

NON-SCHEME RIVERS INVESTIGATION PRIORITISING FUTURE STUDIES

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Front Cover Photos

Permeable groyne work on the Upper Mangahao River five kilometres upstream of Tutaekara Road funded by an Environmental Grant.
Photo: (Richard Apthorp)

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1. INTRODUCTION

This report has been prepared in order to address the flooding and erosion risk to the wider community posed by those rivers and streams within the Region that are currently not being managed within a scheme.

This report updates the report “Wider Rivers Investigation – Prioritising Future Studies”, November 2003, John Philpott & Associates Ltd. Several of the investigations proposed in that report have been completed, although the budget available also had to cover the Councils coastal hazards investigations. It is timely now to review the priorities.

The Council, through its management of the Region’s 22 river control and 13 drainage schemes, mitigates flooding and erosion to a large number of the rivers and streams, as would be expected. These include most of those watercourses where the hazards are the greatest. However, there are still a significant number of rivers and streams where community assets, private property and people are at risk to some degree.

Under the Resource Management Act, the Council has the responsibility to avoid or mitigate natural hazards to the whole region and not be limited to the river Schemes that are currently in existence.

Legal advice received on this responsibility has indicated that the Council should assess what flood and erosion mitigation works are required for the whole Region. However, the Council retains discretion as to what works it will carry out and is not required to fully address all flood and erosion risks in the Region.

Through its 2013-14 Annual Plan Council allocated funds to prepare a report identifying those non-scheme rivers and streams throughout the Region where flooding and erosion hazards exist and assigning priorities to these to assist with future planning. It is envisaged that the studies identified as being necessary in this report will extend over the next ten years and be an important input into the 2015-16 to 2024-25 Long-Term Plan process.

Resource constraints, together with the generally limited nature of available engineering survey or hydrological data, will dictate that the studies identified will not necessarily be in-depth, comprehensive investigations. Nevertheless they are expected to identify important issues, provide useful conclusions and recommendations and provide a basis for further consultation with the communities concerned.

As river control functions are only part of what the Council is required to do and because the Council has a limited budget, this report prioritises the studies to maximise the benefit obtained from the non-Scheme rivers investigation programme.

Accordingly this report presents information and priorities on over 70 rivers and streams assessed, in order to determine an appropriate investigations programme.

2. METHODOLOGY

2.1 River and Stream Identification

A diverse range of sources were examined. Numerous interviews were conducted with representatives of various Councils who had a good knowledge of locations of flooding and erosion risks to the community that were not being addressed by existing schemes. Whilst a good guide was obtained from the listing of rivers and streams in the 2003 Investigation, there were several additional watercourses identified where problems had become evident since that review. Conversely some streams that previously had a lower priority, now had no priority and were classified accordingly.

2.2 Regional Council Engineers and the Group Manager Operations

All Horizons Regional Council Area Engineers and their nominated staff were asked to identify rivers and streams in their respective area where flood and erosion risks existed and the nature and scale of those risks. Mr Allan Cook, Group Manager Operations, provided guidance and background, especially in respect of the Northern Area. They were given a summary listing of the 2003 investigation findings and asked to comment on changes, additions and reductions to the watercourse involved and associate risks. Where appropriate, the listings included further watercourses known to have problems not identified in 2003 and those watercourses now not relevant (due to them being incorporated in schemes since 2003). Furthermore, they were given a spreadsheet to guide the areas of information required in their response.

The following staff were consulted:

| | |
|----------------------|---|
| Northern Area | <i>Wayne Spencer, Jeremy Cummings (who provided a very extensive in-depth assessment for watercourses in the Ruapehu District) and Lew Marsh</i> |
| Central Area | <i>Paul Joseph, Ian McMahon and Lucy Ferguson</i> |
| Eastern Area | <i>Richard Apthorp and Grant McLaren</i> |
| Southern Area | <i>John Foxall</i> |

2.3 District Council Engineers and Planners

The Asset Managers and Planners of the District Councils were asked to identify rivers and streams in their respective areas where flood and erosion risks existed. They were given the same summary listings from the 2003 Investigation and the associated spreadsheet. Their perspective was from:

1. Rivers and streams that threatened assets for which they were responsible (for example roading, river intakes and bridge and culvert crossings); and
2. Rivers and streams that threatened settlements and individual housing.

The following people were consulted:

Ruapehu District Council ***Warren Furner and Anne-Marie Westcott***

Wanganui District Council ***Kritzo Venter***

Manawatu District Council ***Hamish Waugh and Phil O'Connor***

Rangitikei District Council ***Hamish Waugh and Phil O'Connor***
(managing on RDC behalf)

Tararua District Council ***Nicole Gowing and Tom Dodd***

Horowhenua District Council ***Tony Thomas, Glen O'Connor and***
Gallow Saily

Palmerston North City Council was not consulted as Horizons Regional Council Operations staff had very good familiarity on the state of and issues of the streams in the City boundaries.

2.4 Environmental Grant Applications

The Horizons Regional Council Engineers provided details on the number of Environmental Grant funded works over recent years. This gives a good indication on the erosion and willow congestion problems in several of the rivers and streams. The information is summarised in Table 1 and Appendix A.

2.5 Site Inspections

Site inspections were carried out in some areas, particularly around Ohakune where a significant flood (varying between 5% AEP and 1% AEP) had occurred in several streams on 15 October 2013. The authors' knowledge from numerous site inspections over the past eight years was also included in the assessment.

3. ANALYSIS

Details of all the relevant parameters are presented in Table 1, Table 2 and Appendix A. Table 1 presents details of the rivers with High and Medium Priority investigation needs; with the Medium Priority ranked Medium 1 having a higher priority than Medium 2. Table 2 presents details of the rivers with Low Priority investigation needs and those previously investigated.

The following parameters are presented in Tables 1 and 2.

- **Colour Coded Rivers Priority.** A rapid presentation of priority groupings described by “High” (Red Colour), “Medium 1” (Green), “Medium 2” (Yellow) and “Low” (Blue). Also shown are rivers and streams already investigated, and requiring no further investigation (shown in Grey). This keeps the same colour coding as the 2003 Assessment for direct comparison.
- **District.**
- **Priority Ranking.** Based on a summarised assessment of the contributing factors being flood risk, erosion and other.
- **Total Problem Points.** This is a total score out of 25 problem points covering flood risk, erosion and other.
- **Previous Investigation.** Identifies those rivers and streams previously investigated.
- **Already Being Managed.** Identifies rivers or streams now partially or fully managed under either Horizons Regional Council or District Council schemes or landowner groups (such as Streamcare Groups). Fully managed schemes are only included for completeness; partially managed schemes are assessed alongside the unmanaged schemes and ranked.
- **Number of Grant Jobs Since 2004.** Refer 3.4 preceding.
- **Cause of Problem and Points.** The cause of the problem was categorised under flooding, erosion and other. Where willow congestion or gravel accumulation causes problems additional to other flooding problems it is recorded under other. Problem Points are attributed out of 10 for the first two categories and out of five for the third. This takes into account the problem extent, severity and consequence – higher points are attributed where houses or settlements are at risk. Whilst a somewhat arbitrary assessment, this does give a consistent evaluation method. Refer Appendix B for the scoring method.
- **Work Required.** Presents a summary of the nature and scale of the work required. This is divided into channel clearing, channel improvement, erosion control and flood control. At the request of Kritzo Venter, enhancement works were added for the Wanganui District streams.

4. PRIORITY

Using the information in Table 1 the ranking for the Non-Scheme Rivers investigations programme was determined. Rankings were set for the High and Medium 1 and 2 Priority classifications as they totalled a significant number of 28 rivers and streams.

Rankings are largely based on the “Total Problem Points” scores. Maps showing the locations of the river and stream reaches are presented in Appendix E.

4.1 High Priority – Ranking 1 to 6

The High Priority Rivers are highlighted in red in Table 1. These were streams with Total Problem Points of 13 or higher (out of 25 possible) – meaning that their evident problems were 50% or higher across those problem ratings possible.

Six rivers or groups of rivers were identified as High Priority as follows:

- **Rank 1 – Upper Mangawhero River & Tributaries.** At 19 Total Problem Points this river system is well clear of the other rivers and streams. Investigations will need to address flooding, erosion and willow congestion; with obvious risks to the community. Several studies already completed will feed well into the determination of an action plan.
- **Rank 2 – Kaikokopu & Tutaieka Streams.** These streams present various risks to the community. The investigations may be able to be phased with stormwater modelling programmed by Wanganui District Council.
- **Rank 3 – Upper Mangahao River.** There have been numerous Environmental Grant works to address significant erosion of this mobile gravel river. These problems require a comprehensive assessment as a matter of priority.
- **Rank 4 – Upper Makino Stream.** Again there have been several recent Environmental Grant works. There are significant erosion and willow congestion problems. A comprehensive approach is again required to address these problems.
- **Rank 5 – Ohura River Tributaries.** There were several Environmental Grant works through these tributary streams. All had areas of willow congestion and some had flooding or erosion problems.
- **Rank 6 – Makotuku Upstream Raetihi.** A 1% AEP (100 Year) flood occurred in this stream on 15 October 2013. Flooding was close to one house and the flood risk needs to be quantified. There is some erosion and willow congestion.

4.2 Medium 1 Priority – Rankings 7 to 13

The Medium 1 Priority Rivers are highlighted in green in Table 1. These were streams with Total Problem Points of 10 to 12 – meaning that their evident problems were slightly less than 50% across those problem ratings possible.

Seven rivers or groups of rivers were identified as Medium 1 Priority as follows:

- **Rank 7 – Ngatarua Stream.** As in the 2003 Assessment this stream is the highest ranked “Medium 1” stream. It has flooding due to channel crossings, other obstructions and areas of excessive vegetation growth. This poses flood risks to residential properties and parts of Putiki Marae.
- **Rank 8 – Makowhai Stream.** There have been several flood risk enquiries in recent years, reflecting developments and flooding problems. There are also areas of channel congestion.
- **Rank 9 – Upper Kiwitea Stream.** There have been several recent Environmental Grant works. There are moderate to significant localised flooding and erosion problems.
- **Rank 10 – Mangaone West.** A portion of this stream is managed by a catchment care group. However, there are also moderate to significant localised flooding and erosion problems in other reaches than that managed.
- **Rank 11 – Mangamako River.** A recent Environmental Grant covered works on 6 separate properties. There are flooding problems, with a house evacuated twice and a MDC road flooded. Severe willow congestion and minor erosion.
- **Rank 12 – Tiraumea River.** A few environmental grants administered by GEM. Flooding in Alfredton area. Some willow congestion, flooding and erosion.
- **Rank 13 – Mangatoro (Waitahora) Stream.** A few Environmental Grant works. There is much self-seeded willow, moderate erosion and some localised rural flooding.

4.3 Medium 2 Priority – Rankings 14 to 28

The Medium 2 Priority Rivers are highlighted in yellow in Table 1. These were streams with Total Problem Points of 8 to 9. Their evident problems are smaller and generally less frequent.

Fifteen rivers or groups of rivers were identified as Medium 2 Priority as follows:

- **Rank 14 – Piakatutu Stream.**
- **Rank 15 – Awapikopiko Stream & Kumeroa Township.**
- **Rank 16 – Aokautere Streams.**
- **Rank 17 – Wainui River.**

- **Rank 18 – Makuri and Makuri-iti Rivers.**
- **Rank 19 – Ongaonga Stream.**
- **Rank 20 – Turitea Stream.**
- **Rank 21 – Kawhatau River.**
- **Rank 22 - Upper Ohau River.**
- **Rank 23 – Awarua Stream Upstream SH3.**
- **Rank 24 – Purua Stream.**
- **Rank 25 – Ongarue River.**
- **Rank 26 – Haynes Creek.**
- **Rank 27 – Upper Mangaone Stream.**
- **Rank 28 – Waituna Stream.**

4.4 Low Priority – No Rankings

The Low Priority Rivers are highlighted in blue in Table 2. These streams are unranked as they are unlikely to be included in the 10 years investigation programme. Their evident problems are much smaller and less frequent. However, they should still be recognised as potentially requiring investigation, should situations change and problems increase.

Nine rivers or groups of rivers were identified as Low Priority in no ranking order as follows:

- **Upper Whanganui Streams – Including Makomiko and Kakahi Streams.**
- **Whangaehu – Tokiahuru Stream**
- **Mangawharariki Stream.**
- **Upper Kahuterawa Stream.**
- **Upper Mangatainoka Stream.**
- **Mangaroa Stream.**
- **Waoku Stream.**
- **Hokio Stream.**
- **Otauru Stream.**

4.5 Schemes Previously Investigated

During the course of the investigation six rivers or streams previously investigated were given further consideration. They are highlighted in grey in Table 2. These streams are also unranked.

All these rivers and streams either did not warrant further investigation, either because there was no basis to change past decisions, or because they now were in a formally constituted river management scheme.

TABLE 1 - NON-SCHEME RIVERS INVESTIGATION PRIORITIES - HIGH & MEDIUM

| | | |
|------|----------|--|
| Key: | High | |
| | Medium 1 | |
| | Medium 2 | |

| River Name | District | Total Problem Points | Previous Investigation | Already Being Managed | Number Grant Jobs Since 2004 | Cause of Problem and Points | | | Work Required | | | | |
|---------------------------|----------|----------------------|------------------------|-----------------------|------------------------------|-----------------------------|---------|----------------------------|-------------------|---------------------|-------------------|-----------------|-----------------|
| | | | | | | Flooding | Erosion | Other | Channel Clearing | Channel Improvement | Enhancement Works | Erosion Control | Flood Control |
| RUAPEHU | | | | | | | | | | | | | |
| Ohura Tributaries | Ruapehu | 13 | | | | | | Willow Congestion | | | | | |
| Maraekowhai Stm | | | Sep-12 | No | 1 | | | Willow Congestion | | | | | |
| Toetoe Stm | | | Feb-13 | No | IN1413 | | | Willow Congestion | Yes | | | | |
| Mangaroa Stm | | | Feb-13 | No | IN1412 | | | Willow Congestion | Yes | | | | |
| Whenuakura Stm | | | Mar-14 | No | 1 | | | Willow Congestion | Yes | | | | |
| Waikaka Stm | | | Mar-14 | No | 1 | Yes | | Willow Congestion | Yes | | | | |
| | | | Apr-13 | No | IN1403 | | | Willow Congestion | Yes | | | | |
| | | | | | | 5 | 3 | 5 | | | | | |
| Makotuku Upstream Raetihi | Ruapehu | 13 | | No | | 2013 close to one house - 7 | Yes 4 | Some willow congestion - 2 | Yes | | | Yes | Maybe |
| Upper Mangawhero | Ruapehu | 19 | | No | | Yes | Yes | Willow Congestion | Yes | Yes | | Bank Protection | Yes |
| Mangaetoroa | | | | No | 1 | | | | Willow Congestion | Yes | | | |
| Makaranui | | | | No | IN1364 | | | Yes | Yes | Willow Congestion | Yes | | |
| Mangateitei | | | | No | IN1368 | | | Yes | Yes | Willow Congestion | Yes | | |
| | | | | | | 9 | 7 | 3 | | | | | |
| Ongarue | Ruapehu | 8 | | | | | | | | | | | |
| Confl. Waimihia Stm | | | Dec-12 | No | 1 | | | Yes | Willow Congestion | Yes | | | |
| | | | Nov-08 | No | 1 | | | | | Willow Congestion | Yes | | |
| Confl. Opotiki Stm | | | Dec-10 | No | 1 | | | Yes | Yes | Willow Congestion | Yes | | Bank Protection |
| | | | Dec-12 | No | 1 | | | | | Willow Congestion | Yes | | |
| | | | Feb-14 | No | 1 | | | Willow Congestion | Yes | | | | |
| | | | | | | | 4 | 4 | | | | | |

| WANGANUI | | | | | | | | | | | | | |
|--|------------|----|---|--|---|---|------------------|---|---------------------------------------|----------------------|-----|---------------------------------------|-----------------------------------|
| Kaikokopu and Tuitaeika Streams | Wanganui | 15 | | | | Yes 8 | Yes 5 | Bank Stability 2 | Yes | Yes | Yes | Yes | Potentially |
| Ngatarua | Wanganui | 12 | | | | Yes 8 | | Vegetation Growth 4 | Yes | Possible | No | Unknown | Potentially |
| Awarua Upstream SH3 | Wanganui | 8 | | | | Yes 6 | | 2 | Yes Ongoing | Isolated Sections | No | Currently progressing | Potentially |
| Purua | Wanganui | 8 | | | | Yes 5 | No | Blockages 3 | Yes | No | No | None Planned | Potentially |
| RANGITIKEI & MANAWATU | | | | | | | | | | | | | |
| Waituna Stream | Manawatu | 8 | | | Significant grant works previous little recent | Roading 3 | Moderate 5 | | Isolated works | | | Periodically | |
| Ongaonga Stream | Rangitikei | 9 | | | | Wilson Bridge 7 | | Hard to improve channel - 2 | | Difficult | | | Medium |
| Makowhai Stream | Manawatu | 11 | | Yes | | Yes. 5 Flooding enquiries - 8 | | Congestion - Medium Above SH1 some below - 3 | Above SH1 especially some below | Maybe possible | | | Yes. Flood Risk Assessments |
| Piakatutu Stream | Manawatu | 9 | Yes | Yes | | Yes. 3 Flooding enquiries. Cemetery Rd & Farmer Rd - 7 | | Various - 2 | Minor | | | | Yes |
| Kawhatau | Rangitikei | 9 | Likely | | | Minor 3 | Yes 6 | | | Minor | | Medium Significant near bridges | |
| Upper Mangaone Stream & Tributaries | Manawatu | 8 | | | | Willow congestion - 4 | Yes 4 | | Moderate | | | Moderate | Maybe |
| Upper Makino Stream (Upstm Reids Line F'Way) | Manawatu | 13 | | | Many | Major willow congestion - 6 | Significant 7 | | Significant | | | Significant | |
| Upper Kiwitea Stream (Upstream Cheltenham) | Manawatu | 11 | | | Several | Yes 5 | Yes 6 | | Moderate- Significant | | | Moderate- Significant | |
| Haynes Creek | Manawatu | 8 | | Streamcare Group in part | | Willow congestion - 4 | Yes 4 | | Moderate | | | Moderate | |
| Mangaone West | Manawatu | 11 | Localised. May be worth of wider investigation | Mangaone West Catchment Care Group in part | Several | Yes 5 | Yes 6 | | Moderate- Significant | | | Moderate- Significant | Maybe |

| | | | | | | | | | | | | | |
|------------------------------|------------|----|------------------------------------|---|---|-------------------------------------|---|----------------------------------|----------------------------|-------|--|--------------------|--|
| Mangamako River (New) | Manawatu | 11 | | | 1 of 6 property owners | Yes 7 | Minor 2 | Yes 2 | Severe Congestion | Maybe | | Minor | Floods MDC road |
| PALMERSTON NORTH | | | | | | | | | | | | | |
| Aokautere Streams | PNCC | 9 | | No. Several small streams. | | Isolated 5 | Yes 3 | Isolated willow congestion -1 | | | | | |
| Turitea | PNCC | 9 | Yes | For GEM Project | Recent major job clearing UpStm Old West Road | Isolated 3 | Isolated 3 | Significant willow congestion -3 | | | | | |
| TARARUA | | | | | | | | | | | | | |
| Tiraumea River | Tararua | 10 | | | | Alfredton to Ihuraua - 5 | Yes 2 | Willow congestion 3 | Yes | | | Yes | |
| Makuri & Makuri-iti Rivers | Tararua | 9 | | | | Around village 4 | Yes 5 | | Yes Gravel | | | | |
| Mangatoro Stream (Waitahora) | Tararua | 10 | | Maybe add to East Manawatu | 2 or 3 recent years | Localised rural 2 | Yes 4 | Much self-seeded willow - 4 | | | | Yes | |
| Upper Mangahao River | Tararua | 14 | | | Several maybe 6 to 7 last 4 years | Localised rural 2 | Yes. Much UpStm Tutaekara Rd - 9 | Yes - Gravel 3 | | | | Yes Significant | |
| Awapikopiko Stream & Kumeroa | Tararua | 9 | | | | Yes 8 | | 1 | | | | | Needs review of informal stopbanks & maintenance |
| Wainui River | Tararua | 9 | Yes - J. Bell Hebertville Flooding | | | Wimbledon? & Herbertville - 7 | | Wimbledon Slip 2 | Occasional Herbertville | | | Wimbledon slip | Assess risk Wimbledon |
| Horowhenua | | | | | | | | | | | | | |
| Upper Ohau River | Horowhenua | 8 | | Yes - small flood model built of reach through Kimberley Reserve up to Gladstone Rd | | Kimberley Reserve and farmland 1 | yes - number of roads and bridges are threatened 7 | | | | | Potentialy | |

TABLE 2 - NON-SCHEME RIVERS INVESTIGATION PRIORITIES - LOW

| | | |
|-------------|------------------------|--|
| KEY: | Low | |
| | Previous Investigation | |

| River Name | District | Total Problem Points | Previous Investigation | Already Being Managed | Number Grant Jobs Since 2004 | Cause of Problem and Points | | | Work Required | | | |
|---|----------|----------------------|-----------------------------|-----------------------|------------------------------|-------------------------------|--------------------|---|------------------|---------------------|-----------------|---------------|
| | | | | | | Flooding | Erosion | Other | Channel Clearing | Channel Improvement | Erosion Control | Flood Control |
| RUAPEHU | | | | | | | | | | | | |
| Ohura Town (Mangaroa River Local Streams) | Ruapehu | | Several - No more proposals | | | Yes | | | NA | NA | NA | NA |
| Upper Whanganui Tribs Makomiko Stream Kakahi Stream | Ruapehu | 4 | Oct-09 Dec-09 | No No | 1 1 | | | Willow Congestion Willow Congestion 4 | Yes | | | |
| Whangaehu Tokiahuru Stream | Ruapehu | 6 | Jan-14 | No | 1 | | Yes 3 | Willow Congestion 3 | Yes | | | |
| WANGANUI | | | | | | | | | | | | |
| Mid Whanganui | Wanganui | | Yes Gary Williams | | | | | | | | | |
| Makirikiri | Wanganui | | Yes | | | | | | | | | |
| Mateongaonga | Wanganui | | Now part of Matarawa Scheme | Yes | | | | | | | | |
| RANGITIKEI & MANAWATU | | | | | | | | | | | | |
| Mangawharariki River (New) | Manawatu | 7 | | | 2 Applications | Yes 3 | Yes 4 | | Moderate | | Moderate | |
| PALMERSTON NORTH | | | | | | | | | | | | |
| Upper Kahuterawa | PNCC | 5 | | | None | Some Willow congestion - 3 | Some Isolated 2 | | | | Minor | |

| TARARUA | | | | | | | | | | | | |
|--|---------|---|----------------------------|--|--------------------------------|----------|----------|--------------------------|---------------|------------|---|-------|
| Lower Ihuraua River (Confluence-SH52 Bridge) | Tararua | - | Yes. 3 Landowner Env Grant | Yes Under Joint Consent | Single EG covers most of Reach | Yes | | | Yes | | | |
| Akitio River | Tararua | - | Yes 2006 | Yes - New Scheme in Place | | Yes | Yes | | | | Yes | Maybe |
| Upper Mangatainoka River | Tararua | 7 | | Maybe reattach to Mangatainoka | Some maybe 3 to 4 last 7 years | Low 2 | Low 2 | Upstm Clarkes Bridge - 3 | Yes | Occasional | Occasional | |
| Mangaroa Stream | Tararua | 7 | | OPS, GEM & Landowners. Join to Mangatainoka? | Several - whole reach planted | 2 | Yes 2 | Gravel & willows 3 | Yes Gravel | | No process for maintenance of plantings | |

| HOROWHENUA | | | | | | | | | | | | |
|---------------|------------|---|--|---|--|--|--|---|--|-------------|--|-----------------------------|
| Waoku Stream | Horowhenua | 4 | | | | flood risk to SH57 4 | | | | | | larger culvert beneath SH57 |
| Hokio Stream | Horowhenua | 7 | | Yes | | low capacity close to Ngatokowaru Marae 3 | Ongoing concerns around management of river mouth, including weed clearance 3 | local concerns (Hokio Beach) around stormwater outfalls being blocked as river levels higher than used to be 1 | | potentially | | |
| Otauru Stream | Horowhenua | 5 | Proposal in 07 for HRC to manage catchment not supported locally | Outlet structure has been upgraded & HDC installed tractor pump | | Can cause flooding to Graham Steet and adjacent properties. Also some farmland flooding 5 | | | | | | |

4.6 Rivers Considered that Presently Do Not Require Further Investigation

During the course of the investigation a further 29 rivers or streams were considered. However, these streams either had only minor or no real existing problems, or were programmed for investigation through other means – notably the Wanganui District Council stormwater modelling programme. They are presented in Appendix C.

5. ESTIMATED COSTS

Estimates have been prepared for the high and medium priority rivers. These are presented in Table 3 with details of the estimates contained in Appendix D. Estimates included provision for:

- Initial field inspection and discussion with the respective Areas Engineer;
- Scoping report;
- Seeking input from affected parties;
- Assessment of existing files and databases;
- Detailed design work if required;
- Survey work if required;
- Assessment of problems and solutions;
- Preparing estimates for recommended works;
- Consultation with affected parties;
- Preparation of final report and recommendations;
- Contingency.

Since the various investigations have yet to be scoped, only Rough Order of Cost (ROC) estimates are able to be provided. However, for budgeting and prioritising purposes these estimates are appropriate.

TABLE 3 - NON-SCHEME RIVERS INVESTIGATION PRIORITIES – COST ESTIMATES

| TABLE 3 - NON-SCHEME RIVERS INVESTIGATION PRIORITIES - HIGH & MEDIUM ESTIMATES | | | | | | | | Key: | |
|--|---------|---|-------------------------|---------------|-------------------|--------------------|---------------------------|-----------------|-------------------------|
| | | | | | | | | High | |
| | | | | | | | | Medium 1 | |
| | | | | | | | | Medium 2 | |
| River Name | Ranking | Design & Investigations Manager (weeks) | Design Engineer (weeks) | Survey (days) | Draughting (days) | Subtotal (Dollars) | Contingency 15% (Dollars) | Total (Dollars) | Total Rounded (Dollars) |
| Upper Mangawhero & Tributaries - Ohakune | 1 | 4.2 | 1 | 3 | 3 | 0 | 0 | 0 | 46,000 |
| Kaikokopu and Tuitaieka Streams | 2 | 0.6 | 4 | 2 | 3 | 0 | 0 | 0 | 34,400 |
| Upper Mangahao River | 3 | 0.6 | 4 | 4 | 2 | 0 | 0 | 0 | 37,700 |
| Upper Makino Stream | 4 | 0.6 | 3 | 2 | 2 | 0 | 0 | 0 | 27,700 |
| Ohura Tributaries | 5 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Makotuku Stream Upstream Raetihi | 6 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Ngatarua Stream | 7 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Makowhai Stream | 8 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Upper KIWITEA Stream | 9 | 0.6 | 3 | 1 | 1 | 0 | 0 | 0 | 24,400 |
| Mangaone West Stream | 10 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Mangamako River | 11 | 0.6 | 2.5 | 2 | 2 | 0 | 0 | 0 | 25,000 |
| Tiraumea River | 12 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Mangatoro Stream (Waitahora) | 13 | 0.6 | 3 | 1 | 1 | 0 | 0 | 0 | 24,400 |
| Piakatutu Stream | 14 | 0.6 | 3.5 | 1 | 1 | 0 | 0 | 0 | 27,200 |
| Awapikopiko Stream & Kumeroa | 15 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Aokautere Streams | 16 | 0.6 | 5 | 2 | 2 | 0 | 0 | 0 | 39,000 |
| Wainui River | 17 | 0.6 | 4 | 3 | 2 | 0 | 0 | 0 | 35,500 |
| Makuri & Makuri-iti Rivers | 18 | 0.6 | 4 | 2 | 2 | 0 | 0 | 0 | 33,300 |
| Ongaonga Stream | 19 | 0.6 | 3 | 1 | 1 | 0 | 0 | 0 | 24,400 |
| Turitea | 20 | 0.6 | 3.5 | 1 | 1 | 0 | 0 | 0 | 27,200 |
| Kawhatau River | 21 | 0.6 | 4 | 1 | 1 | 0 | 0 | 0 | 30,000 |
| Upper Ohau River | 22 | 0.6 | 4 | 1 | 1 | 0 | 0 | 0 | 30,000 |
| Awarua Stream Upstream SH3 | 23 | 0.6 | 3.5 | 1 | 1 | 0 | 0 | 0 | 27,200 |
| Purua Stream | 24 | 0.6 | 3.5 | 1 | 1 | 0 | 0 | 0 | 27,200 |
| Ongarue River | 25 | 0.6 | 3.5 | 1 | 1 | 0 | 0 | 0 | 27,200 |
| Haynes Creek | 26 | 0.6 | 3 | 1 | 1 | 0 | 0 | 0 | 24,400 |
| Upper Mangaone Stream & Tributaries | 27 | 0.6 | 4 | 1 | 1 | 0 | 0 | 0 | 30,000 |
| Waituna Stream | 28 | 0.6 | 2.5 | 1 | 1 | 0 | 0 | 0 | 21,600 |
| | | | | | | | | Total | 856,900 |

6. SUMMARY

This report has been prepared in order to address the flooding and erosion risk to the wider community posed by those rivers and streams within the region that are not in a scheme.

Accordingly this report presents information and priorities on over 70 rivers and streams identified within the region and assessed, in order to determine an appropriate investigations programme. Problem ratings were assigned to the high and medium priority rivers.

Of these rivers the following were identified:

- Six High Priority rivers or streams whose evident problems were 50% or higher across those problem ratings possible.
- Seven Medium 1 Priority rivers or streams whose evident problems were slightly less than 50% across those problem ratings possible.
- 15 Medium 2 Priority rivers or streams whose evident problems are smaller and generally less frequent.
- Nine rivers or groups of rivers were identified as Low Priority in no ranking order.
- Six rivers or streams previously investigated were given further consideration. All these rivers and streams either did not warrant further investigation, either because there was no basis to change past decisions, or because they now were in a formally constituted river management scheme.
- A further 29 rivers or streams were considered. However, these streams either had only minor or no real existing problems, or were programmed for investigation through other means.

Table 3 summarises the priorities and estimates.

It is envisaged that the studies identified as being necessary in this report will extend over the next ten years and be an important input into the 2015-16 to 2024-25 Long-Term Plan process.

TABLE 4 - NON-SCHEME RIVERS INVESTIGATION PRIORITIES – SUMMARY

| Priority | River/Stream Name | Estimated Cost of Investigation (\$) |
|----------|---|--------------------------------------|
| 1 | Upper Mangawhero & Tributaries - Ohakune | 46,000 |
| 2 | Kaikokopu & Tuitaeika Streams | 34,400 |
| 3 | Upper Mangahao River | 37,700 |
| 4 | Upper Makino Stream | 27,700 |
| 5 | Ohura River Tributaries (excl Ohura Township) | 33,300 |
| 6 | Makotuku Upstream Raetihi | 33,300 |
| 7 | Ngatarua Stream | 33,300 |
| 8 | Makowhai Stream | 33,300 |
| 9 | Upper Kiwitea Stream | 24,400 |
| 10 | Mangaone West Stream | 33,300 |
| 11 | Mangamako River | 25,000 |
| 12 | Tiraumea River | 33,300 |
| 13 | Mangatoro Stream (Waitahora) | 24,400 |
| 14 | Piakatutu Stream | 27,200 |
| 15 | Awapikopiko Stream - Kumeroa | 33,300 |
| 16 | Aokautere Streams | 39,000 |
| 17 | Wainui River | 35,500 |
| 18 | Makuri & Makuri-Iti Rivers | 33,300 |
| 19 | Ongaonga Stream | 24,400 |
| 20 | Turitea Stream | 27,200 |
| 21 | Kawhatau Rivers | 30,000 |
| 22 | Upper Ohau River | 30,000 |
| 23 | Awarua Stream | 27,200 |
| 24 | Purua Stream | 27,200 |
| 25 | Ongarue River | 27,200 |
| 26 | Haynes Creek | 24,400 |
| 27 | Upper Mangaone Stream | 30,000 |
| 28 | Waituna Stream | 21,600 |

| | | |
|-----|----------|--|
| Key | High | |
| | Medium 1 | |
| | Medium 2 | |

7. Appendices

APPENDIX A

NON-SCHEME RIVERS EVALUATION

DETAILED TABLES BY DISTRICT AND DESCRIPTION OF RELEVANT PARAMETERS

| River/Stream Name | RUAPEHU DISTRICT COUNCIL | |
|--|-----------------------------------|--|
| Ohura Town (Mangaroa Stream reach & Local Streams) | Location | Immediate vicinity of Ohura. Mangaroa Stream flows into Ohura River and joins Whanganui River South West of Taumarunui. |
| | Description | Slow flowing rivers & streams with high silt loading and heavy willow congestion passing through Ohura Town reach. |
| | Hazards and assets at risk | Ohura Township housing and infrastructure. Deeply investigated in the past and proposals rejected. No more proposals planned. |
| Ohura Tributaries Maraekowhai Stm Toetoe Stm Mangaroa Stm Whenuakura Stm Waikaka Stm | Location | All these tributaries flow into the Ohura Stream. |
| | Description | Slow flowing rivers & streams with high silt loading and heavy willow congestion. Several Environmental Grant works to relieve congestion. |
| | Hazards and assets at risk | Flooding and erosion of productive farmland. Landowners may be interested in comprehensive approach. |
| Makotuku Stream upstream Raetihi | Location | Mangawhero tributary with headwaters on south-western slopes of Ruapehu. Skirts eastern side of Raetihi Township. |
| | Description | Shallow willow congested channel upstream of Raetihi. |
| | Hazards and assets at risk | Very close to one house in 15 October 2013 flood (c. 1% AEP). Possible flooding or erosion threats to isolated houses and farmland. Raetihi water supply intake. |
| Upper Mangawhero Stream & tribs Mangaetoroa Makaranui Mangateitei | Location | Headwaters generally on southern slopes of Ruapehu. Flows through Ohakune township. |
| | Description | Steep active high-energy streams capable of causing rapid erosion and flooding. Some willow congestion. |
| | Hazards and assets at risk | Significant risk to Ohakune Township and to rural lifestyle properties. Several detailed investigations require augmentation and collation into a Forward Action Plan. |

| | | |
|--|-----------------------------------|--|
| Upper Whanganui tribs Makomiko Stm Kakahi Stm | Location | Confluence with Upper Whanganui River upstream of Taumarunui. |
| | Description | Fairly natural flowing through rugged natural landscape with some areas of farmland. Some willow congestion and minor erosion. |
| | Hazards and assets at risk | Flooding and erosion of high value native bush areas and some farmland. |
| Ongarue River | Location | To north-east of Taumarunui. Large catchment with multiple tributaries. |
| | Description | Slow moving deep river. Extensive willow clearance work in the past and several Environmental Grant works to relieve congestion. |
| | Hazards and assets at risk | Mainly affects productive farmland. Flood risk at Taumarunui mitigated by stopbanks. |
| Whangaehu Tokiahuru Stream | Location | Headwaters on southern slopes of Ruapehu. |
| | Description | Steep active stream capable of causing erosion and flooding. Some willow congestion. |
| | Hazards and assets at risk | Flooding or erosion threats to farmland |

| River/Stream Name | WANGANUI DISTRICT COUNCIL | |
|--|-----------------------------------|--|
| Kaikokopu & Tuitaeika Streams | Location | Headwaters to north of Wanganui. Flows into Whanganui River through Aramoho. |
| | Description | Relatively small catchments, with the Tuitaeika Stream the larger. Narrow confined channels. |
| | Hazards and assets at risk | Flooding risks to Aramoho, including old fertilizer factory area and some houses on the edge of the city. Also erosion risks and vegetative congestion. On WDC stormwater modelling programme. Possible detention dams option. |
| Ngatarua Stream | Location | Tributary flowing into Whanganui River through Putiki on left bank upstream of SH3 Bridge. |
| | Description | Small catchment with rural headwaters. Very confined through Putiki. Undersized culverts. |
| | Hazards and assets at risk | Significant flood risk to houses and land and buildings around Putiki Marae. |
| Awarua Stream upstream SH3 | Location | Tributary flowing into Whanganui River on left bank downstream of SH3 Bridge. |
| | Description | Rural catchment. |
| | Hazards and assets at risk | Flooding in Marybank area. Flooding of farmland both upstream and downstream of SH3. Area downstream SH3 addressed by WDC. |
| Mid-Whanganui | Location | Pipiriki to Kukuta. |
| | Description | Previous studies. |
| | Hazards and assets at risk | Small pockets farmland at risk. Minor risk to road. |
| Makirikiri | Location | Tributary flowing into Whanganui River on left bank at Upokongaro. |
| | Description | Previous studies. Bad willow congestion – major clearing works in past. |
| | Hazards and assets at risk | Problem understood to be under control. |

| | | |
|---------------------|-----------------------------------|--|
| Mateongaonga | Location | Tributary flowing into Whanganui River on left bank two km upstream rail bridge. |
| | Description | Previous studies. Matarawa Diversion flows into Mateongaonga. Willow congestion. |
| | Hazards and assets at risk | Understood that works plan in place with WDC. |
| Purua | Location | Tributary flowing into Whanganui River on left bank near Durie Hill. |
| | Description | Small catchment with rural headwaters. Some willow congestion. |
| | Hazards and assets at risk | Slight flooding threats to urban and farmland. |

| River/Stream Name | RANGITIKEI & MANAWATU DISTRICT COUNCILS | |
|--------------------------|--|--|
| Waituna Stream | Location | Left bank tributary of Rangitikei River. Flows through Waituna West. |
| | Description | Medium sized rural catchment. Realignment works at downstream end in the 1990s to control flooding. |
| | Hazards and assets at risk | Significant grant works previously, but little recent. Flooding and erosion threats to farmland and roading. MDC currently no major concerns. |
| Ongaonga Stream | Location | Tributary of Porewa flows through Hunterville. Lower section in Porewa Scheme. |
| | Description | Channel upstream of Wilsons Bridge is undersized but difficult to widen because of unstable hillside. |
| | Hazards and assets at risk | Mainly a flood risk at Hunterville, though no recent flooding documented. MDC (on behalf of Rangitikei DC) currently no major concerns. |
| Makowhai Stream | Location | Tributaries to east and south of Sanson, several originating between Mt Biggs and Mt Stewart. Flows into Rangitikei River just upstream and opposite of Flock House. |
| | Description | Large rural catchment with significant lifestyle block component. Drain-like channel managed as part of a drainage scheme below SH1 by MDC. Maybe extend scheme above SH1. Some willow congestion. |
| | Hazards and assets at risk | Several requests for flood risk advice. Both farmland and houses at risk of flooding. Several enquiries about impact of works at Ohakea on downstream flooding – but less than minor. MDC currently no major concerns. |
| Piakatutu Stream | Location | Originates near Mt Biggs and flows through Sanson. |
| | Description | Rural catchment with significant lifestyle block component. Partially managed. Some willow congestion. |
| | Hazards and assets at risk | Several requests for flood risk advice. Both farmland and houses at risk of flooding. MDC currently no major concerns. |

| | | |
|--|-----------------------------------|---|
| Kawhatau River | Location | Substantial river originating in Ruahine Ranges with confluence on left bank of Rangitikei River just upstream of Mangaweka. |
| | Description | Substantial native bush in headwaters and mainly steepland farmland elsewhere. Requires careful gravel management. |
| | Hazards and assets at risk | Isolated river management issues and threats to bridges. |
| Upper Mangaone Stream & Tributaries | Location | Mangaone Stream and tributaries upstream of Bunnythorpe. |
| | Description | Very largely farmland little bush. Significant channel with lowland catchment. Willow congestion in places. |
| | Hazards and assets at risk | Flooding and erosion risk to farmland. No buildings at risk, but extensive areas flooded. MDC currently no major concerns. |
| Upper Makino Stream | Location | Makino Stream upstream of Reids Line Floodway. Lower reaches in Lower Manawatu Scheme. |
| | Description | Very largely farmland little bush. Under-sized channel with lowland farmland. Major willow congestion and significant areas of erosion. Many Environmental Grants works. |
| | Hazards and assets at risk | Significant threats to farmland. MDC currently no major concerns. |
| Upper Kiwitea Stream | Location | Kiwitea Stream upstream of Cheltenham. Lower reaches in Lower Kiwitea Scheme. |
| | Description | Very largely farmland little bush. Varies from wide open channel to narrow incised channel flowing through steepland country. Changes to a wide floodplain at Cheltenham. Willow congestion resulting in moderate to significant flooding and erosion. Several Environmental Grant works. |
| | Hazards and assets at risk | 1978 investigation identified need for soil conservation management for downstream benefits. Scheme not adopted due to cost. Erosion and channel congestion threatens farmland. MDC past concerns over local bridge problems. |

| | | |
|------------------------------|-----------------------------------|---|
| Haynes Creek | Location | Significant sized tributary of Kiwitea Stream with confluence 2 km below Cheltenham. |
| | Description | Very largely farmland little bush. Some areas of wide open valley, some steepland. Moderate willow congestion. Streamcare group recently started. |
| | Hazards and assets at risk | Erosion and channel congestion threatens farmland. MDC currently no major concerns, although past concerns over local bridge problems. |
| Mangaone West | Location | Large stream located to west of Feilding with confluence with Makino Stream near upstream end of Kitchener Park. |
| | Description | Very largely farmland some small pockets bush. Well established Streamcare group manages part of the catchment under a stream management plan. This may be worth extending to whole catchment to mitigate erosion and flooding problems. Several Environmental Grant works. |
| | Hazards and assets at risk | Moderate to significant erosion and flooding threats to farmland outside Streamcare scheme. MDC no major concerns. |
| Mangamako Stream | Location | Tributary flowing into Rangitikei River on left bank midway between Vinegar Hill and Ohingaiti. |
| | Description | Very largely farmland some small pockets bush. Severe willow congestion. One recent Environmental Grant work involving six landowners. |
| | Hazards and assets at risk | In recent years' road closed twice and house evacuated. |
| Mangawharariki Stream | Location | Sizable stream originating with confluence on left bank of Rangitikei River just opposite Mangaweka. |
| | Description | Very largely farmland with some larger areas of bush. Two recent Environmental Grant works. Isolated moderate willow congestion. |
| | Hazards and assets at risk | Isolated moderate erosion and flooding of farmland. |

| River/Stream Name | TARARUA DISTRICT COUNCIL | |
|------------------------------|-----------------------------------|---|
| Tiraumea River | Location | Very major catchment to east of Woodville through to Eketahuna. Confluence on left bank of Manawatu River near Ngawapurua. |
| | Description | A largely entrenched willow congested river over most of its length. Past severe upper catchment erosion has changed it from a gravel bed river into a silt choked river. Few recent Environmental Grant works. |
| | Hazards and assets at risk | Some erosion and flooding. Flooding particularly in Alfredton area. |
| Makuri and Makuri-iti Rivers | Location | Significant catchment to east of Pahiatua that confluences with Tiraumea River on left bank upstream of Ngaturi. |
| | Description | Gravel bed streams with some significant erosion. Flooding particularly in Makuri Township area. Few recent Environmental Grant works. |
| | Hazards and assets at risk | Requires careful management of gravel to manage flood risk, but not excessive extraction. |
| Lower Ihuraua River | Location | Confluence with Tiraumea River near Alfredton. |
| | Description | Catchment largely farmland. A single Environmental Grant work covered most of the reach and operated under a joint consent. Willow congestion largely addressed |
| | Hazards and assets at risk | Some unavoidable flooding of farmland. |
| Mangatoro Stream (Waitahora) | Location | Significant sized stream lying directly to the west of the Puketoi Ranges and flowing north to confluence on left bank of Manawatu River near Dannevirke. |
| | Description | Catchment largely farmland and channel incised with papa faces. Some slumping and erosion with much self-seeded willow. A few recent Environmental Grant works. Maybe add to Eastern Manawatu Scheme. |
| | Hazards and assets at risk | Little farm land at risk, some localised flooding. TDC have previously carried out extensive works to protect roads and bridges – ongoing concern. |

| | | |
|---------------------------------|-----------------------------------|---|
| Upper Mangahao River | Location | Headwaters in north-eastern Tararua Ranges through to Mangahao Rd Bridge. Below this point in Lower Mangahao-Upper Manawatu Rivers Scheme. |
| | Description | Gravel bed river with significant bed load. Much erosion upstream of Tutaekara Road. 16 Environmental Grant Works in last five years. Requires heavy planning to hold riverbanks. |
| | Hazards and assets at risk | Requires detailed river management design to mitigate significant erosion risks to farmland and other community assets. TDC have had concerns about erosion upstream of Mangahao Bridge. |
| Akitio River | Location | Rivermouth into Pacific Ocean at Akitio. |
| | Description | Large catchment with soft fine sediments. Mainly farmland with smaller areas of bush and forestry. Stream has a fine mobile bed and over much of its length causes no problems. Some willow congestion downstream of Waione. Vegetation control scheme in place, maybe extended to further erosion later. |
| | Hazards and assets at risk | Some flooding and erosion of farmland. TDC have previously indicated no concerns over risks to roading assets and have no current concerns. |
| Upper Mangatainoka River | Location | Headwaters in eastern Tararua Ranges. Reach above Putara Gorge to the west of Eketahuna. |
| | Description | Above Putara Gorge the river is wide with a large gravel bed. A few Environmental Grant works in last 10 years. Small amount of flooding and erosion. |
| | Hazards and assets at risk | Some farmland at risk from flooding and erosion. TDC previously concerns at Clarke's Bridge, no recent concerns raised. |
| Mangaroa Stream | Location | Headwaters in north-eastern Tararua Ranges. Confluence with Mangatainoka River at Nireaha. |
| | Description | Steep gravel river with rocky bed. High bed load. Several recent Environmental Grants OPS, GEM & landowners. Whole reach now planted. Perhaps join to Mangatainoka River Scheme. |
| | Hazards and assets at risk | Mostly excessive gravel supply causing problems in Mangatainoka. Some rural flooding and erosion. |

| | | |
|---------------------------------------|-----------------------------------|---|
| Awapikopiko Stream and Kumeroa | Location | Moderate sized stream flowing north to confluence on left bank of Manawatu River near Kumeroa. |
| | Description | Mainly farmland, some bush. Flows past Kumeroa Township. |
| | Hazards and assets at risk | Need to check capacity, structure and maintenance of informal stopbanks at Kumeroa. These protect Kumeroa from both Manawatu River and Awapikopiko Stream. |
| Wainui River | Location | Rivermouth into Pacific Ocean at Herbertville. |
| | Description | Large River with fine sediments. Major slip of hillside for several hundred metres at Wimbledon. Willow congestion has been a problem in lower reaches. About five Environmental Grant works in recent years. |
| | Hazards and assets at risk | Significant flood risk at Herbertville investigated by Jon Bell in September 2012. Onset of flooding at 5% AEP. Much lesser flood risk at Wimbledon requires assessment. |

| River/Stream Name | PALMERSTON NORTH CITY COUNCIL | |
|--------------------------------|-----------------------------------|--|
| Aokautere Streams | Location | All significant streams on left bank of Manawatu River between Turitea Stream and Manawatu Gorge. |
| | Description | Small channels draining steep land country mainly low density pastoral land use with some forestry and native bush. Isolated willow congestion and some flooding and erosion. |
| | Hazards and assets at risk | Some flooding risks and erosion. A significant amount of both subdivisions development and lifestyle development. Landowners often unfamiliar with risks. Hopefully all recent developments in accordance with One Plan requirements, frequent requests for advice on developments or problems. |
| Upper Turitea Stream | Location | Confluence on left bank of Manawatu River approximately 3 km downstream of Fitzherbert Bridge. Now part of LMS below Tennent Drive. |
| | Description | Headwaters native bush with some forestry, comprising around half the catchment. Steep land country and wide valleys mainly low density pastoral land use, though increasing subdivision into lifestyle blocks. In lower reaches flows through Massey University, Bledisloe Park and science centres and farms. Significant willow congestion in places, with isolated flooding and erosion. Recent major clearing job upstream of Old West Road. |
| | Hazards and assets at risk | Stopbanks now protect science centres downstream of Tennent Drive. A gain landowners often unfamiliar with risks. Hopefully all recent developments in accordance with One Plan requirements, frequent requests for advice on developments or problems. |
| Upper Kahuterawa Stream | Location | Headwaters of Kahuterawa Stream accessed from Scotts Road |
| | Description | Majority of area planted in forestry, with major harvesting operations and culverts installation currently. Two steep land pastoral farms. Some willow congestion and isolated erosion. |
| | Hazards and assets at risk | Minor. Mainly erosion of farmland due to willows. |

| River/Stream Name | HOROWHENUA DISTRICT COUNCIL | |
|-------------------------|-----------------------------------|--|
| Waoku Stream | Location | Southern Area –Horowhenua - Pots Hill – 7 km north east of Levin, upstream of SH57. |
| | Description | Steep drain like channel with some minor bank erosion |
| | Hazards and assets at risk | Flooding occurs on pastoral farmland of SH57. This flooding is potentially a risk to SH57. HDC have no other concerns |
| Upper Ohau River | Location | Southern Area – Horowhenua – 5 km south of Levin. Draining from the Tararua Ranges |
| | Description | Small to medium catchment area. Downstream of the Kimberly Reserve the river is part of the Ohau Manakau Scheme. The river upstream of the Scheme has a very wide gravel bed in places with significant gravel movement, ranges in width with high and low riverbanks. |
| | Hazards and assets at risk | <p>HDC have problems with bluff downstream of water supply intake.</p> <p>The mobility of the river presents erosion risks along Florida Road. There is also potential for erosion to cause problems for the Kimberly Road Bridge.</p> <p>Gravel bed could potentially be stabilised to control gravel movement downstream. There is potential for this gravel movement to become a problem for the Scheme downstream.</p> |
| Hokio Stream | Location | Southern Area – Horowhenua – 5 km north west of Levin – Draining from Lake Horowhenua |
| | Description | Short stream of approximately 7 km in length drains from Lake Horowhenua to the Tasman Sea at Hokio beach. |
| | Hazards and assets at risk | <p>On going stream management issues at Lake outlet are dealt with by Horizons.</p> <p>Some flooding of pastoral land around Ngatokowaru Marae. There are concerns around erosion at the mouth of the river. There is on going maintenance and weed clearance of the channel in Hokio Beach.</p> |

| | | |
|----------------------|-----------------------------------|--|
| Otauru Stream | Location | Southern Area – Horowhenua – West of Shannon Draining from the Tararua Ranges. |
| | Description | Small catchment area. Channel is effectively a drain downstream of Shannon. |
| | Hazards and assets at risk | There is a flood risk to Margret Street, Graham Street and a couple of adjacent properties. Downstream of Shannon flooding of farmland occurs. Outlet structure has been upgraded and HDC have installed a tractor pump to help minimise the hazard of this flooding. |

APPENDIX B

NON-SCHEME RIVERS EVALUATION

PROBLEM RANKING POINTS

NON-SCHEME RIVERS INVESTIGATION

PROBLEM RANKING POINTS

Flooding

| | |
|---|------|
| Localised farmland flooding | 0-4 |
| Immediate vicinity isolated houses or widespread farmland flooding | 4-7 |
| Settlements or extreme farmland flooding | 7-10 |

Erosion

| | |
|---|------|
| Localised erosion amongst farmland | 0-4 |
| Localised erosion threats to isolated houses or widespread amongst farmland | 4-7 |
| Erosion/congestion threats to settlements or extreme problems through farmland | 7-10 |

Other 0-5

(Can include channel congestion when additional to other flooding causes or erosion)

Problem Ranking Classes

| | |
|----------|---------------|
| High | 13 or greater |
| Medium 1 | 10-12 |
| Medium 2 | 8-9 |
| Low | 7 or less |

APPENDIX C

NON-SCHEME RIVERS EVALUATION

RIVERS CONSIDERED THAT PRESENTLY DO NOT REQUIRE FURTHER INVESTIGATION NON-SCHEME RIVERS EVALUATION

**RIVERS CONSIDERED THAT PRESENTLY DO
NOT REQUIRE FURTHER INVESTIGATION**

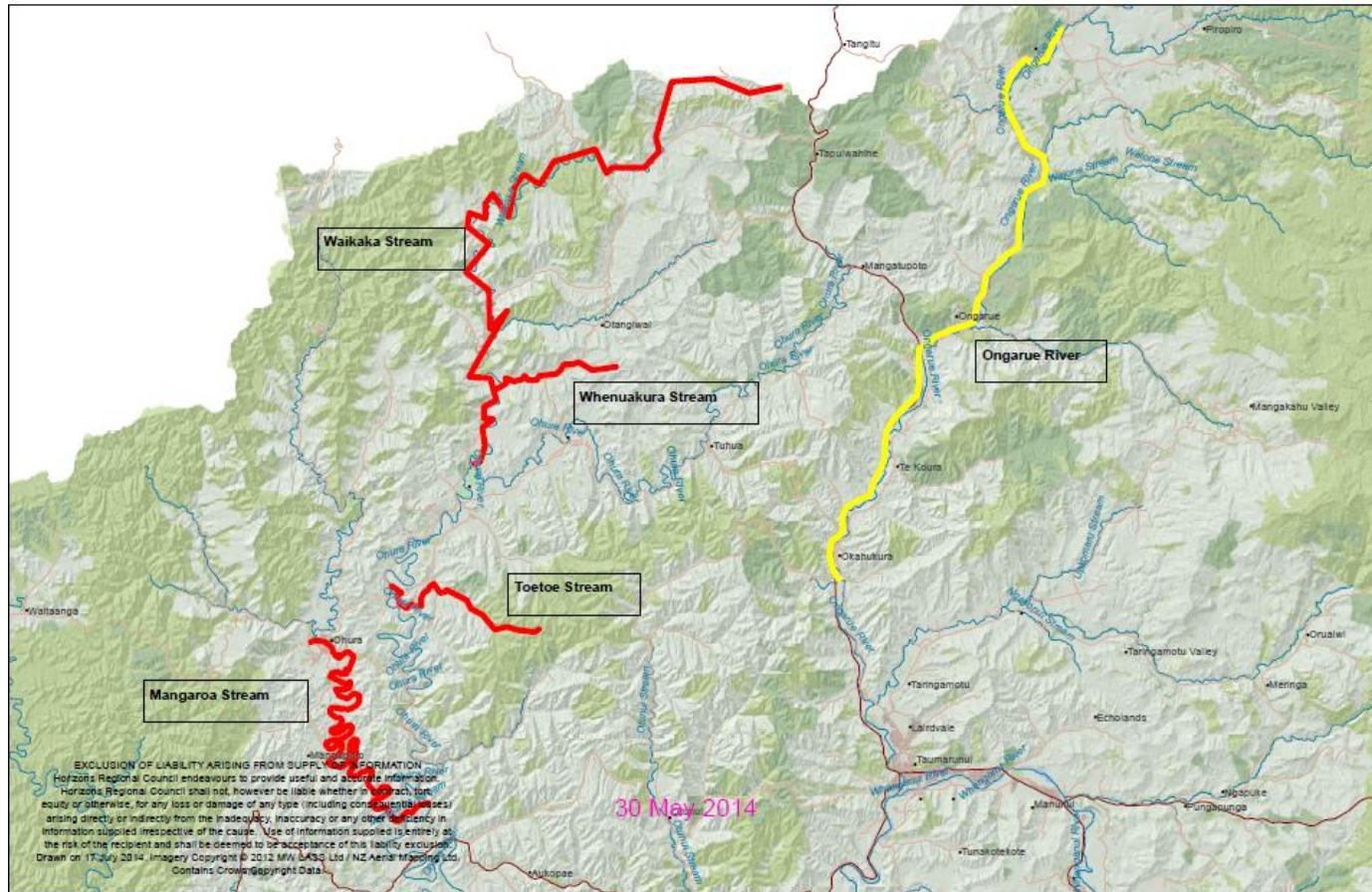
| River/Stream Name | Location by District | Relevant Information |
|------------------------|-----------------------|---|
| Piopiotea Stream | Ruapehu | No problems advised by either Ruapehu District or Horizons staff. 2003 Report commented on erosion of productive land and threats to bridges. Very visual uncontrolled erosion adjacent to SH4 now not obvious. |
| Whakapapa Stream | Ruapehu | No recent problems reported, isolated problems in the past, not requiring overall review. |
| Retaruke Stream | Ruapehu | No recent problems reported. Isolated erosion in the past but not of productive pasture. |
| Tangarakau Stream | Ruapehu | No recent or past issues identified. |
| Whangamomona Stream | Ruapehu | No recent or past issues identified. |
| Mangatepopo Stream | Ruapehu | No recent or past issues identified. |
| Upokongaro Stream | Wanganui | No recent problems reported. Previous flooding and erosion remedied by willow clearance works. |
| Kai-Iwi Stream | Wanganui | No recent or past issues identified. |
| Turoa Stream | Wanganui | Best handled through Wanganui District Council Stormwater modelling investigation. |
| Zoo Creek | Wanganui | Best handled through Wanganui District Council Stormwater modelling investigation. |
| Upper Rangitikei River | Rangitikei & Manawatu | No current concerns. River relatively stable and only occasional work required at Hunterville water supply intake works. |
| Hautapu River | Rangitikei | No current river management issues identified. Slips have caused damage to roading, unrelated to river. |
| Moawhango River | Rangitikei | Some issues with submerged trees creating debris. No other recent or past issues identified. |
| Pakihikura Stream | Rangitikei | No recent problems reported. Isolated past erosion in lower reaches, but not threatening assets. |
| Streams in Rewa | Manawatu | No recent problems reported. Some previous culvert |

| | | |
|------------------------|------------------|--|
| Area | | blockage problems from erodible gullies. |
| Upper Pohangina River | Manawatu | No recent or past issues identified. Downstream of the Makawakawa confluence at Komako this river is in the Pohangina-Oroua Rivers Scheme. |
| Upper Oroua River | Manawatu | No recent or past issues identified. Downstream of the Apiti Bridge this river is in the Pohangina-Oroua Rivers Scheme. Riverbed degradation recorded at Apiti Bridge addressed by recent bridge underpinning works. |
| Nguturoa Stream | Palmerston North | No recent issues identified. Previously some willow congestion but no assets in floodplain. |
| Upper Ashhurst Stream | Palmerston North | Minor isolated flooding and erosion. |
| Stoney Creek | Palmerston North | Minor isolated flooding and erosion. Lower Section below SH3 is in LMS Scheme. |
| Owahanga Stream | Tararua | No recent problems reported bar minor willow congestion. |
| Upper Makakahi River | Tararua | No recent problems reported. There have been minor past problems with Eketahuna water supply intake. |
| Upper Koputaroa Stream | Horowhenua | Local flooding matter affecting flooding at SH57 and surrounding land. This has been investigated and addressed. No other recent problems reported. |
| Upper Manakau Stream | Horowhenua | Has some flooding risks including flooding of South Manakau Road. However impact of flooding is small. |
| Upper Tokomaru River | Horowhenua | Designed riprap installation addresses erosion problem at SH57 Bridge. Steep gravel bed upstream SH57 - no recent problems reported. Lower section LMS Scheme. |
| Upper Waikawa Stream | Horowhenua | Stream below SH1 in Waikawa-Manakau Scheme. Upstream is entrenched and no problems reported. |
| Mangaore Stream | Horowhenua | Channel erosion sites downstream of Mangahao Power Station remedied under Power Station consent. |
| Upper Kara Stream | Horowhenua | Lower reaches return banked in LMS Scheme. No willow congestion and no recent or past issues identified. |
| Mangapukatea Stream | Horowhenua | No willow congestion and no recent or past issues identified. |

APPENDIX D

NON-SCHEME RIVERS EVALUATION

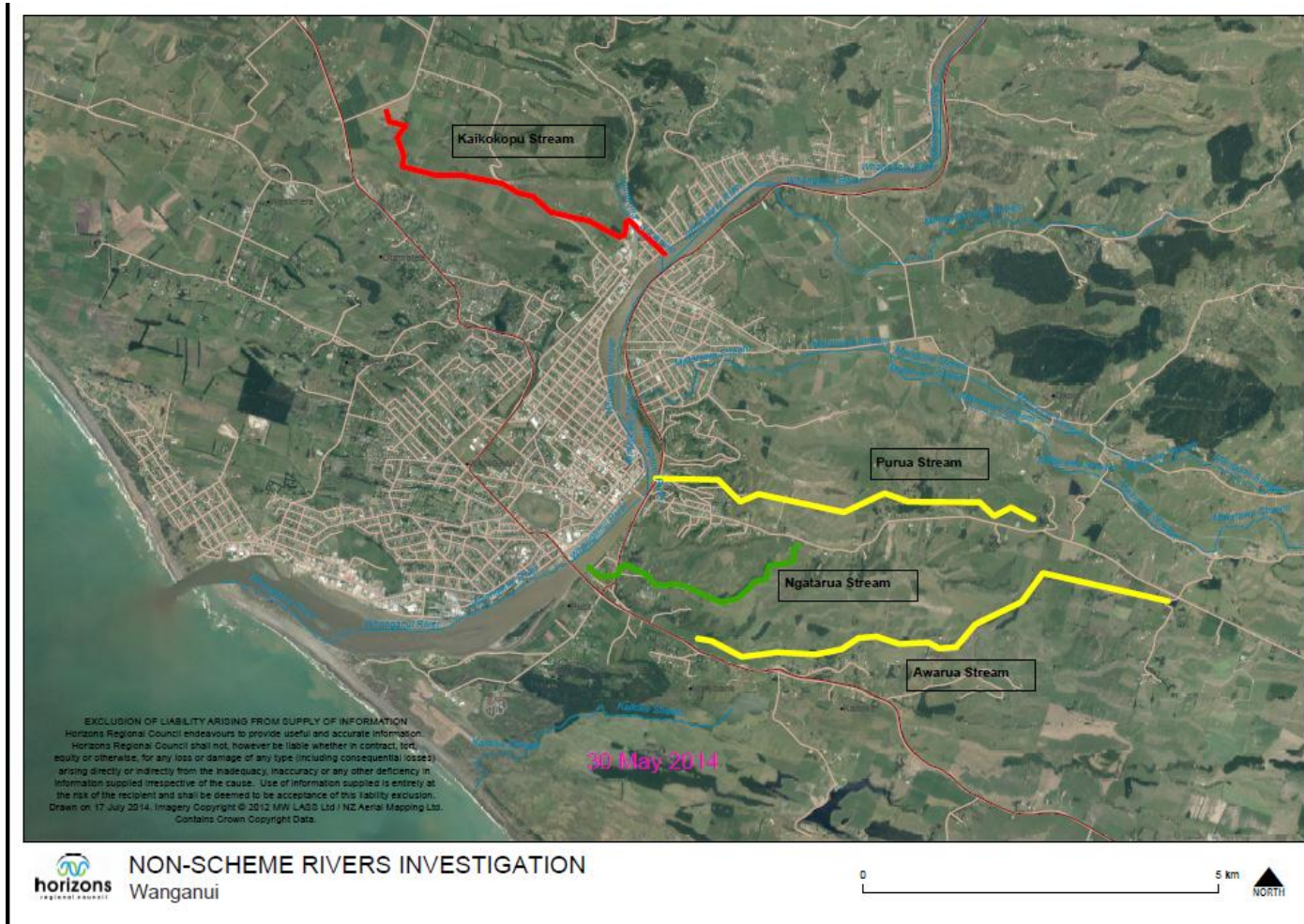
MAPS SHOWING LOCATION OF RIVERS RECOMMENDED FOR INVESTIGATION

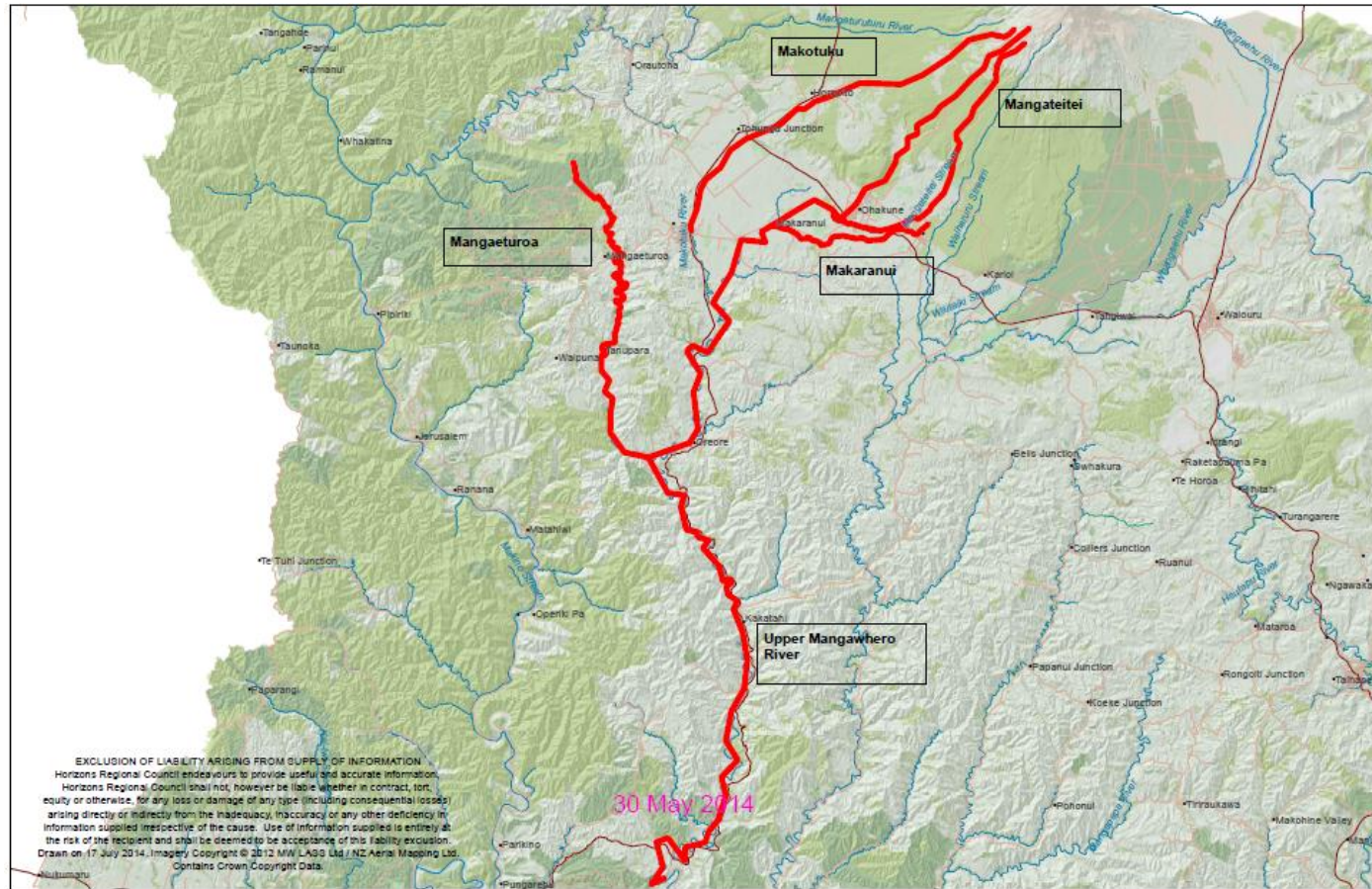


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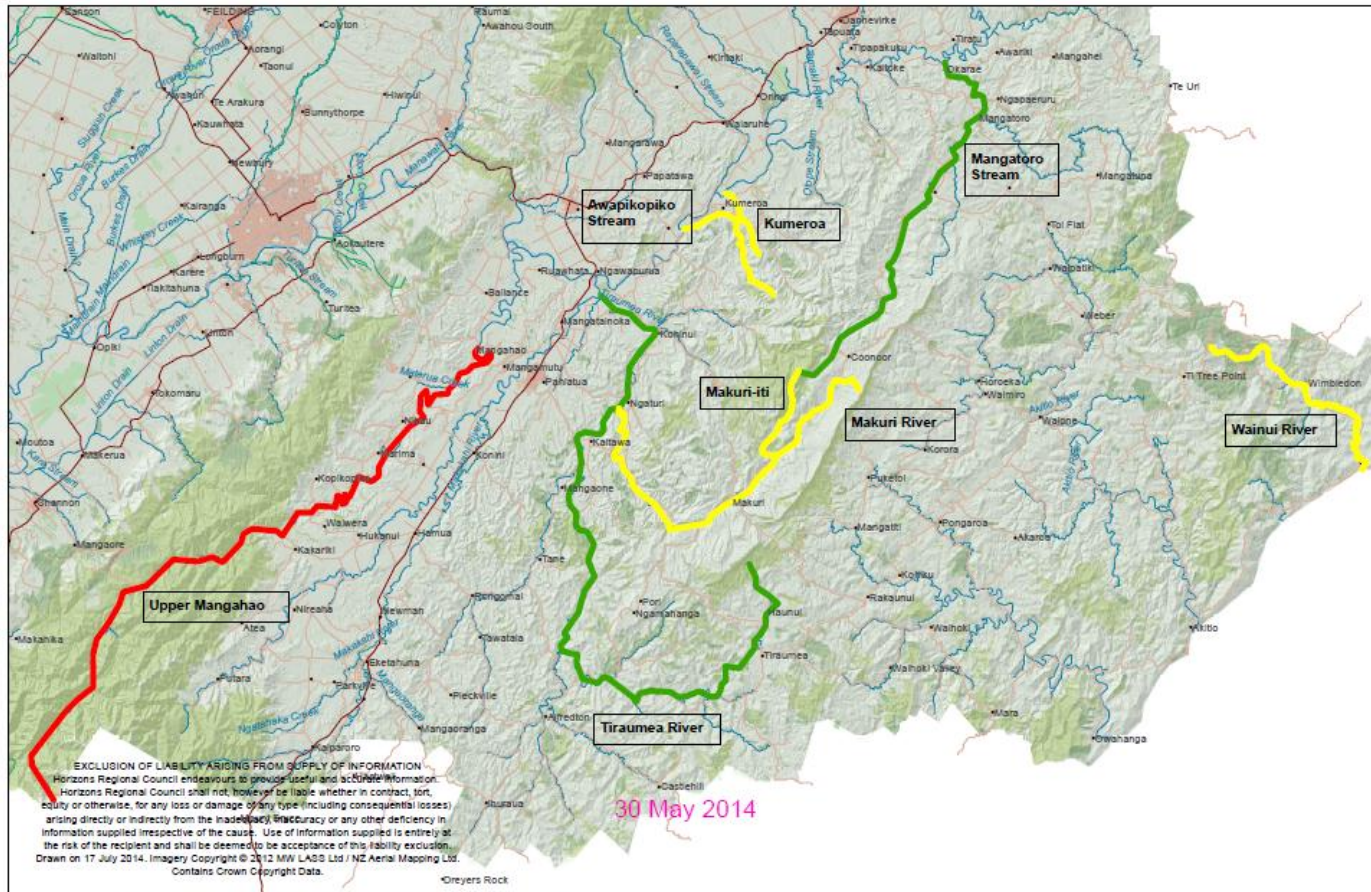
NON-SCHEME RIVERS INVESTIGATION
 Ohura Tributaries & Ongarue River





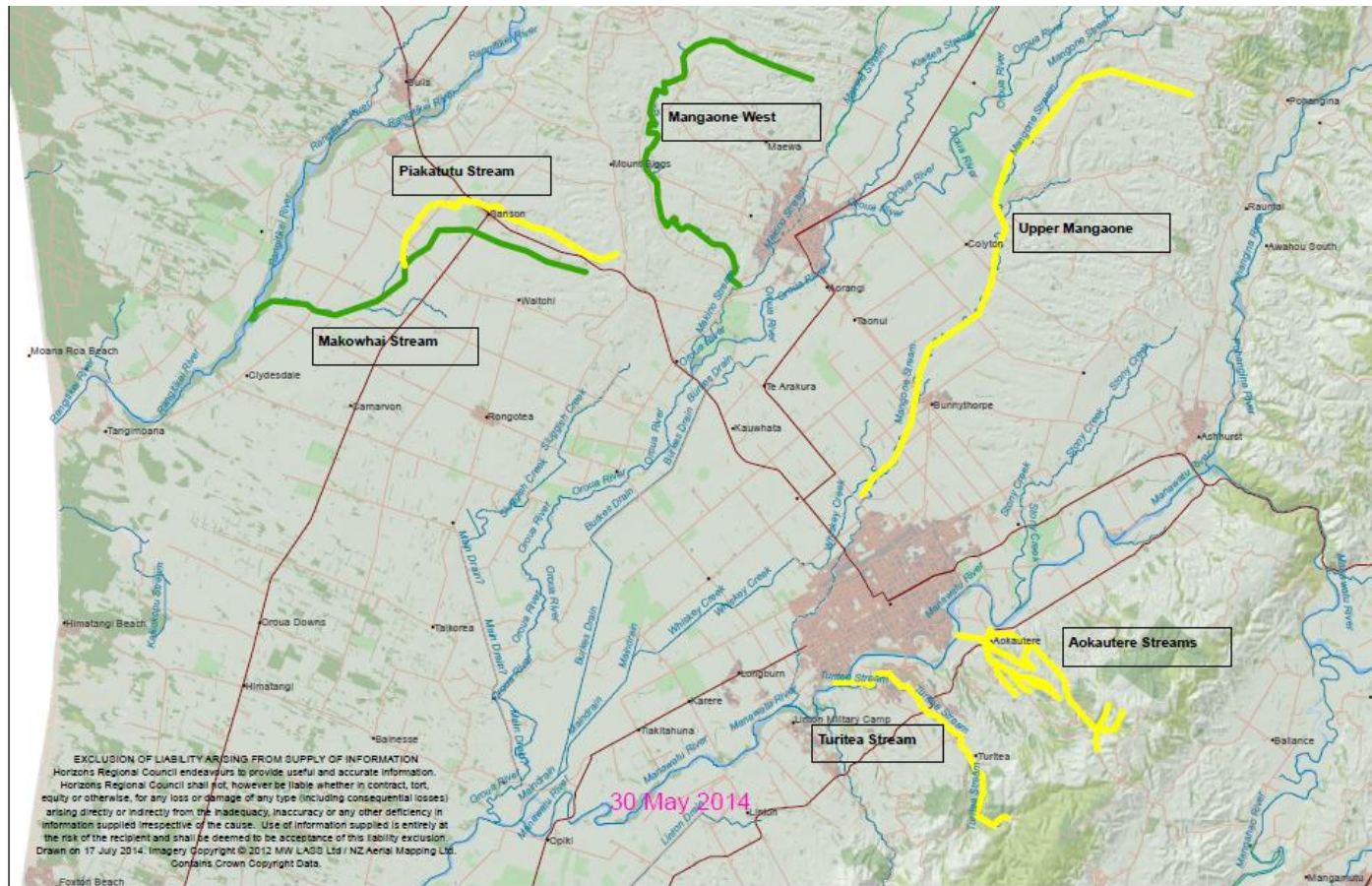


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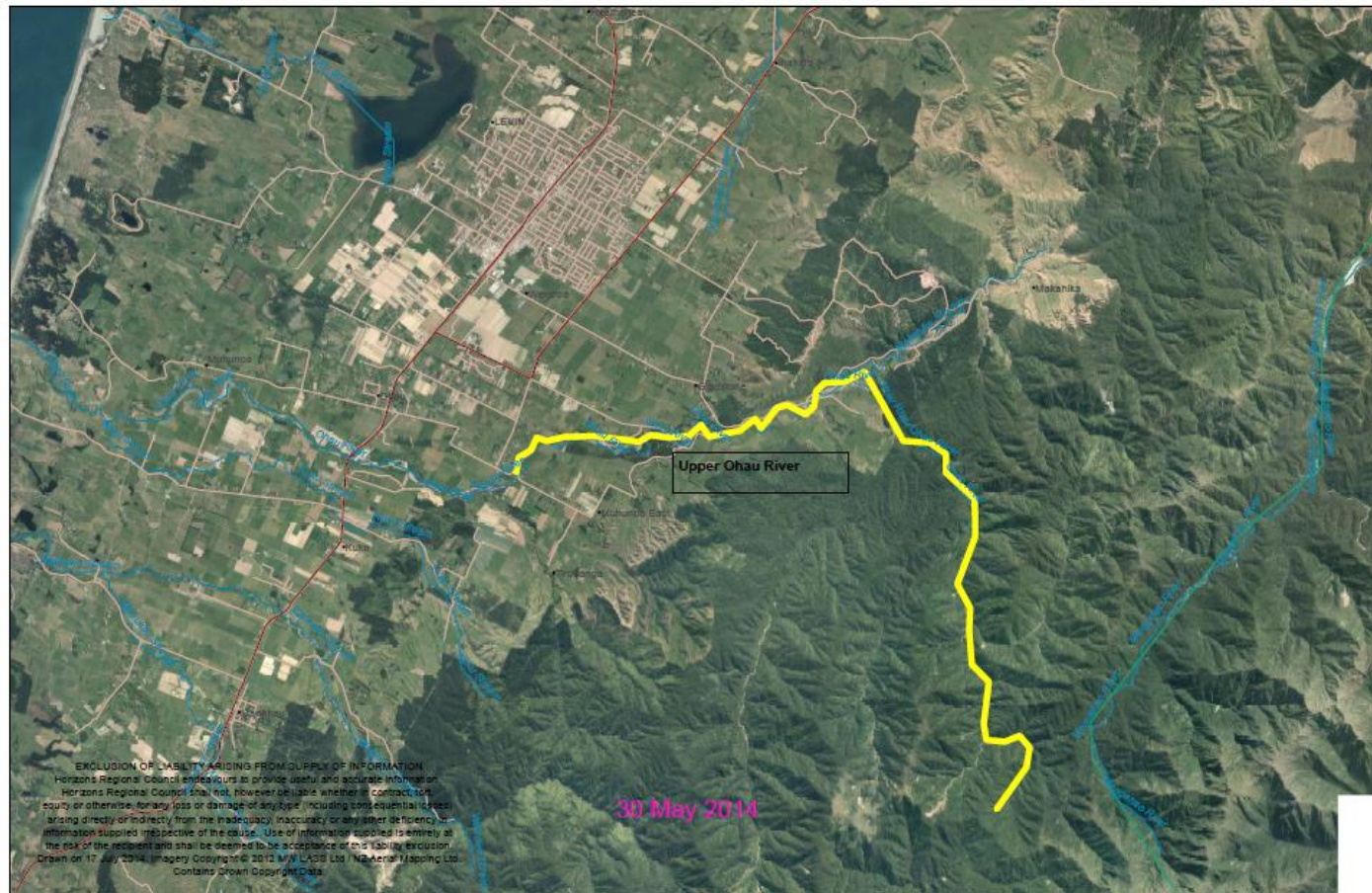
horizons regional council
NON-SCHEME RIVERS INVESTIGATION
 Taraua



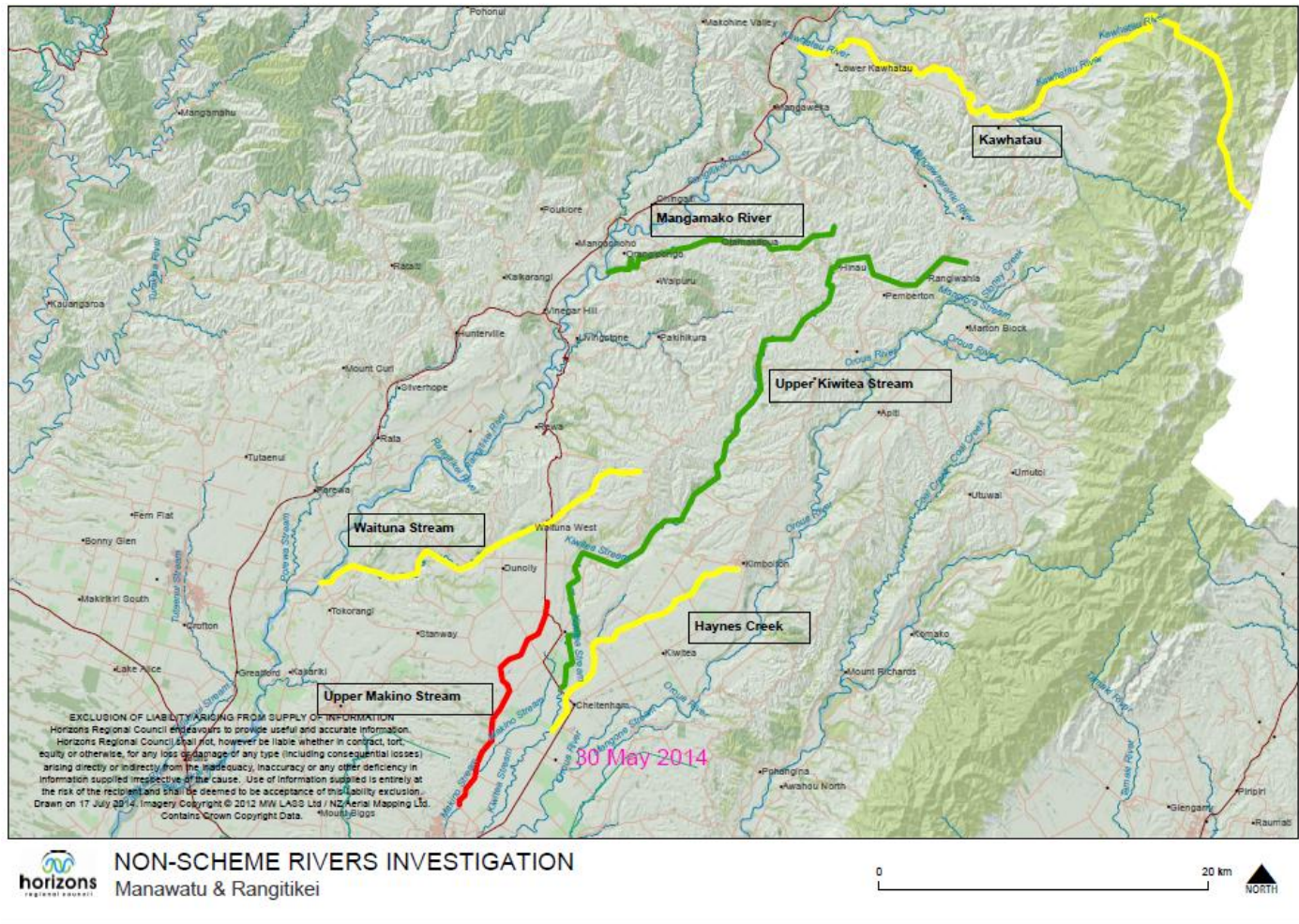


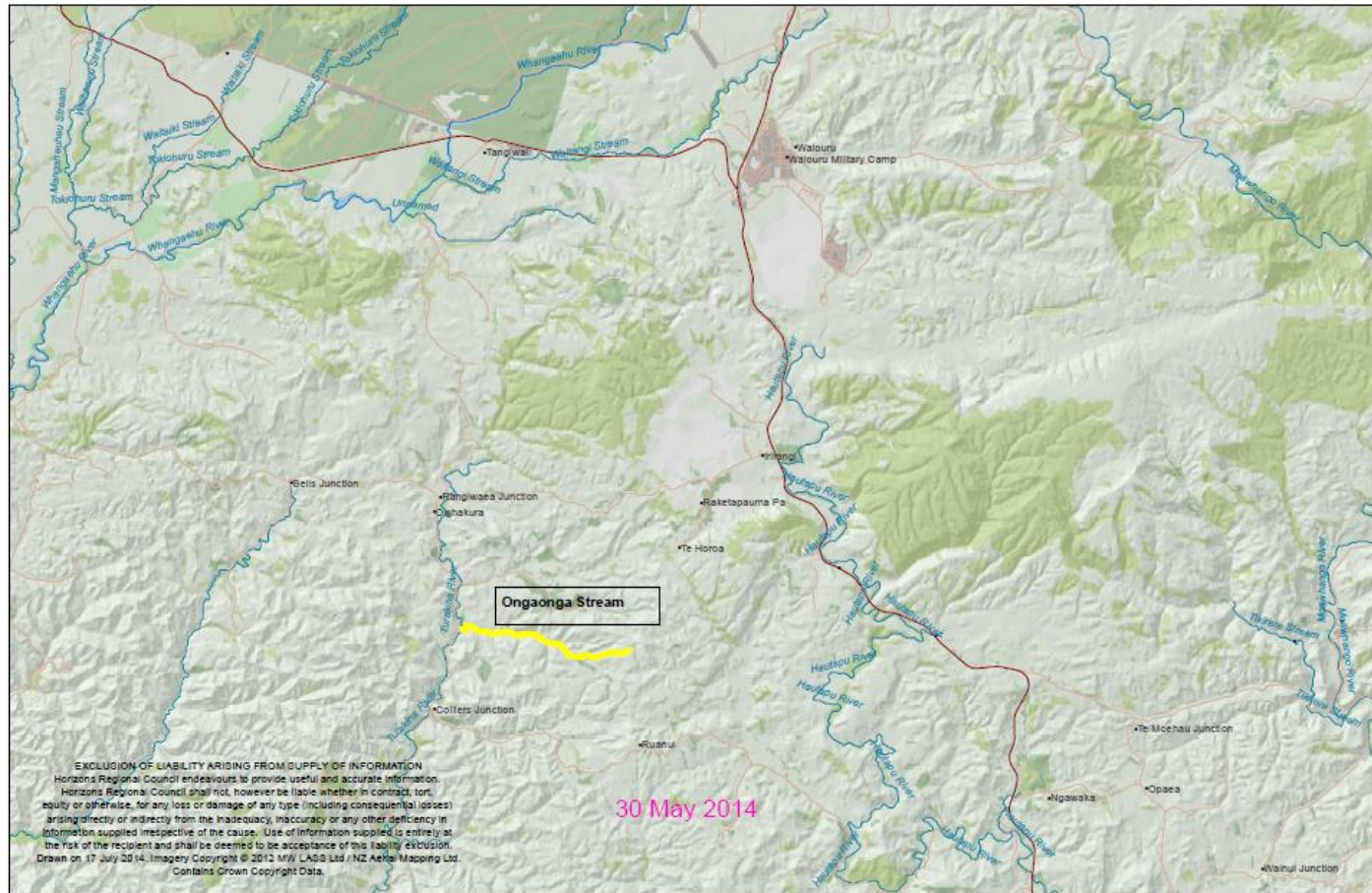
NON-SCHEME RIVERS INVESTIGATION
Rangitikei, Manawatu and Palmerston North





 **NON-SCHEME RIVERS INVESTIGATION**
Horowhenua





NON-SCHEME RIVERS INVESTIGATION
 Ongaonga Stream

