

Pohangina – Oroua Catchment Control Scheme Scheme Review



FINAL REPORT

JANUARY 2002

Pohangina – Oroua
Catchment Control Scheme
Scheme Review



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Cover Photograph
Pohangina Valley Looking East

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FOREWARD

It is Council's Policy to review the river and drainage schemes under its management, to set the design standards to be maintained, identify improvements, and develop future management strategies.

This review is wide-ranging, examining the erosion control and channel management requirements of the whole Scheme, exploring funding options to enable a greater expenditure on Scheme works without significant impacts on the level of rating required. The review recommends a management strategy for the Scheme for the next 15 to 20 years. It has also clarified the need for a re-classification for rating purposes.

Following the adoption of the Scheme Review by Council in September 2001, the recommendations of the draft review have been amended along with a number of minor technical corrections and amendments to the body of the report.

Many people have contributed to this technical review, which was prepared by John Philpott, Consulting Engineer with particular input from Allan Cook, Area Engineer.

We acknowledge the assistance from ratepayers with the investigation work, the Liaison Committee for helping to target issues and review draft options, and other horizons.mw staff for providing technical support and peer review.

P M Davies
GENERAL MANAGER

C J Lester
CHAIRMAN

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Pohangina - Oroua Catchment Control Scheme Review Summary Report

1. Introduction

This report summarises the objectives, processes, and outcomes of the Pohangina - Oroua Catchment Control Scheme Review undertaken in 2000/2001. It sets out the recommendations adopted by the Council after consultation with ratepayers and other affected parties. It brings together the relevant reports and key documents, including Council meeting papers (Annex A –D).

2. Overview of the Scheme

The Scheme provides landowners within the Scheme area, a degree of protection against the adverse effects of changes in the alignment of the Pohangina and Oroua Rivers and of erosion that can occur when the unstable course sand deposits present in the catchment become exposed. The Scheme also provides small areas with drainage and to a limited extent, controls flooding of some of the low-lying river flats.

The Pohangina Oroua Scheme covers: the main stem of the Pohangina River from its confluence with the Manawatu River to its confluence with the Makawakawa Stream at Komako; and the Oroua River from its confluence with the Kiwitea Stream to the Apiti Bridge. Minor works on some of the smaller tributaries of the Rivers have also been carried out.

Early river control works focused on stabilising the Pohangina River into a 120m wide channel using tree bank protection works and continuous bands of willows along each bank. Work in the Oroua River focused on maintaining a channel width of 100m. Planting work was required in some areas and in other areas work was required to widen the channel to achieve this design width.

Soil conservation works carried out as part of the Scheme concentrated on stabilising the Belmont and Goulters gullies and some other minor tributaries of both the Pohangina and Oroua Rivers.

The Scheme commenced in 1967 but landowners had made significant attempts to control erosion on the two rivers prior to that. Extensive early work was also carried out in the sand country following a very severe storm in 1935 that caused significant erosion in the unconsolidated sand formations that bisect the Scheme area.

The Scheme has been funded by a combination of rates based on a classification carried out in 1967 and Government subsidies which ceased in the late 1980's.

3. Purpose of the Review

The purpose of the review was to assess the present performance of the Scheme and identify how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner.

4. The Review Process

The Scheme review was undertaken by the Consulting Engineer John Philpott with assistance from Consulting Engineer Gary Williams and Area Engineer Northern – Allan Cook. Other Council staff provided technical expertise with scheme operation, forestry information, survey, draughting, rate information, document preparation and peer review.

Extensive community consultation took place including meetings with the ratepayer liaison group, and individual ratepayers. A series of public meetings were also held to explain the findings and recommendations of the review to ratepayers.

5. The Draft Scheme Review

The draft scheme review was completed in June 2001. It included:

- a. an examination of the hydrology, geology, sediment transport and gravel extraction issues;
- b. an examination of the factors influencing channel shape and the rivers response to the actions of the Scheme;
- c. an examination of the effectiveness of the Scheme to date,
- d. the establishment of a set of design principles;
- e. the application of those principles to the Scheme to determine a plan for the future management of the Pohangina and Oroua Rivers;
- f. an examination of the future of the Goulters Gully Forestry;
- g. an examination of the Scheme drainage;
- h. an examination of the equity of the existing classification and rating system; and

- i. the presentation of the long term estimates for managing the Scheme.

On 19 June 2001, the Council endorsed the draft review for public consultation (refer Annex B). Following a programme of consultation with ratepayers and other affected parties in July and August 2001 (refer Annex C), the Operations committee of Council considered verbal and written submissions (refer Annex D). Council subsequently adopted the Pohangina - Oroua Catchment Control Scheme Review at its 18 September 2001 meeting.

6. Minor Technical Amendments

A number of technical amendments have been made to the final report. It is therefore important that the draft reports are not used for the management of the Scheme.

7. Amendments to Recommendations

The Council adopted the Review with some minor amendments to the review, and some amendments and additions to the recommendations. These are set out in detail in Appendix A.

8. Final Report

The final Scheme review report is amended to include all the changes set out in Appendix A. The final report is at Annex A.

9. Conclusion

The comprehensive nature of the Review, and the input from Scheme ratepayers, has provided the Council with a sound foundation for the future management of the Scheme for at least the next 15 to 20 years.

Appendix A

POHANGINA - OROUA CATCHMENT CONTROL SCHEME REVIEW

RECOMMENDATIONS FROM DRAFT REVIEW (including adopted amendments)

RECOMMENDATIONS

Pohangina River

- a. adopt the Pohangina River design alignment as detailed in Section 12 of the Review and as shown on Figure 9;
- b. undertake the protection works in priority order unless flood damage requires work on a reach of the river to be done out of sequence with its priority;
- c. carry out changes to work priorities in the future if required using the principles set out in the Review;
- d. undertake the planting programme on each reach of the river along with the protection works on that reach and layer and maintain existing trees as part of this work;
- e. assign any surplus funds in any year to planting and channel maintenance;
- f. maintain beaches and clear vegetation to ensure the design fairway is kept clear;
- g. obtain as far as possible, agreements with landowners in regard to protection plantings.

Oroua River

- h. implement a \$70,000 annual programme of river management works as set out in Section 13 Table 11 of the Review;
- i. undertake works wherever possible in accordance with the Oroua River Design Parameters as set out in Section 12 table 10 of the Review;
- j. prioritise protection works in accordance with section 13 table 12 of the Review;
- k. carry out changes to work priorities in the future if required using the principles set out in the Review;

- l. carry out planting works to create the 20 metre bands of willows as detailed on Figure 11;
- m. obtain as far as possible, agreements with landowners in regard to protection plantings.

Soil Conservation works

- n. utilise the income from the sale of the Goulters Gully forest to:
 - re-establish the protection forest as soon as possible in such a way as to maximise erosion protection as well as future tree production; and
 - assist with the funding of Scheme works spread over a 25 year period;
- o. prepare a detailed programme for forestry reestablishment for approval by the Scheme Manager prior to the harvesting of the Goulters Gully forest;

Drainage

- p. maintain drains as part of the Scheme only where they provide benefit to more than one property;
- q. fund all future Scheme drainage works through rates over those who directly benefit from those works;

Maintenance

- r. maintain existing Scheme assets ahead of constructing new Scheme assets;
- s. always include the cost of ongoing maintenance works when preparing estimates for new capital works;

Totara Reserve

- t. discuss the future management or of the Pohangina River through the Totara Reserve with the Manawatu District Council and establish a suitable management plan and funding agreement for the maintenance of this section of the River;

Non-Scheme Assets

- u. obtain funding for works required to protect assets where the owner of those assets do not contribute to the Scheme from the asset owner unless otherwise agreed to by **horizons.mw** and the Scheme ratepayers;

- v. share funding of protection works required to prevent riverbank erosion that is threatening both non-ratepayer asset and ratepayer assets except where natural river processes would be accepted if the non-scheme asset was not present. In these cases the total cost of the protection works shall be fully funded by the asset owner;

Consents Classification

- w. obtain a global consent to enable the protection works to be undertaken that are not covered by the Regional Beds of Rivers, lakes and Associated Activities Plan;
- x. reclassify the Scheme;
- y. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme;

Scheme Finances

- z. increase Scheme rates by 2.5% in 2003/2004, by 2.5% in 2004/2005 and by 2.5% in 2005/2006;
- aa. manage scheme expenditure in line with the details set out on table 17 of the review;
- bb. monitor expenditure of Scheme funds over the long term to maintain equity within the Scheme; and
- cc. direct gravel extractors to beaches where gravel extraction would facilitate general river management.

Annex A

Amended Scheme Review

Pohangina – Oroua

Catchment Control Scheme

Scheme Review

(with amendments as adopted by Council)



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EXECUTIVE SUMMARY

Objective of the Review

The objective of the Pohangina Oroua Scheme Review was to assess the present performance of the Scheme and identify how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner.

The Present Scheme

The Scheme provides landowners within the Scheme area, a degree of protection against the adverse effects of changes in the alignment of the Pohangina and Oroua Rivers and of erosion that can occur when the unstable course sand deposits present in the catchment become exposed. The Scheme also provides small areas with drainage and to a limited extent, controls flooding of some of the low-lying river flats.

The Pohangina Oroua Scheme covers the main stem of the Pohangina River from its confluence with the Manawatu River to its confluence with the Makawakawa Stream at Komako and the Oroua River from its confluence with the Kiwitea Stream to the Apiti Bridge. Minor works on some of the smaller tributaries of the Rivers have also been carried out.

Early river control works focused on stabilising the Pohangina River into a 120m wide channel using tree bank protection works and continuous bands of willows along each bank. Work in the Oroua River focused on maintaining a channel width of 100m. Planting work was required in some areas and in other areas work was required to widen the channel to achieve this design width.

Soil conservation works carried out as part of the Scheme concentrated on stabilising the Belmont and Goulters gullies and some other minor tributaries of both the Pohangina and Oroua Rivers.

Issues Considered in the Review

The review sets out the early history of the area and the development of the Scheme that commenced in 1967. Landowners had made significant attempts to control erosion on the two rivers prior to the establishment of the Scheme. Extensive early work was also carried out in the sand country following a very severe storm in 1935 that caused significant erosion in the unconsolidated sand formations that bisect the Scheme area.

The review briefly examines the geology, hydrology and sediment transport and gravel extraction issues that relate to the Scheme. The review examines factors influencing channel shape and the rivers responses to the actions of the Scheme.

The review examines the effectiveness of the Scheme to date, establishes a set of design principles and applies those principles to the Scheme to determine a plan for the future management of the Pohangina and Oroua Rivers. A long term estimate has been prepared considering both future income and all works and non works expenditures. The Appropriateness of the existing classification has been considered.

Findings of the Review

The Scheme has managed to a large degree to stabilise the two rivers. However the flood carrying capacity of both Rivers has not been maintained. Gravel build up and encroaching vegetation has confined the flood flows placing undue pressure on the protection works on the outside of bends. This has caused significant and reasonably regular damage to the protection works and the consequential loss of productive land.

To a large extent this problem has been caused through the expectations by ratepayers that all erosion damage will be repaired whilst at the same time limiting available financial resources. These two factors have resulted in there being insufficient funds to carry out both robust protection works and the necessary channel maintenance.

The soil conservation works have been very successful with both the sand gullies and the minor tributaries being significantly stabilised. Very little work has been required in these areas over the last ten years.

The analyses of past and proposed expenditure in the Scheme have shown that the existing classification was reasonably equitable for the first 10 years or so but in the last 10 years the level of expenditure on the Oroua River has not been aligned with the proportion of rates sourced from the Oroua ratepayers.

The Future Scheme

A set of design parameters have been established for both rivers and applied where appropriate. A complete plan for the future alignment of the Pohangina River below the Totara Reserve has been prepared. However, because the meander pattern in the Oroua River is constantly being restarted from bend distortions and areas of harder materials, Oroua River management cannot be significantly improved by following an overall design channel. An overall plan for the Oroua River has therefore not been prepared. Design channels have however been drawn up for representative reaches and these can be used as a guide to management where applying these design channels would assist river management measures, site by site.

Estimates have been placed on the cost of implementing the Pohangina River design and on a level of expenditure considered appropriate to manage the Oroua River. Under the programme of works set out in the review, expenditure on the Pohangina River would be almost double the existing level for the next five years and then drop back to a level very similar to the existing level. This will be possible because of the improved alignment that will be created by the proposed works, the more robust works being carried out, and because of the maintenance of the flood carrying capacity of the river that will reduce the damage potential during flood events.

The estimate for the Oroua River proposes a level of expenditure forty percent higher than at present. This will enable more robust works to be carried out along with a programme of channel maintenance. It is expected that works will be required on an ongoing basis on the Oroua River because of the inability to apply an overall design.

It is recommended that drain maintenance works continue in the scheme only where the drains service more than one property and that close attention is paid to the ongoing management of the Goulters Gully complex.

The review recommends that the income from the sale of the Goulters Gully Forestry be used to replant and manage the ongoing forestry to provide protection to the unstable sand formations and the remaining funds be used to fund scheme works over the next 25 years.

Conclusions

The Scheme has to a large extent achieved its original objectives of controlling and preventing erosion in the Castlecliffian sand formations and in stabilising the Pohangina and Oroua rivers as nearly as possible in the positions that existed in the late 1960s.

The original scheme envisaged that the ongoing river management work would maintain a clear fairway along both rivers to maintain their flood carrying capacity. This has not been achieved. The Oroua River over much of its length is still too narrow and consequently large flood events cause considerable damage to established edge protection works.

The Pohangina River generally has a channel width close to the original design, but build ups of gravel and vegetation on the beaches have impacted on its flood carrying capacity resulting in continual high levels of flood damage.

Significant increases in expenditure on Scheme works will be required over the next 6 to 7 years to carry out the necessary works and following their completion it will be necessary to retain the level of expenditure at a level 40 to 50% higher than at present to maintain these works and the flood carrying capacity of the channels.

The Pinus Radiata Forest planted to control runoff on the edges of the Goulters Gully complex and make good use of land purchased by the Scheme, are now ready to be harvested. Once replanting and forestry management expenses have been deducted, the income from the sale of these trees will provide the Scheme an annual income. The level of this income will depend on the proportion of the capital spent in the first 5 years. The Proposed expenditure plan for the Scheme will provide an ongoing level of income of approximately \$25,000.

The replanting of these trees will be vital to maintain the stability of the sand gullies and careful management of the area will be required during and following the harvesting work.

The proposed significant increases in scheme expenditure will be funded from the forestry income as well as a small increase in Scheme rates.

The Scheme is being managed in a professional manner with a good balance of input from a Liaison Committee made up of ratepayers within the catchment. The current management system should continue being heavily guided by the river management regime set out in this review. Failure to implement this management regime will not only ensure a continuation of the existing level of flood damage but will probably see an

even greater amount of damage occur as the flood carrying capacity of the channels reduces further.

Recommendations

Pohangina River

- a. adopt the Pohangina River design alignment as detailed in Section 12 of the Review and as shown on Figure 9;
- b. undertake the protection works in priority order unless flood damage requires work on a reach of the river to be done out of sequence with its priority;
- c. undertake the planting programme on each reach of the river along with the protection works on that reach and layer and maintain existing trees as part of this work;
- d. assign any surplus funds in any year to planting and channel maintenance;
- e. maintain beaches and clear vegetation to ensure the design fairway is kept clear;
- f. carry out changes to work priorities in the future if required using the principles set out in the Review;
- g. obtain as far as possible, agreements with landowners in regard to protection plantings.

Oroua River

- h. implement a \$70,000 annual programme of river management works as set out in Section 13 Table 11 of the Review;
- i. undertake works wherever possible in accordance with the Oroua River Design Parameters as set out in Section 12 table 10 of the Review;
- j. prioritise protection works in accordance with section 13 table 12 of the Review;
- k. carry out planting works to create the 20 metre bands of willows as detailed on Figure 11;
- l. carry out changes to work priorities in the future if required using the principles set out in the Review;
- m. obtain as far as possible, agreements with landowners in regard to protection plantings.

Gravel Management

- n. direct gravel extractors to beaches where gravel extraction would facilitate general river management;

Soil Conservation works

- o. utilise the income from the sale of the Goulters Gully forest to:
- re-establish the protection forest as soon as possible in such a way as to maximise erosion protection as well as future tree production; and
 - assist with the funding of Scheme works spread over a 25 year period;
- p. prepare a detailed programme for forestry reestablishment for approval by the Scheme Manager prior to the harvesting of the Goulters Gully forest;

Drainage

- q. maintain drains as part of the Scheme only where they provide benefit to more than one property;
- r. fund all future Scheme drainage works through rates over those who directly benefit from those works;

Maintenance

- s. maintain existing Scheme assets ahead of constructing new Scheme assets;
- t. always include the cost of ongoing maintenance works when preparing estimates for new capital works;

Totara Reserve

- u. discuss the future management or of the Pohangina River through the Totara Reserve with the Manawatu District Council and establish a suitable management plan and funding agreement for the maintenance of this section of the River;

Non-Scheme Assets

- v. obtain funding for works required to protect assets where the owner of those assets do not contribute to the Scheme from the asset owner unless otherwise agreed to by **horizons.mw** and the Scheme ratepayers;
- w. share funding of protection works required to prevent riverbank erosion that is threatening both non-ratepayer asset and ratepayer assets except where natural river processes would be accepted if the non-scheme asset was not present. In these cases the total cost of the protection works shall be fully funded by the asset owner;

Consents

- x. obtain a global consent to enable the protection works to be undertaken that are not covered by the Regional Beds of Rivers, lakes and Associated Activities Plan;

Classification

- y. reclassify the Scheme and ensure that in the long term the funding obtained from each of the catchments is in proportion to the expenditure in each of those catchments;
- z. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme;

Scheme Finances

- aa. increase Scheme rates by 5% in 2002/2003, by 5% in 2003/2004 and by 5% in 2004/2005;
- bb. manage scheme expenditure in line with the details set out on table 17 of the review; and
- cc. monitor expenditure of Scheme funds over the long term to maintain equity within the Scheme.

1. THE SCHEME

The Pohangina Oroua Catchment Control Scheme is essentially a ratepayer collective managed by **horizons.mw**. It provides landowners within the Scheme area, a degree of protection against changes in river alignment causing a loss of productive land through erosion, and against the adverse effects of the erosion that can occur when the unstable course sand deposits present in the catchment become exposed. The Scheme also provides small areas with drainage (by maintaining a network of drains), and to a limited extent, controls flooding of some of the low-lying river flats.

The Pohangina Oroua Scheme area, shown on Figure 2, covers the main stem of the Pohangina River from its confluence with the Manawatu River to its confluence with the Makawakawa Stream at Komako and the Oroua River from its confluence with the Kiwitea Stream to the Apiti Bridge. Both rivers have their headwaters in the Ruahine Ranges. Minor works on some of the smaller tributaries of the Pohangina River have also been carried out.

For the 1998/99¹ financial year the Scheme expenditure was \$208,756, which ranks as the 5th largest river control scheme operated by **horizons.mw**. Of this total \$67,039 was funded by a General Rate contribution. The remaining \$141,717 was funded by ratepayers and from interest off reserves. The relative distribution of the \$141,717 is shown in the Figure 1. The General Rate contribution funded survey work carried out for the scheme review process and the engineering management costs over above the 20% of works costs². Details of Scheme expenditure are set out in the chart in Appendix A.

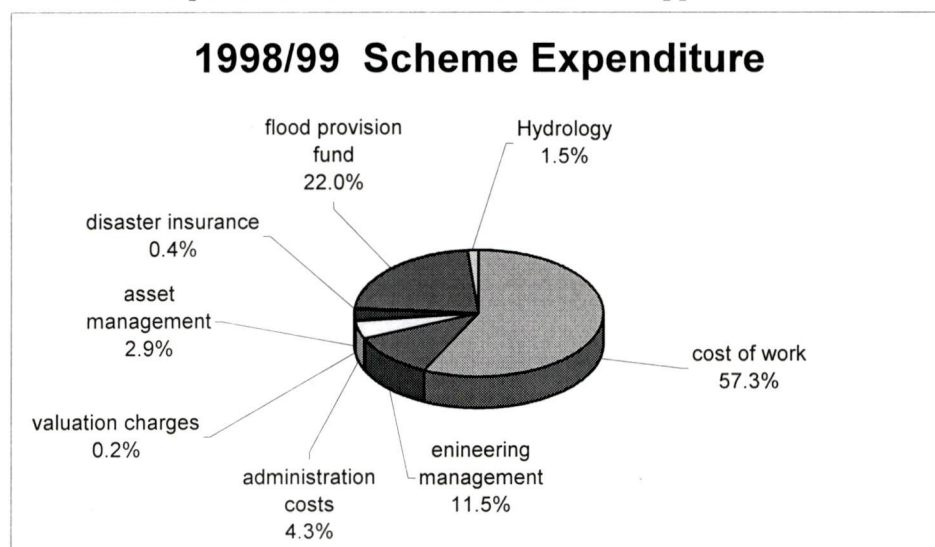


Figure 1. Relative Distribution of 1998/1999 Scheme Expenditure

¹ This year was chosen as it represents a more typical year in the recent history of the Scheme. The repair of severe flood damage that occurred in November 1999 and April 2000 has resulted in a very atypical year.

² Under horizons.mw's new funding policy Review and Classification costs are fully funded from then general rate, along with 20% of all other scheme costs.

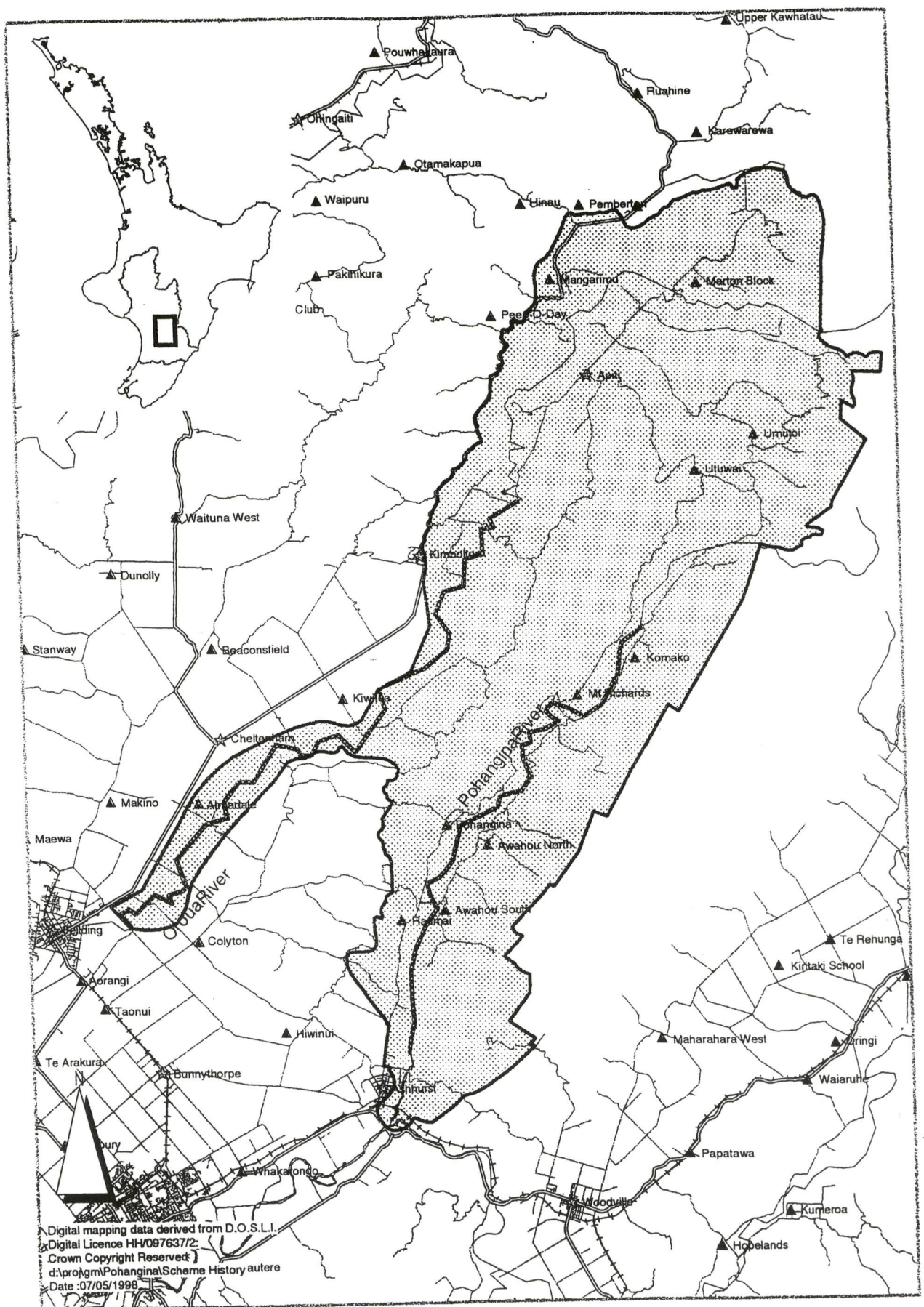


Figure 2. Scheme Map

2. HISTORY

2.1 Pre Scheme History of the Area

Early European settlement commenced in the Pohangina Valley in the 1840's although settlement in any number didn't commence until the 1880's. By 1898 many of the present roads had been formed but were rough and difficult to negotiate in the winter months.

Over this early period, the initial development of farms located on the unconsolidated sand area took place as the New Zealand dairy and meat export industry was being established.

By 1906 a considerable proportion of the indigenous forest had been felled and burnt and English grasses sown. After a few years the initial fertility created from the ash declined and the pasture was invaded with fern and scrub. The use of cattle and subdivision on smaller blocks helped to prevent reversion and a rotation of cutting and burning scrub every few years generally kept the pasture clear.

By the 1930's increased runoff from the poor pasture and the decay of the tree roots increased the land's susceptibility to erosion. In 1935 an exceptionally severe storm resulted in accelerated gully erosion in the unconsolidated sand country. In each successive high intensity storm, further gullies began actively eroding whilst more modest storms kept the erosion active once it had begun.

The 1859 survey maps of J T Stewart showed the Pohangina River as a narrow (140m) channel meandering between heavily vegetated banks. 1906 to 1910 photographs of the area showed that the Pohangina River had become a wide (350 to 370m) braided channel with eroded banks and little evidence of indigenous or exotic riparian vegetation. Present Channel widths range between 50 and 250 metres but are more commonly about 70 metres. Over most of the channel length there are narrow bands of willow protection work along both banks.

In 1944 the Manawatu Catchment Board was constituted under the Soil Conservation and Rivers Control Act 1941 and almost immediately the Board initiated research on soil conservation techniques within its district. The control of erosion using engineering structures, vegetation and vegetative structures, and improved livestock and pasture management techniques were investigated.

Prior to the formation of the Catchment Board river protection works had been intermittent and dependent on finance available from property owners. Considerable lengths of bank protection had been established along the Oroua River with some had been established along the Pohangina River.

The initial Pohangina Oroua Scheme report was produced in March 1964 and no further river control work was carried out until scheme funds became available in 1967. Soil conservation works continued over this intervening period funded from the Board Works programme.

2.2 History of the Scheme

The Soil Conservation and Rivers Control Council gave financial and technical approval for the Scheme in 1966.

The Scheme was established with two main objectives. These were:

- to control and prevent erosion in the catchment area and to achieve maximum economic production taking a long term view; and
- to stabilize the Pohangina and Oroua river channels as nearly as possible in their position at that time and to carry out work to stabilise the larger tributaries. These included Beehive Creek, Coal Creek, the Mangoira and Mangahuia Streams and the tributaries of the Pohangina running up into the Ruahine Ranges.

Lesser objectives were:

- the control of flooding through the maintenance of the stopbank that existing at the time the Scheme was established;
- the reclamation of large areas of bare shingle or areas covered in lupin; and
- the improvement of existing drains and the construction of drains into swampy areas.

The financial approval was for \$228,000 at a \$3 for \$1 subsidy and a further \$60,000 was given from the Soil Conservation and Rivers Control Council as a special grant. The total amount was spent in a series of annual works programmes between February 1967 and March 1978.

2.3 The Original Soil Conservation Programme

Two broad categories of conservation work were recognised as the programme of scheme works was developed. These were farm benefits and community benefits.

Farm benefits covered all work that was of direct benefit to individual farms. This work was to be carried out with normal soil conservation subsidy under a guidance provided by a Soil Conservation Farm Plan.

Community benefit covered work with considerable offsite impact i.e. the reduction of sediment input to the rivers. The work was to be carried out to overcome serious erosion and the costs were to be borne entirely by the Scheme. The objectives for this type of work were:

- the control of active erosion and major sources of sediment principally in the Caslecliffian sand formations;
- the storage of erosion products; and
- the prevention of gully development.

Groenendijk³ reviewed the soil conservation work completed in the first five years and then again after the next five years in 1971 and 1977 respectively. As a result of his reviews a number of changes were made to the gully planting programmes, moving away from fencing to using larger planting protected from stock with netlon sleeves. Gully structures had been successful but flood detention dams proposed for steep narrow valleys had not proceeded on the grounds that there were not cost effective. 160 ha of land had been voluntarily retired in the first five years of the Scheme.

Concrete block drop structures were found to be successful in controlling gully erosion as these gave almost instant results. A number of these were then used in Culling's Gully and the Goulter-Belmont Gully complex.

Details on the soil conservation work carried out up to 1979 is set out in the 1979 review by E C O'Connor and G G Brougham⁴ and in the two reports by Groenendijk 1971⁵ and 1977⁶

The 1979 Review recommended that the works that were identified in the initial Scheme, which had not been completed prior to the 1979 review, be completed.

2.4 The Original River Control Programme

River Control work on the Pohangina River proposed to stabilise the channel at a width of 120 metres, as nearly as possible in the alignment at that time by means of tree bank protection where necessary and elsewhere by planting willow and poplar to form a continuous growth 10 metres wide along both banks. Plantations of trees were proposed to be planted behind the willows and

³ Gerald Groenendijk was employed by the Catchment Board as a soil conservator during the period of Scheme implementation and was heavily involved in the soil conservation works within the Scheme.

⁴ Pohangina-Oroua Catchment Control Scheme Review , Scheme Design and Works 1980-1985, prepared in 1979.

⁵ Pohangina –Oroua Catchment Control Scheme, Soil Conservation 1967-1971, MCB report unpublished. 1971.

⁶ Pohangina –Oroua Catchment Control Scheme, Soil Conservation. A review of the first 10 years of operation. MCB report unpublished. 1977.

in other suitable sites for groyne work in future years. These works were planned to be carried out from the confluence with the Manawatu River to the gorge at 21 Mile. Lighter work was proposed above that point to the Piripiri Bridge.

Fencing work was proposed along both banks to exclude stock from growing areas. Abandoned river channels were to be blocked off using groynes and banks. Four areas covering 450 ha were to be drained.

Works on the Oroua River proposed to stabilise the channel as far as possible in its position at that time. This would be achieved by thickening up and improving the willow and poplar planting to form a continuous growth 10 metre along both banks particularly on the outsides of bends. The channel was proposed to be 100 m wide and some trees would need to be removed to achieve this. Planting of trees for bank protection was to be carried out as part of the Scheme. These works were proposed to be carried out from the confluence with the Kiwitea Stream to the London's Ford at 25 mile. Lighter work was proposed above that point to the Apiti Bridge.

Four areas covering 250 ha were to be drained.

Note only one large area is currently drained.

3. GEOLOGY

The headwaters of the Pohangina and Oroua Rivers lie in the Ruahine Range. This Range is made up of highly fractured and deeply weathered greywacke (alternating siltstone and sandstone) that has been eroded into very steep land of ridges and valleys. Away from the range the rivers flow within entrenched valleys, cut deeply into synclinal folds in old uplifted peneplains (of marine deposits). The faults of the uplifted Ruahine Range and the syncline/anticline folding have a NE trend. The uplifted peneplains are tilted, and the deep entrenchments expose, in places, thick deposits of coarse poorly consolidated sands, along with layers of pumice and greywacke derived gravels. Severe gully erosion occurs where these coarse sand deposits are exposed.

The primary supplies of river channel bed material are gravel from the rangeland greywacke and sand from the exposed sand deposits of the peneplains. There is a relatively low input of gravel from the Oroua River headwaters, with the Pohangina River having a more eroded headwater, and many tributaries coming from the range land along its course. On the other hand, there is a much more substantial input of sand to the Oroua River, than to the Pohangina River.

4. Hydrology

There is a steep rainfall gradient from the peneplains up into the Ruahine Range, and the orographic influence of the range is stronger the more intense the storm. Most floods occur in autumn and winter, from about May to September, when monthly average discharges are high. However, intense short duration storms can occur from January to March.

The flood flows of the Pohangina are relatively higher (per unit of catchment area) than the Oroua, and while rainfall patterns generally affect the river catchments in a similar way, the relative magnitude of flood flows down the two rivers can be significantly different.

Flood flows follow complex patterns, with an interspersing of quiescent and stormy periods. The available records, since the 1940s, show periods of greater flood intensity around 1948-50, 1965-67, 1970-72, around 1975, 1979-81, 1988 and recently from 1999. There was also a single large flood event in 1992, and another significant one in 1985.

Appendix B sets out the historical flood pattern for the two rivers.

5. SEDIMENT TRANSPORT AND GRAVEL EXTRACTION

5.1 Sediment Transport

The channel material of the Pohangina River is mainly gravel derived from the Ranges, and re-worked down the channel. The material moves down in a complex pulsing way, with continual channel change, of both bed and banks. The cross section surveys carried out over recent decades show little in the way of overall trends, with perhaps some slight degradation along the lower reaches. Localised variations occur, especially at natural controls on the channel migration, and at artificial constrictions, such as bridges.

There is a relatively lower input of gravel to the Oroua River, and the available cross section data shows some overall degradation trend up to Te Awa. This degradation has increased the undercutting of banks, with an associated trend towards more asymmetric sections at bends. At the same time, there has been a compensating silting along the channel banks, especially within the willow edge vegetation.

The degradation trend is probably a response to channel confinement, and except in very localised areas is not due to the extraction of gravel bed material – which has not been excessive.

The large inputs of sand to the Oroua River, which have occurred along the areas of exposed sand deposits, have affected the channel form downstream. The erosion of bank material along this river gives rise to relatively high suspended silt loads.

5.2 Gravel Extraction

The Pohangina River is a primary source of gravel for the Lower Manawatu River. The lower part of the Pohangina River, downstream of the Saddle Road Bridge and at the confluence are, or have been, sites of significant gravel extraction. Gravel accumulates at these sites which are accessible and in reasonable proximity to their end use.

There are a variety of potential adverse effects associated with over-extraction from these sites, including:

- destabilisation of bridge sites;
- damage to scheme works; and
- starvation of the Lower Manawatu River of gravel.

Several attempts have been made to assess gravel transport rates and volumes for the Pohangina River including:

- channel efficiency surveys of the entire river carried out in the 1970's and in the early 1990's;
- gravel monitoring between Totara Reserve and Komako during the late 1970's and early 1980's;
- gravel monitoring in the vicinity of the Saddle Road Bridge during the mid to late 1980's;
- basic monitoring surveys of the confluence area at various times.

From these surveys and monitoring, annual bed load transport rates have been estimated to be:

- from the Channel efficiency surveys, c 20,000 m³
- from the Totara Reserve monitoring reach, c 18,000 m³

Because of the potential for over extraction from the Pohangina River and its impact on the Lower Manawatu gravel resource, a maximum annual extraction volume of 25,000 m³ was set for the Pohangina River in the Regional Beds of Rivers, Lakes and Associated Activities Plan.

The setting of a volume for the River does not provide any guidance on how the available resource should be allocated, nor where extraction should cease / be encouraged along the River. There is concern that most of the extraction would be concentrated in the reach between the Saddle Road Bridge and the confluence.

To ensure that this does not occur the future granting of gravel extraction consents will be managed to ensure that:

- extraction volumes from this reach will be restricted and extractors encouraged to find alternative sites on the Pohangina River; and
- extraction from berm and island areas be encouraged (as apposed to active river extraction).

6. CHANNEL SHAPE

The rivers are relatively steep gravel carrying rivers, with varying channel form depending on variations in sediment loading and riverside vegetation. The channel form can vary over both space and time, from a single thread meandering form, to semi-braided or a split channel form with quite long relatively straight reaches. Thus, as the intensity of floods vary and the gravel bed material moves down the river channel in pulses, the channel form changes. During quiescent periods and where there is a relative deficit of gravel bed material, the river channel will develop a well-defined meander with a single thread form. During periods of more intense floods and where there is a relative accumulation of gravel bed material, the river channel will develop a semi-braided form, or if there is confining edge vegetation, the river will respond by breaking out and forming long parallel channels around the vegetation. This breaking out and development of long split channels is called ana-branching, to give what is called a anatomising channel form. This form is common along rivers where the spread of tall tree vegetation confines or restricts flood flows, and disrupts the normal channel form adjustments.

The channel reaches that are semi-braiding, single thread meandering or straight, vary along the rivers, although a particular form can predominate along a given reach due to the presence of natural control features, such as bluffs, or artificial constrictions such as bridges. In general, river management should allow for the development of the full range of likely channel forms all the way along the rivers.

There are different meander forms that are used by the rivers to make up the different overall channel patterns, and the size and shape of these meanders can be determined from empirically derived relationships as well as from a study of aerial photography. The flood pattern of the rivers is reasonably well known from the hydrological records, and the size of the bed material has been assessed from samples taken along the rivers. Some general information on river grades is given in the 1979 Scheme Review, based on cross section survey data. Using this information on channel slopes, bed material sizes and dominant flood flows, the widths of the various meander channels (in metres) have been assessed. These are set out in Table 1.

Table 1: Pohangina River and Oroua River Meander Widths

Meander Type	Oroua	Pohangina
Minor threshold of motion meander (Smallest well formed meander)	20 m	30 m
Major threshold of motion meander (Longer slope adjusting meander)	35 m	60 m
Live bed flow dominant meander (Overall active width meander)	65 m	110 m

These widths are quite consistent along the managed reaches of the rivers, despite changes in bed material size and channel grade.

The threshold of motion meanders tend to oscillate from one form to the other down the river, with a continuous meandering starting from control points, such as bluffs, break outs, bed accumulations etc, or artificial controls of managed vegetation or structures. The overall flow dominant meander is less well defined in these gravel bed rivers, but is the general form within which single threads or semi-braiding patterns form.

7. SCHEME & RIVER RESPONSES

The channels of the Pohangina and Oroua rivers have been confined by farm development and river works over a long period of time, prior to the Scheme, as well as by Scheme management. There have been on going attempts to suppress the semi-braiding response of the river, and following breakouts, to re-instate the single thread channel. Thus, following the larger flood events when the river responds to its confinement by widening and/or breaking out, river management has re-imposed a narrow single thread channel form. This form will persist naturally, with a relatively low level of management, during quiescent periods and along reaches of relative bed material deficit. Difficulties arise as an aggradation phase moves into a reach, while the re-instated protection works are again destroyed when the next period of intense floods occurs.

Overlays of the river channels, taken from the 1985, 1992 and 2000 aerial photography, indicate little overall change in the position and form of the rivers. This similarity over time is however mainly due to the continual management of the rivers. The original legal surveys of the channel of the two rivers show how far the existing general river alignment has been displaced from the position it was in when these early surveys were undertaken.

The Pohangina River, for obvious reasons, is more braided than the Oroua River, and along this river there are reaches that have remained more braided. This would be partly due to the level of management exercised, given prevailing river conditions along a reach, and partly due to natural differences, because of valley slope adjustments, bluff controls etc.

The Oroua River has been more confined and managed by vegetation, and where there is semi-braiding it is less intense than on the Pohangina River. The Oroua is more easily constrained by vegetation, but responds by entrenching, and can develop deep asymmetric sections at overtight bends.

There is a general tendency for bank erosion to occur where the river channel is narrow and of restricted amplitude, and where overtight bends have developed due to either natural controls or because of the partial restraint of edge vegetation. However, whether bank erosion is of concern depends on the prevailing condition of the river (semi-braided or single thread) and the level of management being exercised.

8. HAZARD AREAS

The areas of hazard from bank erosion, channel break outs and flooding are, in general terms, well defined by the terrace system within which the rivers flow. There is a major entrenchment due to the down cutting into the old marine surfaces, with high terraces being formed along both sides of the rivers. Within this major entrenchment there is some more complex terracing, and on the valley floor there is some minor terracing from recent channel migration and re-working of the valley deposits.

The overall risk area can be readily identified from aerial photography, using stereo pairs to observe relief. The finer detailing of the hazards is more difficult to achieve, although some recognition can be given to the minor terracing on the valley floor.

The higher risk areas have then been defined from the aerial photography, without field checking, to give a general risk identification, without any specific division into risks from flooding, channel breakouts and bank erosion. Any activities within these identified areas should then be assessed in terms of the likely risks from these hazards.

The risk to the assets on the valley floor including productive farmland, roads, bridges and farm access has been taken into consideration when prioritising the proposed future works described in Section 12 and 13.

9. SCHEME EFFECTIVENESS TO DATE

Comparing the outcomes of implementing the Scheme over the past 34 years with what was planned to be achieved when the original Scheme Plan was prepared in 1964, will provide not only an appreciation of the success of works carried out to date but also a guide as to what should be continued and what could be changed to ensure the Scheme meets the needs of present and future ratepayers.

The principle objectives of Scheme were:

- to control and prevent erosion in the catchment area and to achieve maximum economic production taking a long term view; and
- to stabilize the Pohangina River and Oroua River channels as nearly as possible in their position at that time and to carry out work to stabilise the larger tributaries.

The works in the Scheme have been divided into two distinct activities managed quite separately for a number of years. These are the soil conservation activities that had a high profile in the early years and the river control activities where nearly all the recent focus has been. This shift in focus has been seen by some as the Scheme neglecting its soil conservation responsibilities but the proven success of the soil conservation works and the ongoing need for river control works justifies this shift.

9.1 Soil Conservation Activities

The original Scheme divided the soil conservation works into two categories: being farm benefits and community benefits.

The farm benefit work has been carried out through the development of soil conservation farm plans and has been funded by direct landowner contribution and subsidised initially as “Board Work” and more recently as part of the **horizons.mw**’s Soil Conservation Environmental Grant Scheme. A large number of Soil Conservation Farm Plans have been prepared for the Scheme area.

Soil conservation works providing a community benefit have involved the control of active erosion in the Castlecliffian sand formations, the storage of erosion products; and the prevention of gully development. The majority of this work has been funded by the Scheme.

The principal focus of the Community Benefit work has been on the stabilisation of the Goulters / Belmont Sand Gullies and other gullies draining to the Pohangina River where gully erosion was occurring in the unconsolidated sand formations. Other work that has provided community

benefit involved the stabilisation of the streams that feed to the Pohangina River from both the steep unstable hill country to the west of the Pohangina and from the foothills below the Ruahines to the east.

Goulters Gully Area

Land clearance for farming, the breakdown of the root material after 30 to 40 years and two intensive storms in quick succession in 1936 caused severe gully erosion that cut through three properties and rendered nearly 200 hectares useless in the area now known as the Goulters Gullies.

One hundred hectares of the gullies were placed in the control of the Manawatu Catchment Board in 1958 and remedial work carried out on both Board and Private land. Willow and poplar planting was carried out along with the construction of detention dams and drop structures.

Fencing was carried out to keep stock out of the gullies where the nature of the gullies enabled stock to enter. Further fencing was carried out as the gully floor stabilised and the gully sides battered off giving access to stock.

Many of the early gully control structures failed as their foundations were undermined and these were not replaced. One of these structures has survived as it is surrounded by heavy planting. Any further grade control structures will only work when combined with heavy planting.

Major work carried out as part of the Scheme, to productively utilise the Scheme owned land and to control runoff, involved the planting of more than 40 hectares of *Pinus Radiata* forestry, the most recent completed in 1994 to overcome problems in Face Gully. The planting of pines trees has significantly reduced the runoff into the gullies at their heads and the gully control structures referred to above have not been replaced, as there is no longer a need for them.

Care will need to be taken when the trees are harvested to ensure that runoff does not start a new phase of gully erosion.

The majority of these forestry assets are now mature and plans to harvest them are currently being prepared. Refer to Section 14 on the Goulters Gully Forestry.

Following the stabilisation of the base of the gullies and the resulting stabilisation of the gully sides, natural revegetation has occurred on the more shaded sides of the gullies. The exposed sunny gully sides are still fairly bare and wind and rain are now the main erosion elements. This erosion is however very slow and not of great concern to the **horizons.mw** staff who manage the gullies. The success of the erosion control work can be measured by the fact that no works have been required in these gullies since 1994 other than the control of animals.

Details of the soil conservation work carried out up to 1979 are set out in the 1979 Review by E C O'Connor and G G Brougham⁷ and in the two reports by Groenendijk 1971⁸ and 1977⁹. Copies of the two unpublished reports are included in Appendix C.

9.2 River Control Activities

The 1964 Scheme proposed to stabilise the Pohangina and Oroua Rivers as nearly as possible in the alignments that existed at that time by carrying out tree bank protection and tree planting works to form a continuous band of willows along both banks of both rivers. Prior to the Scheme, protection works had been carried out by landowners over fairly long lengths of river and some farmers had attempted to get ahead of the river by planting up banks which could be attacked in the future.

Pohangina River Channel Geometry

The Scheme proposed that the Pohangina River channel be 120 metres wide between 10 metre wide bands of willow growth and that the channel be kept clear of weeds, logs and other trees. It was proposed that the entire length of both banks be fenced to exclude all stock. Existing stopbanks were to be maintained, and some abandoned river channels, that still carried floodwater, were to be closed off.

Without carrying out extensive time consuming research into past reports, it is not possible to readily determine what works were actually carried out in the early stages of the Scheme. However it can be seen from the series of aerial photographs taken in 1950, 1971 and 2000 set out in Figure 3 that the principle objective of the Scheme has been achieved as a result of the works.

These photographs show that the river no longer has a wide braided bed and below the Totara Reserve, it has been transformed into a relatively narrow single thread channel, similar, in some extent, to the river around the time of the early European settlement in the mid 1800s. In 1859, the Surveyor J T Stewart described the Pohangina River as having a narrow (140m wide) channel meandering between heavily vegetated banks. Above the Totara Reserve the river is now much narrower than it was prior to the Scheme but is still generally much wider than the river below the Reserve.

Even where the river has been narrowed up, a number of significant factors exist today that did not exist in the mid 1800s that contribute to the need for the ongoing high levels of expenditure to maintain the channel in its existing

⁷ Pohangina-Oroua Catchment Control Scheme Review , Scheme Design and Works 1980-1985, prepared in 1979.

⁸ Pohangina –Oroua Catchment Control Scheme, Soil Conservation 1967-1971, MCB report unpublished. 1971.

⁹ Pohangina –Oroua Catchment Control Scheme, Soil Conservation. A review of the first 10 years of operation. MCB report unpublished. 1977.

alignment. These differences include the change from a river flowing between heavily vegetated river banks to a river edged with a relatively narrow band of willows, and large vegetated gravel beaches that form and confine the river into a deep channel on the outside of the bends.

It can be seen from Figure 4 that as the channel has been narrowed up over the past 30 years, the flood damage sustained has increased significantly for the same sized flood events.

It should be noted that the 1999 flood damage is very high because of the change in the type and extent of repair work that has been carried out to repair the flood damage that occurred in two significant flood events in 1999 and 2000.

The 1979 review indicated that the need for the high levels of ongoing maintenance and flood damage repair were possibly due to shortcomings in the original scheme design with respect to channel width, amplitude and radius. This argument is supported by flood damage reports that state that bank erosion persists in reaches with a narrow channel width and restricted amplitude.

Close examinations of the 1964 and 1979 Scheme reports however show that the channel width and radius of curvature recommended in each report were very similar. The only major difference in the two reports was the meander length. The 1979 report recommended a meander length approximately 20% longer than the 1964 figure. The meander length in the Pohangina River however is constrained by the many bluffs and other fixed points on the river. The design analysis carried out as part of this review has identified a very similar channel geometry to that set out in the 1964 and 1979 reports and it would therefore be reasonable to assume that the persistent erosion was not caused by a shortcoming in the design but instead from a shortcoming in its implementation.

Investigation and design work carried out as part of this review, and design work carried out following the April 2000 flood event¹⁰ identified that the critical factor in ensuring that the Scheme is effective is the need to maintain an effective river channel. That is one with the ability to pass flood flows without concentrating a high proportion of the river's energy into a very narrow band especially on the outside of a bend.

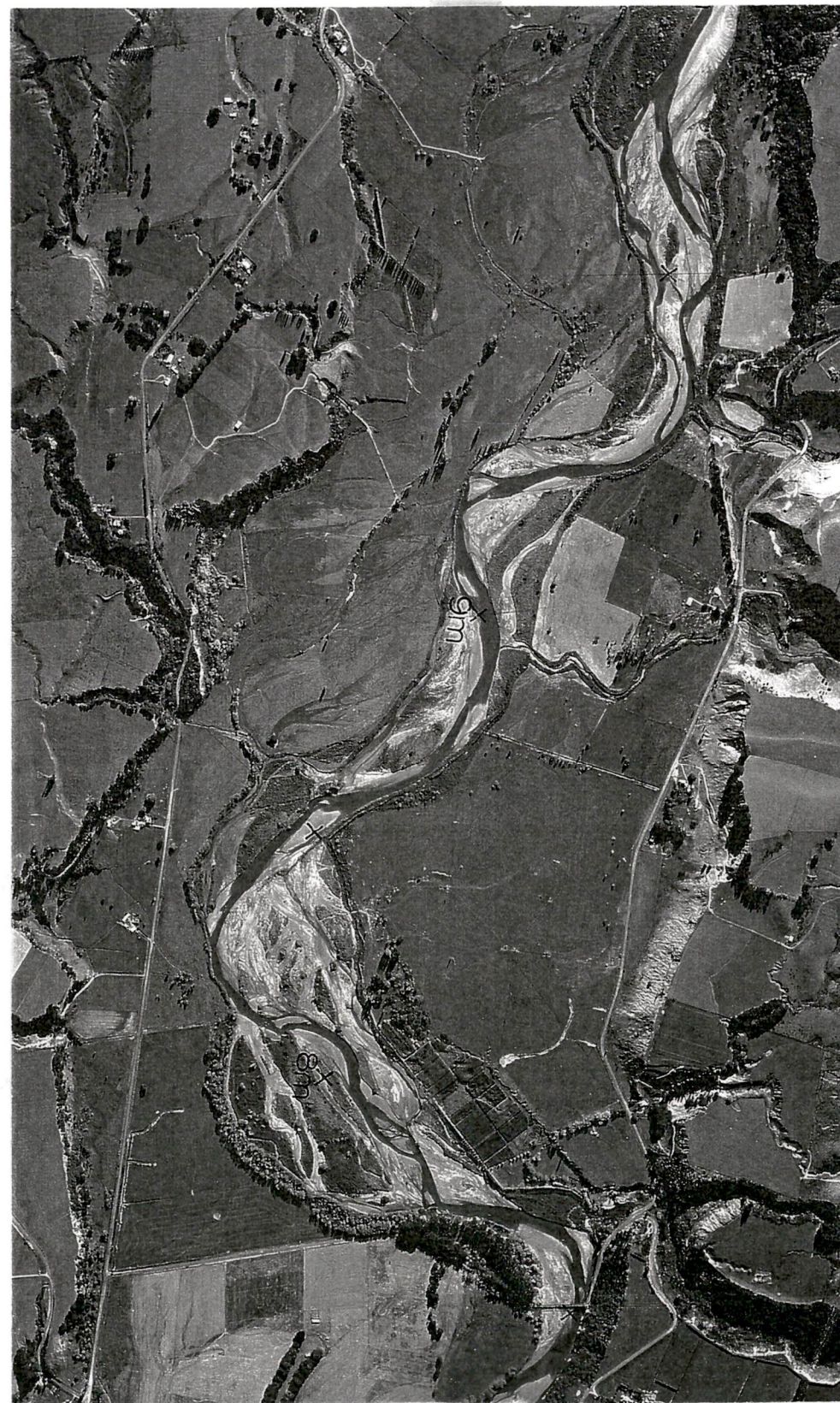
In simple terms the Scheme has not created a river channel with a width of 120 metres with 10 metre bands of willows along each bank. In many areas the channel is much narrower than 120 metres.

Section 12 sets out the proposed management plan that would ensure that such a channel would be created and maintained.

¹⁰ Extensive flood damage occurred during this flood and it was recognised that more comprehensive design was required. This design work has formed the basis for the recommendations in this review.



1950



1971



2000

Figure 3. Changes in the Pohangina River Channel Geometry

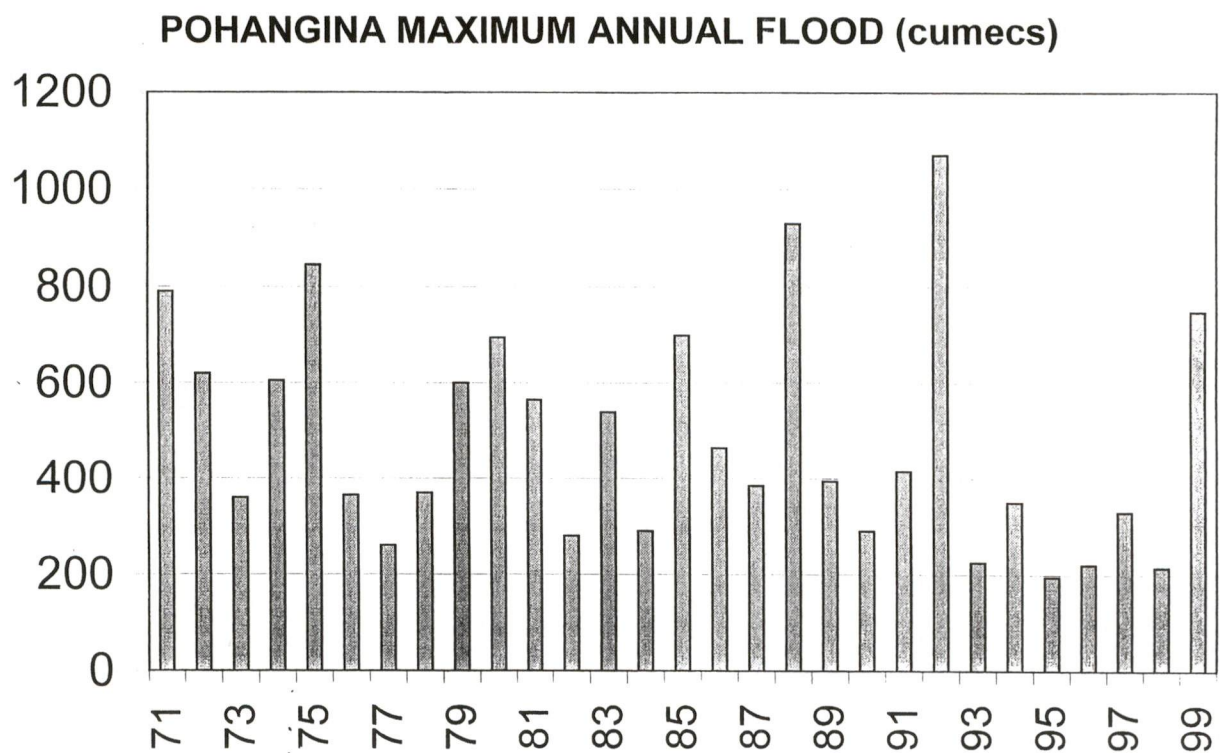
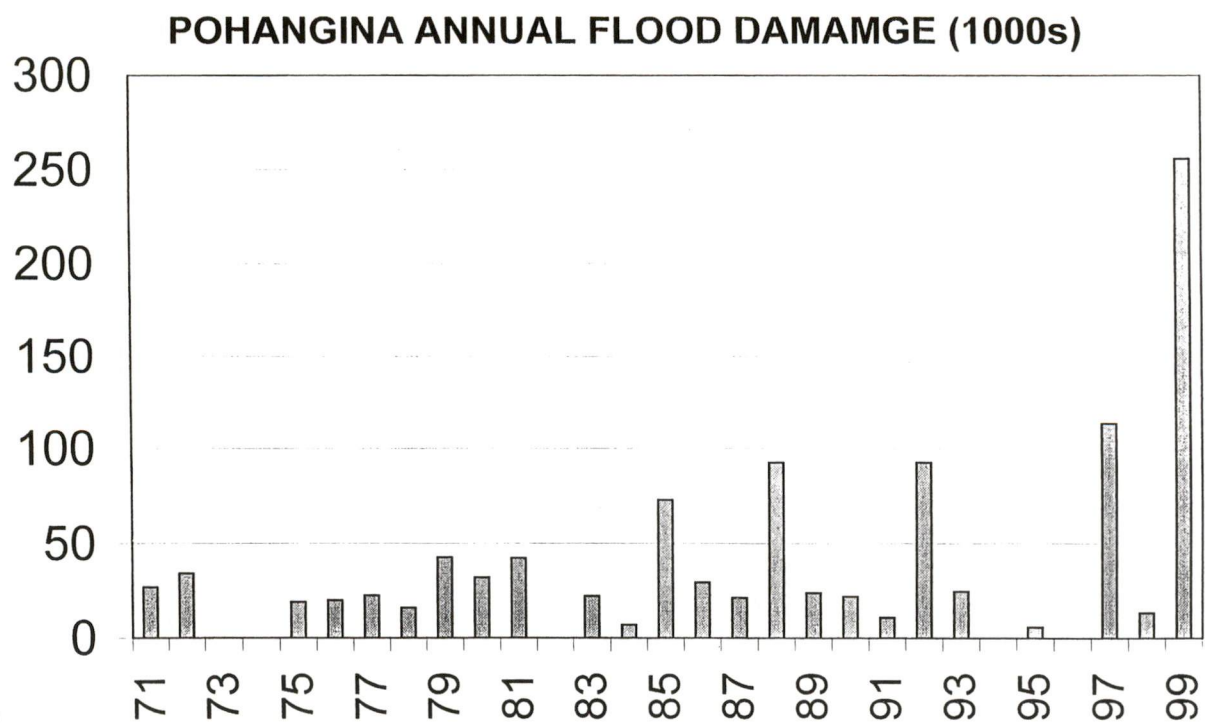


Figure 4. Pohangina River Comparison of Annual Flood Damage and Maximum Annual Flood

Pohangina River Tree Planting

Extensive tree planting has been carried out over the years along the edges of the channel and even though the plan to create 10 metre bands of willows along both banks has not been fully achieved, there is clearly far more edge protection and willow planting on the Pohangina River than was there prior to the Scheme.

For various reasons however, in many cases the width and robustness of the planting, on the outside of the bends where erosion has frequently occurred, is inadequate.

Until relatively recent times many sections of the river had wide rough willow infested areas adjacent to the channel in addition to the edge protection planting. In many cases these areas were old river bed that had silted up and vegetated. Farming practices however over the last 30 years and especially in the last 10 have resulted in most of these areas being cleared to enable the land to be utilised for production.

The net results of this land clearance has been: to remove a tree resource for protection works; to remove a line of defence that existed should the river breach the line of the protection work; and to remove an area that filtered flood debris from the flood flows thus reducing the debris deposits on the productive pasture.

The need for increased production to maintain farming profitability has also made landowners less willing to give up land to accommodate the 10m band of riparian planting.

The Closing Off of Old Pohangina River Channels

By comparing the aerial photographs of 1968, 1971, 1980, 1985, 1992 and 2000 it was easy to see that the 1964 goal to close off old river channels was not really achieved until the early 1980s. The 1985 photographs show a significant reduction in the number of overflow channels and a much more confined single thread channel was definitely evident by 1992.

Oroua River Channel Geometry

The Scheme proposed that the Oroua River channel be 100 metres wide between 10 metre wide bands of willow growth particularly on the outer side of bends. It was also proposed that the entire river from the confluence with the Kiwitea Stream to the Apiti Bridge be fenced to exclude all stock.

Extensive willow planting was carried out by landowners prior to the Scheme and large areas of rough, undeveloped and heavily willow infested berm land outside this planting has been progressively cleared over the years with a noticeable increase in this clearance work quite recently.

Because of this extensive planting, the Oroua River channel at the time the Scheme was established was narrower than the design channel width over much of its length. The Catchment Board's Chief Engineer, Paul Evans, set the design width at 100 metres (5 chain) and recognised that some willow growth would need to be removed to achieve this width.

As with the Pohangina river, without carrying out extensive time consuming research into past reports, it is not possible to readily determine what works were actually carried out in the early stages of the Scheme. However it can be seen from the series of aerial photographs taken in 1950, 1971, and 2000 set out in Figure 6 that the river was narrowed up and confined between 1950 and 1971 especially in the lower reaches. It can also be seen from these photographs that the early control works carried out prior to the Scheme and then by the Scheme, have prevented major channel changes since 1971 in this particular reach. This is reasonably typical throughout the river.

In 1971 approximately 40% of the River had a fairway width of 65 metres (the new design width, refer to Table 10 in section 13). Since that date the channel has been further confined into a single thread channel and by 1992 only approximately 30% of the river was at the design width. The only significant alignment changes have occurred from meander migration.

With the exception of some small sections of willow clearance very little proactive channel widening has been carried out in an attempt to create a river that meets the original design.

The Oroua River in its present form is not able to easily move the alluvial deposits it flows through and the channel meanders are constantly being distorted and deflected. The meanders are thus less well formed than in the Pohangina River with the meander pattern constantly being restarted from bend distortions and areas of harder materials. This prevents major changes to the meander pattern occurring, which to some extent limits the ability of the channel to widen itself naturally over time.

An examination of the annual flood damage sustained by the Scheme between 1971 and 1999 shows that during the period from 1971 to about 1988 there was a very low level of flood damage repair work carried out compared to the period 1989 to 1999. Refer Table 2 below.

Table 2: Flood Damage Repair Costs, Oroua River 1971 to 1999.

Period	Oroua River Flood Damage Repair Costs	% of Total
Whole period from 1971 to 1999	\$630,000	100%
1971 to 1988 (18 years)	\$133,000	21%
1989 to 1999 (11 years)	\$479,000	79%

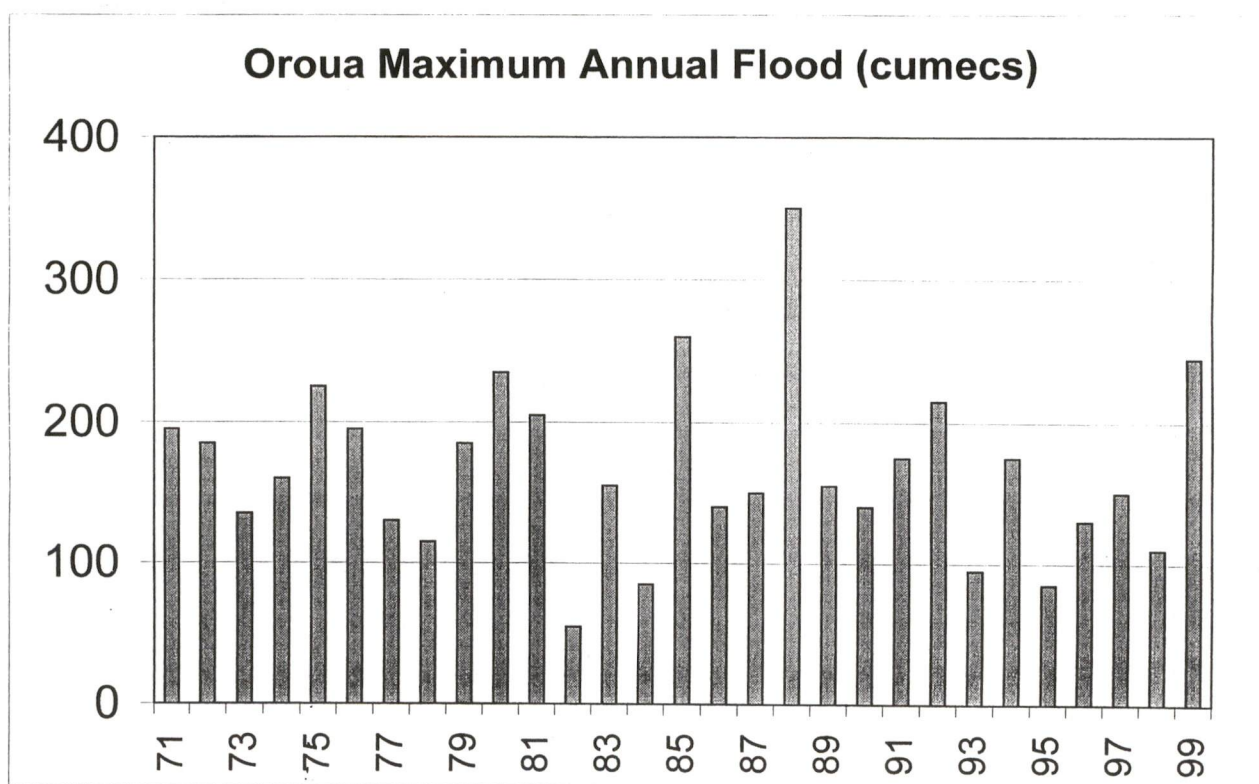
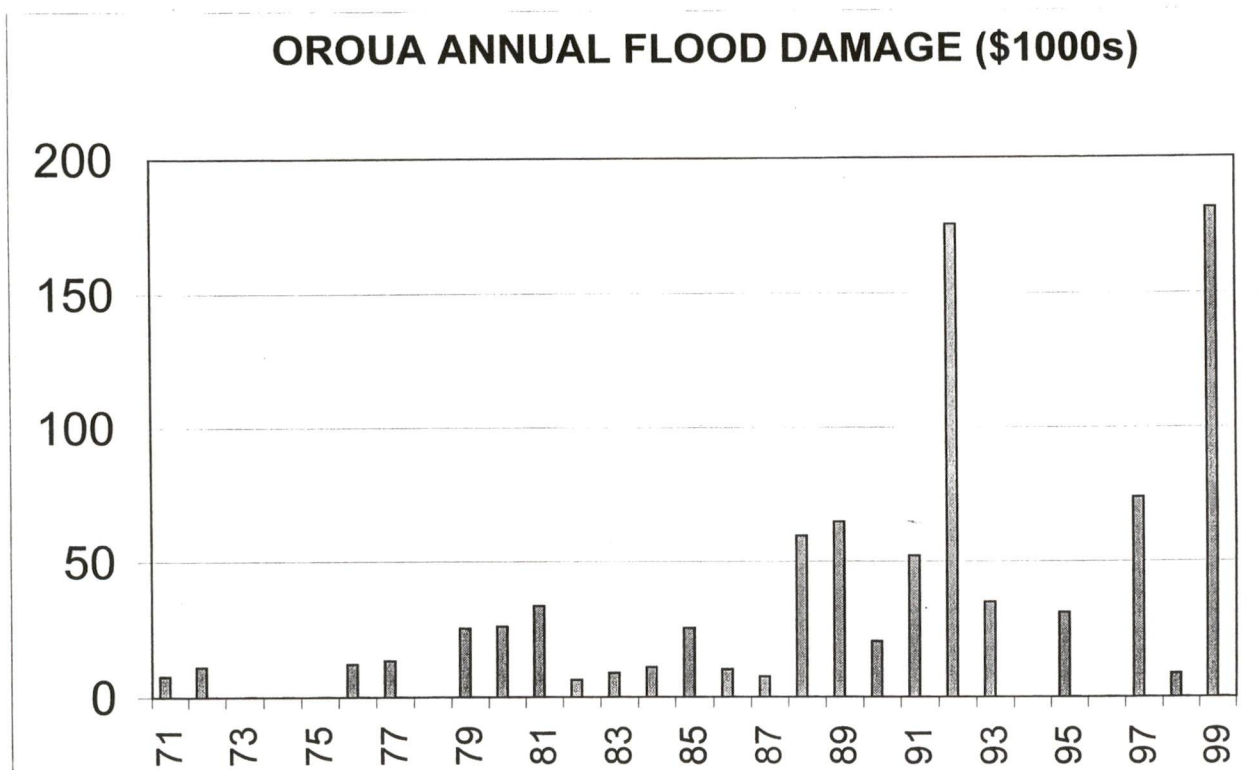


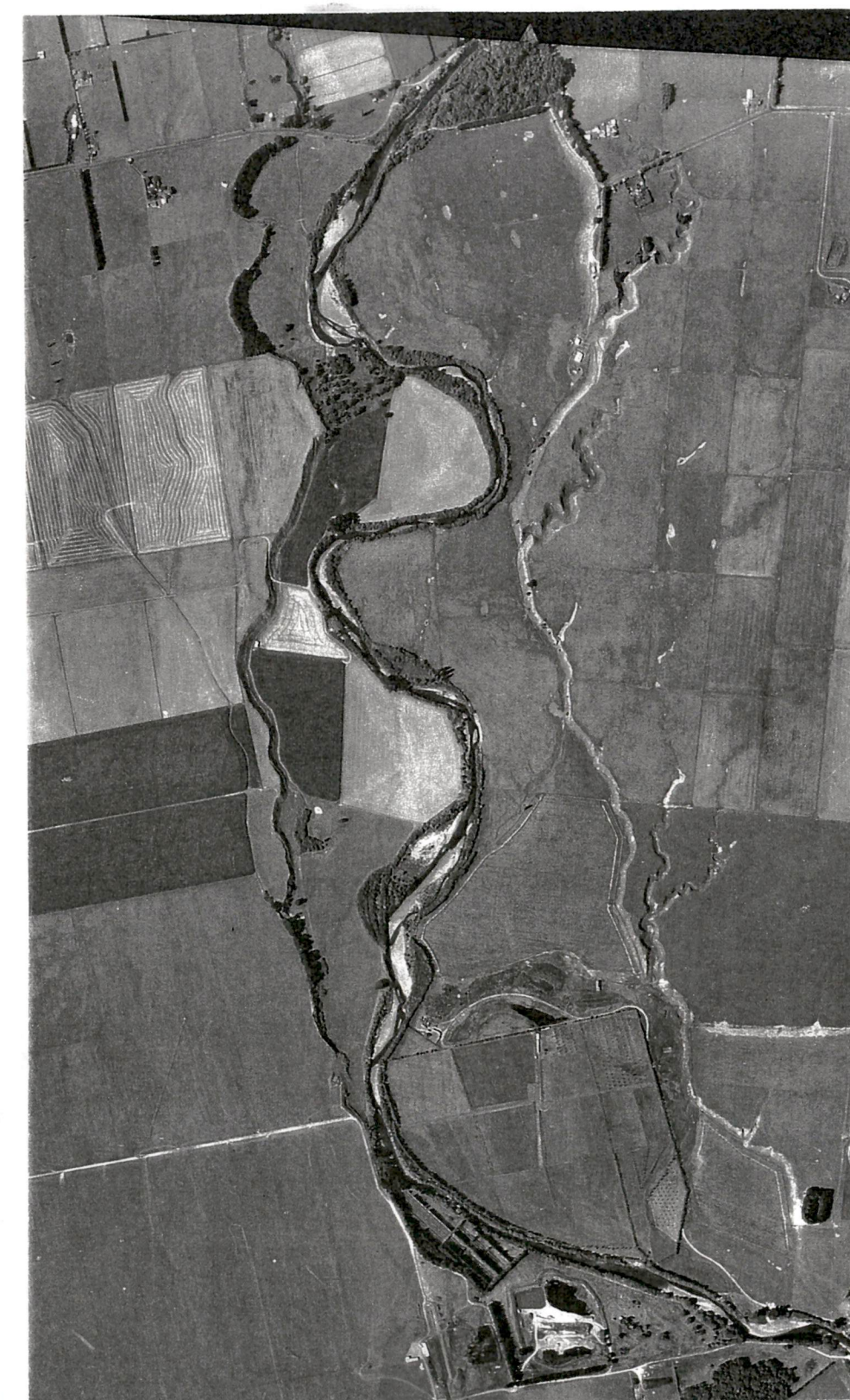
Figure 5. Oroua River Comparison of Annual Flood Damage and Maximum Annual Flood



1950



1971



2000

Figure 6. Changes in the Oroua River Channel Geometry

Figure 6 enables the comparison of flood damage and maximum annual flood flows over this period. It is reasonable to conclude that the narrow channel width was reasonably sustainable during the period when there were no significant flood events. This narrow channel however has not been adequate to carry the large floods that occurred between 1988 and 1992 and the channel widened out considerably in places during those and subsequent events.

Extensive protection works have been carried out in the last 10 years to maintain this channel and provide a degree of stability to the channel now that it has widened out. It is important to note however that during the period 1971 to 1999, the flood damage that occurred did so where the channel was narrow and the sections of the river where flood damage has been very light are areas where the channel is close to the design width.

It is interesting to note that the annual average flood damage for the 12 years since 1998/89 has been almost 6 times greater than for the period of 18 years prior to that. It may be reasonable to assume that if the Scheme plan had been implemented and the channel proactively widened, the channel would have been able to handle the floods during the 1988 to 1992 period and the expenditure over the past few years could have been significantly smaller than what actually occurred.

This may however be oversimplifying the situation. The intensity of farming has resulted in landowners being more aware of the impacts of erosion on their properties and has as a result demanded a greater level of expenditure on erosion repairs. Whilst this has probably contributed to the increase in expenditure, a wider channel more capable of passing the floods without placing undue pressure on the bank protection works would have reduced the level of flood damage.

9.3 Scheme Stopbank

The 1964 Scheme plan proposed that the stopbanks that existed at the time the Scheme was established would be maintained. These are primarily in place to control overflows during moderate flood events and were not put in place to prevent flooding during large events. The Scheme has carried out maintenance of a number of these stopbanks over the years and some have even been replaced when severe erosion of the river bank has scoured them away. The cost of maintaining these banks is very low and this work should continue. Any new classification however should consider the beneficiaries and establish a system to ensure those who benefit fund the cost of their maintenance.

Some stopbanks have been built by landowners since 1964 but these are not considered to be scheme assets and have not been maintained by the Scheme.

The Scheme stopbanks are shown on figures 9 and 11.

9.4 Scheme Drains

Four areas in the Pohangina Valley and four areas in the Oroua Valley covering 450 ha and 250 ha respectively were planned to be drained in the original scheme proposal.

Drainage works have been carried out in four areas in the Pohangina Valley but only one area in the Oroua Valley. Only one area in the Oroua has been rated for drainage.

15.4 km of drains are maintained by the Scheme to service these areas on an as required basis. Maintenance is generally carried out once per year. Refer figure 12 for the locations of these drains.

10. RIVER DESIGN PRINCIPLES

Management of the rivers will be more effective, and less costly overall (taking account of both farming costs and river management costs) when account is taken of the natural processes of the rivers, and the way in which they respond over time to natural variations and to imposed management changes. Vegetation management should consider the natural spread of vegetation and the way in which the channel form will alter depending on the nature and extent of edge vegetation.

There are specific meander shapes that the rivers naturally follow, and these shapes can be used to guide bank protection and river training works. Thus when repairing protection works at bends, the re-established works can be laid out to fit in with the width, radius and amplitude of the natural meanders.

Continuous protection works around the full length of a bend, to the curvature of a natural meander, will be more effective than works that only repair the gap, do not fit in with upstream and downstream conditions, and are not well aligned.

The threshold of motion meander shapes can be used to lay out and align bank protection works and vegetation buffer zones. However, the longer and wider meander of the flow dominant form should be considered as well, as this provides some guidance on the nature and spread of the semi-braiding response during periods of more intense river activity.

The width of the natural meanders can also be used as a guide to the thickness of vegetation buffer zones, as the size of erosion embayments is related to these meander shapes.

A more comprehensive management of the rivers does not necessarily mean heavier protection works, or the use of rock structures instead of vegetation works. Vegetation management, with some strengthening in places, using anchor weights or driven piles and cabling (in different arrangements) is likely to be the only practical approach, except at major structures, such as bridges and road formations. The effectiveness of vegetation works can, though, be greatly increased by:

- carrying out more extensive works at one time;
- aligning the works to the natural meander shapes;
- allowing for channel migration and widening within the managed channel;
- having a continuous on going programme of buffer zone establishment and extension (by planting & layering trees, fencing off from stock etc);

- responding quickly to damage to protection measures, to maintain edge consistency as much as practical; and
- carrying out channel clearing, channel shaping, beach raking, gravel extraction, the management of invasive shrubs and trees etc – to allow channel migration and form adjustments to occur with least distortion from spreading vegetation and gravel accumulations.

11. RIVER DESIGN APPLICATION

The design principles have been applied to the Pohangina and Oroua rivers to draw up design channels and buffer zone areas to guide management of the rivers. The meander form used has depended on the natural conditions of a given reach, the effects of past management and the assets at risk. The rivers can express different forms depending on the prevailing conditions, and as conditions change the channel form will change.

Thus the design channels have been adapted to fit the prevailing conditions, with a minimum of alteration, by using different forms and applying the meander pattern (of width, amplitude and wavelength) to the existing river channel. The natural meander forms are clearly evident in the river meanders, and in general a design meander pattern can be fitted to the existing channel. However, as river conditions change over time, the form of the river changes. There can also be sudden changes in form.

The Pohangina River is a powerful enough river to actively move its bed material and erode its banks, and relatively consistent and well-formed meander patterns form along the river. The Oroua River is less able to move the alluvial materials it flows through, and the channel meanders are constantly being distorted and deflected. The channel meanders are then less well formed, and the meander pattern is constantly being re-started, from bend distortions and areas of harder materials.

In preparing the future design alignment and works programme for the Pohangina River, three meander forms have been used.

11.1 The Threshold of Motion Meander

Where the river has formed a single channel, and is being relatively tightly managed, then the smallest design channel, based on the threshold of motion meander form, has been applied. This gives a well-defined channel that meanders consistently (of similar meander amplitude and wavelength). This design channel is lined by a constant width buffer zone around the outer (erosion) side. The well-defined channel will still migrate downstream, and some allowance has been made for this natural movement in the definition of the channel and buffer zone areas.

This design channel requires the highest level of management, as a particular channel position (of many possible channel positions) is being maintained. Downstream migration will continue to occur, and an important part of river management under this regime will be to minimise the generation of distortions, by considering what is happening along a series of bends, and the downstream response from management interventions at a given bend.

11.2 The Flow Dominant Meander – type 1

Where there is a less defined and more mobile main channel within a wider channel area, then a wider design channel has been applied, based on the flow dominant meander width. This channel width provides sufficient space for the active main flow channels to migrate, with a constant width buffer zone along the overall line of channel movement. The buffer zones on each side contain the channel meanders, but come under less pressure because channel migration can occur, albeit within a confined space.

Under this management regime the buffer zones do not have to be repaired so promptly, following erosion damage, so that reinstatement can take place over a period of time. Thus wider buffer zones are used, but repairs are less expensive as more gradual reclamation of eroded areas can be achieved using mainly vegetative means. The wider channel is though more prone to re-vegetation, especially by vigorous exotic species, and some regular channel clearing would be necessary as part of this approach.

11.3 The Flow Dominant Meander – type 2

Where there is sufficient space available, and the river tends towards a wider semi-braided form, then an even wider design channel, or fairway, can be applied. In this case the fairway is wide enough to allow main flow channel migration with a minimum of restraint, but sufficiently narrow to inhibit channel splitting. The management approach is one of quite frequent but low level interventions, mainly of channel clearing and re-vegetation of eroded areas within the buffer zones.

Fully implemented, there is still a considerable management cost, although not of heavy protection works. However, a lower level of management is possible, by accepting some channel re-vegetation and less than consistent buffer areas, and in this case without giving rise to much increase in the risk of major breakouts. The channel form is likely to adapt to an ana-branching¹¹ form, with a relatively low risk of complete breakout beyond the defined river area of channel and buffer zones. For the other design channels explained above, the intensity of management suggested for this option would directly and proportionally increase the risk of channel breakouts.

¹¹ Ana branching is when the main flow forms a new channel away from the existing main channel and shortcuts quite a long section of the main channel.

12. THE POHANGINA RIVER DESIGN

A detailed design has been prepared for the Pohangina River up to the Totara Reserve. All three types of design channels have been applied, in the proportions detailed in Table 3, with transition reaches as required.

For the section of river above the Totara Reserve up to river distance 36km (old river distance 21 Miles) the Flow Dominant Meander predominates. Very little flood damage repair works have been carried out above the Totara Reserve Bridge over the past 30 years and carrying out a comprehensive programme of works in this reach of the river is probably not cost effective.

The design channels and buffer zones for the river below the Totara Reserve are shown on aerial photographic plans. Refer to Figure 9, sheets 1 to 12. These design alignments should be taken as a strong guide to management, with the approach and intensity of management fitting the requirements of the different channel forms.

Table 3: Meander Forms used for the Pohangina River Design below the Totara Reserve

Meander Form	Length of River
The Threshold of Motion Meander	11.2 km
The Flow Dominant Meander – type 1	9.4 km
The Flow Dominant Meander – type 2	1.2 km

Over time these design channel boundaries will need to be altered, and should be reviewed in response to changing conditions. There is an important time variation in channel conditions. The pattern of floods goes through periods of high intensity and more quiescent times, and resulting changes in river conditions over time, as well as in space along the river, must be taken account of in managing the river.

Prior to the Scheme the River had a wide braided channel and if the “Flow Dominant Meander regime” had been adopted at that time, the cost of managing the river would most likely be far less than it costs today. There would however be approximately 250 ha less land in production.

There is potential for the river above the Totara reserve to further narrow up as edge vegetation encroaches and gravel beaches vegetate significantly increasing the amount of bank erosion. It would therefore be prudent to carry out channel management work to maintained the 110 metres wide channel.

Photographic plans of this section of the river are included in Appendix D. An allowance has been made in the long term funding programme for \$3,000 per year for the first 5 years and then \$5,000 every five years.

Estimates have been prepared to implement the design. These are based on the cost of the various types of work carried out to repair the flood damage sustained in the November 1999 and April 2000 floods. These recently

completed works were carried out to a higher standard than has been the case in the past and are in line with the recommended works proposed to manage the Pohangina River in the future. The estimates for managing the Pohangina River are summarised in Table 4.

These estimates have assumed that the live tree bank protection that currently exists would not form part of the new protection works. This will only be true if it were lost to erosion before the new protection works were carried out or it was not on the correct alignment. In many of the proposed works sites, the works are generally on the correct alignment but will need strengthening, extending to avoid them being outflanked, and the alignment improved. For the long term funding programme set out in Section 20 it has been assumed that 30 % of the existing work will form part of the proposed new works.

One key factor affecting the ability of the existing protection works to provide the level of protection proposed by this management option, is that at critical times there has been insufficient funding to carry out the necessary planting, the maintenance of that planting and the necessary channel maintenance. The estimates in table 4 make provisions for each of those items.

Table 4: Estimate for Works Required to Implement the Pohangina River Design below the Totara Reserve

Type of work	Quantity of work	Estimated Cost
Capital Works Years 1 to 7		
Tree bank protection (<i>Total cost</i>)	4,400 metres	\$461,500
Beach removal and management		\$42,500
Vegetation removal (see note 1)		\$124,600
Planting	94 ha	\$38,100
Maintenance		
Layering and Channel Maintenance	Year 1 to 7	\$214,000
Layering and Channel Maintenance	Year 8 to 15	\$527,500
TOTAL		\$1403,200

Note 1: includes an allowance for stopbank set back at river distance 20.8 km (50% share with landowner)

Fundamental to the success of the recommended management option will therefore be that **all** the proposed works are carried out including the planting, the layering and the channel management work. Failure to carry out protection works on one bend may put the works on the next bend downstream at risk of being outflanked or damaged due to poor alignment of the flow.

Failure to plant and manage the buffer strips, and maintain the clear fairway will result in ongoing high levels of flood damage with the resultant uncertainty that this brings.

Protection works often fail when high velocity floodwater either breaks out through the protection planting/buffer planting or returns to the river through this planting. Wider buffer strips reduce the velocity of these flood flows with a consequential reduction in damage.

Landowners on whose property the protection works are being constructed will be required to make available a strip of land between 30 metres and 50 metres wide on which to plant the planted buffer strips. In many cases along the river the buffer strip already exists but is narrower than that recommended in the Review. The buffer strip needs to be only 30 or 50 metres wide in total and not an additional 30 to 50 metres on top of the existing buffer strip width. Landowners will be required to fence off the buffer strips to exclude all stock.

Where sections of the river bank are non-erodible, planting will not necessarily be required. Where these areas are identified the master planting plan held by the Scheme Manager will be amended accordingly. The final decision on planting requirements lies with the Scheme Manager.

The work necessary to maintain the alignment of Pohangina River and the integrity of the protection works has been separated into 30 different works areas. The work at 7 of these has already been completed to a high standard. The area directly upstream of the Raumai Bridge should be the responsibility of the Manawatu District Council but has been included in the estimates at this stage. The works in the remaining 22 areas involve protection works, planting of the buffer strips, the fairway clearing and the maintenance of all the works.

Prior to the buffer strip planting on the left bank at river distance 20.8 km, the stopbank shall be relocated to a new line on the inland side of the planting. The cost of this work will be shared 50:50 between the Scheme and the landowner and all future maintenance will be funded by the landowner.

12.1 Pohangina River Flood Damage Repair

The level of flood damage sustained by the Pohangina River will reduce as a result of the proposed works. It is proposed however, that \$10,000 will be set aside annually into a flood damage reserve to fund the damage that will inevitable occur during significant flood events. An additional \$15,000 will be set aside for the Oroua River.

In the past during years when only small floods occurred, about \$19,000 of damage has still occurred. The amount of the annual damage expenditure will reduce quite quickly as the higher priority protection works are completed. \$10,000 has been allowed for in the scheme estimate to fund this more regular damage in the future. The \$10,000 is budgeted in the annual works budget.

12.2 Pohangina River Works Priority

It is clearly not possible to fund the entire programme in the first year, nor are there sufficient physical resources to carry out the works. The works have therefore been prioritised to ensure that the funds are spent where they will give the greatest scheme benefit. Three factors were considered when determining the priorities. These were:

- the amount of work that has historically been carried out at each site. The information is summarised in Figure 7;
- the land at risk if the works were not carried out; and
- the potential for the loss of alignment control.

Table 5 sets out the results of the analysis and the details behind this are set out in Appendix E. The priority of each site is marked on the plans in Figure 9.

The River between rivers distances 9 - 10.5 km has been very stable for many years despite the narrowness of the channel. The works proposed at this site to establish buffer strips through the productive pasture to create a 110 metre wide channel ranks 11th on the works priority largely because of the quality of the land at risk if the river was to get out of control through this reach.

It is recommended that this reach of the river be maintained in its present form but if a major breach of the existing protection works were to occur requiring significant expenditure to control the rivers alignment, then work would be undertaken in accordance with the appropriate design meander form.

12.3 Design and Priority Flexibility

The programme of works set out in Table 5 appears to be very prescriptive. That is, it sets out what is to be done when and where. It is highly likely however that flood damage will occur during the first seven years of the proposed programme that may require the priorities to be adjusted. If damage occurred for example in year 2 at a site programmed for works in year 5, it would be sensible to carry out the year 5 programmed work and then rearrange the works programme from then on. There is no reason why this could not be done.

The real difficulty comes when there is a need to carry out works at a number of sites on the programme but where the available funding is insufficient either because the total cost is too high, the year's budget has already been spent or the emergency reserves are low.

At this point, a number of options are available. These are:

- leave the repair of the damage until the following year and reprioritise the programmed works;
- take out a loan to fund the works and pay it back over say 10 years;
- take out a loan and pay it back as soon as possible by not carrying out any capital works until the loan is repaid;
- take out a loan and pay it back through rating in the following year.

The first option could result in the damage being made worse during subsequent floods. This risk is always there but would be made worse if the repair work was left for an extended period.

The second option would result in less funds being available for the programmed works because capital and interest payments would be required.

The third option may be acceptable but would depend on the sites at which works were carried out and how far through the Scheme was on the programme of capital works. This option however may delay works at sites that give the highest benefit to the Scheme and make it vulnerable to significant flood damage.

The fourth option would enable the programme to be kept on track but would result in a very uneven and unpredictable rating cash flow for Scheme ratepayers.

One solution to this irregular rate requirement would be to place more funds in the emergency reserves on an ongoing basis. To place an additional \$20,000 in the emergency reserve fund each year would require a rate rise of about 10%. This could be spread over 2 years and result in two years of rate increases at 10% then a 5% increase in the following year and then no more increases. At year 2010 the rate reductions could still commence.

This still leaves the scheme vulnerable until the reserves have built up and then following their drawdown until they are rebuilt.

Option four would result in the proposed Scheme works being implemented as soon as possible by enabling the programme of works to continue. The sooner the programme of works is completed the sooner the flood damage expenditure is reduced.

Failure to adopt an option to fund the inevitable flood damage especially in the first 3 to 4 years of the Scheme will either result in further rate rises to fund increased interest payments or in areas of unrepaired damage.

12.4 Description of the Works

Figure 8 shows samples of the three different meander forms. Tables 6, 7 and 8 describe the works that will be carried out to maintain the river in each form.

12.5 Summary of Design Parameters – Pohangina River

Table 5 summarises the design parameters used for the Pohangina River.

Table 5: Pohangina River Design Parameters

Meander Form	Channel width	Fairway width	Radius of Curvature	Buffer Zone Width
The threshold of motion meander form	60 m	110 m	240 m to 360 m	30 m ¹²
The Flow Dominant Meander – type 1	na	110 m	na	30 m
The Flow Dominant Meander – type 2	na	180 m	na	60 m

¹² The 30 meter buffer width could be reduced to 20 metres for the threshold of motion meander form when the standard of protection work is very high.

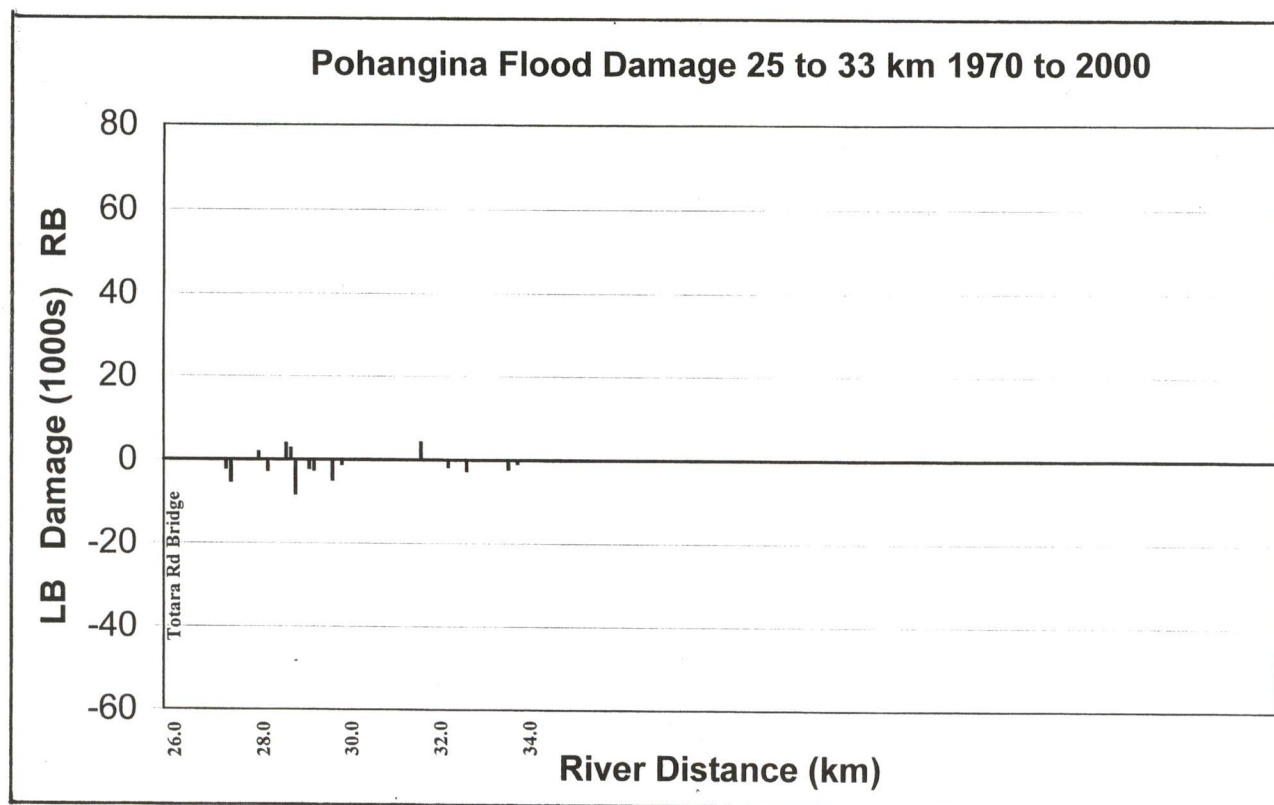
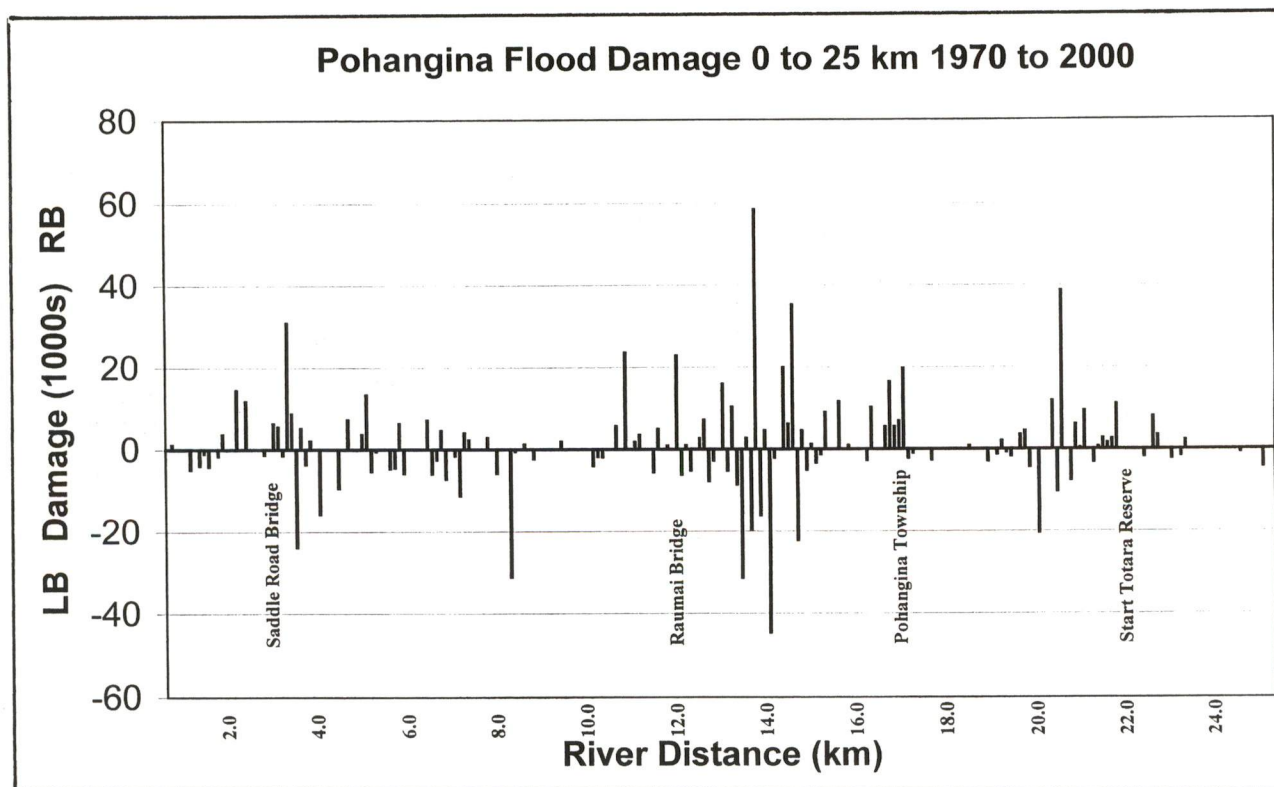


Figure 7. Location of Pohangina River Flood Damage 1970 to 2000

Table 5: Pohangina River Future Works Costs and Priorities															Channel Maintenance			
River Reach	LB / RB or channel C	Priority based on historical damage cost	Land at risk	Land risk factor	Alignment control factor	Sum of risk factors	Priority Order	Total works costs	Planting costs Refer Appendix E	TOTAL COST	TOTAL COST ASSUMING UP TO 30% OF EXISTING WORK IS RETAINED	layering Planting existing at year 1	Layering Yrs 10 to 15	Channel Maintenance	ANNUAL PACKAGES OF WORK			
14.50 to 14.90	L	10	good titled land	5	5	15	1	44,000	840	44,840	32,840				YEAR 1	\$107,485		
15.70 to 16.00	L	10	good titled land	5	5	15	2	3,125		3,125	3,125							
13.80 to 14.20	R	9	road, titled land, alignment	5	3.5	13	3	45,500	1,080	46,580	34,580							
3.50 to 3.90	R	8	good titled land	5	3	12	4	16,500	0	16,500	13,500							
12.80 to 13.70	R	6	road, bridge	5	3	11	DC	31,250	2,640	33,890	2,640	13800		7000	YEAR 2	\$104,180		
4.10 to 4.40	L	8	non titled yet good land	3	4	11	5	42,000	660	42,660	32,160							
11.20 to 11.70	R	4.5	good titled land	5	2	9.25	6	60,000	720	60,720	47,220	13800		11000	YEAR 3	\$102,340		
22.90 to 23.25	R	6	good titled land	4	2	9	7	41,000	600	41,600	32,600							
6.60 to 7.00	L	1	good titled land	5	3	8.5	8	38,000	540	38,540	29,540							
20.50 to 21.60	C	6	non titled right Good left	3	2	8	9	15,500	1,800	17,300	13,400	13800		13000	YEAR 4	\$126,940		
4.90 to 5.40	R	5	good titled land	2	3	7.5	10	58,250	660	58,910	52,160							
9.20 to 10.30	C	1	good titled land	5	2	7.5	11 **	1,000	2,880	3,880	3,880							
16.00 to 17.50	C	5	no title R/B narrow land L/B	2	2	6.5	12	15,000	3,120	18,120	18,120							
7.10 to 8.20	C	3	l/b non titled R/B rough	2	2.5	6	13	12,500	6,480	18,980	18,980	13800		20000	YEAR 5	\$120,310		
22.20 to 22.50	L	1	good titled land	2	3.5	6	14	35,000	960	35,960	26,960							
10.70 to 11.20	C	1	R/B non titled L/B small good land	3	2	5.5	15	1,000	1,200	2,200	2,200							
19.70 to 20.10	L	1	non titled left	2	3	5.5	16	38,500	480	38,980	29,980							
18.20 to 19.70	C	1	non titled L/B, bluff & narrow strip R/B	2	2.5	5	17	2,500	2,880	5,380	5,380							
11.90 to 12.10	L	1	good land small	2	2	4.5	18	20,750	240	20,990	14,990	13800		27000	YEAR 6	\$90,010		
5.40 to 6.00	L	3	bluff	1	2	4.5	19	30,250	720	30,970	26,970							
1.00 to 2.90	C	1	L/B poor. R/B upstm Good titled land	1.5	2	4	20	4,500	4,560	9,060	9,060							
8.35 to 8.70	R	1		0.5	0.5	1.5	22	29,000	480	29,480	21,980			32000	YEAR 7	\$67,480		
6.00 to 6.40	R	1	non titled rough	1	2	3.5	21	41,000	480	41,480	32,480			35000				
The following works have been completed during 1999 and 2001						SUB TOTAL		\$626,125	\$34,020	\$660,145	\$504,745				YEAR 8	\$48,800		
8.80 to 9.20	L	2	good titled land	5	3	9	7	57,800	600	58,400		13800	0	35000				
3.50 to 3.90	R	8	good titled land	5	3	12	4	15,500	600	16,100		13800	0	35000	YEAR 9	48800		
15.00 to 15.35	R	10	good titled land	5	5	15	1	32,750	840	33,590								
15.70 to 16.00	L	10	good titled land	5	5	15	1	22,000	360	22,360		13800	10500	35000	YEAR 10	\$59,300		
17.60 to 18.20	R	5	good land non titled	3	2.5	8	9	45,250	720	45,970								
21.20 to 21.40	L	4	bluff L/B goob land L/B d/s	2.5	3	7.5	10	25,120	360	25,480		13800	7500	35000	YEAR 11	\$56,300		
21.60 to 22.00	R	5		3.5	4	10	6	31,500	600	32,100		13800	20500	35000				
						SUB TOTAL		\$229,920	\$4,080	\$234,000					YEAR 12	\$69,300		
** Works only to be carried out if flood damage places the rivers alignment at risk													21500	35000				
Refer to Section 12.2 of the report						TOTAL		\$856,045	\$38,100	\$894,145					YEAR 13	\$56,500		
													74500	35000				
													44000	35000	YEAR 14	\$109,500		
															YEAR 15	\$79,000		

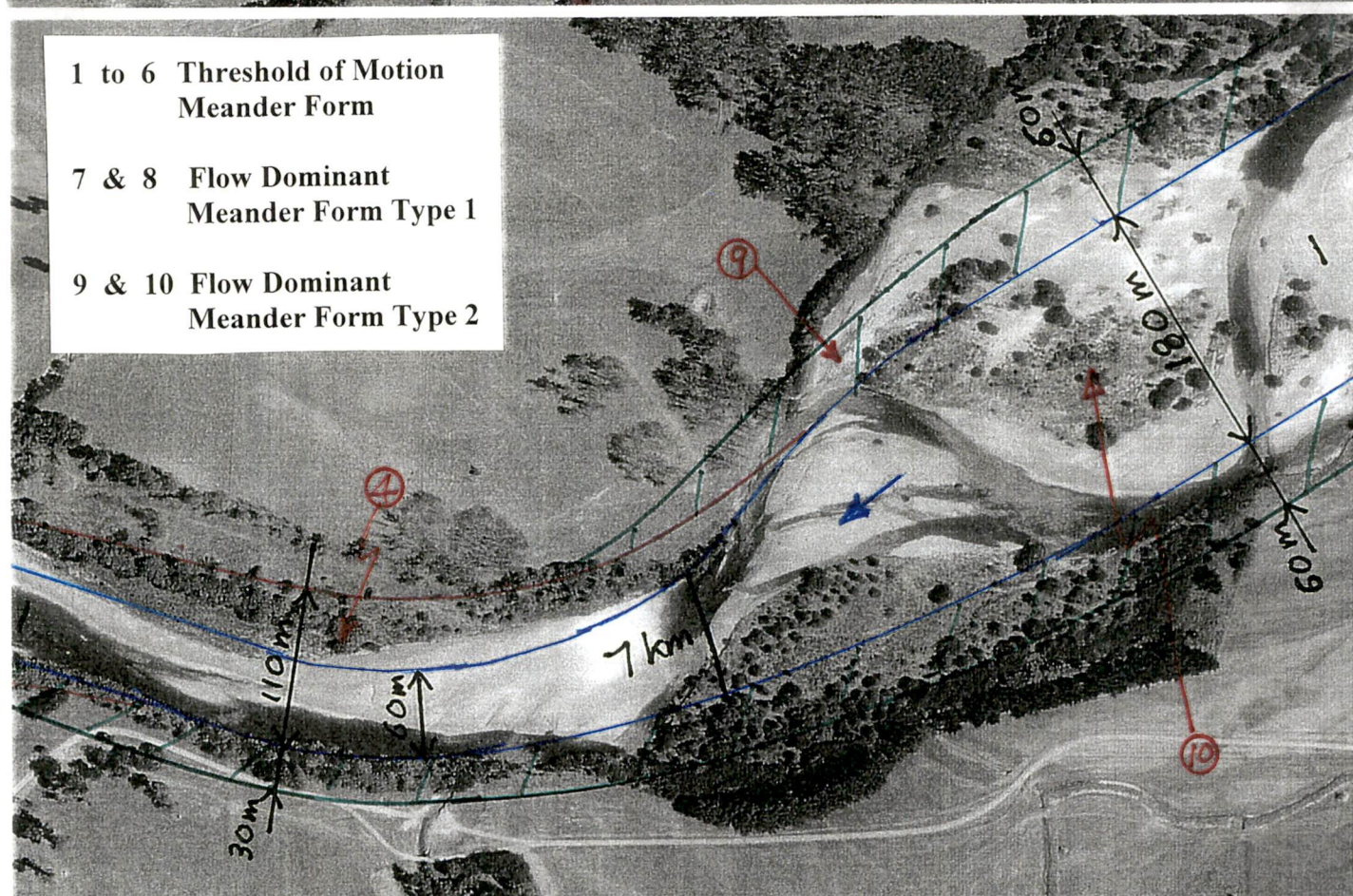
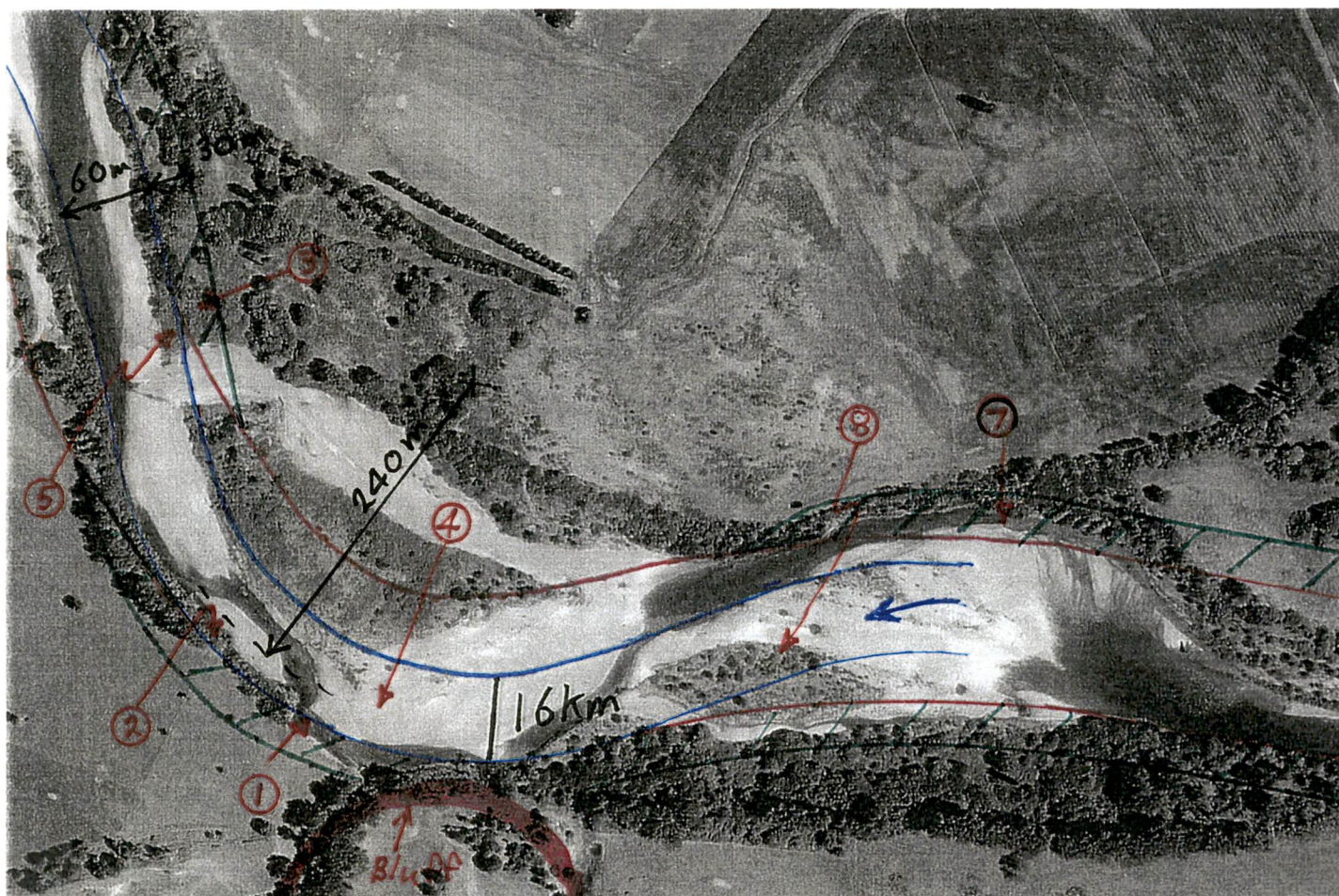


Figure 8. Pohangina River Meander Forms

Table 6: The Threshold of Motion Meander Form

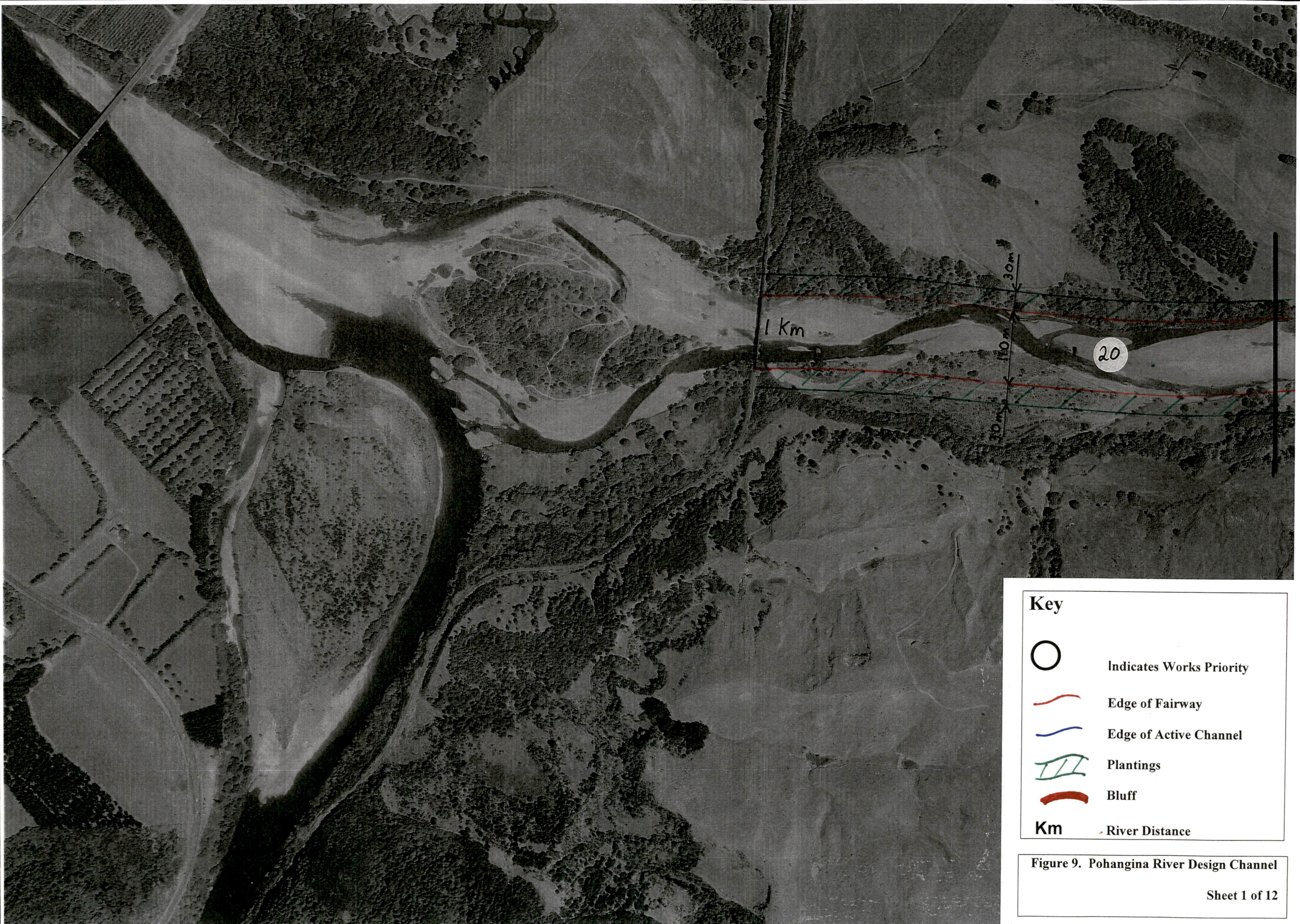
General Description	A tightly controlled meander of radius either 240 metres or 360 metres and a channel width of 60 metres with the outside of the bend protected with live tree bank protection. A clear fairway 110 metres wide around the bend will be maintained. A 30 metre wide buffer will be planted on the outside of the bend.
1. Bank protection	The bank protection on the outside of the bend must be strong, continuous and extend far enough upstream to above the thalweg crossover point. The downstream extent of the work must be such that the river is guided into the next meander but not so far as to totally restrict meander migration.
2. Outside of curve - bank realignment	Maintaining the protection works on a too tight an alignment will increase the chances of failure. If additional effort is to be put into maintaining the integrity of the protection work it will need to be on the design alignment. This will require some existing protection works to be removed but their removal must be seen as an integral part of providing and maintaining the integrity of the works.
3. Buffer strip planting	A continuous 30 metres strip of planting is required behind the protection work extending upstream and downstream to above and below the bank protection but tapering out to maintain the channel width. Existing planting will be incorporated into the new planting and layering carried out as required The planting must be fenced off from stock by the landowner. The 30 m strips of planting may be reduced to 20 metres where the riverbank has a long history of being stable and there is a limited potential for it to be attacked by the river in the future.
4. Inside of bend beach clearing	The full 110 metres of channel width must be maintained to ensure that floods do not put undue pressure on the protection works. This will involve both the removal of vegetation on a regular but as required basis and by maintaining the gravel beaches to control their height. The latter will either require the beach to be pushed into the channel or for the beaches to be moved back from the edge of the water. The latter may be carried out by commercial extraction.
5. General fairway maintenance	This will involve maintaining the channel width between bends. Failure to do this will cause an early or late cross over between meanders and will cause an unsatisfactory alignment to form.
6. Allowance for meander migration	Meander migration will occur and it is important when constructing or maintaining protection works that the rivers desire for the meanders to migrate downstream is recognised. Failure to do this will increase the risk of over tight bends occurring with the inevitable increase in maintenance costs. It will be important that landowners are made aware of the likelihood of meander migration and its impacts on their assets.

Table 7: The Flow Dominant Meander Form – Type 1

General Description	A loosely controlled meander where the channel width provides sufficient space for the active main flow channels to migrate, with a constant width buffer zone along both sides of the overall line of channel movement. A clear fairway width of 110 metres will be maintained.
7. Buffer strip planting	<p>A continuous 30 metres strip of planting is required along both banks from one end of the reach to the other unless a cliff or other hard natural feature makes the buffer strip unnecessary.</p> <p>Existing planting will be incorporated into the new planting and layering carried out as required</p> <p>When this buffer is damaged during flood events it must be replanted to ensure its effectiveness is maintained.</p> <p>The planting must be fenced off from stock by the landowner.</p>
8. Fairway maintenance	This work will involve maintaining a clear waterway between the buffer zones. This will involve keeping the fairway clear of vegetation and by preventing the build up of large gravel deposits that confine the river and place heavy pressure on the protection work on the outside of the bends. The latter is unlikely to occur as long as the fairway width is maintained at 110 metres.

Table 8: The Flow Dominant Meander Form – Type 2

General Description	A loosely controlled meander where the channel width is sufficient to enable the river to have a semi-braided form. In this case the fairway is wide enough to allow main flow channel migration with a minimum of restraint, but sufficiently narrow to inhibit channel splitting. A wide buffer along the overall line of channel movement. A reasonably clear fairway width of 180 metres will be maintained.
9. Buffer strip planting	<p>A continuous 50 metres strip of planting is required along both banks from one end of the reach to the other unless a cliff or other hard natural feature makes the buffer strip unnecessary. Existing planting will be incorporated into the new planting and layering carried out as required</p> <p>When this buffer is damaged during flood events it must be replanted to ensure its effectiveness is maintained but not in as high a priority as for type 1 meander forms.</p> <p>The planting must be fenced off from stock by the landowner.</p>
10. Fairway maintenance	This work will involve maintaining a reasonably clear fairway between the buffer zones.



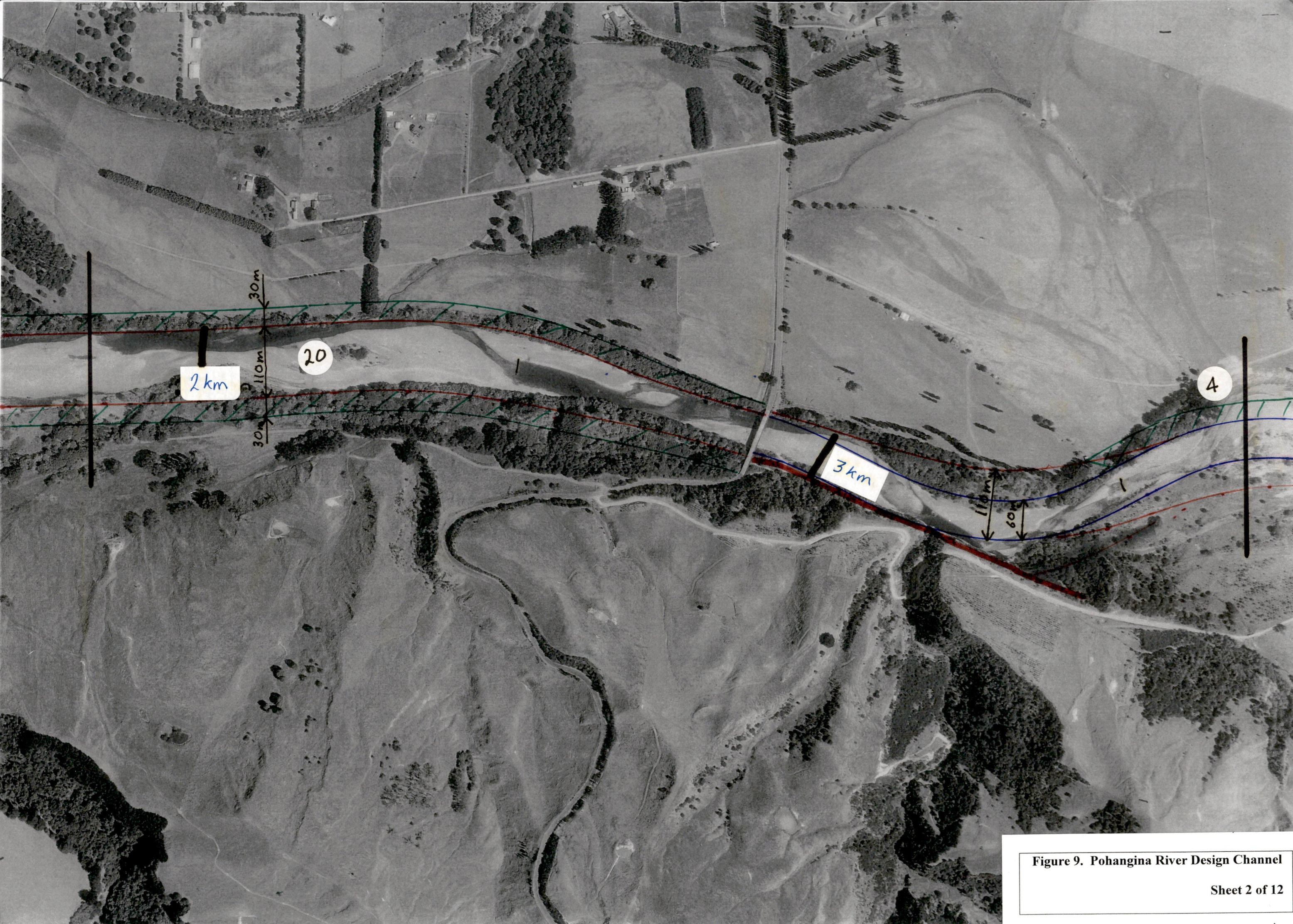


Figure 9. Pohangina River Design Channel

Sheet 2 of 12

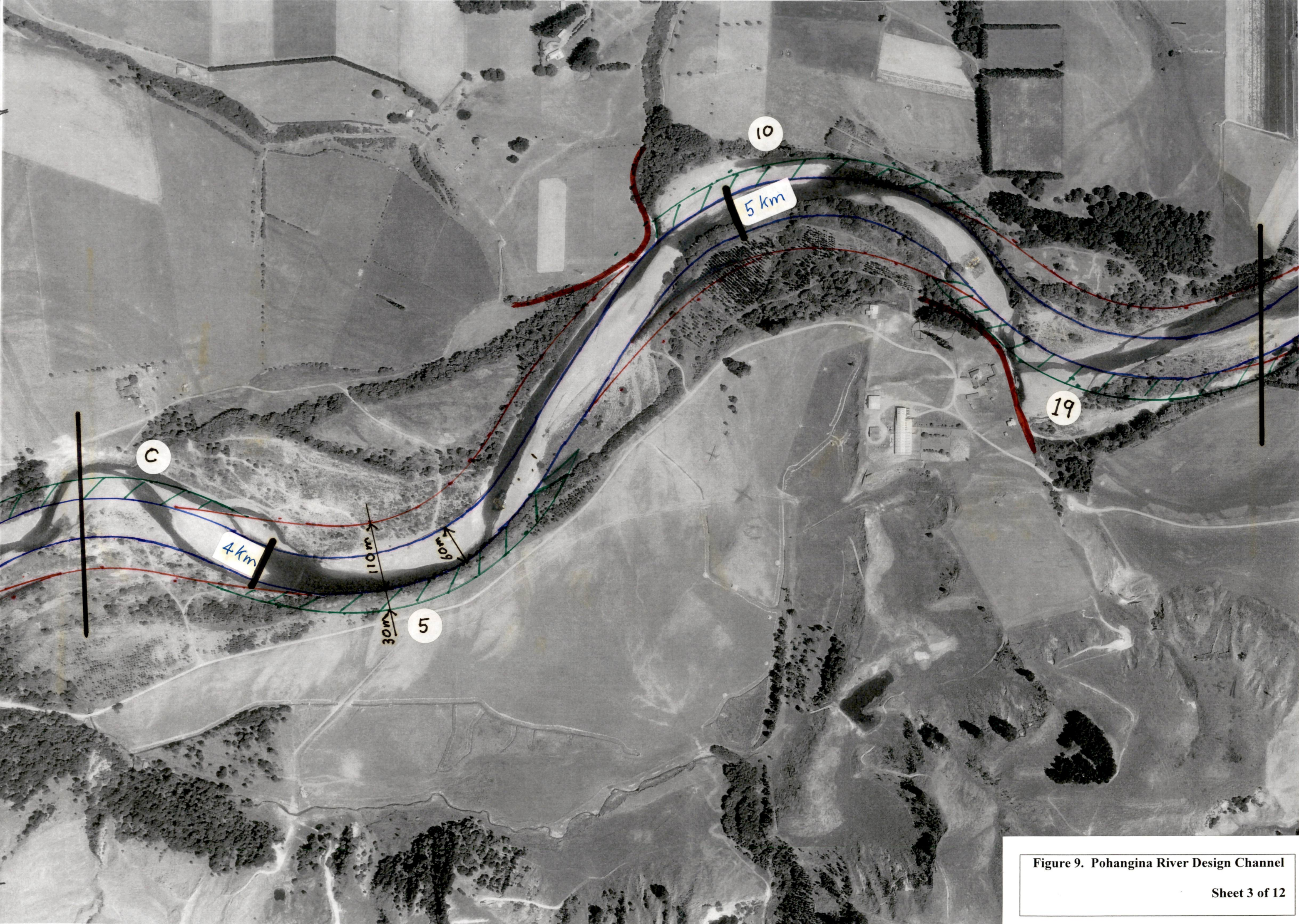


Figure 9. Pohangina River Design Channel

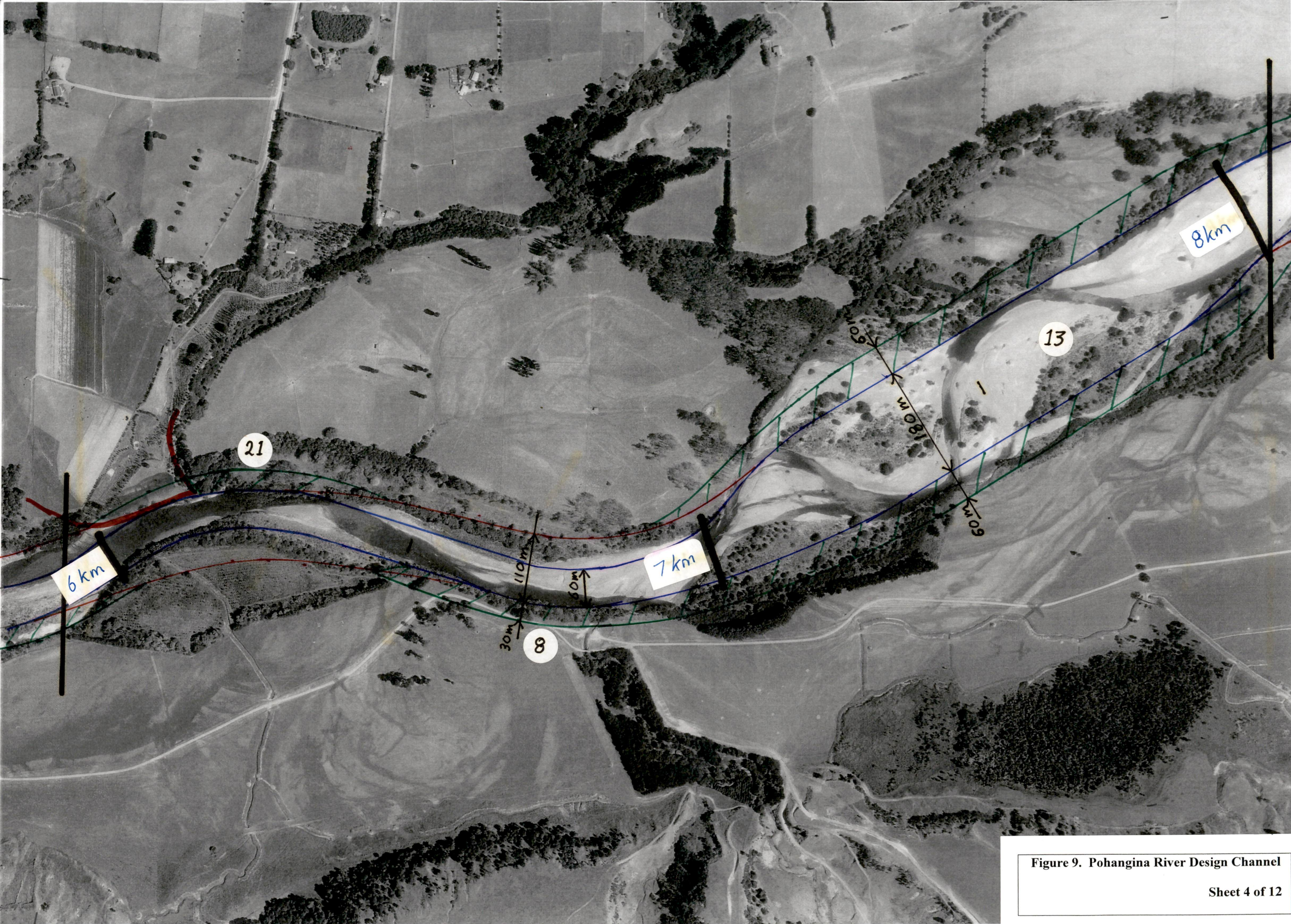


Figure 9. Pohangina River Design Channel

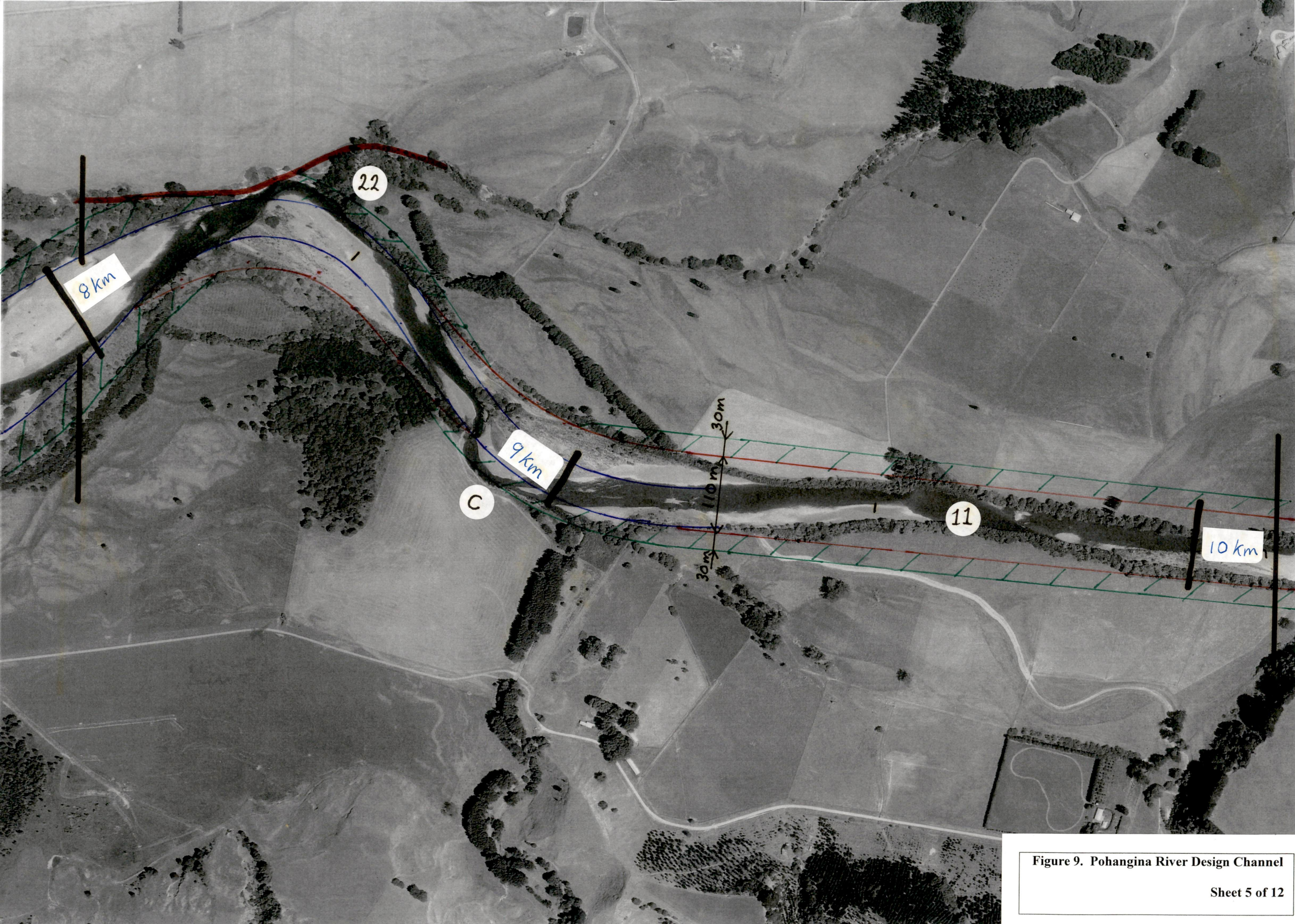


Figure 9. Pohangina River Design Channel

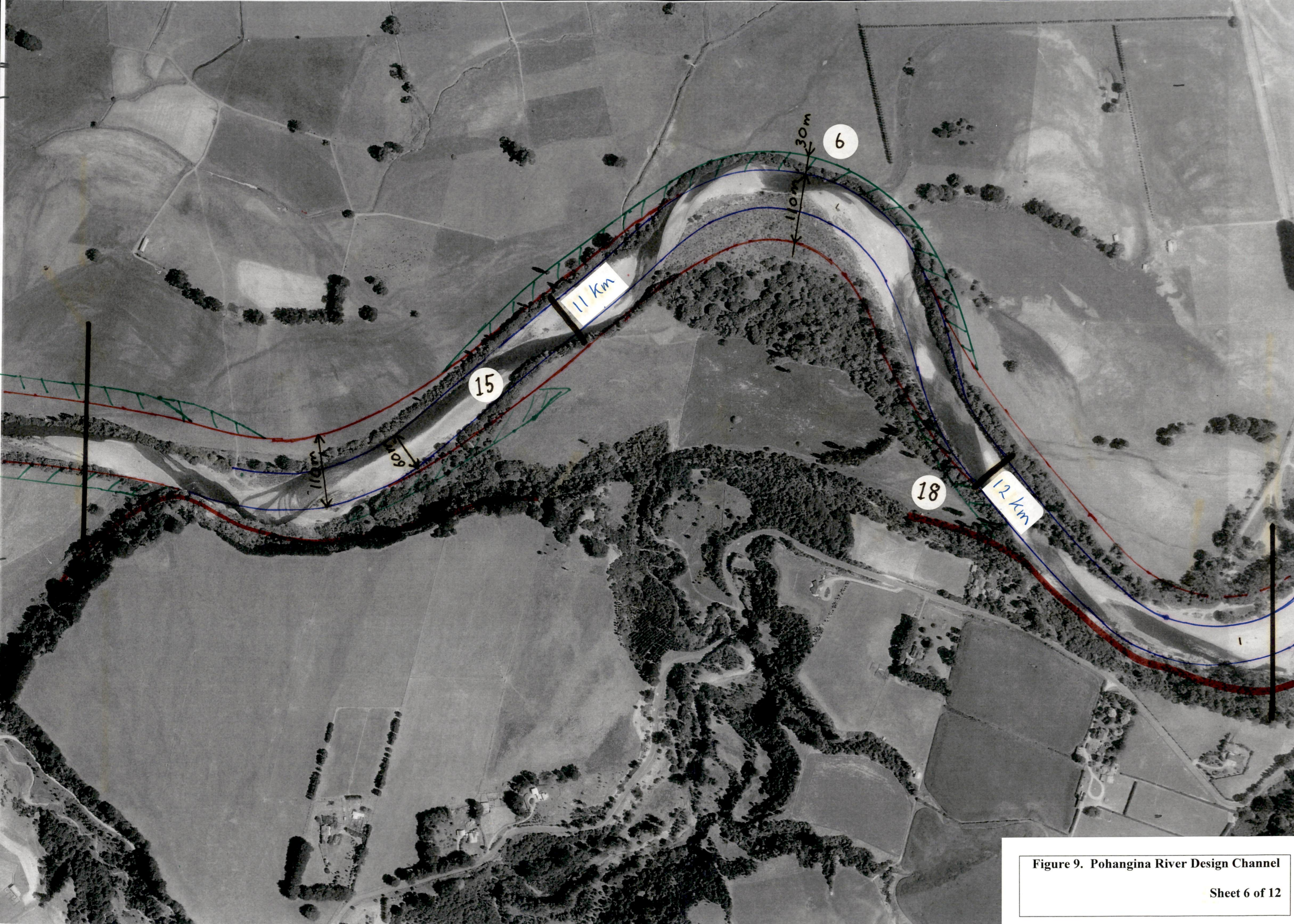


Figure 9. Pohangina River Design Channel



Figure 9. Pohangina River Design Channel



Figure 9. Pohangina River Design Channel

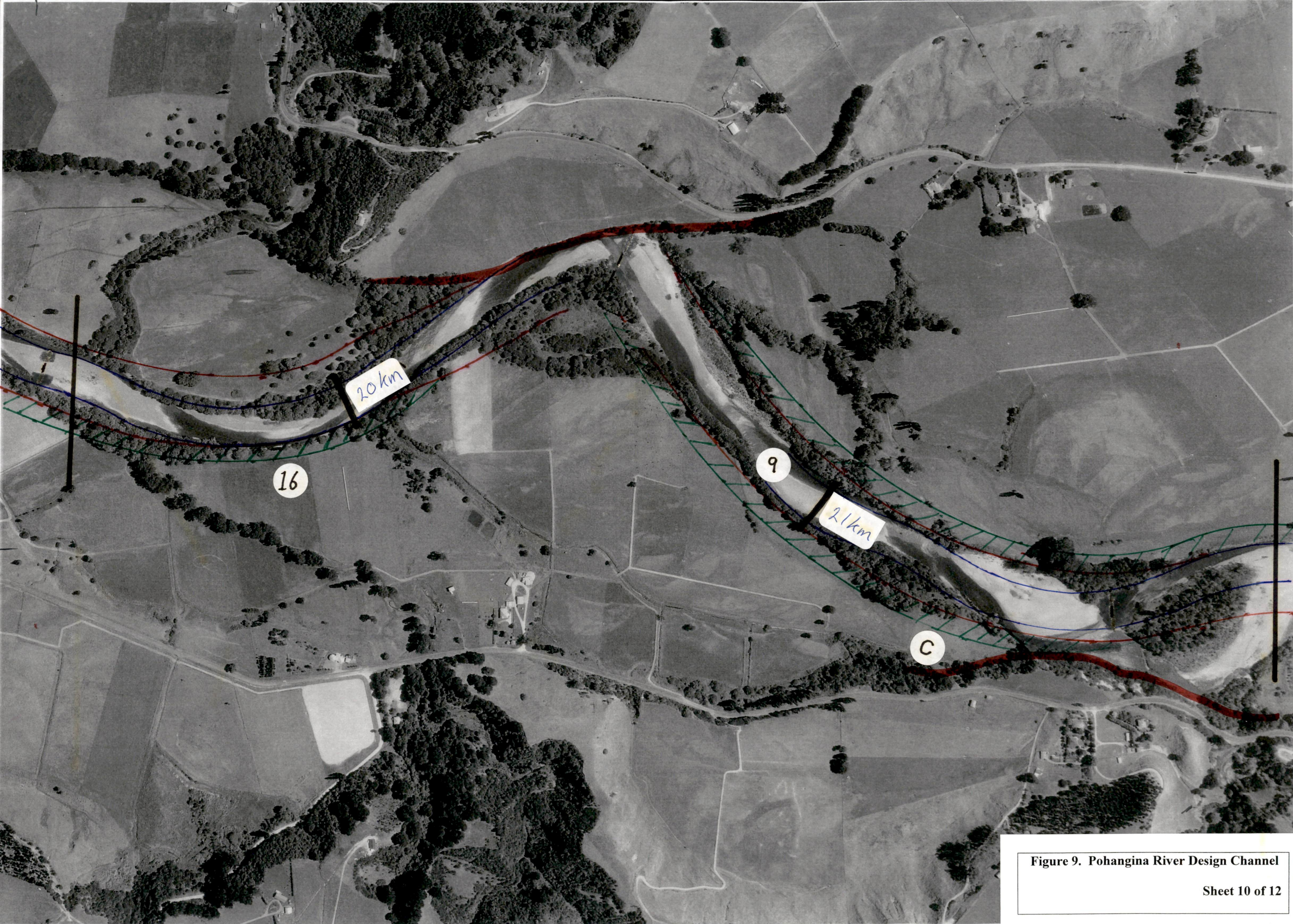


Figure 9. Pohangina River Design Channel

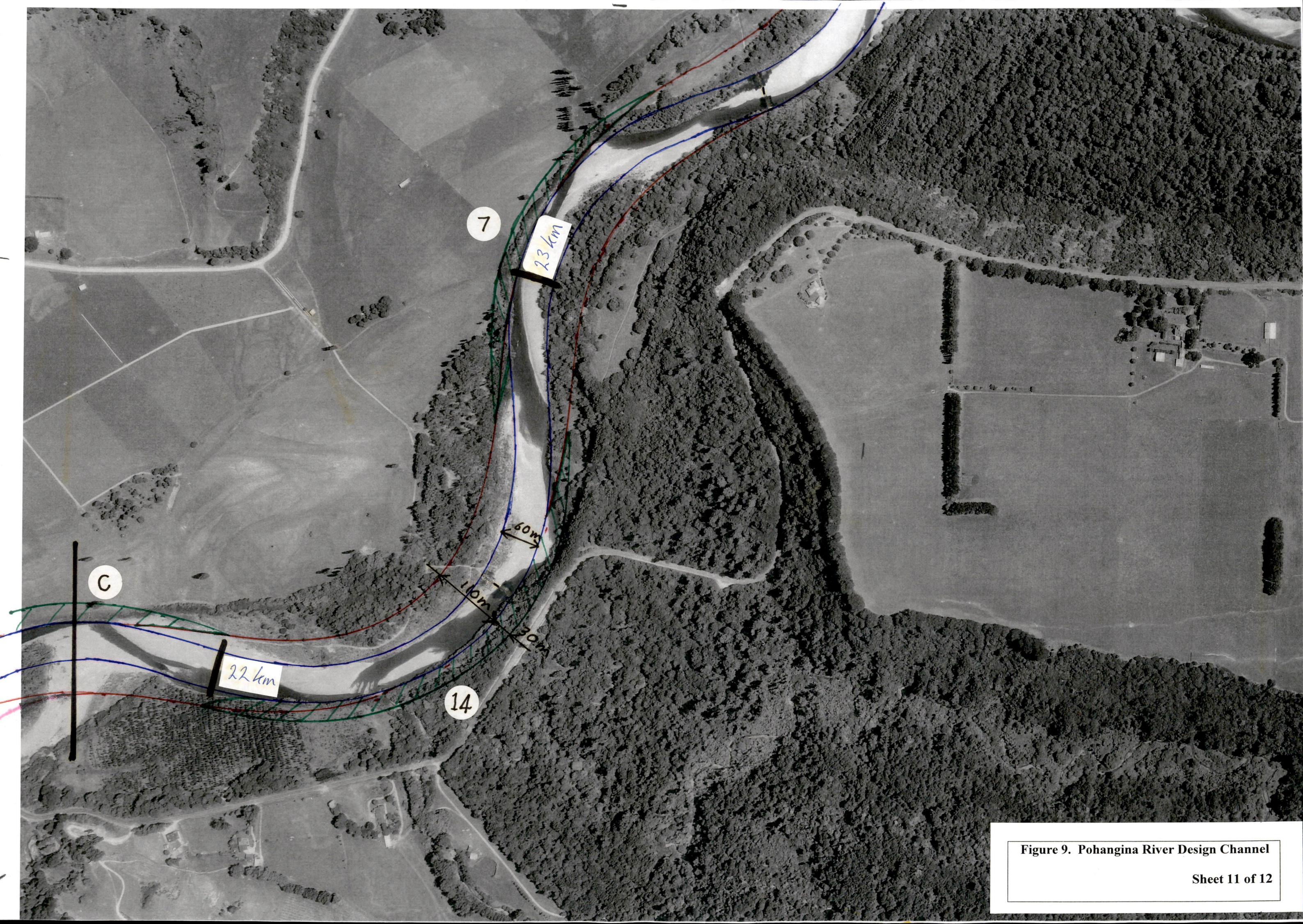


Figure 9. Pohangina River Design Channel



Figure 9. Pohangina River Design Channel

13. THE OROUA RIVER DESIGN

For the Oroua River, design channels and buffer zones have been drawn up for the three meander forms along representative reaches. Refer Figure 11. However, realistic and practical design channels that fit the natural forms can not be drawn up for the full (managed) length of the Oroua River but there are some reaches where applying these design channels would assist river management.

Where there are substantial areas of river flats, and where a greater intensity of river management would be worthwhile, applying a “type 1” design channel, (refer to Section 12 for general descriptions of design channel types) based on the flow dominant meander, could provide a useful management guide.

Elsewhere on the Oroua River, the natural meander forms can be used to guide management measures, site by site. Refer to Table 10 for design parameters. This essentially means that, in the case of the Oroua River, for much of its length river management cannot be significantly improved by following an overall design channel along a reach. Management must then be more piecemeal, and will therefore inevitably be less effective.

Table 10: Oroua River Design Parameters

Meander Form	Channel width	Fairway width	Radius of Curvature	Buffer Zone Width
The threshold of motion meander form	35 m	65 m	140 m to 210 m	20 m
The Flow Dominant Meander – type 1	na	65 m	na	20 m
The Flow Dominant Meander – type 2	na	105 m	na	35 m

na – not applicable

Analysing Scheme expenditure for the Oroua River over the past twelve years shows a reasonably consistent level of expenditure on works except following the 1992 and the 1999/2000 floods.

Table 11 sets out the average annual expenditure on the Oroua River over the past 12 years and an estimate of the proposed annual expenditure required to largely continue with the existing management regime but also recognising the need to carry out a greater level of maintenance and the widening the buffer zones. Refer to Section 9 – Oroua River Channel Geometry regarding the need for this work.

13.1 The Analysis

Past flood damage and expenditure records for the Oroua River show that the level of flood damage sustained does not vary significantly above the average figure until 10 year plus floods occur. At that point the annual flood damage jumps by \$80,000 - 90,000 to approximately \$120,000. It would therefore be reasonable to place \$15,000 annually into a flood damage reserve to enable the damage sustained in these flood to be repaired.

As the channel is widened proactively through channel clearing work and the general level of channel maintenance is increased, the level of flood damage should decrease, increasing the level of funds available to maintain the channel. Failure to increase the level of expenditure at least in the medium term will ensure the same level of flood damage will continue and probably get worse. Figure 5 confirms the trend of increasing levels of flood damage.

Table 11: Oroua River Actual and Proposed Expenditure

Type of works	Average Annual Expenditure (12 years)	Proposed Annual Expenditure
Channel clearing	\$2,600	\$5,000
Tree planting	\$4,900	\$5,000
Tree layering	\$900	\$5,000
Flood damage repair	\$36,000	\$40,000 ++
Approx. contribution to flood damage reserve	\$10,000	\$15,000 * *
TOTAL	\$54,400	\$70,000

++ excluding the large flood expenditure (to be funded from the flood damage reserves).

* * Total reserve contribution includes \$10,000 from the Pohangina River.

The design of future works on the river must, where possible, take into account the width and shape requirements of the meander forms set out in Table 10 above. Much of the river however does not fit within these parameters and so in these situations creating a smooth alignment for the reach of river affected should be the main consideration. This may result in carrying out more work than just repairing the immediate problem, but should ensure a more sustainable alignment long term.

From an analysis of the 2000 aerial photographs it can be determined that approximately 25% of the river has planting up to the design standard of 20 metres on both banks and 40% of the planting on either bank is up to the design standard. The remaining sections of the river are planted quite well however with the total planting of approximately 80% of the design. To bring all the riparian planting up to design would involve the planting of between 14 and 17 hectares of trees at a cost of about \$7,000. This planting will fit easily into the existing programme of tree planting. When the tree planting has been completed the allocation for planting should be used to maintain the existing trees and maintain the channel fairway width.

Any new protection works must be planted behind the work to a width of 20 to 35 metres depending on the meander form being managed. Landowners on whose property the protection works are being constructed will be required to make available a strip of land for the planting. Landowners will be required to fence off the buffer strips to exclude all stock.

13.2 Oroua River Works Priority

Like the works required in the Pohangina River, it is clearly not possible to fund the entire programme in the first year, nor are there sufficient physical resources to carry out the works. The works have not been specifically identified and prioritised but it is important that the funds are spent where they will give the greatest scheme benefit. Three factors should be considered when determining the priorities. These are:

- the amount of work that has historically been carried out at each site. Figure 10 shows the location of the flood damage works over the period 1970 to 2000;
- the land at risk if the works were not carried out; and
- the impact on the loss of alignment if the works were not carried out.

Based on these criteria the highest priority reaches of the river have been identified and are marked in red on Figure 11 and are set out in Table 12.

Table 12: Priority Reaches for Oroua River Works

Priority	Reach of River
1	5.0 km to 12.0 km
2	31.5 km to 38.0 km
3	18.0 km to 20.0 km
4	25.5 km to 27.7 km

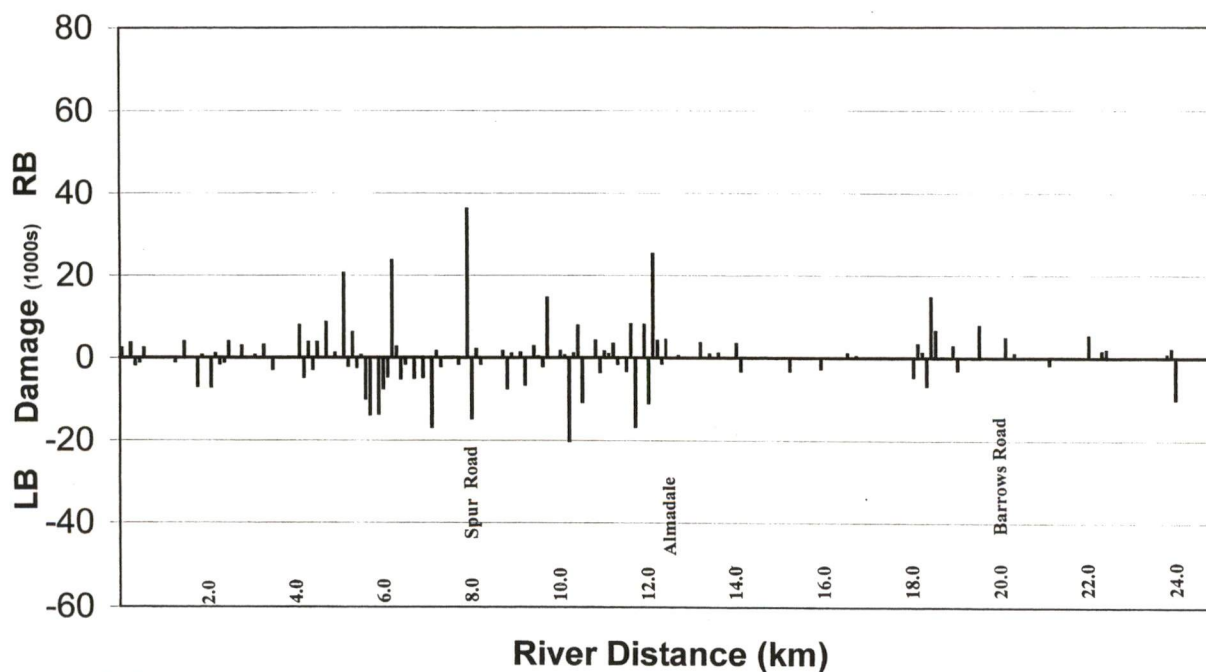
13.3 Flood Damage Repair

Flood damage over the past twelve years on the Oroua River has averaged \$36,000 in the years without big floods and \$130,000 in the years with big floods. The 12 year damage bill was \$727,000. The proposed future funding plan would provide \$660,000 over this period. This should be adequate if the proactive channel works are carried out and future works are carried out in line with the design parameters.

An additional \$10,000 per year into the Emergency Reserve would make a significant difference but would increase the rates required by 5% overall.

The options set out for the Pohangina River in Section 13.3 could also apply to the Oroua River by borrowing to raise money to fund the works and rating to fully repay the loan in the year following.

Oroua Flood Damage 0 to 25 km 1970 to 2000



Oroua Flood Damage 25 to 43 km 1970 to 2000

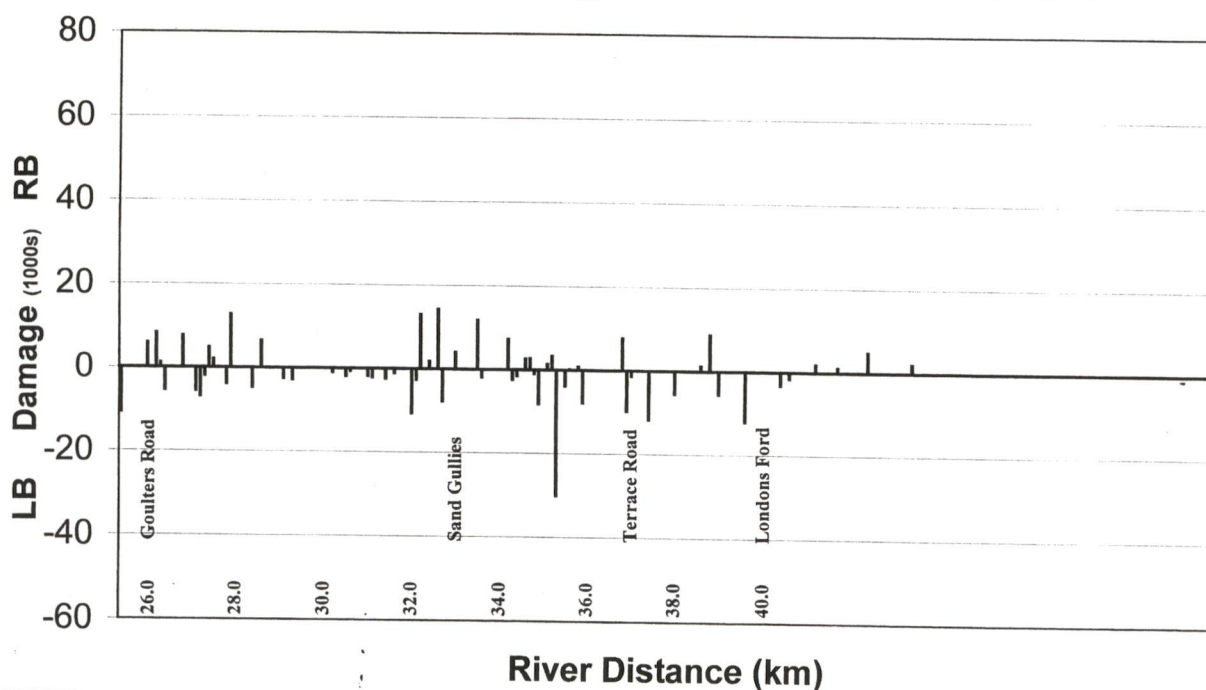


Figure 10. Location of Oroua River Flood Damage 1970 to 2000



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel

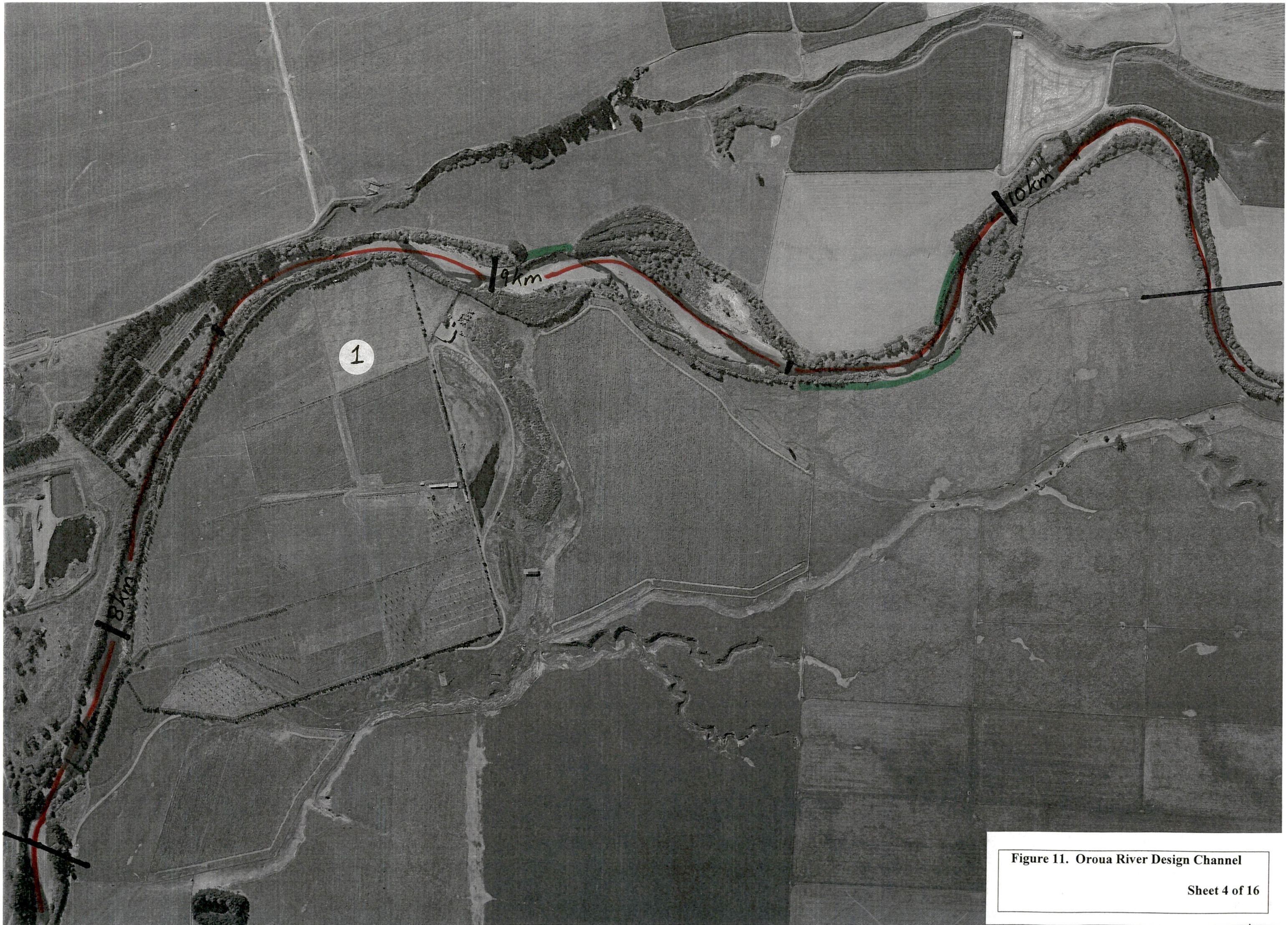


Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel

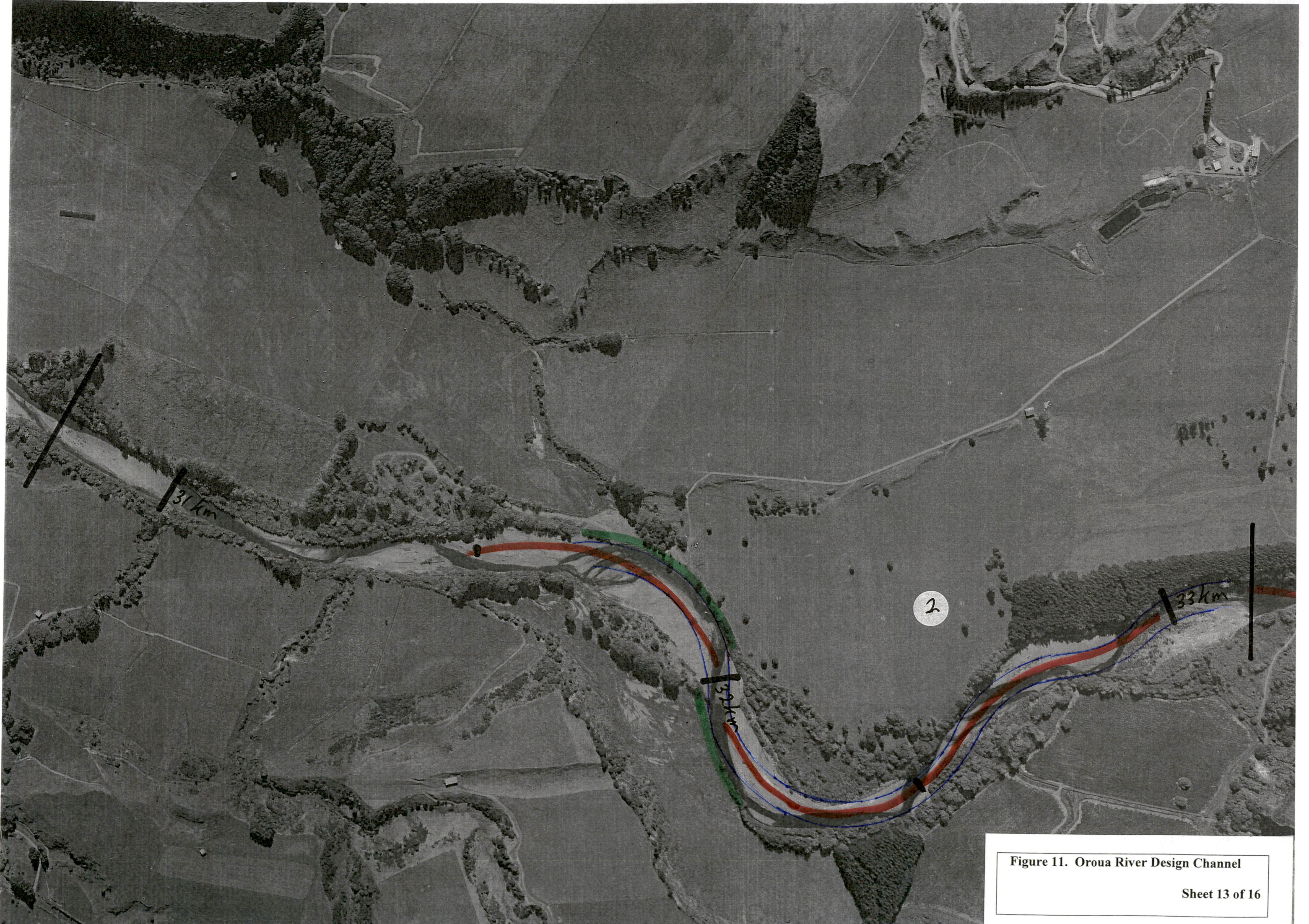


Figure 11. Oroua River Design Channel

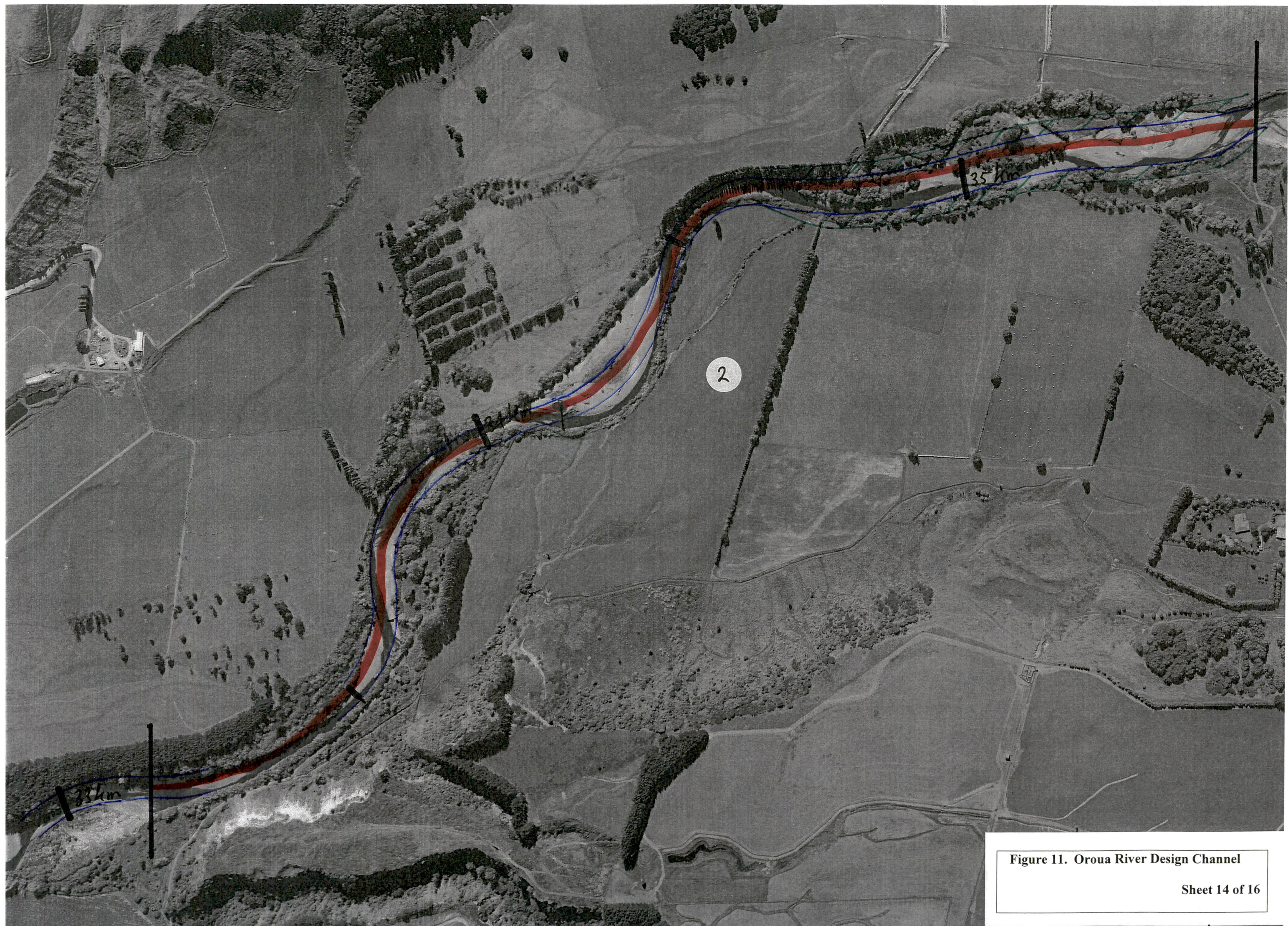


Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel



Figure 11. Oroua River Design Channel

14. GOULTERS GULLY FORESTRY

Sections 2 and 9 above set out the historical development of the forestry in the Goulters Gully complex.

Approximately 38.4 hectares of *Pinus Radiata* was planted between 1969 and 1978 with a further 30 hectares planted by Belmont Station in 1994.

The 38.4 hectares are now ready for harvesting and plans are well underway to harvest the trees over the next two to three years.

The timing of their release to the market is critical to ensure that the income from the trees is optimised.

horizons.mw's soil conservation staff have prepared a budget for the harvesting, and a cash flow for the first 15.3 hectares and estimates for the remaining 23.1 hectares have been prepared based on these figures. As the costs and returns will vary from block to block and the demand from the market at the time of harvest will also vary it was considered that a more detailed estimate was not warranted at this stage.

The management of the various blocks has been variable when compared to the management practices undertaken today. Pruning varies from 0 to over 8 meters and stocking rates vary considerably from the low 200s to over 300 stems per hectare. Details of the tree crop and conditions for the different blocks are set out in an unpublished report titled "Goulters Gully Logging report"¹³.

Table 13 sets out the information for the blocks that have been evaluated to date.

Table 13: Value of the Harvested Trees from the First 15.3 ha.

Stand	Area hectares	Tree Value per hectare	Logging and Management Costs per hectare	Net Return per hectare	Net Total Return
1	10.3	\$34,200	\$17,040	\$17,160	\$176,750
3	5.0	\$29,250	\$12,920	\$16,330	\$81,650
TOTAL	15.3 ha				\$258,400

¹³ Goulters Gully Logging report – horizons.mw library, Regional House, Palmerston North. Undated but produced in 2000.

The average value of the trees harvested from stands 1 and 3 is \$16,900 per hectare. Using this average to determine the value of the full 38.4 hectares of trees gives an approximate value of \$650,000.

The ongoing management of the Goulters Gullies is critical to the stability of the area. Harvesting without recognising the fragile nature of the underlying soils could easily result in further severe erosion occurring. This consideration has increased the cost of the harvesting work resulting in the lower than normal net return from these trees and taking these matters into consideration, the cost of future planting and management of the trees has been estimated to be \$5,600 per hectare. This brings the total replanting and management cost to \$215,000.

The total return from the forestry is therefore estimated to be

$$\$650,000 - \$215,000 = 435,000.$$

The actual return will depend on the state of the market at the time the trees are sold, the cost of harvesting, replanting and ongoing management. It is not possible to predict these with accuracy but for planning the future Scheme expenditure, the net return figure from the forestry will be taken to be \$435,000.

The forestry asset has a significant value and is now insured for \$511,000 for the timber and \$50,000 to replant. The cost of the insurance is approximately \$245 per annum.

Future Management

As stated above the future management of the area on which the forestry is situated is critical to ensure the ongoing stability of the very fragile sand formations. Prior to any harvesting a detailed programme of reestablishment will need to be produced and approved by the Scheme Manager.

15. DRAINAGE

Currently the Pohangina Oroua Scheme maintains 15.4 km of drains. \$4,000 to \$5,000 per annum or 5% of the normal level of Scheme expenditure is allocated annually to the drain maintenance programme.

When the Scheme was established in 1967 the land which received drainage benefit was rated Class A. In the 2000/2001 year \$4,064 were collected from A class ratepayers over and above the level of the Class B rate. This is considerably less than the overall cost of carrying out the drain maintenance works when adding on an allowance for management and administration. A new classification will need to address this problem.

The drains provide drainage to four areas in the Pohangina Valley and one area in the Oroua Valley. Some of the drains service only one landowner whereas some extend over a number of kilometres providing drainage outlets to a large number of properties.

The Scheme was established initially to ensure that in the long term maximum economic production is obtained from the land. This was achieved largely by carrying out soil conservation and rivers control activities in the Scheme area. Effective drainage is also a factor contributing to the productive potential of the land and for this reason was included in the Scheme.

The impact on the economic productivity of the Scheme area from the maintenance of the drains is minor and their continued inclusion in the Scheme should be questioned.

In the other schemes managed by horizons.mw, that have been reviewed in recent years, the drains providing little if any community benefit, that is they lie entirely on one farm, have been removed from the drain maintenance programme by agreement with the landowners.

An examination of the drains in the Scheme show that many of the drains lie entirely on one farm and the future management of these drains as part of the Scheme should be considered further and decisions made when the Scheme is reclassified.

Table 14 sets out the drains that currently form part of the Scheme. Only Drain N lies in the Oroua Catchment. The drains are shown on Figure 12, sheets 1 - 3.

Table 14: Scheme Drains

Drain no.	Landowner	length km	Drain no.	Landowner	length km
A.	O'Neil	0.4	H.	Leamy-Pratt	0.5
B.	O'Neil	0.8	J.	Leamy	0.7
C.	Hepburn-O'Neil	1.4	K.	McCartney-Edwards	1.4
D.	O'Neil	0.3	L.	Carroll	1.3
E.	Akers	1.1	M.	Caldwell	1.0
F.	Jones-Lucas	3.0	N.	Paorangi-Moss	2.4
G.	McDonald	1.1			
TOTAL LENGTH					15.4 km

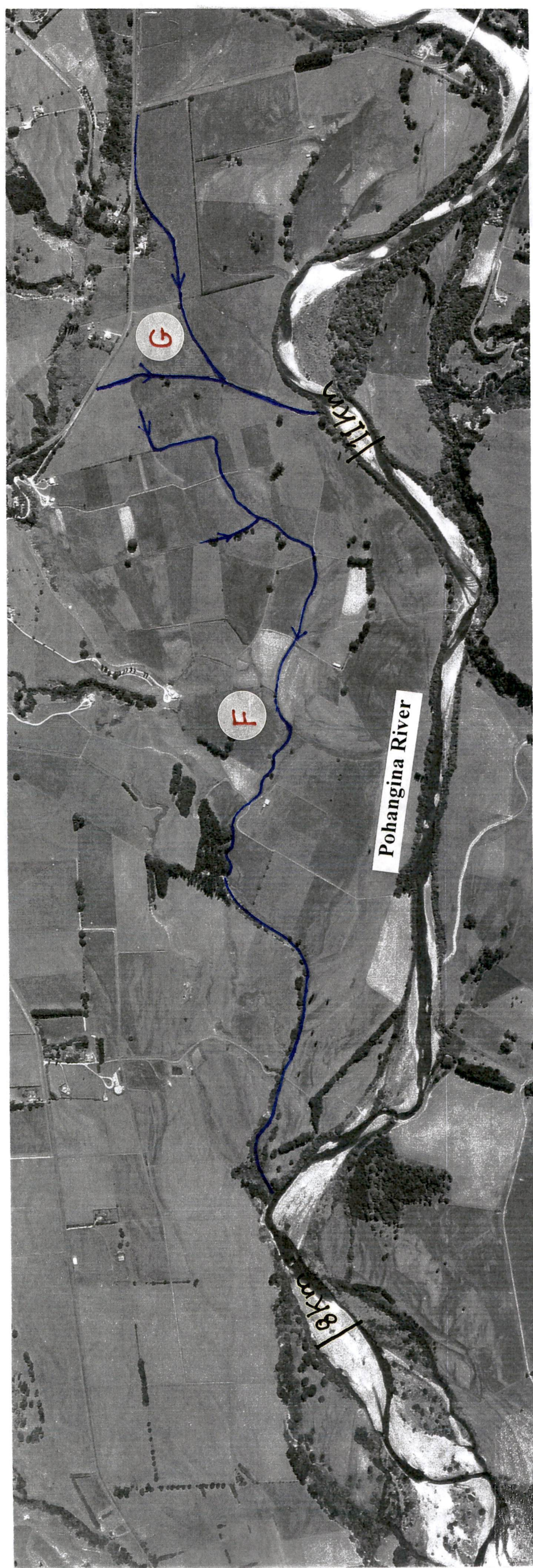
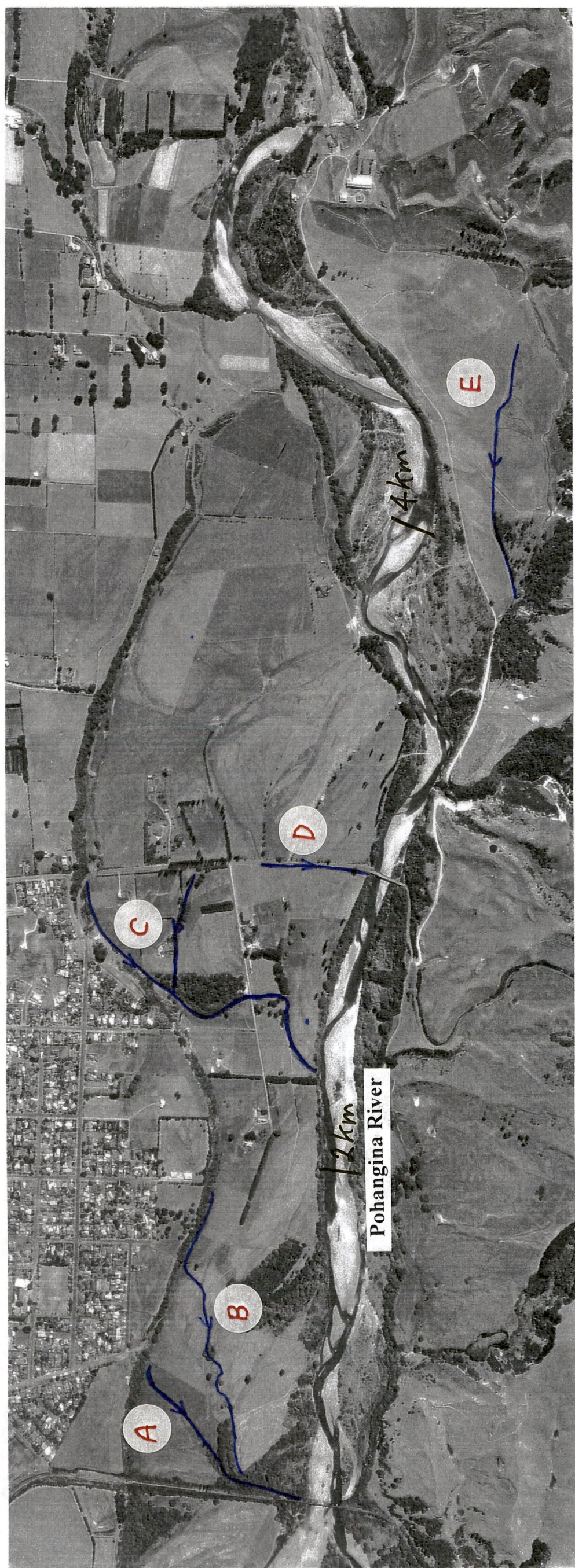


Figure 12. Location of Scheme Drains – Sheet 1

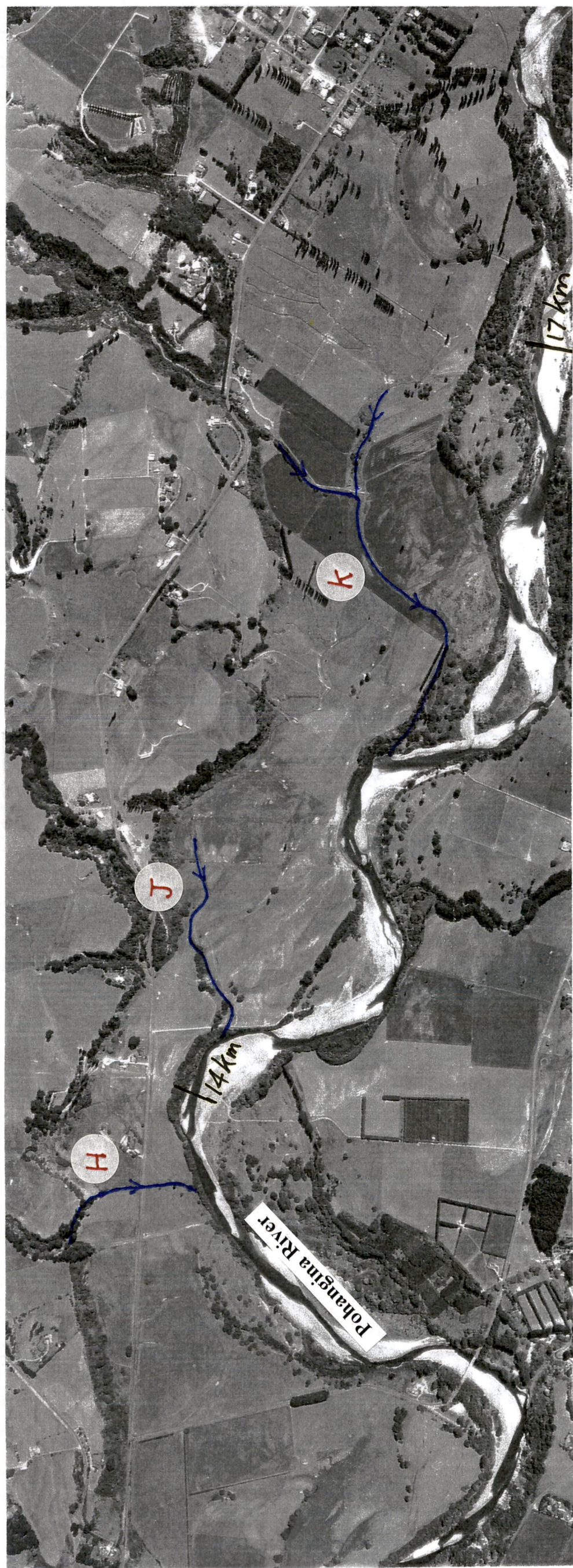


Figure 12. Location of Scheme Drains – Sheet 2



Figure12. Location of Scheme Drains – Sheet 3

16. MAINTAINING SCHEME ASSETS

Fundamental to the success of the Scheme will be the maintenance of all scheme assets to ensure they continue to provide their design level of service.

Existing Scheme assets which include erosion protection works, stopbanks, plantings and drains must be maintained ahead of constructing new Scheme assets and Scheme assets should not be constructed unless there is a plan to fund the necessary maintenance works.

The channels of the Pohangina and Oroua Rivers are not considered assets in the Scheme Asset Management Plan but to ensure the effectiveness of the Scheme is maintained the flood carrying capacity of these channels must be maintained as if they were Scheme assets.

Without maintaining these channels, history has shown that a significant loss in capacity will occur through gravel beach build-ups, edge vegetation encroachment, and beach vegetation.

17. PROTECTION OF ACCRETION

17.1 Rating Accreted Land

There are a number of issues with respect to the accretion land within the Scheme. Accretion land that has not been claimed by the adjacent landowner has no title and therefore no rate reference. Therefore despite the fact that this land benefits from the scheme works either directly or indirectly, it cannot be rated to recognize the benefit received. For this land to be rated, the adjacent landowner would need to claim it as accretion.

The area of unclaimed accretion in the Pohangina River is approximately 150 ha. This is approximately 15% of the land in classes A, B and C. There is a similar amount of titled land in Classes A, B, and C that now forms part of the riverbed. Overall at this point in time, one compensates the other but when the Scheme is reclassified the titled land in the riverbed will not be rated for the high level of benefit that it is currently rated for.

The problem of not being able to rate the unclaimed accretion or the landowner who farms the unclaimed accretion will be examined during the reclassification of the Scheme.

17.2 Protection of Accreted Land

The other significant concern raised by ratepayers is the expenditure of scheme funds to protect land that is not rated. Nearly all the works proposed in this review of the Scheme are required to maintain channel alignment. Therefore even if a particular protection work was providing protection to an area of accreted land, failure to carry out the work would place other sections of rated land at risk.

Of the 28 sites where capital works will be carried out over the next 7 years according to the programme of works identified in the review or have recently been carried out, only four of them provide significant protection to unclaimed accretion. Of those four, only one could be left and not have a significant impact on channel alignment.

If the location of accreted land was taken into consideration when determining the order of priority for the proposed works, the works protecting accreted land would not move very far at all on the priority list from where they are now.

18. LOCAL AUTHORITY CONTRIBUTION & THE PROTECTION OF NON-SCHEME ASSETS

18.1 The Totara Reserve

When the Scheme was first established and the classification prepared in 1966, no Local Authority contribution was established through the classification process. A Local Authority contribution has however been paid to the Scheme since very soon after the classification was finalised. The contribution is currently collected from the Manawatu District Council and the 2000/2001 level of contribution was set at \$6,567 (GST excl).

There has been considerable debate over the years about what the contribution covered. A study of the old files¹⁴ has determined that the contribution is a contribution in lieu of a rate for the Totara Reserve.

When the classification was prepared in 1967 the Pohangina Valley Domain, now known as the Totara Reserve, was classified within the Scheme with 300 acres in Class B, 88 acres in Class C and 361.25 acres in Class E.

The Totara Reserve land is however non-rateable, but at that time, if it had been rateable, the rates would have been \$251.52.

Following discussions between the Palmerston North City Council and the Manawatu Catchment Board, the two authorities agreed in November 1969 that the City Council would make an annual grant in lieu of rates of \$250 commencing in 1970/71 and subject to annual review.

In a letter¹⁵ dated 10 November 1969, the Board undertook to maintain all river protection work in the reserve area as part of the Pohangina Oroua Scheme.

Recalculating the rate today on the current rates per hectare for land in Classes B, C and E would bring the 2000/2001 contributions to \$6,067.

It is not clear why the contribution for 2000/2001 is \$500 higher than this.

The level of contribution needs to be renegotiated with the Manawatu District Council along with the level of works if any that will be undertaken as part of the Scheme.

18.2 Ashhurst Township

The Pohangina Oroua Scheme Classification included part of Ashhurst Township, then under the administration of the Oroua County Council. At that

¹⁴ File 30/X in **horizons.mw**'s file system (Old MCB file) and File 27/6 in **horizons.mw**'s file system (Old MCB file)

¹⁵ File 30/X in **horizons.mw**'s file system (Old MCB file)

time, the Catchment Board collected its scheme rate from the urban area of Ashhurst and because of a legislative requirement a minimum rate of 50 cents per property was collected. Because this almost doubles the rate that was struck for each property, there was considerable pressure from Ashhurst ratepayers to collect the rate in a way that resulted in them only paying the rate that was struck and not the minimum rate. It was finally agreed after a petition and much debate that the Oroua County Council would collect the Scheme rate on behalf of the Catchment Board through its normal rating system. This rate is now collected through the Palmerston North City Council.

The benefit provided to Ashhurst was identified at the time as both indirect benefit, and direct benefit by way of maintenance of a drainage outlet that catered for water spilling over the edge of the terrace to the west of the town.

The level of benefit received by Ashhurst and the level of rating will need to be considered during the reclassification of the Scheme.

18.3 Protection of Non Scheme Assets

The protection works carried out as part of the Scheme are designed to protect property and assets of those who contribute to the Scheme through the payment of Scheme Rates.

All protection works required to protect assets where the owner of those assets does not contribute to the Scheme should be funded by the asset owner unless otherwise agreed to by **horizons.mw** and the Scheme ratepayers.

In the Pohangina Oroua Scheme these assets include all the bridges in the Scheme area owned by the Manawatu District Council, Transit NZ, and Transrail and sections of roads and railway that are at risk of being flooded or undermined by river erosion.

In some situations it is difficult to determine what the appropriate cost share should be when protection works provide protection to both scheme assets and non-scheme assets.

If works are required to prevent riverbank erosion that is only threatening a non-ratepayer asset, then the works must be fully funded by the asset owner.

If works are required to prevent riverbank erosion that is threatening both a non-ratepayer asset and a ratepayer asset, then the cost of the works must be shared between the Scheme and the asset owner. However in many situations within the Scheme damage to ratepayers assets may be accepted as part of natural river processes and in these situations the total cost of the protection works shall be funded by the asset owner.

19. RIVER DISTANCES

Recording the location of works in the river in the past has been by way of a river distance. The original Scheme Plan that detailed the works to be carried out marked the river distances in miles. A 1971 set of 10 chains to the inch aerial photographs that were used for many years for this purpose had slightly different location for these river distances.

Works carried out since these river distances were established have shortened the channel and these distances are no longer accurate and errors occur when trying to locate past works.

All references to past works in this report relate to the distances used by those keeping the records at the time.

It is now timely to establish a new basis for the measurement of river distance that relates to the river as it stands today.

Zero kilometers on the Pohangina river is a hard point to fix because of the mobile nature of its confluence with the Manawatu River and so the railway bridge at Ashhurst has been set as river distance 1.0 km.

The new river distances are marked on the photographs in Figures 9 and 11.

The same story goes for the Oroua River but the distances are not as far out of alignment with the river today. However to create a river distance recording system that can be used to accurately locate works in the future, the river distances have been repositioned.

In order to duplicate the old distances as much as possible it was decided to match the old 2.5 mile mark with the new 4 km mark and renumber up stream and downstream from there. The 4 km mark is the bridge on the Colyton Feilding Road.

20. CLASSIFICATION

20.1 The Existing Classification

A classification divides the Scheme area into relative benefit areas or classes that provide an equitable basis for the setting of rates to distribute the costs of carrying out capital and maintenance works.

The existing classification was carried out under the provisions of the Soil Conservation and Rivers Control Act 1941 on an area basis. It was prepared for the Manawatu Catchment Board in 1966 by I G Macdonald and signed by the Chairman on 17 January 1967. A copy is at Appendix F.

Table 15 sets out the existing classification for the Scheme and the proportions of the rates collected for the 2000/2001 financial year.

Table 15: Scheme classification and Rating Levels for 2000/2001 (GST INCL)

Class	Area	Relative % benefit	Rate per hectare	Rate collected
A	166.00	100	\$71.99	\$11,950
B	1419.68	66	\$47.51	\$67,454
C	1015.74	33	\$23.76	\$24,131
D	11885.09	4	\$2.88	\$34,229
E	10280.14	2	\$1.44	\$14,803
F	30640.20	1	\$0.72	\$22,060
TOTAL	55406.85			\$174,627

A number of interesting points that influenced the assignment of classes to the various areas of the Scheme were made by the classifier. These can be summarised as follows:

The Pohangina River

- in contrast to the Oroua River the Pohangina river is unstable and has for the greater part a wide area of river bed wherein it may change its course considerably even over brief periods;
- protection work is negligible considering the total length involved and there is a shortage of willows; and
- there is a major deficiency in fencing.

The Oroua River

- the Oroua River is generally stable in comparison to the Pohangina River;

- there are several stretches much too narrow to cope with normal floods;
- there is a wide variation in the standard of the bank protection works in the Oroua River;
- there are cases of well planted, well fenced river banks however there could be some removal of willows required to widen the bed even in these cases; and
- in comparison with conditions on the Pohangina, existing protection work is generally of a good standard.

20.2 The Need for a New Classification

Reclassification is generally required when there are significant changes to the expenditure from that planned at the time of the last classification.

By analyzing the rates collected from riparian ratepayers it can be determined that the ratio of rates collected from the Oroua ratepayers to the rates from the Pohangina ratepayers was approximately 40 to 60.

The past expenditure on the Scheme is reasonable well documented but the expenditure on maintenance between the Pohangina and the Oroua Rivers up until 1989 was not split between the two rivers. The expenditure on flood damage has therefore been used as an indicator of overall expenditure and this has been analysed for the period from 1971 to 2000. The results of this analysis are shown in Table 16.

Table 16: Rating Levels compared to Flood Damage Expenditure

River	Relative Riparian Rating	Expenditure on Flood Damage		
		1971 to 1981	1971 to 1989	1988 to 1998
Pohangina	60 %	62 %	49 %	43 %
Oroua	40 %	38 %	51 %	57 %

It is clear from these records that up until 1981 the proportion of the rates collected from the two rivers matched the expenditure in the two rivers. However since that time the expenditure distribution has almost switched. This therefore shows that the existing rating system is no longer collecting rates in an equitable way.

Comparing the expenditure on flood damage over 2 km reaches of the Pohangina and Oroua Rivers with the rate income obtained from riparian ratepayers in those reaches, it can be seen that over the period 1970 to 2000, the income and expenditure are not aligned. Figures 13, 14 and 15 clearly show these discrepancies.

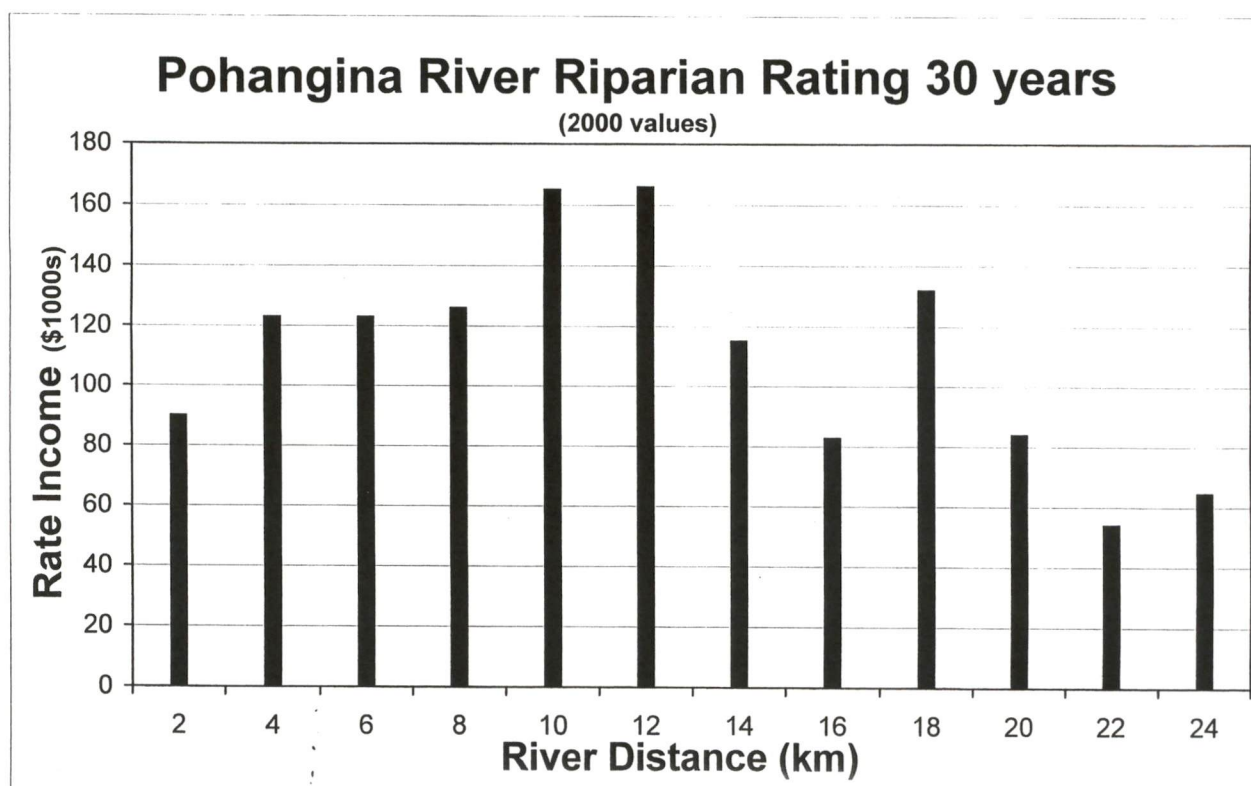
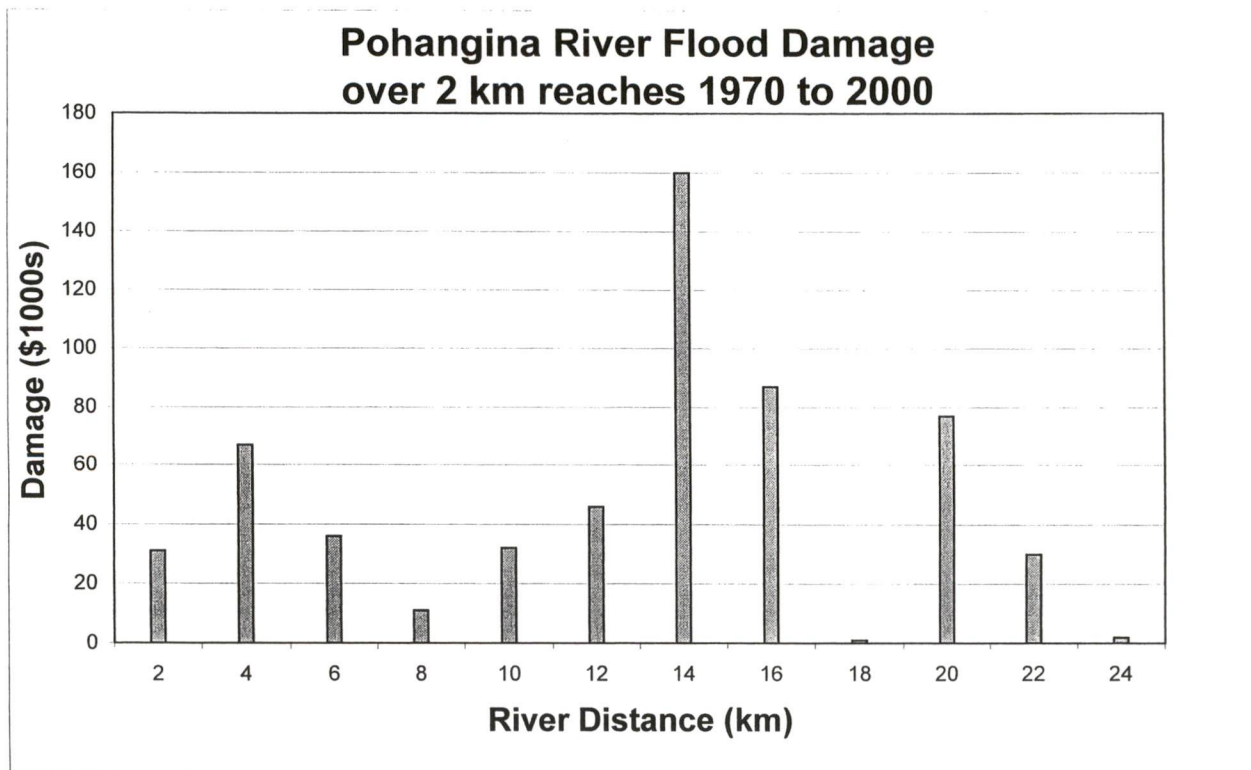
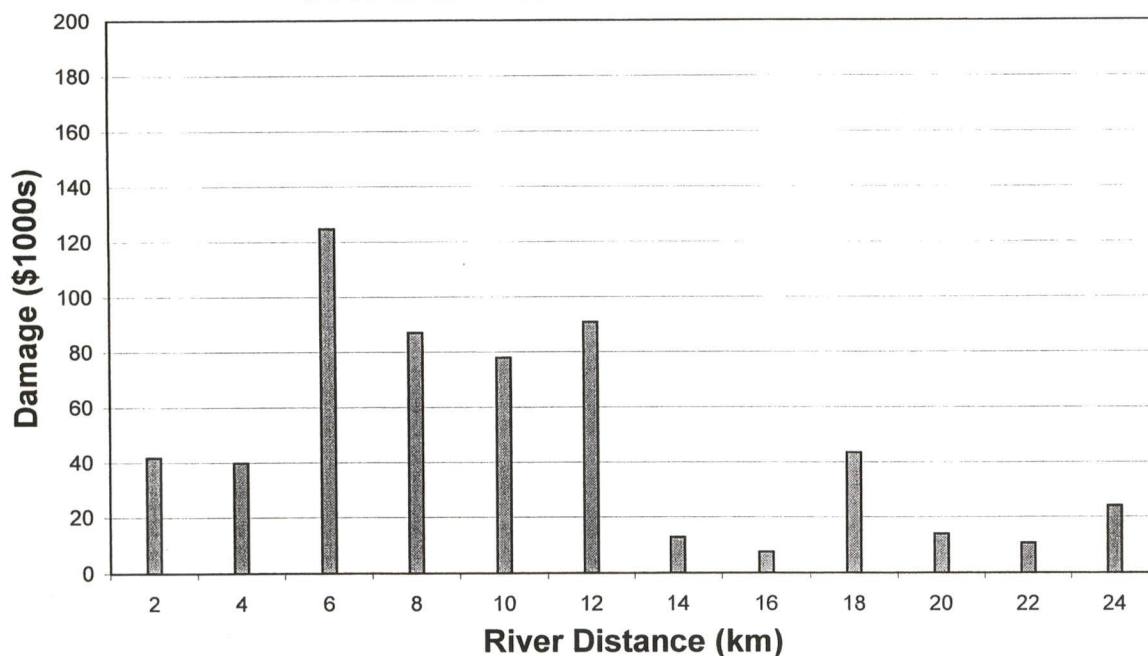


Figure 13. Comparison of Pohangina River Flood Damage Expenditure with Rating Income 1970 to 2000

Oroua River Flood Damage over 2 km reaches 1970 to 2000



Oroua River Riparian Rating 30 years (2000 values)

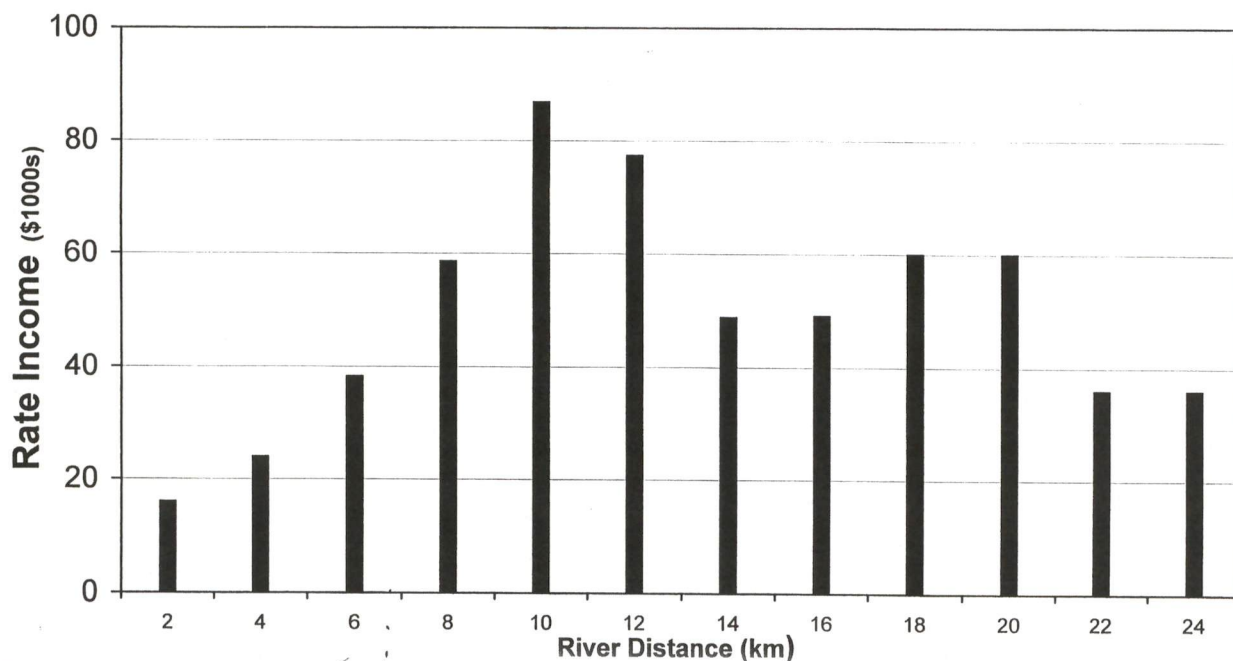
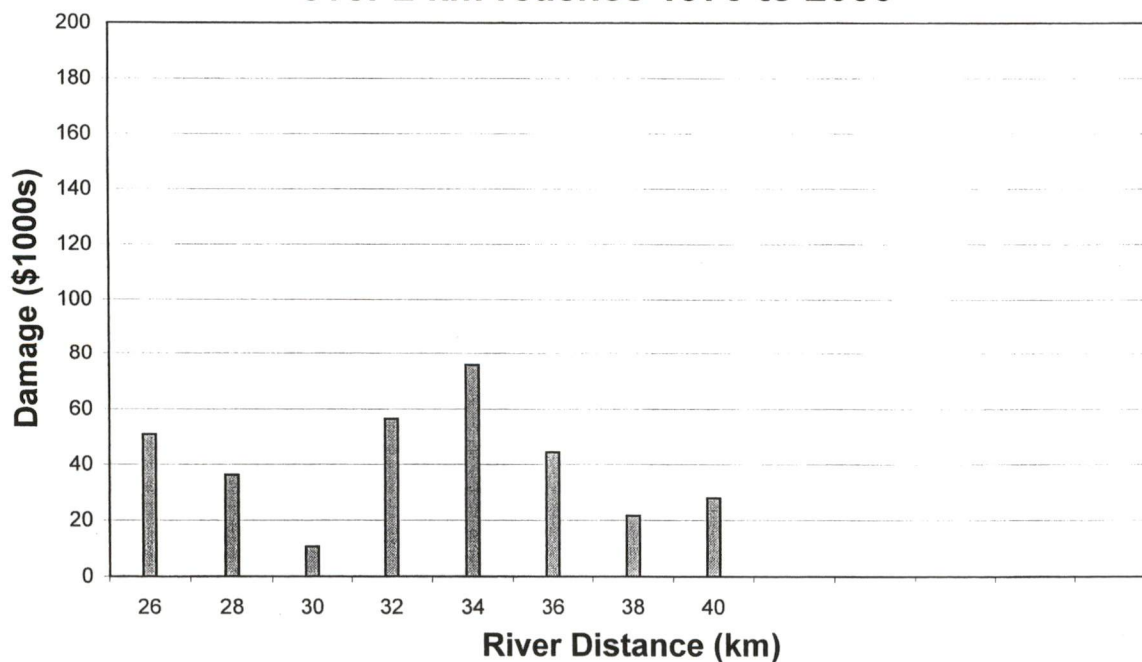
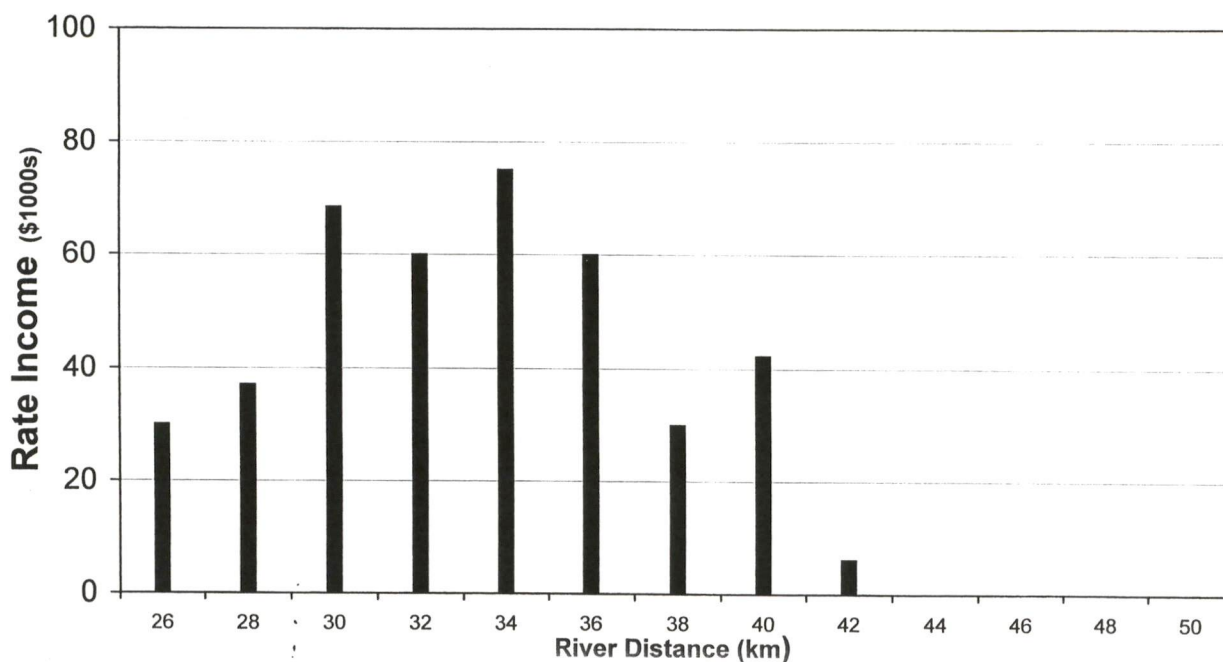


Figure 14. Comparison of Oroua River Flood Damage Expenditure with Rating Income 1970 to 2000 – Sheet 1

Oroua River Flood Damage over 2 km reaches 1970 to 2000



Oroua River Riparian Rating 30 years (2000 values)



**Figure 15. Comparison of Oroua River Flood Damage Expenditure with
Rating Income 1970 to 2000 – Sheet 2**

Figure 16 sets out the proposed expenditure on the Pohangina River by 2km reaches and the rating income for 30 years. It can clearly be seen that the existing classification will not be equitable for the funding of future works.

Soil Conservation

Under the original classification approximately 25% of the rates were to be collected from the Class D area, which was the area requiring community funded soil conservation work. This area was mainly the area of the sandy silty very erodeable soils. When the initial works were undertaken more than 25% of the Schemes funds were budgeted to be spent in this area but there has been almost no expenditure since 1992 and even that was an isolated year.

With the future maintenance of scheme works in this area funded from returns from the forestry, very little if any rating will be required in the future. It is therefore considered inequitable to continue collecting soil conservation rating under the existing classification.

20.3 A New Differential Rating System

The rating provisions of the Soil Conservation and Rivers Control Act 1941 were repealed with the introduction of the Rating Powers Act in 1988.

The new Act does not limit the number of classes or categories as they are called today and instead allows as many categories to be used as is necessary to ensure an equitable rating system is developed. This would allow separate rating categories (classes) for each of the Oroua and Pohangina river systems, for indirect benefit, for the urban areas, for drainage, and to reflect how the use of all land within the catchment either contributes to or alleviates the need for works.

21. SCHEME FINANCES

A long term programme for funding the works on the Pohangina River, the Oroua River, the Goulters Gully Forestry, and the Drainage activity, set out in Sections 12 to 15, has been prepared and is set out in Table 17.

The table sets out the Scheme income from Scheme rates, general rates, and forestry, and the Scheme expenditure on works, management, and other costs including loan repayments.

The table shows that to enable the works proposed in the Scheme Review to be carried out, the Scheme rate will need to rise by 15% by the year 2004/05, above the rate proposed for the 2001/02 financial year. The proposed rate for 2001/02 is 10% higher than the 2000/01 rate. The proposed 2001/02 rate rise has been necessary to fund the repayments from the loan taken out for the repair of the flood damage sustained in the November 1999 and the April 2000 floods. These proposed increases would bring the total rate rise to 27% over a 4 year period.

The long term funding programme proposes that the 2004/2005 rate will be held until 2008/2009 at which time a steady reduction in rates will occur for 8 years down to a level of rating last seen in the mid 1990s.

It is important to stress here that the proposed reduction in rates is subject to the following:

- that the proposed rate increases occur as programmed;
- that the return from the forestry investments are close to those budgeted;
- that the works programme be fully implemented as proposed in the review;
- that maintenance is carried out as programmed;
- that meander migration does not require additional work to be carried out that was not envisaged in the Review.

If this programme of works is not adopted it is very likely that the level of flood damage will continue much as it has over the years but may well get worse as the rivers narrow further because of lack of funds available for channel and fairway maintenance.

An analysis of the total rates required to continue with the status quo shows that after 15 years the total rates paid for continuing with the status quo will equal the total rates paid to implement the proposed works programme, but at that point in time the rates being paid will be significantly less that would be the case is the status quo were to continue.

The following assumptions have been made whilst preparing the long term estimate:

- that the proposed works and maintenance programme will be fully implemented;
- that the rate of interest for the 2000/01 loan repayments is assumed to be at a constant 7.5% throughout the term of the loan. A shift of up to 1% in either direction would not significantly change the recommended rate changes;
- that the rate of interest for the return on the forestry funds is assumed to be at a constant 7.5% throughout the term of the investment. A shift of up to 1% in either direction would not significantly change the recommended rate changes;
- that the 'major' flood damage repair work can be funded by the funds set aside each year in the Flood Damage Reserves or from additional rates in the year following the expenditure on flood damage where the damage cost exceeds the level of the emergency reserve. The proposed Scheme works will reduce the level of flood damage and the capital works will be carried out at the flood damage sites if the damage was to occur in the first 6 years of the proposed works programme;
- that 30% of the existing protection works would be retained in establishing a well protected design alignment in the Pohangina River;
- the Goulters Gully Forest will be harvested in the next two years; and
- **horizons.mw**'s policy on General Rate contribution to Schemes, continues.

The budget has been prepared using 2000/2001 figures. Inflation will affect the costs and rate requirements over time.

The two charts in Figures 16 and 17 on the following pages show the Scheme expenditure for 2002/03 and for 1998/99. It can be clearly seen that the proposed works programme will spend a significantly larger proportion of the Scheme income on works than was the case in 1998/99.

The proposed works programme for 2002/03 is 146% larger in dollar terms than the 1998/99 works programme (excluding the expenditure on Soil Conservation Forestry).

Table 17: Pohangina Oroua Scheme Long Term Estimates

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17			
Scheme Balance (at start of period)	-7,515	663	8,981	3,981	-4,276	-1,339	2,171	4,048	-3,152	2,206	9,297	10,445	29,769	29,853	31,939	-8,375			
INCOME																			
% Rate rise (+) / Decrease (-ve)	10.00%	0.00%	2.50%	2.50%	2.50%	0.00%	0.00%	2.50%	0.00%	0.00%	-5.00%	-5.00%	-5.00%	-5.00%	0.00%	0.00%			
Scheme Rates (2000/2001 \$154,773)	170,250	170,250	174,506	178,869	183,341	183,341	183,341	187,924	187,924	187,924	178,528	169,602	161,121	153,065	153,065	153,065			
Territorial Bulk Rates	7,223	7,223	7,404	7,589	7,778	7,778	7,778	7,973	7,973	7,973	7,574	7,196	6,836	6,494	6,494	6,494			
General Rate Contribution	37,824	77,214	54,514	54,914	59,114	57,714	51,114	45,014	41,314	41,314	38,917	37,317	39,917	37,317	47,917	42,817			
General Rate Contribution Review	52,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Emergency reserve interest	1,345	4,095	6,370	8,320	9,945	1,625	3,250	4,875	6,500	8,125	1,625	3,250	4,875	6,500	8,125	1,625			
Forestry Income	0							17756	17756	17756	17756	17756	17756	17756	17756	17756			
Extra draw from forestry reserve		90000	105000	80000	75000	85000	65000												
TOTAL INCOME	269,542	348,782	347,794	329,691	335,178	335,458	310,483	263,542	261,467	263,092	244,401	235,121	230,506	221,133	233,358	221,758			
EXPENDITURE																			
Pohangina below Totara Reserve	49,000	117500	114000	116000	137000	130000	100000	77500	59000	59000	69500	66500	79500	66500	119500	89000			
Pohangina above Totara Reserve	0	3000	3000	3000	3000	3000	0	0	0	0	5000	0	0	0	0	5000			
Oroua	31,000	65000	65000	65000	65000	65000	65000	65000	65000	65000	55000	55000	55000	55000	55000	55000			
Drain Maintenance	5,000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000			
Soil Conservation Forestry	0	15,300	38,854	25,059	1,727	16,753	24,787	15,798	18,040	16,307	22,041	960	960	960	960	960			
TOTAL WORKS EXPENDITURE	85,000	204,800	224,854	213,059	210,727	218,753	193,787	162,298	146,040	144,307	155,541	126,460	139,460	126,460	179,460	153,960			
Management Costs																			
Engineering Management	58,880	58,000	58,000	58,000	58,000	58,000	58,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000			
Asset Mgmt Planning	1,559	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600			
Rates Administration	4,077	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000			
Other Costs																			
Valuation services	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520			
Asset insurance and LAPP	867	867	867	867	867	867	867	867	867	867	867	867	867	867	867	867			
Hydrological	3,887	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100			
Scheme Reclassification	52,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Emergency reserve interest Trans	1,345	4095	6370	8320	9945	1625	3250	4875	6500	8125	1625	3250	4875	6500	8125	1625			
Emergency Reserve Contribution	18,000	45000	35000	30000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000			
Loan Repayment - Int & Prin	34,329	17,482	17,482	17,482	17,482	17,482	17,482	17,482	17,482	17,482									
TOTAL EXPENDITURE	261,364	340,464	352,793	337,948	332,241	331,947	308,606	270,742	256,109	256,001	243,253	215,797	230,422	219,047	273,672	241,672			
Scheme Balance (at end of period)	663	8,981	3,981	-4,276	-1,339	2,171	4,048	-3,152	2,206	9,297	10,445	29,769	29,853	31,939	-8,375	-28,289			
Return on Forestry			POHANGINA-OROUA					Emergency Reserves											
Amount invested			\$650,000					The emergency reserve calculations assume that a flood would occur on average every 5 years that would require the reserve to be fully drawn down.											
Interest Rate:			7.5 %																
number of years			25																
Term :		Number of Qtrs:	100																
Interest Rate per quarter:		Per Quarter:	1.875																
Instalment:		Per Year:	\$57,763																
Loan	Budget	Interest	Principle	ot Paymen	Balance														
Period	Year Ended				415000														
Loan Calculation			POHANGINA-OROUA					Management Costs											
Amount Borrowed:			\$240,000		\$113,671	\$126,329		It has been assumed that when the capital works on the Pohangina River have been completed by 2007/08 the management costs would reduce.											
Interest Rate:			7.5 %		7.5														
number of years			10		10														
Term :		Number of Qtrs:	40		36														
Interest Rate per quarter:		Per Quarter:	1.875		1.875														
Instalment:		Per Year:	\$34,329		\$17,482			Half loan paid off with forestry income											

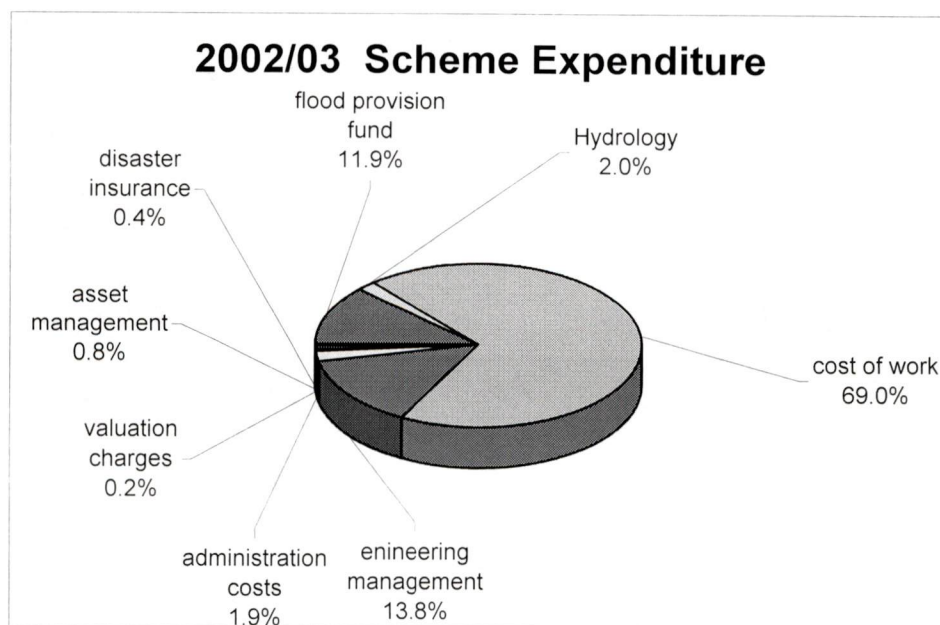


Figure 16: 2002/03 Scheme Expenditure

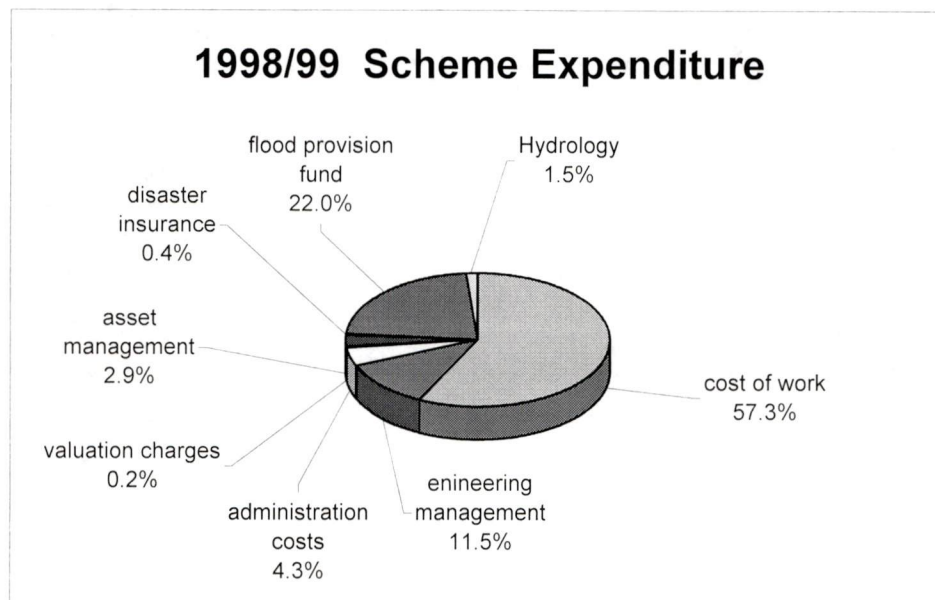


Figure 17: 1998/99 Scheme Expenditure

22. SCHEME MANAGEMENT

22.1 General

The Scheme was managed until 1989 by the Manawatu Catchment Board under the legislative power of the Soil Conservation and Rivers Control Act 1941.

In 1989 the reform of Local Government resulted in the functions of the Catchment Board being transferred to the Manawatu-Wanganui Regional Council (now re-branded as **horizons.mw**). This change made no significant difference to the management of the Pohangina Oroua Scheme.

Management of the scheme assets has been put on a more sound footing by the Scheme Asset Management Plan that was completed in 1999. This was prepared to satisfy the statutory requirements of the Local Government Amendment Act 1996 to improve accountability and decision making for ratepayers. The Plan provides a strategic approach to managing the scheme assets. The Plan will need to be reviewed if this Scheme Review is adopted.

Management policy, procedures, performance and practises are similar for all the River and Drainage Schemes managed by Council and are assumed to be appropriate and therefore outside the scope of this Review.

22.2 Liaison with Ratepayers

To ensure that the Schemes provides the required standard of service at an acceptable cost, the Council seeks input from scheme ratepayers at annual meetings and more regularly through the Scheme Liaison Committee. Annual Meetings provide a forum for ratepayers to discuss budgets and works programmes, and Council holds meetings with the Liaison Committee Chairmen to discuss policy, budgets and significant issues arising during the year.

A lack of communication with new ratepayers can lead to problems associated with the operation and maintenance of the scheme works. Information leaflets are being prepared to help improve awareness of the functions of the respective schemes.

22.3 Scheme Liaison Committee

The Liaison Committee is an informal committee established to facilitate effective communication between Scheme Ratepayers and **horizons.mw**. Its role is essentially to represent ratepayers by making known to **horizons.mw** Staff, the views of ratepayers on Scheme issues and to disseminate information to ratepayers on Scheme activities. The Pohangina Oroua Scheme Committee has met on at least two occasions per year over recent years.

The terms of reference prepared in 1996 for the Scheme Committee is as follows:

- a. each Liaison Committee shall consist of five members with a broad representation of the Scheme taking into account both the main ratepayer interests and the geographical extent of the Scheme. Additional or fewer Committee members may be appointed at the discretion of the Regional Council;
- b. members of the Liaison Committee will usually be nominated by ratepayers at the annual Scheme Ratepayer Meeting and will be confirmed in writing by the Regional Council shortly thereafter;
- c. a Chairman for the Liaison Committee shall be appointed by the Liaison Committee members;
- d. the Regional Council will request meetings with the Liaison Committee as necessary to discuss works programmes and other Scheme management issues;
- e. the Chairman of the Liaison Committee or in his absence another member, may be required from time to time to attend meetings with the Operations Committee of the Regional Council; and
- f. liaison between the Regional Council and the Liaison Committee will generally be through the Council's Area Engineer for the Scheme, or his assistants.

22.4 The Role of the Ratepayers

The first paragraph of this report states that the Scheme is essentially a ratepayer collective managed by the Council. In order that the Scheme provides the best service to its ratepayers, it is important that the ratepayers, especially the riparian ratepayers and those who have scheme drains on their properties, are vigilant in carrying out their responsibilities especially following flood events. The Scheme Ratepayers have a responsibility to:

- a. prevent unnecessary damage to protection works and scheme drains caused by stock and other farming practices; and
- b. notify the Area Engineer or Scheme Liaison Committee of any problems with the integrity of the protection works or blockages in the Scheme drains.

22.5 The Scheme Manager

The Scheme is managed by an Area Engineer appointed by **horizons.mw**. The Scheme Manager is responsible for preparing and implementing an annual works programme to ensure the Asset Management Plan and the recommendations of the Scheme Review are implemented.

Engineering Management Costs are charged directly to the Scheme and along with other Scheme costs are subsidized by 20% through the General rate contribution.

22.6 Global Warming

A section on the effects of global warming has been added at this point as the response required at this stage will be a management one.

The effects of global warming will increase the temperature of the sea which will result in an increased level of evaporation. This will in turn cause more high intensity rainstorms. On the other hand the warming will reduce the frequency of the more normal rainfall events.

For the Pohangina Oroua Scheme this may result in years with very small flood damage and an increase in the frequency of the larger events. The net result in damage cost may be much the same as at present but this is pure speculation.

There is still insufficient information with which to chart the trend over the next 20 or 30 years and so the Scheme manager will need to keep an eye on the changes that are occurring in the scheme and recommend to ratepayers appropriate courses of action when these are identified.

The type of scheme works that are now being undertaken and the recommendations in this review to maintain the flood carrying capacity of the channel should cater for at least some of the changes that are likely to occur.

22.7 Consents

The works necessary to manage the Pohangina and Oroua Rivers involve activities that are controlled by the Regional Plan for the Beds of rivers and lakes and Associated Activities. A number of these activities are permitted under the plan but some, especially those that require significant disturbance of the active channel will require a consent.

Maintenance of the works that existed prior to the notification of the Regional Plan for Beds of Rivers and Lakes and Associated Activities are permitted.

A consent was applied for and granted, subject to a range of conditions, to carry out the river control works that were required at 8 sites on the Pohangina and Oroua River following the November 1999 and the April 2000 floods.

A consent will be required to carry out many of the protection works set out in this report and for practical and efficiency reasons it would be worthwhile applying for a global consent for all works on the two rivers.

A copy of the consent granted for the work at the eight sites is attached in Appendix G.

22.8 Other Management Costs

Time spent and other costs associated with asset management and rates administration are charged directly to the Scheme and are subsidized in the same way as engineering management costs.

22.9 Scheme Review Costs

Scheme review, survey, detailed design and classification costs are charged to the scheme. However under current Council Policy, those costs are fully offset by a contribution from General Rate.

23. CONCLUSION

The Scheme, established in 1967, has, to a large extent achieved its original objectives of controlling and preventing erosion in the Castlecliffian sand formations and in stabilising the Pohangina and Oroua rivers as nearly as possible in the positions that existed in the late 1960s.

The original scheme envisaged that the majority of the work would be completed in the first seven years and that the ongoing river management work would maintain a clear fairway along both rivers to maintain their flood carrying capacity. The latter however was not achieved. The Oroua River over much of its length is still too narrow and consequently large flood events cause considerable damage to established edge protection works.

The Pohangina River works have on one hand been more successful as the river is now confined to largely a single thread channel (in 1970 much of the river was wide and braided) but on the other hand, the flood carrying capacity of the fairway has not been maintained, resulting in continual high levels of flood damage.

Insufficient funding to carry out erosion control works sufficiently robust to stand up to these flood events has been the root cause of this regular flood damage. The need for the repair of this damage has further exacerbated the shortage of funds available for the maintenance of the channel and flood fairway.

To provide the level of protection expected by landowners today, sufficient scheme funds will be necessary to carry out both the robust protection works as well as works necessary to maintain the flood carrying capacity of both rivers. Significant increases in expenditure on Scheme works will be required over the next 6 to 7 years to carry out the necessary works. Following their completion it will be necessary to maintain the level of expenditure at a level 40 to 50% higher than at present but less than in the preceding 6 to 7 years.

The key to the success of the works will be the planting and ongoing management of the planted buffer strips. Ratepayer commitment will be required to make land available for the buffer strips and to fence the strips to prevent stock damage.

The stabilization of the eroding Goulter and Belmont gully systems has been successfully achieved and extensive *Pinus Radiata* forest plantings planted to control runoff and make good use of land purchased by the Scheme, are now ready to be harvested. Plans are in place to harvest these trees over the next two years and the return from them once replanting and forestry management expenses are deducted, will provide the Scheme with an average annual income and a capital injection to enable the programmed works to be completed as soon as possible.

The replanting of these trees will be vital to maintain the stability of the sand gullies and careful management of the area will be required during and following the harvesting work.

The proposed significant increases in scheme expenditure will be funded from a small increase in Scheme rates as well as income from the forestry investments.

Analysis of the existing rating system has shown that it is no longer collecting rates on an equitable basis and the report concludes that the scheme should be reclassified following the adoption of the recommendations of this review.

The Scheme is being managed in a professional manner with a good balance of input from a Liaison Committee made up of ratepayers within the catchment. The current management system should continue being heavily guided by the river management regime set out in this review. Failure to implement this management regime will not only ensure a continuation of the existing level of flood damage but will probably see an even greater amount of damage occur as the flood carrying capacity of the channels reduces further.

24. RECOMMENDATIONS

Pohangina River

- x. adopt the Pohangina River design alignment as detailed in Section 12 of the Review and as shown on Figure 9;
- y. undertake the protection works in priority order unless flood damage requires work on a reach of the river to be done out of sequence with its priority;
- z. undertake the planting programme on each reach of the river along with the protection works on that reach and layer and maintain existing trees as part of this work;
- aa. assign any surplus funds in any year to planting and channel maintenance;
- bb. maintain beaches and clear vegetation to ensure the design fairway is kept clear;
- cc. carry out changes to work priorities in the future if required using the principles set out in the Review;
- dd. obtain as far as possible, agreements with landowners in regard to protection plantings.

Oroua River

- ee. implement a \$70,000 annual programme of river management works as set out in Section 13 Table 11 of the Review;
- ff. undertake works wherever possible in accordance with the Oroua River Design Parameters as set out in Section 12 table 10 of the Review;
- gg. prioritise protection works in accordance with section 13 table 12 of the Review;
- hh. carry out planting works to create the 20 metre bands of willows as detailed on Figure 11;
- ii. carry out changes to work priorities in the future if required using the principles set out in the Review;
- jj. obtain as far as possible, agreements with landowners in regard to protection plantings.

Gravel Management

- kk. direct gravel extractors to beaches where gravel extraction would facilitate general river management;

Soil Conservation works

- ll. utilise the income from the sale of the Goulters Gully forest to:
- re-establish the protection forest as soon as possible in such a way as to maximise erosion protection as well as future tree production; and
 - assist with the funding of Scheme works spread over a 25 year period;
- mm. prepare a detailed programme for forestry reestablishment for approval by the Scheme Manager prior to the harvesting of the Goulters Gully forest;

Drainage

- nn. maintain drains as part of the Scheme only where they provide benefit to more than one property;
- oo. fund all future Scheme drainage works through rates over those who directly benefit from those works;

Maintenance

- pp. maintain existing Scheme assets ahead of constructing new Scheme assets;
- qq. always include the cost of ongoing maintenance works when preparing estimates for new capital works;

Totara Reserve

- rr. discuss the future management or of the Pohangina River through the Totara Reserve with the Manawatu District Council and establish a suitable management plan and funding agreement for the maintenance of this section of the River;

Non-Scheme Assets

- ss. obtain funding for works required to protect assets where the owner of those assets do not contribute to the Scheme from the asset owner unless otherwise agreed to by **horizons.mw** and the Scheme ratepayers;
- tt. share funding of protection works required to prevent riverbank erosion that is threatening both non-ratepayer asset and ratepayer assets except where natural river processes would be accepted if the non-scheme asset was not present. In these cases the total cost of the protection works shall be fully funded by the asset owner;

Consents

- dd. obtain a global consent to enable the protection works to be undertaken that are not covered by the Regional Beds of Rivers, lakes and Associated Activities Plan;

Classification

- ee. reclassify the Scheme and ensure that in the long term the funding obtained from each of the catchments is in proportion to the expenditure in each of those catchments;
- ff. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme;

Scheme Finances

- gg. increase Scheme rates by 5% in 2002/2003, by 5% in 2003/2004 and by 5% in 2004/2005;
- hh. manage scheme expenditure in line with the details set out on table 17 of the review; and
- ii. monitor expenditure of Scheme funds over the long term to maintain equity within the Scheme.

Appendix A

Historical Expenditure

HISTORICAL EXPENDITURE ON THE POHANGINA OROUA SCHEME

	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
			12 months				
River control works POHANGINA							information
Channel clearing	130	0	349		1,725	10,769	not
Tree planting	3,081	4,928	4,977	2,313	677	5,601	available
tree layering	2,878	1,105	2,035	1,599	283		
Tree protection							
rock protection							
stopbanks					1,628		
flood damage repair POHANGINA	75,596	18,365	15,610	7,658	67,886	17,653	
Pohangina Totals	81,685	24,398	22,971	11,570	72,199	34,023	
River control works OROUA							
Channel clearing	3,124		4,088	4,818	330	200	
Tree planting	214	5,234	6,483	3,234	991	6,187	
tree layering							
Tree protection							
rock protection							
miscellaneous							
stopbanks					1,351		
flood damage repair OROUA	48,402	45,999	18,355	38,968	127,240	25,089	
Oroua Totals	51,740	51,233	28,926	47,020	129,912	31,476	
Soil conservation				7,710			
Drain Maintenance	4,645	5,956	2,751	3,498	415	4,056	
TOTAL WORKS EXPENDITURE	138,070	81,587	54,648	69,798	202,526	69,555	78,986
Management Costs							
Engineering management	34,517	20,376	10,935	13,930	13,922	16,096	17,500
Administration charge		7,165	2,683	1,404	4,400	2,796	3,500
Asset mgmt	0	0		0	0	0	0
LAPP Levy	0	0		0	0	146	146
Valuation charges	250	265		2,907	0	638	638
Review/Design/survey		0		0	0	0	0
Hydrology charge	2,000	2,000	2,000	2,000	2,000	2,004	2,000
other costs (incl Loans)		0		0	0	0	
TOTAL MANAGEMENT	36,767	29,806	15,618	20,241	20,322	21,680	23,784
Transfer to emergency reserves	0	0	25,000	24,400	24,000	23,000	23,000
transfer interest to emergency reserves			0		3,616	0	1,725
loan repayment interest							
Loan repayment capital							
TOTAL EXPENDITURE	174,837	111,393	95,266	114,439	250,464	114,235	127,495
Income							
rates	110,363	110,363	146,751	107,354	107,354	112,722	112,722
local authority rates and contributions	4,680	4,680	5,892	4,553	4,553	4,781	4,781
interest off reserves			0		3,616	0	1,725
General Rate contribution							
transfer from emergency reserves					79,003		
other income	25,857	25,857	11,200	6,200	52,046	9,474	1,396
Loan							
Grant from General Rate							
TOTAL INCOME	140,900	140,900	163,843	118,107	246,572	126,977	120,624

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01
POHANGINA						
Channel clearing			1,326	0	250	8,400
Tree planting	5,670	5,658	1,888	521	2,772	4,638
tree layering		1,878	500	2,995	3,570	5,000
Tree protection						
rock protection		512				
stopbanks						
flood damage repair POHANGINA	18,000	19,248	66,438	21,064	104,738	233,649
Pohangina Totals	23,670	27,296	70,152	24,580	111,330	251,687
OROUA						
Channel clearing	3,926	6,000	700	1,373	450	
Tree planting	4,190	7,690	11,655	2,758	7,144	10,847
tree layering	656		0	4,566	4,774	
Tree protection						
rock protection		2,218				
miscellaneous						
stopbanks						
flood damage repair OROUA	30,948	28,482	44,201	40,771	110,852	167,466
Oroua Totals	39,720	44,390	56,556	49,468	123,220	178,313
Soil conservation						
Drain Maintenance	11,722	3,341	634	3,995	0	5,000
TOTAL WORKS EXPENDITURE	75,112	75,027	127,342	78,043	234,550	435,000
Management Costs						
Engineering management	18,750	19,200	19,600	44,653	72,485	58,550
Administration charge	3,750	3,840	3,920	4,070	4,165	3,750
Asset mgmt	0	0	0	4,004	78	1,548
LAPP Levy	219	257	231	484	202	1,848
Valuation charges	517	488	486	231	468	520
Review/Design/survey	0	0	0	38,075	32,511	44,116
Hydrology charge	2,004	2,000	2,000	2,000	10,780	4,228
other costs (incl Loans)	545	700	721	1,830	293	
TOTAL MANAGEMENT	25,785	26,485	26,958	95,347	120,982	114,560
Transfer to emergency reserves	23,000	23,000	23,000	30,000	24,000	16,000
transfer interest to emergency reserves	3,958	6,270	8,126	5,366	6,779	457
loan repayment interest						13,151
Loan repayment capital						12,595
TOTAL EXPENDITURE	127,855	130,782	185,426	208,756	386,311	591,763
Income						
rates	117,867	120,725	120,726	132,795	138,373	154,773
local authority rates and contributions	5,020	5,120	5,119	5,634	5,916	6,567
interest off reserves	3,958	6,270	8,126	5,366	6,779	457
General Rate contribution				67,039	80,654	82,354
transfer from emergency reserves			50,000		146,000	
other income						
Loan						240,000
Grant from General Rate						100,000
TOTAL INCOME	126,845	132,115	183,971	210,834	377,722	584,151

Appendix B

Historical Flood Patterns

HISTORICAL FLOOD PATTERN - POHANGINA RIVER AT MAIS REACH

[illegible]

HISTORICAL FLOOD PATTERN OROUA RIVER AT ALMADALE				
YEAR	PEAK FLOW (m3/s)	NUMBER 2 year & greater	DURATION above 2 year	FLOOD DAMAGE \$1000 s
1948	220	5 year	8¼	
1949	230	5 year	19½	
1950	245	5-10 year	20¾	
1951	105			
1952	110			
1953	145			
1954	175	2 year	6½	
1955	145			
1956	270	10 year, +	27¼	
1957	155			
1958	360	50 year	7½	
1959	120			
1960	70			
1961	115			
1962	165			
1963	175	2 year	2¼	
1964	95			
1965	285	multi 15-20 year, +	55¾	
1966	170	2 year	1¼	
1967	240	5-10 year, +	9½	
1968	155			
1969	85			
1970	185	2-5 year	1¾	
1971	195	2-5 year	9	24.8
1972	185	2-5 year	2	4.1
1973	135			0
1974	160			0
1975	225	5 year	5	0
1976	195	2-5 year	10	17.8
1977	130			19.4
1978	115			0
1979	185	multi 2-5 year	¾	38.3
1980	235	5-10 year, 2 year	12½	35.2
1981	205	two 2-5 year	6½	51.4
1982	55			9.7
1983	155			13.5
1984	85			15.9
1985	260	10 year	17½	36.9
1986	140			15
1987	150			11
1988	350	multi 50 year, 5 year	25	87.9
1989	155			95.8
1990	140			30.2
1991	175	2 year	¼	78.4
1992	215	5 year		266.9
1993	95			52.7
1994	175	2 year	2½	0
1995	85			46.1
1996	130			0
1997	150			109.2
1998	110			8.4
1999	245	5-10 year	15½	194.3
2000	190	2-5 year	2¼	0

Appendix C

Soil Conservation Reports – First 10 Years

MANAWATU CATCHMENT BOARD

POHANGINA/OROUA CATCHMENT CONTROL SCHEME

SOIL CONSERVATION WORKS COMPLETED

The first year of operation - winter 1967 - saw the establishment of 16 fenced planting blocks. This block planting was done in strategic localities e.g. around vulnerable waterfalls in active or potentially active gullies. The first year's work was concentrated in the Raumai - Pohangina Township area. This work took 1,600 sheep poles and 2,280 stakes.

Gully planting in the first year was confined to the Goulter - Krull - Belmont system where 5,500 stakes were used.

Also in the same year one wooden flume, 4 cable-pole netting dams and 7 pole-netting dams were constructed. The wooden cantilever flume with a heavy concrete anchor is serving its purpose very well. The use of netting dams has been discontinued in the main gullies because, although successful in small catchments, they do not stand up to the force of floodwaters and debris in the bigger gullies.

In 1968 - the second year - 15 blocks were established involving 9, 142 sheep poles and 2, 910 stakes. The locality of these was further north in the Ridge Road, Te Awa Road, area.

The gully planting was again concentrated in the Goulter/Belmont gullies, taking 490 cattle poles 14,000 sheep poles, 4,000 stakes and 1,000 Tasmanian Blackwood plants.

A big slip blocked the main Goulter/Belmont gully. An attempt was made to convert the sandy slip into a permanent silt trap but the attempt failed.

Third year - 1969 - Eight gully blocks were established in various localities in the district.

The first helicopter drop was made in this season, placing 6,600 stakes and sheep poles (27 flights) in 1½ hours in the difficult Goulter Belmont system. This was so successful that later in the same season a second drop was arranged of 600 cattle poles, 5000 sheep poles and 4,00 stakes. This time the locality was Culling's gully and Beehive Creek. Another 1000 sheep-poles were taken into Krull's gully by truck and tractor. A timber weir to act as stable base for flood measurements was constructed in Beehive Creek. Retirement fencing of Beehive Creek was subsidised by the scheme involving 93 chains.

Fourth year 1970 - Five blocks were established this season, consisting of 750 cattle poles half of which were protected with netlon sleeves.

The gully work was in Goulter - Belmont, Beehive Creek, Nichol and Young's gullies. This involved 970 cattle poles, 18,000 sheep poles and 6,000 pines.

A half steel pipe flume was constructed at the head of the "band gully" and another one in a tributary gully head of Belmont's No. 7 gully ~~last~~.

Another flume on Jackson's in the Kimbolton area is serving its purpose very well and protects a potentially dangerous gully degrade. A small diversion - detention bank was constructed on Stewart's - Te Awa.

207 chains of gully retirement fencing was subsidised by the Scheme.

Fifth Year 1971 - Ten gully blocks, mainly on eastern tributaries of the Pohangina River, were established this year.

Gully work was done in the following localities:- Moar, Culling, Carrick, Beehive, Nichol, Young, Goulter - Belmont. A concrete block drop structure in Cullings gully looks very successful. 172 chains of fencing were completed.



RESULTS

As can be seen from the above yearly description the fenced gully blocks from the early years were not continued. Because of the short length of the fencing, they were difficult to keep and maintain stock proof and the creek - crossings, especially in the larger catchments needed constant attention. Most of the blocks are in inaccessible localities and maintenance proved to be too high. Therefore in the later blocks, the fencing was dispensed with and instead larger material was used: Cattle poles individually protected with netlon sleeves. This has proved more effective and cheaper, with an overall lower death rate. It was found that small material often gave a poor strike and growth rate. Especially in the gully planting, where large numbers of plant material were used, the obvious economy of smaller material gave disappointing results. The use of stakes was therefore discontinued and the minimum size is now the so - called sheep pole.

Most of the block planting has been successful, except in some of the eastern tributaries of the Pohangina River where successive flooding caused heavy losses. Replacement work has since been carried out.

Farmer cooperation has been excellent throughout and in several instances scheme works in strategic localities has spurred the farmers on to continue this work on a farm scale under the normal subsidy schemes.

Gully structures have been successful except the netting dams and one instance where a steel flume was undermined.. No large debris dams, have been constructed to date as no economic technique has been designed so far. Similarly, no flood detention dams have been constructed as the steep and narrow shape of the valleys provided too little ponding in relation to the earthworks required.

Planting has been successful in the gullies where some initial stabilisation has occurred. In the more active sections we are experiencing the same problems as originally happened with the Te Awa gullies. Patience is the first requirement and only by repeated attempts can success be expected in the long run.

STOCK AND OPOSSUMS

Exclusion of stock is undoubtedly a first requirement to obtain success with gully work. So much so that in some cases, if a choice had to be made between (1) stock and planting and (2) no stock and no planting, the latter would be more advisable. This is because of the natural regrowth first by pioneer plants of grasses, clovers, lupins, tree lucerne through to eventually a scrubby cover of tutu, manuka, coprosma, five finger, matipo etc. Later, taller native tree species like rewa-rewa, kowhai, black beech, totara etc. can be expected to take over.

That is the reason why the retirement fencing of a large tributary of the Pohangina River in the middle of the unconsolidated sand country has been encouraged under the scheme. So far 5 miles of fencing has been done on Beehive Creek, with very encouraging results. Over the whole area approx-400 acres have been retired for Soil Conservation purposes. This has been done on a voluntary basis, with no compensation or purchase of land, and only a token offer of scheme funds.

Opossums are a constant worry and the choice of plant species depend to a large degree on the expected level of opossum activity.

To cope with the Scheme demand on plant material approximately 20 acres of unproductive river bank areas in the Pohangina Valley were planted in stool nurseries. Stocking was mainly in the new Italian hybrid varieties. Unfortunately these are suffering from heavy losses compared to some of the older varieties. In several cases plantings have to be restricted to less palatable types e.g. silver poplars (poor strike rates so far), generosa and yunnanensis poplars and Booth willows.

POHANGINA/OROJA CATCHMENT CONTROL SCHEME

1967 - 1971

SOIL CONSERVATION EXPENDITURE

	BLOCK PLANTING	GULLY PLANTING	STRUCTURES	
	Item 1	Item II	Item III	Total Items I to III
1967	\$1,735	\$633	\$741	\$3,109
1968	5,591	2,182	1,970	9,743
1969	1,374	7,584	760	9,718
1970	827	6,629	2,830	10,286
1971	882	4,740	1,765	7,387
(To 23.12.71)				
<u>TOTALS</u>	\$10,409	\$21,768	\$8,066	\$40,243

POHANGINA/OROUA CATCHMENT CONTROL SCHEME
SOIL CONSERVATION PROPOSALS
FIVE YEARS 1972-1976

No major changes in techniques or policy are envisaged over the next five years.

It is hoped that some way can be found to afforest the catchment of Goulter's "sand gully." Reduction of run-off will render the chances of stabilizing this gully much more feasible.

At the same time a vigorous policy of stock and opossum control in the Goulter Krull/Belmont gully system will be continued to give the plantings every possible chance of success. More retirement fencing is therefore necessary.

The Moar/Kennedy "cactus country" has substantially benefited from Moar's Farm Forestry Encouragement Loan Scheme. Complete stock exclusion by fencing is the aim with further planting required. Over the whole area it is expected that another 900 acres will have to be retired for water and soil conservation purposes. Another concrete block structure in Culling's gully is planned and further work will be dovetailed with the Farm Plan proposals.

Control of Beehive Creek and Nichol's gully is well under way. Supplementary planting will only be necessary up till Seddon's tributary. Upstream of this it is expected that natural revegetation coupled with protection of tributary outlets by paired planting will restore the balance of stability.

The blow-out of the headwaters of the Parami Stream, a tributary of the Oroua River near Apiti has already partially been treated under a farm scheme but further works are necessary for complete safety. This will be done under the P.O.S. scheme.

Other isolated silt-contributing erosion areas such as Jackson's Kimbolton and the slump opposite Totara Reserve will also be attended to.

Goulter Est area of Goulter
discussed by Board 2/3/1977

MANAWATU CATCHMENT BOARD

POHANGINA/OROUA CATCHMENT CONTROL SCHEME

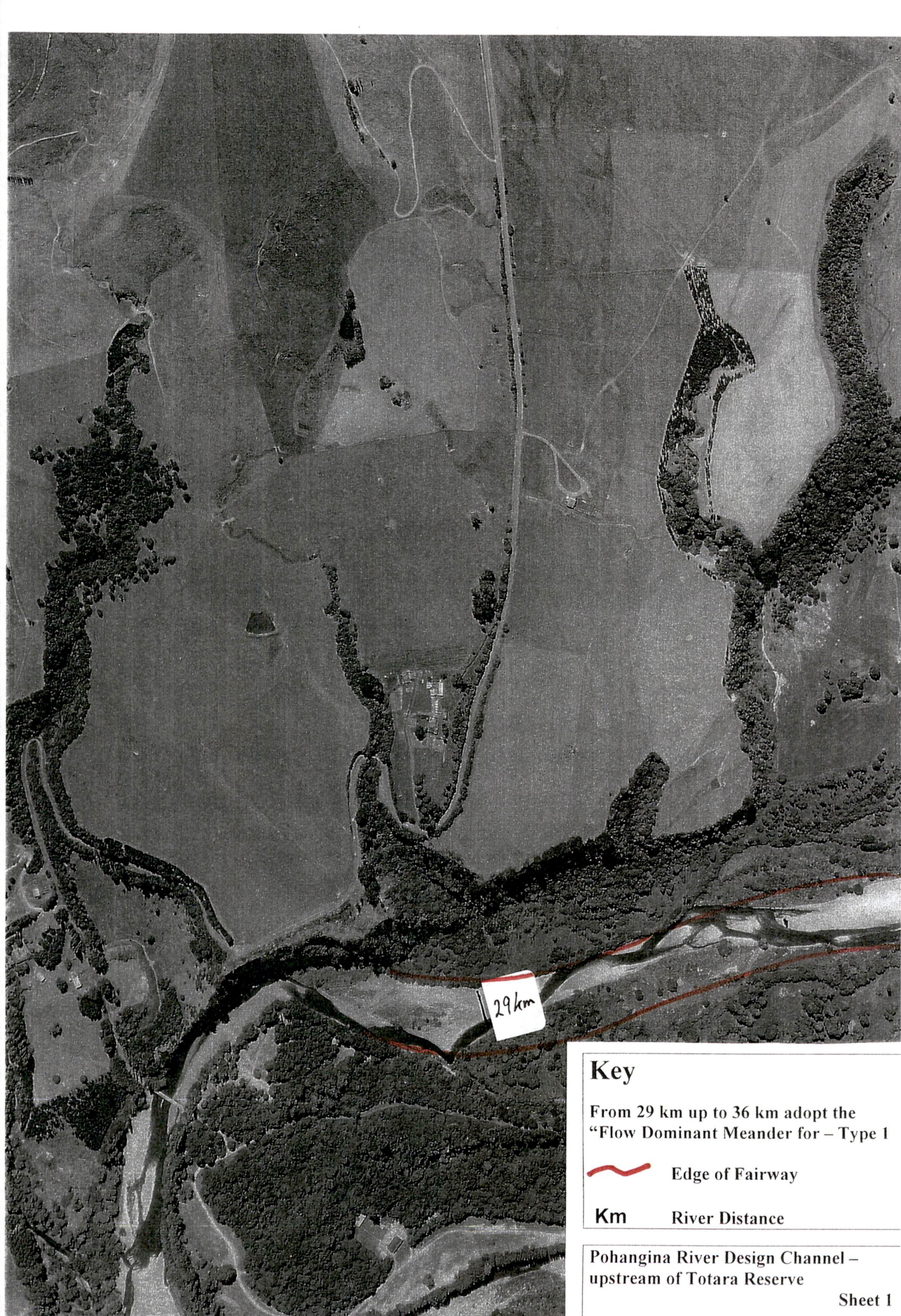
FIVE YEAR SOIL CONSERVATION PROPOSALS 1972 - 1976

	1972	1973	1974	1975	1976	TOTAL
Item I Tributary planting	\$800	\$1,500	\$3,000	\$4,000	\$5,000	\$14,300
Item II Gully planting and fencing.	4,000	3,000	3,500	3,000	2,500	16,000
Item III Structures or Upper Catchment Plantings	2,000	3,000	3,500	4,000	5,000	17,500
Item IV Isolated slump and Bank erosion control.	500	500	1,000	1,500	2,000	5,500
Item V Contingencies 20%	1,430	1,500	2,200	2,500	2,900	10,530
TOTALS	\$8,730	\$9,500	\$13,200	\$15,000	17,400	63,830

GMMG:SC
10:4:72


Appendix D

Pohangina River Upstream Totara Reserve



Key

From 29 km up to 36 km adopt the
"Flow Dominant Meander for – Type 1

 Edge of Fairway

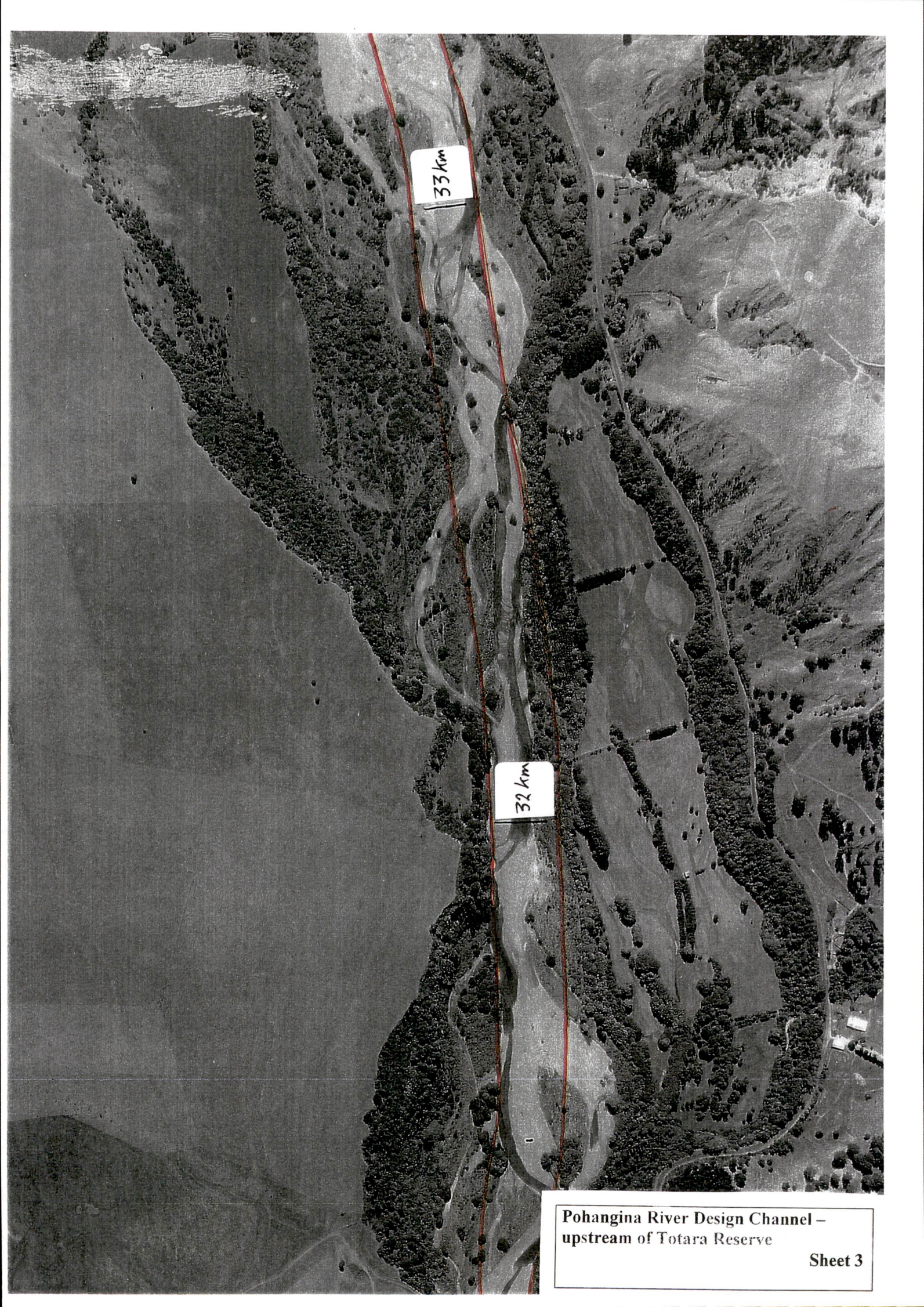
Km River Distance

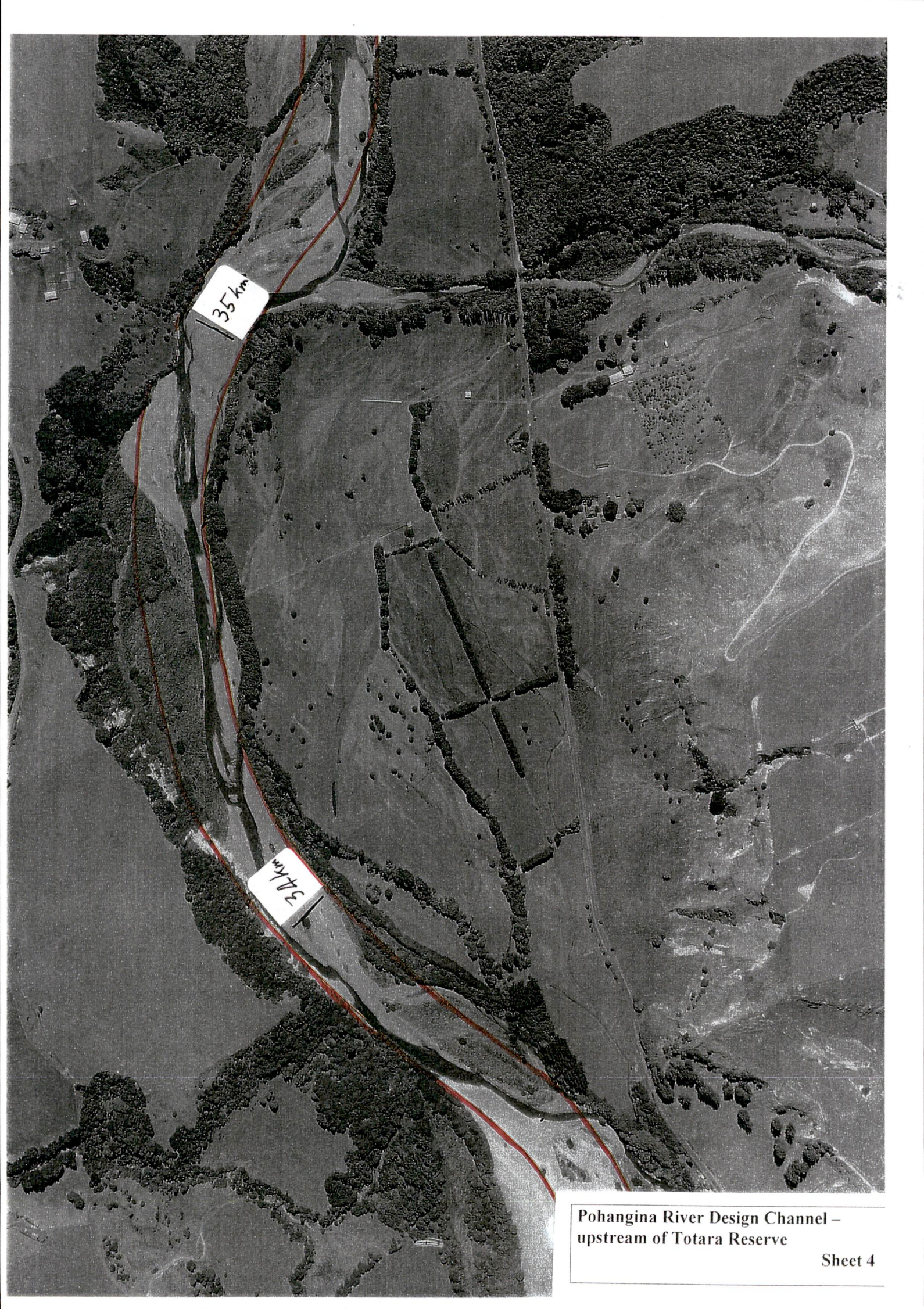
Pohangina River Design Channel –
upstream of Totara Reserve



Pohangina River Design Channel –
upstream of Totara Reserve

Sheet 2





Pohangina River Design Channel –
upstream of Totara Reserve



Pohangina River Design Channel –
upstream of Totara Reserve

Appendix E

Protection Works and Planting Calculations

POHANGINA RIVER FUTURE PLANTING REQUIREMENTS

River Reach			Length m	left bank width	right bank width	Area planted m ²	number of poles	Cost
1.0	to	2.9	1900	30		57,000	2,280	2,280
1.0	to	2.9	1900		30	57,000	2,280	2,280
3.5	to	4.0	500		30	15,000	600	600
4.0	to	4.5	550	30		16,500	660	660
4.9	to	5.4	550		30	16,500	660	660
5.4	to	5.9	600	30		18,000	720	720
6.2	to	6.4	400		30	12,000	480	480
6.5	to	6.9	450	30		13,500	540	540
6.9	to	8.2	1300	60		78,000	3,120	3,120
6.9	to	8.3	1400		60	84,000	3,360	3,360
8.4	to	8.7	400		30	12,000	480	480
8.7	to	9.2	500	30		15,000	600	600
9.2	to	10.2	1000	30		30,000	1,200	1,200
9.0	to	10.4	1400		30	42,000	1,680	1,680
10.5	to	11.1	600	30		18,000	720	720
10.8	to	11.2	400		30	12,000	480	480
11.2	to	11.8	600		30	18,000	720	720
11.9	to	12.1	200	30		6,000	240	240
12.8	to	13.5	800		30	24,000	1,680	1,680
12.8	to	13.5	600	30		18,000	720	720
13.5	to	14.3	900		30	27,000	1,080	1,080
13.5	to	13.7	200	30		6,000	240	240
14.4	to	15.0	700	30		21,000	840	840
15.0	to	15.6	700		30	21,000	840	840
15.7	to	15.9	300	30		9,000	360	360
16.1	to	17.6	1500	30		45,000	1,800	1,800
16.2	to	17.3	1100		30	33,000	1,320	1,320
17.6	to	18.1	600		30	18,000	720	720
18.1	to	19.0	900		30	27,000	1,080	1,080
18.2	to	19.7	1500	30		45,000	1,800	1,800
19.7	to	20.1	400	30		12,000	480	480
20.6	to	21.2	700	30		21,000	840	840
21.2	to	21.5	300	30		9,000	360	360
20.6	to	21.6	800		30	24,000	960	960
21.6	to	22.0	500		30	15,000	600	600
22.0	to	22.7	800	30		24,000	960	960
22.8	to	23.3	500		30	15,000	600	600
TOTALS			28450			934,500	38,100	\$38,100

planting cost \$1 per pole
planted at 5 metre centres

number of poles 37,380

POHANGINA RIVER LAYERING REQUIREMENTS

River Reach			Layering existing planting	Layering Cost first 5 years	layering new planting	cost of layering new planting	year to be layered
			m	\$	m	\$	
1.0	to	2.9	100	Total cost is 6900 m @ \$10 per m = \$69000. Cost per year for 5 years = \$13,800	1800	18000	16
1.0	to	2.9	1000		900	9000	16
3.5	to	4.0	100		400	4000	10
4.0	to	4.5	300		250	2500	12
4.9	to	5.4	200		350	3500	14
5.4	to	5.9			600	6000	16
6.2	to	6.4	200		200	2000	17
6.5	to	6.9	300		150	1500	13
6.9	to	8.2			1300	13000	14
6.9	to	8.3			1400	14000	14
8.4	to	8.7	200		200	2000	16
8.7	to	9.2	350		150	1500	10
9.2	to	10.2			1000	10000	14
9.0	to	10.4			1400	14000	14
10.5	to	11.1			600	6000	15
10.8	to	11.2			400	4000	15
11.2	to	11.8	400		200	2000	12
11.9	to	12.1			200	2000	15
12.8	to	13.5			800	8000	12
12.8	to	13.5			600	6000	12
13.5	to	14.3	400		500	5000	11
13.5	to	13.7			200	2000	12
14.4	to	15.0	450		250	2500	11
15.0	to	15.6	500		200	2000	10
15.7	to	15.9	200		100	1000	10
16.1	to	17.6	600		900	9000	14
16.2	to	17.3			1100	11000	14
17.6	to	18.1	500		100	1000	10
18.1	to	19.0			900	9000	15
18.2	to	19.7			1500	15000	15
19.7	to	20.1	400		0	0	10
20.6	to	21.2			700	7000	13
21.2	to	21.5	300		0	0	10
20.6	to	21.6			800	8000	13
21.6	to	22.0	400		100	1000	10
22.0	to	22.7			800	8000	15
22.8	to	23.3			500	5000	13
TOTALS			6900		21550	215500	
				13800			

Appendix F

Classifiers Report 1996

CONFIDENTIAL

POHANGINA - OROUA CATCHMENT

27/6

CONTROL SCHEME

CLASSIFIER'S REPORT ON 3.11.66.

1. Classification inspections commenced on 8th July, following meetings of ratepayers at Pohangina on 27th June, and at Kimbolton on 5th July. A preliminary report was presented to the board on 3rd June. The classification, completed on 28th October, involved 67 days of inspections and office work. Progress in field-work was retarded in July because of wet weather.

2. Oroua river. Protection work to extend over 27 miles. Banks and cliffs on the right-hand side generally are stable in contrast with those on the left-hand side. Here, there are several lengths of breaking banks and cliffs. The river generally is stable in comparison with the Pohangina. Nevertheless there are a number of points where banks are eroding. Also there are a number of obstructions impeding the flow. There are several stretches much too narrow for coping with normal floods. As for bank protection, there is wide variation in the standard on the various frontages. There are cases of well-planted banks well fenced. However there could be some removal of willows required to widen the bed even in these cases. In comparison with conditions on the Pohangina, protection work existing is generally of a good standard.

3. Pohangina river. Protection work to be done over 21 miles. In contrast with the Oroua the Pohangina is unstable and has for the greater part a wide area of river-bed wherein it may change its course considerably even over brief periods. There are a number of breaking cliffs and banks on both sides. Protection work is negligible considering the total length involved, and there is a shortage of willows. There is also a major deficiency in fencing.

In classifying the land adjacent to the rivers, there has been due regard to the obviously greater benefit to be derived by Pohangina rate-payers.
Hill Country: This has been divided into three parts for classification purposes.

F - Involving the area bounding Kimbolton Road round through the Rangiwahia and Apiti areas to the upper reaches of the Pohangina river. This area will benefit indirectly only. There could be strategic planting on the upper reaches of both rivers and some gully control work. The area generally is sound.

E - The greywacks country extending from the upper reaches of the Pohangina south to No.4. line road. There is evidence that some creek and gully control will be essential.

D - About 30,000 acres comprising that area lying between the two rivers and described by the Soil Survey Authority as being of Sandy Silt Soil. There are several examples of severe erosion in this area. Obviously the area is vulnerable, despite the apparently stable nature of some areas. There has been due regard to this aspect in the classification.

4. River land. C and B - Comprising the areas adjacent to the rivers. Consideration has been taken of physical features such as apparently stable cliffs and terraces which limit the benefit derivable.

5. Drainage and access. A - Being those areas to benefit from drainage and river protection and/or provision of access. These areas are negligible in extent when the total classified area is considered.

6. General. Impressions are that ratepayers are favourably disposed to the scheme, particularly in the Pohangina river areas.

I.G. Macdonald,

CLASSIFIER

IMcd:RFB
4.11.66.

MANAWATU CATCHMENT BOARD

POHANGINA - OROUA CLASSIFICATION

The Classifier has fixed the proportions between the rates as follows:-
A 100, B 67, C 33, D 4, E 2, F 1, and the area in each class, the rate and the
yeild is tabulated below.

	<u>Ratio of</u> <u>Rates</u>	<u>Area</u> <u>in Class</u>	<u>Rate per</u> <u>Acre</u>	<u>Yield</u>
Class A	100	301 acres	11/4d	£ 170
" B	67 ⁶	3637 acres	7/7d	1,379
" C	33	2629 acres	3/9d	493
" D	4	26157 acres	5.4d.	588
" E	2	24572 acres	2.7d	277
" F	1	69371 acres	1.35d	393
TOTALS		126667 acres		£3,300

Annex B

Approval Of Draft Scheme Review For Public Consultation

- | | |
|--------------------------------|---------|
| - Agenda Item | 19/6/01 |
| - Minutes from Council Meeting | 19/6/01 |

APPROVAL OF POHANGINA OROUA SCHEME REVIEW FOR PUBLIC CONSULTATION

PURPOSE

1. This report outlines the findings of the draft Pohangina Oroua Scheme Review and seeks approval for release of the Review for public consultation and input. A copy of this Review is included as a separate volume with Councillors' agenda. A copy of the Draft Review is available for inspection by the public at the reception desk of **horizons.mw**, 11-15 Victoria Avenue, Palmerston North.

BACKGROUND

2. The purpose of the Review was to assess the performance of the present Scheme and identify how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner, and to explore options for improvements in the design and operation that will be effective for the next 10-20 years. The Review was undertaken as part of **horizons.mw**'s Annual Plan programme for 2000/2001.
3. The present Scheme provides Pohangina Oroua Scheme landowners with a degree of protection against the adverse effects of changes in the alignment of the Pohangina and Oroua Rivers and of erosion that can occur when the unstable course sand deposits present in the catchment become exposed. The Scheme also provides small areas with drainage and to a limited extent, controls flooding of some of the low-lying river flats.
4. The Pohangina Oroua Scheme covers the main stems of the Pohangina River from its confluence with the Manawatu River to its confluence with the Makawakawa Stream at Komako and the Oroua River from its confluence with the Kiwitea Stream to the Apiti Bridge. Minor works on some of the smaller tributaries of the rivers have also been carried out.
5. The Pohangina Oroua Scheme commenced under the management of the Manawatu Catchment Board in 1967. Prior to the Scheme, landowners had made significant attempts to control erosion on the two rivers and extensive early work was also carried out in the sand country.
6. The Scheme Review has been prepared by Consulting Engineer, John Philpott. A peer Review has been completed by Allan Cook, Area Engineer Northern and by Derek McKee, Special Projects Engineer.
7. The draft Scheme Review includes:
 - a. a discussion of the Scheme history, geology, hydrology, sediment transport and gravel extraction;
 - b. an explanation of the factors influencing channel shape and the rivers responses to the actions of the Scheme;
 - c. an examination of the effectiveness of the Scheme to date;

- d. an explanation of the principles of river design and the application of these to the Scheme;
- e. the future designs for the Pohangina and the Oroua Rivers identifying the works required to manage the scheme in line with the design principles and in line with the requirements and needs of the ratepayers;
- f. a discussion on the future management of the Goulters Gully Forestry and of the Scheme drainage;
- g. a detailed examination of the existing classification;
- h. a detailed analysis of past and future scheme finances; and
- i. a discussion on issues relating to the management of the Scheme.

PRESENT SCHEME PERFORMANCE

- 8. The Scheme has to a large degree, stabilised the two rivers. The flood carrying capacity however of both Rivers has not been maintained. Gravel build up and encroaching vegetation has confined the flood flows placing undue pressure on the protection works on the outside of bends. This has caused significant and reasonably regular damage to the protection works with the consequential loss of productive land.
- 9. To a large extent this problem has been caused through an expectation by ratepayers that all erosion damage will be repaired whilst at the same time limiting available financial resources. These two factors have resulted in there being insufficient funds to carry out both robust protection works and the necessary channel maintenance.
- 10. The soil conservation works have been very successful with both the sand gullies and the minor tributaries being significantly stabilised. Very little work has been required in these areas over the last ten years.

FUTURE SCHEME MANAGEMENT

- 11. A complete plan detailing the future alignment of the Pohangina River below the Totara Reserve has been prepared. However, on the Oroua River, because the meander pattern is constantly being restarted from bend distortions and areas of harder materials, river management cannot be significantly improved by following an overall design channel. Therefore an overall plan for the Oroua River has not been prepared. However design channels have been drawn up for representative reaches and these can be used as a guide to management where applying these design channels would assist river management measures, site by site.
- 12. Estimates have been placed on the cost of implementing the Pohangina River design and on a level of expenditure considered appropriate to manage the Oroua River. Under the programme of works set out in the review, expenditure on the Pohangina River would be almost double the existing level for the next five years and then drop back to a level similar to the existing level. It is hoped that this cut back will be possible because of the improved alignment that will be created by the proposed works, the more robust works being carried out, and because of the maintenance of the flood carrying capacity of the river that will reduce the damage potential during flood events.

13. The estimate for the Oroua River proposes a level of expenditure forty percent higher than at present. This will enable more robust works to be carried out along with a programme of channel maintenance. It is expected that works will be required on an ongoing basis on the Oroua River because of the inability to apply an overall design.
14. Drain maintenance carried out as part of the Scheme should continue only where the drains service more than one property.
15. The Goulters Gully Forest will require ongoing management to ensure both the stability of the area is maintained and the forestry investments are optimised to provide ongoing income for the Scheme.

FINANCIAL CONSIDERATIONS

16. The Scheme is funded at present by Scheme rates and a regional input of 20% from the General Rate. Over the years, Scheme funds have also been set aside in an emergency reserve but this has proven inadequate to deal with the major flood events. A loan was taken out in 2000/2001 to repair flood damage resulting from large floods in 1999 and 2000. A lump sum contribution from the General Rate was also made at this time to enable more robust repair works to be carried out than has been possible in the past.
17. To fund the Pohangina River and Oroua River erosion control works identified in the Review, and to carry out the necessary maintenance works, additional Scheme funding will be required.
18. The review recommends that this funding be obtained by increasing the level of rates by 5% per annum over each of three years and by utilizing income that will become available when the Goulters Gully Forestry is milled starting in the summer of 2001/2002.
19. The review discusses options to fund future flood damage when the cost of its repair is greater than the reserve funds. The Review recommends that a loan be taken out to repair the damage as soon as possible and repaying it in full in the following year through an increase in Scheme Rates. Repaying it over time will only impact on the ability to carry out the programmed capital works and the maintenance work.

CLASSIFICATION

20. The analyses of past and proposed expenditure in the Scheme have shown that the existing classification was reasonably equitable for the first 10 years or so but in the last 10 years the level of expenditure on the Oroua River has not been aligned with the proportion of rates sourced from the Oroua ratepayers. There are also a significant number of reaches on both rivers where the rating levels do not reflect the expenditure in those reaches.
21. To ensure that these anomalies and inequities are put right, it is recommended that a new differential rating system be developed for the Scheme.

CONSULTATION

22. The Scheme Liaison Committee was consulted during the progress of the Review.
23. A newsletter was sent to all ratepayers at the commencement of the Review explaining the review and seeking their feedback on issues of concern regarding the Scheme.
24. Following Council's endorsement of the Draft Review, all ratepayers within the Scheme will receive a newsletter summarising the main conclusions and recommendations.
25. Ratepayer meetings will be held on 10 and 12 July 2001 to explain the findings of the Review. An open day to enable ratepayers to talk over issues with staff will be held on 18 July 2001, and follow up discussions of either a formal or informal nature will be organised as appropriate.
26. Formal submissions on the draft Scheme Review will be sought by 31 July 2001. These will be considered by the Operations Committee on 16 August 2001 with the final review being submitted to Council for adoption at its 18 September 2001 meeting.

RECOMMENDATIONS

27. It is recommended that the Committee:
 - a. **notes** the draft Pohangina Oroua Catchment Control Scheme Review;
 - b. **approves** the draft Review as the basis for further consultation with Scheme Ratepayers;
 - c. **notes** that all Scheme Ratepayers will be advised of outcomes of the Review, invited to public meetings in July and invited to make submissions by 31 July 2001; and
 - d. **agrees** that submissions be heard and considered by the Operations Committee at a special meeting on 16 August 2001.

P M Davies
GENERAL MANAGER

Annex

- A Pohangina – Oroua Catchment Control Scheme Review as a separate Report.

APPROVAL OF POHANGINA OROUA SCHEME REVIEW FOR PUBLIC CONSULTATION

Report No. 01-76

This report outlined the findings of the draft Pohangina Oroua Scheme Review and sought approval for release of the Review for public consultation and input. It was noted that this Review was included as a separate volume with the Agenda.

The Chairman welcomed Mr Allan Cook and Mr John Philpott to the meeting. Mr Philpott spoke to the report and gave a presentation.

Members discussed the report and several amended dates were noted:

- Paragraph 25. The dates of the Ratepayer meetings are now **17 and 19 July**;
Paragraph 26. Formal submissions will be sought by **7 August 2001**. These will be considered by the Operations Committee on **23 August 2001**.

Accordingly several dates in the Recommendations were amended.

01-377

Resolved

Murfitt/M Guy

that the Council:

- a. **notes** the draft Pohangina Oroua Catchment Control Scheme Review;
- b. **approves** the draft Review as the basis for further consultation with Scheme Ratepayers;
- c. **notes** that all Scheme Ratepayers will be advised of outcomes of the Review, invited to public meetings in July and invited to make submissions by 7 August 2001; and
- d. **agrees** that submissions be heard and considered by the Operations Committee at a special meeting on 23 August 2001.

CARRIED

Annex C

Ratepayer Newsletter

20 June 2001

Dear Ratepayer

Pohangina Oroua Catchment Control Schemes Newsletter

Draft Review Approved for Consultation

On 19 June 2001 the draft Pohangina Oroua Catchment Control Scheme Review was approved by **horizons.mw** for consultation with Scheme Ratepayers.

This newsletter sets out the main outcomes of the Review and the proposed consultation programme.

Although you may not be significantly affected by the Review, we would still appreciate your feedback and recommendations on issues which you consider should be included as part of the final decision.

Background

The purpose of the Review was to assess the performance of the present Scheme and identify how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner. It has also clarified the need for re-classification for rating purposes.

The Scheme Review has been prepared by Consulting Engineer John Philpott in consultation with the Scheme Liaison Committee, Scheme Ratepayers, the Scheme Manager, Allan Cook and Soil Conservator Kevin Rooke.

The draft Scheme Review includes:

- a discussion of the Scheme history, geology, hydrology, sediment transport and gravel extraction;
- an examination of factors influencing channel shape and the rivers responses to the actions of the Scheme;
- an examination of the effectiveness of the Scheme to date;
- the determination of a set of design principles;
- the application of those principles to the Scheme to determine a plan for the future management of the Pohangina and Oroua Rivers;
- an examination of the future of the Goulters Gully forestry;
- an examination of the Scheme drainage;
- an examination of the equity of the existing classification and rating system; and
- the presentation of the long term estimates for managing the Scheme.

Overview of the Scheme

The Scheme provides landowners within the Scheme area, a degree of protection against the adverse effects of changes in the alignment of the Pohangina and Oroua Rivers and of erosion that can occur when the unstable course sand deposits present in the catchment become exposed. The Scheme also provides small areas with drainage and to a limited extent, controls flooding of some of the low-lying river flats.

The Pohangina Oroua Scheme covers the main stem of the Pohangina River from its confluence with the Manawatu River to its confluence with the Makawakawa Stream at Komako and the Oroua River from its confluence with the Kiwitea Stream to the Apiti Bridge. Minor works on some of the smaller tributaries of the Rivers have also been carried out.

Early river control works focused on stabilising the Pohangina River into a 120m wide channel using tree bank protection works and continuous bands of willows along each bank. Work in the Oroua River focused on maintaining a channel width of 100m. Planting work was required in some areas and in other areas work was required to widen the channel to achieve this design width.

Soil conservation works carried out as part of the Scheme concentrated on stabilising the Belmont and Goulters gullies and some other more minor tributaries of both the Pohangina and Oroua Rivers.

The Scheme commenced in 1967 with the main objectives of controlling and preventing erosion in the catchment and stabilising the Pohangina and Oroua River channels as nearly as possible in their positions at that time.

Findings of the Review

The Scheme has managed to a large degree to stabilize the two rivers. However the flood carrying capacity of both Rivers has not been maintained. Gravel build-up and encroaching vegetation has confined the flood flows placing undue pressure on the protection works on the outside of bends. This has caused significant and reasonably regular damage to the protection works with the consequential loss of productive land.

To a large extent this problem has been caused through the expectations by ratepayer that all erosion damage will be repaired whilst at the same time limiting available financial resources. These two factors have resulted in there being insufficient funds to carry out both robust protection works and the necessary channel maintenance.

The soil conservation works have been very successful with both the sand gullies and the minor tributaries being significantly stabilised. Very little work has been required in these areas over the last ten years.

The Future Scheme

A set of design parameters have been established for both rivers and applied where appropriate. A complete plan for the future alignment of the Pohangina River below the Totara Reserve has been prepared. However, because the meander pattern in the Oroua River is constantly being restarted from bend distortions and areas of harder materials, Oroua River management cannot be significantly improved by following an overall design channel. An overall plan for the alignment of the Oroua River has therefore not been prepared. Design channels have however been drawn up for representative reaches and these can be used as a guide to management where applying these design channels would assist river management measures, site by site.

An integral part of the future scheme will involve the planting of 30 to 50 metre bands of willows along both banks except on the insides of bends. Landowners will be required to make land available for these plantings but should be rewarded by less flood debris on their land and less risk of loss of pasture through erosion.

Estimates have been placed on the cost of implementing the Pohangina River design and on a level of expenditure considered appropriate to manage the Oroua River. Under the programme of works set out in the review, expenditure on the Pohangina River would be about three times the existing level for the next five years and then drop back to about double the existing level. The reduction will be possible because of the improved alignment that will be created by the proposed works, the more

robust works being carried out, and because of the maintenance of the flood carrying capacity of the river that will reduce the damage potential during flood events.

The estimate for the Oroua River proposes a level of expenditure forty percent higher than at present. This will enable more robust works to be carried out along with a programme of channel maintenance. It is expected that works will be required on an ongoing basis on the Oroua River because of the inability to apply an overall design.

It is recommended that drain maintenance works continue in the scheme only where the drains service more than one property and that close attention is paid to the ongoing management of the Goulters Gully complex.

The review recommends that the income from the sale of the Goulters Gully Forestry be used to replant and manage the ongoing forestry to provide protection to the unstable sand formations and the remaining funds be used to fund scheme works over the next 25 years.

Classification

The analysis of past and proposed expenditure in the Scheme have shown that the existing classification was reasonably equitable for the first 10 years or so but in the last 10 years the level of expenditure on the Oroua River has not been aligned with the proportion of rates sourced from the Oroua.

To ensure that the future Scheme works are funded by those who benefit from the works and who contribute to the need for the works, the Review recommends that new differential rating systems be developed for the Scheme. This will be developed following the completion of the Review.

Where to Now?

The programme for consultation is detailed on the next page.

We trust that the meetings will help ratepayers fully understand the proposed recommendations and upgrading works, and that the submissions process will give ratepayers sufficient opportunity to recommend any changes to the Review that they consider necessary.

Additional follow-up discussions of either a formal or informal nature will be organised as appropriate.

Submissions from Ratepayers

Written submissions on the draft Review are sought by **7 August 2001** and should be sent to Freepost No. 374, Pohangina Oroua Scheme Review Submissions, **horizons.mw**, Private Bag 11025, Palmerston North. These submissions will be considered at a hearing meeting of the Operations Committee on 16 August 2001.

The draft Review will be adopted, subject to amendments arising from the submissions, at the Council Meeting on 18 September 2001.

Yours faithfully

John Philpott

JOHN PHILPOTT & ASSOCIATES
CONSULTING ENGINEERS

NOTE: If you are unable to attend the meetings, but still wish to discuss matters, please contact John Philpott by phone on (06) 358 1000 or e-mail john.philpott@inspire.net.nz

Full copies of the draft Review, which has about 130 pages have been distributed to the Scheme Liaison Committee and will be available at the Ratepayer Meetings. Copies may also be obtained by contacting Reception at Regional House, phone 06-952-2800 or e-mail reception@horizons.govt.nz.

Pohangina Oroua Catchment Control Schemes Review

Consultation Programme

1. Ratepayer meetings – Presentation of the Review

The meetings will summarise the key findings and recommendations of the Review and provide the opportunity for ratepayers to seek clarification and raise issues of concern in an open forum. The presentation will be made at two meetings – we invite you to attend either or both meetings.

Evening meeting	17 July 2001	7.30pm	Pohangina Hall
Afternoon meeting	19 July 2001	1.30pm	Kiwitea Hall

2. Open Day

Ratepayers are invited to come and talk to staff on a one to one basis about any issues associated with the Review.

Open Day	25 July 2001	10am - 3pm	Pohangina Hall
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3. Submissions sought

Please make your written submissions early so we can have sufficient time to consider the matters raised and meet with you if necessary to discuss them.

**Send submissions to: Freepost No.374,
Pohangina Oroua Scheme Review Submissions,
horizons.mw, Private Bag 11025, Palmerston North.**

Submissions close	7 August 2001	Last day to send submissions.
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4. Submissions Hearing

We will summarise your submission and make appropriate comment and recommendations. A copy of these will be sent to you prior to the hearing. Your submission, together with staff recommendations, will be considered by members of the Council's Operations Committee. You will have the opportunity to speak in support of your written submission. Please indicate on your submission whether or not you wish to be heard.

Submissions Hearing	23 August 2001	10am	Pohangina Hall
(when the report was sent out the date was 16 August in error)			

Annex D

Submissions Hearing

- Submissions Hearing Report 23/8/01
- Discussion on Individual Submissions
- Individual Submissions

**POHANGINA- OROUA CATCHMENT CONTROL SCHEME
SUBMISSIONS HEARING : SCHEME REVIEW**

PURPOSE

1. To hear and consider verbal and written submissions on the draft Pohangina – Oroua Catchment Control Scheme Review.

BACKGROUND

2. On 19 June 2001 the Council approved the draft Pohangina – Oroua Catchment Control Scheme Review document for consultation with scheme ratepayers.
3. The Review assessed the performance of the present Scheme and identified how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner.

CONSULTATION

4. There has been an extensive programme of public consultation with the Scheme Ratepayers.

20 June 2001	Newsletter mailed out to all ratepayers in the Pohangina Oroua Scheme area. The newsletter summarised the issues and recommendations and detailed the programme of consultation.
4 July 2001	Public Notice of consultation programme in the Feilding Herald and the Manawatu Evening Standard.
17 July 2001	Public Meeting at Pohangina Hall. Presentation of the Review at 7.30pm. Approximately 30 ratepayers attended
19 July 2001	Public Meeting at Kiwitea Hall. Presentation of the Review at 1.30pm. Approximately 20 ratepayers attended
7 June 2001	Open Day at Pohangina Hall 7 ratepayers took the opportunity to discuss issues with John Philpott and Allan Cook.

5. The ratepayer meetings were chaired by Councillor Murfitt, with Consulting Engineer John Philpott giving the presentation. In attendance were Allan Cook Area Engineer Northern (Pohangina Hall meeting), and Kevin Smith, Engineers Assistant.

SUBMISSIONS RECEIVED

6. Written submissions have been received from four individual ratepayers, from the Liaison Committee and a from the Manawatu District Council. A copy of each submission is in Annex B.
7. The six submissions received have been analysed and summarised in Annex A.

RECOMMENDED CHANGES TO THE REVIEW

8. Analysis of the submissions suggests that most of the recommendations in the Review are acceptable to ratepayers. A number of additional issues were raised and the following changes and additions are recommended for inclusion in the Final Report.
 - a. That the Scheme works plans be amended to include the relocation of the stopbank at 21.8 km outside of the proposed line of willow planting before they are planted and the cost split 50: 50 with the landowner and the Scheme. A note must be included in the review to ensure that all future stopbank maintenance costs and rebuilding costs must lie with the landowner.
 - b. That the Review be amended such that the non-erodeable sections of river bank are not planted and the master planting plans, held by the Scheme Manager, be amended accordingly as these are identified.
 - c. That the Review be amended with the addition of a note to the bottom of table 9 stating that the 30 m planting width may be reduced to 20 m where the river bank has a long history of being stable and there is limited potential for it to be attacked by the river in the future.
 - d. That the works programme set out in the Review be amended to bring the planting programme for the reach of the Pohangina River directly upstream of the Raumai Bridge, forward to the 2002/2003 year and the protection works and channel clearing be carried out in 2001/2002 or as soon as funding becomes available from the Manawatu District Council.
 - e. That the attached revised Table 17, Pohangina Oroua Scheme long term Estimates replace the table in the Review. This includes the repayment of 50% of the loan in 2002/2003 and the rate requirements altered accordingly.
 - f. That the following recommendations are added to the Section 24, Recommendations:
 - i. direct gravel extractors to beaches where gravel extraction would facilitate general river management;
 - ii. monitor expenditure of Scheme funds and adjust the rating system if required to maintain equity within the Scheme;
 - iii. changes to work priorities in the future must be carried out using the principles set out in the Review;
 - iv. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme; and
 - v. examine the powers of the Council with respect to stock damage to protection plantings.
 - g. That recommendations t. in Section 24: Recommendations, is amended to read "reclassify the Scheme and ensure that in the long term the funding obtained from each of the catchments is in proportion to the expenditure in each of those catchments".

SUBMISSIONS TO BE HEARD

9. Only Colin Giles of the Manawatu District Council, and J B Martin, have indicated at this stage, their wish to speak in support of their submission at the hearing. Other submitters may wish to be heard on the day.
10. The format for verbal presentations is as follows:
 - a. each speaker is allocated ten minutes for their presentation; and
 - b. a further five minutes is allowed for questions on the submission from the Committee members.

RECOMMENDATIONS

11. It is recommended that the Committee:
 - a. **notes** that all the submissions have been acknowledged together with a copy of the submissions summary (Annex A);
 - b. **considers** the discussion relating to the submissions;
 - c. **endorses** the changes to the Review as recommended in this report, and other changes arising from the Submissions Hearing, for approval and final adoption at the Council Meeting on 18 September 2001.

W J L Philpott
CONSULTING ENGINEER
John Philpott and Associates

ANNEX

- A. Summary of Submissions
- B. Copies of submissions received.

DISCUSSION ON INDIVIDUAL SUBMISSIONS

Submitter: John Caldwell

Location: Pohangina River, Left Bank, River Distance = 21 km

Submission:

- a. That a stopbank protecting Mr Caldwell's property at 20.8 km which lies in the path of the proposed planting would need to be realigned to the farm side of the planting if the work proceeds.
- b. That the planned 30 m strip of planting on top of a very stable section of riverbank at 20 km is unnecessary.
- c. That the width of planting be reduced from 30 m to 20 m except in areas where there has been a problem in the past or where sections of the river pressure indicates it to be necessary.

Discussion:

- a. Planting the stopbank or leaving it on the riverside of the trees is not a sensible idea and so relocating it is the only practical option. The issue at hand is who is responsible for its relocation. It is not clear who paid for it to be constructed in the first place but Mr Caldwell is not being rated for the protection it provides nor for its future maintenance.

On the basis that having the river planted along this alignment benefits both the landowners on the left and right banks of the river, the cost of its relocation could be a shared cost with the scheme. Future costs of stopbank maintenance would then lie with the landowner unless it was taken into consideration in the classification. As the scheme is not fundamentally a flood control scheme, the future costs should lie entirely with the landowner.

- b. There is little if any point of planting the riverbank along a very stable section of river. I therefore see that the plans can be amended to recognise this.
- c. The width of planting is a concern raised by a number of the submitters. Most of the lower sections of riverbank on the Pohangina River have had problems in the past. Some have clearly had more than others. Where a bank has a history of being very stable planting a 30 metre strip is probably more than is required to ensure that the stability of the river is maintained. The difficulty lies in defining which areas are stable and which are not and which areas may become unstable in the future as meanders migrate. I believe it is a reasonable request to reduce the planting width in some locations, however, the decision whether to plant 20 or 30 metres must lie solely with the river manager and then only in areas of the river where the river is very stable. The planting programme needs to detail these sections of riverbank and the programme to plant the 30 metre sections adhered to.

The Review already recommends on page 43 that 30 m buffer zones could be reduced to 20 m for the threshold of motion meander form when the standard of protection work is very high.

Recommendations:

Recommendations arising from the submission:

- a. The stopbank at 21.8 km be relocated to the outside of the proposed line of willow planting before they are planted and the cost split 50: 50 with the landowner and the Scheme. Future maintenance costs and rebuilding costs must lie with the landowner.
- b. That the non-erodeable sections of riverbank are not planted and the master planting plans, held by the Scheme Manager, be amended accordingly as these are identified.
- c. That the 30 m planting width be reduced to 20 m only where the riverbank has a long history of being stable and there is limited potential for it to be attacked by the river in the future.

Submitter: J B Martin

Location: Oroua River

Submission:

- a. That the Scheme be split into two Schemes based on the two rivers.
- b. That the Scheme be reviewed every 5 years.
- c. That there be more flexibility on the types of planting to remove the reliance on willows.
- d. When the land is retired and fenced landowners should be encouraged to plant production trees as an edge plantation alongside the willows.
- e. That the future of the Scheme be brought back to ratepayers for consideration when the classification and level of rating has been determined.
- f. That there be much more emphasis on gravel extraction and gravel control to prevent build up of gravel that leads to flooding. That the gravel build up leads to flooding more than channel constriction.
- g. The retention dams be investigated.
- h. That the charging for water extraction be investigated during the development of the new rating system and the funds used to fund river control works.
- i. That consultation is necessary between authorities that have overlapping river control responsibilities.

Discussion:

- a. It is possible to split the two rivers as they have distinct catchments. However that would create two small schemes and remove the advantages of being able to spread costs around when one area needs large expenditure in one year and another area in another year. It is possible to closely track expenditure and make adjustments to the rating system if required in the future. This can create all the advantages of separate schemes for each river whilst retaining the advantages of one scheme.
- b. Reviewing the schemes every 5 years would add considerable expense to the ratepayers. Closer monitoring of scheme effectiveness would however ensure that works programmes were adjusted to meet the changing needs of the scheme and the ratepayers.
- c. The Scheme Manager has indicated that he is already considering other species in light of the Saw Fly problem.
- d. Landowners can always plant production trees at the back of willow planting but not instead of river control plantings such as willows. Production trees such as pines do not have the same ability to resist erosion and filter flood debris as well maintained willows.

- e. The Scheme is in place for the benefit of ratepayers and as they fund the works to a large degree, they will have the right to request that the Scheme be reconsidered if necessary following the outcome of the development of a draft differential rating system.
- f. The issue of gravel build-up and channel congestion has been addressed in the Scheme through the control of beach vegetation and channel shaping where required. This will remove the build up at some critical locations and slow down the development of these build-ups at others. The extraction of gravel is a very expensive unless it can be carried out by extractors who need the gravel for commercial purposes. These extractors only wish to extract from very accessible areas and there is insufficient demand to direct them to less accessible areas. Gravel extractors however can be guided to the areas of build up in preference to those areas where extraction has traditionally taken place.
- g. Control of flooding in rivers the size of the Pohangina and Oroua Rivers using retention dams is not practicable. The cost of doing so would be far greater the scheme could afford. Gaining consent to construct dams of either of these river would also be very unlikely.
- h. It is not legally possible to charge for water extraction and allocate the funds collected to river control in the Pohangina and Oroua Rivers.
- i. There is no overlapping control with respect to river control in the Pohangina and Oroua Rivers. There are a number of affected parties but **horizons.mw** is the controlling authority. Where consents are involved the Planning Tribunal can influence activities as they relate to environmental management.

Recommendations:

Recommendations arising from the submission:

- a. That the two catchments continue to be managed within one Scheme but the development of the differential rating system take into account the need to ensure that in the long term the funding obtained from each of the catchments is in proportion to the funding required in each of those catchments.
- b. That the scheme be reviewed as and when required.
- c. That gravel extractors be directed to beaches where gravel extraction would facilitate gravel river management.

Submitter: Graham and Helen Johnson

Location: Pohangina River- Right bank – River Distance = 4.5 km

Submission:

- a. That a lot of productive land would be made unproductive if the 50 m band of planting is carried out along the river. It would be more prudent to plant 30 metre bands of willows along areas where damage has not occurred over the past 20 years and 50 metres where damage has occurred. If situations were to change in the future the Scheme should expand the 30 m to 50 m.
- b. That maintenance and monitoring of riverbanks and areas adjacent to the river should be of paramount importance especially in relation to stock grazing in the planted areas.

Discussion

- a. There is no plan to plant 50 m bands of willows on the Pohangina or the Oroua Rivers and 90 % of the proposed planting will be in 30 metre wide bands with 10% at 60 metres.

The location of the 60 metre wide bands of willows is where there is no plan to carry out any other form of erosion control work and in this case the 60 metre bands are considered a minimum. This section of river, river distance 7 to 8 km largely has rough berm land. About 3 hectares of this area is productive and because of the characteristics of the river in this location, the land has a reasonably high risk of erosion.

Nearly all the planting is proposed along reaches of the river where erosion has occurred over the last 20 years.

- b. The Scheme Review proposes a much higher standard of channel maintenance than that that has occurred in the past.

Monitoring is carried out of areas where problems frequently occur and other areas are inspected when landowners report problems.

It will be necessary that landowners fence all planted areas to prevent stock damaging the willows. An inspection of these areas from time to time will monitor stock damage.

The Scheme belongs to the landowners and they are the best watchdogs. Damage caused by other ratepayers should be reported to the Scheme Manager who will take the appropriate action.

As all staff time is charged directly to the Scheme, additional monitoring by staff will increase Scheme costs.

Recommendation

No recommendations arise from this submission.

Submitter: Rob Crothers

Location: Oroua River

Submission:

- a. That there is an imbalance of monies spent on the Pohangina side of the Scheme.

Discussion:

- a. I believe that there are two underlying issues that are raised in this submission.

The first is that the rate income for the Pohangina and Oroua Rivers will favour the Pohangina River. This will not be the case. The proposed new rating system will ensure that the level of rating for the Oroua River ratepayers will reflect the expenditure on the Oroua River and will not be directed to fund works in the Pohangina River.

The second issue is that of the income from the forestry returns and its distribution to the Scheme.

The historical rating distribution between the Pohangina and the Oroua is approximately 60% from the Pohangina and 40% from the Oroua. The forestry investment has been funded from rates and therefore on the 60:40 split. The distribution of funds from the forestry income will be based on the expenditure on works on the two rivers. When taking into account programmed works and expected flood damage expenditure the distribution of forestry income will be almost exactly 60:40 during the first 6 years and after 15 years the split will average slightly less than 60:40, which will favour the Oroua Catchment.

These calculation were based on the reviewed cash flow supported by the Liaison Committee and recommended later in this report.

Recommendation

Recommendations arising from the submission:

- a. That the proposed revised funding system stand but the expenditure of Scheme funds be monitored and the rating system be adjusted in the future if required to maintain equity within the Scheme.

Submitter: Colin Giles – Manawatu District Council

Location: Various bridge sites especially the Raumai Bridge on the Pohangina River, and the Totara Reserve.

Submission:

- a. That the Manawatu District Council has a particular interest in Section 18 of the Review "Local Authority Contribution and the Protection of Non – Scheme Assets".
- b. Council supports the management regime for the Pohangina River.
- c. Council would encourage the works proposed upstream of the Raumai Bridge be carried out urgently.
- d. That the MDC wishes to discuss the recommendation that states:

"share the funding of protection works required to prevent riverbank erosion that is threatening both non-ratepayer asset and ratepayer assets except where natural river processes would be accepted if the non-scheme asset was not present. In these cases the total cost of the protection works shall be fully funded by the asset owner".

MDC acknowledges that any betterment required to protect non-scheme assets could be considered a local authority cost, but the cost of the do-minimum option as well as future ongoing maintenance could be considered as part of the overall management regime of the river.

Discussion:

- a. It appears in the proposed plan set out in the Review for works in the Pohangina River directly upstream of the Raumai Bridge that all the cost is to be borne by the MDC. The planting and future maintenance of that planting however, already lies with the Scheme. This needs to be made clearer in the Review document. The planting is programmed for the year 2003/2004 and the protection works and channel clearing were not programmed at all. If the later work was to be carried out by the Scheme and funded by the MDC there is no reason why it could not be carried out in the 2001/2002 year. Planting could be brought forward a year to 2002/2003 and not significantly affect the scheme budget as the cost is only \$2,640.

Recommendation

Recommendations arising from the submission:

- a. That recommendation r. in the body of the Scheme Review, page 122 and recommendation m in the executive summary (they are the same) stand.
- b. That the planting programme for the Raumai be brought forward to the 2002/2003 year and the protection works and channel clearing be carried out in 2001/2002 and funded directly by the Manawatu District Council.

Submitter: The Pohangina Oroua Scheme Liaison Committee

Submission:

- a. They generally support the proposed river management philosophy.
Refer to actual submission for wording on submission 1 to 4.
- b. They support the intention to establish buffer planting strips to generally define a wider river channel. However they noted an assurance given during the consultation programme that some reduction on the proposed 30 m buffer width may be justified in certain circumstances. They wish to be assured that the Scheme Manager will exercise some flexibility in that regard.
- c. They support the proposal to undertake works on the Pohangina River according to a predetermined priority order. However they note an assurance that priorities may need to be reassessed following future flood events. Nevertheless they agree that the principal of priority based on level of risk, which the review establishes, should continue to be applied.
- d. They recognise that there is little point in doing the planting if those who allow stock to graze in the riverbed are not brought to task.
- e. They recognise the value of the Goulter's Gully production forest in enabling the execution of the major works proposed in the review. They strongly support the replanting and future management of the area as a first charge against logging revenues and that the area be managed to ensure the future land stability and to maximise returns from the next tree crop for future management purposes.
- f. They recommend that 50% of the loan be repaid in year 2002/03 and the rate increases reduced to 2.5%.
- g. They support the proposed reclassification and contend that a significant level of indirect benefit should continue to be applied.
- h. They consider that owners of non-Scheme assets who derive benefit from Scheme works must contribute in future in proportion to the benefit received.
- i. They request that every effort be made to find a mechanism to address the unfairness of unclaimed accretion land not contributing to scheme funds considering it receives benefit from the Scheme works.
- j. They support the proposal to remove from the Scheme, drains that serve one property only.

Discussion:

- a. With respect to planting width refer to the discussion and recommendations in the first submission.
- b. Section 12.3 of the review discusses works priorities but there needs to be more emphasis on the point that once priorities are altered due to floods or other legitimate reasons then a new priority order must be established using the principles set out in the Review.

J R & A C Caldwell
"Te Punga"
743 Pohangina Valley East Road
R D 14
ASHHURST
(06) 329 4847

00007679

25 July, 2001

Pohangina Oroua Scheme
Review Submissions,
Horizons.mw
Private Bag 11025
PALMERSTON NORTH

Dear Sir,

Re – Pohangina Oroua Catchement Control Scheme

I wish to make a submission on two sections of work on our river boundary that have been highlighted in the draft review of the above-mentioned scheme.

Section 1 – River Reach 20.50 – 21.60: (Yr 3)

On the eastern side of the river a 1.2 metre high stopbank appears to be impeding the correct channel width. The middle section of this reach suffered extensive damage to the tree protection work and the existing stopbank during the 1988 flood. Damage to our outlying paddocks was extensive as the river flowed through this area, large amount of debris, timber and gravel; 4000m³ of silt and gravel were removed from the paddocks and the bank was re-instated after the tree protection work was completed. The scheme made a significant contribution to this stopbank because the land is low lying. If the bank were not there even medium flood events would flood this area. We feel that the bank would need to be realigned to the farm side of the planting if this work proceeds. Failure to have this protection would make our dairy farming operation vulnerable to very regular flooding.

Section 2 - Reach 19.90 – 20.10: (Yr 5)

On the eastern side from the 20km mark down stream some 250 metres the river is held in its channel by a bank of approximately 5 metres high. A pappu bank extends up from the water line making this bank very stable. We submit that the planned 30 metre strip of planting on top of this bank is unnecessary and a waste of our titled land and the scheme's money.

I have been on this property for 27 years and apart from some minor erosion above the papp bank in big floods this area is very much intact. With the planned channel widening on the west side, much of the pressure in these events would be alleviated.

We would be very happy for the Engineering staff to inspect both of these sites and discuss any matters arising from these submissions

I thank you for the opportunity to be able to put forward a submission.

Yours faithfully

A handwritten signature in cursive script, appearing to read 'John Caldwell', written in dark ink.

John Caldwell

J R & A C Caldwell
"Te Punga"
743 Pohangina Valley East Road
R D 14
ASHHURST
(06) 329 4847

31 July, 2001

Pohangina Oroua Scheme
Review Submissions,
Horizons.mw
Private Bag 11025
PALMERSTON NORTH

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Dear Sir,

Re – Pohangina Oroua Catchement Control Scheme

After attending the ratepayer meeting and the open day at the Pohangina Hall on 25 July 2001, I would like to put forward the following submission.

The width of planting on the Pohangina River is reduced from 30 to 20 metres except in areas where there has been problems in the past or sections where river pressure indicates it to be necessary. Many farms on the valley floor have long river frontages and planting 30 metre strips will have a severe impact on farming operations. In many instance plantings of less than 10 metres has proved adequate, so in most cases a 20 metre-planting strip should provide realistic protection.

Thank you for you consideration; I do not wish to be heard on this submission.

Yours faithfully



John Caldwell

Submission to the review of the Pohangina-Oroua Scheme

This submission is forwarded with the intent of improving the quality and quantity of catchment works on the Oroua River. This river flows past my property for approximately one mile and I can see the quality of its waters getting worse every year.

The present scheme review is devoted entirely to maintaining a flood channel of sufficient width to cope with major floods and to plant willows inside bends in 20 and 30 metre strips fencing these off and thereby retiring the land adjacent to the river for control work. I have no problem with the suggested scheme apart from some minor suggestions for improvement.

I personally believe that the time is opportune to devote more time and effort to mitigate floods and attempt to control the vast differences between the high and low flow particularly on the Oroua River. Towards this ideal, I respectfully suggest more effort to place retention dams to slow highs and more control on water extraction as the lows are allowing metal build-ups to occur on the lower reaches of the river.

The classification of the scheme in total as a joint scheme as has operated in the past would appear to have matured to the point that the requirements of each river is different to such a degree that they should be split into two schemes with their own control schemes and finance. A joint fund for emergency funds should be made available by Horizonz using Goulters Gully forestry to fund such an amount, as may be required. I suggest an average of the last two major flood costs would indicate an amount required.

I request that this scheme review be held in abeyance until classification of rating potential has been undertaken. I suggest this course of action because the enactments of legislation have been so widespread that rivers, reserves and rating will be a new field of litigation. I would like to explain this further to the submissions committee.

The following list is my response to the request to submit by way of submission to Horizonz on the review of the Pohangina-Oroua catchment control scheme.

1. Split the scheme into two, each river individually.
2. Length of scheme before review five years.
3. More flexibility on planting so that the scheme is not totally reliant on willows. Where land is retired and fenced an added incentive could be to encourage owners to plant production trees as an edge plantation alongside willows.
4. Bring scheme back to ratepayers when the scheme has had financial incomes rating etc worked out for their comment and approval.
5. Much more emphasis on metal extractors and control so that build-up of river base does not contribute to excess flooding. The raising of the stream bed creates a situation of potential damage from flooding just as much if not more so than a channel restriction.
6. Investigate retention dams and placements.

In the course of changing the rating accountability, that a directive be the possibility of charging for water extraction to fund the catchment control be investigated. After all, ratepayers adjacent to the river are funding channel correction and flood control it seems only fair that such work is protecting the extractors of water, that some financial charge should be made to assist in river control many of the water users are not ratepayers of control work.

8. The many changes of legislation have effectively put river catchment control measures under more than one committee and authority. An overall perspective is difficult to come to terms with as each authority is operating under different rules. I believe that consultation is necessary between authorities so that overlapping of rules are for the good of the river. No two rivers are alike and each requires its own solutions.

Because of time restraints, this submission has been condensed to points only. I wish to be heard in support at the submissions hearing.

JB Martin

J.B. Martin 3/8/01

Pohangina Road,
R.D.10
PALMERSTON NORTH

29TH JULY 2001

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WSP
WSP

To whom it may concern:-

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to WSP

We wish to make a submission concerning the Pohangina Oroua Scheme Review.
There are two points which we have concerns about.

1. There is going to be a lot of productive land going to be made unproductive if the 50 metre planting is carried out all along the river. Would it be prudent to plant 30m bands in areas where flood damage has not occurred in the last 20 years and 50 metres where damage has occurred. This would not enroach on so much productive land. Any areas which become flood prone or damage occurs the Scheme should have the authority to take the 50m band of planting.

2. The maintenance and monitoring of river banks and areas adjacent to the river should be of paramount importance i.e. the grazing of stock on river banks, inadequate fencing of planted areas, as prices for stock improve, some farmers will see the opportunity to graze a few more head of stock and use the river bank for this. There appears to be no clout in the legislation at present to control the grazing of river banks and planted areas. There is no benefit in planting these areas if there will not be any monitoring of grazing etc. also this person could also point out problems that maybe beginning to occur with the river, that may prevent further damage before it occurs.

Graham & Helen Johnson.

Kimbolton Road
R.D.7
Feilding

Horizons M.W.
Private Bag
Palmerston North.

06-08-01

Dear Sir,

Re: - Submission to the Review of the Pohangina Oroua Protection Scheme.

This is a submission referring to Mr John Philpot's review cash flow.

"That over ten years there is an imbalance of monies being spent on the Pohangina side of the scheme."

I realise that the need to spend this money on the Pohangina River at the present time is urgent, but feel that it is my duty as a representative of the people on the Oroua side of the scheme to point out the imbalance so that in the future when the Oroua River needs money spent on it the imbalance has been noted.

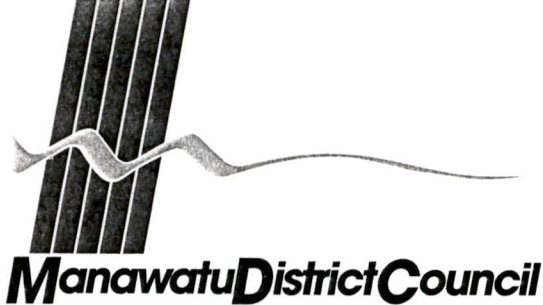
Yours sincerely



Rob Crothers.

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07 AUG 2001
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Copied to WSP

00007596



Ref: 4/0500
4/0541

10 August 2001

The General Manager
horizons.mw
Private Bag 11025
PALMERSTON NORTH

Dear Sir

DRAFT POHANGINA-OROUA CATCHMENT CONTROL SCHEME

Thank you for the opportunity to make a submission on the Draft Pohangina-Oroua Catchment Control Scheme produced by the Manawatu-Wanganui Regional Council. (horizons.mw.)

The Manawatu District Council has a particular interest in Section 18 of the Scheme Review document titled "Local Authority Contribution & the Protection of Non -Scheme Assets"

Council supports the proposal to follow a management regime to plant and manage the buffer strips and maintain the clear fairway of the Pohangina River downstream of its confluence with the Makawakawa Stream.

Council would encourage the work proposed on the 12.80km to 13.70km section of the Pohangina River, which includes the Raumai Bridge, be carried out urgently.

Council wishes to discuss the philosophy of "Recommendation m." in relation to protection of non-scheme assets. Council acknowledges that any betterment required to protect non-scheme assets could be considered a local authority cost, but the cost of the do-minimum option as well as future ongoing maintenance could be considered as part of the overall management regime of the river.

Where required, we would like to discuss specific contributions based on this philosophy.

Yours faithfully

Colin Giles
ROADING MANAGER

submission - draft pohangina-oroua catchmentcontrolscheme.10,08,2001.doc

135 Manchester Street, Private Bag 10-001, Feilding, New Zealand
Telephone 0-6-323 0000, Facsimile 0-6-323 0822
Email: public@mdc.govt.nz Webpage: www.mdc.govt.nz

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POHANGINA OROUA SCHEME REVIEW

Submission from the Scheme Liaison Committee

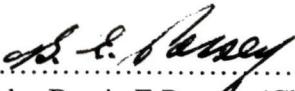
00007697

The Scheme Liaison Committee met on 30 July 2001 to consider its position in relation to the Draft Pohangina Oroua Catchment Scheme Review – June 2001.

The Committee makes the following submissions in respect of the draft document:

1. We generally support the proposed river management philosophy.
2. We support the review observation that the channel has been over confined in many areas in the past and we recognise that the proposals address that situation in a positive and practicable manner.
3. We support the proposal to undertake protection work to higher engineering and construction standards and on a more comprehensive basis than has been possible in the past. We recognise that this is the only way that escalating flood damage repair costs will be controlled. We recognise that increased expenditure on works, particularly in the earlier years, will be required to achieve that objective.
4. We support the proposal to undertake 'in channel' works to improve channel capacity and alignment. We request that advance resource consents be obtained so as to prevent delays in undertaking that work as and when it is required.
5. We support the intention to establish buffer planting strips to generally define a wider river channel, however we note an assurance given during the consultation process that some reduction in the proposed 30m buffer width may be justified in certain circumstances. We wish to be assured that the Scheme Manager will exercise some flexibility in that regard.
6. We support the proposal to undertake works on the Pohangina according to a predetermined priority order. However we note an assurance that priorities may need to be reassessed following future flood events. Nevertheless we agree that the principal of priority based on level of risk, which the review establishes, should continue to be applied.
7. We recognise the desirability of establishing substantially increased areas of protection plantings on both rivers. However we have some concern that the investment involved may not be respected by some riparian landowners. We believe there is little point in doing additional planting if those who allow stock to graze in the river bed are not brought to task.

8. We recognise the value of the Goulter's Gully production forest in enabling the execution of the major works proposed in the review. We strongly support the replanting and future management of the area as a first charge against logging revenues. The area must be managed to ensure the future land stability and to maximise returns from the next tree crop for future river management purposes.
9. We have considered the various cash flow/funding options as presented in amendments to Table 17. We recommend that option which provides for the repayment of 50% of the existing Scheme loan in year 2002/03 and which involves initial rate increases of 2.5%. We are aware that a re-classification could see a shift in the incidence of rating to riparian ratepayers and in that situation any increase greater than 2.5% is likely to be unacceptable.
10. We believe that there are anomalies in the present rating classification and support the proposal to reclassify the Scheme. However we are strongly of the opinion that there is little if any resistance to the present rate on Classes D and E and contend that a significant indirect benefit rate should continue to be applied in respect of those classes.
11. We consider that owners of non-Scheme assets who derive benefit from the Scheme works must contribute in future in proportion to the benefits received.
12. We are aware that occupiers of areas of accretion land are obtaining substantial benefits without making a commensurate contribution to Scheme funds. We request that every effort be made to find a mechanism to address the unfairness of that situation.
13. We support the proposal to remove from the Scheme the maintenance of those drains which serve one property only.


.....
Signed by Barrie E Passey (Chairman)
on behalf of the Pohangina Oroua Scheme
Liaison Committee

Date: .....

Annex E

Adoption of the Draft Scheme Review

- Agenda Item 18/9/01
- Minutes of the Hearing
- Minutes from Council Meeting
- News Release 18/9/01

ADOPTION OF THE POHANGINA - OROUA CATCHMENT CONTROL SCHEME REVIEW

PURPOSE

1. To report on the outcome of the submissions hearing on the Pohangina - Oroua Catchment Control Scheme Review, and to obtain a Council resolution to adopt the Review with amendments.

BACKGROUND

2. On 19 June 2001 the Council approved the draft Pohangina - Oroua Catchment Control Scheme Review document for consultation with scheme ratepayers.
3. The Review assessed the performance of the present Scheme and identified how it can be managed in the future to best meet the needs of the ratepayers in a sustainable manner.
4. There has been an extensive programme of public consultation with the Scheme Ratepayers involving a newsletter sent to all ratepayers, two public meetings and an open day. The Meetings and the open day were well attended.
5. Written submissions were received from four individual ratepayers, as well as a submission from the liaison Committee and a submission from the Manawatu District Council.
6. The submissions were considered by the Operations Committee at the Pohangina Hall on 23 August 2001, with four ratepayers speaking in support of their submission.

RECOMMENDED CHANGES TO THE REVIEW

7. Following the consideration of the submissions and the consideration of the recommendations presented in the draft Review, the Committee endorsed the following changes. A number of other changes are also noted that arise from the changes recommended by the Committee.

- a. The following paragraph should be added at the end of section 12.

Prior to the buffer strip planting on the left bank at river distance 20.8 km, the stopbank shall be relocated to a new line on the inland side of the planting. The cost of this work will be shared 50:50 between the Scheme and the landowner and all future maintenance will be funded by the landowner.

- b. Table 4, Table 5, Table 17 and Appendix E should be amended as a result of a. above to allow an additional \$2,500 of Scheme expenditure in year 3 of the proposed works programme.

- c. The following paragraph should be added between the second to last and the last paragraphs in section 12 and the works plans amended accordingly.

Where sections of the river bank are non-erodible, planting will not necessarily be required. Where these areas are identified the master planting plan held by the Scheme Manager will be amended accordingly. The final decision on planting requirements lies with the Scheme Manager.

- d. Table 6, number 3 should be amended to include the following sentence:

The 30 m strips of planting may be reduced to 20 metres where the riverbank has a long history of being stable and there is a limited potential for it to be attacked by the river in the future.

- e. That 50% of the existing scheme loan be paid off with income from the Goulters Gully Forestry.
- f. That table 5 be amended to shift the planting directly upstream of the Raumai Bridge from 2003/2004 to 2002/2003.
- g. That Table 17 be amended to reflect the change set out in e. and f. above and the rate requirements changed accordingly. (A new copy of Table 17 is attached.)
- h. The following recommendations are added to Section 24 – Recommendations of the review.
- i. direct gravel extractors to beaches where gravel extraction would facilitate general river management;
 - ii. monitor expenditure of Scheme funds over the long term to maintain equity within the Scheme;
 - iii. carry out changes to work priorities in the future if required using the principles set out in the Review;
 - iv. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme; and
 - v. obtain as far as possible, agreements with landowners in regard to protection plantings.
- i. That recommendations t. in Section 24: Recommendations, is amended to read “reclassify the Scheme and ensure that in the long term the funding obtained from each of the catchments is in proportion to the expenditure in each of those catchments”.

RECOMMENDATIONS

8. It is recommended that the Council:
- a. **notes** that all of the submissions have been acknowledged by the General Manager on behalf of the Council;
 - b. **approves** the recommended amendments to the Pohangina - Oroua Catchment Control Scheme Review as set out in paragraphs 7 a. to i above;
 - c. **adopts** the Pohangina - Oroua Catchment Control Scheme Review including the approved amendments;
 - d. **instructs** the General Manager to inform all those who have made submissions of the outcomes of the Council's deliberations on the submissions; and
 - e. **instructs** the General Manager to prepare a new differential rating system for the Schemes in 2001-2002.

P M Davies
GENERAL MANAGER

W J L Philpott
CONSULTING ENGINEER
John Philpott & Associates

ANNEX

- A. Updated version of - Table 17: Pohangina - Oroua Scheme Long Term Estimates.
- B. Minutes of the meeting of the Operations Committee held on 23 August 2001.

Table 17: Pohangina Oroua Scheme Long Term Estimates

10,000 extra allocated for Oroua regular flood damage. Altered flood damage reserve amounts. Pay off half the loan in 2002/03 and spread the rest over the remaining time payments the same. Note this requires less rate increases largely because of the loan repayment and the extra Regional Grant up front to pay 20% of this.

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Scheme Balance (at start of period)	-7,515	663	8,981	3,981	-1,076	1,861	5,371	7,248	48	5,406	12,497	13,645	32,969	33,053	35,139	-5,175
INCOME																
% Rate rise (+) / Decrease (-ve)	10.00%	0.00%	2.50%	2.50%	2.50%	0.00%	0.00%	2.50%	0.00%	0.00%	-5.00%	-5.00%	-5.00%	-5.00%	0.00%	0.00%
Scheme Rates (2000/2001 \$154,773)	170,250	170,250	174,506	178,869	183,341	183,341	183,341	187,924	187,924	187,924	178,528	169,602	161,121	153,065	153,065	153,065
Territorial Bulk Rates	7,223	7,223	7,404	7,589	7,778	7,778	7,778	7,973	7,973	7,973	7,574	7,196	6,836	6,494	6,494	6,494
General Rate Contribution	37,824	77,214	54,514	54,114	59,114	57,714	51,114	45,014	41,314	41,314	38,917	37,317	39,917	37,317	47,917	42,817
General Rate Contribution Review	52,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emergency reserve interest	1,345	4,095	6,370	8,320	9,945	1,625	3,250	4,875	6,500	8,125	1,625	3,250	4,875	6,500	8,125	1,625
Forestry Income	0							17756	17756	17756	17756	17756	17756	17756	17756	17756
Extra draw from forestry reserve		90000	105000	80000	75000	85000	65000									
TOTAL INCOME	269,542	348,782	347,794	328,891	335,178	335,458	310,483	263,542	261,467	263,092	244,401	235,121	230,506	221,133	233,358	221,758
EXPENDITURE																
Pohangina below Totara Reserve	49,000	117500	114000	112000	137000	130000	100000	77500	59000	59000	69500	66500	79500	66500	119500	89000
Pohangina above Totara Reserve	0	3000	3000	3000	3000	3000	0	0	0	0	5000	0	0	0	0	5000
Oroua	31,000	65000	65000	65000	65000	65000	65000	65000	65000	65000	55000	55000	55000	55000	55000	55000
Drain Maintenance	5,000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Soil Conservation Forestry	0	15,300	38,854	25,059	1,727	16,753	24,787	15,798	18,040	16,307	22,041	960	960	960	960	960
TOTAL WORKS EXPENDITURE	85,000	204,800	224,854	209,059	210,727	218,753	193,787	162,298	146,040	144,307	155,541	126,460	139,460	126,460	179,460	153,960
Management Costs																
Engineering Management	58,880	58,000	58,000	58,000	58,000	58,000	58,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Asset Mgmt Planning	1,559	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Rates Administration	4,077	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Other Costs																
Valuation services	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520
Asset insurance and LAPP	867	867	867	867	867	867	867	867	867	867	867	867	867	867	867	867
Hydrological	3,887	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100
Scheme Reclassification	52,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emergency reserve interest Trans	1,345	4095	6370	8320	9945	1625	3250	4875	6500	8125	1625	3250	4875	6500	8125	1625
Emergency Reserve Contribution	18,000	45000	35000	30000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000
Loan Repayment - Int & Prin	34,329	17,482	17,482	17,482	17,482	17,482	17,482	17,482	17,482	17,482						
TOTAL EXPENDITURE	261,364	340,464	352,793	333,948	332,241	331,947	308,606	270,742	256,109	256,001	243,253	215,797	230,422	219,047	273,672	241,672
Scheme Balance (at end of period)	663	8,981	3,981	-1,076	1,861	5,371	7,248	48	5,406	12,497	13,645	32,969	33,053	35,139	-5,175	-25,089
Return on Forestry			POHANGINA-OROUA					Emergency Reserves								
Amount invested			\$650,000					The emergency reserve calculations assume that a flood would occur on average every 5 years that would require the reserve to be fully drawn down.								
Interest Rate:			7.5 %													
number of years			25													
Term :	Number of Qtrs:		100													
Interest Rate per quarter:	Per Quarter:		1.875													
Instalment:	Per Year:		\$57,763													
	Loan Period	Budget Year Ended	Interest	Principle	ot Paymen	Balance										
						415000										
Loan Calculation			POHANGINA-OROUA					Management Costs								
Amount Borrowed:			\$240,000					It has been assumed that when the capital works on thew Pohangina River have been completed by 2007/08 the management costs would reduce.								
Interest Rate:			7.5 %													
number of years			10													
Term :	Number of Qtrs:		40													
Interest Rate per quarter:	Per Quarter:		1.875													
Instalment:	Per Year:		\$34,329													



Minutes of a meeting of the Operations Committee of **horizons.mw** at the Pohangina Hall, Pohangina at 10.00am on Thursday, 23 August 2001 to hear submissions to the Pohangina-Oroua Catchment Control Scheme Review.

PRESENT Crs G P Murfitt (Chairman), M J F Guy, A J Pengelly and C J Lester (ex officio, from 10.45am to 12.07pm).

IN ATTENDANCE	Consulting Engineer	Mr W J L Philpott
	Area Engineer Northern	Mr A Cook
	Committee Secretary	Ms K Booth

ALSO PRESENT Cr D B Meads.(from 10.04am), four members of the public as submitters, and Mr B H Sampson.

The Chairman welcomed submitters to the meeting and advised the recommendations would be put forward to the September Council meeting. He advised that each submitter had been allocated ten minutes for their presentation with a further five minutes allowed for questions from Committee members.

Mr John Martin stated that he was new to the District. When he purchased the property, neither he nor his solicitors were aware a Scheme existed. He suggested Schemes should be notated on the Title. With regard to the rating change, he said this should have changed before 30 June 1988 under law, and he believed the rating should be in place before a Scheme is put in place.

Mr Martin reiterated and amplified on the points made in his submission, namely those of splitting the Scheme into two Schemes; the review period being five years, not 10 years; and having the flexibility to plant other species. His concern here was disease if only one species was planted. He would consider fencing and planting other species just inside the fence. He suggested five trees deep of production trees, for example larch, redwood. The Chairman advised that landowners are currently able to plant trees on the landward side of the protection plantings.

Mr Martin's concern with potential flooding arose through the low flow at summertime being insufficient to carry metal down the river, thus creating a gravel build-up. He believed retention dams would improve the flooding situation, the dam placement being assessed by forestry and catchment audits, and appreciated this was a large cost. He felt the various local authorities who have catchment control measures over the river, should liase with each other. Mr Martin also believed it was unjust that landowners adjacent to the river pay rates, while other landowners may freely take water from the river.

In response to Mr Martin's suggestion on the use of any surplus from Goulters Gully forest harvesting, The Chairman and the Consulting Engineer explained the receipt of income will be staggered; that surplus money will be used for silviculture to maintain the forest.

Mr Martin said that in the instance of local authorities creating a reserve, this could affect an **horizons.mw** Scheme and that **horizons.mw** and local authorities should consult prior. The Chairman said the Committee would get advice.

Mr Colin Giles representing the Manawatu District Council (MDC), said MDC supported the proposed regime and management of the river, particularly for the benefit of non-scheme assets such as roads and bridges, and for the stabilising of the bed of the river. He said the pressure on the Raumai Bridge caused by channel movement is of urgent concern, and elaborated on the problem. The options are to either move the bridge, or realign the channel to relieve pressure. Mr Giles saw the cost of river realignment as a joint cost between the Scheme and the local authority.

Mr Barrie Passey, Chairman of the Pohangina Oroua Scheme Liaison Committee, said the Committee wanted to reinforce its agreement with the Scheme Review as presented, which gives credence to, and addresses, problems present in the river for a long time. The Committee complimented the Consulting Engineer on his professional overview of the Scheme. The Liaison Committee felt it is not a well-managed river at present. It appreciated there would be costs involved in remedying that, although it would be difficult to judge whether the proposed rates are excessive until after the reclassification. The Liaison Committee considered, that if the Scheme fund is allowed to drop below that required to maintain the Scheme, an injection of funds must be put back into the scheme quickly, perhaps by rating in the year following the event, otherwise works would be held up because of a funding deficit.

Mr Passey mentioned the fencing of protection plantings, his definition of a fence being "to keep stock out". He did not feel there needed to be specifics in the Scheme about what type of fence or type of stock, but highlighted the possible damage to a landowner's property, caused by wandering stock.

Mr Andrew MacDonald, also a member of the Liaison Committee, spoke from a personal point of view. As a fourth generation landowner he was aware of huge problems with the Raumai Bridge and considered it should have been built larger. He said that ten years ago, there were erosion problems with the bank at the side of the bridge. He considered plantings at 20m would be quite stable. He would like to see every little hole in the river fixed, rather than leaving them to become bigger, and creating costly problems.

The Chairman thanked everyone for attending the Submissions Hearing. He advised that the submitters will receive a letter from **horizons.mw** about the submissions, together with a copy of the report to Council and the Operations Committee's recommendations.

The meeting adjourned at 11.25am.

The meeting resumed at 12.05pm.

Members fully discussed the submissions and staff provided clarification as required. Each submission was discussed and recommendations made to that submission.

Mr John Caldwell –

The Chairman confirmed that the Consultant Engineer had discussed with Mr Caldwell, the content of Recommendation (a) below, and that Mr Caldwell was comfortable with the 50:50 split of costs.

Recommendations

- a. The stopbank at 21.8km be relocated to the outside of the proposed line of willow planting before it is planted and the cost split 50:50 with the landowner and the Scheme. Future maintenance costs and rebuilding costs must lie with the landowner.
- b. That the non-erodible sections of riverbank are not planted and the master planting plans, held by the Scheme Manager, be amended accordingly as these are identified.
- c. That the 30m planting width be reduced to 20m only where the riverbank has a long history of being stable and there is limited potential for it to be attacked by the river in the future.

Mr John Martin –

- a. The Chairman considered there was no basis for having the river scheme split in half and that closer monitoring of the scheme will be carried out to ensure the Scheme remains effective and funding systems remain equitable.

The results of the monitoring will be reported in the Schemes annual report

- b. Members agreed that the Liaison Committee should monitor progress against the Scheme objectives and to note any difficulties that arise; that it agrees with the Scheme objectives. It was suggested that a report on the implementation of the review be presented at the annual Scheme meeting.
- c.&d. **horizons.mw** does not discourage people from extra plantings in addition to Scheme plantings. However the regional council does discourage production trees instead of willows. The Area Engineer Northern said that willows do not thrive when planted with pines and macrocarpa, but are compatible with natives.
- e. It was acknowledged that as far as the classification is concerned, it is a public process and open for submission, and the reply to Mr Martin should reflect this.
- f. Members agreed with Mr Martin that the gravel build-up in channels needs to be managed, and the Review allows for this.
- g. The Scheme provides an erosion benefit, not a flood benefit. Retention dams can exacerbate erosion problems. At some future date retention dams could be investigated for purposes outside the area of erosion.
- h. Charging for water extraction is not legally possible, as we cannot sell the resources.
- i. There was discussion on esplanade reserves, road reserves, accretion land and other areas. **horizons.mw** recognises the overlapping with esplanade strips. It has responsibility for river margins, and will address this should it become an issue.

The Consultant Engineer considered Mr Martin to be incorrect in regard to the rating issues, and **horizons.mw** did not have to reclassify the Scheme in 1988 when the Rating Powers Act came into existence.

Recommendations

Members agreed with (a) and (c) but amended (b) as follows:

- a. That the two catchments continue to be managed within one Scheme but the development of the differential rating system take into account the need to ensure that in the long term the funding obtained from ratepayers and applied to works is equitable in terms of funding principles.
- b. That the scheme be reviewed as determined by **horizons.mw**. The Liaison Committee agrees with the Scheme philosophies and is to review progress against the Scheme review and to forward any concerns of ratepayers to the Scheme Manager for consideration.
- c. That gravel extractors be directed to beaches where gravel extraction would facilitate gravel river management.

Graham and Helen Johnson –

- a. The 50 metre bands mentioned do not exist. They are either 30m or 60m. The Consultant Engineer clarified where these were, and that the 10% refers to the length of the plantings. 60m applied to a minimal part of the overall river. 50m is mentioned in the review but is an error and will be changed in the final report.
- b. The Area Engineer Northern suggested a commonsense approach. Under the Soil and Conservation Act it is an offence to damage protection works. He recommended that ratepayers be encouraged to monitor their own river banks and report incidents of flood damage or stock damage to the Scheme Manager of the Liaison Committee.

Recommendations

- a. That the powers of the Council with respect to stock damage to protection plantings be investigated and publicised.

Mr Rob Crothers –

- a. The Consulting Engineer investigated this submission and found that a rating system that distributed cost would remain equitable for some time. What **horizons.mw** is proposing matches very closely to what has been rated in the past.

Recommendation

- a. That the proposed revised long term scheme budget stand but the expenditure of Scheme funds be monitored to maintain equity within the Scheme.

Mr Colin Giles – Manawatu District Council –

- a. Members understood that Mr Giles wished **horizons.mw** to pay a share of funding protection works to prevent riverbank erosion that threatens the Raumai Bridge. The Consultant Engineer said that capital works needed to be carried out and maintained.

Recommendations:

- a. Funding of protection works required to prevent riverbank erosion that is threatening both non-ratepayer asset and ratepayer assets must be shared between the Scheme and the asset owner unless where natural river processes would be accepted if the non-scheme asset was not present. In these cases the total cost of the protection works shall be fully funded by the asset owner.
- b. That the planting programme for the Raumai be brought forward to the 2002/2003 year and the protection works and channel clearing be carried out in 2001/2002 and funded directly by the Manawatu District Council.
- c. Consultation between the Manawatu District Council and Scheme Manager be undertaken annually to determine works to be done.
- d.

The Pohangina Oroua Scheme Liaison Committee –

The Chairman said that the Liaison Committee knew the philosophy in this Scheme, of cooperation of riparian landowners, and he would like to foster it.

Recommendations

- a. That changes to priorities in the future are generally carried out using the principles set out in the Review.
- b. That the powers of the Council with respect to stock damage to protection plantings be investigated and publicised.
- c. That the attached revised Table 17, Pohangina Oroua Scheme Long Term Estimates replace the table in the Review. This includes the repayment of 50% of the loan in 2002/2003 and the rate requirements altered accordingly.
- d. That the rating of unclaimed accretion land be carefully examined during the establishment of a new rating system for the Scheme.

RECOMMENDATIONS

OP 01-134

Resolved

Pengelly/M Guy

- a. **notes** that all the submissions have been acknowledged together with a copy of the submissions summary (Annex A);
- b. **considers** the discussion relating to the submissions;

- c. **endorses** the changes to the Review as recommended in this report and through the Submissions Hearing, for approval and final adoption at the Council meeting on 18 September 2001 as follows:
- a. "That the Scheme works plans be amended to include the relocation of the stopbank at 21.8 km outside of the proposed line of willow planting before they are planted and the cost split 50:50 with the landowner and the Scheme. A note must be included in the review to ensure that all future stopbank maintenance costs and rebuilding costs must lie with the landowner.
 - b. That the Review be amended such that the non-erodible sections of river bank are not necessarily planted and the master planting plans, held by the Scheme Manager, be amended accordingly as these are identified.
 - c. That the Review be amended with the addition of a note to the bottom of table 9 stating that the 30 m planting width may be reduced to 20 m where the river bank has a long history of being stable and there is limited potential for it to be attacked by the river in the future.
 - d. That the works programme set out in the Review be amended to bring the planting programme for the reach of the Pohangina River directly upstream of the Raumai Bridge, forward to the 2002/2003 year and the protection works and channel clearing be carried out in 2001/2002 or as soon as funding becomes available from the Manawatu District Council.
 - e. That the attached revised Table 17, Pohangina Oroua Scheme long term Estimates replace the table in the Review. This includes the repayment of 50% of the loan in 2002/2003 and the rate requirements altered accordingly.
 - f. That the following recommendations are added to the Section 24, Recommendations:
 - i. direct gravel extractors to beaches where gravel extraction would facilitate general river management;
 - ii. monitor expenditure of Scheme funds over the long-term to maintain equity within the Scheme;
 - iii. changes to work priorities in the future must generally be carried out using the principles set out in the Review;
 - iv. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme; and

- v. obtain as far as possible, agreements with landowners in regard to protection plantings.
- g. That recommendations t. in Section 24: Recommendations, is amended to read "reclassify the Scheme and ensure that in the long-term the funding obtained from ratepayers and applied to works is equitable in terms of funding principles".

CARRIED

The meeting closed at 1.27pm

Confirmed

GENERAL MANAGER

CHAIRMAN

ADOPTION OF THE POHANGINA-OROUA CATCHMENT CONTROL SCHEME REVIEW
Report No. 01-162

This item reported on the outcome of the submissions hearing on the Pohangina-Oroua Catchment Control Scheme Review, and requested a resolution from Council to adopt the Review with amendments.

Mr Philpott thanked the Committee for the opportunity to prepare the report, and answered members' questions.

The question was raised on whether members of the public have any right of appeal, once the recommendations have been adopted by Council. There was a full discussion on whether the recommendations and resolutions adopted by this Committee and endorsed at the full Council meeting the following day, should be subject to final adoption at that meeting, or a month hence to allow for any other concerned parties to make their views known. Mr Philpott advised that all submitters had been notified of this Committee's meeting, had received a copy of the Agenda and the minutes of the Submissions Hearing meeting, and were aware of the outcome of the Hearing and the recommendations. There was no decision made to alter the current process, and it was acknowledged that submitters could take (civil) court action if they chose.

Cr Pengelly expressed appreciation of Mr Philpott's report and his professional overview of the scheme.

OP 01-137

Resolved

M Guy/Pengelly

- a. **notes** that all of the submissions have been acknowledged by the General Manager on behalf of the Council;
- b. **approves** the recommended amendments to the Pohangina - Oroua Catchment Control Scheme Review as set out in paragraphs 7 a. to i. as follows;

- a. The following paragraph should be added at the end of section 12.

Prior to the buffer strip planting on the left bank at river distance 20.8 km, the stopbank shall be relocated to a new line on the inland side of the planting. The cost of this work will be shared 50:50 between the Scheme and the landowner and all future maintenance will be funded by the landowner.

- b. Table 4, Table 5, Table 17 and Appendix E should be amended as a result of a. above to allow an additional \$2,500 of Scheme expenditure in year 3 of the proposed works programme.

- c. The following paragraph should be added between the second to last and the last paragraphs in section 12 and the works plans amended accordingly.

Where sections of the river bank are non-erodible, planting will not necessarily be required. Where these areas are identified the master planting plan held by the Scheme Manager will be amended accordingly. The final decision on planting requirements lies with the Scheme Manager.

- d. Table 6, number 3 should be amended to include the following sentence:

The 30 m strips of planting may be reduced to 20 metres where the riverbank has a long history of being stable and there is a limited potential for it to be attacked by the river in the future.

- e. That 50% of the existing scheme loan be paid off with income from the Goulters Gully Forestry.
- f. That table 5 be amended to shift the planting directly upstream of the Raumai Bridge from 2003/2004 to 2002/2003.
- g. That Table 17 be amended to reflect the change set out in e. and f. above and the rate requirements changed accordingly. (A new copy of Table 17 is attached.)
- h. The following recommendations are added to Section 24 – Recommendations of the review.
 - i. direct gravel extractors to beaches where gravel extraction would facilitate general river management;
 - ii. monitor expenditure of Scheme funds over the long term to maintain equity within the Scheme;
 - iii. carry out changes to work priorities in the future if required using the principles set out in the Review;
 - iv. carefully examine the issue of rating unclaimed accretion during the establishment of a new rating system for the scheme; and
 - v. obtain as far as possible, agreements with landowners in regard to protection plantings.
- i. That recommendation t. in Section 24: Recommendations, is amended to read "reclassify the Scheme and ensure that in the long term the funding obtained from each of the catchments is in proportion to the expenditure in each of those catchments".
- c. **adopts** the Pohangina - Oroua Catchment Control Scheme Review including the approved amendments;
- d. **instructs** the General Manager to inform all those who have made submissions of the outcomes of the Council's deliberations on the submissions; and
- e. **instructs** the General Manager to prepare a new differential rating system for the Schemes in 2001-2002.

CARRIED



News Release

GM 01 30
AMO

18 September 2001

IMPROVEMENTS IN STORE FOR POHANGINA-OROUA SCHEME

A comprehensive programme of work and improvements has been approved for the Pohangina-Oroua Catchment Control Scheme.

At yesterday's Operations Committee meeting, Councillors endorsed a Review of the scheme. "The Review sets out what work is needed on the scheme and how it will be funded," Committee Chairman Garry Murfitt said.

The scheme involves about 600 ratepayers and its main function is to guard against erosion and other damage from alignment changes to the Pohangina and Oroua Rivers.

Cr Murfitt said the Review recommends many improvements for the scheme. "There will be better management of gravel and vegetation build-up in the scheme's rivers to keep a clear flood path. The scheme will take a coordinated approach to managing the river channels as a whole, not just addressing patch-up jobs. Extensive riverbank protection plantings will also be carried out."

Forestry planted by the scheme in the 1970s will be harvested to help fund the work. Replanting will be a high priority activity. "Half of the scheme's current loan will be paid off using income from Goulters Gully Forestry," Cr Murfitt said.

Cr Murfitt said that a new differential rating system for the scheme for 2002-2003 would be prepared. This will ensure that funding obtained from ratepayers in the Pohangina Catchment and the Oroua Catchment is in proportion to benefit received from works in each area.

The Review is the product of extensive consultation with scheme ratepayers. It includes changes made after the Operations Committee considered submissions on the Review in August.

ENDS. For more information contact:

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