiri Stream
Upokongaro
Westmere
R28
Whanganui River
Mateongaonga Stream
Okoia
Matarawa Stream
Wanganui
R29
Marybank
Kaitoke
Kaitoke Stream
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Lower Whanganui Scheme - Inanga and Whitebait Values
0 1 2 3 4 Kilometres


GRID NORTH
MAG NORTH
R38
Turakina River
Kahuraponga Creek
Makirikiri Stream
Link drain
unnamed tributary
Makirikiri Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Makirikiri Scheme
0
500
1,000 Meters


R9
A35
A36
A20
R8
R3
R4
Mangatainoka
R7
R5
Pahiatua
Tokomaru
A44
A43
A42
A24
A26
A16
A11
A13
A14
A15
A10
A18
A19
A17
Eketahuna
Aokautere Stream
Kahuterawa Stream
Ngaturoa Stream
Mangahao River
Hukanui Stream
Mangaraupiu Stream
Mangaroa Stream
Makotukutuku Stream
Bruce Stream
Mangamarie Stream
Makakahi River
Mangaone River
Tiraumea River
Ihuraua Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Mangatainoka Scheme
0 2 4 6 8 10 Kilometres


Pungarehu
Mangotai Stream
A115
Kaiwhaiki Pa
Upongaro Stream
Matatare Stream
Makirikiri Stream
Upokongaro
Mangamoku Stream
Whanganui River
Mateongaonga Stream
R28
Kaukatea Stream
Okoia
Mangaone Stream
Matarawa Stream
Fordell
Marybank
Kaitoke
Kaitoke Stream
Warrengate
Wangaehu
Whangaehu River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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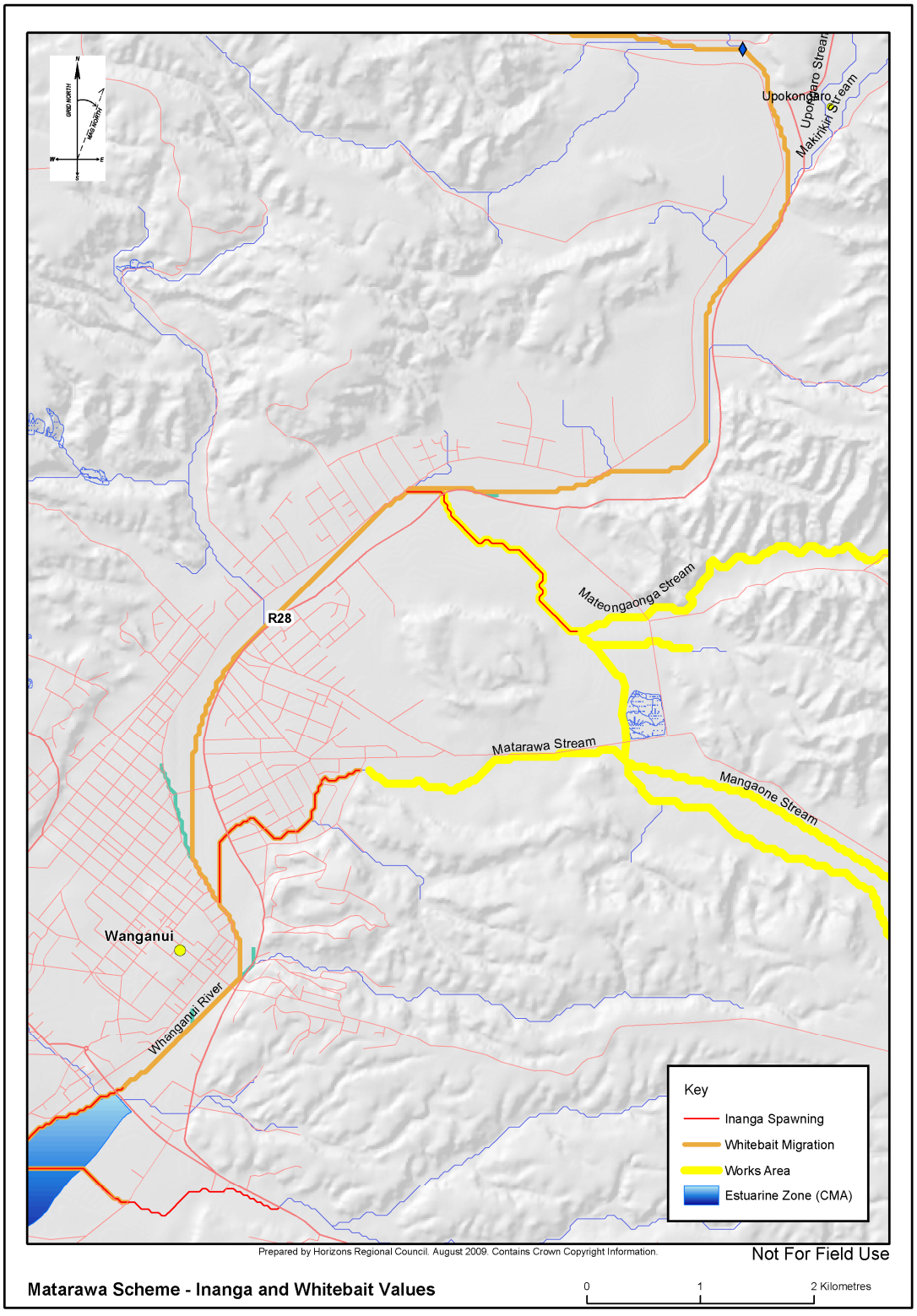
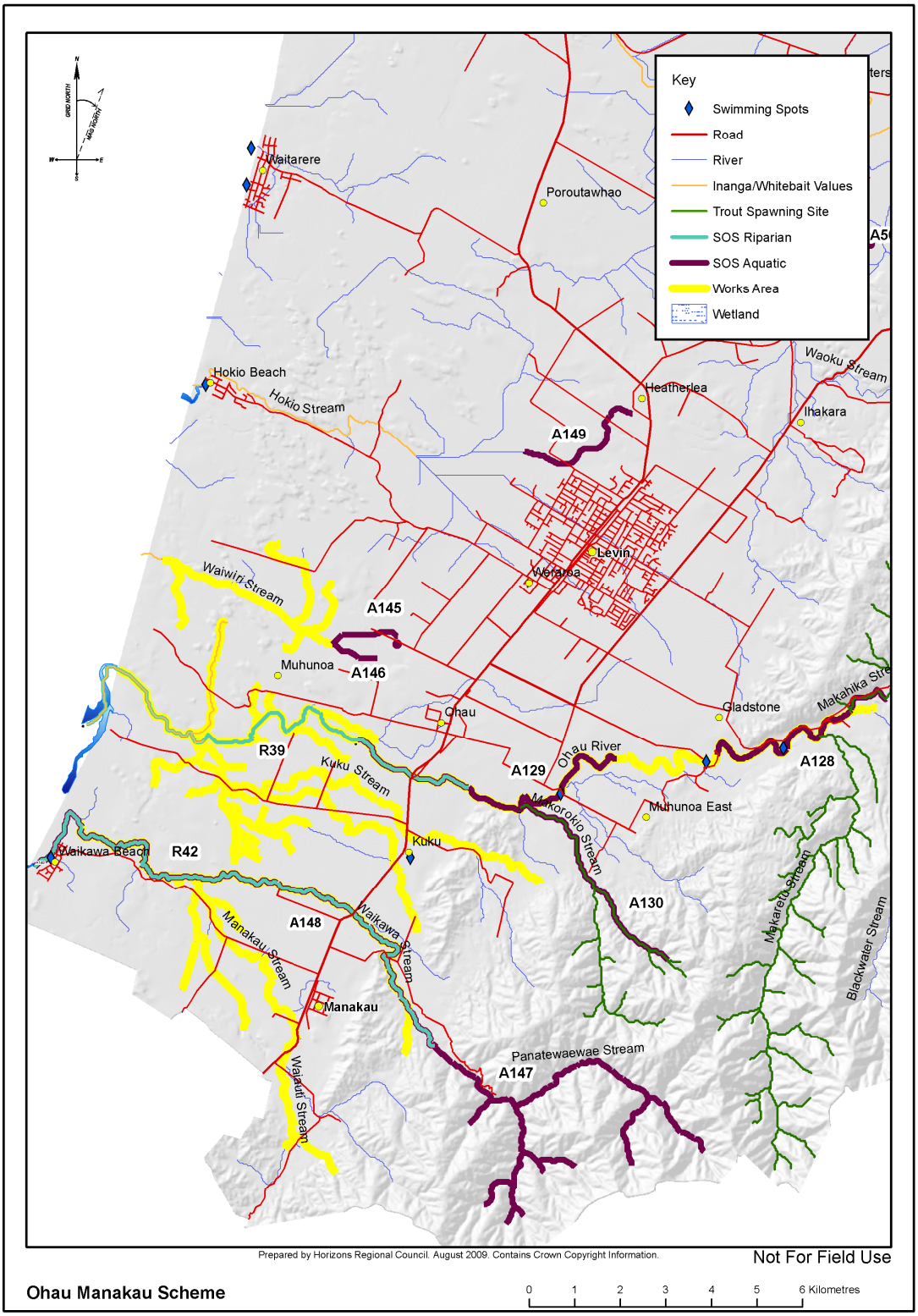
Not For Field Use
Matarawa Scheme
0 1 2 3 4 5 Kilometres


Upokongaro
Upokongaro Stream
Makirikiri Stream
R28
Mateongaonga Stream
Matarawa Stream
Mangaone Stream
Wanganui
Whanganui River
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Matarawa Scheme - Inanga and Whitebait Values
0
1
2 Kilometres


Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Waitarere
Poroutawhao
Hokio Beach
Hokio Stream
Heatherlea
Waoku Stream
Ihakara
A149
Levin
Weraroa
Waiwiri Stream
A145
Muhunoa
A146
Ohau
Gladstone
Makahika Stream
R39
Kuku Stream
A129
Ohau River
A128
Muhunoa East
Makorokio Stream
Kuku
Waikawa Beach
R42
A130
Makaretu Stream
Blackwater Stream
A148
Manakau Stream
Waikawa Stream
Manakau
Panatewaewae Stream
A147
Waiauti Stream
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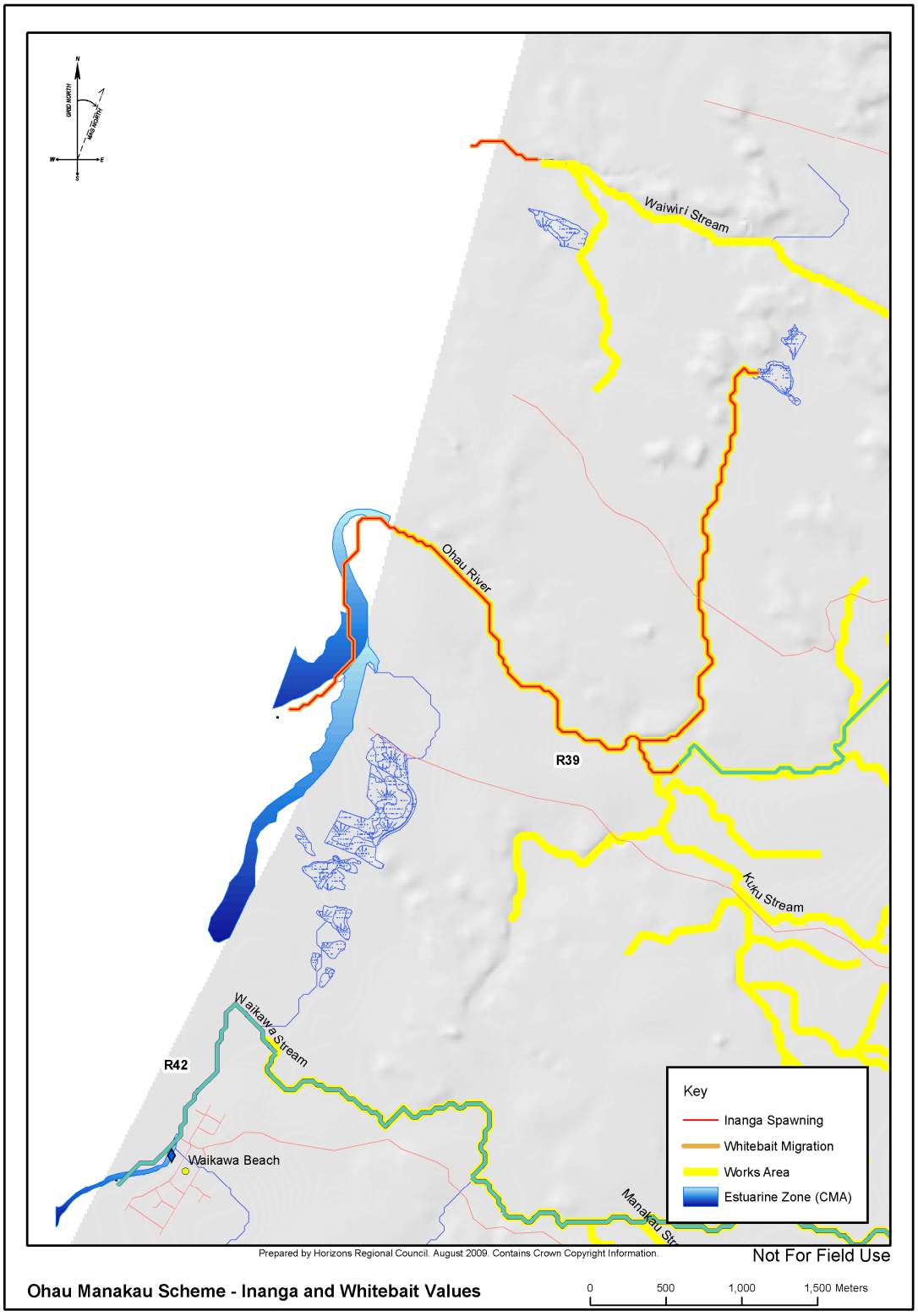
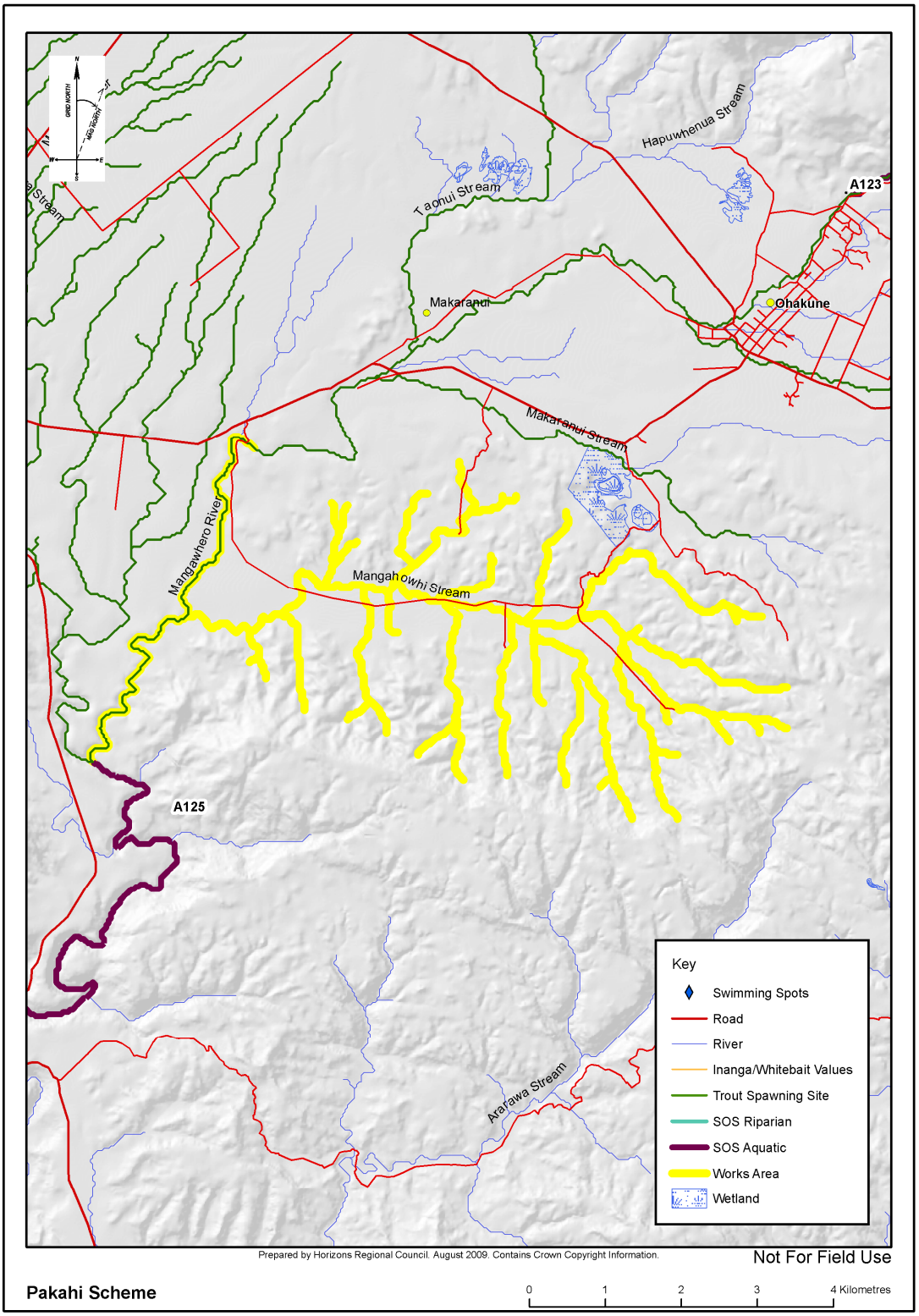
Not For Field Use
Ohau Manakau Scheme
0 1 2 3 4 5 6 Kilometres


Waiwiri Stream
Ohau River
R39
Kuku Stream
Waikawa Stream
R42
Waikawa Beach
Manakau Str
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Ohau Manakau Scheme - Inanga and Whitebait Values
0
500
1,000
1,500 Meters


Hapuwhenua Stream
Taonui Stream
A123
Makaranui
Ohakune
Makaranui Stream
Mangawhero River
Mangahowhi Stream
A125
Ararawa Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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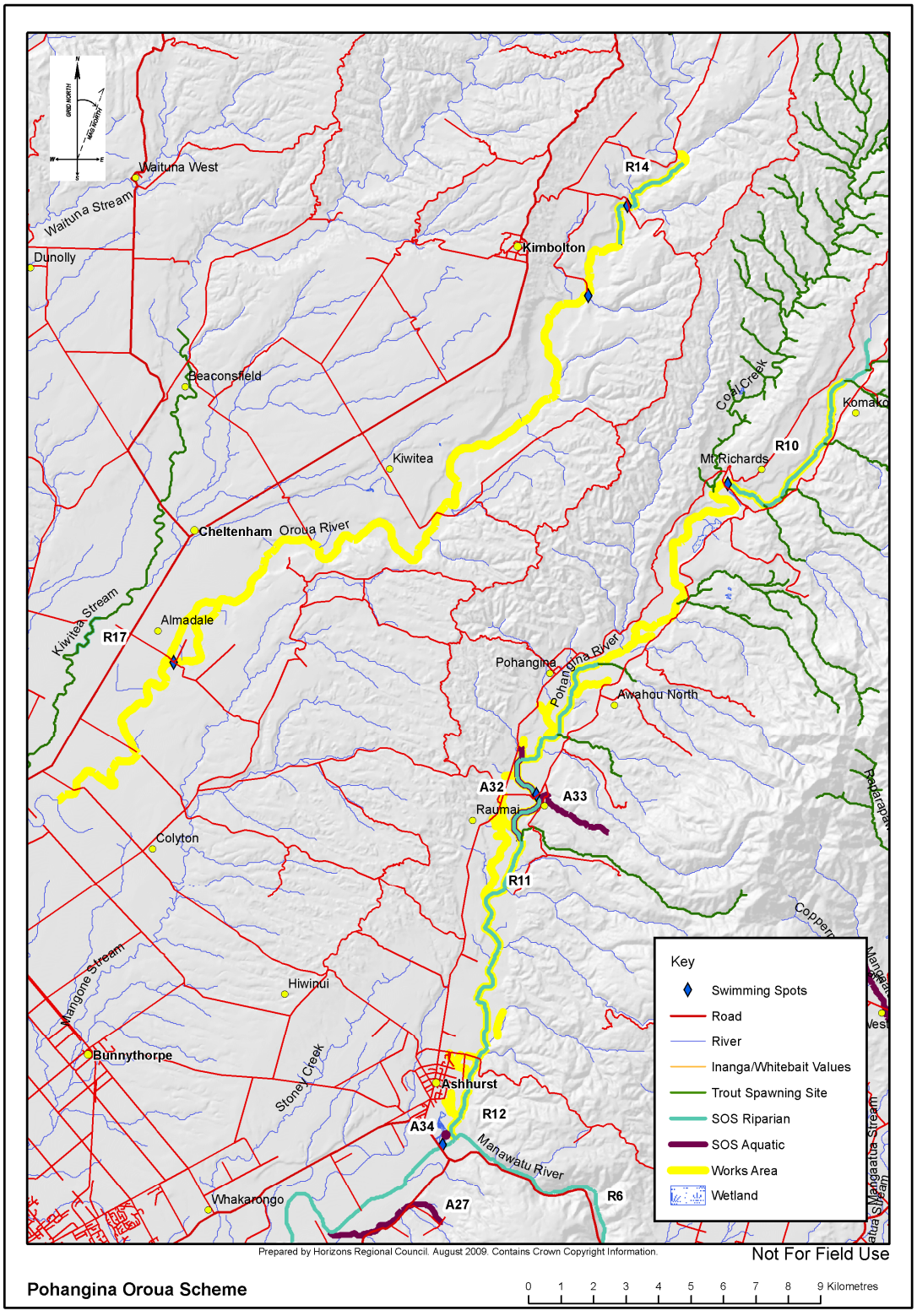
Not For Field Use
Pakahi Scheme
0
1
2
3
4 Kilometres


Waituna West
Waituna Stream
Dunolly
Beaconsfield
Kimbolton
R14
Coal Creek
Komako
R10
Mt Richards
Kiwitea
Cheltenham
Oroua River
Kiwitea Stream
R17
Almadale
Pohangina
Pohangina River
Awahou North
A32
A33
Raumai
Colyton
R11
Mangone Stream
Hiwinui
Bunnythorpe
Stoney Creek
Ashhurst
A34
R12
Manawatu River
R6
Whakarongo
A27
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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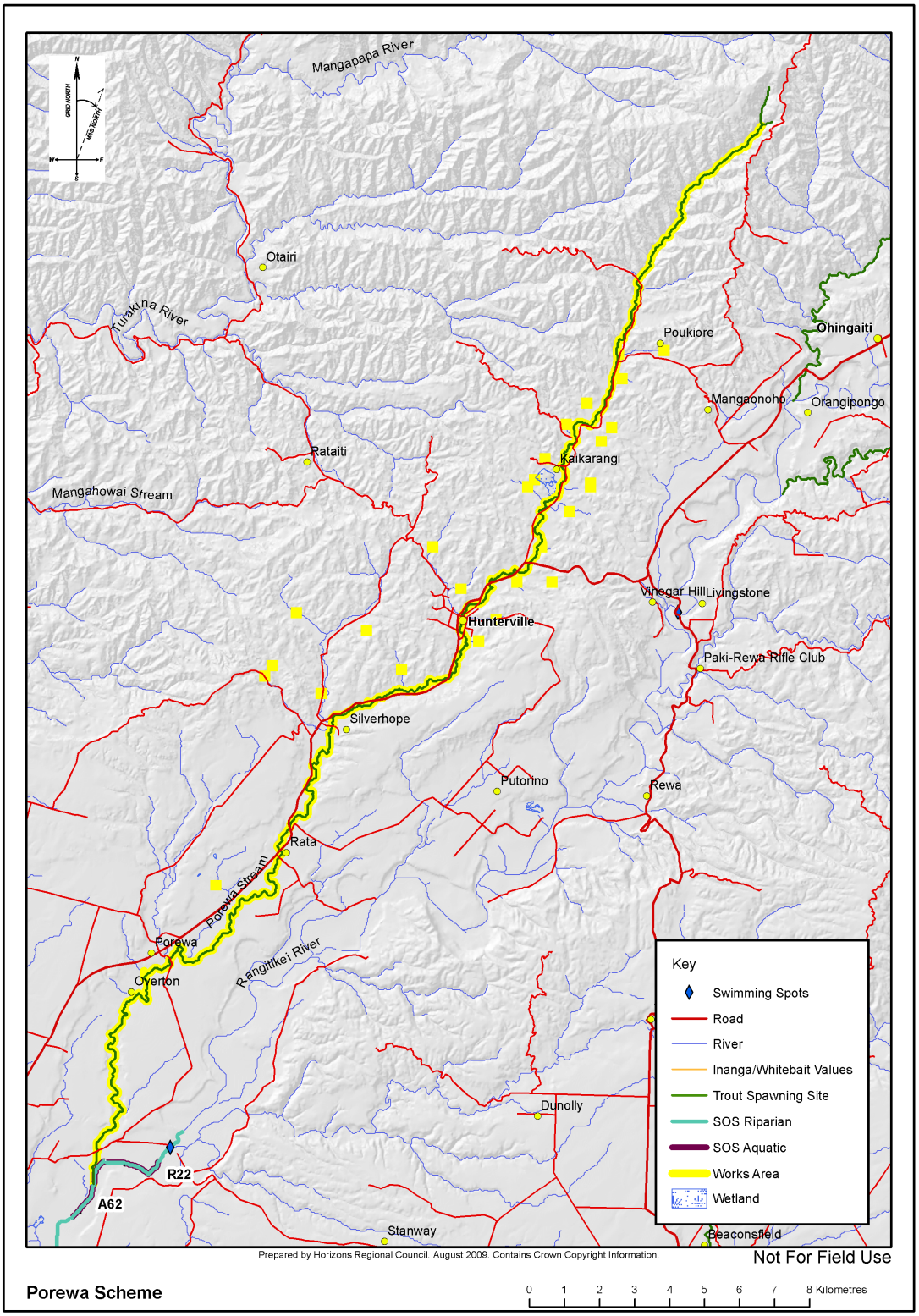
Not For Field Use
Pohangina Oroua Scheme
0 1 2 3 4 5 6 7 8 9 Kilometres


Mangapapa River
Otairi
Turakina River
Poukiore
Ohingaiti
Mangaonoho
Orangipongo
Ratatiti
Kaikarangi
Mangahowai Stream
Vinegar Hill
Livingstone
Hunterville
Paki-Rewa Rifle Club
Silverhope
Putorino
Rewa
Rata
Porewa Stream
Porewa
Overton
Rangitikei River
Dunolly
R22
A62
Stanway
Beaconsfield
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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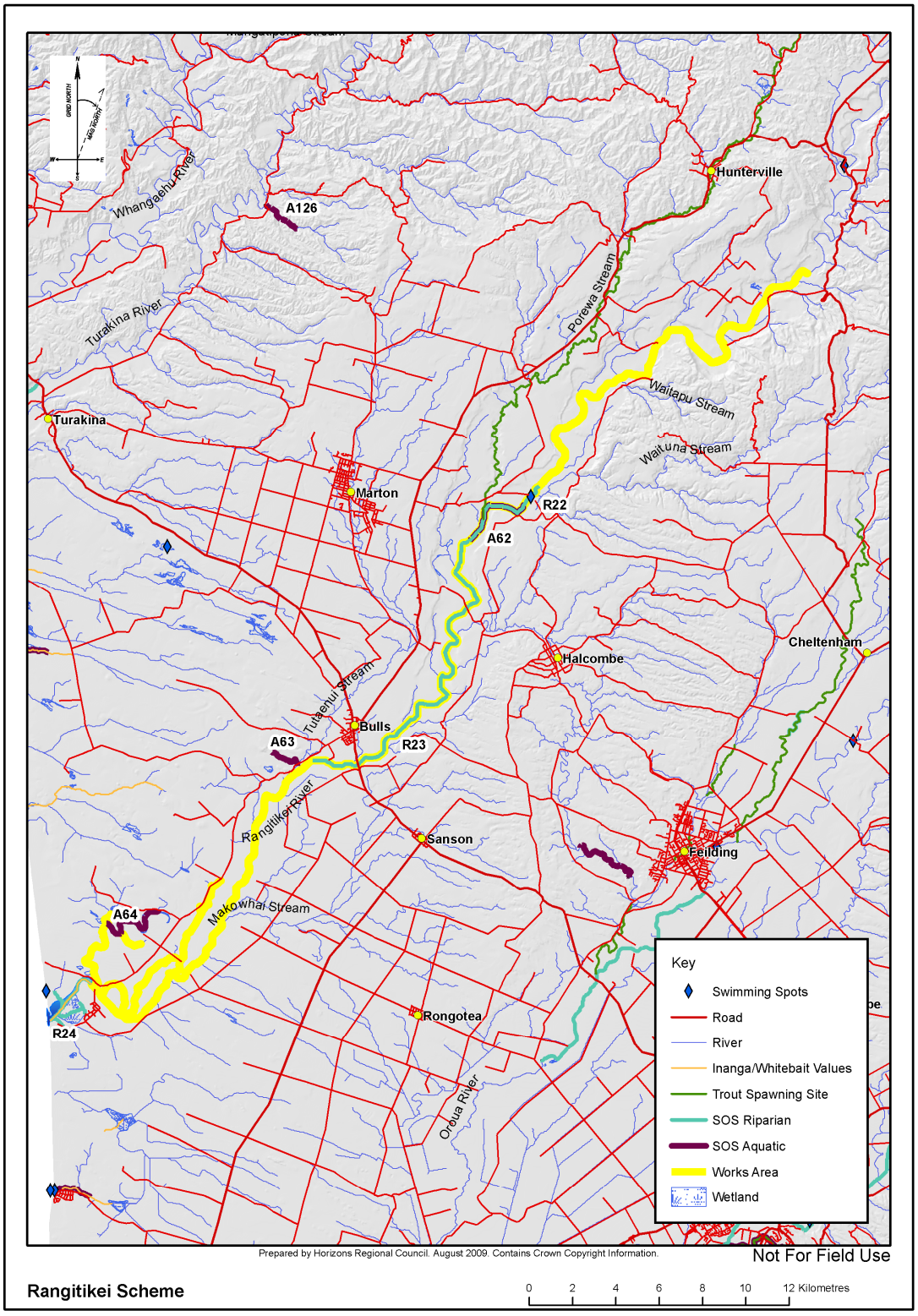
Not For Field Use
Porewa Scheme
0 1 2 3 4 5 6 7 8 Kilometres


Whangaehu River
A126
Turakina River
Turakina
Hunterville
Porewa Stream
Waitapu Stream
Waituna Stream
Marton
R22
A62
Halcombe
Cheltenham
Tutaenui Stream
Bulls
A63
R23
Rangitikei River
Sanson
Feilding
A64
Makowhai Stream
R24
Rongotea
Oroua River
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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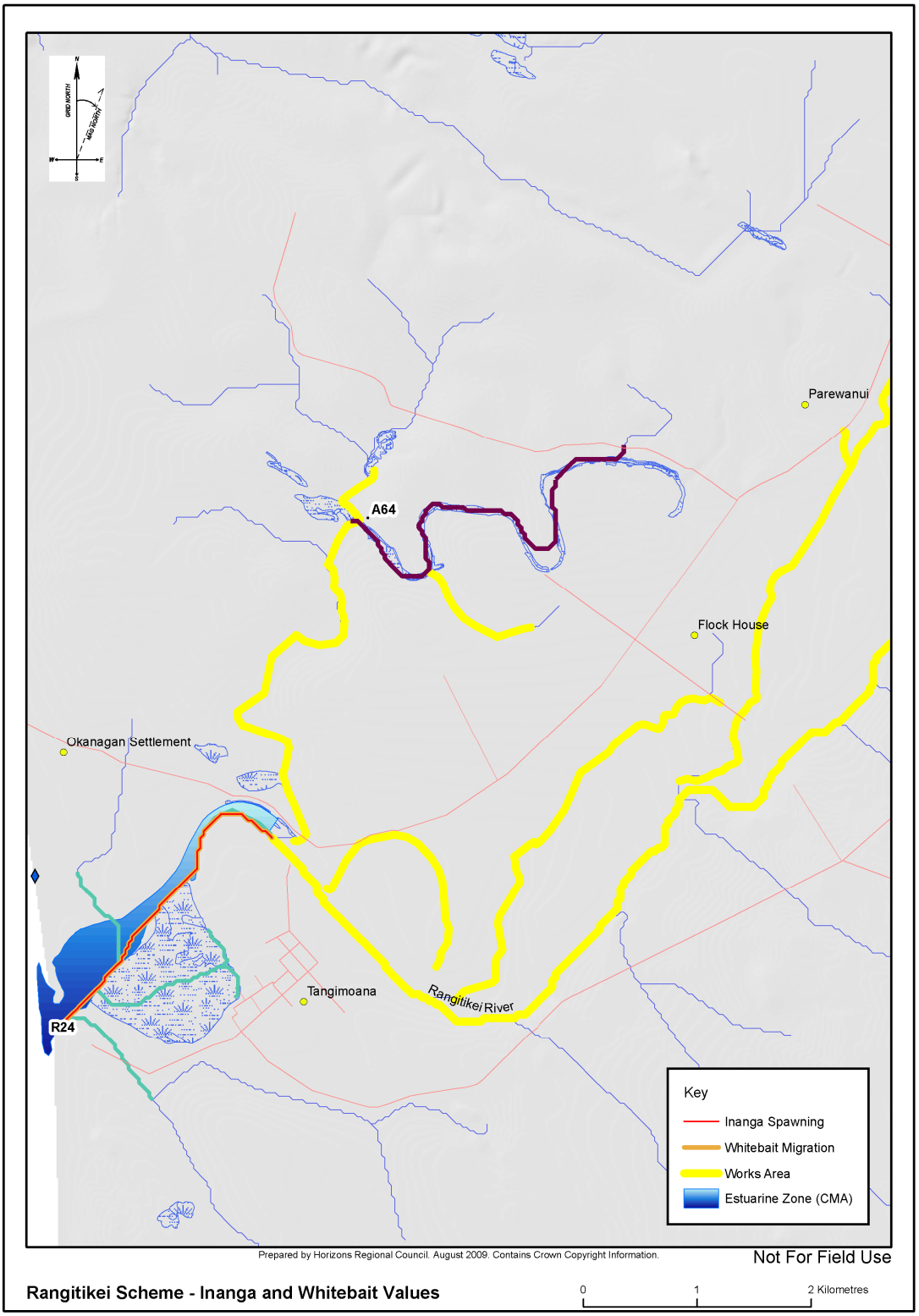
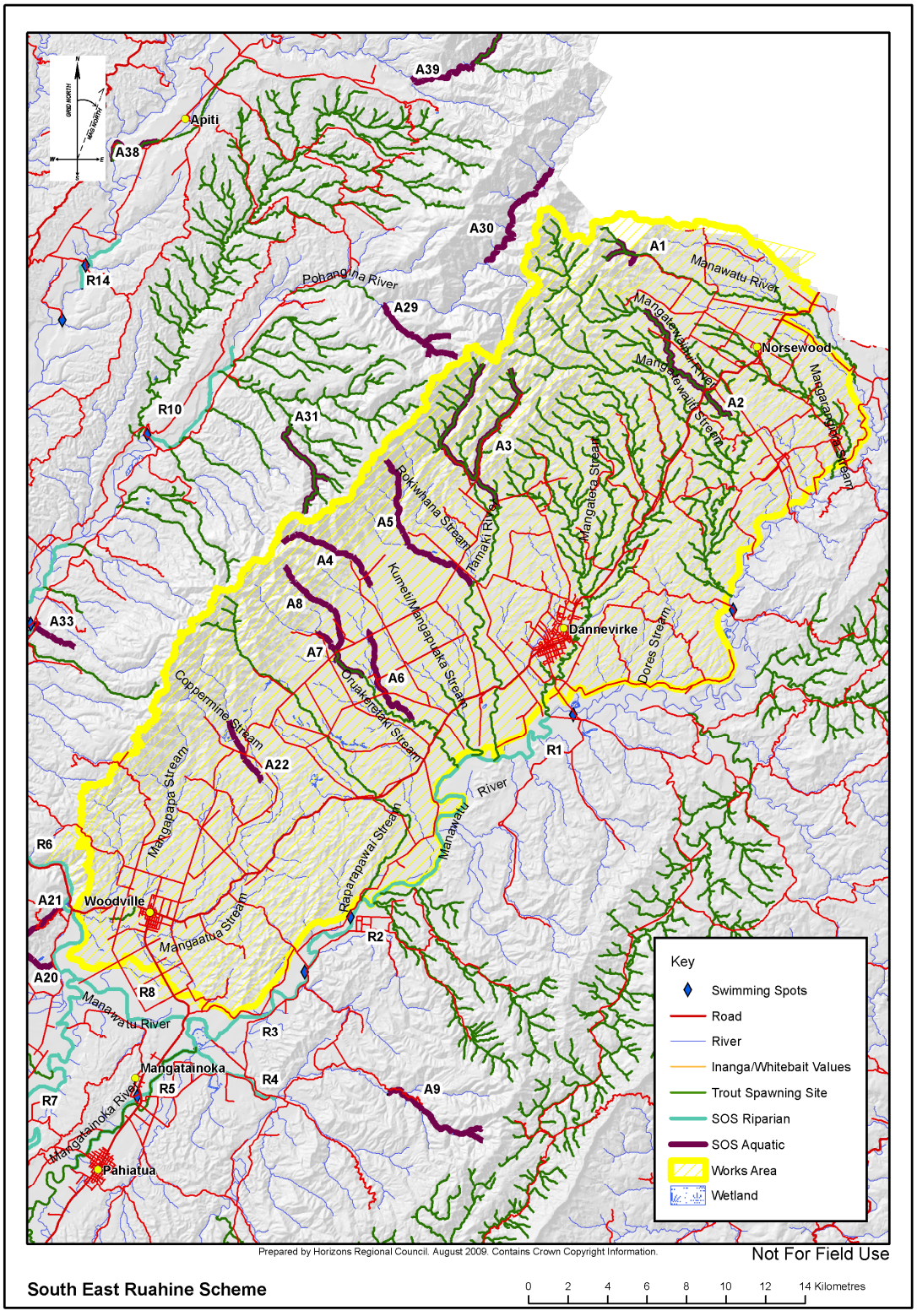
Not For Field Use
Rangitikei Scheme
0 2 4 6 8 10 12 Kilometres


GRID NORTH
MAG NORTH
Parewanui
A64
Flock House
Okanagan Settlement
Tangimoana
Rangitikei River
R24
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Rangitikei Scheme - Inanga and Whitebait Values
0
1
2 Kilometres


A39
Apiti
A38
A30
A1
R14
Pohangina River
Manawatu River
A29
Norsewood
A2
R10
A31
A3
Rokiwhana Stream
Ramaki River
Mangateka Stream
A5
A4
A8
Kumeti/Mangapuaka Stream
A33
Dannevirke
Dores Stream
A7
A6
Oruakeretaki Stream
Coppermine Stream
R1
A22
Mangapapa Stream
River
Manawatu
R6
Raparapawai Stream
A21
Woodville
R2
Mangaatua Stream
A20
R8
Manawatu River
R3
Mangatainoka
R4
R5
A9
R7
Mangatainoka River
Pahiatua
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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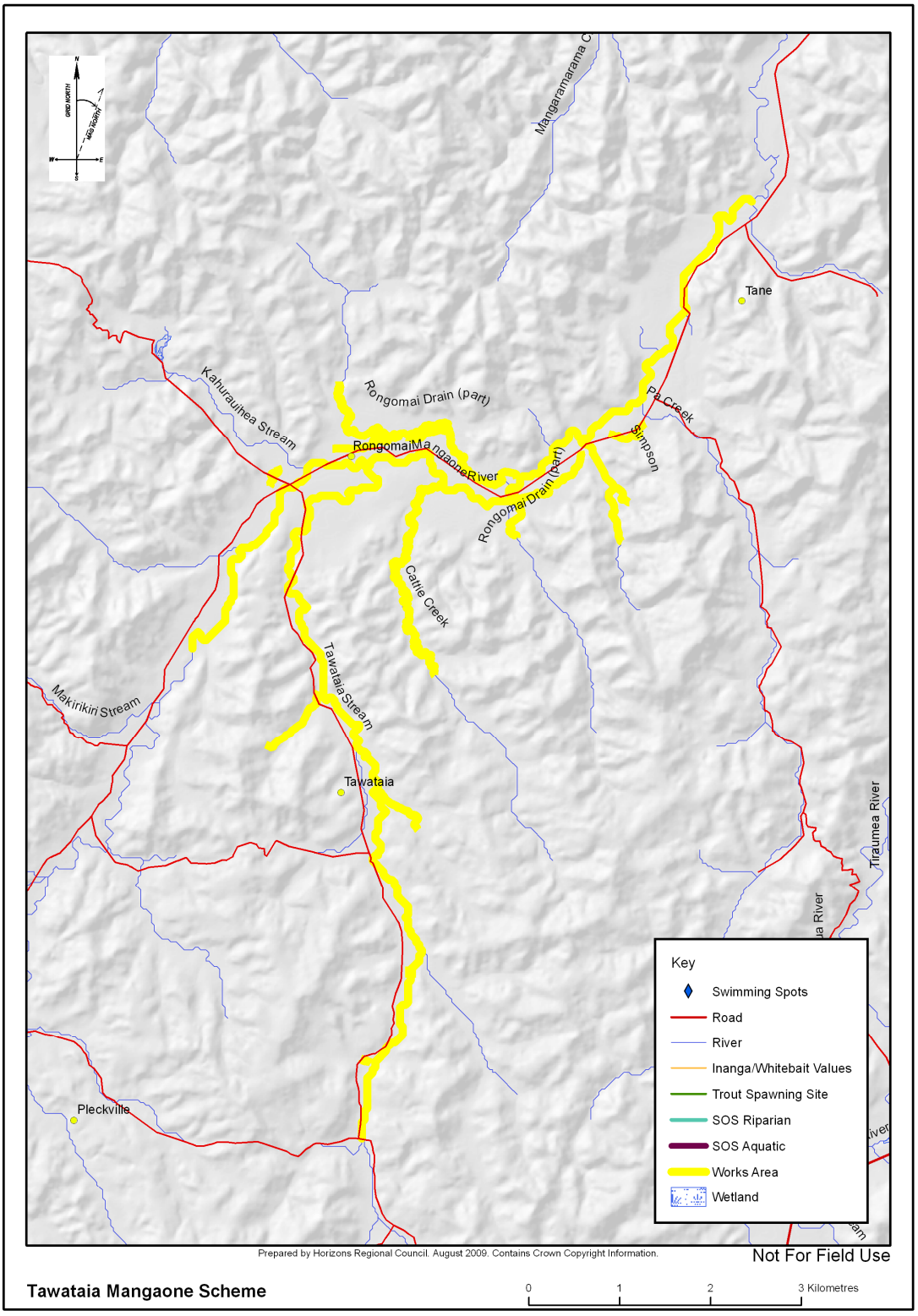
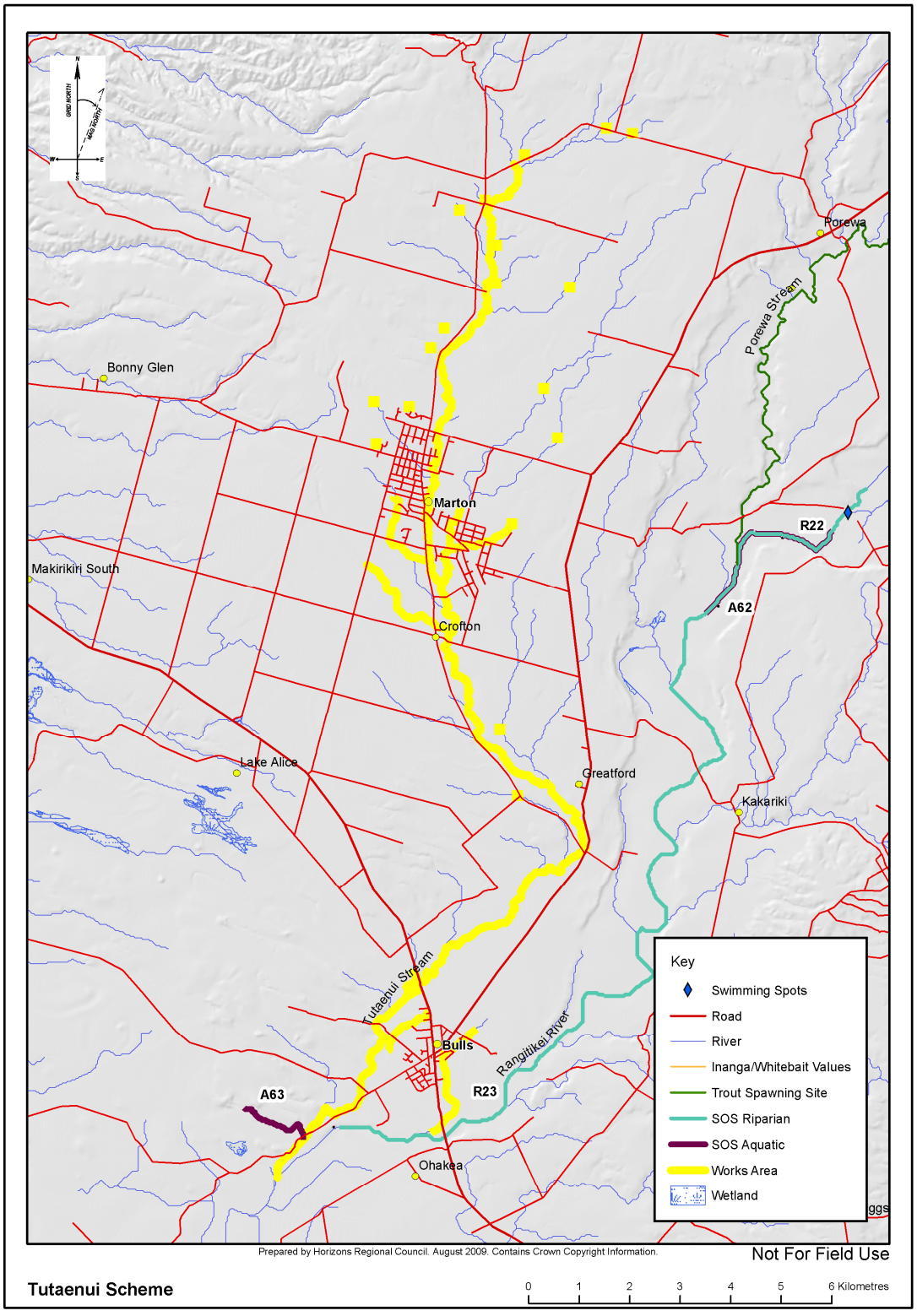
Not For Field Use
South East Ruahine Scheme
0 2 4 6 8 10 12 14 Kilometres


Mangaramarama C
Tane
Kahurauhea Stream
Rongomai Drain (part)
Pa Creek
Simpson
RongomaiMangaoneRiver
Rongomai Drain (part)
Cattle Creek
Tawataia Stream
Makirikiri Stream
Tawataia
Tiraumea River
Pleckville
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Tawataia Mangaone Scheme
0
1
2
3 Kilometres


Porewa
Porewa Stream
Bonny Glen
Marton
R22
Makirikiri South
A62
Crofton
Lake Alice
Greatford
Kakariki
Tutaenui Stream
Bulls
Rangitikei River
A63
R23
Ohakea
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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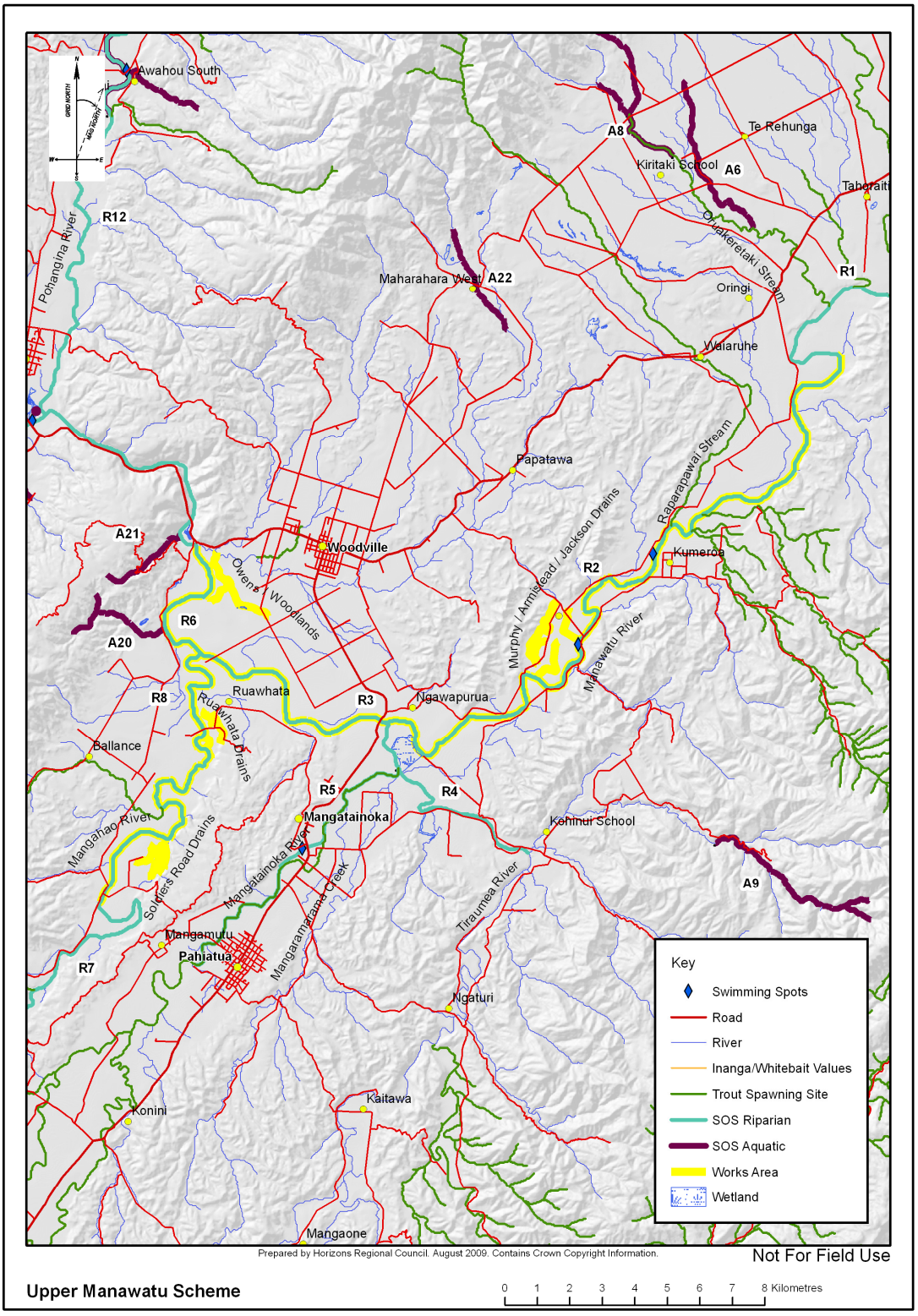
Not For Field Use
Tutaenui Scheme
0 1 2 3 4 5 6 Kilometres


Awahou South
A8
Te Rehunga
Kiritaki School
A6
Tahoraiti
R12
Pohangina River
Maharahara West
A22
Oruakeretaki Stream
R1
Oringi
Waiaruhe
Papatawa
Rapaarapawai Stream
A21
Woodville
Owens / Woodlands
Murphy / Armistead / Jackson Drains
R2
Kumeroa
R6
A20
Manawatu River
R8
Ruawhata
R3
Ngawapurua
Ruawhata Drains
Ballance
R5
R4
Mangatainoka
Kohinui School
Manganao River
Sorfiers Road Drains
Mangatainoka River
Mangaramarama Creek
Tiraumea River
A9
Mangamutu
Pahiatua
R7
Ngaturi
Kaitawa
Konini
Mangaone
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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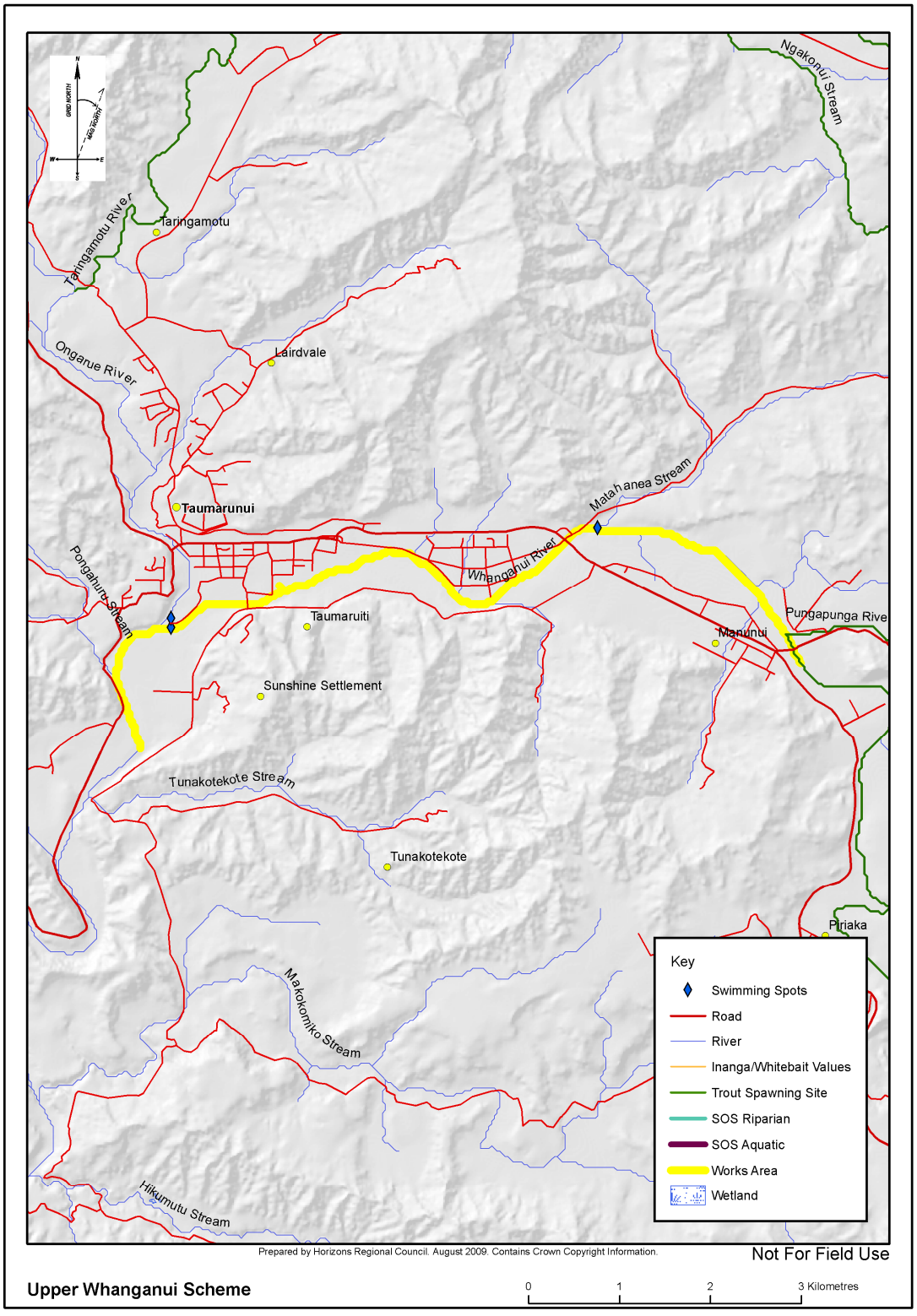
Not For Field Use
Upper Manawatu Scheme
0 1 2 3 4 5 6 7 8 Kilometres


Ngakonui Stream
Taringamotu River
Taringamotu
Ongarue River
Lairdvale
Taumarunui
Matahanea Stream
Whanganui River
Pongahuru Stream
Taumaruiti
Pungapunga River
Manunui
Sunshine Settlement
Tunakotekote Stream
Tunakotekote
Piriaka
Makokomiko Stream
Hikumutu Stream
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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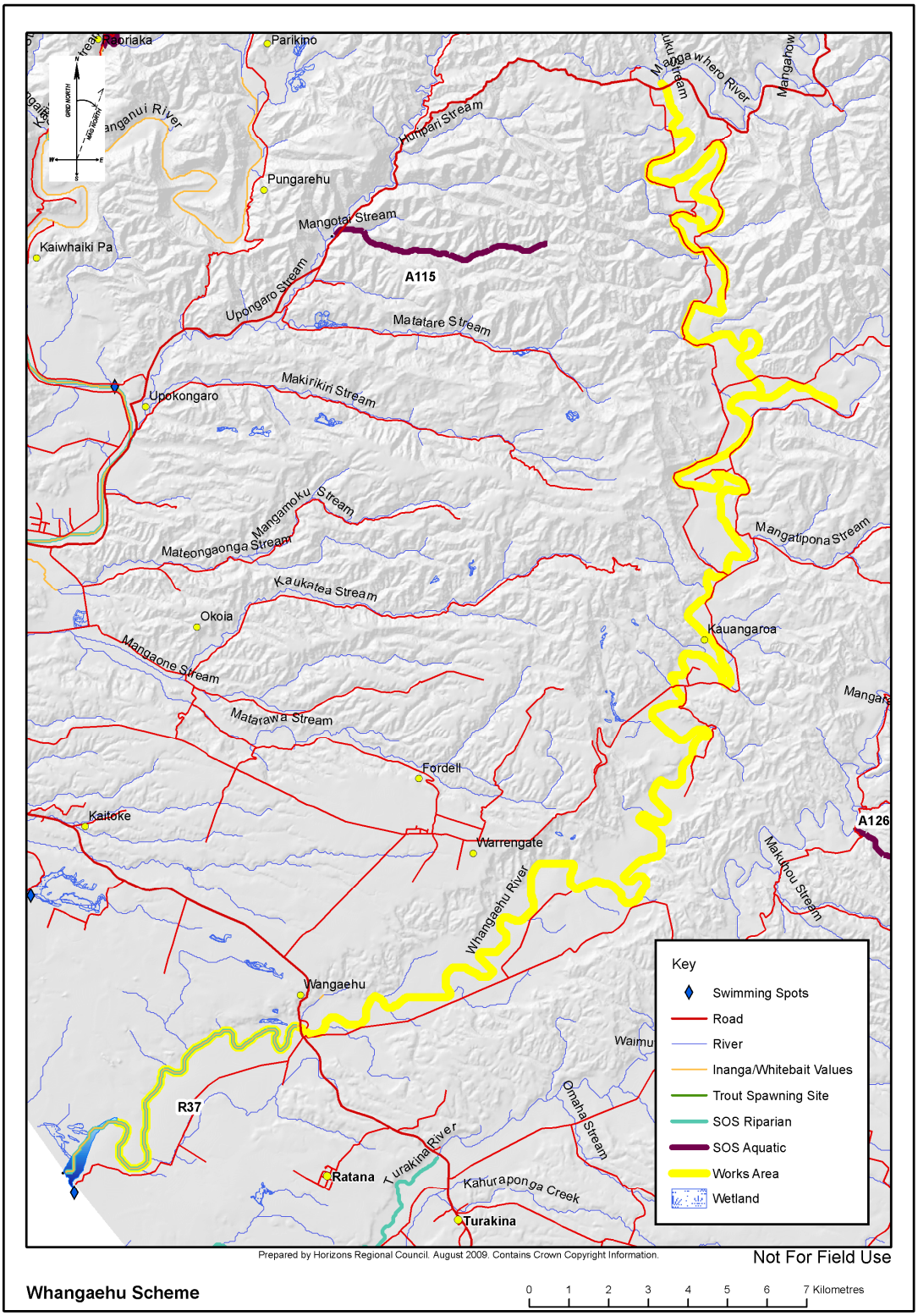
Not For Field Use
Upper Whanganui Scheme
0
1
2
3 Kilometres


Parikino
Pungarehu
Kaiwhaiki Pa
Upokongaro
Okoia
Kauangaroa
Fordell
Kaitoke
Warrengate
Wangaehu
Ratana
Turakina
A115
A126
R37
Hunpari Stream
Mangotari Stream
Upongaro Stream
Matatare Stream
Makirikiri Stream
Mangamoku Stream
Mateongaonga Stream
Kaukatea Stream
Mangaone Stream
Matarawa Stream
Mangatipona Stream
Whangaehu River
Makuhou Stream
Omaha Stream
Turakina River
Kahuraponga Creek
Waimu
Key
Swimming Spots
Road
River
Inanga/Whitebait Values
Trout Spawning Site
SOS Riparian
SOS Aquatic
Works Area
Wetland
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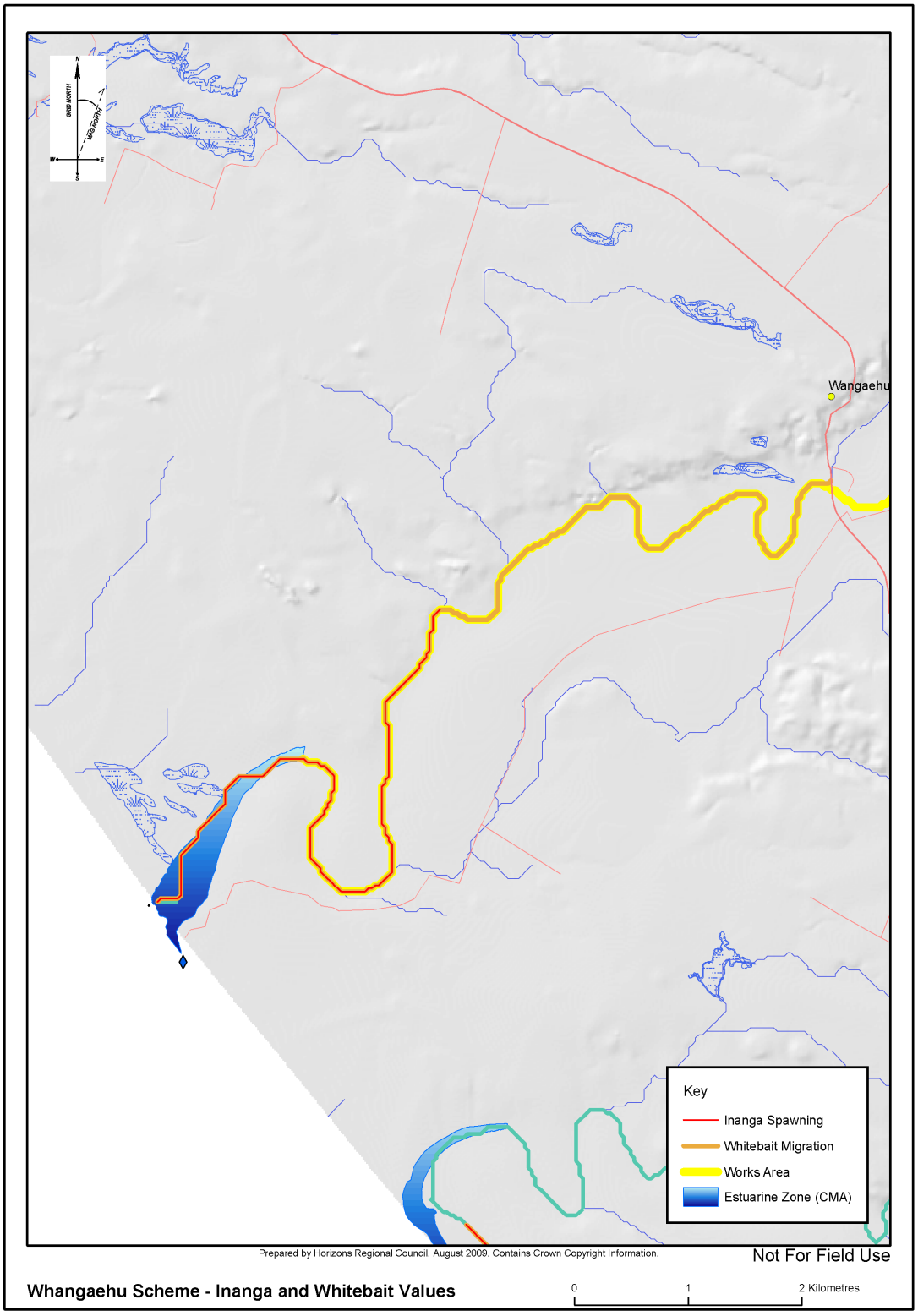
Not For Field Use
Whangaehu Scheme
0 1 2 3 4 5 6 7 Kilometres


Wangaehu
Key
Inanga Spawning
Whitebait Migration
Works Area
Estuarine Zone (CMA)
Prepared by Horizons Regional Council. August 2009. Contains Crown Copyright Information.
Not For Field Use
Whangaehu Scheme - Inanga and Whitebait Values
0
1
2 Kilometres

4 Scheme Dams and Locations

Asset No.	Asset Name	Northing	Easting
Scheme:	**Matarawa**		
588510	1.1	6137700	2698100
588520	1.2	6138600	2696700
588530	2.1	6140300	2695300
588540	3.1	6141900	2698800
588550	3.2	6141500	2698700
Scheme:	**Pakihi**		
618500	McDougalls	6192200	2714500
618510	Wallace Pearson	6191900	2713800
Scheme:	**Porewa**		
628500	29	6137100	2730100
628510	39	6130100	2722600
628520	42	6136100	2724000
628530	43	6136400	2724200
628540	44	6135600	2725600
628550	45	6137900	2724900
628560	46	6137400	2726900
628570	54	6136300	2727900
628580	62	6137700	2730600
628590	63	6138800	2731200
628600	64	6138800	2732200
628610	73	6138600	2729600
628620	75	6139800	2728800
628630	82	6141500	2731500
628640	83	6141700	2731700
628650	84	6142300	2732000
628660	85	6143300	2732600
628670	86	6143900	2733200
628680	92	6139800	2731900
628690	93	6140800	2732700
628700	94	6141500	2733300
628710	94A	6141600	2733300
628720	95	6142800	2733600
628730	96	6143200	2733900
628740	97	6144600	2734200
628750	98	6145400	2735400
628760	100	6145300	2734100
Scheme:	**Tawataia-Mangaone**		
428500	Tawataia Dam	6058100	2747600

Asset No.	Asset Name	Northing	Easting
Scheme:	**Tutaenui**		
668500	E1	6118300	2714400
668510	E2	6122377	2714638
668520	E3	6124075	2715543
668530	E4	6125062	2715264
668540	E6	6127072	2715782
668550	E7	6127146	2714320
668560	E8	6127912	2714328
668570	E9	6129697	2714887
668580	E10	6130238	2716510
668590	E11	6130137	2717030
668600	W1	6116975	2714748
668610	W2	6123945	2711945
668620	W3	6124800	2711900
668630	W4	6124700	2712600
668640	W5	6125863	2713030
668650	W6	6126253	2713291
668660	W7	6128600	2713600
668670	W8	6128800	2714100

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PART FOUR

Forms for Self Monitoring

Form One

horizons regional council

Asset No……

WORKS COMPLETION FORM

Date: .....

River/Drain: .....

Site: .....

Type of Works: .....

Checklist to ensure compliance with performance standards.
If performance standard has not been met, an explanation should be provided in the comments section.

Tied tree works securely anchored	**Y / N**
Completed works present no adverse effects on fish or birdlife habitat	**Y / N**
Works do not pose a hazard to navigation	**Y / N**
No fuel spillage, fuel or oil leaks	**Y / N**
No disturbance of archaeological/historic or cultural sites	**Y / N**
No slash or debris left in floodway. All rubbish cleaned up. Site left tidy	**Y / N**
Spoil material graded smooth	**Y / N**
Grass sown (Surface cover)	**Y / N**
As-built drawings/photos loaded into AMS	**Y / N**
AMS dimensions/inspections/works updated	**Y / N**

Comments: *(Add further comments overleaf if necessary)*

……

……

……

……

……

……

Signed:…… Position:……..

horizons regional council

Asset No……

NON PRACTICABLE STANDARDS FORM

Date: .....

River/Drain: .....

Site: .....

Type of Works: .....

Criteria for Undertaking Works:

Justification for Not Undertaking the Standard:

……

……

……

……

Consideration of Alternatives:

……

……

……

……

Assessment of environmental effects of the method not covered by the standard.
(Expert advice maybe required):

……

……

……

……

Counter signed / approved by Area Engineer prior to works and dated. **Y** / **N**

Forward to Compliance Manager prior to undertaking. **Y** / **N**

Works Supervisor:……..... Date:……

Area Engineer:……... Date:……

Form Three

OPERATIONS GROUP SITE SAFETY AND ENVIRONMENTAL START-UP FORM

EMERGENCY ONLY DIAL 111

In an emergency call give your name, what the emergency is about and where to send help (road name, number, closest town)

horizons regional council

PART 1: TO BE COMPLETED BY HORIZONS REGIONAL COUNCIL WORKS SUPERVISOR

Site Location: ..... Date: .....

Job Description: .....

HRC Works Supervisor: ..... Ph: .....

OSH Notification Required: Yes / No Details: .....

Utility Company Notification Required -Power, Gas, Roading etc: Yes / No Details: .....

Signed: HRC Works Supervisor: ..... Date: .....

PART 2: TO BE COMPLETED BY PARTY RESPONSIBLE FOR SITE HEALTH AND SAFETY

Contractor: ..... Ph: .....

Site Safety Supervisor: ..... Ph: .....

Holder of Current First Aid Certificate: ..... Ph: .....

First Aid Kit on Site: Yes / No Located: ..... HRC Plant Hire Register: Yes / No

WORK PARTY DETAILS

Name	Task	Experience	Adequately Trained/ Licences	PPE	Signed

HAZARD IDENTIFICATION AND CONTROL

Hazard / Special Value (Environmental / Hydro / Recreational)	Method Of Control (To Eliminate, Isolate or Minimise)
Hydro Recorder Site within 0.5 km upstream / 1 km downstream Yes / No	

TYPE OF PLANT TO BE USED

Plant Type	Current Certificate	Protection Fitted	Comments

Checklist Completed - Signed by Contractor Site Supervisor: .....

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PART FIVE

Planting Guides

1. Plants Commonly Associated with Inanga Eggs

Common Name		Scientific Name	Where Eggs are Found
Native Grasses	Wiwi	*Juncus gregiflorus*	Around base and lower stems
	Jointed rush	*Juncus articulatus*	Around base and lower stems
	Flax	*Phormium tenax*	Around bases, often in association with grasses in the periphery
	Raupo	*Typha orientalis*	Attached and under decaying leaves
	Umbrella sedge	*Cyperus eragrostis*	Around base of plant
Introduced Grasses	Tall fescue	*Festuca arundinacea*	Around the root hairs or on the decaying grass blades around the base
	Creeping bent	*Agrostis stolonifera*	Under the mat of runners that forms on the soil surface
	Yorkshire fog	*Holcus lanatus*	On the soft hairs on the leaves and stems
	Twitch, couch	*Agropyron repens*	On the thick root mat
	Cow parsley	*Apium nodiflorum*	On the floating stems and root hairs
Herbs	Monkey musk	*Mimulus guttatus*	Attached to the roots and stems
	Lotus	*Lotus sp.*	Attached to the roots and stems
	Buttercup	*Ranunculus repens*	Attached to the roots and stems
	White clover	*Trifolium repens*	Attached to the roots and stems
	Peppermint	*Mentha x piperita*	Attached to the roots and stems

(Source: Richardson & Taylor, 2002)

2. Tree Planting Guide

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
BEACH – The area between the actively flowing channel and the riverbank. This area is where the main flood flows are carried and will be at its capacity in the average annual flood.						
Carex geminata	rautahi	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	
Carex secta	purei	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	
Carex virgata	swamp sedge	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	
Cortaderia fulvida	toetoe	grass (to 3.5 m in flower)	full	dry or damp	riparian margins, damp places	especially edge between berm and riverbank
Cortaderia toetoe	toetoe	grass (to 4 m in flower)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing
Hebe stricta var atkinsonii	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	south of the Manawatu Gorge only
Hebe stricta var stricta	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	north of the Manawatu Gorge only
Phormium cookianum	flax, whararikì	monocot herb (1-2 m)	full (light demainding)	dry, damp or boggy	exposed places, riparian margins, damp places	hardy
Phormium tenax	flax, harakeke	monocot herb (2-3 m)	full (light demainding)	dry, damp or boggy	wetland or riparian margins	hardy
BERM – The area between the river and stopbank.						
Alectryon excelsus	titoki	medium tree (> 5 m)	full or partial	mainly dry	riverbanks, well drained fertile alluvial terraces	Young plants frost tender; palatability: possum
Aristolelia serrata	wineberry, makomako	medium tree (> 5 m)	full	mainly dry	riparian margin/ forest margins	Can be deciduous or semi-deciduous and somewhat skant in density. Wind intolerant; palatability: possum
Carex geminata	rautahi	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	especially edge between berm and riverbank
Carex secta	purei	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	especially edge between berm and riverbank

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Carex virgata	swamp sedge	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	especially edge between berm and riverbank
Coprosma propinqua	mingimingi	shrub – small tree (< 5 m)	full	dry, damp or boggy	riverbanks and riparian margins	hardy
Coprosma robusta	karamu	shrub – small tree (< 5 m)	full	dry or damp	riverbanks and riparian margins	hardy and fast growing
Cordyline australis	cabbage tree, ti kouka	tall tree (> 10 m)	full or partial	dry, damp or boggy	alluvial terraces, riparian margins, wetland	can tolerate sitting in water
Coriaria arborea	tutu	shrub – small tree (< 5 m)	full	dry	riparian margins, alluvial soils	very effective erosion control plant, can grow to 8 m; palatability: toxic
Cortaderia fulvida	toetoe	grass (to 3.5 m in flower)	full	dry or damp	riparian margins, damp places	especially edge between berm and riverbank
Cortaderia toetoe	toetoe	grass (to 4 m in flower)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing
Dacrycarpus dacrydioides	kahikatea	tall tree (> 10 m)	full or partial	dry, damp or boggy	frequently flooded and poorly drained lowland alluvial soils	slow growing
Dodonea viscosa	akeake	shrub – small tree (< 5 m)	full	dry	coastal riparian margins, lowland scrub and forest	can grow to tree ~ 7 m
Geniostema rupestre	hangehange	shrub – small tree (< 5 m)	full or partial	dry	riparian margins, lowland forest	Young plants frost tender; palatability: possum
Hebe stricta var atkinsonii	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	south of the Manawatu Gorge only
Hebe stricta var stricta	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	north of the Manawatu Gorge only
Hedycarya arborea	pigeonwood, porokaiwhiri	medium tree (> 5 m)	full or partial	dry or damp	fertile soils	slow growing
Hoheria angustifolia	narrow-leaved lacebark	medium tree (> 5 m)	full or partial	dry or damp	riparian margin, forest margins	fast growing
Hoheria sexstylosa	long-leaved lacebark, houhere	medium tree (> 5 m)	full or partial	mainly dry	riparian margin, forest margins	fast growing
Kunzea ericoides	kanuka	shrub (5 m) or tree (> 10)	full	dry	riparian margins, lowland scrub and forest	hardy
Leptospermum scoparium	manuka	shrub – small tree (< 5 m)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing; palatability: rabbits (young plants)

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Leucopogon fasciculatus	mingimingi	shrub – small tree (< 5 m)	full	dry	riparian margins, lowland scrub and forest, rocky soils	
Melicytus ramiflorus	mahoe	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	can grow into a tree of 15 m; young plants frost tender; palatability: possum
Myoporum laetum	ngaio	shrub – small tree (< 5 m)	full	dry	riparian margins, lowland forest	not common inland in our region (known from the Gorge); frost tender; palatability: toxic
Nothofagus solandri var solandri	black beech	tall tree (> 10 m)	full	dry	terrace riser	
Olearia paniculata	akiraho	shrub – small tree (< 5 m)	full	dry (free draining)	riparian margins, lowland forest	
Olearia rani	heketara	shrub (< 5 m)	full	dry	riparian margins, forest margins	can grow to tree ~ 7 m. Olearia rani var rani not found in our region.
Olearia solandri	shrub daisy	shrub (< 5 m)	full	dry or damp	riparian margins	
Olearia virgata	twiggy tree daisy	shrub – small tree (< 5 m)	full	dry, damp or boggy	wetland or riparian margins	
Pennantia corymbosa	kaikomako	medium tree (> 5 m)	full or partial	dry or damp (boggy)	lowland forests	slow growing
Phormium cookianum	flax, whararikì	monocot herb (1-2 m)	full (light demainding)	dry, damp or boggy	exposed places, riparian margins, damp places	hardy
Phormium tenax	flax, harakeke	monocot herb (2-3 m)	full (light demainding)	dry, damp or boggy	wetland or riparian margins	hardy
Pittosporum eugenoides	tarata	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	can grow into a tree of ~ 12 m
Pittosporum tenuifolium	kohuhu	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	greater tolerance to soil moisture extremes than P. eugenioides
Plagianthus regius	ribbonwood, manatu	tall tree (> 10 m)	full or partial	dry or damp	riverbanks and lowalnd alluvial terraces	fast growing
Podocarpus totara	totara (lowland)	tall tree (> 10 m)	light demanding	free draining	free draining alluvial terraces	Growth and form are best in sheltered sites; palatability: possum
Prumnopitys taxifolia	matai	tall tree (> 10 m)	full or partial	dry or damp	alluvial soils	Can tolerate water logging and flooding and also drying out; palatability: possum

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Pseudopanax arboreus	five-finger, whauwhaupaku	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	young plants frost tender; palatability: possum
Pseudopanax crassifolius	lancewood, horoeka	tall tree (> 10 m)	full or partial	dry	forest to riparian edge	Growth and form are best in sheltered sites; young plants frost tender; palatability: possum
Sophora godleyi	kowhai, Rangitikei kowhai	tall tree (> 10 m)	full or partial	free draining	riparian margins	adverse to pooled water, use in Rangitikei; palatability: rabbits (young plants)
Sophora microphylla	kowhai	tall tree (> 10 m)	full or partial	free draining	riparian margins	adverse to pooled water; palatability: rabbits (young plants)
ENHANCEMENT PLANTING – Riparian margin plantings for amenity or biodiversity purposes 9may be adjacent to, but does not contribute to, river protection works).						
Alectryon excelsus	titoki	medium tree (> 5 m)	full or partial	mainly dry	riverbanks, well drained fertile alluvial terraces	young plants frost tender; palatability: possum
Aristolelia serrata	wineberry, makomako	medium tree (> 5 m)	full	mainly dry	riparian margin/ forest margins	can be deciduous or semi-deciduous and somewhat skant in density; wind intolerant; palatability: possum
Coprosma propinqua	mingimingi	shrub – small tree (< 5 m)	full	dry, damp or boggy	riverbanks and riparian margins	hardy
Coprosma robusta	karamu	shrub – small tree (< 5 m)	full	dry or damp	riverbanks and riparian margins	hardy and fast growing
Cordyline australis	cabbage tree, ti kouka	tall tree (> 10 m)	full or partial	dry, damp or boggy	alluvial terraces, riparian margins, wetland	can tolerate sitting in water
Cortaderia fulvida	toetoe	grass (to 3.5 m in flower)	full	dry or damp	riparian margins, damp places	hardy and fast growing
Cortaderia toetoe	toetoe	grass (to 4 m in flower)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing
Dacrycarpus dacrydioides	kahikatea	tall tree (> 10 m)	full or partial	dry, damp or boggy	frequently flooded and poorly drained lowland alluvial soils	slow growing
Dodonea viscosa	akeake	shrub – small tree (< 5 m)	full	dry	coastal riparian margins, lowland scrub and forest	can grow to tree ~ 7 m
Eleaocarpus hookerianus	pokaka	tall tree (> 10 m)	partial	dry, damp or boggy		best with shelter when young

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Geniostema rupestre	hangehange	shrub – small tree (< 5 m)	full or partial	dry	riparian margins, lowland forest	young plants frost tender; palatability: possum
Hebe stricta var atkinsonii	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	south of the Manawatu Gorge only
Hebe stricta var stricta	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	north of the Manawatu Gorge only
Hedycarya arborea	pigeonwood, porokaiwhiri	medium tree (> 5 m)	full or partial	dry or damp	fertile soils	slow growing
Hoheria angustifolia	narrow-leaved lacebark	medium tree (> 5 m)	full or partial	dry or damp	riparian margin, forest margins	fast growing
Hoheria sexstylosa	long-leaved lacebark, houhere	medium tree (> 5 m)	full or partial	mainly dry	riparian margin, forest margins	fast growing
Knightia excelsa	rewarewa, NZ honeysuckle	tall tree (> 10 m)	full or partial	dry or damp		
Kunzea ericoides	kanuka	shrub (5 m) or tree (> 10)	full	dry	riparian margins, lowland scrub and forest	hardy
Leptospermum scoparium	manuka	shrub – small tree (< 5 m)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing; palatability: rabbits (young plants)
Leucopogon fasciculatus	mingimingi	shrub – small tree (< 5 m)	full	dry	riparian margins, lowland scrub and forest, rocky soils	
Myoporum laetum	ngaio	shrub – small tree (< 5 m)	full	dry	riparian margins, lowland forest	not common inland in our region (known from the Gorge); frost tender; palatability: toxic.
Nothofagus solandri var solandri	black beech	tall tree (> 10 m)	full	dry	terrace riser	
Olearia paniculata	akiraho	shrub – small tree (< 5 m)	full	dry (free draining)	riparian margins, lowland forest	
Olearia rani	heketara	shrub (< 5 m)	full	dry	riparian margins, forest margins	can grow to tree ~ 7 m. Olearia rani var rani not found in our region
Olearia solandri	shrub daisy	shrub (< 5 m)	full	dry or damp	riparian margins	
Olearia virgata	twiggy tree daisy	shrub – small tree (< 5 m)	full	dry, damp or boggy	wetland or riparian margins	
Pennantia corymbosa	kaikomako	medium tree (> 5 m)	full or partial	dry or damp (boggy)	lowland forests	slow growing
Phormium cookianum	flax, whaririki	monocot herb (1-2 m)	full (light demainding)	dry, damp or boggy	exposed places, riparian margins, damp places	Hardy

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Phormium tenax	flax, harakeke	monocot herb (2-3 m)	full (light demainding)	dry, damp or boggy	wetland or riparian margins	Hardy
Pittosporum eugenoides	tarata	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	can grow into a tree of ~ 12 m
Pittosporum tenuifolium	kohuhu	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	greater tolerance to soil moisture extremes than P. eugenioides
Plagianthus regius	ribbonwood, manatu	tall tree (> 10 m)	full or partial	dry or damp	riverbanks and lowalnd alluvial terraces	fast growing
Podocarpus totara	totara (lowland)	tall tree (> 10 m)	light demanding	free draining	free draining alluvial terraces	Growth and form are best in sheltered sites; palatability: possum
Prumnopitys taxifolia	matai	tall tree (> 10 m)	full or partial	dry or damp	alluvial soils	Can tolerate water logging and flooding and also drying out; palatability: possum
Pseudopanax arboreus	five-finger, whauwhaupaku	medium tree (> 5 m)	full or partial	dry	forest to riparian edge	young plants frost tender; palatability: possum
Pseudopanax crassifolius	lancewood, horoeka	tall tree (> 10 m)	full or partial	dry	forest to riparian edge	growth and form are best in sheltered sites; young plants frost tender; palatability: possum
Sophora godleyi	kowhai, Rangitikei kowhai	tall tree (> 10 m)	full or partial	free draining	riparian margins	adverse to pooled water, use in Rangitikei; palatability: rabbits (young plants)
Sophora microphylla	kowhai	tall tree (> 10 m)	full or partial	free draining	riparian margins	adverse to pooled water; palatability: rabbits (young plants)
FLOODPLAIN – Floodable area of indistinct boundary. Floods under major events.						
Alectryon excelsus	titoki	medium tree (> 5 m)	full or partial	mainly dry	riverbanks, well drained fertile alluvial terraces	young plants frost tender; palatability: possom
Coprosma propinqua	mingimingi	shrub – small tree (< 5 m)	full	dry, damp or boggy	riverbanks and riparian margins	hardy
Coprosma robusta	karamu	shrub – small tree (< 5 m)	full	dry or damp	riverbanks and riparian margins	hardy and fast growing
Cordyline australis	cabbage tree, ti kouka	tall tree (> 10 m)	full or partial	dry, damp or boggy	alluvial terraces, riparian margins, wetland	can tolerate sitting in water

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Cortaderia toetoe	toetoe	grass (to 4 m in flower)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing
Dacrycarpus dacrydioides	kahikatea	tall tree (> 10 m)	full or partial	dry, damp or boggy	frequently flooded and poorly drained lowland alluvial soils	slow growing
Eleaocarpus hookerianus	pokaka	tall tree (> 10 m)	partial	dry, damp or boggy		best with shelter when young
Hedycarya arborea	pigeonwood, porokaiwhiri	medium tree (> 5 m)	full or partial	dry or damp	fertile soils	slow growing
Hoheria angustifolia	narrow-leaved lacebark	medium tree (> 5 m)	full or partial	dry or damp	riparian margin, forest margins	fast growing
Hoheria sexstylosa	long-leaved lacebark, houhere	medium tree (> 5 m)	full or partial	mainly dry	riparian margin, forest margins	fast growing
Knightia excelsa	rewarewa, NZ honeysuckle	tall tree (> 10 m)	full or partial	dry or damp		
Kunzea ericoides	kanuka	shrub (5 m) or tree (> 10)	full	dry	riparian margins, lowland scrub and forest	hardy
Leptospermum scoparium	manuka	shrub – small tree (< 5 m)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing; palatability: rabbits (young plants)
Olearia virgata	twiggy tree daisy	shrub – small tree (< 5 m)	full	dry, damp or boggy	wetland or riparian margins	
Pennantia corymbosa	kaikomako	medium tree (> 5 m)	full or partial	dry or damp (boggy)	lowland forests	slow growing
Phormium tenax	flax, harakeke	monocot herb (2-3 m)	full (light demainding)	dry, damp or boggy	wetland or riparian margins	hardy
Plagianthus regius	ribbonwood, manatu	tall tree (> 10 m)	full or partial	dry or damp	riverbanks and lowalnd alluvial terraces	fast growing
Podocarpus totara	totara (lowland)	tall tree (> 10 m)	light demanding	free draining	free draining alluvial terraces	growth and form are best in sheltered sites; palatability: possum
Prumnopitys taxifolia	matai	tall tree (> 10 m)	full or partial	dry or damp	alluvial soils	can tolerate water logging and flooding and also drying out; palatability: possum
RIVERBANK – Slope between river channel and berm.						
Carex geminata	rautahi	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	
Carex secta	purei	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	

Species	Common name	Structural class	Light	Soil moisture	Preferred habitat (in relation to river works)	Comments
Carex virgata	swamp sedge	sedge (< 2 m)	full	wet or boggy	wetland or riparian margins	
Coriaria arborea	tutu	shrub – small tree (< 5 m)	full	dry	riparian margins, alluvial soils	very effective erosion control plant, can grow to 8 m; palatability: toxic
Cortaderia fulvida	toetoe	grass (to 3.5 m in flower)	full	dry or damp	riparian margins, damp places	hardy and fast growing
Cortaderia toetoe		grass (to 4 m in flower)	full	dry, damp or boggy	riparian margins, damp places	hardy and fast growing
Hebe stricta var stricta	koromiko	shrub (< 5 m)	full or partial	dry	riparian margin	north of the Manawatu Gorge only

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PART SIX

Critical Habitat Requirements
SOS – A

1. Summary of Critical Habitat Requirements of Significant Aquatic Species in the Manawatu-Wanganui Region

Species	Critical Habitat Threats	Critical Spawning Threats	Timing
banded kokopu (*Galaxias fasciatus*) (migratory) – Alton Perrie, Greater Wellington 	Loss of forested riparian margin Loss of pool/backwater habitat	Bankside and riparian disturbance in adult habitat – particularly adjacent to backwaters and pools High requirement for bankside vegetation, debris and overhead cover for spawning Regulation/loss of overbank flow during autumn freshes	Pool, backwater and forested margin loss – year round Spawning: 1 April – 1 July
giant kokopu (*Galaxias argenteus*) (migratory) Giant kokopu – Stephen Moore, Landcare Research 	Instream barriers Loss of forested riparian margin Loss of slow flowing / pool habitat in lowland waterways Disconnection / loss of forested wetland habitat Loss of instream woody debris Presence of brown trout	Margin disturbance in adult habitat Regulation/loss of overbank flow during autumn freshes	Upstream barriers to juvenile migration (migrates later than other whitebait (Nov) – Spring and Summer Spawning: 1 May – 31 August
shortjaw kokopu (*Galaxias postvectis*) (migratory)	Loss of podocarp/broadleaf riparian forest and over-hanging cover Loss of instream woody debris Loss of pool/backwater habitat Loss of high quality aquatic invertebrates	Bankside and riparian disturbance in adult habitat – particularly adjacent to backwaters and pools High requirements for overhead cover, vegetation and debris for riparian spawning Regulation/loss of overbank flow during autumn freshes	Pool, backwater and forested margin loss – year round Spawning: 1 April – 1 July

Species	Critical Habitat Threats	Critical Spawning Threats	Timing
Koaro (*Galaxias brevipinnis*) (migratory) – Stephen Moore, Landcare Research 	Forest clearance Opening up of gullies Disturbance of substrate invertebrates Loss of flow in upland streams	Riparian and instream disturbance Loss of cobble/boulder substrate on river margins Barriers to juvenile migration (flood gates)	Spawning: 1 March – 1 July Juvenile migration September – October (inclusive)
dwarf galaxias (*Galaxias divergens*) (non-migratory)	Presence of trout Disturbance of substrate Loss of upper tributary habitat heterogeneity Loss of high quality aquatic invertebrates	Instream and riparian disturbance in adult habitat Sedimentation (suspended and settled during spawning and juvenile development)	Spawning: 1 September – 1 March (peaking in November/December) Juvenile development 1 November – 31 March (peaking in December/ January)
brown mudfish (*Neochanna apoda*) (non-migratory)	Wetland drainage Forest swamp clearance Drain clearance and road grading Lowered water table	Drain maintenance and loss of woody cover in drains during spawning Lowering of water table during/post spawning	February – April (during first heavy rains after dry season)
lamprey (*Geotria australis*) (migratory)	Loss of riparian and instream cover Loss of habitat and flow heterogeneity Disturbance/loss of sandy shallow backwaters	Loss of riparian cover	June – September – inward adult migration August – September – outward juvenile migration
redfin bully (*Gobiomorphus huttoni*) (migratory)	Water quality degradation Loss of high quality aquatic invertebrates Loss of habitat heterogeneity	Instream disturbance or embedding of cobble spawning substrates Sedimentation (suspended and on spawning substrate) – particularly during juvenile migration	July – December Juvenile migration November – February
bluegill bully (*Gobiomorphus hubbsi*)	Water quality degradation Loss of high quality aquatic invertebrates Loss of habitat heterogeneity	Instream barriers Instream disturbance or embedding of cobble spawning substrates	Juvenile migration Spring and Autumn

Species	Critical Habitat Threats	Critical Spawning Threats	Timing
inanga spawning (*Galaxias maculatus*) (NFS value) – Stephen Moore , Landcare Research 	Physical disturbance of spawning habitat and sedimentation Loss of overbank flows from autumnal freshes and high tides	Loss of estuarine and lower river riparian vegetation Disconnection of lower river channels from estuarine flood plains	1 February – 1 May (inclusive) on high tides during full and new moons
blue duck / whio (*Hymenolaimus malachorhynchos*)	Introduced mammalian predators Loss of indigenous riparian forest Loss of flow and habitat heterogeneity Regulation of turbulent flows Loss of high quality aquatic invertebrates Human or physical disturbance within known territories	Disturbance of breeding pairs Disturbance of nesting sites Disturbance of family groups with chicks Predation Grazing of riparian vegetation used for nesting	Breeding adults are site specific and can be affected by disturbance at any time of the year Nesting July – December (peaking August – October) Juvenile development October – January

2. Summary of Critical Habitat Requirements of Trout Fishery, Trout Spawning and Native (whitebait) Fishery Values in the Manawatu-Wanganui Region

Value	Critical Habitat Threats	Critical Spawning Threats	Timing
inanga spawning (*Galaxias maculatus*) (value)	Physical disturbance of spawning habitat and sedimentation Loss of overbank flows from autumnal freshes and high tides	Loss of estuarine and lower river riparian vegetation Disconnection of lower river channels from estuarine flood plains	1 February – 1 May (inclusive) on high tides during full and new moons
whitebait fishery (value)	Coastal fish barriers and flood gates Channelisation of streams and removal of instream cover	See inanga spawning value	15 August – 30 November (inclusive)
trout spawning (value)	Sedimentation of spawning gravels Barriers to upstream adult migration	Physical disturbance of spawning habitat and release of sediment upstream or within spawning grounds High water temperatures	1 May – 30 September (inclusive) Juvenile development July - December
trout fishery (value)	Loss of habitat Heterogeneity (well developed pool and riffle complex) Loss of instream and riparian cover Loss of high quality aquatic invertebrates Water quality degradation High water temperature Low dissolved oxygen High suspended and deposited sediment load	See trout spawning value	Sedimentation effects can be critical to adult persistence and juvenile survival during low flows

Definition of Terms

Where *italics* are used in this definition of terms, the definition is from section 2 of the Resource Management Act 1991.

Accretion The growth or increase by means of gradual additions.

Aggradation The building up of the land surface by the deposition of fluvial or marine deposits.

Aggregate Crushed rock or gravel screened to sizes for use in road surfaces, concrete or bituminous mixes.

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

Archaeological Site Any place in New Zealand that:

(a) Either:

(i) Was associated with human activity that occurred before 1900; or

(ii) Is the site of the wreck of any vessel where that wreck occurred before 1900; and

(b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand. (Section 2, Historic Places Act 1993)

Bank Includes the banks bounding either side of a river bed. Banks may be natural landforms such as terraces or artificial such as a stopbanks.

Beach In relation to any river, stream or lake, refers to the zone of unconsolidated material that extends landward from the waterline to where there is a marked change in material or physiographic form, or to the line of permanent vegetation.

Bed *(a) In relation to any river:*

(i) For the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters cover at its annual fullest flow without overtopping its banks;

(ii) In all other cases, the space of land which the waters of the river cover at its fullest flow without overtopping its banks; and

(b) In relation to any lake, except a lake controlled by artificial means;

(i) For the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters of the lake cover at its annual highest level without exceeding its margin;

(ii) In all other cases, the space of land which the waters of the lake cover at its highest level without exceeding its margin; and

(c) In relation to any lake controlled by artificial means, the space of land which the waters of the lake cover at its maximum permitted operating level; and

(d) In relation to the sea, the submarine areas covered by the internal waters and the territorial sea.

Bed-load The material (sand, silt, gravel and rock detritus) transported down a river in or on the bed of a river, as opposed to material transported in suspension.

Bed material Includes all material within the bed of a river derived from catchment erosion processes. This includes all technical categories of clay, silt, sand, gravel and larger size particles.

Berm The floodway between the river and its stopbanks or terraces.

Bund A bank or structure (usually shallow) built to contain or hold fluid discharge.

Catchment The total area from which a single river collects surface runoff.

Channel width The horizontal distance between the toes of the riverbanks averaged over the reach where the works are undertaken.

Coastal marine area *The foreshore, seabed, and coastal water, and the air space above the water:*

(a) Of which the seaward boundary is the outer limits of the territorial sea;

(b) Of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of:

(i) One kilometre upstream from the mouth of the river; or

(ii) The point upstream that is calculated by multiplying the width of the river mouth by five.

Construct Includes create or build, alter, reconstruct, extend, remove and demolish.

Cross-sections Vertical profiles of the surface contour across rivers and streams.

Culvert A drain crossing under a road or embankment. All culverts with floodgates are called Floodgated Culverts.

Degrade The lowering of a river by erosion of its bed.

Deposition The entrapment and/or settling out of sediment carried by a natural agency (eg. rivers, wind) in one location, leading to accretion.

Drainage channel A watercourse, the bed of which is either artificial or has been modified away from its natural bed.

Erosion The process of the wearing away of the land's surface by natural processes and human activities, and the transporting of the resulting sediment.

Excavation Removal by extraction or separation (from the original location).

Extraction Removal by excavation or separation (from the original location).

Flood level The vertical height reached by flood water at a particular site.

Floodplain The surface of relatively smooth land built of alluvium, adjacent to a river channel, and covered with water during flooding of the river.

Floodway An artificial passage for flood water.

Flow path The land area between the bed of a river or drain and the crest of a stopbank.

Gravel A collective term for the material in a bed of a river. It includes sand, silt, shingle, rocks and boulders.

Greywacke An indurated, poorly sorted sandstone or mudstone.

Habitat A place or type of site where an organism or population naturally occurs.

Hapu A sub-unit of a Maori social, political and economic structure comprised of whanau (extended families) all recognising descent from a common ancestor.

Heritage place A place of special interest by having special cultural, architectural, historical, scientific, ecological, or other interest (refer to section 189(2) of the Act).

Heritage values The values associated with any place of special interest, character, intrinsic or amenity value or visual appeal, or of special significance for spiritual, cultural, scientific or historical (including archaeological) reasons.

Historic area: *An area of land that:*

(a) Contains an inter-related group of historic places; and

(b) Forms part of the historical and cultural heritage of New Zealand; and

(c) Lies within the territorial limits of New Zealand. (Section 2, Historic Places Act 1993).

Historic place *(a) Means:*

(i) Any land (including an archaeological site); or
(ii) Any building or structure (including part of a building or structure); or
(iii) Any combination of land and a building or structure that forms part of the historical and cultural heritage of New Zealand and lies within the territorial limits of New Zealand; and

(b) Includes anything that is in or fixed to such land. (Section 2, Historic Places Act 1993).

Inanga (*galaxias maculatus*) The adult of one of the juvenile lifestages known collectively as “whitebait”.

Indigenous In relation to species means plants and animals found naturally in New Zealand.

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

Inland toe of a stopbank The point where the stopbank slope (usually 1 in 2) on the inland side of the stopbank meets the unaltered ground surface.

Instream values Those uses or values of rivers and streams that are derived from within the river system itself, and include those associated with fresh water ecology and recreational, scenic and educational uses.

In stream works Works that require the use of mobile machinery in the wetted channel or will release sediment in the water course.

Intrinsic values *In relation to ecosystems, means those aspects of ecosystems and their constituent parts which have value in their own right, including: (a) their biological and genetic diversity; and (b) the essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience.*

iwi A political unit of Maori social and economic organisation comprised of many sub groupings (hapu). A purpose oriented confederation based on genealogical ties.

iwi authority *The authority which represents an iwi and which is recognised by that iwi as having authority to do so.*

Kaiawa The food found in and around rivers and streams.

Kaitiakitanga *The exercise of guardianship; and, in relation to a resource, includes the ethic of stewardship based on the nature of the resource itself.*

Maintenance In relation to structures, means to keep or restore a structure to a state of good repair and includes the reconstruction or alteration of part of a structure, provided that:

i. the maintenance does not result in any increase in the base area of the structure

ii. the activity does not change the character, scale or intensity of any effects of the structure on the environment (except to reduce any adverse effects or to increase any positive effects)

Mauri The essence of all being inherent in things both animate and inanimate.

Median flow The flow in the stream or river which is exceeded 50% of the time.

Modified Stream A channel that has been constructed or modified primarily for land drainage purposes.

Natural character The qualities of the environment that give recognisable character to an area. These qualities may be ecological,

	physical, spiritual, cultural or aesthetic in nature. They include modified and managed environs.
Rehabilitation	To restore to a former level or state.
Riparian margin	A strip of land which is frequently moist and is adjacent to a river or lake. A riparian margin generally extends from the perceived change in contour of the flood plain to the waterway itself.
River	The continually or intermittently flowing body of fresh water, and includes a stream and modified water course; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and far drainage canal).
Sediment	Unconsolidated particulate material deposited, from a suspension, by physical, chemical or biological processes. In particular this refers to mud, silt, sand and gravel that has been deposited in the bed of a flowing river or stream.
Sedimentation	The settling out of particles (sediment) that have been transported by water.
Siltation	Infilling with silt.
Spillway	A passage in or about a hydraulic structure for escape of surplus water.
Stockpile	A pile of gravel that has been obtained from a river.
Stopbank	Barrier or embankment constructed near or alongside a river, and designed to contain flood flows and prevent high river flows flooding onto adjacent land.
Structure	*Any building, equipment, device, or other facility made by people and which is fixed to land; and includes any raft.*
Surface waterbody	The freshwater in a river, lake, stream, pond, wetland or drain that is not located within the coastal marine area.
Stream crossing	Any structure supporting a path, road or track over a streambed including culverts, fords and bridges.
Tangata whenua	The people of the land; *in relation to a particular area, means the iwi, or hapu, which holds mana whenua over that area*.
Temporary stockpile	A stockpile that only exists while the site is being actively worked.

Territorial Authority	A district council or a city council (as defined in the Local Government Act 2002).
Waahi tapu	Includes sites, areas or localities associated with tapu. May include burial grounds, battle grounds or areas of spiritual significance.
Waahi tupuna	Includes sites, areas or localities of historical and spiritual significance to whanau, hapu or iwi but not necessarily tapu sites. Important pathways, village sites, boundary indicators etc are included as waahi tupuna
Watercourse	The natural path that water in any river or stream follows over the land surface.
Waterbody	Means *fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.*
Water's edge	The boundary between the water in a river or stream and the adjoining dry land.

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Appendix 1

One Plan Schedule Ba20 - Flood Control / Drainage Water Management Value

1. Purpose

The following tables list the waterbodies described in the One Plan valued for Flood Control/Drainage Water Management Value. The reaches are the full extent of the Works Area which controls the scope of the Code. These textual descriptions shall be used as the definitive reference for the Works Area in any given scheme. The following map depicts the Flood Control/Drainage Water Management Value (Works Area) as reaches and is used in the One Plan.

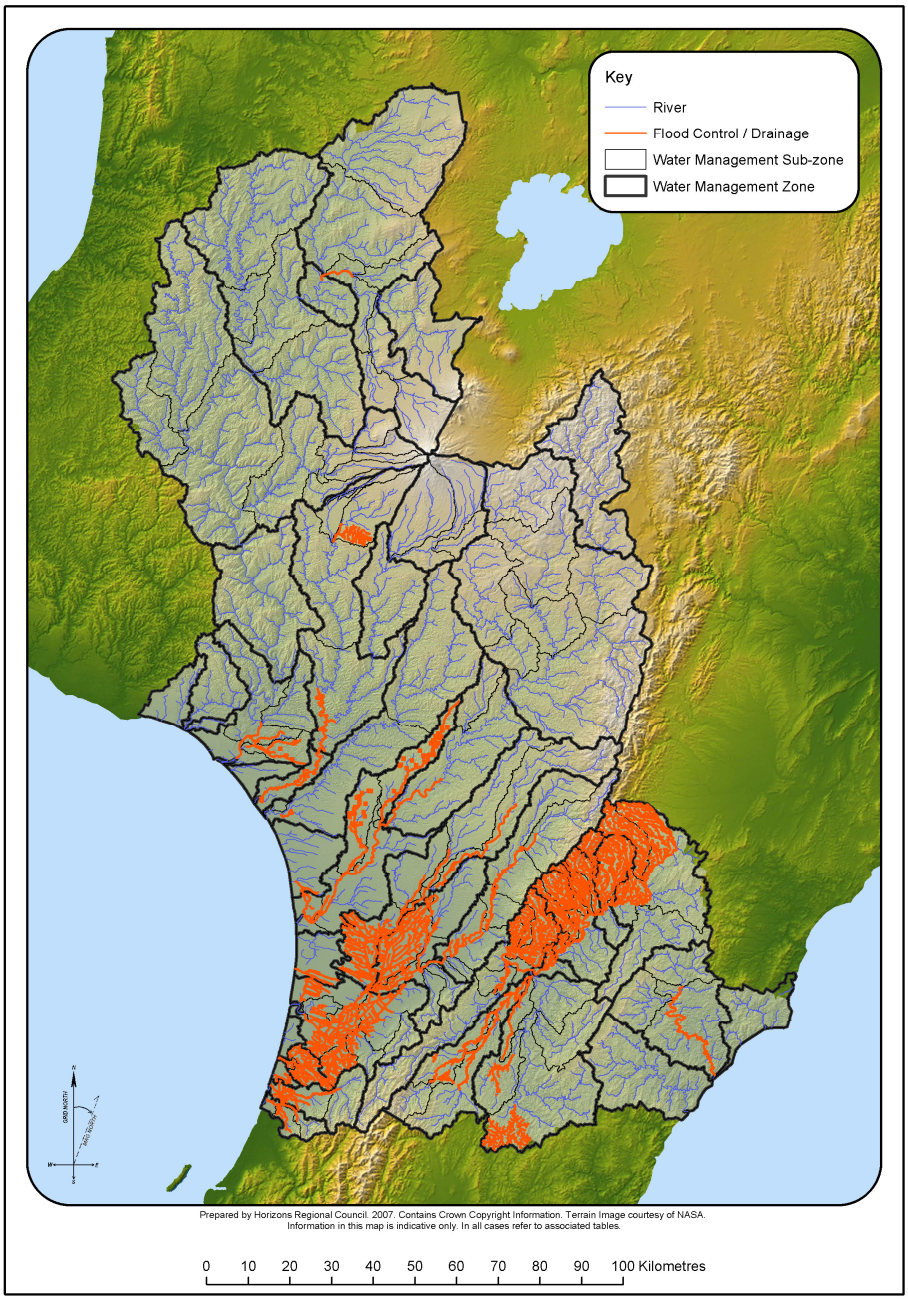

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
Upper Manawatu, Weber –Tamaki, Tamaki-Hopelands, (Mana_1, Mana_2 and Mana_5)	Upper Manawatu, Weber -Tamaki, Tamaki-Hopelands, Mangatoro (Mana_1a, Mana_1c Mana_2a, and Mana_4a)	Manawatu River	From approx. NZMS 260 T24:693-984 to approx. NZMS 260 U23:865-229	Eastern Manawatu South East Ruahine
Upper Manawatu, Weber –Tamaki, Upper Tamaki, Upper Kumeti Tamaki-Hopelands, Upper Gorge, (Mana_1, Mana_2, Mana_3, Mana_4, Mana_5, Mana_6, and Mana_9)	Upper Manawatu, Mangatewanui, Mangatera, Lower and Upper Tamaki, Lower and Upper Kumeti, Oruakeretaki, Raparapawai, Managpapa, Mangaatua (Mana_1a, Mana_1b, Mana_2b, Mana_3, Mana_4, Mana_5b, Mana_5c, Mana_5d, Mana_5e, Mana_6, Mana_9b, and Mana_9c)	Manawatu River and all tributaries on the true right	The Manawatu River from the Manawatu Gorge at approx. NZMS 260 T24:496-926 to source, and all tributaries on the true right of this reach from their confluence with Manawatu River to source / Manawatu-Wanganui Regional Boundary.	Upper Manawatu South East Ruahine
Tamaki-Hopelands, Hopelands – Tiraumea, Upper Gorge (Mana_5, Mana_6 and Mana_9)	Tamaki-Hopelands, Hopelands – Tiraumea, Upper Gorge (Mana_5a, Mana_6 and Mana_9a)	Manawatu River	From approx. NZMS 260 T24:496-926 to approx. NZMS 260 T24:693-984	Upper Manawatu South East Ruahine
Tamaki-Hopelands, Hopelands – Tiraumea (Mana_5 and Mana_6)	Tamaki-Hopelands, Hopelands – Tiraumea (Mana_5a, and Mana_6)	Armistead Drain 31	From approx. NZMS 260 T24:613-896 to approx. NZMS 260 T24:610-906	Upper Manawatu
Hopelands – Tiraumea (Mana_6)	Hopelands – Tiraumea (Mana_6)	Murphy Drain 29	From approx. NZMS 260 T24:600-885 to approx. NZMS 260 T24:607-896	Upper Manawatu
	Hopelands – Tiraumea (Mana_6)	Jackson and Murphy Drain 28	From approx. NZMS 260 T24:600-889 to approx. NZMS 260 T24:607-909	Upper Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
	Hopelands – Tiraumea (Mana_6)	Armistead and Jackson Drain 30	From approx. NZMS 260 T24:599-890 to approx. NZMS 260 T24:603-896	Upper Manawatu
Tiraumea (Mana_7)	Upper Tiraumea (Mana_7a)	Ihuraua River and tributaries	From approx. NZMS 260 T25:576-547 to source / Manawatu-Wanganui Regional Boundary	Ihuraua
	Mangaone River (Mana_7c)	Mangaone River	From approx. NZMS 260 T25:514-666 to NZMS 260 T25:452-616	Mangaone - Tawataia
		Tawataia Creek	From confluence with Managaone River at approx. NZMS 260 T25:471-637 to approx. NZMS 260 T25:470-563	Mangaone - Tawataia
		Tawataia Managaone Scheme Detention Dam	100 metres upstream and down stream of approx. NZMS 260 T25:476-581	Mangaone - Tawataia
		Schnell-Hislop Drain 141	From confluence with Tawataia Stream at approx. NZMS 260 T25:472-601 to source	Mangaone - Tawataia
		Schnell-Cooper Drain 190	From confluence with Tawataia Stream at approx. NZMS 260 T25:466-612 to source	Mangaone - Tawataia
		Rongomai Drain 10 (part)	From approx. NZMS 260 T25:460-635 to approx. NZMS 260 T25:460-634	Mangaone - Tawataia
Tiraumea (Mana_7)	Mangaone River (Mana_7c)	Rongomai Drain 10 (part)	From confluence with Mangaone River at approx. NZMS 260 T25:487-635 to approx. NZMS 260 T25:467-639 (south branch) and to approx. T25: 468-646 (north branch)	Mangaone - Tawataia
		Rongomai Drain 10 (part)	From approx. NZMS 260 T25:495-638 to approx. NZMS 260 T25:488-629	Mangaone - Tawataia
		Cattle Creek Drain 10a	From approx. NZMS 260 T25:479-635 to approx. NZMS 260 T25:479-614	Mangaone - Tawataia

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Simpson Drain 136	From confluence with Mangaone River at approx. NZMS 260 T25:459-640 to approx. NZMS 260 T25:499-629 (east branch) and to approx. T25: 500-633 (west branch)	Mangaone - Tawataia
		Evans Drain 120	From approx. NZMS 260 T25:502-642 to approx. NZMS 260 T25:498-640	Mangaone - Tawataia
		MWRC Drain 237	From approx. NZMS 260 T25:472-571 to approx. NZMS 260 T25:470-571	Mangaone - Tawataia
	Mangaramarama (Mana_7e)	Mangaramarama Creek	From confluence with Tiraumea River at approx. NZMS 260 T24:559-854 to approx. NZMS 260 T24:485-657	Mangatainoka
		Mangaramarama Creek tributary	From confluence with Mangaramarama Creek at approx. NZMS 260 T24:525-790 to approx. NZMS 260 T24:529-782	Mangatainoka
	Mangaramarama and Lower Mangatinoka (Mana_7e and Mana_8c)	Mangaramarama Creek Tributary and associated drains	From confluence with Mangaramarama Creek at approx. NZMS 260 T24:548-836 to source	Mangatainoka
Mangatainoka (Mana_8)	Lower, Middle and Upper Mangatainoka, Makakahi (Mana_8a, Mana_8b, and Mana_8c)	Mangatainoka River	From confluence with Tiraumea River at approx. NZMS 260 T24:557-856 to approx. NZMS 260 T25:310-600	Mangatainoka
Mangatainoka (Mana_8)	Middle Mangatainoka (Mana_8b)	Mangatainoka River Tributary and associated drains	From Nireaha Road bridge at approx. NZMS 260 T25:358-629 to source	Mangatinoka
		Mangatainoka River Tributary and associated drains	From confluence with Mangatainoka River at approx. NZMS 260 T25:369-654 to approx. NZMS 260 T25:364-643	Mangatinoka

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Mangatainoka River Tributary Drain	From confluence with Mangatainoka River at approx. NZMS 260 T25:377-652 to source	Mangatinoka
		Hukanui Stream Tributary	From approx. NZMS 260 T25:390-677 to approx. NZMS 260 T25:308-673	Mangatinoka
		Mangatainoka River Tributary	From confluence with Mangatainoka River at approx. NZMS 260 T25:406-697 to approx. NZMS 260 T25:390-685	Mangatinoka
		Mangatainoka River Tributary and associated drains	From confluence with Mangatainoka River at approx. NZMS 260 T25:431-705 to source	Mangatinoka
		Mangamaire Stream	From confluence with Mangatainoka River at approx. NZMS 260 T25:452-763 to approx. NZMS 260 T25:448-761	Mangatinoka
		Mangatainoka River Tributary and associated drains	From confluence with Mangatainoka River at approx. NZMS 260 T24:500-802 to source	Mangatinoka
		Mangatainoka River Tributary and associated drains	From confluence with Mangatainoka River at approx. NZMS 260 T24:512-815 to source	Mangatinoka
		Mangatainoka River Tributary and associated drains	From approx. NZMS 260 T24:523-822 to source	Mangatinoka
Mangatainoka (Mana_8)	Middle Mangatainoka (Mana_8b)	Mangatainoka River Tributary and associated drains	From approx. NZMS 260 T24:528-813 to source	Mangatinoka

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region				
Management Zone	**Sub-zone**	**River**	**Locality Description**	**Flood Control and/or Drainage Scheme**
		Mangaraupiu Stream Tributary Drain and network	From confluence with Mangapraupiu Stream at approx. NZMS 260 T25:325-660 to source	Mangatinoka
		Mangaraupiu Stream Tributary	From approx. NZMS 260 T25:329-666 to approx. NZMS T25:352-667	Mangatinoka
		Mangaraupiu Stream Tributary	From approx. NZMS 260 T25:321-662 to approx. NZMS T25:319-661	Mangatinoka
	Lower Mangatainoka (Mana_8c)	Mangatainoka River Tributary	From approx. NZMS 260 T24:541-840 to source	Mangatinoka
	Makakahi (Mana_8d)	Makakahi River	From confluence with Mangatainoka River at approx. NZMS 260 T24:475-775 to approx. NZMS 260 T25:382-582	Mangatinoka
		Makakahi River Tributary	From approx. NZMS 260 T25:370-600 to source	Mangatinoka
		Makakahi River Tributary	From confluence with Makakahi River at approx. NZMS 260 T25:418-670 to approx. NZMS 260 T25:400-653	Mangatinoka
		Makakahi River Tributary	From confluence with Makakahi River at approx. NZMS 260 T25:419-674 to approx. NZMS 260 T25:400-669	Mangatinoka
Upper Gorge (Mana_9)	Mangaatua (Mana_9c)	Owens Road Drain	From approx. NZMS 260 T24:502-923 to approx NZMS 260 T24:500-908	Upper Manawatu
		Woodland Road Drain	From approx. NZMS 260 T24:506-913 to approx NZMS 260 T24:518-904	Upper Manawatu
Upper Gorge (Mana_9)	Upper and Lower Mangahao (Mana_9d and Mana_9e)	Mangahao River	From confluence with Manawatu River at approx. NZMS 260 T24:496-892 to approx NZMS 260 T24:465-815	Upper Manawatu
	Lower Mangahao (Mana_9e)	Soldiers Road Drain network	From confluence with the Mangahao River at approx. NZMS 260 T24:487-835 to source	Upper Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Ruawhata Drain Network (part)	From confluence with the Mangahao River at approx. NZMS 260 T24:494-876 to source	Upper Manawatu
		Ruawhata Drain Network (part)	From approx. NZMS 260 T24:500-874 to approx. NZMS 260 T24:503-864	Upper Manawatu
		Ruawhata Drain Network (part)	From approx. NZMS 260 T24:498-875 to approx. NZMS 260 T24:501-870	Upper Manawatu
Middle Manawatu (Mana_10)	Middle Manawatu (Mana_10a)	Ashhurst Stream / Raukawa Road Drain	From confluence with Manawatu River at approx. NZMS 260 T24:404-948 to approx. NZMS 260 T23:446-013	Ashhurst Lower Manawatu
		Stoney Creek including Eagles and Whakarongo Drains	From confluence with Manawatu River at approx. NZMS 260 T24:372-910 to approx. NZMS 260 T24:376-943 (Eagles) and to approx. NZMS 260 T24:376-931 (Whakarongo)	Lower Manawatu
		Goodman Badger Drain	From confluence with Manawatu River at approx. NZMS 260 T24:384-927 to source	Lower Manawatu
	Upper, Middle and Lower Pohangina (Mana_10b, Mana_10c and Mana_10d)	Pohangina River	From confluence with Manawatu River at approx. NZMS 260 T24:449-966 to approx. NZMS 260 T23:569-200	Pohangina Oroua
Middle Manawatu (Mana_10)	Middle Pohangina (Mana_10c)	Pratt Drain (drain H)	From approx. NZMS 260 T23:468-078 to approx. NZMS 260 T23:464-078	Pohangina Oroua
		Leamy Drain (drain J)	From approx. NZMS 260 T23:470-083 to approx. NZMS 260 T23:470-089	Pohangina Oroua
Middle Manawatu (Mana_10)	Middle Pohangina (Mana_10c)	Fairless Drain (drain K)	From approx. NZMS 260 T23:477-090 to approx. NZMS 260 T23:479-101	Pohangina Oroua
		Carroll Drain (drain L)	From approx. NZMS 260 T23:486-103 to approx. NZMS 260 T23:496-107	Pohangina Oroua

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Caldwell Drain (drain M)	From approx. NZMS 260 T23:504-120 to approx. NZMS 260 T23:509-121	Pohangina Oroua
		Caldwell Drain (drain M)	From approx. NZMS 260 T23:504-120 to approx. NZMS 260 T23:509-121	Pohangina Oroua
	Lower Pohangina (Mana_10d)	Kirk Drain (drains A and B)	From approx. NZMS 260 T24:449-973 to source	Pohangina Oroua
		Hepburn Drain (drain C)	From approx. NZMS 260 T24:453-985 to source	Pohangina Oroua
		Kirk Drain (drain D)	From approx. NZMS 260 T24:455-990 to source	Pohangina Oroua
		Akers Drain (drain E)	From approx. NZMS 260 T24:462-997 to approx. NZMS 260 T24:464-005	Pohangina Oroua
		Jones-Edwards-Mai Drain (drain F)	From approx. NZMS 260 T24:458-040 to source	Pohangina Oroua
		McDonald Drain (drain G)	From approx. NZMS 260 T24:466-062 to source	Pohangina Oroua
Middle, Lower, and Coastal, Manawatu (Mana_10, Mana_11 and Mana_13)	Middle, Lower, and Coastal Manawatu (Mana_10a, Mana_11a and Mana_13a)	Manawatu River	From CMA at approx. NZMS 260 S24:009-766 to approx. NZMS 260 T24:440-960	Lower Manawatu
Lower Manawatu (Mana_11)	Lower Manawatu (Mana_11a)	Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:219-830 to source	Manawatu
		Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:245-851 to source	Manawatu
Lower Manawatu (Mana_11)	Lower Manawatu (Mana_11a)	Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:254-849 to source	Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Whitelocks Drain	From approx. NZMS 260 S24:227-824 to approx. NZMS 260 S24:170-724	Lower Manawatu
		Opiki Leave Brdg Blk No. 1	From approx. NZMS 260 S24:196-834 to approx. NZMS 260 S24:197-831	Lower Manawatu
		Opiki Leave Brdg Blk No. 2	From approx. NZMS 260 S24:203-830 to approx. NZMS 260 S24:197-832	Lower Manawatu
		Opiki Leave Brdg Blk No. 3	From approx. NZMS 260 S24:193-827 to approx. NZMS 260 S24:190-829	Lower Manawatu
		Terry Drain	From approx. NZMS 260 S24:184-831 to approx. NZMS 260 S24:183-825	Lower Manawatu
		MacAloons No. 2	From approx. NZMS 260 S24:172-824 to approx. NZMS 260 S24:174-823	Lower Manawatu
		MacAloons No. 1	From approx. NZMS 260 S24:163-826 to approx. NZMS 260 S24:168-824	Lower Manawatu
	Upper and Lower Mangaone Stream (Mana_11d and Mana_11e)	Mangaone Stream	From confluence with Manawatu River at approx. NZMS 260 S24:281-872 to approx. NZMS 260 T24:335-995	Lower Manawatu
	Upper Mangaone Stream (Mana_11d)	Mangaone Stream Tributary	From confluence with Mangaone Stream at approx. NZMS 260 T24:319-963 to source	Manawatu
		Mangaone Stream Tributary	From confluence with Mangaone Stream at approx. NZMS 260 T24:322-967 to source	Manawatu
		Mangaone Stream Tributary	From confluence with Mangaone Stream at approx. NZMS 260 T24:325-969 to source	Manawatu
Lower Manawatu (Mana_11)	Upper Mangaone Stream (Mana_11d)	Mangaone Stream Tributary	From confluence with Mangaone Stream at approx. NZMS 260 T23:317-005 to source	Manawatu
		Darby Creek and Houghton Drain	From confluence with Mangaone Stream at approx. NZMS 260 T24:325-978 to source	Lower Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
	Main Drain (Mana_11f)	Main Drain and connected tributaries including drains	From confluence with Manawatu River at approx. NZMS 260 S24:181-836 to source	Manawatu
Oroua (Mana_12)	Upper Oroua (Mana_12a)	Oroua River	Oroua River from approx. NZMS 260 T23:330-070 to approx. NZMS 260 T23:518-270	Pohangina Oroua
		Paorangi Drain	From approx. NZMS 260 T23:375-131 to approx. NZMS 260 T23:359-112	Pohangina Oroua
	Middle and Lower Oroua, Kiwitea (Mana_12b, Mana_12c and Mana_12d)	Oroua River	From confluence with Manawatu River at approx. NZMS 260 S24:165-826 to approx. NZMS 260 T23:308-067	Lower Manawatu
	Lower Oroua (Mana_12c)	Sluggish Creek and connected tributaries including drains	From confluence with Oroua River at approx. NZMS 260 S24:176-843 to source	Te Kawau
		Oroua River Tributary	From approx. NZMS 260 S24:149-846 to source	Te Kawau
		Blackmoor Drain	From approx. NZMS 260 S24:166-829 to source	Lower Manawatu
	Kiwitea (Mana_12d)	Kiwitea Stream	From confluence with Oroua River at approx. NZMS 260 T23:308-067 to NZMS 260 T23:310-073	Lower Manawatu
			From approx. NZMS 260 T23:310-073 to approx. NZMS 260 T23:358-162	Kiwitea
Oroua (Mana_12)	Makino (Mana_12e)	Makino Stream	From confluence with Oroua River at approx. NZMS 260 S23:243-006 to NZMS 260 S23:289-082	Lower Manawatu
Coastal Manawatu (Mana_13)	Coastal Manawatu (Mana_13a)	Manawatu River Tributary	From Foxton Beach Settlement at approx. NZMS 260 S24:001-797 to source	Himatangi

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Tokomaru River Tributary (drain)	From confluence with Tokomaru River at approx. NZMS 260 S24:143-729 to source	Makerua
		Seymours Oxbow Drain	From confluence with Manawatu River at approx. NZMS 260 S26:134-162 to source	Makerua
		Manawatu River tributaries including drains	All drains situated between the Manawatu River and Moutoa Floodway, from their confluence with the Manawatu River to source	Moutoa
		Moutoa Floodway and tributaries including drains	From confluence with the Moutoa Floodway to source	Moutoa
		Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:051-721 to source	Koputaroa
		Amon Drain	Amon Drain, from confluence with Manawatu River at approx. NZMS 260 S24:064-717 to source	Koputaroa
		Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:069-707 to source	Koputaroa
		Manawatu River Tributary	From confluence with Manawatu River at approx. NZMS 260 S24:093-711 to source	Koputaroa
		Manawatu River Tributary Drain	From approx. NZMS 260 S24:158-822 to approx. NZMS 260 S24:164-824	Lower Manawatu
		Sargent Drain	From approx. NZMS 260 S24:156-819 to approx. NZMS 260 S24:151-813	Lower Manawatu
Coastal Manawatu (Mana_13)	Coastal Manawatu (Mana_13a)	Funell Drain	From approx. NZMS 260 S24:148-810 to approx. NZMS 260 S24:151-812	Lower Manawatu
		Funells No.1 Drain	From approx. NZMS 260 S24:143-804 to approx. NZMS 260 S24:143-803	Lower Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Funells No.2 Drain	From approx. NZMS 260 S24:133-796 to approx. NZMS 260 S24:134-787	Lower Manawatu
		Funells No.3 Drain	From approx. NZMS 260 S24:119-786 to approx. NZMS 260 S24:123-786	Lower Manawatu
		Barnes Drain	From approx. NZMS 260 S24:108-781 to approx. NZMS 260 S24:114-784	Lower Manawatu
		Phillips Drain	From approx. NZMS 260 S24:114-774 to source	Lower Manawatu
	Lower Tokomaru (Mana_13c)	Linton Drain and tributaries including drains	From confluence with Tokomaru River at approx. NZMS 260 S24:196-775, including all drains between Linton Drain and the Manawatu River to the west and all drains from Main Trunk Railway to the east as far upstream as Columbus Street (Linton) at approx. NZMS 260 S24:253-835	Makerua and Lower Manawatu
		Tokomaru River	From confluence with Manawatu River at approx. NZMS 260 S24:134-727 to approx. NZMS 260 S24:222-771	Makerua and Lower Manawatu
		Mangaharakeikei Stream	From confluence with Tokomaru River at approx. NZMS 260 S24:186-755 to approx. NZMS 260 S24:203-749	Makerua
		Tokomaru River Tributary	From confluence with Tokomaru River at approx. NZMS 260 S24:176-742 to source	Makerua
		Tokomaru River Tributary	From confluence with Tokomaru River at approx. NZMS 260 S24:180-747 to source	Makerua
		Kara Stream	From confluence with Manawatu River at approx. NZMS 260 S24:145-730 to approx. NZMS 260 S24:168-712	Lower Manawatu
		Kara Stream Tributary (drain)	From confluence with Kara Stream at approx. NZMS 260 S24:153-725 to source	Makerua
Coastal Manawatu (Mana_13)	Lower Tokomaru (Mana_13c)	Mangapuketea	From confluence with Kara Stream at approx. NZMS 260 S24:160-720 to approx. NZMS 260 S24:178-724	Lower Manawatu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
	Mangaore (Mana_13d)	Mangaore Stream	From confluence with Manawatu River at approx. NZMS 260 S24:117-717 to approx. NZMS 260 S24:147-709	Lower Manawatu
		Mangaore Stream Tributary	From confluence with Mangaore Stream at approx. NZMS 260 S24:124-716 to source	Makerua
		Mangaore Stream Tributary	From confluence with Mangaore Stream at approx. NZMS 260 S24:126-716 to source	Koputaroa
	Koputaroa (Mana_13e)	Koputaroa Stream	Koputaroa Stream from confluence with Manawatu River at approx. NZMS 260 S24:106-710 to source	Koputaroa
	Foxton Loop (Mana_13f)	Manawatu River Tributary	From confluence with Foxton Loop (Manawatu River) at approx. NZMS 260 S24:032-783 to source	Foxton East
		Manawatu River Tributary	From confluence with Foxton Loop (Manawatu River) at approx. NZMS 260 S24:024-771 to source.	Whirikino
Lower and Coastal Rangitikei (Rang_3 and Rang_4)	Lower, Coastal, and Tidal Rangitikei (Rang_3a, Rang_4a and Rang_4b)	Rangitikei River	From CMA at approx. NZMS 260 S23:010-001 to NZMS 260 T22:341-330	Rangitikei
Coastal Rangitikei (Rang_4)	Coastal Rangitikei (Rang_4a)	Rangitikei River Tributary	From confluence with Rangitikei River at approx. NZMS 260 S23:046-006 to source.	Rangitikei
		Bulls Domain Drain and Racecourse Drain	From confluence with Rangitikei River at approx. NZMS 260 S23:130-103 to source	Tutaenui
	Tidal Rangitikei (Rang_4b)	Forest Road Wetland Tributary	From approx. NZMS 260 S23:018-034 to source	Forest Road
		Forest Road Wetland Tributary	From approx. NZMS 260 S23:022-036 to source	Forest Road

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
Coastal Rangitikei (Rang_4)	Tidal Rangitikei (Rang_4b)	Parewanui Drains and their tributaries	Five drains situated between Forest Road and Parewanui Road, from confluence with Rangitikei River to source.	Rangitikei
	Porewa (Rang_4c)	Porewa Stream	From confluence with Rangitikei River at approx. NZMS 260 S23:191-216 to source	Porewa
		Porewa Scheme Detention Dam 29	100 metres upstream and down stream of approx. NZMS 260 T22:301-371	Porewa
		Porewa Scheme Detention Dam 39	100 metres upstream and down stream of approx. NZMS 260 S22:226-301	Porewa
		Porewa Scheme Detention Dam 42	100 metres upstream and down stream of approx. NZMS 260 S22:240-361	Porewa
		Porewa Scheme Detention Dam 43	100 metres upstream and down stream of approx. NZMS 260 S22:242-364	Porewa
		Porewa Scheme Detention Dam 44	100 metres upstream and down stream of approx. NZMS 260 S22:256-356	Porewa
		Porewa Scheme Detention Dam 45	100 metres upstream and down stream of approx. NZMS 260 S22:249-379	Porewa
		Porewa Scheme Detention Dam 46	100 metres upstream and down stream of approx. NZMS 260 S22:269-374	Porewa
		Porewa Scheme Detention Dam 54	100 metres upstream and down stream of approx. NZMS 260 S22:279-363	Porewa
		Porewa Scheme Detention Dam 62	100 metres upstream and down stream of approx. NZMS 260 T22:306-377	Porewa
		Porewa Scheme Detention Dam 63	100 metres upstream and down stream of approx. NZMS 260 T22:312-388	Porewa

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Porewa Scheme Detention Dam 64	100 metres upstream and down stream of approx. NZMS 260 T22:332-388	Porewa
Coastal Rangitikei (Rang_4)	Porewa (Rang_4c)	Porewa Scheme Detention Dam 73	100 metres upstream and down stream of approx. NZMS 260 S22:296-386	Porewa
		Porewa Scheme Detention Dam 75	100 metres upstream and down stream of approx. NZMS 260 S22:288-398	Porewa
		Porewa Scheme Detention Dam 82	100 metres upstream and down stream of approx. NZMS 260 S22:315-415	Porewa
		Porewa Scheme Detention Dam 83	100 metres upstream and down stream of approx. NZMS 260 T22:317-417	Porewa
		Porewa Scheme Detention Dam 84	100 metres upstream and down stream of approx. NZMS 260 T22:320-423	Porewa
		Porewa Scheme Detention Dam 85	100 metres upstream and down stream of approx. NZMS 260 T22: 326-433	Porewa
		Porewa Scheme Detention Dam 86	100 metres upstream and down stream of approx. NZMS 260 T22: 332-439	Porewa
		Porewa Scheme Detention Dam 92	100 metres upstream and down stream of approx. NZMS 260 T22: 319-398	Porewa
		Porewa Scheme Detention Dam 93	100 metres upstream and down stream of approx. NZMS 260 T22: 327-408	Porewa
		Porewa Scheme Detention Dam 94	100 metres upstream and down stream of approx. NZMS 260 T22: 333-415	Porewa
		Porewa Scheme Detention Dam 94A	100 metres upstream and down stream of approx. NZMS 260 T22: 333-416	Porewa

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Porewa Scheme Detention Dam 95	100 metres upstream and down stream of approx. NZMS 260 T22: 336-428	Porewa
		Porewa Scheme Detention Dam 96	100 metres upstream and down stream of approx. NZMS 260 T22: 339-432	Porewa
Coastal Rangitikei (Rang_4)	Porewa (Rang_4c)	Porewa Scheme Detention Dam 97	100 metres upstream and down stream of approx. NZMS 260 T22: 342-446	Porewa
		Porewa Scheme Detention Dam 98	100 metres upstream and down stream of approx. NZMS 260 T22: 354-454	Porewa
		Porewa Scheme Detention Dam 100	100 metres upstream and down stream of approx. NZMS 260 T22: 341-453	Porewa
	Tutaenui (Rang_4d)	Tutaenui Stream	From approx. NZMS 260 S23:100-093 to approx. NZMS 260 S23:146-296	Tutaenui
		Tutaenui Stream Tributary	From confluence with Tutaenui Stream at approx. NZMS 260 S23:133-212 to approx. NZMS 260 S23:136-227 (north arm) and approx. NZMS 260 S23:146-224 (east arm)	Tutaenui
		Tutaenui Stream Tributary	From confluence with Tutaenui Stream at approx. NZMS 260 S23:135-202 to approx. NZMS 260 S23:118-216	Tutaenui
		Tutaenui Scheme Detention Dam E1	100 metres upstream and down stream of approx. NZMS 260 S23:144-183	Tutaenui
		Tutaenui Scheme Detention Dam E2	100 metres upstream and down stream of approx. NZMS 260 S23:146-224	Tutaenui
		Tutaenui Scheme Detention Dam E3	100 metres upstream and down stream of approx. NZMS 260 S23:155-241	Tutaenui
		Tutaenui Scheme Detention Dam E4	100 metres upstream and down stream of approx. NZMS 260 S23:153-251	Tutaenui

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Tutaenui Scheme Detention Dam E6	100 metres upstream and down stream of approx. NZMS 260 S23:158-271	Tutaenui
		Tutaenui Scheme Detention Dam E7	100 metres upstream and down stream of approx. NZMS 260 S23:143-271	Tutaenui
		Tutaenui Scheme Detention Dam E8	100 metres upstream and down stream of approx. NZMS 260 S23:143-279	Tutaenui
Coastal Rangitikei (Rang_4)	Tutaenui (Rang_4d)	Tutaenui Scheme Detention Dam E9	100 metres upstream and down stream of approx. NZMS 260 S23:149-297	Tutaenui
		Tutaenui Scheme Detention Dam E10	100 metres upstream and down stream of approx. NZMS 260 S23:165-302	Tutaenui
		Tutaenui Scheme Detention Dam E11	100 metres upstream and down stream of approx. NZMS 260 S23:170-301	Tutaenui
		Tutaenui Scheme Detention Dam W1	100 metres upstream and down stream of approx. NZMS 260 S23:147-170	Tutaenui
		Tutaenui Scheme Detention Dam W2	100 metres upstream and down stream of approx. NZMS 260 S23:119-239	Tutaenui
		Tutaenui Scheme Detention Dam W3	100 metres upstream and down stream of approx. NZMS 260 S23:119-248	Tutaenui
		Tutaenui Scheme Detention Dam W4	100 metres upstream and down stream of approx. NZMS 260 S23:126-247	Tutaenui
		Tutaenui Scheme Detention Dam W5	100 metres upstream and down stream of approx. NZMS 260 S23:130-259	Tutaenui
		Tutaenui Scheme Detention Dam W6	100 metres upstream and down stream of approx. NZMS 260 S23:133-263	Tutaenui

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Tutaenui Scheme Detention Dam W7	100 metres upstream and down stream of approx. NZMS 260 S23:136-286	Tutaenui
		Tutaenui Scheme Detention Dam W8	100 metres upstream and down stream of approx. NZMS 260 S23:141-288	Tutaenui
		Hanratty Drain	From approx. NZMS 260 S23:122-119 to approx. NZMS 260 S23: 130-127	Tutaenui
		Lower Tutaenui Overflow Channel	From approx. NZMS 260 S23:126-130 to approx. NZMS 260 S23: 128-131	Tutaenui
Coastal Rangitikei (Rang_4)	Tutaenui (Rang_4d)	Tricker Drain	From approx. NZMS 260 S23:127-133 to approx. NZMS 260 S23: 127-135	Tutaenui
		Marton West Stream	From approx. NZMS 260 S23:130-216 to approx. NZMS 260 S23: 123-229	Tutaenui
Cherry Grove and Te Maire (Whai_2 and Whai_3)	Cherry Grove and Te Maire (Whai_2a and Whai_3)	Whanganui River	From approx. NZMS 260 S18:054-531 to approx. NZMS 260 S18:127-541	Upper Whanganui
Lower Whanganui (Whai_7)	Lower Whanganui (Whai_7a)	Mateongaonga Stream	From confluence with Whanganui River at approx. NZMS 260 R22:877-433 to confluence with Mangamoku Stream at approx NZMS 260 S22:937-430	Matarawa
		Mangamoku Stream	From confluence with Mateongaonga Stream at approx. NZMS 260 S22:937-430 to source	Matarawa
		Mateongaonga Stream Tributary	From confluence with Mateongaonga Stream at approx. NZMS 260 R22:889-426 to source	Matarawa
		Bardell Drain	From approx. NZMS 260 S22:913-403 to approx. NZMS 260 R22:893-410	Matarawa
	Coastal and Lower Whanganui (Whai_7a and Whai_7b)	Whanganui River	From CMA at approx. NZMS 260 R22:849-380 to approx. NZMS 206 S22:906-468	Lower Whanganui

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
	Matarawa (Whai_7d)	Matarawa Stream including detention dams	From approx. NZMS 260 R22:870-409 to approx. NZMS 260 S22:012-368	Matarawa
		Matarawa Stream Tributary Detention Dam	100 metres upstream and down stream of approx. NZMS 260 S22:967-386	Matarawa
		Mangaone Stream	From confluence with Matarawa Stream at approx. NZMS 260 R22:893-410 to approx. NZMS 260 S22:940-394	Matarawa
Lower Whanganui (Whai_7)	Matarawa (Whai_7d)	Railway Drain	From approx. NZMS 260 S22:922-396 to approx. NZMS 260 S22:916-400	Matarawa
		Okoia Drain	From approx. NZMS 260 S22: 924-399 to approx. NZMS 260 S22:921-398	Matarawa
		Kaimatira Road Drain	From approx. NZMS 260 S22:901-420 to approx. NZMS 260 R22:890-420	Matarawa
		Mangaone Stream Tributary Detention Dam	100 metres upstream and down stream of approx. NZMS 260 S22:953-403	Matarawa
		Kaukatea Stream including detention dams	From confluence with Mangaone at approx. NZMS 260 S22:919-399 to NZMS 260 S22:002-425	Matarawa
		Kaukatea Stream Tributary Detention Dam	100 metres upstream and down stream of approx. NZMS 260 S22:987-415	Matarawa
Lower Whangaehu (Whau_3)	Lower Whangaehu (Whau_3a)	Whangaehu River	From approx. NZMS 260 S22:046-398 to approx. NZMS 260 S22:085-468	Whangaehu
		Mangawhero River	From confluence with the Whangaehu River at approx. NZMS 260 S22:066-471 to approx. NZMS 260 S22:041-550	Whangaehu

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
	Upper Mangawhero (Whau_3d)	Mangawhero River	From approx. NZMS 260 S20:080-903 to approx. NZMS 260 S20:113-947	Pakahi
		Mangahowhi Stream and detention dams	From confluence with the Mangawhero River at approx. NZMS 260 S20:092-922 to source	Pakahi
Coastal Whangaehu (Whau_4)	Coastal Whangaehu (Whau_4)	Whangaehu River	From CMA at approx. NZMS 260 S23:903-287 to approx. NZMS 260 S22:046-398	Whangaehu
		Whangaehu River Tributary	From confluence with Whangaehu River at approx. NZMS 260 S22:988-319 to source	Haunui
Coastal Whangaehu (Whau_4)	Coastal Whangaehu (Whau_4)	Whangaehu River Tributary	From confluence with Whangaehu River at approx. NZMS 260 S22:006-338 to source	Haunui
		Whangaehu River Tributary	From confluence with Whangaehu River at approx. NZMS 260 S22:009-341 to source	Haunui
Turakina (Tura_1)	Lower Turakina (Tura_1)	Makirikiri Stream	From confluence with Turakina River at approx. NZMS 260 S23:955-245 to approx. NZMS 260 S23:983-250	Makirikiri
		Makirikiri Stream Tributary	From confluence with Makirikiri Stream at approx. NZMS 260 S23:975-247 to approx. NZMS 260 S23:981-247	Makirikiri
		Makirikiri Stream Tributary (drain)	From confluence with Makirikiri Steam Tributary at approx. NZMS 260 S23:981-247 to confluence with Makirikiri Stream at approx. NZMS 260 S23:983-250	Makirikiri
Ohau (Ohau_1)	Upper and Lower Ohau (Ohau_1a and Ohau_1b)	Ohau River	From CMA at approx. NZMS 260 S25:930-595 to approx. NZMS 260 S25:097-586	Ohau Manakau
	Lower Ohau (Ohau_1a)	Kuku Stream	From confluence with Ohau River at approx. NZMS 260 S25:946-580 to source	Ohau Manakau
		Lake Waitaha outlet stream	From confluence with Ohau River at approx. NZMS 260 S25:946-580 to source	Ohau Manakau

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
		Haines Drain and Tributaries	From confluence with Ohau River at approx. NZMS 260 S25:952-578 to source	Ohau Manakau
		Parkin Drain and Tributaries	From confluence with Ohau River at approx. NZMS 260 S25:960-582 to source	Ohau Manakau
		Burnell Drain and Tributaries	From confluence with Ohau River at approx. NZMS 260 S25:963-585 to source	Ohau Manakau
		Catley Drain and Tributaries	From confluence with Ohau River at approx. NZMS 260 S25:967-581 to source	Ohau Manakau
Ohau (Ohau_1)	Lower Ohau (Ohau_1a)	Honore Drain and Tributaries	From confluence with Ohau River at approx. NZMS 260 S25:974-585 to source	Ohau Manakau
Akitio (Akit_1)	Upper and Lower Akitio (Akit_1a and Akit_1b)	Akitio River	From CMA at approx. NZMS 260 U25:996-618 to approx. NZMS 260 U24:918-832	Akitio
	Lower Akitio (Akit_1b)	Wakawahine Stream	From confluence with Akitio River at approx. NZMS 260 U25:985-658 to approx. NZMS 260 U25:985-660	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U25:982-658 to approx. NZMS 260 U25:980-657	Akitio
		Mangahewa Stream	From confluence with Akitio River at approx. NZMS 260 U25:967-700 to approx. NZMS 260 U24:968-702	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U25:955-705 to approx. NZMS 260 U25:955-702	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U25:950-714 to approx. NZMS 260 U25:951-716	Akitio
		Mangahuia Stream	From confluence with Akitio River at approx. NZMS 260 U24:932-706 to approx. NZMS 260 U24:932-704	Akitio

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region				
Management Zone	**Sub-zone**	**River**	**Locality Description**	**Flood Control and/or Drainage Scheme**
		Mangaone Stream	From confluence with Akitio River at approx. NZMS 260 U24:929-713 to approx. NZMS 260 U24:929-711	Akitio
		Waihoro Stream	From confluence with Akitio River at approx. NZMS 260 U24:907-722 to approx. NZMS 260 U24:906-723	Akitio
		Rakaupuhipuhi Stream	From confluence with Akitio River at approx. NZMS 260 U24:913-762 to approx. NZMS 260 U24:914-763	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U24:889-761 to approx. NZMS 260 U24:888-760	Akitio
		Makupara Stream	From confluence with Akitio River at approx NZMS 260 U24:881-767 to NZMS 260 U24:879-766	Akitio
Akitio (Akit_1)	Lower Akitio (Akit_1b)	Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U24:882-768 to approx. NZMS 260 U24:882-770	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U24:898-781 to approx. NZMS 260 U24:898-783	Akitio
		Akitio River Tributary	From confluence with Akitio River at approx. NZMS 260 U24:888-788 to approx. NZMS 260 U24:887-790	Akitio
		Waihi River	From confluence with Akitio River at approx NZMS 260 U24:895-802 to NZMS 260 U24:894-806	Akitio
		Table Stream	From confluence with Akitio River at approx NZMS 260 U24:910-812 to NZMS 260 U24:909-813	Akitio
		Tahuokaretu Stream	From confluence with Akitio River at approx NZMS 260 U24:913-817 to NZMS 260 U24:914-816	Akitio

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region

Management Zone	Sub-zone	River	Locality Description	Flood Control and/or Drainage Scheme
Southern Whanganui Lakes (West_5)	Southern Whanganui Lakes (West_5)	Raumai Range Stream Tributary	From confluence with Raumai Stream at approx. NZMS 260 S23:990-083 to source	Forest Road
Northern Manawatu Lakes (West_6)	Northern Manawatu Lakes (West_6)	Coastal Lake Station Stream	From CMA at approx. NZMS 260 S24:989-875 to source	Himatangi
Lake Papaitonga (West_7)	Lake Papaitonga (West_7)	Waiwiri Stream	From approx. NZMS 260 S25:939-619 to source	Ohau Manakau
Waikawa (West_9)	Waikawa (West_9a)	Waikawa Stream	From approx. NZMS 260 S25:921-561 to approx. NZMS 260 S26:994-119	Ohau Manakau
	Manakau (West_9b)	Waikawa Stream Tributary	From confluence with Waikawa Stream at approx. NZMS 260 S26:994-119 to source	Ohau Manakau
		Campbell Drain	From confluence with Waikawa Stream at approx. NZMS 260 S26:942-548 to source	Ohau Manakau
Waikawa (West_9)	Manakau (West_9b)	Manakau Stream	From confluence with Waikawa Stream at approx. NZMS 260 S25:946-549 to confluence with Waiauti Stream at approx. NZMS 260 S25:966-508	Ohau Manakau
		Waiauti Stream	From confluence with Manakau Stream at approx. NZMS 260 S25:946-549 to source	Ohau Manakau
		Manakau Stream Tributary including drains	From confluence with Manakau Stream at approx. NZMS 260 S25:947-546 to source	Ohau Manakau
		Manakau Stream Tributary including drains	From confluence with Manakau Stream at approx. NZMS 260 S25:950-543 to source	Ohau Manakau

Table Ba.20: Location of the Flood Control and Drainage values in the Manawatu-Wanganui Region				
Management Zone	**Sub-zone**	**River**	**Locality Description**	**Flood Control and/or Drainage Scheme**
Lake Horowhenua (Hoki_1)	Lake Horowhenua and Hokio (Hoki_1a and Hoki_1b))	Hokio Stream and tributaries (including drains)	Hokio Stream and tributaries, including tributaries of Lake Horowhenua, from the CMA at approx. NZMS 260 S25:949-657 to source	Hokio