Opunake Flood Control Scheme

Asset Management Plan

Taranaki Regional Council
Private Bag 713
Stratford 4352

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Summary

Objectives

The Opunake Flood Control Scheme consists of a number of component infrastructural assets to provide the following:

- security from floods in the Opunake township in a 1% Annual Exceedance Probability (AEP) Flood event.

Term

In perpetuity

Maintenance

Maintenance is funded to ensure the Scheme objectives will be met.

Reporting

Annually
- Prepare annual maintenance plan and budget.
- Discuss and agree with Council (report in LTP)
- Report on works undertaken and costs to Council.

Three Yearly - Revalue infrastructural assets

Six Yearly - Review asset management plan. Agreed and adopted by Council.

Flood Performance
Report to Council on performance of scheme in all large flood events.

Funding

Maintenance funded by: Targeted rate over the South Taranaki District Council

Damage repairs funded by:
Rates (as above)
Financial reserves
Reprioritising works
Loan

Financial reserves

Aim to:
- Build up reserves to meet above average planned expenditure.
- Draw down reserves to meet unexpected expenditure.

Review of plan

Review when there is a change in maintenance standards, a change in funding policy, or at 6 yearly intervals.

1. Introduction

1.1 The Plan

This management plan has been prepared to assist those delegated the responsibility for managing the Opunake Flood Control Scheme on behalf of the Taranaki Regional Council (the Council).

The Opunake Flood Control Scheme fundamentally provides flood protection to the Township of Opunake from floods originating from the Hihiwera Stream Catchment. Figure 1 shows the location of the Scheme.

The Opunake Flood Control Scheme assets include unlined clay channels, rock lined channels, large culverts and headwalls, rock riprap drop structures, fences and gates.

The current valuation of these assets (in terms of Local Government requirements) to June 2020 is $450,680.

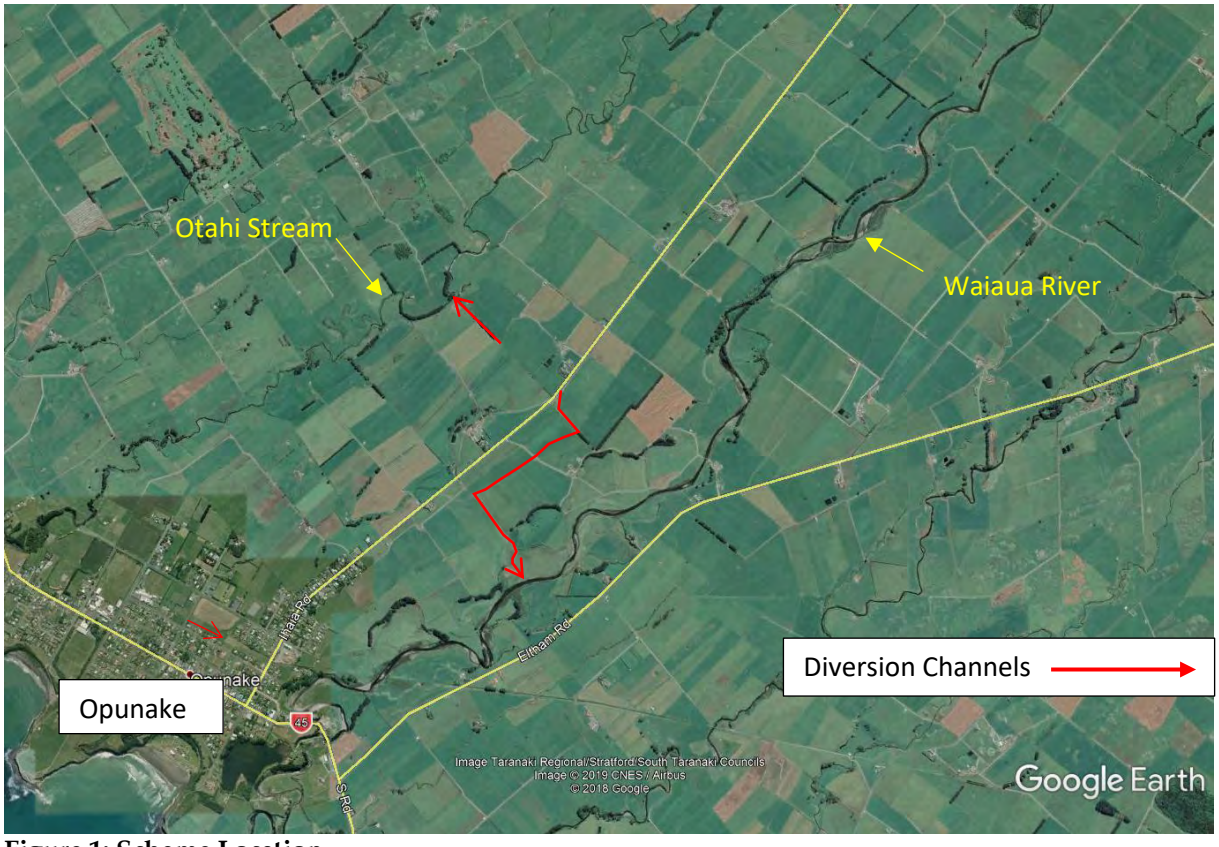

Figure 1: Scheme Location

1.2 Purpose and ownership of the Plan

The purpose of this Plan is to provide the means and mechanisms to enable the Scheme Manager to plan for the most efficient economic and sustainable management of the Opunake Flood Control Scheme.

The Opunake Flood Control Scheme assets need to be managed, to ensure they continue to effectively deliver scheme benefits on a long term, sustainable basis. Management requires provision for monitoring, maintenance and in some instances eventual replacement of these assets.

This Plan defines the objectives and performance standards for the Opunake Flood Control Scheme and the level of maintenance needed to ensure these are met at all times.

The Plan also provides a base against which the Council's performance in maintaining these infrastructural assets can be measured. This management plan will provide a framework for technical, and financial inputs relating to the assets and their impact on long term financial planning.

Responsibility for implementing the Plan lies with the Council, which is the body responsible for managing the asset.

1.3 Duration and review of the Plan

The duration of the Plan is ten years from the date of formal preparation and acceptance by Council. This Plan has also been prepared with a 50-year time horizon. Maintenance costs and rates are current to June 2020.

1.4 Legislative requirements

The principal statute affecting the management of infrastructure assets is the Local Government Act 2002 (the Act).

The Act empowers local authorities to provide a range of services. Specifically, the Act, together with the Soil Conservation and Rivers Control Act 1941, obligates regional councils to minimise and prevent damage by floods and erosion. The Council executing its responsibilities and powers as a catchment authority in terms of the Soil Conservation and Rivers Control Act 1941 constructed the schemes.

Part VI of the Act requires councils to effectively and efficiently manage their finances and assets. This involves planning for the maintenance, loss of service potential and capital upgrade of all assets. The associated funding for these commitments also needs to be provided for.

This asset management plan will assist the Council with defining the basis for determining long-term financial strategies. Information from the Plan will be used in preparing financial plans and statements required by the Act.

The Office of the Controller and Auditor-General (OAG) has a responsibility to ensure that councils comply with the requirements of the Local Government Act 2002. Part of this involves ensuring that councils are adequately providing for the ongoing maintenance, renewal and capital expenditure on infrastructure assets. The OAG has issued a number of guidelines to assist councils in the preparation of asset management plans.

1.5 Assumptions

There are a number of assumptions made in preparation of this asset management plan. These are made using current knowledge and experience, but may vary with time and in the light of further experience. Further, they will be updated when the Plan is reviewed. The assumptions are:

- that the Council will continue to perform its existing functions in respect to the current legislation;
- there will be no major changes that impact upon the role of the Council in terms of soil conservation and river control; and
- financial projections are in 2020/2021 dollars.

1.6 Assets to be managed

The Opunake Flood Protection Scheme currently includes three lengths of channel constructed to divert flood waters from the Hihiwera Stream to the Otahi Stream and to the Waiaua River and from the Allison Street Channel to the Hihiwera Stream.

The Scheme Assets include:

- The 390m long diversion channel to the Otahi Stream.
- The rock riprap drop structure into the Otahi Stream.
- 1220m of unlined diversion channel to the Waiaua River.
- 253m of rock lined diversion channel to the Waiaua River.
- Two rock riprap lined drop structures with a total length of 52m.
- Rock riprap at the outlet to the Waiaua River.
- Rock riprap lining on one 90 degree bends on the diversion channel to the Otahi Stream and on two 90 degree bends on the diversion channel to the Waiaua River.
- The 60m long 1200mm diameter Euroflow culvert and associated headwalls adjacent to Ihaia Road.
- The 10m long 1200mm diameter Euroflow culvert and associated headwalls beneath the farm tanker track
- 1000m of fencing and one access gate.

Figures 3, 4, and 5 show the location of the Scheme assets in more detail.

1.7 Scheme Background

The Opunake Flood Protection Scheme was constructed in response to a significant flood event in August 2015 where a large number of properties in Opunake were affected by floodwater originating from the Hihiwera Stream and a channel that has been named as the Allison Street channel.

The Scheme has been designed to manage the 100-year return period flood flows in the Hihiwera Stream and the Allison Street channel, with an allowance for climate change through to 2067, to prevent such a flood event from flooding properties in the Opunake Township.

As increasing the capacity of the two stream channels that pass through Opunake was not practicable, a range of options to divert flood waters away from the town were examined. The final Scheme plan which involves diverting the flood waters to the Otahi Stream and Waiaua River was decided upon in late 2016 with the construction works undertaken in 2017 and 2018.

Further channel management and ongoing maintenance works are required within the Opunake Urban area but these will be undertaken by the South Taranaki District Council and do not form part of the Scheme.

1.8 Catchment description

The catchment of the Hihiwera Stream and Allison Street channel upstream of the Opunake Urban boundary have areas of 248 and 69 hectares respectively. The catchments are uniformly graded from an elevation of 100m down to 35m at the town boundary and almost entirely used for dairy farming.

The existing stream channels are relatively small and unable to carry the flood flows that occur in heavy rainfall events. These flood flows spill overland but generally rejoin the main channels before they enter the urban area. These overland flows will generally be caught by the diversion channels which cut across the lay of land.

1.9 Climate

Because of its exposure to disturbed weather systems from the Tasman Sea, the Taranaki region is often quite windy, but has few climate extremes. The most settled weather occurs during summer and early autumn.

The mountain and ranges have a strong influence on rainfall in the area by attracting orographic type events which are often associated with frontal systems and depressions moving through the Tasman Sea. Rainfall in the Hihiwera Stream catchment is not significantly affected by the mountain as the catchment extends only 5km inland from the coast.

The rainfall events that will result in large floods in the catchment will generally arise from small storm cells sweeping in from the coast. High intensity rainfall events lasting only about 1.5 hours will give rise to significant flood events in the catchment.

1.10 Climate change

Some of the predicted impacts of a moderate rate of climate change for Taranaki include changes in average temperature, sea level rise and rainfall patterns. In general, Taranaki, like much of the west coast of New Zealand, is likely to become warmer and wetter.

Climate scientists estimate that Taranaki's temperature could be up to 3°C warmer over the next 70-100 years. This compares to a temperature increase in New Zealand during last century of about 0.7°C. Taranaki could be up to 20% wetter with more varied rainfall patterns and flooding could become up to four times as frequent by 2070.

As extreme weather events become more frequent or severe, the costs and damages associated with them are also likely to increase.

Allowances have been made in the design of the flood protection works for the effects of climate change.

1.11 Land ownership

The Opunake Scheme assets lie on private and public land, including land under the control of the South Taranaki District Council.

Easements will be taken out to cover the parts of the Scheme that lies on Private land.

The land ownership details are as shown on Figure 2.

Table 1: Land ownership details

Location	Owner
A and C	Michael Drought 197 Ihaia Road, Opunake, 4681 LOT 1 DP 2823 LOT 2 DP 20874 SEC 1 SO 13308
B	Road Reserve – STDC
D	DOC Reserve – Concession – 64004-OTH
E	Hickey & Neal Limited 3450 Eltham Road, RD 32, Opunake, 4682 PT SECS 35 & 36 BLK IX OPUNAKE SD - X REF 11930/51000 11940/04400
F	Michael Drought 197 Ihaia Road, Opunake, 4681 Title details yet to be determined

Figure 2: Land ownership

1.12 Protection standard and design flood flows

The Opunake Scheme has been designed to divert 1% AEP flood flows from the catchments upstream of the two diversion points.

The two diversion channels have freeboard and will carry flood flows greater than the 1% AEP flow. However, this cannot be relied on. In the event of significantly larger flows, it is possible that flood waters may enter the main Hihiwera Stream catchment and the Allison Street channel catchment downstream of the diversion points. In such events there is the potential for flooding in the downstream channels.

The downstream channels, culverts and diversion structures have sufficient capacity to carry the flow arising from a 1% AEP storm event in the whole catchment less that diverted to the Otahi and the Waiaua.

The downstream channels and diversions **have not** been designed to carry the flow from a 1% AEP flood event in the now reduced catchment area.

The following summarizes the final design flood flow parameters.

The Opunake flood control Scheme involves the diversion of flows from the Hihiwera Stream channel, the larger of the two channels, to the Otahi Stream to the west and the Waiaua River to the east.

The flow from 70 hectares of the catchment is diverted to the Otahi Stream and the flow from 106 hectares is diverted to the Waiaua River leaving the flow from 72 hectares of the Hihiwera Stream catchment to pass on downstream through the Opunake urban area.

The 1% AEP flood flow in the existing Hihiwera catchment has been determined to be 12.3 cumecs. The diversion to the Otahi will be 4 cumecs and the diversion to the Waiaua will be 4.7 cumecs leaving 3.6 cumecs in the channel at Whitcombe Road to pass on downstream through the Opunake urban area.

The smaller channel, known as the Allison Street channel, has a catchment of 69 hectares and a 1% AEP flood flow of 3.4 cumecs. The analysis of the flows in this channel does not take into consideration the significant restriction imposed by the culverted section of the channel adjacent to the School on Whitcombe Road. Significant ponding will still occur in this area and will as a result attenuate the downstream flows.

The combined flow in the two stream channels will in theory be 7.1 cumecs but because of the restrictions in the Allison Street channel, the flow rate required to pass through the urban area may be significantly less.

Stage 3 of the Scheme works are designed to divert up to 3 cumecs from the Allison Street channel into the Hihiwera Stream channel at the downstream end of the large culvert that passes beneath the railway land at the northern edge of the Opunake urban area.

The design of the stage 3 works involves a control device on the Allison Street channel that will allow the flow that can pass on downstream along its original path to be increased by up to 0.9 cumecs, if and when the existing section of the Allison Street channel through the urban area is improved.

2. General Scheme information

2.1 Principal Scheme features

2.1.1 Catchment Description

The catchment of the two steam channels that pass through Opunake has an area of 317 hectares (248 ha in the Hihiwera and 69 ha in the Allison Street catchment.

The most upstream extent of the catchment lies only 4.5 km to the northwest of the Opunake Township with the land falling at a relatively uniform grade over its total length.

The stream channels are therefore not directly affected by rainfall events on Mount Taranaki but it is clear that the mountain affects the nature of rainfall events.

The catchment is almost exclusively used for dairy farming with very few trees. There are a number of roadside drains that feed into the main stream channels but these all lie within the main catchment area.

2.1.2 Scheme Works (refer to Figures 3, 4, and 5)

The Scheme works are confined to three diversion channels and associated structures as follows:

The diversion to the Waiaua River.

This diversion commences at the large culvert that passes the stream channel beneath the farm access race adjacent to Ihaia Road and extends to where the diversion joins the Waiaua River.

The maintenance of the roadside channel upstream of the large culvert is the responsibility of the South Taranaki District Council.

The diversion to Otahi Stream

The diversion is a straight section of channel leading straight to the Otahi Stream. The original channel downstream of the diversion has been filled in. The channel upstream of the diversion is not part of the scheme and is maintained by the landowner. There is a small bank that ties the left bank of the diversion channel to the adjacent high ground to ensure that any overflows from the upstream channel are diverted into the diversion channel.

The Allison Street channel diversion

The channel lies directly to the north of the houses along the northern side of Gisborne Terrace. The diversion channel ends where it enters the existing old Hihiwera Stream railway culvert.

The diversion includes the structure associated with the throttle plate at the upstream end of the diversion but not the rest of the structure and weed screen. The rest of the structure is maintained by the South Taranaki District Council.

2.1.3 Overview of Scheme assets

The Opunake Flood Protection Scheme assets include:

The diversion to the Otahi Stream

- The upstream end of the diversion involves a rock riprap lined 90 degree bend in the channel that turns the channel across the fall of the land towards the Otahi Stream.
- The 400m long diversion channel to the Otahi Stream. The channel is cut through a high area of ground but falls on a uniform grade to edge of the terrace before it drops into the Otahi Stream. The left bank of the channel was built up over a section to achieve the required channel freeboard but this has been contoured into the adjacent paddock and is no longer an identifiable asset.
- The rock riprap drop structure into the Otahi Stream. This is a very steep drop down the bank of the Otahi Stream.
- 20m long guide bank at upstream end of diversion channel to catch overland flow from upstream and divert it into diversion channel.
- 350m of post and electric wire fencing along the left bank. The right bank fence was an existing boundary fence.

The diversion to the Waiaua River

- 1235m of unlined diversion channel to the Waiaua River.
- 254m of rock lined diversion channel to the Waiaua River.
- Two rock riprap lined drop structures with a total length of 52m.
- Rock riprap on two 90 degree bends.
- Rock riprap at the outlet to the Waiaua River.
- The 60m long 1200mm diameter Euroflow culvert and associated headwalls and rock riprap adjacent to Ihaia Road.
- The 10m long 1200mm diameter Euroflow culvert and associated headwalls and rock riprap beneath the farm tanker track. (The upgraded tanker track is not a scheme asset.)
- 1170m of fencing and one access gate.

The Allison Street channel diversion

- 130m of unlined diversion channel to the Hihwera Stream.
- A concrete channel lining and entry slab at the railway culvert end of the diversion channel.
- Channel throttle in the existing STDC Allison Street channel structure.

Figures 3, 4 and 5 details the general location of these assets.

3. Assets

3.1 Description of assets

3.1.1 Unlined diversion channels

Unlined diversion channel are channels cut directly into the insitu ground. Batter slopes are all at 1.5 horizontal to 1 vertical. The base width varies from 0.75m to 1.5m. The depth varies from 1m to 2.5m. The channels will grow vegetation over time.

3.1.2 Rock lined diversion channels

Similar to the unlined channels but lined with a 250mm layer of 75mm to 200mm broken faced rock riprap.

3.1.3 Rock riprap lined drop structures

Similar to the unlined channels rock riprap lined with a 1 m thick layer of ¼ tonne graded rock riprap placed over a layer of granular filter.

3.1.4 Rock riprap lined bends

90 degree bends in the channel lined with ¼ tonne graded rock riprap.

3.1.5 Euroflo culverts

These culvert are 1200mm dimeter twin walled EUROFLO is a twin walled HDPE (high density polyethelene culvert pipes.
The culverts have either a rock riprap headwall or a Humes precast concrete headwall. The channel at the outlet to the culverts is lined with ¼ tonne rock riprap

3.1.6 Access track

Access tracks in this context are formed access track over the stopbank or along the riverside of the stopbank used to provide access to the river side of the stopbank and river bank for inspection maintenance purposes, and recreational purposes.

3.1.7 Concrete walkway path

Concrete walkway paths are paths located along the top of the stopbank and along the berm land to provide public access for recreational purposes.

3.1.8 Fences and gates

Three types of fencing are included in this asset type.

- 350m of single wire electric
- 962m of post and 4 wire plus two electric
- 08m of 7 wire boundary fence

3.1.9 Concrete entry slab

This asset is a concrete lining to the channel upstream of the Railway culvert entrance on the Allison Street diversion. The concrete lines the channel floor for 2m and up the batter slopes by 1m.

3.1.10 Adjustable throttle in Allison Street channel control structure

The asset is a galvanized steel adjustable gate that closes the size of the opening into the downstream section of the existing Allison street channel. The structure can only be adjusted in low flow period to either increase or decrease the flood flow past the structure.

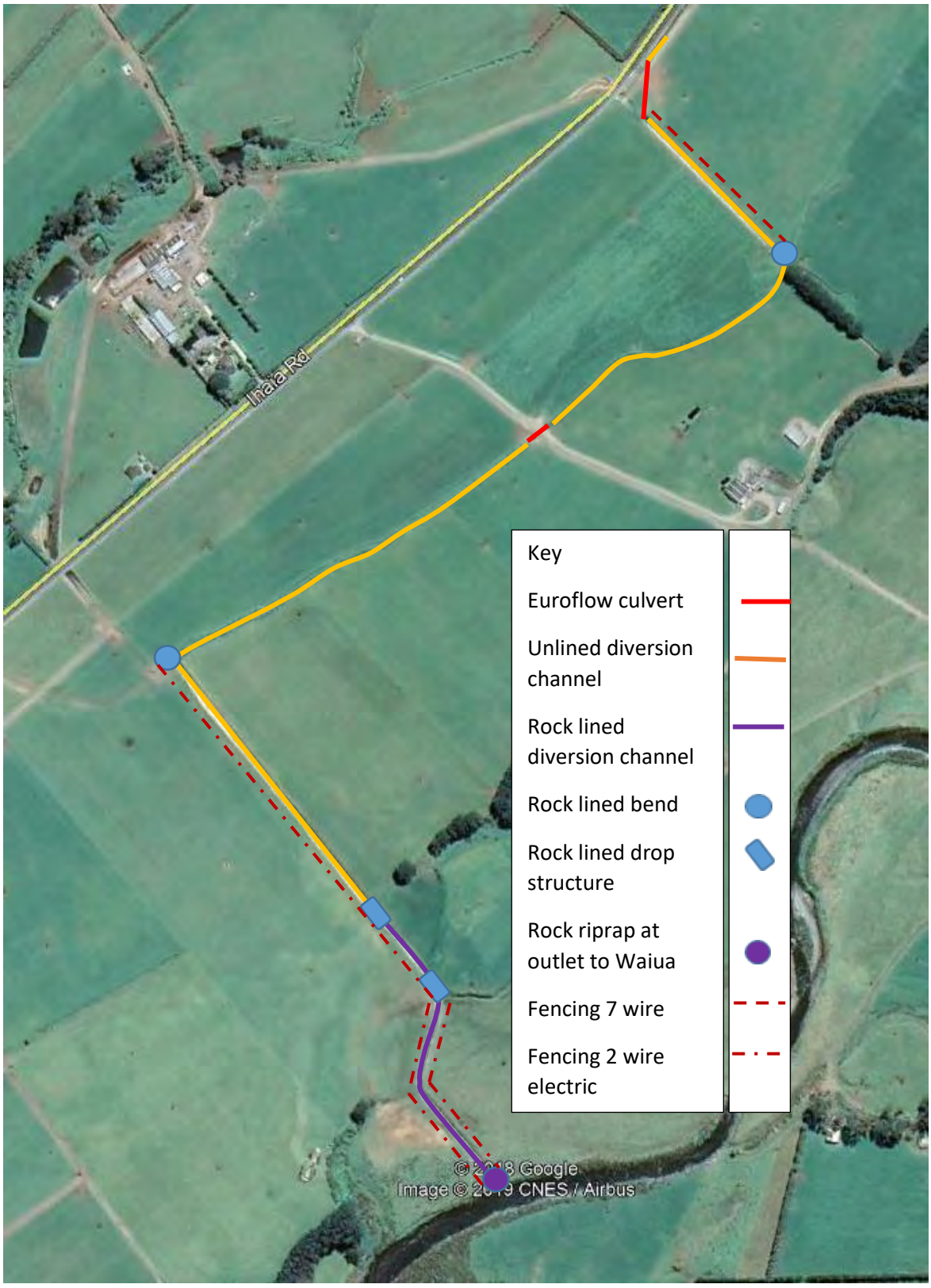

Figure 3: Location of Scheme Assets – Diversion to the Waiaua River

Figure 4: Location of Scheme Assets – Diversion to the Otahi Stream

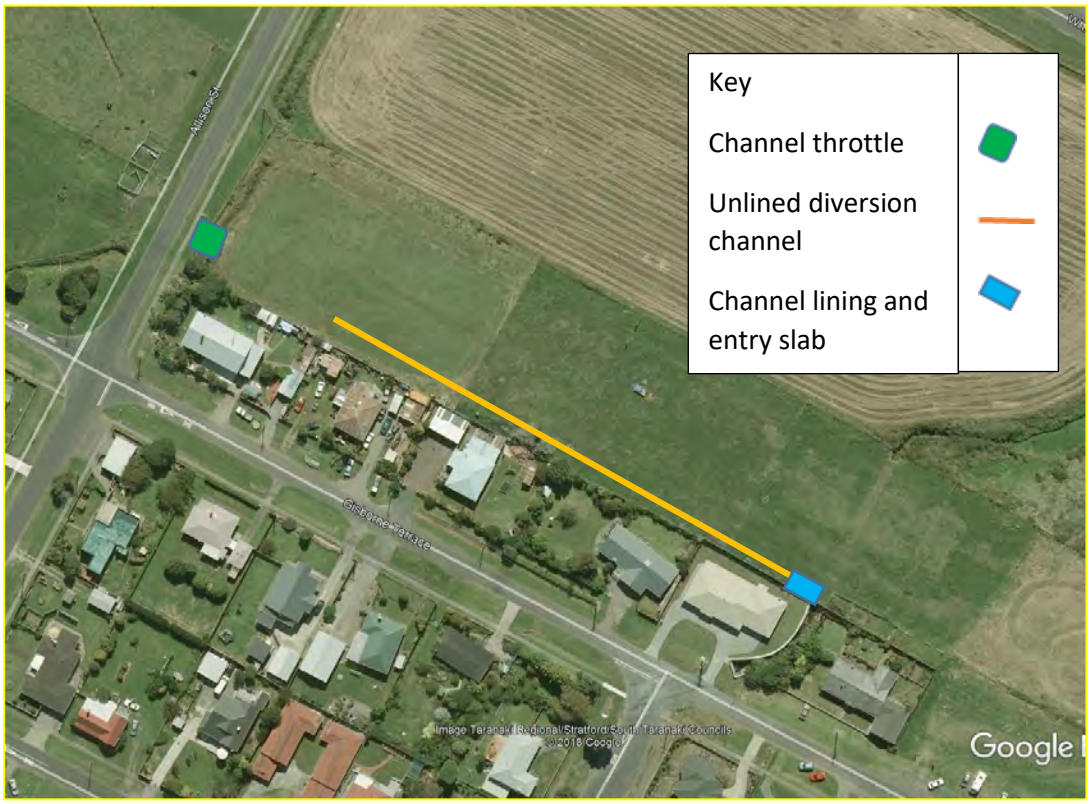

Figure 5: Location of Scheme Assets – Diversion to the Lower Hihiwera Stream

3.2 Asset capacity – design standards

3.2.1 All channel asset, rock riprap, and culverts

All these assets have been designed to carry the flows and remain effective in a 1% AEP flood event.
The channels are designed to have at least 300mm of freeboard.

3.2.2 The channel throttle on the Allison Street Channel

This assets has been designed to throttle the flow reaching the existing STDC control such that in a 1% AEP flood flows at least 3 cumecs will be diverted from the Allison Street channel into the diversion channel that flows towards the existing Hihiwera Stream railway culvert. The throttle plate is adjustable to allow a larger proportion of the flood flow to remain in the Allison Street channel downstream of the throttle gate if during flood flows, there appears to be surplus capacity in the channel.

3.3 Physical parameters

Table 1: Physical Parameters

Asset Type	Location	Life (years)	Quantity			
Diversion to the Otahi Stream						
Diversion channel	Refer to Figure 4	indefinite			400	m
Stopbank / guidebank		indefinite	130	m^3	20	m
Rock riprap		indefinite	150	m^3		
Rock riprap/drop structure		Indefinite	50	m^3		
Fencing	Along left bank of diversion channel	20			350	m
Diversion to the Waiaua River						
Unlined diversion channel	Refer to Figure 3	Indefinite			560	m
Existing channel to maintained by Scheme		Indefinite			680	m
Rock lined diversion channel		Indefinite			254	m
Rock lined drop structure		Indefinite			52	m
Rock lining in channel		Indefinite	437	m^3		
Rock Lining in drop structures		Indefinite	300	tn		
Euroflow culverts		Indefinite			72	m
Fencing – Post and 2 wire electric		20			962	m
Fencing 7 wire		20			208	m
Allison Street Channel diversion						
Diversion Channel	Refer to Figure 5	Indefinite			130	m
Concrete ling and entry slab		40	1	no.		
Channel Throttle		25	1	no.		

3.4 Asset condition

3.4.1 Diversion channels and rock linings

The channel were excavated through natural ground in 2017 and 2018.

They will alter in shape slightly over time and as flood flows occur.

Channel stability will however continue to be monitored by visual inspection.

Rock riprap linings will be monitored to ensure it remain effective. Replenishment is generally not required but will be undertaken if required.

3.4.2 Structures

A regular programme of maintenance will be carried out as required on all structures. Asset condition is monitored by regular inspection. Structural concrete is inspected periodically.

3.4.3 Fencing

Fencing will need little maintenance unless damaged by the landowners. Regular inspection will be undertaken to ensure the channels are not damaged by stock gaining access through fences.

3.5 Asset management system

The Taranaki region has a relatively small number of river control schemes within which infrastructural assets have been constructed and these schemes have a relatively small number of assets.

Because of this, it is possible to manage and keep track of these assets with very simple tools. Other councils that have a large network of infrastructural assets generally have an array of asset management tools used for the management of their assets.

The infrastructural assets are recorded in a simple Excel spreadsheet located on the Council's file system, Number 2571041.

The Council does not have a Schedule of River Scheme Assets located within its financial record system.

3.6 Asset value

River scheme infrastructural assets in the Taranaki Region are valued at current replacement value.

The valuation of the Opunake Flood Protection Scheme assets are reviewed and updated annually following a detailed inspection of the total Scheme. This is a practical option as the area involved and the number of Scheme assets is relatively small.

The 2020 asset values are set out in Table 2 and in internal document derived from 'Asset Valuation Spreadsheet 2571041.

Table 2: Asset Values (30 June 2020)

Asset Type	Location	Quantity				Value 30/6/2020 $
Channel						
Stage 1	Diversion to Otahi Stm	400	m			47,830
Stage 2	Diversion to Waiaua River	861	m			129,550
Stage3	Diversion with railway land	130	m			12,890
Rock Riprap						
Stage 1	Bends and drop structures	3,117	m^3			21,530
Stage 2	Bends and drop structures	460	tonne			31,700
Stage 2	Channel lining	437	m^3			47,180
Culverts						
Stage 2	Chainages 100 & 638	72	m			102,230
Miscellaneous						
stopbank	Stage 1 - Chainage 0	130	m^3			4,240
Fencing	Stage 1	350	m			15,080
Fencing	Stage 2	1,170	m			29,970
Concrete entry slab	Stage 3		LS			2,540
Channel Throttle	d/s Gold Street		LS			5,940
TOTAL						**$450,680**

Frodo: 2571041 and 2571039

4. Maintenance and renewals plan

4.1 Asset management system

Maintenance refers to the work necessary to retain the operating standard or service capacity of the scheme and to keep the asset operational. Because the assets are subject to unpredictable climate events, the work needed cannot always be accurately forecast in time. However, experience gives a very good guide as to the type and general level of work necessary to meet scheme requirements in periods of 'normal' weather events i.e. the base level of maintenance.

Maintenance can include:

- Works to maintain a structural element e.g. a rock lining, drop structure or throttle structure;
- Regular operational activities, channel weed spraying
- Replacement of elements of the system such as fencing and other structural elements over time.

The maintenance plan will set out the programmes and costs required to maintain the desired level of service.

4.2 Service levels

4.2.1 General

The current standard of protection provided by the Opunake Flood Protection Scheme is the 1% AEP standard.

The hydraulic capacity provided by river control works can be determined with reasonable consistency and accuracy. The greater problem is in determining the security of the primary defenses against erosion. The level of risk of failure can only be roughly estimated.

Since the Scheme assets have only recently been constructed (2017/2018), there are few records of past maintenance requirements or costs.

The channels and rock lining will settle down over time and vegetation becomes established but they remain a little vulnerable for a period of time.

4.2.2 Channels

The Council will maintain the channels to a level to ensure that they can adequately carry the design flood flows. For design standards see Section 3.2.

4.2.3 Structures

The Council will maintain all structures in a workable condition at all times to function to their design standards.

4.2.4 Culverts

Culverts, headwalls and outlet protection rock riprap will be monitored periodically. Clearing flood debris and rock riprap replenishment will be undertaken if the riprap if and when required.

4.3 Maintenance history

The Opunake Scheme assets were constructed in 2017 and 2018 and as such there is no maintenance history.

4.4 Maintenance programme

The Council has now developed a maintenance programme, which will minimize the risks of failures to the system, and thereby provide for the most efficient and economic operation, to the service standards determined previously. A detailed assessment has been undertaken of the work required to provide for the long term sustainable management of the Opunake Flood Protection Scheme assets.

The key work components of this are summarised in Table 3 below, along with a general description of the activity and its estimated required frequency. Frequencies given are for the range of conditions anticipated throughout the Opunake Flood Protection Scheme.

The Opunake Flood Protection Scheme assets have been separated into distinct components to ensure the Scheme assets are inspected at a level that identifies all maintenance issues. Inspection and reporting at a large scale can result in important items being missed.

Table 3: Maintenance frequency

Item/Activity	Description	Estimated Frequency
Overall Scheme Assets		
• General inspection	• Overview and general inspection of Scheme assets	• 1 yearly OR • Soon after significant flow events
• Weed control	• Weed spraying	• 1 yearly check
• Rock riprap mtce	• Checking riprap integrity and top-up	• Top up as required
Diversion Channels		
• Inspection of channel integrity	• Walkover inspection checking to ensure that there is no significant channel erosion.	• 1 yearly • OR • Soon after significant flow events
• Weed control	• Weed Spraying and mechanical cleaning if required	• 1 yearly
• Rock riprap mtce	• Checking riprap integrity and top-up	• As required

Culverts • Normal inspection • Inspection after flood event	• Overview and general inspection • Detailed inspection looking for inlet and outlet erosion and debris blockages	• 1 yearly • After flood event
Guide banks • Detailed inspections • Effectiveness	• Check integrity (stock damage) • After flood event – check to see that it catches overland flow from upstream channel	• 6 monthly • After flood event
Throttle structure • Normal inspection • Inspection after flood event	• Check for integrity and fixings • Check and clear debris	• 1 yearly • After flood event
• **Fences and Gates**	• Visual integrity check – repair as required	• 1 yearly

In general the priority order for maintenance work in the Opunake Flood Protection Scheme will be:

- retaining the integrity of the diversion channels and drop structures;
- Keeping channels clear of weeds and debris
- keeping culvert entrances clear of debris and rock riprap integrity
- maintenance of ancillary works.

4.4.1 Programmed inspections

All programmed inspections must be recorded and files in on Opunake files

All matters identified as needing action must be completed as soon as practicable and marked off on the inspection sheets once completed.

4.5 Maintenance costs

4.5.1 Existing

As the Scheme has only just been constructed, there are no historical maintenance costs.

4.5.2 Asset maintenance expenditure requirements

All expenditure on infrastructure assets will fall into one of two categories: capital expenditure or operating expenditure.

(a) Capital expenditure.

There are no plans for any capital improvement works

(b) Operating expenditure

All maintenance, upgrading, reconstruction, renewal and renovation work that does not increase the capacity of assets is treated as operating expenditure.

Operating expenditure can be divided further into two; normal ongoing day to day routine maintenance works and those other more infrequent larger projects that upgrade or renew the asset to its full (or original) service potential.

(i) Routine maintenance expenditure: Routine Maintenance projects can be expected to display some of the following characteristics:

- Regular and ongoing annual expenditure necessary to keep the assets operating at the required level of service, e.g. inspections; management; liaison with ratepayers etc.
- Day to day and/or general upkeep works designed to keep the assets operating, e.g. insurances, power costs.
- Works which provide for the normal care and attention of the asset including repairs and minor replacements.
- Minor response type remedial works i.e. isolated instances where portions or sections of a unit of an asset fail and need immediate repair to make the asset operational again.

This work would be charged to: "Opunake Scheme Maintenance" – 30 03 04 2464

(ii) Renewal expenditure: Work displaying one or more of the following attributes can be classified as renewal expenditure:

- Works which do not increase the capacity of the asset, i.e. works which improve and enhance the assets restoring them to (or below) their original size, condition, capacity, etc.
- The replacement component of augmentation works which does not increase the capacity of the asset, i.e. that portion of the work which restores the assets to their original size, condition, capacity, etc.
- The replacement component of a capital work which replaces the redundant element of an existing asset.
- Renewal and/or renovation of existing assets, i.e. restoring the assets to a new or fresh condition.

This work would be charged to: "Opunake Scheme Maintenance" – 30 03 04 2464

4.6 Expenditure

With the completion of the capital works undertaken over then period 2017 to 2018, Expenditure in the foreseeable future will focus almost entirely on maintenance with some minor renewals.

A long term program of monitoring and maintenance works with detailed cost estimates and the average annual expenditure required to ensure the Scheme is maintained to its full service potential is set out in Section 6.

5. Funding and financial planning

5.1 Accounting policies

It is the accounting policy of the Council that the Opunake Flood Control Scheme's assets are not depreciated. The funds required to maintain the asset in an as new condition are considered to be the maintenance budgets in the forthcoming period.

The Council uses the following procedures when applying the above policy:

- all expenditure (routine maintenance, flood damage maintenance and maintenance works) to maintain the existing as new condition (as required by the scheme objectives) is considered to be normal maintenance work and is financed as part of the maintenance budgets established for the period; and
- any additional new minor capital works that increases the assets performance ability are included in the capital works budget for the period, but, are still financed from any accumulated reserve funds.

The Council also values the assets annually.

5.2 Revenue and financing policy

It is the Council's policy that river control schemes are funded by targeted rates over the community benefiting from the protection.

The Opunake Flood Control Schemes is funded from a rate that is a 100% capital value based targeted works and services rate, applied over the whole of the South Taranaki District. This system is considered to be the most administratively efficient and appropriate funding mechanism.

5.3 Funding for disaster relief

The Taranaki Regional Council has made the decision to be self-funding in the event of a major disaster in the flood management scheme areas. This philosophy exists due to:

- the potentially high cost of insurance (relative to the benefits)
- the low probability of accessing Government or other disaster funding through participation in projects such as LAPP (Local Authority Protection Programme)
- the ability of the Council to reinstate the assets without significant financial implications

5.4 Routine maintenance costs

Routine maintenance costs for the Opunake Flood Protection Scheme assets will be relatively constant and easy to estimate. The cost of routine maintenance has been based on estimated works requirements but will need to be amended over time as maintenance records are collected. The estimated costs include monitoring and maintenance. The new maintenance programme is set out in Section 4.4 and estimated maintenance costs are set out in Section 6.

5.5 Flood damage funding

Due to the variability of flood events and their unpredictability, determining an appropriate programming of flood damage maintenance expenditure is more difficult than estimating routine maintenance allowances. Annual flood damage maintenance expenditure will vary greatly, from virtually nothing to moderate costs if damage to rock riprap of channel banks occur. Costs over a number of years could be very low, then, during a period of more intense flooding, maintenance costs could increase to beyond the annual average.

Therefore, no sensible programming of the flood damage costs can be prepared. Rather the estimated an annual average flood damage maintenance cost could be used to guide annual scheme funding, with the unexpended portion of the budgeted costs accumulated year by year. As no annual flood damage costs have occurred to date, no estimate can be prepared at this point in time. This matter should be reviewed in 5-years time.

In the cases where there are significant flood damage repairs, the process established in section 5.6 would be utilised to reinstate the schemes to as new condition.

5.6 Non-routine maintenance costs

From time to time the Council needs to expend additional funds to maintain the level of protection offered by the flood control schemes because either the river and stream channel dynamics have significantly changed or the Council's knowledge and understanding of the schemes has improved. This expenditure is not of a capital nature as the overall level of protection offered by the schemes has not changed. Accordingly, it is included in the Annual river works budget. This expenditure has to be funded using the same funding policy as the other maintenance expenditure.

5.7 Capital works funding

Capital expenditure that increases the level of protection provided by a scheme will generally be funded by either external or internal borrowing. This reflects the long life of the assets and the need to spread the costs of those assets over the life of the assets. Interest and principal repayments for the borrowing will be funded by the targeted rate.

No capital improvements are envisaged for this scheme

5.8 Financial planning

The funding of expenditure on the Opunake Flood Protection Scheme is by way of a targeted rate. This is currently set to cover all expenditure in accordance with the Revenue and Financing Policy.

Any under-expenditure on the scheme is transferred to the South Taranaki River Scheme reserve. Similarly, any over-expenditure is funded from a transfer out of the reserve. As at 30 June 2019 the balance of this reserve was zero.

Each year, the targeted rate is expected to fund the routine maintenance plus any flood damage maintenance work identified in the annual programme for the schemes. As noted above, if there is an unusually high level of repairs arising out of the annual review then this will be funded via the process outlined in Section 5.1.

If there were no significant repairs arising out of the annual inspections then the reserve fund would continue to grow. The appropriate maximum level for the reserve needs to be considered.

This level is dependent upon the Council's ability to reinstate the assets as a result of a rare large damaging flood event. The Council has a philosophy of self-insurance to recover the service potential of the scheme assets after such an event. The estimated worst case scenario is total flood damage of $500,000. The Council needs to be able to fund this level of expenditure at a maximum.

5.9 Funding for disaster relief

In all river flood control schemes the damage caused by the rare large floods is particularly hard to estimate and can vary greatly. This damage occurs at irregular intervals, with unpredictable timing. In the case of a major flooding event it is proposed that funding for reinstatement be accessed through the following hierarchy:

- First, any unused/uncommitted funds from the maintenance budgets for the river control schemes for that financial year will be used;
- Second, any balance remaining in the reserve fund will be used;
- Third, any surplus Council-wide cash and investment balances will be loaned to the scheme reserve fund; and
- Finally, consideration will be given to the raising of debt finance.

The individual options available will be considered on a case by case basis.

6. Maintenance and monitoring cost estimates

Table 4 sets out the ongoing cost of maintaining and monitoring of the Opunake Flood Protection Scheme.

The frequency of the works have been estimated but may vary as a result of the frequency of flood events and other changes that may necessitate more frequent activities in some areas.

The actual will vary from year to year but will be known when annual budgets are prepared.

Table 4: Long Term monitoring and Maintenance Requirements

Item	Work Description	Work Frequency	contractor cost	TOTAL annualised
		Years		Excluding Staff
General	6 monthly inspections			
Drain Maintenace	Spraying	1	1500	1,500
Channel Maintenance	Erosion repair - rock riprap	5	5000	1,000
General Maintenance	Fencing and culverts	5	2,000	400
TOTALS				$2,900

Table 5 sets out the estimated cost of managing and maintaining the Opunake Flood Protection Scheme for the period 2021 to 2031.

The estimates separate the staff and internal cost from external costs that would be contracted out. The flood damage allowance is as per Section 5.3.

Table 5: Cost estimates 2021 to 2031

Year	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Contracting Costs	$ 1,500	$ 1,500	$ 6,500	$ 3,500	$ 1,500	$ 1,500	$ 1,500	$ 6,500	$ 3,500	$ 1,500
Total Annual Maintenance co	$ 1,500	$ 1,500	$ 6,500	$ 3,500	$ 1,500	$ 1,500	$ 1,500	$ 6,500	$ 3,500	$ 1,500

Note: In addition to these costs, an allowance for flood damage of $10,000 is shared with the Okato and Waitotara Schemes.

7. Infrastructure Strategy

This Infrastructure Strategy identifies:

- the infrastructure issues for the Scheme for the period from 2015 to 2045; and
- the principle options for managing those issues and the implications of the options.

The Opunake Flood Control Scheme was constructed in 2017 and 2018 to provide protection to the 1% Annual Exceedance Probability (AEP) flood event with an allowance for increase flood flows arising from climate change to the year 2065.

The land use in the area protected by the Scheme is a mixture of rural, commercial, industrial and residential with the majority of the area being rural and residential. The 1% AEP protection standard is considered to be the accepted standard for town the size of Opunake.

Changes in the land uses are likely to occur over time but it is unlikely that the percentages of land use type will vary significantly over the next 30 years. The value of the assets in and around Opunake protected by the Scheme are very unlikely to change significantly over the next 30 years to warrant an upgrade to a higher standard of protection. Notwithstanding this, there is no plan to further upgrade to the level of service provided by the Scheme before 2065 as the Scheme will provide at least 1%AEP standard until that date.

The risk to the Scheme infrastructure arising from natural disasters is low. The nature and ongoing maintenance of the assets make them resistant to significant damage in large flood events. Any damage that did occur would be funded from Scheme Reserves. $10,000 is budgeted each year for the repair of flood damage from the South Taranaki Schemes and if unspent, accumulates in the Scheme reserves account.

The Scheme has infrastructural assets that fall into six types. The following table sets out how the Council will manage these asset types.

Table 6: Renewal and replacement requirements

Asset Type	Renewal or replacement requirements	Expenditure
Open earthen channels	• No replacement required. The channels will be maintained to the design shape and standard.	Operational
Open rock lined channels	• No replacement required. The channels will be maintained to the design shape and standard.	Operational
Rock riprap drop structures	• No replacement required. The channels will be maintained to the design shape and standard. Minor toping up may be required very irregularly.	Operational
Euroflo culverts and headwalls	• Culverts and headwalls have a life exceeding 30 years	Nil
Throttle structure	• Galvanized steel structure generally above water level – unlikely to require replacement in foreseeable future	Nil
Fencing and gates	• Fences and gates have a life shorter than 30 years but individually have a low replacement cost and will be replaced as a maintenance activity as required	Operational

Risk Management

The following table sets out the risk faced by the Scheme assets by natural disasters and indicates the financial implications and potential size of that risk.

The potential risk to the Scheme assets arise from over design flood events and from earthquakes.

Table 7: Risk factors by Scheme asset

Asset Type	Disaster Type	Risk	Financial Risk	Expenditure type to fund repair
Open earthen channels	Flood	Some minor erosion damage possible. Any damage would be very localised	Minor	Operational
Open rock lined channels	Flood	Some minor erosion damage possible. Any damage would be very localised	Minor	Operational
Rock riprap drop structures	Flood	Some damage possible. Any damage would be very localised	Minor	Operational
Euroflo culverts and headwalls	Flood	Could suffer minor damage from being overtopped	Minor	Operational
Throttle structure	Flood	Minimal	Minor	Operational
Fencing and gates	Flopod and Earthquake	Could suffer minor damage due to foundation failure	Minor	Operational

The indicative estimated set out below for the management of the Scheme assets is drawn from Section 6 of this plan. There will be no capital expenditure over the next 30 year period.

Table 8: Indicative 30year estimate

Year(s)	2021/ 2022	2022/ 2023	2023/ 2024	2024/ 2025	2025/ 2026	2026/ 2027	2027/ 2028	2028/ 2029	2029/ 2030	2030/ 2031	2031/ 2036	2036/ 2041	2041/ 2046	2046/ 2051
Estimated operating costs ($1000's)	1.5	1.5	6.5	3.5	1.5	1.5	1.5	6.5	3.5	1.5	15	15	15	15

Assumptions Made

The assumptions made in determining the above estimates are:

- That the frequency and size/nature of the future maintenance works required are in line with that which has occurred over recent years.
- That the frequency of damaging flood events and the damage that occurs in these events does not change significantly.

8. Performance monitoring

As well as the regular inspection and monitoring of Opunake Flood Protection Scheme assets to ensure that they maintain their integrity and provide the required flood standard, there is a need to monitor the performance of the Scheme in relation to its protection standard.

Traditional performance monitoring techniques are not easily applied to management of river schemes. Outcomes depend on the occurrence of unpredictable flood events, and the nature of fluvial hydraulics is complex and subject to random phenomena. However, it is still possible to apply the general principles of monitoring. Indeed, performance monitoring is required in order to adequately manage the assets. Review of the asset management plan will also depend on findings of performance monitoring.

The goal of the Opunake Flood Protection Scheme is to maintain the risk of flood damage at acceptable levels, by maintaining the desired levels of flood protection (note that the risk of flood damage rather than actual flood damage is referred to).

Cross section surveys are one of the most important monitoring programmes for management of the Opunake Flood Protection Scheme. The cross section surveys can be used to help identify volumetric changes to the river and stream channels and banks, and possibly local points of erosion or deposition. Using the cross-section information, changes in cross sectional area of the river that may impact on flood carrying capacity of the channel can be monitored and the design flood levels can be reassessed every fifteen years or so. Any significant reduction in channel cross section would require more frequent reassessment. Stopbank surveys are used to monitor the available freeboard.

8.1 Flood level monitoring

On the diversion channels, flood flows that get to within 0.75 meters of the top of the channel bank at any points along the channels must be monitored closely. If possible maximum water levels must be observed and pegged during the flood event and later surveyed. If the actual event cannot be monitored, as soon as possible after the flood event has receded, the highest debris marks must be carefully observed, pegged and surveyed.

It cannot be stressed strongly enough how important this information is. Good actual flood information will enable the flood flow models to be checked and channel and culvert size fine-tuned if required.

If flood levels are pegged during an event, the time at which the various parts of the river were pegged must be recorded.

8.1.1 Record keeping

All monitoring records must be filed in the Council's electronic filing system with clear reference to the channel being monitored, and the dates of the event.

Appendix 1

Inspection Sheets