Whangaehu-Mangawhero River Scheme Audit

July 2013

Author
Jon Bell
Design Engineer

Acknowledgements to
Jeremy Cummings, Senior Engineering Officer
Wayne Spencer, Area Engineer
Allan Cook, Group Manager Operations

July 2013
ISBN: 978-1-927250-28-0
Report No: 2013/EXT/1325

CONTACT	**24hr Freephone 0508 800 800**		**help@horizons.govt.nz**		**www.horizons.govt.nz**
SERVICE CENTRES	**Kairanga** Cnr Rongotea & Kairanga-Bunnythorpe Rds Palmerston North **Marton** Cnr Hammond & Hair Sts **Taumarunui** 34 Maata Street **Woodville** Cnr Vogel (SH2) & Tay Sts	**REGIONAL HOUSES**	**Palmerston North** 11-15 Victoria Avenue **Wanganui** 181 Guyton Street	**DEPOTS**	**Levin** 11 Bruce Road **Taihape** Torere Road Ohotu
POSTAL ADDRESS	Horizons Regional Council, Private Bag 11025, Manawatu Mail Centre, Palmerston North 4442 | **F** 06 9522 929				

CONTENTS

1. Background

A study of the Whangaehu and Mangawhero Rivers to identify flood and erosion hazards was carried out in 2001 as part of the 'Wider Rivers Initiative'. This initiative was set up to study rivers in the Region that were not included in the existing schemes managed by Horizons Regional Council (HRC).

The study report, titled "The Whangaehu and Mangawhero River – A Report on Flooding and Erosion Hazards – December 2001", identified a number of important issues and made a number of recommendations that required further investigations in specific areas.

The main recommendations were as follows:

- *The most comprehensive approach to the problems identified would be to initiate a 'scheme' to manage the edge vegetation over defined sections of both rivers.*
- *Those sections would most likely comprise the Mangamahu to river mouth sections of the Whangaehu and the lower 25 km of the Mangawhero, that is from SH4 to the Whangaehu River confluence. A sustained programme of tree clearing and replanting would be required and would involve considerable costs.*
- *However, the problems identified on the Whangaehu River are not sufficient to encourage the landowners to participate in a scheme at the present time. It is considered that the problems will be manageable if individual landowners are provided with appropriate advice, and are encouraged to undertake timely obstruction clearing work and some preventative maintenance of the riparian margins.*
- *The problems in the lower Mangawhero are more pressing, and appear to justify a more proactive approach. It is proposed that the environmental grant policy be the mechanism employed to facilitate a programme of works.*

Provision was subsequently made in the 2003-04 Annual Plan for the development of a river management plan. That work however, had not commenced at the time of the February 2004 flood which flooded areas in the catchments to levels not previously recorded, especially in the areas upstream of Kauangaroa. In the areas downstream of Kauangaroa, where the valley floor widens considerably, the areas flooded in February 2004 were very similar to those flooded in 1897. The 1897 flood was much more extensive than any other known flood up until 2004.

The 2001 Wider Rivers Report noted that channel degradation caused by the narrowing of the channel had compensated, to some extent, for the loss in channel capacity caused by the sediment build-up and willow and poplar growth along the channel edges. Close inspection of the Mangawhero River downstream of SH4, and the reaches of the Whangaehu River directly downstream of the Mangawhero confluence showed, however, that it was very unlikely the degradation could have compensated for the significant loss in channel capacity caused by vegetation encroachment. That loss would therefore have significantly impacted on the flood levels experienced in 2004.

The devastation caused by the 2004 flood resulted in a request from the community for the advancement of a more detailed study of the Whangaehu and Mangawhero Rivers and for the development of a channel management regime. Extensive discussion with some of the worst affected landowners on the Mangawhero River identified a strong desire to deal with the channel congestion problem that was believed to be the major cause of the flooding that was experienced.

A more detailed investigation was undertaken and a draft river management plan was prepared for the purpose of stakeholder consultation which commenced in July 2006.

In October 2006, Council noted majority stakeholder support for a pro-active river management regime and requested staff to develop a new targeted rating system.

Following a non-statutory consultation and hearings process in February-March 2007, Council adopted the Draft Whangaehu and Mangawhero River Scheme Management Plan and proposed new rating system. Those proposals were finally adopted through the 2007-08 Annual Plan and the scheme commenced in July 2007.

In early 2008, landowners in the upper reaches of the initially prepared scheme area on the Mangawhero River expressed concern about the works required and the level of rating in their reach of the river.

As a result of representation from those landowners and discussions with the Liaison Committee, adjustments were made to the upstream extent of the scheme and the rating system was adjusted accordingly.

2. The Audit Process

The audit process has involved the following:

- Scheme Management
  Discussion with the Scheme Manager to gain an understanding of how the scheme is being managed.
- Review of Channel Management
  Review of the channel management works to see if they have been undertaken in accordance with the Scheme Management Plan, and a review of the effectiveness of these works.
- Audit of Expenditure and Funding
  An examination of how the expenditure on scheme works compares with the annual estimates, the appropriateness of the level of rating, and the level of reserves.
- Review of Rating System
  A review of the rating system to determine whether it collects rates from those who benefit from the scheme in an equitable manner.
- Presentation of a draft audit report to the Scheme Liaison Committee and incorporation of their feedback in a final report.

3. Scheme Location

The scheme works area following the 2008 amendment includes the Mangawhero River from 4 km downstream of SH4 to its confluence with the Whangaehu River, and the Whangaehu River from 2.5 km upstream of the Mangawhero confluence to 4 km upstream of its river mouth. The total scheme area used for rating purposes includes the entire rateable catchments of both the Whangaehu and Mangawhero Rivers.

3.1 General Description of the Scheme Area

The Whangaehu and Mangawhero River catchments have their headwaters on Mount Ruapehu. The stream channels which carry rainfall off the mountain are steep. In the lower reaches of the river there is a transition to shallow braided as the channel gradients decrease. The courses of the rivers are generally straight and found in wide flood plains.

Downstream of SH49, the Ohakune to Waiouru Road, the rivers become deeply entrenched and the channel forms are restricted by the narrowness of the valleys. There is a wide range of sediment sizes with large boulders eroded from the numerous steep bluffs that the rivers flow through.

For the Whangaehu River downstream of Mangamahu there is a change in the material through which the river flows. This material consists of less consolidated marine sediments that are more easily eroded. The entrenchment of the channel decreases considerably and there is an increase in width of the river terraces. Although the overall entrenchment of the river decreases, the riverbanks can easily contain most flood flows with depths of up to 7.5 m. The riverbanks have a large volume of fine sediment build-up amongst the vegetation. Several gravel beach deposits can be seen that contain a high percentage of sand and silt.

From SH4, the Mangawhero River is sluggish, flowing through a narrow defined channel. Sand and silt dominate the sediment content and the turbidity is high.

The upper Mount Ruapehu plateau is included in the Tongariro National Park and is protected accordingly. The land use in the lower plateau includes farming, forestry (native and exotic trees), and also a reserve set aside for defence training. From the plateau to the river mouth, sheep and cattle farming predominate, with a concentration of dairy farming on the fertile river terraces over the lower 30 km. A limited amount of horticulture development has occurred on the lower reaches.

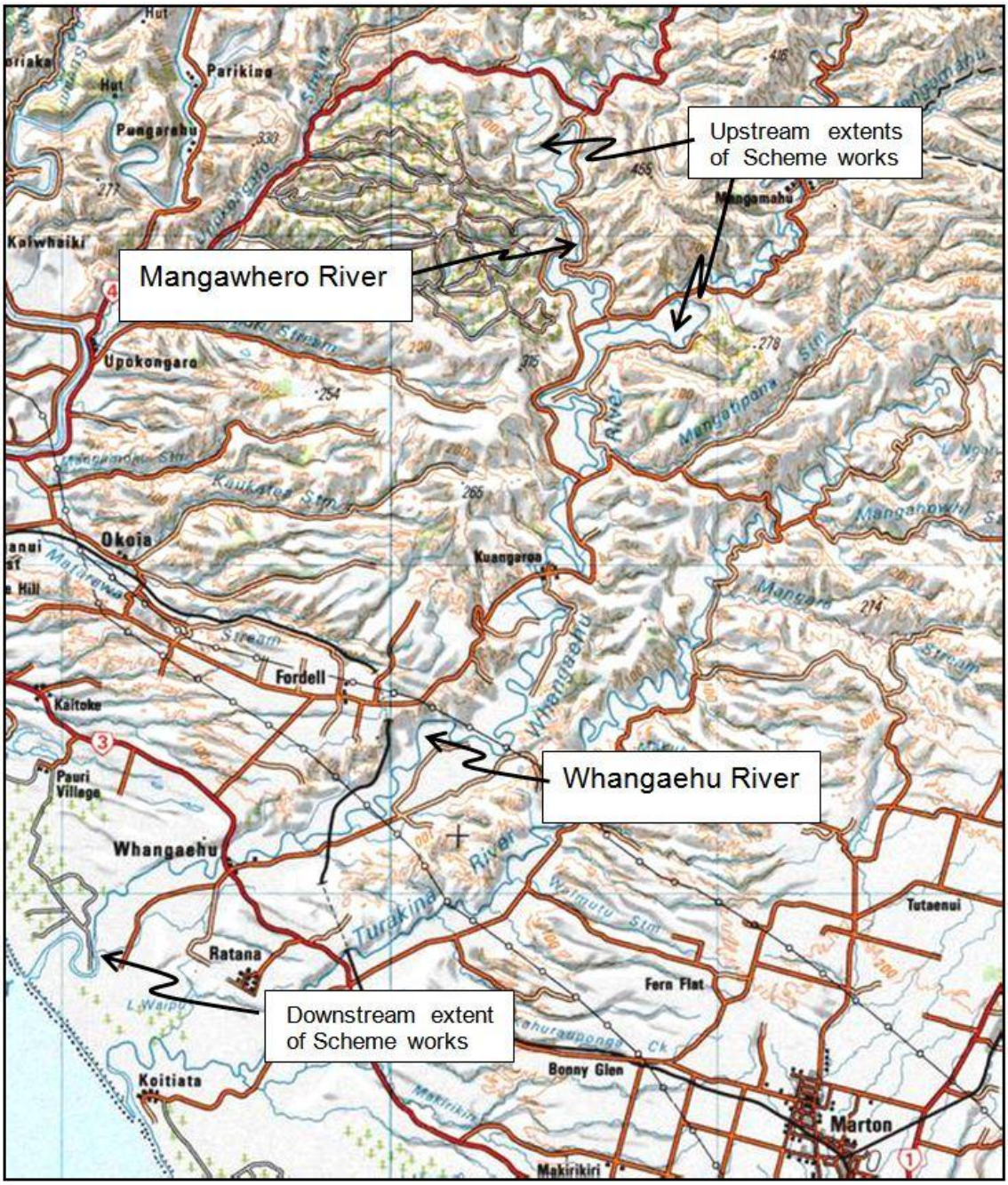


Figure 3.1 – Map showing extent of Scheme Works Area

3.2 Whangaehu River Details

The Whangaehu River has a total catchment area of 1,994 km^2, and is approximately 213 km in length. The catchment area is bounded to the west by the Whanganui River catchment and to the east by the Turakina River catchment. The Whangaehu River is the main outlet for the Crater Lake on Mount Ruapehu, and it also drains the south eastern slopes of the mountain. The river mouth is situated 12 km south east of Wanganui City.

Crater Lake is sourced from rain and snowmelt and because of the volcanic environment, the water in the lake can be extremely acidic and carries high concentrations of toxic heavy metal compounds. The Wahianoa Aqueduct intercepts 22 streams in the upper catchment, diverting an average flow of 3.5 m^3/s from the Whangaehu River to Lake Moawhango.

3.3 Mangawhero River Details

The two main tributaries of the Whangaehu River are the Mangawhero River (840 km^2) and the Tokiahuru Stream (226 km^2). The Tokiahuru Stream drains the southern flank of Mount Ruapehu. The Mangawhero River originates on the south western side of Mount Ruapehu in the vicinity of Turoa Ski Field, and flows through Ohakune in a direction generally parallel to the Whangaehu River. The confluence with the Whangaehu River is situated between Mangamahu and Kauangaroa, approximately 54 km upstream of the Whangaehu River mouth.

4. Scheme Management

Scheme Liaison Committee and ratepayer meetings have been held regularly. Scheme meetings in the early years, were a little contentious as there were discussions about the requirements and extent of the scheme works. These led to the adjustment of the upstream extent of the scheme in 2008.

There was also a reluctance early on, to have programmed aerial spraying completed in the vicinity of the Kauangaroa Marae. However, once the scheme objectives and the benefits were explained and understood, that reluctance was overcome. The assistance of the Liaison Committee was of considerable value in that regard.

It is noted that from 2011-12, there has been a significant reduction in the amount of time Horizons staff have spent in trying to convince riparian landowners of the need for, and benefit of, works proposed on their properties. This has led to significant savings in terms of management costs.

An important aspect of the scheme has been the very positive working relationship that has been forged between the Scheme Manager and the Scheme Liaison Committee. This relationship has been vital in ensuring buy-in to the scheme from the wider community and ratepayers.

Scheme budgets are well managed and the Scheme has a small credit balance. The scheme finances are discussed further in Section 6.

Annual reports have been prepared detailing expenditure and the works that have been undertaken.

It is recommended however, that improvements are made to the recording of works completed and associated cost information in relation to the respective differential rating areas. This recommendation is made in order to better facilitate any future analysis of the rating system.

5. River Channel Management

The works undertaken as part of the scheme have all been done for river channel management purposes. The scheme has focused on maintenance activities largely involving the clearance of encroaching vegetation rather than the creation of capital assets.

Whilst the Scheme Management Plan and subsequent Annual Reports have referred to “Capital” works, this is something of a misnomer as these works have involved activities that would usually be described as “maintenance” works. The term “Capital” works has been used loosely to differentiate between the initial channel clearance works and the ongoing channel maintenance and vegetation regrowth control works.

5.1 Initial Clearance Works

The original Scheme Management Plan, dated July 2007, scheduled the initial channel clearance works to be completed over a five year period between 2007 and 2012. When the Scheme Management Plan was updated in November 2009, the works programme continued to 2012 however, the extent of the works was reduced in the upper reaches of the scheme.

At the end of 2012, the majority of this clearance work had been completed although there was a small amount outstanding, mainly in the Upper Whangaehu and Upper Mangawhero reaches. The works are scheduled to be completed by the end of the 2013-14 financial year.

In line with the wishes of the Scheme Liaison Committee these initial works were carried out systematically commencing at the downstream end of the scheme and progressing upstream.

The initial clearance works have mainly consisted of the mechanical clearance of trees from the river banks as well as aerial spraying of trees. As well as the physical clearance of the channel the initial works have also involved the removal of debris from the river channel, stockpiling and burning of debris and planting of trees on vulnerable banks of the river.

5.2 Maintenance Works

As well as the initial clearance of the channel, there has also been a small amount of maintenance works carried out in the early years of the scheme. The works have mainly involved the spraying of any willow regrowth in previously cleared areas. There has also been some layering work undertaken and the clearance of debris blockages.

5.3 Effectiveness of the Works Undertaken

Whilst it is not possible to accurately quantify the effects of the scheme in terms of channel capacity, it has been noted that the number of debris

blockages requiring removal has decreased as the scheme has progressed, which has been attributed to the increased conveyance capacity of the river channel.

Classical rivers theory tells us that the vegetation clearance works undertaken as part of the scheme will have increased the capacity of the river channel by lowering its “roughness”.

The roughness of a river channel is described by a Manning’s Number (Manning’s n). This number is an empirically derived coefficient that is based on a number of factors, most notably the surface roughness of a channel. The capacity of a river channel to carry flood flows is inversely proportional to the Manning’s Number.

If we reasonably assume that the scheme works have lowered the typical value of Manning’s n attributable to the scheme rivers from 0.05 to 0.035, this would equate to a 43% increase in the conveyance capacity of the rivers in the scheme area.

5.4 Future Works

Once the initial channel clearance works have been completed in 2013-14 the scheme will move into a maintenance phase. Since the works completed will have then substantially cleared the channel in the reaches required by the Scheme Management Plan there is no need to modify the maintenance plan.

In accordance with the Scheme Management Plan future works will largely focus on the spraying of regrowth. Following the success of the aerial spraying in the initial phase of the scheme works it is proposed that the maintenance spraying will mainly be carried out in similar fashion but possibly on a triennial basis.

Feedback from the Liaison Committee is that it would be beneficial for riparian landowners to have a clear understanding as to how far future maintenance spraying would extend onto their properties from the river edge. That would then enable them to make their own arrangements for vegetation management beyond that defined boundary.

The Scheme Management Plan also notes that the maintenance phase of the scheme will require some planting to be undertaken. This is supported by the Scheme Engineer who believes that some judicious planting of willows, or alternative species, will be required on the outside of some bends in the river.

With support now having been gained for work in the vicinity of the Kauangaroa Marae, it is recommended that there should be some flexibility allowed for some small increases in the current projected works programme to allow for this work to be undertaken. These small changes should be accommodated as they will ensure that the whole channel within the scheme reach is cleared in line with the Scheme Management Plan. Completion of this work will help to ensure the continued support of a community that the Scheme Liaison Committee has been very proactive in gaining.

It is understood that the completion of these additional works will require the extension of the presently proposed maintenance spraying programme as well as a small amount of mechanical channel clearance works.

6. Scheme Finances

6.1 Scheme Expenditure

6.1.1 Budgetary Control

Table 6.1, below, sets out the expenditure for the period 2007 to 2012 against the budget. The 2007-08 budget is from the original Scheme Management Plan, and the remaining budget figures are taken from the revised Scheme Management Plan from 2009. A more detailed breakdown of scheme expenditure can be seen in Annex A.

Table 6.1 - Whangaehu & Mangawhero Scheme Expenditure 2007-2013

Financial Year	Works Expenditure		Engineering Management		Other Costs (including loan servicing)		Total Expenditure	
	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
2007-08	213,567	164,511	37,619	33,968	5,850	11,795	257,036	210,274
2008-09	185,400	181,039	39,956	42,064	27,023	21,060	252,379	244,163
2009-10	185,400	182,600	40,862	36,274	41,699	38,000	267,961	256,874
2010-11	185,400	184,382	40,770	41,461	52,907	64,693	279,077	290,536
2011-12	185,400	194,864	45,044	32,802	67,721	66,749	298,165	294,415
2012-13 *(Forecast)*	40,400	40,400	36,507	19,252	72,954	72,950	149,861	132,602

An examination of the actual scheme expenditure compared with scheme budget on an annual basis shows that the expenditure is being well managed.

There was a significant underspend in the first year of the scheme, 2007-08, as the aerial spraying of willow proved to be a more cost effective way of controlling vegetation than the mechanical channel clearance proposed in the original Scheme Management Plan.

The underspend in the first year of the scheme meant that the loan draw-down was significantly less than anticipated. This reduction in loan draw-down, as well as lower than predicted interest rates, has led to savings made against budgeted expenditure in subsequent years.

The 2010-11 financial year saw a total overspend of $11,459 as a result of a transfer of $15,000 from a scheme credit balance arising from savings in previous years, to establish an Emergency Reserve Fund.

In 2011-12 there was an over expenditure on works, however, this was more than offset by savings in the engineering management budget.

6.1.2 Scheme Budget Compared with the Scheme Management Plan

As discussed in Section 5, the initial clearance phase of the scheme works is currently scheduled to be completed in 2013-14 rather than 2011-12 as originally planned. The total cost of the initial clearance works, as currently forecast, has been compared with those that were set out in the Scheme Management Plan in 2008. This cost comparison can be seen in Table 6.2 below.

Table 6.2 - Comparison of Initial Clearance Phase Cost Estimates, Verses Forecast Actual Costs

	2007-2014 Works/Management Cost Estimates Verses Actual and Forecast Costs		
	2008 Scheme Management Plan Estimated Cost	Current Forecast of Actual Cost to Completion	Difference
Works Expenditure	$1,037,706	$1,003,196	-$34,510
Management Costs	$307,500	$257,712	-$49,788

Note: 'other costs' such as loan servicing are excluded in the above table.

As can be seen, the scheme expenses have been well managed over the past six years and the costs involved in the initial clearance phase of the scheme are very much in line with those predicted in 2008.

The current forecast of actual costs to completion of the initial clearance phase of the scheme do not allow for the additional work that is recommended to be carried out in and around Kauangaroa. Even allowing for the estimated cost of $15,000 for these works, the forecast of actual costs to complete the initial clearance phase is still $19,510 below that estimated in the Scheme Management Plan in 2008.

6.2 Loan

Table 6.3, overleaf, shows the loan draw-downs and repayments in the period 2007-2015 compared with those that were budgeted for in the original Scheme Management Plan in 2007 and also with those that were budgeted for in the revised Scheme Management Plan in 2009.

Table 6.3 - Whangaehu & Mangawhero Scheme Loan 2007-15

	Financial Year										
	2007-08		2008-09			2009-10			2010-11		
	2007 Budget	Actual	2007 Budget	Forecast in 2009 Scheme Management Plan	Actual	2007 Budget	2009 Budget	Actual	2007 Budget	2009 Budget	Actual
loan balance at start of year	$0	$0	$142,000	-	$95,199	$286,392	$231,269	$219,312	$448,364	$345,576	$334,309
loan advance	$142,000	-	$148,000	-	$135,000	$170,000	$135,000	$130,000	$185,000	$155,000	$165,000
Interest	$5,850	-	$10,650	-	$8,802	$21,479	$20,914	$18,480	$33,627	$29,615	$26,842
Principal	$0	-	$3,608	-	$10,887	$8,027	$20,693	$15,003	$13,899	$21,656	$22,334
Loan balance at end of year	$142,000	-	$286,392	-	$219,312	$448,364	$345,576	$334,309	$619,465	$478,919	$476,975

	Financial Year										
	2011-12			2012-13			2013-14			2014-15	
	2007 Budget	2009 Budget	Actual	2007 Budget	2009 Budget	Forecast	2007 Budget	2009 Budget	Forecast	Forecast	Forecast with additional drawdown
loan balance at start of year	$619,465	$478,919	$476,975	$802,161	$605,764	$602,869	$786,448	$581,657	$594,569	$590,293	$590,293
loan advance	$204,000	$155,000	$155,000	$15,000	$0	$18,000	$0	$0	$25,000	$0	$15,000
Interest	$46,460	$38,949	$33,989	$60,162	$42,403	$39,771	$58,984	$40,716	$39,459	$41,321	$41,846
Principal	$21,304	$28,156	$29,106	$30,713	$24,106	$26,300	$33,658	$25,794	$29,276	$29,309	$30,578
Loan balance at end of year	$802,161	$605,764	$602,869	$786,448	$581,657	$594,569	$752,791	$555,864	$590,293	$560,984	$574,715

The table shows that up until the end of the 2011-12 financial year, the loan balance was largely on track with that predicted in the revised 2009 forecast (including the actual draw-down in 2007-08), with the total draw-down being $8,000 less than forecast.

Those draw-downs since 2012 totalling $58,000 were not forecast in 2009 but have been supported by the Scheme Liaison Committee in the interest of completing all initial channel clearance works to a uniform standard and either have been, or will be, approved through the Annual Plan process.

If actual total borrowings are compared with those forecast in the original 2007 Scheme Management Plan, then the total anticipated draw-down upon completion of the initial works phase will be $119,000 less than originally budgeted.

This significant saving is largely attributable to the reduced extent of the works area on the Mangawhero River and the more cost effective methods of channel clearance ultimately employed.

It is noted that the loan balance peaked in June 2012 and that all loans are forecast to be fully repaid by 2027.

6.3 Emergency Reserve Fund

A scheme Emergency Reserve Fund was set up in the 2010-11 financial year. This fund was created to deal with large river blockages that may occur when annual scheme budgets have been committed to other works.

$15,000 was transferred into the scheme reserve account. This money came from the savings made from the budgeted works expenditure in previous years.

At the end of the 2011-12 financial year, the total Emergency Reserve Fund, including interest, stood at $15,889.50.

Under the current budget this fund will be slowly increased through the interest it accrues.

The Scheme Manager advises that he would like the level of Emergency Reserves to be around $20,000 as this would be an appropriate level with which to be able to clear any potential blockages and to undertake some remedial erosion control work if necessary.

This level of Emergency Reserve will be reached in 2015-16 if the Emergency Reserve Fund is left to accrue interest. It could also be possible to increase the level of the reserve by contributing any savings made from the works budget in the next couple of financial years while the initial channel clearance work is finished.

6.4 Forecast Budget

The forecast budget can be seen in Annex A.

That budget recognises that initial clearance work has been substantially completed and makes appropriate provision for the anticipated maintenance requirements.

However, as noted in Section 5.4 it is recommended that some additional clearance works be undertaken in and around Kauangaroa. The estimated cost of these additional works is $15,000 and it is likely that loan funding of that magnitude will be required.

7. The Scheme Rating System

7.1 History of the Rating System

A targeted differential rating system was developed in late 2006 and was adopted following a submissions hearing process through the 2007-08 Annual Plan.

In 2008 adjustments were made to the upstream extent of the scheme and adjustments were made to the rating system accordingly. These adjustments were made following representations from landowners at the upstream extent of the Mangawhero River works area, seeking exclusion from that area.

7.2 The Current Rating System

The current rating system covers the entire Whangaehu and Mangawhero River catchments. Channel clearing and maintenance works extend from 4 km upstream of the Whangaehu River mouth to 2.5 km upstream of the Mangawhero confluence, and up the Mangawhero to 4 km downstream of the SH 4 Bridge.

When the differential rating system was developed the following matters were taken into consideration:

- The benefits that are, in the opinion of the Council, likely to accrue, directly or indirectly, to any property from the scheme works; and
- The extent to which the characteristics or use of any property, or any actions of its occupier, are, in the opinion of the Council, likely to either contribute to or alleviate the need for scheme works.

Four direct benefit areas were identified along with indirect benefit and contributor areas.

7.2.1 Indirect Benefit

Not all properties in the scheme area are considered to receive indirect benefit from the works carried out as part of the scheme. Upper catchment landowners have little if any linkage to the lower reaches of the Mangawhero and Whangaehu Rivers. The properties which were considered to indirectly benefit from the scheme were identified and these were included in the indirect benefit rating category (IN). The total number of properties in the IN category as at July 2013 is 471.

Various options were considered for the level of, and method of, determining the liability for the IN rate. Through the submissions process and the deliberations of the Hearing Committee and Council, it was concluded that the appropriate level of indirect benefit rating would be 10% of the total rate

required, and that it would be collected as a Uniform Annual Charge (UAC) over each rateable property with an occupied dwelling in the IN rating area.

The rating system defined the IN category as "all properties or parts of properties that lie within the catchment and indirectly benefit from the scheme."

Currently there are 482 properties in the IN category.

7.2.2 Contributor Rate

All properties in the scheme area that drain to either the Mangawhero or Whangaehu Rivers are considered to contribute to the need for the scheme.

Accordingly, all rateable properties in the scheme area that contribute to the need for scheme works are levied in respect of Contribution (CN).

In determining the level of contribution, the Council gave consideration to:

- Increased run-off resulting from increased drainage; and
- Altered run-off characteristics resulting from the removal of vegetation.

There is no way of precisely determining the impact of the extra water from the contributors. As a result of the submissions process and the deliberations of the Hearing Committee and Council, the Council concluded that the level of CN rating would be 35% of the total rate required and that it would be collected on an area basis.

The rating system defined the CN category as "all properties or parts of properties that lie within the catchment of the Whangaehu and Mangawhero Rivers, that contribute to the need for the scheme, excluding those properties that are listed as having a native bush cover, or closed canopy exotic forest cover."

A large area of land upstream of SH49 that lies within the catchment is part of the Tongariro National Park and as such, is not rateable. As at July 2013, 64% of the total catchment area was rated in the contributor category.

7.2.3 Direct Benefit

Four direct benefit areas were identified, and these are discussed below. The costs apportioned to each rating category are the estimated costs of the works in the areas covered by each category, or the estimated cost of works in another rating area that provide benefits to areas within the respective rating area.

7.2.4 Rating Category UM

Defined as "all properties or parts of properties receiving direct benefit from the channel clearing and maintenance works carried out on the Mangawhero River from a point 4 km downstream of SH4 to a point 5 km upstream of the Mangawhero River confluence with the Whangaehu River."

This 81.1 hectare benefit area is a strip of rateable land either 50 m or 25 m wide bordering the river. The strip has been located to allow for the roads and other non-rateable areas of land to ensure that there is a rateable strip along the full length of the river. The 25 m wide strip is on one particular property that has a small area of land, but a long length of river, to better reflect the benefits provided by the scheme.

7.2.5 Rating Category LM/UW

Defined as "all properties or parts of properties receiving direct benefit from the channel clearing and maintenance works carried out on the Mangawhero River downstream of a point 5 km upstream of the Mangawhero River confluence with the Whangaehu River and on the Whangaehu River from a point 2.5 km upstream of the confluence to a point 1 km below the bridge at Kauangaroa."

This benefit area largely comprises all the river flats (some 642 hectares) bordering the river over this reach.

7.2.6 Rating Category MW

Defined as "all properties or parts of properties receiving direct benefit from the channel clearing and maintenance works carried out on the Whangaehu River between a point 1 km below the bridge at Kauangaroa to the SH3 Bridge."

This benefit area largely comprises all the floodplain (some 1,321 hectares) bordering the river over this reach.

7.2.7 Rating Category LW

Defined as "all properties or parts of properties receiving direct benefit from the channel clearing and maintenance works carried out on the Whangaehu River between the SH3 Bridge and a point 4 km upstream from the river mouth. Total area in this category is 843 ha.

7.3 Location of the Rating Areas

The location of the rating areas described above can be seen on the plans contained in **Error! Reference source not found.**

7.4 Summary of Rating Details

River Reach	Category Code	Reach Length (km)	Rating Basis	Area Rated (Hectares)	Differentials
Upper Mangawhero	UM	10.6	Area	78.73	5.5496%
Lower Mangawhero and Upper Whangaehu	LM	24	Area	642.06	24.3762%
Mid Whangaehu	MW	24	Area	1321.64	21.1971%
Lower Whangaehu	LW	9	Area	843.37	3.8772%
Indirect Benefit	IN		UAC	471 properties	10%
Contributor	CN		Area	127,588	35%

7.5 Changes from the Original Rating System Adopted in 2007

The rating system described above, is that which is currently used following modifications that were adopted by Council in 2008 following consultation with ratepayers.

The changes that were made were:

- The upstream boundary of the scheme was moved from 7.5 km upstream of SH4 to 4 km downstream of SH4.
- The area included within the Upper Mangawhero (UM) rating category, was altered from an area that included the low lying floodable area to a strip of land bordering each side of the channel to better reflect the channel management works undertaken on this reach of the river.
- The allocation of ongoing maintenance costs to the UM category was reduced as the follow up spraying, planting and blockage removal were considered to be less than for the river further downstream.

7.6 Appropriateness of the Current Rating System

7.6.1 Indirect Benefit and Contributor Rating Categories

As described in Section 7.2 the levels of the indirect benefit and contributor rating categories were adopted, following a submissions and hearings process, through the 2007-08 Annual Plan.

Nothing has changed in the interim with respect to either the areas affected or the differentials applied and accordingly there is no need to review those categories.

7.6.2 Direct Benefit Rating Categories

The differentials applied to each of the four direct benefit categories were based to a large extent, on the estimated cost of clearance works required in the respective river reaches. With those works now substantially completed, it is possible to compare actual and forecast costs with those estimated at the time of developing the rating system.

Table 7.1, overleaf, shows the forecast expenditure to complete the initial clearance phase of the scheme compared with the 2008 scheme Management Plan estimated costs to the end of 2013-14. The current forecast costs have been calculated from the actual costs to date as recorded in the Scheme Annual Reports, as well as estimates of costs for work to be completed in the 2012-13 and 2013-14 financial years.

As can be seen from the table, the current forecasts of expenditure in the Upper Mangawhero (UM) and Lower Whangaehu (LW) reaches are close to those predicted in 2008. This suggests that the cost estimates for work in these reaches were fairly accurate.

Table 7.1 also shows that there has been a significant over spend in the Mid Whangaehu (MW) reach, in the order of $120,000, and a large underspend of approximately $150,000 in the Lower Mangawhero and Upper Whangaehu (LM/UW) reach.

The first significant mechanical clearing and burning was encountered in the MW river reach and it was soon found that costs significantly exceeded estimates prepared at the time the Scheme Management Plan was developed. A decision was then made to increase the use of aerial spraying and to reduce the amount of mechanical clearing and burning. While the cost per kilometre for the latter was reduced accordingly, total costs for the MW reach still exceeded the estimate.

Following on from the experience gained in the MW reach, there was a substantially increased reliance on aerial spraying in the LM/UW reach. The effectiveness and cost efficiency of the spraying, together with the associated reduction in mechanical clearance and burning, resulted in significant savings against the original budget for this reach.

Table 7.1 - Scheme Expenditure to end of Initial Clearance Phase by Rating Area

	Rating Area											
	UM			LM/UW			MW			LW		
	2008 Management Plan Estimate	Current Forecast	Difference	2008 Management Plan Estimate	Current Forecast	Difference	2008 Management Plan Estimate	Current Forecast	Difference	2008 Management Plan Estimate	Current Forecast	Difference
Tree Removal	$87,750	$45,406	**-$42,344**	$346,700	$156,753	**-$189,947**	$265,600	$302,778	**$37,178**	$35,600	$16,294	**-$19,306**
Spraying Costs	$9,859	$6,271	**-$3,588**	$24,359	$60,381	**$36,022**	$30,208	$95,726	**$65,518**	$12,318	$29,558	**$17,241**
Contingency	$6,902	$11,812	**$4,909**	$53,292	$75,476	**$22,184**	$42,004	$44,933	**$2,929**	$6,300	$718	**-$5,582**
Clearing	$0	$0	**$0**	$0	$6,150	**$6,150**	$15,000	$32,677	**$17,677**	$15,000	$0	**-$15,000**
Blockage Removal	$9,853	$58,728	**$48,875**	$27,886	$0	**-$27,886**	$27,886	$0	**-$27,886**	$0	$0	**$0**
Planting	$2,744	$9,499	**$6,755**	$7,766	$10,565	**$2,799**	$7,766	$31,897	**$24,131**	$2,912	$7,575	**$4,662**
Total Works Cost	**$117,109**	**$131,715**	**$14,606**	**$460,003**	**$309,325**	**-$150,678**	**$388,464**	**$508,011**	**$119,547**	**$72,130**	**$54,145**	**-$17,985**

It would appear that had similar proportions of mechanical clearing, burning and aerial spraying techniques been employed in both the MW and LM/UW reaches, then a similar relationship between Scheme Management Plan estimated costs and actual costs would have resulted in each of these reaches.

The savings made in the upper reaches essentially arose from experience gained, at some cost, in the lower reaches.

Accordingly, it is fair and reasonable that ratepayers in the LM/UW reach should make some contribution to costs in the MW reach, as indeed they effectively have done under the current rating system.

Furthermore, since future rates will largely be used to fund loan servicing costs associated with initial clearance works, together with regrowth control costs that will essentially be uniform across the full length of the scheme, there is no justification for amending the rating differentials between the respective categories at this time.

8. Conclusions

The Whangaehu and Mangawhero River Scheme has been well managed for the six years since its establishment and the original objective has been substantially achieved. A strong relationship has developed between the Scheme Manager and key stakeholders, and that has contributed significantly to the successful initial channel clearance phase and to the high degree of community ownership of the scheme.

The scheme is currently in a two year transition period from major clearance to low level maintenance.

The level of funding forecast for the next five years is appropriate for the anticipated level of maintenance works and scheduled loan servicing. Accordingly, scheme rates should be held at their present level as indicated in the 10-year financial forecast in Annex A.

The scheme has built up an Emergency Reserve Fund that is anticipated to stand at $16,891 at the end of the 2012-13 financial year. The Scheme Manager advises that ideally the fund should be maintained at a level of approximately $20,000.

It is noted, that there are some further channel clearance works that should ideally be carried out in and around Kauangaroa to complete the initial clearance phase of the scheme, that are not allowed for in the current 10-year financial forecast. It is recommended that these works be undertaken in 2014-15 and that appropriate funding provision, most likely involving a small loan advance, be made in the 2014-15 Annual Plan.

Variances between the estimated cost of works within the respective river reaches, as used in the development of the scheme rating system, and actual costs of those works, can be satisfactorily explained. Accordingly, the present rating system with its component direct benefit differentials is deemed to be fair and equitable.

9. Recommendations

1. That the Liaison Committee's contribution to outcomes, in terms of supporting management and engendering community ownership of the scheme, be recognised.

2. That provision be made in the 2014-15 Annual Plan for additional 'initial' channel clearance works in the vicinity of Kauangaroa, at an estimated cost of $15,000.

3. That in order to better facilitate any future analysis of the rating system, improvements be made to the recording of works completed and associated cost information, in relation to the respective differential rating areas.

4. That the present rating system, including direct benefit category differentials, be confirmed as a fair and equitable means of apportioning the cost of initial channel clearance works and the forecast maintenance programme.

5. That the areal extent of future maintenance work be clearly defined in either mapping or narrative from and communicated to ratepayers.

Appendix A 10 Year Financial Forecast

Last updated
Completed Date

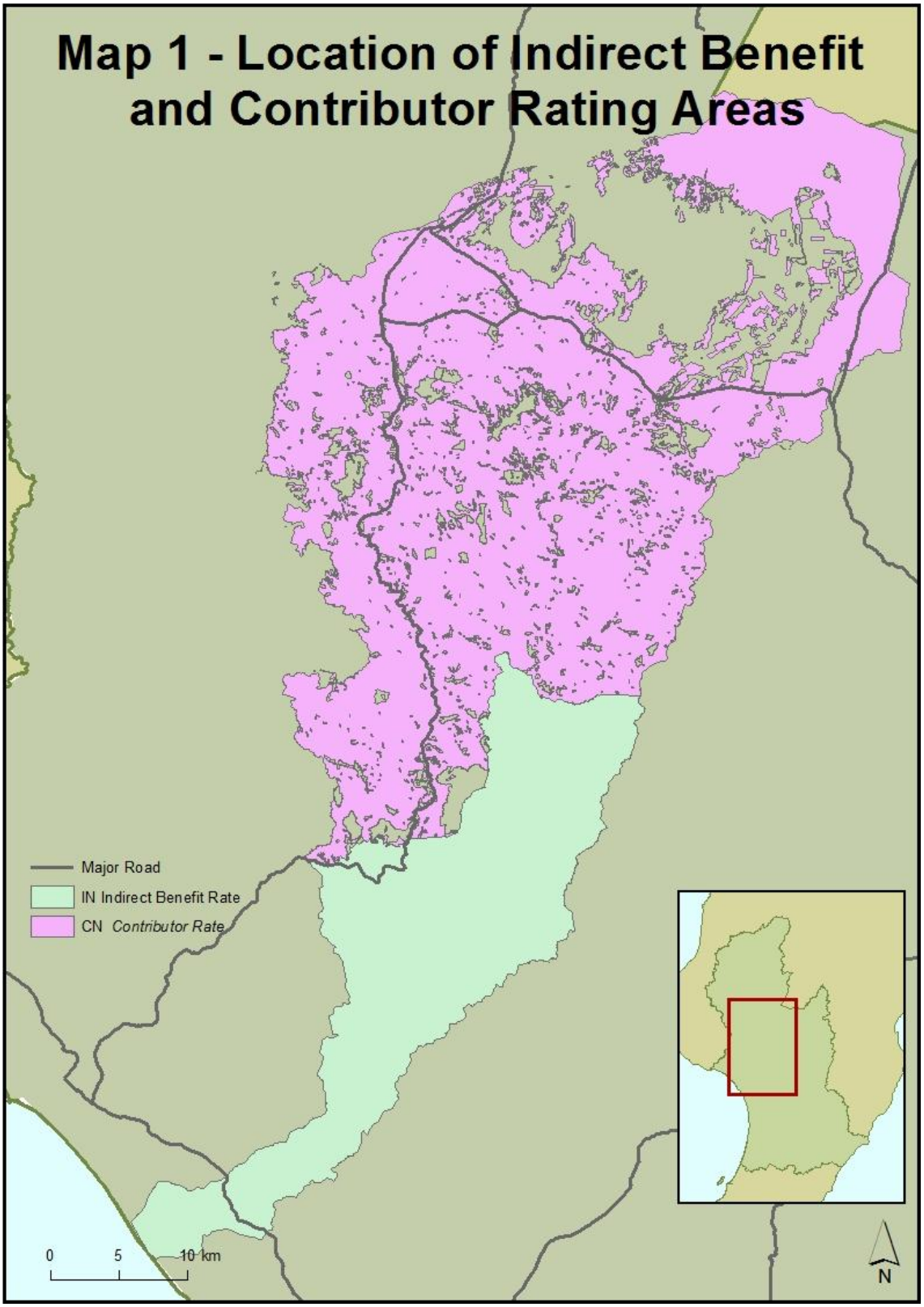
Whangaehu-Mangawhero River Scheme

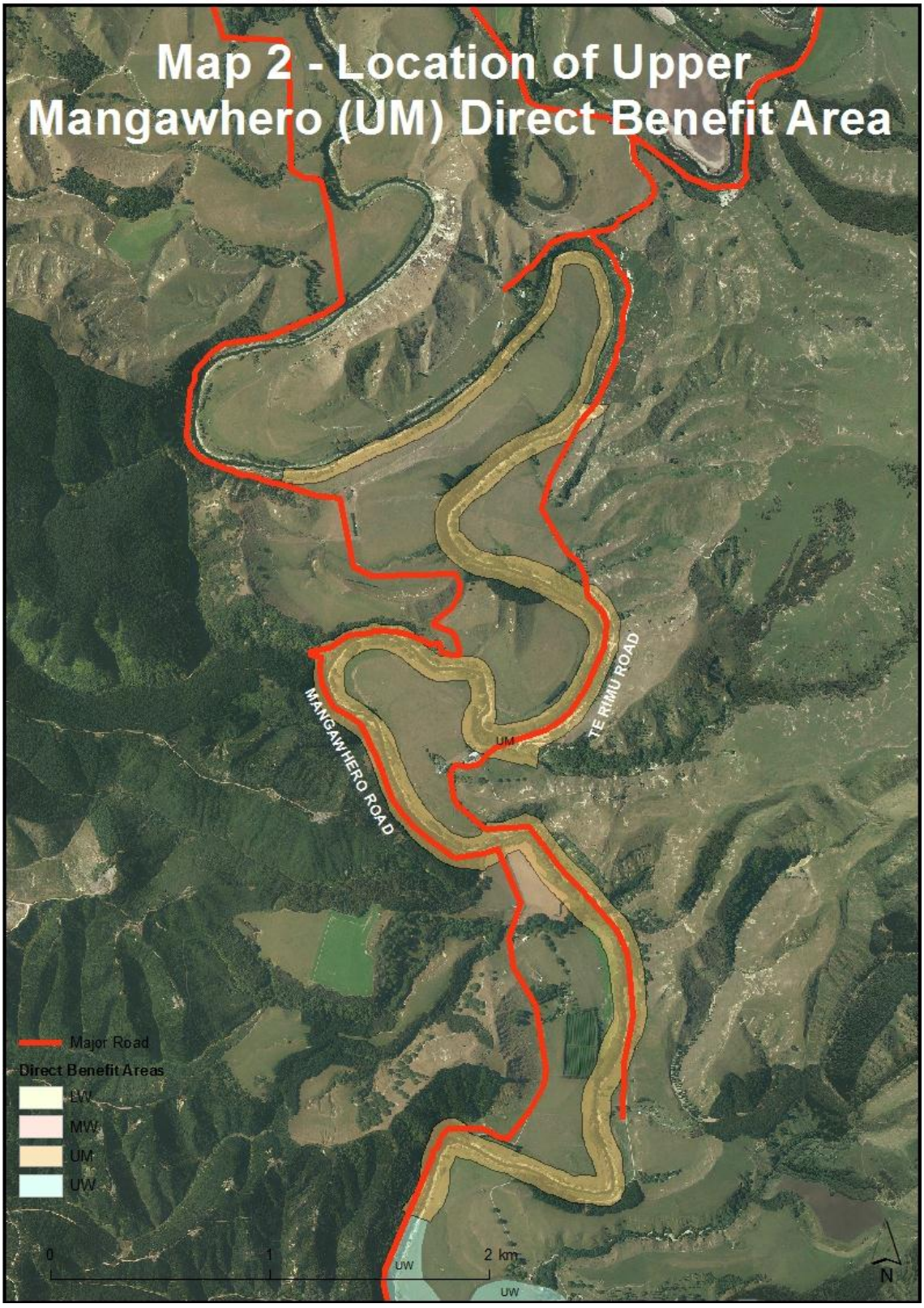
General Rate % 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2

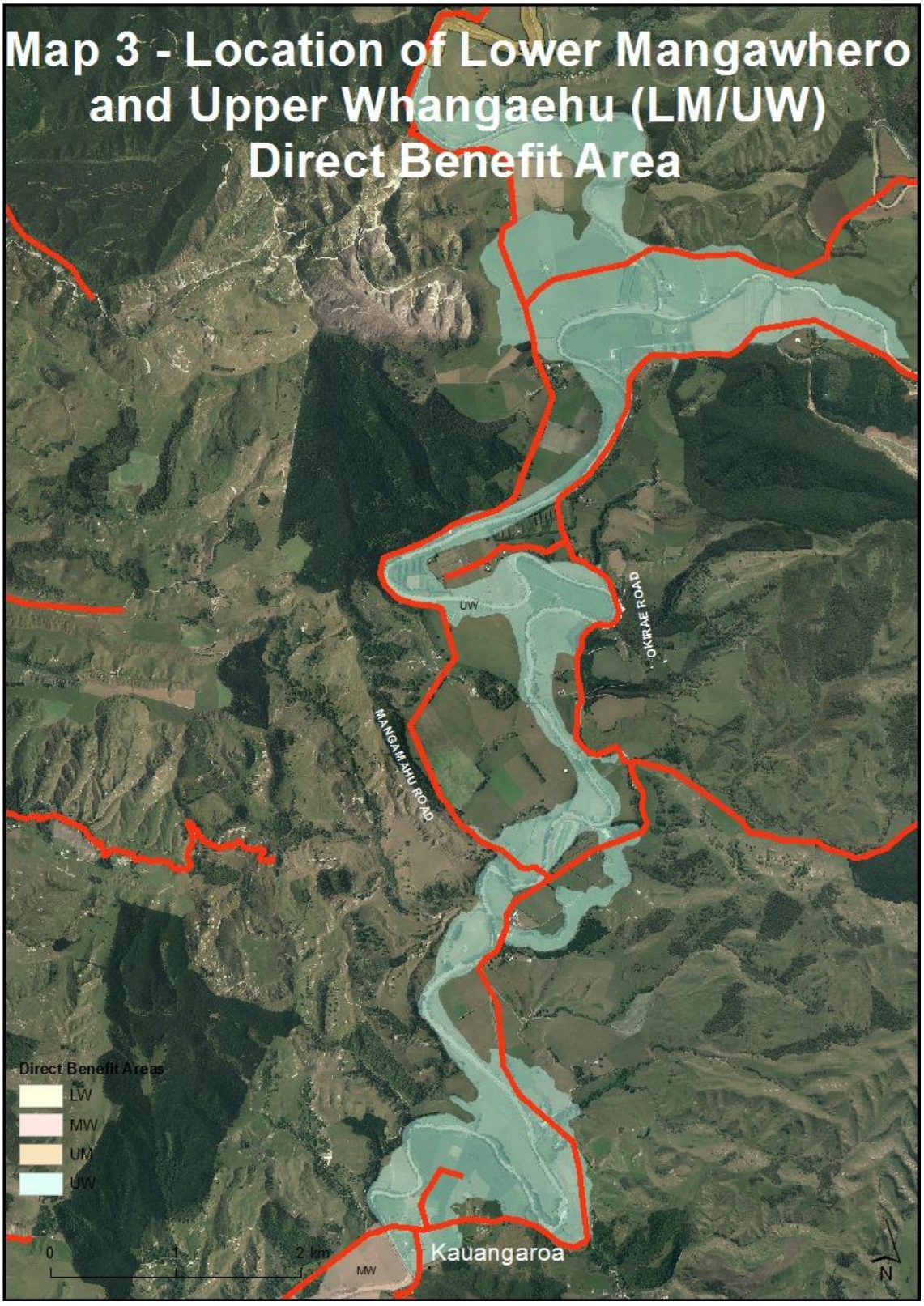
Forecast of Total Expenditure and Funding

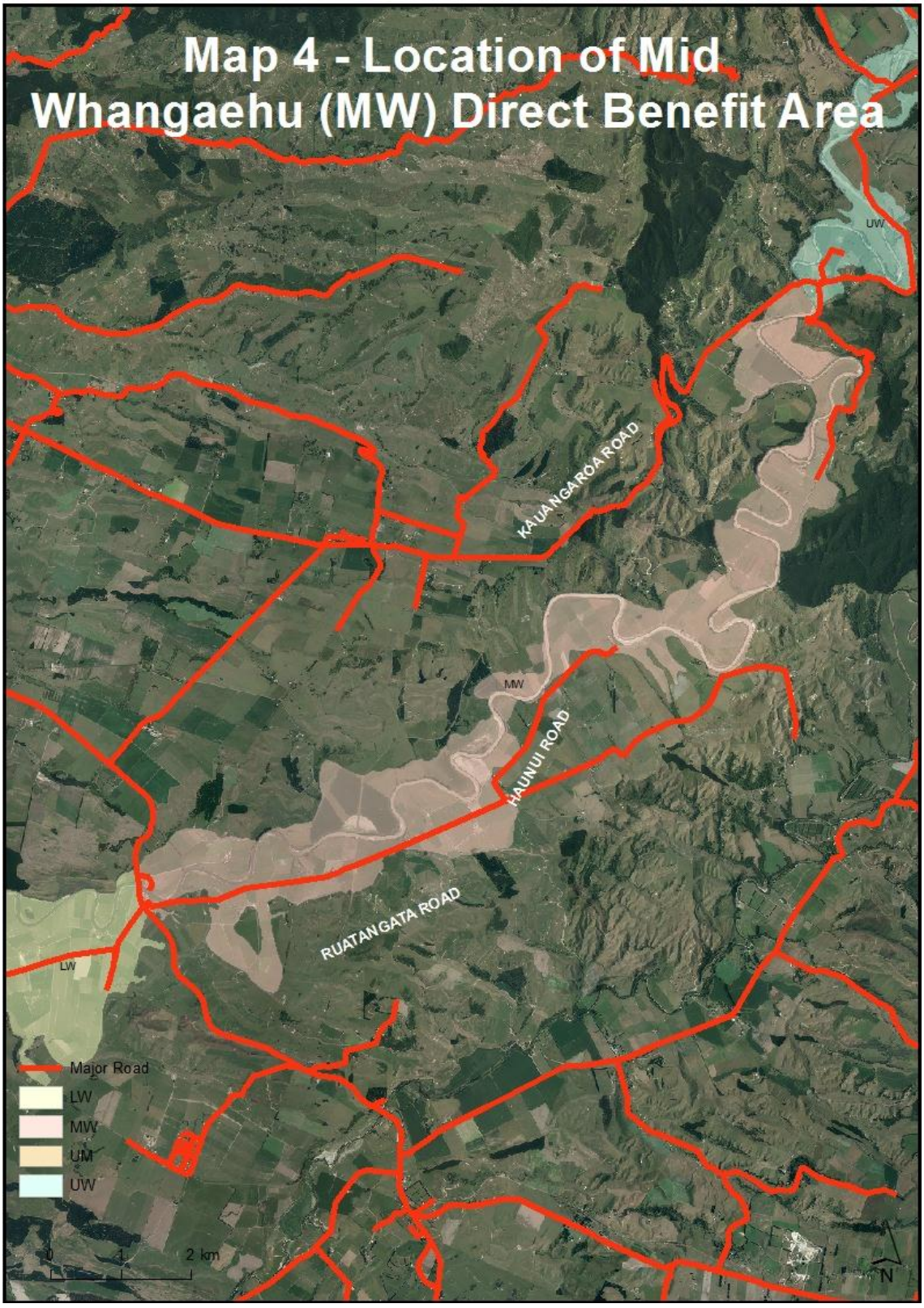
Expenditure Category	100% Funded	Ozone CC	Ugen Acct	Proj code	10/11 Actual	11/12 Actual	12/13 Forecast	13/14 Forecast	14/15 Forecast	15/16 Forecast	16/17 Forecast	17/18 Forecast	18/19 Forecast	19/20 Forecast	20/21 Forecast	21/22 Forecast	31/32
	Flag Y/N	356					-0.14%	1.08%	-9.14%	1.77%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Scheme Balance (At Start of period)					**5464**	**4,581**	**286**	**12,445**	**6,985**	**4,123**	**4,415**	**4,707**	**4,999**	**5,291**	**5,583**	**5,875**	**Comments**
Scheme Rate % Increase						0.0%	1.8%	0.0%	-7.6%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
INCOME																	
Scheme Rates					98,230	98,230	100,000	100,000	92,425	94,094	94,094	94,094	94,094	94,094	94,094	94,094	
General Rate (Plus Adj if any)					22,107	27,705	21,960	27,115	23,072	23,451	23,451	23,451	23,451	23,451	23,451	23,451	
Interim Flat Rate																	
General Rate Cont for Mgmt Costs					-	-	3,800	-	-	-	-	-	-	-	-	-	
Rental & Gravel Extractions		03*22*10	326	B00101		-											
Flood Damage Insurance/Govt Assistance		03*22*10	318	B00101	0	-											
Govt Contributions/Fixed 3rd Party		03*22*10	251	B00101		-											
Recvy-Sundry (Internal) Tsfr from other		03*22*10	389	B00101		-											
Recvy-Sundry (External) Income, etc.		03*22*10	328	B00101	4,315	8,295											
Emergency Reserve																	
Transfer into Scheme from Reserve		03*22*10	480	B00101	-	-		3,000	(3,000)								
Interest		03*22*10	383	B00101	-	890	1,001	1,064	1,017	1,385	1,486	1,595	1,711	1,836	1,970	2,114	
Loans																	
Loan 1 Advance Internal		03*22*10	469	B00101	165,000	155,000	18,000	25,000									
Loan 2 Advance Internal		03*22*10	469	B00101													
Depreciation not funded		03*22*10	470	B00101	-	-	-	-	-	-	-	-	-	-	-	-	
TOTAL INCOME					**289,652**	**290,120**	**144,761**	**156,179**	**113,514**	**118,930**	**119,031**	**119,139**	**119,256**	**119,380**	**119,514**	**119,658**	
EXPENDITURE																	
Works Expenditure																	
Repairs & Maintenance (Staff)		03*22*20	890	B00102	-	-	-	-	-	-	-	-	-	-	-	-	
Repairs & Maintenance (Contractor Services etc)		03*22*20	578	B00102	184,382	194,864	40,400	55,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400	
Repairs & Maintenance					184,382	194,864	40,400	55,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400	
Flood Damage Repairs (Staff)		XXXXX	890	XXXXX	-	-	-	-	-	-	-	-	-	-	-	-	
Flood Damage Repairs (Contractor Services etc)		XXXXX	578	XXXXX	-												
Flood Damage Repairs					-	-	-	-	-	-	-	-	-	-	-	-	
Capex Works-Flood Damage (Staff)		XXXXX	890	XXXXX		-	-	-	-	-	-	-	-	-	-	-	
Capex Works-Flood Damage (Contractor Services etc)		XXXXX	578	XXXXX													
Capex Works-Flood Damage					-	-	-	-	-	-	-	-	-	-	-	-	
Capex (Staff)		03*22*39	890	B00103	-	-	-	-	-	-	-	-	-	-	-	-	
Capex (Contractor Services, etc)		03*22*39	578	B00103	-	-											
Capex					-	-	-	-	-	-	-	-	-	-	-	-	
Total Works Expenditure					**184,382**	**194,864**	**40,400**	**55,400**	**20,400**	**20,400**	**20,400**	**20,400**	**20,400**	**20,400**	**20,400**	**20,400**	
Management Costs																	
Engineering Management (Staff) xxSMEM		03*22*10	890	B00101	39,457	30,798	17,000	32,165	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	
Asset Management Plans (Charge) xxSMPL		03*22*10	876	B00101	-	-	250	250	250	250	250	250	250	250	250	250	
Rates Administration Charge xxSMAD		03*22*10	872	B00101	2,004	2,004	2,002	2,002	2,002	2,002	2,002	2,002	2,002	2,002	2,002	2,002	
Other Costs																	
Valuation Costs	N	03*22*10	858	B00101		-											
Asset Insurance	N	03*22*10	645	B00101	-	-	-	-	-	-	-	-	-	-	-	-	
Hydrological	N	03*22*10	881	B00101	-	1,919	2,078	2,023	2,078	2,078	2,078	2,078	2,078	2,078	2,078	2,078	
Scheme Review/Classification (Staff)	Y	03*22*50	890	B00104	-	-	3,800	-	-	-	-	-	-	-	-	-	
Scheme Review/Classification Misc	Y	03*22*50	854	B00104	-	-											
Scheme Review/Classification	Y				-	-	3,800	-	-	-	-	-	-	-	-	-	
Scheme Associated Design Cost	Y		854		-	-											
Scheme Non Associated Review Design Cost (Not 100% Funded by General Rate)																	
Staff	N		890		-	-	-	-	-	-	-	-	-	-	-	-	
Lease Management	N	03*22*10	874	B00101	-	-											
Misc -Comms & Proms etc.	N	03*22*10	829	B00101	517	845											
Dam Surveillance	N	03*22*10	766	B00101	-	-											
Legal	N	03*22*10	856	B00101													
Total Management					**41,978**	**35,566**	**25,130**	**36,440**	**24,330**	**24,330**	**24,330**	**24,330**	**24,330**	**24,330**	**24,330**	**24,330**	
Depreciation		03*22*10	583	B00101	-	-	-	-	-	-	-	-	-	-	-	-	
Emergency Reserve																	
Interest Transfer		03*22*10	980	B00101	-	890	1,001	1,064	1,017	1,385	1,486	1,595	1,711	1,836	1,970	2,114	(117)
Contribution		03*22*10	980	B00101	15,000	-											
Loan Repayment																	
Interest - Loan 1 Internal		03*22*10	**883**	B00101	26,842	33989	39,771	39459	41321	42074	39790	37335	34696	31859	28809	25531	0
Principal-Loan 1 Internal		03*22*10	**969**	B00101	22,334	29106	26,300	29276	29308	30449	32733	35188	37827	40664	43714	46992	0
Interest - Loan 2 Internal		03*22*10	**883**	B00101	0	0	0	0	0	0	0	0	0	0	0	0	0
Principal-Loan 2 Internal		03*22*10	**969**	B00101	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENDITURE					**290,536**	**294,415**	**132,602**	**161,639**	**116,376**	**118,638**	**118,739**	**118,848**	**118,964**	**119,089**	**119,223**	**119,367**	
Scheme Balance (At end of period)					**4,581**	**286**	**12,445**	**6,985**	**4,123**	**4,415**	**4,707**	**4,999**	**5,291**	**5,583**	**5,875**	**6,167**	
Additional Loan 1 Repayments at Year End	**Add'tl Internal Principal Repayment Loan 1**						40	0	0	0	0	0	0	0	0	0	
Additional Loan 2 Repayments at Year End	**Add'tl Internal Principal Repayment Loan 2**						0	0	0	0	0	0	0	0	0	0	
Emergency Reserve (End of Year)				0	15,000	15,890	16,891	14,955	18,972	20,356	21,843	23,437	25,148	26,984	28,954	31,067	58,456
Loan Period - Loan 1 Internal					17	16	15	14	13	12	11	10	9	8	7	6	0
Loan Period - Loan 2 Internal						0	0	0	0	0	0	0	0	0	0	0	0
Internal Loan (End of Year)				334309	476,975	602,869	594,569	590,293	560,985	530,536	497,803	462,615	424,788	384,124	340,410	293,418	0
Internal Loan 2 (End of Year)					0	0	0	0	0	0	0	0	0	0	0	0	0
Target Emergency Reserve Level					0	0	0	0	0	0	0	0	0	0	0	0	
Emerg Interest Rate assumed to be					6.24%	5.93%	6.30%	6.30%	6.80%	7.30%	7.30%	7.30%	7.30%	7.30%	7.30%	7.30%	-0.20%
Loan 1 Internal Interest Rate:					6.44%	6.13%	6.50%	6.50%	7.00%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	
Loan 1 Internal Interest Only Flag (Y/N)					N	N	N	N	N	N	N	N	N	N	N	N	N
Loan 2 Internal Interest Rate:					6.44%	6.13%	6.50%	6.50%	7.00%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	0.00%
Loan 2 Internal Interest Only Flag (Y/N)					N	N	N	N	N	N	N	N	N	N	N	N	N
General Rate Contribution for Mgmnt Costs Adjustment etc					0	0	0	0	0	0	0	0	0	0	0	0	
General Rate Adjustment					0	0	0	0	0	0	0	0	0	0	0	0	

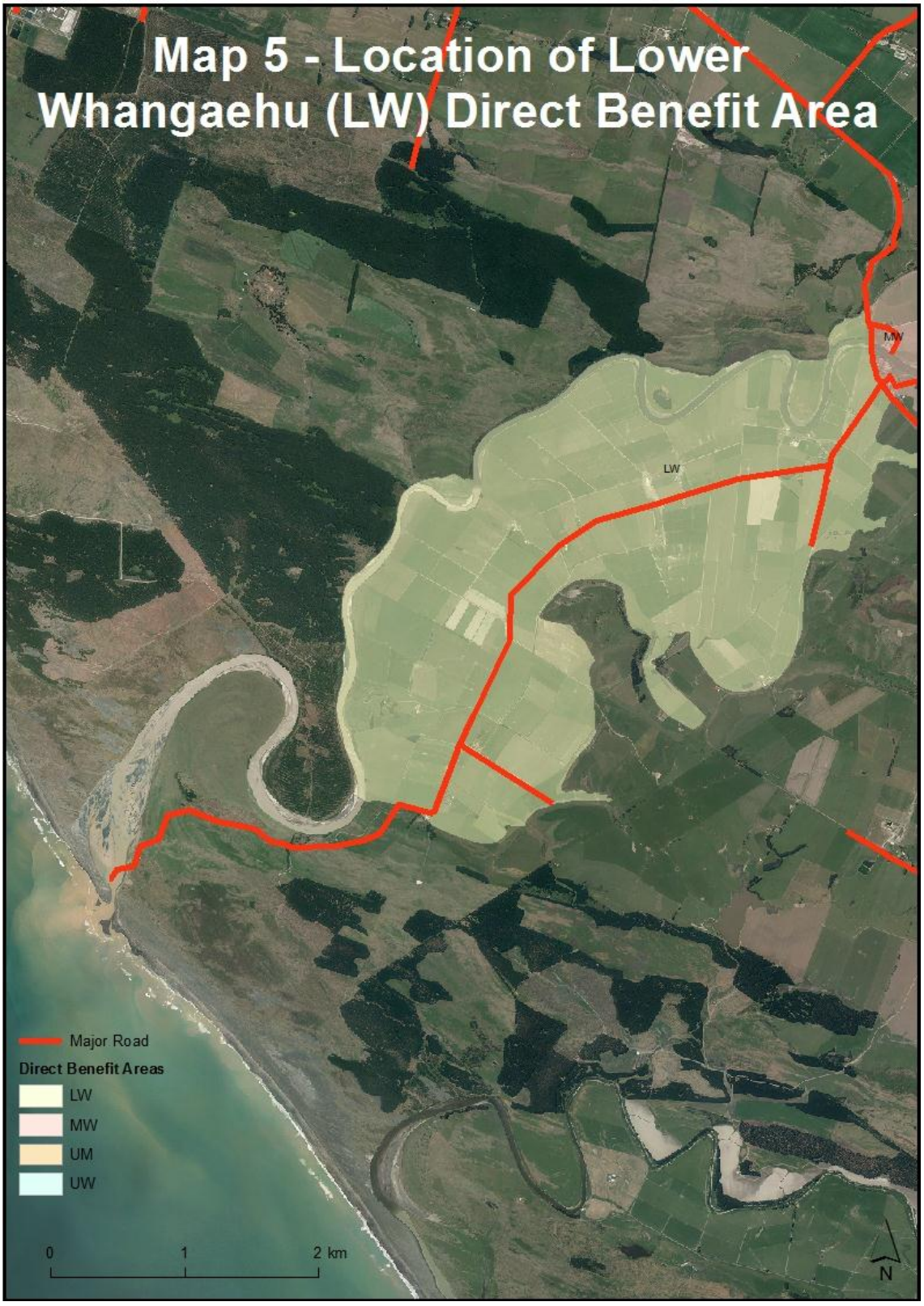
Appendix B Location of Rating Areas


Map 1 - Location of Indirect Benefit and Contributor Rating Areas
Major Road
IN Indirect Benefit Rate
CN Contributor Rate
0
5
10 km
N


Map 2 - Location of Upper Mangawhero (UM) Direct Benefit Area
MANGAWHERO ROAD
TE RIMU ROAD
UM
UW
UW
Major Road
Direct Benefit Areas
LW
MW
UM
UW
0
1
2 km
N


Map 3 - Location of Lower Mangawhero and Upper Whangaehu (LM/UW) Direct Benefit Area
UW
OKRAE ROAD
MANGAMAHU ROAD
Direct Benefit Areas
LW
MW
UM
UW
0
1
2 km
MW
Kauangaroa
N


Map 4 - Location of Mid Whangaehu (MW) Direct Benefit Area
UW
KAUANGAROA ROAD
MW
HAUNUI ROAD
RUATANGATA ROAD
LW
Major Road
LW
MW
UM
UW
0
1
2 km
N


Map 5 - Location of Lower Whangaehu (LW) Direct Benefit Area
MW
LW
Major Road
Direct Benefit Areas
LW
MW
UM
UW
0
1
2 km
N