The Piako River Scheme (PRS) is a comprehensive scheme providing flood control, river management and drainage improvements within the entire Piako and Waitoa Rivers Catchment. Environment Waikato is charged with the overall management responsibilities of the scheme under legislation. The goals and objectives of Environment Waikato’s policies, strategic and annual plans incorporate specific sections recognising the PRS as well as other similar schemes. Environment Waikato has developed the original Asset Management Plan (AMP) of the PRS in 1997, which forms the basis for this review. It included the historic background for the scheme works, description of the assets, maintenance and depreciation costs and the total funding requirements to ensure that the assets will continue to perform and provide their expected level of service into the future.

A. Purpose of this plan
The purpose of this plan is mainly to update the original AMP with all the development undertaken to improve the management of scheme over the last five years, the current and future costs of managing the scheme. It also meets Audit NZ requirement to review such plans regularly within five years as a minimum.

The development since 1997 includes, the development of asset management guidelines for the different types of assets, PRS differential rating system for funding the scheme works, development of the asset management accounting policies, latest asset valuations, development of the asset management information systems, review of the current service levels and extension of the services to meet the local communities demand for the services provided.

B. Assets description
The PRS assets comprise approximately 166 km of stopbanks, 59 floodgates, 32 pump stations, 554 hectares of scheme land and associated river and drainage works covering more than 257 km of the rivers, major tributaries and drains. It also incorporates the extension of the river management services into the upper catchments.

The scheme assets are designed to protect land from tidal flooding in the Firth of Thames, flooding of the Piako and Waitoa River, internal flooding of protected land generated by local runoff, and to provide drainage improvements for the land adjoining the main lower and middle rivers systems. River management works including catchment oversight, channel works, fencing and planting are aimed at improving channel stability, improving water quality and enhancing habitat values.

C. Levels of service
Chapter 3 of the review explains in detail the customer expectations, and aspects of the service levels provided by the scheme, including a review of the current service levels and desired levels. The level of service provided by each asset forms an integral part of the overall levels of services provided by the scheme as a whole. In general, the scheme assets provide the following four key levels of service:

i. The foreshore stopbanks and their extension into the tidal reaches provide flood protection from 100-year tidal flooding in the Firth of Thames.
ii. The channel works and associated stopbanks forming the floodway along the main stem of the lower Piako River provide flood protection from a 50-year flood in the Piako River. Lower protection is provided within the emergency ponding zones and along the Waitoa River systems.
iii. The floodgates and pump stations provide gravity and pumped drainage outlet to discharge internal runoff generated by a 10-year event within the
local drainage catchments into the main river systems within a maximum ponding period of three days.

iv. Catchment oversight and river management services to ensure stability of the upper catchment streams. The review identified the need for formalising and extending these services to cover streams not included in the original scheme AMP.

D. Future demand
Chapter 4 discusses the expected future demand for the services and identified the current demands expressed by the community. The community demands include retaining the current level of service, to extend the scheme to cover the Otway Basin, and extend the catchment and river to cover the whole upper catchment streams. It also identified the further investigation necessary to determine the impacts of upgrading the protection standards within the ponding zones.

E. Lifecycle management
Chapter 5 of the review provides detailed information on the assets, their value, condition and performance, the management, monitoring, maintenance and renewal activities and costs necessary to ensure that these will continue to perform and meet the community expectations into the future.

The total scheme assets value as at 1 July 2001 was assessed at $24,345,473 with an accumulated depreciation of $675,413. The scheme is generally in a good condition and performing to design standards. The lifecycle management plan estimates the overall management, monitoring and maintenance costs of the scheme assets to be $1,238,087 per annum and the renewal costs to be $675,404 per annum. The total funding requirements for the asset management of the scheme is found to be $1,928,251 per annum on average for the period 2003 – 2014. However, this will vary and expected to increase with increased inflation.

This chapter also discusses emergency response, insurance and disaster recovery requirements, creation and acquisition plan and the disposal plan.

F. Financial summary
Chapter 6 covers the financial statements and projections and the funding strategy. The actual and projected revenue and expenditure over the six years 2000/01 to 2005/06 are presented with similar actual and projected reserves position. The funding strategy summarises the differential rating system of the PRS adopted in 1999 and fully implemented in 2001. It also provides that for new capital works, subject to meeting certain criteria, the scheme contributes 25% of the total capital cost, while the beneficiaries of works shall contribute the remaining 75%.

The main aspect of the rating system is that it identifies the different levels of benefits provided by each asset type on each property, as well as identifying the contributors to the need for the assets. In general, the asset management of the scheme is funded through rental of scheme property, direct rates over the whole catchment and from the general regional rates. The regional contribution is fixed at 15% of the total asset management costs.

G. Asset management practices
The Piako River Scheme assets and components are all registered in the Asset Management Information System (Conquest II). The system holds a record of each asset, its components, its design parameters, service level and the financial information (i.e. asset value, depreciation, base life and remaining life). The system also keeps results of condition and performance audits on the basis of which, maintenance and renewal decisions are made, prioritised and programmed.

Maintenance and renewal programmes are prepared through a formal process of identifying deficiencies, effects on asset performance, risks associated with asset
under performance, time and cost. This part is completed at the Works Supervisors and Works Manager Level for the whole PRS annually. These plans are presented to the Group Manager/ Asset Management for consideration and initial approval. Maintenance and Renewal Plans are then presented to the Scheme Liaison Subcommittee for formal discussion and approval. These Plans are finally presented to the Council’s Operations Committee for discussion and final sign off for implementation in the following year/ or years.

Tactics used in implementation include combining projects of the same type into one project covering a number of assets within the same scheme or within other schemes, which reduces the overall cost per asset (i.e. Crest level surveys, river cross-section surveys and structures audit are carried each under one contract for all River Schemes). Other tactics include planning of works so that these are undertaken during the summer periods, when the assets are least needed, to ensure that the level of service is provided most of the times, especially in the flood seasons. On going liaison with the communities directly affected by the works is ongoing, to ensure their concerns are addressed.

H. Monitoring and improvement plan
A monitoring and improvement plan is prepared to ensure that the assets are managed in the most cost effective and efficient way in the future. This section of the plan focuses on future improvements in the ways works are undertaken. These include, improving the information system, establishing environmental guidelines and best practice guidelines for works in rivers and streams. It also include improving the risk management approach and allowing for disaster recovery and emergency management.

An audit and monitoring programme is undertaken periodically to ensure that the Assets and the way they are managed are in accordance with the provisions of this plan and any future requirements arising from changes in legislation or practice.
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1 Introduction

Environment Waikato is responsible for the management and maintenance of the Piako River Scheme since 1989, when the Hauraki Catchment Board and the Waikato Catchment Board were amalgamated with other drainage boards and local bodies as a result of local government reorganisation, forming The Waikato Regional Council “Environment Waikato”. The Scheme was constructed and managed by the Hauraki Catchment Board prior to 1989.

The Government approved the Piako River Scheme in June 1960. Construction of works began in 1962 and was officially completed in 1979 at a cost of approximately $76 million in today’s terms (March 2002 costs - CCI 4290). The completed Scheme works comprise about 166 km of stopbanks, (3 - 4 million m³) of channel excavation, 59 floodgates and 32 pumpstations.

Environment Waikato manages the Scheme in accordance with the provisions of the Asset Management Plan for the Piako River Scheme, which was initially adopted by Council in September 1997, after extensive public consultation. The Audit Office requires Local Authorities to review the Asset Management Plans at a minimum of five yearly intervals

This document provides a review of the first Asset Management Plan, including the following:

- Update the plan information, confirmation of the current levels of service, costs of the service and funding requirements including all the development in the asset management policies and practices which have occurred over the last five years.

- Extension of the service levels to cover Catchment and River management in the upper catchment outside the original scheme area.

The plan framework is based on the following basic elements:

- The scope of scheme assets and works.
- The statements of the Levels of Service that the scheme stakeholders can expect,
- The corresponding measures of performance and compliance,
- The condition assessment of the asset, and
- The requirements and costs of maintaining the assets to provide the required level of service and long term funding requirements.

The above basic elements determine the resources required to be applied to operate and maintain the Scheme assets.

The key aspects for the customers or beneficiaries of the scheme are the level of service that they can expect, the funding levels required to maintain this service level, the funding sources, and communication flows. The following process was followed in developing this plan;

Define level of service
↓
Define management actions and costs
(Necessary to maintain the level of service)
↓
Funding requirements
Figure 1   Piako catchment plan
2 Background

2.1 Purpose of the Plan

The purpose of this asset management plan is to provide for the effective management of the overall Piako catchment and river systems, including the flood protection and drainage outlet assets and catchment services to the levels and standards agreed with the community. The plan presents a summary of the operation, maintenance, management and renewal of the infrastructure components, which collectively constitute the Piako River Scheme in a single document. This will enable appropriate financial provisions to be made over the long-term to ensure the service provided by the scheme and its component assets can be maintained in perpetuity.

There are four main reasons for the Review of Asset Management Plan, which are:

♦ To comply with Audit New Zealand requirement of reviewing the AMP on five yearly basis as a minimum.
♦ To update the current AMP and incorporate all the development and change which has been undertaken in asset Management since the plan was adopted in 1997.
♦ Review the service levels and costs of the operation, maintenance, management and renewal of the infrastructure components, which collectively constitute the Piako River Scheme in a single document. This will enable appropriate financial provisions to be made over the long-term to ensure the service potential of the assets can be maintained in perpetuity.
♦ Incorporate catchment and river management additional works, which Environment Waikato has been undertaking outside the scope of the previous plan. These works have been identified as necessary to reduce the extent of flooding and its effects.

2.1.1 Relationship with other documents

Many of the aspects of asset management are the subjects of policies, guidelines and performance criteria contained within other, existing documents. The aim of this Plan is to provide a “centralised” reference containing all of the key points and information but by which the reader can also be directed to the appropriate references should more detailed information be required. Some of those documents contain information which will be revised and updated on regular basis, (such as annually in the case of Annual Plans, Annual Reports, five-yearly in the case of long-term plans and strategic documents, and as appropriate in the case of other documents). To avoid having to revise and reprint the main body of this Plan at such frequent intervals all short-term supporting information has either been placed into appendices or its source document(s) referenced in the text of this Plan.

The specific documents that should be read with and form a part of this Asset Management Plan are listed in Table 1 below. These documents should be consulted where more specific information is required on particular aspects of the Scheme.
Table 1  Key documents forming part of this plan

<table>
<thead>
<tr>
<th>Document name</th>
<th>Key information</th>
<th>Document location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment Waikato: Annual Plan 2000-2001</td>
<td>Short-term financial programme</td>
<td>EW - Communications</td>
</tr>
<tr>
<td>Environment Waikato: Strategic Plan 2001-2011</td>
<td>Long-term (10-year) financial programme</td>
<td>EW - Communications</td>
</tr>
<tr>
<td>Environment Waikato: Funding Policy</td>
<td>Funding policies and options. Rating systems</td>
<td>EW - Communications</td>
</tr>
<tr>
<td>Environment Waikato: Stopbank Management Guidelines</td>
<td>Generic management of the stopbanks</td>
<td>EW - Asset Management</td>
</tr>
<tr>
<td>Environment Waikato: Floodgate Management Guidelines</td>
<td>Generic management of the floodgates</td>
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</tr>
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<td>Environment Waikato: Pump Station Management Guidelines</td>
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</tr>
<tr>
<td>Environment Waikato: Asset Condition and Performance Report</td>
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</tr>
<tr>
<td>Opus International Consultants Ltd: Valuation of Infrastructural Assets, Environment Waikato</td>
<td>Valuation methodology and results for flood protection schemes.</td>
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</tr>
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<td>Environment Waikato: The Piako River Scheme Differential Rating System, August 1999</td>
<td>Methodology and outcomes of the rating review for the Piako River Scheme, where the funding is coming from.</td>
<td>EW - Asset Management</td>
</tr>
</tbody>
</table>

2.1.2  Organisational structure

Environment Waikato’s Asset Management Group is responsible for the management and maintenance of the Piako River Scheme assets. The group consults with the Piako River Scheme Liaison Subcommittee and reports to the Waikato Regional Council’s Operations Committee. Management is undertaken through three units, which are the Rivers and Drainage Technical Unit, the Works Unit, and the Services Unit. The organisational structure of the Asset Management Group is shown in (Figure 2).

The structure is flat and all units interact formally and informally to provide the services. However, co-ordination of works and programmes is carried through formal meeting and reporting to unit managers and the Group Manager.
2.1.3 Reasons for scheme ownership and legislative requirements

Regional Councils are charged with the responsibility of managing complete catchments and river systems and empowered to undertake works to protect communities from floods, under the Soil Conservation and Rivers Control Act 1941. Environment Waikato is the owner and manager of the Piako River Scheme. River Schemes constitute both physical assets and other works within the catchment and river systems, and incorporate interrelated dynamics within a whole catchment. All these act together to provide the required service level. Management of such schemes requires regional authorities empowered to implement policies across the whole catchment.

Environment Waikato is authorised and indeed required to own, manage or regulate the Piako River Scheme under the following Acts and Agreements of Parliament:

- Soil Conservation and Rivers Control Act, 1941
- Land Drainage Act, 1908
- Local Government Act, 1974
- Resource Management Act, 1991
- Rating Powers Act, 1988
2.1.4 Corporate mission, goals and objectives

The Mission Statement for Environment Waikato is:

“To manage the environment in a sustainable way in consultation with the people of the Waikato Region for the social, cultural and economic well-being of present and future generations.”

The mission statement is an overriding vision that Environment Waikato has for its operations. Underlying the Mission Statement is a number of Goals. Goals relating to the management of assets include:

i. “To be a good corporate citizen and fulfil the requirements of legislation under which Council operates.”

ii. “To see the Region’s resources managed in a sustainable and efficient way.”

iii. “To protect and improve the natural heritage of the Region.”

iv. “To increase public knowledge of environmental issues and promote participation in environmental activities.”

v. “To consult with the people of the Region.”

vi. “To be a cost effective and efficient organisation operating in an open and accountable manner.”

The objectives of the Asset Management Group are to:

- Secure the long-term performance and maintain the value of the assets of the Piako River Scheme for the effective delivery of scheme benefits to a standard (service levels) and cost agreed with the community.

- Ensure provision of the scheme benefits is managed for the eventual replacement of the scheme assets. Adequate provision for this is essential for the long term viability and well being of the local communities in the area.

- Ensure that the assets of the Piako River Scheme are managed in a consistent, efficient and sustainable manner.

2.1.5 Preparation approach of this asset management plan

This Plan is based on the previous Piako River Scheme Asset Management Plan (EW, September 1997) and other existing supporting documents. It also incorporates all the development and improvements in asset management practices since the first plan was adopted. No additional information has been obtained specifically for the preparation of this Plan. Elements of this Asset Management Plan are embodied in other documents. To avoid replication of existing information, in many instances this Plan refers the reader to the originating document for further information.

The style of this Plan is principally the format outlined in the International Infrastructure Management Manual – Australia/New Zealand Edition (2000). This Plan has a basic approach to asset management. However, the plan improvement programme contained within Section 8.0 outlines steps that need to be taken to move the existing plan towards a more advanced approach.

2.2 Scope of the scheme

2.2.1 Scope of the scheme

The Piako River Scheme is an integrated flood protection Scheme comprising stopbanks, floodway and flood storage ponding zones, drainage outlets, pump stations and channel enlargement and clearance works. The Piako River and its major tributary
the Waitoa River have a combined catchment area of 1590 km² (Figure 1). The catchment is divided into three zones, namely the Delta Zone, Middle zone and Upland zone.

The majority of the Scheme works and assets are located within the Delta zone, which extends from the mouth of the Piako River near Pipiroa to the confluence of the Piako and Waitoa Rivers. This is a former delta swamp, which has been drained and developed, except the area of the Kopuatai Peat Dome. The river has almost a flat gradient. Much of the shallow peat in the area has disappeared and the deeper peats have settled appreciably. Large areas of land are only one or two metres above mean sea level, presenting significant drainage difficulties. The Scheme provides protection from both the sea tide and flood flows in the Piako River.

The Middle zone extends from the confluence to Morrinsville (on the Piako River) and Matamata (on the Waitoa River). In this zone the main works have been the construction of intermittent stopbanks along the Piako and Waitoa Rivers up to the Paeroa/Tahuna Road and clearance of vegetation from the channels. The works also included channel excavation along the Waitoa River to a point just downstream of Waitoa Township and the Piako River up to Whakahoro Road.

The Upland (Southern) zone extends south and west from Morrinsville and south from Matamata to cover the remainder majority of the catchment. In this zone the works have been restricted to channel clearing and minor channel excavation. These works have lowered flood levels and thus improved drainage conditions in adjacent farmland.

### 2.2.2 Assets covered

This Plan covers those assets and works that make up the Piako River Scheme. The assets within this scheme are listed below.

- Compacted earth structures such as earth structures forming the stopbanks, detention dams and earth spillways (total length approximately 166 km).

- Reinforced concrete, steel and timber structures such as floodgates, pumpstations, debris control structures and concrete channels. (59 floodgates and 32 pump stations).

- Waterways and river channels involving excavations, gradient control and erosion control structures, plantings and fencing. (Approximately 257 km of rivers, tributary streams, and artificial channels).

- 554 hectares of Crown Land associated with the Piako River Scheme. The land is specifically acquired for the purposes of the Soil Conservation and River Control, to construct the scheme assets upon, and allow sufficient accessibility and control for the ongoing maintenance and renewal of the scheme.

- Catchment and River Management, including oversight and consistent maintenance and management of upper catchment streams and rivers.

### 2.2.3 Key stakeholders

All assets are owned and managed by the Environment Waikato Regional Council.

The key stakeholders for the Piako River Scheme are as follows:

- **Scheme ratepayers** (parties that receive protection from the scheme assets, or contribute towards the need for the scheme), and the communities within the scheme area.

- **Territorial Local Authorities** (Hauraki District Council and Matamata Piako District Council).

- **Environment Waikato Regional Council.**

- **Audit Department.**
3 Levels of service

Levels of service define the benefits that the asset is able to provide the stakeholders with. Each asset has a certain function and performance which can be measured in accordance with that function.

Flood protection and drainage schemes are essentially constructed to protect land and property from inundation by flooding. The scheme area is prone to flooding from three different sources, which are the sea, the Piako and Waitoa Rivers and local catchments runoff. The scheme works provides flood protection by two integrated mechanisms, the first being a system of stopbanks, channel improvements and diversions, which restrict flood flows within designed flood-ways and specific designated ponding zones. These works prevent inundation of land caused by the sea and river floods. The second being a system of floodgated drainage outlets and pump stations to discharge runoff from local catchments into the flood-way during and after flood events. Drainage from throughout the catchment combined with that of the floodgates is improved through the integrated maintenance and management of the main river and stream channels.

The risks associated with flooding dictate the level of protection or the service level of the scheme and its individual assets. The costs of maintaining and managing the assets to ensure they continue to provide defined levels of services is a function of the capital costs of the assets and the costs of ongoing monitoring, operation, maintenance and renewal activities. As a general rule, the higher the service levels of assets, the higher the costs of maintaining and managing these assets. Defining the service level is then a balance between the ongoing costs of maintaining and renewing the assets and the benefits received in term of savings in flood damage costs, increased production and well being of benefiting landowners and communities.

The implications of land inundation are severe and directly affect land productivity and the well being of the benefiting communities. Inundation of farming land for more than three consecutive days can damage the grass and affect farming operations significantly. Description of the service levels is provided in more detail in section 3.4 below.

The level of service that the scheme is required to provide is not set in concrete and may be modified due to possible future changes in land use and priorities for stakeholders or future advances in assessing the risk of inundation.

3.1 Customer expectations

The level of service provided by the scheme was initially established when the PRS was designed in 1960. These design service levels were confirmed in 1996 when the first asset management plan was developed. Under the plan review, an update of customer expectations is considered appropriate, as these might change over time. Accordingly, research of customer expectations is a continuing process and is carried out through formal and informal consultation with customers.

Extensive formal consultation was carried out when the first Asset management Plan was developed in 1996 and 1997. Similar consultation was undertaken during the funding review process in 1998 and 1999. The Piako Scheme Liaison Subcommittee was formed in 1999, including representatives from the Drainage Areas and Local Authorities, meeting on six monthly basis to review maintenance and capital works programmes of the Scheme, and overview the management of the service delivery. Another formal avenue opened to all customers is the annual plan process, where customers can lodge submissions on the scheme works programmes or raising any issues of concern.

Informal customer liaison is undertaken on daily basis, as customers have a direct
access to Asset Management staff to raise their concerns and/or request clarifications on the scheme programmes. Staff are carrying out consultation and liaison with landowners in the drainage areas, especially before undertaking works.

It is proposed to develop a Customer Services page on the Environment Waikato website to enable customers to voice their views and to request further information on areas of interest or concern.

3.1.1 Customer liaison group

The Piako River Scheme Liaison sub-committee includes representatives from District Councils, drainage districts, and interest groups. The first meeting for this group was held in June 1999. The group meets every June and November to facilitate discussion on implementation of the plan, identifying problems and successes within the scheme, and as necessary agree on works required. The outcomes of the meetings are presented to the Operations Committee of Environment Waikato for discussion and approval.

In general, formal avenues of customer research and consultation are undertaken for revision of the Asset Management Plans, Annual Plans, and Works Programmes, while informal avenues of customer liaison and feedback occur through the officers on site or in the offices.

3.2 Current and desired levels of service

3.2.1 Current level of service

The reviews confirmed that the assets are providing the levels of services they were designed for. These are as follows:

a. Protection of land within the tidal reaches of the Piako River and affected by sea tide in the Firth of Thames from inundation by a high tide flood of a magnitude equivalent to a 100-year event, with 500-mm of freeboard.

b. Protection of land on both sides of the Piako River (Mouth to Kaihere Ferry) and Awaiti Canal from inundation by a Piako River flood of a magnitude equivalent to 50-year event, with 300-mm of freeboard, or to a 50-year rainfall event associated with high spring tide.

c. Protection of land along the left bank of the Piako River, between Kaihere Ferry and Maukoro Landing, within the First Ponding Zone from inundation by a flood of a magnitude equivalent to a (5-10)-year rainfall event, without freeboard.

d. Protection of land along the right bank of the Piako River, between Kaihere Ferry and Maukoro Landing, within the Initial Ponding Zone from inundation by a flood of a magnitude equivalent to the annual rainfall event, without freeboard.

e. Protection of land along the Piako River (Maukoro Landing to West Road) and the Waitoa River (Confluence to Paeroa-Tahuna Road), within the Second Emergency Ponding Zone from inundation by a flood of a magnitude equivalent to 20-year rainfall event without freeboard.

f. Drainage of protected land by gravity outlets and/or pumps, to ensure a maximum ponding period of three days in a 10-year rainfall event.

g. General catchment and stream management provides improved drainage and decreased riverbank erosion through keeping the streams free of blockages and planting and fencing riverbanks.

Table 2 summarises the Level of Service in technical terms for the groups of assets within the Piako River Scheme management reaches.
Table 2  Level of service summary

<table>
<thead>
<tr>
<th>Defence Name</th>
<th>Defence Type</th>
<th>Defence Against</th>
<th>Defence Components</th>
<th>Quantity</th>
<th>Protection Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreshore</td>
<td>Flood-way</td>
<td>Tide</td>
<td>Stopbanks</td>
<td>15850 m</td>
<td>1% AEP</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>1 No.</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>1 No.</td>
<td></td>
</tr>
<tr>
<td>Mouth to Pipiroa</td>
<td>Flood-way</td>
<td>Tide &amp; Piako River</td>
<td>Channels</td>
<td>3400 m</td>
<td>1% AEP Tide, 2% AEP River</td>
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<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>0</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Pipiroa to Ngatea</td>
<td>Flood-way</td>
<td>Tide &amp; Piako River</td>
<td>Channels</td>
<td>9000 m</td>
<td>1% AEP Tide, 2% AEP River</td>
</tr>
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<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>4</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Ngatea to Kaihere</td>
<td>Flood-way</td>
<td>Tide &amp; Piako River</td>
<td>Channels</td>
<td>13060 m</td>
<td>1% AEP Tide, 2% AEP River</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>10</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Kaihere to Maukoro</td>
<td>Flood-way</td>
<td>Tide &amp; Piako River</td>
<td>Channels</td>
<td>26830 m</td>
<td>1% AEP Tide, 20% AEP River</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>3</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Maukoro to Waitakaruru</td>
<td>Flood-way</td>
<td>Tide &amp; Waitakaruru</td>
<td>Channels</td>
<td>39450 m</td>
<td>1% AEP Tide, 5% AEP River</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>1</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Waitoa River</td>
<td>Flood-way</td>
<td>Waitoa River</td>
<td>Channels</td>
<td>100300 m</td>
<td>1% AEP Tide, 5% AEP River</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>2</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Awaiti/El Stow Canals</td>
<td>Flood-way</td>
<td>Tide &amp; Piako River</td>
<td>Channels</td>
<td>26500 m</td>
<td>1% AEP Tide, 2% AEP River</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>9</td>
<td>10% AEP in 3 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Floodgates</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Maukoro/ Poupourau Canals</td>
<td>Flood-way</td>
<td>Canals</td>
<td>Channels</td>
<td>11250 m</td>
<td>1% AEP Tide, 2% AEP Canal</td>
</tr>
<tr>
<td></td>
<td>Drainage</td>
<td>Internal Runoff</td>
<td>Pump Stations</td>
<td>2</td>
<td>10% AEP in 3 days</td>
</tr>
</tbody>
</table>

Note that:

- The 1% AEP tide level is 3.0-m above mean sea level (MSL). The lower the probability of the flood event or sea level occurring in any one year, the greater the flows in the river, or higher the tide level.
- The flood-way service level is provided by a combination of the stopbank level and the channel capacity. The 2% AEP or 50-year event within the Piako River corresponds to a flow of 280 m$^3$/second. The 20% AEP corresponds to a flow of 140 m$^3$/second.
- The drainage service level is provided by the combination of the pump stations and floodgate assets. Consideration has been given to the fact that floodgates will not operate when the water levels within the flood-way are higher than these behind the stopbanks. Capacities of floodgates and pump stations are designed to discharge the volume of runoff generated by a rainfall event with an accumulative rainfall depth of 38-mm/day over the hill country and 19-mm/day over the flat land in the local catchment of the floodgates and pump stations within a three day period. Such an event is assessed to be a 10-year event (10% AEP).

The scheme management reaches are shown in (Figure 3).
3.2.2 Service level review

The design parameters and service levels of the flood-ways were reviewed by way of hydraulic modelling of the Piako River system. The design parameters and service levels of the floodgates and pump stations were also reviewed by reviewing catchment runoff and capacity of the floodgate outlets and pump capacities. Scheme assets and works currently provide five integrated levels of service as follows:
Tidal protection level of service: The scheme includes approximately 16 kilometres of stopbanks along the foreshores of the Firth of Thames designed to protect land from inundation by sea tide. The service level is defined in terms of (AEP, or Annual Exceedance Probability), which is the probability of the high tide level being exceeded in any one year. In the absence of significant wave effects, analysis by NIWA suggests that extreme see level with an annual probability of less than (1% AEP) are unlikely to exceed (RL 2.3-m) based on a relatively short sea level records. However, during certain cyclonic events, wave effects can overtop natural coastal margins with elevations of (RL 2.6 -3.0 –m). The scheme has adopted the high tide elevation of (RL 3.0 m) as a (1% AEP) or one in a hundred year probability. The foreshore stopbanks are constructed to elevation (RL 3.5 m). The crest levels of these banks are constructed (0.5 m) higher than the (1% AEP) high tide level to allow for wave action, settlement of banks and design uncertainties. This additional height is termed as the Freeboard. The service level against tidal flooding is up to 1% AEP or 100-year high tide event.

Flood-way level of service: The scheme includes a series of stopbanks, diversions and channel works forming defined flood-ways and ponding zones for the Lower Piako and Waitoa Rivers and tributaries. Flood-ways are designed to accommodate flood flows to defined levels generated by specified rainfall events to pass without inundating the low-lying floodplains. The Service level of the flood-way assets are defined by the magnitude of flow causing a river level rise (measured using AEP’s or Annual Exceedance Probability) that the flood-way offers protection against. The Service Level provided by the stopbanks and channel works forming the flood-ways in the original scheme design are different within the different reaches of the scheme and vary from an AEP of 20% (5-year event) to an AEP of 2% (50-year event). However, the review results suggest that the channel degradation through the reach (Mouth to Kaihere Ferry) has increased the flood-way capacity and performance to accommodate the 1% AEP. It should be noted that all stopbanks on the main stem of the Piako River within the tidal reach provide flood protection against the high sea tide up to an AEP of 1% (100-year). All stopbanks are designed with a freeboard height of (300-mm), except for these designed to be overtopped diverting floods into the ponding zones. Detailed service levels of the different reaches are defined in Table 2 below.

Floodgates service levels: A floodgate’s level of service is quantified by the ability of the flaps to prevent back flow from rivers and streams into the protected land. The other aspect of the service level is the capacity of the floodgate outlet to discharge accumulated local catchment runoff generated by a specific rainfall event, behind the gate, within a defined time period. All the Piako Scheme Floodgates prevent water in the flood-ways from back flowing into the protected land. They also have the capacity to discharge all local catchment runoff generated by a rainfall event of a 10% AEP (10-year event) within three days.

Pump stations service levels: A pump station’s level of service is quantified by the security of the pump station operating during a storm event and the ability of the pump station to drain inundated land within a defined time period. The pump stations are designed to operate during the storm events removing the catchment runoff accumulating within the protected area and preventing inundation. The pump stations were designed to assist gravity drainage when floodgates are closed. The service level of all the Scheme pump stations is that they will be secured to operate during storm events at all times and they will pump out the local catchment runoff generated by a rainfall event of a 10% AEP (10-year event) within three days.

Catchment and river management: New services such as new catchment (soil conservation and riparian margin protection works) and river management works in the upper catchment tributaries are incorporated within the Piako Scheme. The proposed service level will ensure consistent management of catchment, rivers and streams throughout the Piako River Catchment. The aim is to ensure stability of catchments and stream channels and improve their hydraulic performance. This in turn will reduce flood
risks, enhance local drainage, reduce erosion and enhance water quality.

3.2.3 Desired level of service
Currently, the communities desired level of service include the following:

♦ To retain the existing service levels provided the scheme.

♦ To extend the catchment and river management services across the whole Piako River Catchment.

♦ To extend the flood protection and drainage service for the Otway Basin area.

♦ To investigate the impacts of proposed options to upgrade the protection standards within the ponding zones.

4 Future demand
Future demands on the Scheme principally lies with land-use changes and stakeholder requirements/expectations for the level of service provided from the Scheme. Other factors that may affect future demand are environmental pressures such as (peat settlement, carbon management, and biodiversity) changes in climate patterns, sea level rise and advances in technology. While the Piako River Scheme works and service levels are well specified, maintaining these into the future can not be separated from the effects of changes in other parts of the catchment. This has lead Environment Waikato to recommending taking a full catchment approach in managing the scheme and addressing future demands and services.

4.1 Demand forecast
The factors influencing demand include change in weather patterns, change of land use and economic/technical feasibility of providing the services. In the long-term, the demand for the Scheme is likely to increase with intensified use of the land adjacent to the Scheme due to population increases and redistribution. Changes in the use of the land from predominantly dairy to other forms of production may also impact the demand on the scheme. Also due to the more frequent inundation of unprotected land with the change experienced in weather patterns. These changes will need to be reflected in the management of the scheme assets and the AMP. The current demand includes the following:

• Since the new differential rating system was adopted, customers’ expectations have increased, as they are more aware of catchment, river and stream management, as well as the scheme asset management. Demand to extend the works to include catchment and river management has been identified and provided on ad-hoc basis over the last two years. This plan proposes to formally include these services as part of the scheme.

• Landowners have indicated demand to extend the scheme flood protection services within the Otway Basin. Feasibility study, surveys, preliminary designs and consultation has been progressed. The proposed works include a short stopbank and a floodgate structure providing a 20 to 50-year flood protection from the Waitoa River. The project is scheduled under the new capital works programme of the Piako River Scheme and is due for completion in the year 2003.

• Demand to upgrade the level of protection within the ponding zones has been identified. Initial feasibility studies for the upgrade are currently being undertaken. The main factors, which will be considered, are the effects of the works on the level of service provided for other parts of the scheme and the environmental effects.
The changes in demand are expected to impact on asset utilisation and on the way the assets are managed. This includes more frequent maintenance, refurbishment/renewal and upgrades of the scheme assets, as beneficiaries are expected to have less tolerance to the floods. Another factor which will impact on service delivery costs is the availability of fill material for topping up stopbanks.

4.2 Changes in technology

Changes in technology may also affect the management, monitoring and decision-making processes and techniques rather than directly enhance the actual physical Scheme. These changes may include the following:

- Use of computerised data loggers for collecting the information.
- Hydraulic modelling and flood forecasting.
- Rainfall or flow statistical analysis techniques; and
- Understanding and monitoring of the Southern Oscillation that affects La Niña and El Niño climate patterns.
- Advanced electrical or mechanical components for pump stations and floodgates.

Advances in technology may improve the quality and accuracy of data, performance of asset components, prediction accuracy and ultimately a more cost-effective management of the scheme.

4.3 Demand management plan

The future demand management of the Scheme will be based ultimately on an acceptable level of risk on the part of the major stakeholders of the Scheme. The customers may eventually decide on what level of service they require from the Scheme based on their land-use, their acceptability of inundation frequency, the consequences of their property being inundated and their level of expenditure to fund the maintenance and renewal of the assets protecting their land.

In flood protection, the only non-asset solutions are insurance and change of land use, and both are generally not available. However, demand is managed by exploring solutions for flood protection and drainage improvements, on a case by case basis. The technical and economic feasibility of these options are assessed and the options with a benefit/cost ratio greater than unity (1) are considered. Ultimately, the landowners have to make the decision on whether the new assets should be constructed or not, as they will fund the majority of the capital cost (75%), and the ongoing maintenance cost.

Currently, the asset management plan allows for construction and acquisition of new assets. It also allows disposal of redundant assets. The process for undertaking any of these includes an assessment of the demand through customer liaison, in addition to the technical and economic feasibility studies for acquiring or disposal of the asset.

5 Lifecycle management plan

The lifecycle management plan for the scheme assets provides that each asset has a base life within which the asset provides the service it was designed for efficiently. The asset is replaced or renewed when it loses the ability to perform as required. The plan provides that no asset should be replaced unless it has lost its service potential and/or it is not cost effective to maintain. Accordingly, the plan emphasises on the frequent inspection, monitoring and preventative maintenance to ensure that the condition and performance of assets are at acceptable levels, and the level of service is maintained.

The condition and performance of assets are assessed annually and a record of maintenance and renewal costs is being held against each asset. This information is used as basis for assigning the appropriate base life for each asset. Assets base lives are extended when they continue to perform efficiently and cost effectively. Extending the asset life is followed by a reduction in depreciation, and ultimately optimised overall
lifecycle cost.

Other approaches used to optimise the lifecycle costs include cost benefit analysis for any new capital and major refurbishment works, using the competitive pricing procedures for major contracts and generally by planning and co-ordination of activities.

5.1 **Background data**

5.1.1 **Physical parameters**

The Piako Scheme is divided into nine reaches, each including assets groups acting together to provide the design levels of service. These were grouped within (Table 2). The asset groups are composed of assets and components, each of which has its own specifications, lifecycle and performance measures. These dictate the way the asset is monitored, operated, maintained and renewed. A plan of the Scheme showing its Sections is shown in (Figure 2). Volume II of this AMP provides maps showing the locations of all the assets of the Scheme.

The full asset register for the Piako River Scheme, assets components and parameters are held on the Asset Management Information System (Conquest II) at the Hamilton Office of Environment Waikato. Within this register is information on the assets age, location and other specific classes of information (Physical and Financial). In general the scheme assets comprise:

166 km of stopbanks
257 km of river, natural stream and artificial channels
59 Floodgate structures
32 Pump stations
554 hectares of scheme land.

5.1.2 **Asset condition and performance**

The Asset Management Group has developed Asset Management Guidelines Documents for stopbank, floodgate and pump station assets. The documents provide detailed information on each type of asset, including the following topics:

- Operational requirements; general description of the asset (purpose and function, operational requirements, service requirements, typical forms, critical attributes, failure modes) and Design standards (operational and structural standards, health and safety and environmental standards).
- Management Strategies; general policy (policy statement, reliability, replacement/refurbishment policy, financial sustainability) and General Management Standards (compatibility with other assets, protection levels)
- Monitoring and maintenance requirements; general (condition and performance assessments, maintenance of components, documentation) and Manufacturer’s Specification.
- Security of asset and land management; general requirements.
- Emergency Response
- Quality Assurance; general requirements, audit procedures and inspections.
- General Costs of Monitoring and Maintenance.

The guideline documents are based on best management practice, and provide general information and detailed procedures of the asset management requirements. Based on these guidelines, an annual assessment of the condition and performance of the scheme assets is undertaken.

5.1.2.1 **Asset performance**

Performance of assets is a measure of the assets' ability to perform and provide the service under design conditions. For this purpose, investigations, surveys and specific
technical data are required for performance assessment of each asset type or group of assets. The asset and component performance assessments are been derived from:

- Hydraulic investigations
- Observed performance records
- Testing and survey of components
- Previous performance assessments
- Performance monitoring during flood conditions.
- Structures audits.

A performance grading system where 1 is defined, as being of a high standard (nearly new) and 5 is a low standard (non performing), is used for assessments. A performance grade of 3 indicates that capital works need to be planned, and performance grades of 4 and 5 indicating that major capital works are needed urgently.

5.1.2.2 Asset condition

The condition assessment of assets is based on visual inspections of the asset components. Different asset attributes are inspected for each asset type and component. An overall condition grade is allocated for each asset, with any deficiencies noted for inclusion in the maintenance programme of the year following the inspection. The asset condition is assessed on the basis of the following:

- Two weekly or monthly monitoring and routine maintenance inspections.
- Periodic overview inspections of structures and properties.
- Boating inspections of channels, stopbanks and properties.
- Annual condition survey for all assets.

The condition grading system is similar to that used for performance assessment, where 1 is defined as being of a high standard and 5 is a low standard. A condition grade of 3 indicates that maintenance should be planned for the coming years and condition grades of 4 and 5 indicate that urgent maintenance or renewal works are required.

The Asset management Group undertakes a general assessment of the Scheme condition and performance annually. The Scheme status report is presented to the Scheme Liaison Subcommittee and the Council’s Operations Committee. This report provides a general assessment based on observations, investigations and technical data collected that year. Where the Scheme assets are found deficient, or not performing to their required performance standard, programmes including investigations and works are proposed to rectify these.

5.1.2.3 Current assets condition and performance

The 2002 Asset Condition and Performance (ACP) Report (written for the 2001/2002 period) summarises the performance of the stopbanks, channels and structures of the Scheme. The asset and component performance assessments have been derived from:

The following table provides a summary of the condition assessment results of all the Scheme assets, as per ACP report.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Summary of condition survey results 2001/2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Groups</td>
<td>Condition Grade</td>
</tr>
<tr>
<td>Stopbanks (m)</td>
<td>1</td>
</tr>
<tr>
<td>Channels (m)</td>
<td>26%</td>
</tr>
<tr>
<td>Floodgates (No.)</td>
<td>10 %</td>
</tr>
</tbody>
</table>
It is obvious from the above that the assets conditions are generally good, and there are no significant works required, other than the normal maintenance and planned replacements of asset components. The assessment results reflect the continuous monitoring, maintenance and renewal works undertaken by Asset Management to ensure that assets are reliable and will perform and provide the service when required.

5.1.3 Scheme environmental condition and performance

Environment Waikato has undertaken assessment of the existing Piako River catchment and scheme environment (attached in Appendix I). The document provides a general description of the current environment, the effects of the scheme works, mitigation measures and proposes certain actions to enhance the environmental condition and performance of the scheme. While the environmental effects are mainly caused by the whole catchment development, the development is largely attributed to the scheme works.

5.1.3.1 Scheme environmental effects

The PRS design has recognised the key existing environmental features of the Piako catchment ecosystem, such as the Kopuatai peat dome, Torehapa peat dome, the flax block and the mangroves. The design allowed for the natural inundation of these areas and these were designated as flood ponding zones, while the mangrove areas were utilised as buffer zones providing erosion protection for the stopbanks. However, the scheme works have contributed to exacerbation of the following effects:

♦ Effects on water quality; The scheme works can exacerbate the problem through sediment release into waterways due to vegetation clearance, erosion of river banks, desilting of channels and other earthworks undertaken.

♦ Degradation of habitat values as a result of deterioration of water quality and vegetation clearance within floodways (land strips adjacent to riverbanks).

♦ Restricted fish passage through floodgates and structures. The floodgate restrict fish passage for 5% of the time only (during flood times), however the floodgate design is one of the most efficient in allowing fish migration.

5.1.3.2 Current practices and mitigation measures

Environment Waikato undertakes a wide range of works both within and adjacent to natural, modified and artificial water bodies. To ensure that the environmental effect of these activities are avoided, remedied or mitigated, the following measures are undertaken:

• Appropriate consultation with environmental organisations and interest groups to ensure that potentially affected parties are aware of the works to be undertaken and that, where relevant, their views are duly accounted for.
• For activities requiring consents, environmental effects are addressed through the consent process, and mitigation measures undertaken as required by the consent conditions.
• For authorised operational and maintenance works, procedures are in place to ensure that sediments are not released into waterways and oil spills are completely avoided or contained.
• Fencing and planting of waterway margins within the scheme land is currently underway, and the scheme properties rental income is mainly used for this project over the next five years. This will ensure that stock will not have direct access to waterway, hence reducing pollution and erosion of river and stream banks.
• Erosion protection works can have very positive environmental benefits. On the Piako River Scheme such works are generally limited to planting on stream banks.
These works result in reduction of erosion, suspended sediments and aggradation of watercourses. It also results improved water quality and habitat.

- All major contracts include specific conditions to ensure that environmental effects of the works are mitigated and/or minimised.
- All new capital works and projects include full assessment of the environmental effects of the proposed works and the mitigation measures. The costs of these are considered in establishing the benefit/cost ratio.
- Staff training to ensure that staff (and contractors where applicable) are aware of potential environmental effects of undertaking asset management activities, possible mitigation measures and that best management practices are implemented in a consistent manner.

5.1.3.3 Overall environmental performance
The scheme has recognised the importance of the key existing environmental features of the Piako catchment ecosystem in its design. These are progressively being enhanced and protected from deterioration and are forming the backbone of the current environment. The scheme is also progressively improving the management processes and work methods with the objective of minimising the ongoing environmental effects.

It is anticipated that with the application of the environmental guidelines and following best practice, the overall catchment environment will be further improved and/or enhanced. The main focus will be on works that will improve water quality. The current state of water quality is defined in the regional plan and Environment Waikato's State of Environment Report 1998 as moderate. This could be used as a benchmark to measure future environmental improvements.

Based on the above, it can be stated that the current scheme environmental performance is good and there are sufficient management processes and practices, which are in line with the regional plans policies, to ensure that further enhancement will be achieved into the future.

5.1.4 Asset condition and performance monitoring
Table 4 outlines the general monitoring activities undertaken to update the asset management information system and to ensure maintenance and upgrade works occur when necessary and the Scheme performs to design standards.

<table>
<thead>
<tr>
<th>Item/activity</th>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopbanks</td>
<td>Condition Survey</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>Crest Level Surveys (Stopbanks on sand and clay foundations)</td>
<td>10 years</td>
</tr>
<tr>
<td></td>
<td>Crest Level Surveys (Stopbanks on peat and marine mud foundations)</td>
<td>5 years</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Condition Survey</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>Structure Audit</td>
<td>10 years</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Condition Survey</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>Structures Audit</td>
<td>10 years</td>
</tr>
<tr>
<td></td>
<td>Ultrasonic Check</td>
<td>2 years</td>
</tr>
<tr>
<td></td>
<td>Submerged Parts Inspection</td>
<td>2 – 5 years</td>
</tr>
<tr>
<td>Channels</td>
<td>Condition Survey</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>Cross Sections survey</td>
<td>10 years</td>
</tr>
<tr>
<td>Catchment Services</td>
<td>Information and advice</td>
<td>As Required</td>
</tr>
<tr>
<td></td>
<td>Catchment oversight</td>
<td>1 year</td>
</tr>
</tbody>
</table>

5.1.5 Piako scheme property management
The total area of land directly associated with the Scheme is estimated to be approximately 554 hectares. That land is nearly all owned by the Crown rather than by
Environment Waikato. The market value of that land as at 1 July 2001 is estimated to be approximately $2.8 million. It is estimated that it would cost approximately $7.4 million to purchase that land as at 1 July 2001, if the land was still in private ownership and the Scheme works were not carried out.

Environment Waikato’s policy is to license Scheme stopbank and floodway land to adjoining owners, wherever practicable. 75 licences are issued, covering approximately 456 hectares, with a licence fee income of approximately $109,000.00 for the year commencing 1 June 2002. Five year licences are issued, all expiring 31 May 2004, and licence fees are reviewable annually on 1 June. Under the terms of the licences, rates are payable by Environment Waikato and licensees are responsible for weed control, fertiliser application, most fence maintenance and supply of water.

Rates, administration and management costs are met from the licence fees.

A riverbank retirement initiative has commenced, whereby Environment Waikato supplies fence materials to encourage licensees to erect necessary fences to exclude all stock from the waterways on or adjacent Scheme land. That fencing initiative will run for up to 10 years, requiring necessary budgeting provision for supply of materials for new fencing, with ongoing supply of materials for repair of those fences damaged by flooding as necessary.

5.1.6 Asset valuations

Environment Waikato values its assets in accordance with the procedures and methods set out in the New Zealand Infrastructure Asset Valuation and Depreciation Guidelines and the Financial Reporting Standard (FRS) No. 3 – Property, Plant and Equipment. Revelations are undertaken every three years on the basis of Depreciated Replacement Cost (DRC). The initial valuation was done as at 1 July 1998, the next was recently completed.

An asset valuation is undertaken on behalf of the Environment Waikato Regional Council every three years. The last valuation was assessed as at 1 July 2001 and completed by Opus International Consultants Ltd. The report entitled “Valuation of Infrastructural Assets, 2001” is available from Environment Waikato Regional Council, Asset Group. Key outputs from the report are:

- Replacement cost (RC).
- Optimised depreciated replacement cost (ODRC).
- Assessment of remaining economic life (ERL).

Assets are fully maintained and depreciated, and therefore no significant changes in valuation are anticipated.

5.1.6.1 Asset replacement valuation summary

The Valuation of Infrastructural Assets 2001 report provides a summary of the replacement value of the assets of the Scheme in July 2001. These values are the most up-to-date values observed while preparing this Plan and are reproduced in (Table 5) below. These do not include the property valuations.
Table 5   Asset replacement values

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopbanks</td>
<td>11,400,322</td>
<td>15,487,554</td>
<td>368,692</td>
<td>337,756</td>
<td>15,518,490</td>
</tr>
<tr>
<td>Channels</td>
<td>0</td>
<td>94,739</td>
<td>0</td>
<td>1,405</td>
<td>93,335</td>
</tr>
<tr>
<td>Floodgates</td>
<td>2,164,045</td>
<td>4,223,719</td>
<td>0</td>
<td>163,145</td>
<td>4,060,574</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>2,393,505</td>
<td>4,534,589</td>
<td>21,740</td>
<td>172,682</td>
<td>4,383,647</td>
</tr>
<tr>
<td>Total</td>
<td>15,957,871</td>
<td>24,345,473</td>
<td>427,771</td>
<td>675,413</td>
<td>24,097,831</td>
</tr>
</tbody>
</table>

5.1.6.2 Valuation method

Valuation methodology is in accordance with the NZIAMM and is on the basis of Optimised Replacement Cost (ODRC). This is outlined in greater detail below.

For asset groups such as pump stations and floodgates the replacement value has been sourced from construction cost records and included all design, construction supervision and administration costs. The construction costs for stopbanks were not available. The replacement value for the stopbanks was based on an equivalent component cost and included earthworks, topssoiling, fencing, royalties to landowners, design and construction supervision and administration.

The replacement value for all parcels of land owned by the EWRC for the Piako river scheme has been based on independent valuations. Replacement value is derived from the average value of the land immediately adjacent to the scheme plus a component for acquisition costs. The total area of land directly associated with the scheme is estimated to be approximately 554 hectares and the market value as at July 1998 is estimated to be approximately $2.3 million. Please refer to the Infrastructural Assets Accounting Policies Guidelines within Appendix.

From the asset replacement value, the optimised depreciated replacement cost (ODRC) is obtained as follows.

\[
\text{ODRC} = \frac{\text{Remaining life}}{\text{Economic Life (years)}} \times \text{Replacement Value}
\]

5.1.6.3 Base life assessments

Base life for the components within the pumping stations and floodgates were originally based on the recommendations within the NZIAMM. The base life for asset components are modified during the three yearly asset valuations based on historical condition monitoring and replacement frequencies.

Historical records of top up frequencies were used for the assessment of the stopbank base life. The frequency of the need to top up the crest level of a stopbank depends on the foundation material. For marine mud, the stopbank settles at a greater rate and requires more frequent top up. Therefore the base life of this type of stopbank is a function of stopbank height and the rate of settlement.

The base life for drains and artificial channels has been based on the recommendations within the International Infrastructure Management Manual 200, New Zealand / Australia Edition, and Annual Plan / Strategic Plan.

5.1.6.4 Key assumptions in the valuation methodology

A statement of key assumptions is contained in the report entitled Valuation of Infrastructural Assets 2001 prepared by Opus International Consultants Ltd. This report is available from Environment Waikato Regional Council.
5.1.7 Historical data

Record of historical financial expenditure is held in the Finance Section archives at the Environment Waikato Regional Council main office in Hamilton.

5.2 Scheme maintenance plan

5.2.1 Scheme management

The management activities for the scheme include a wide range of works necessary to ensure that the scheme assets will provide the services to the levels expected by the customers and stakeholders. These activities include the following:

- **Political accountability**: including preparation and presentations of scheme plans and reports to Council’s Operation Committee. This is to ensure that all works and services provided are consistent with plans and meet the legal requirements under which Environment Waikato operates.

- **Financial accountability management**: including all financial processes and operation associated with the scheme (finance, expenditure, cash flow, rate collection, financial reporting, valuations, depreciation) and compliance with Audit Office requirements.

- **General management and planning**: including the staff time required for preparing, co-ordination and planning all annual programmes, annual reports, replying to submissions and performance management.

- **Property management**: including managing the leases of properties, maintenance and management of properties in line with Environment Waikato policies and compliance with legal requirements.

- **Customer services**: including receiving inquiries and providing information and reply within specific timeframes as per the customer services charter.

- **General engineering and technical support**: including general and specific investigations and design works required to meet scheme design standards, when undertaking the maintenance works. It also includes reviews of standards and guidelines on regular basis.

- **Information management**: including documentation and maintenance of information and supporting systems necessary to manage and operate.

- **Asset management development**: including plans and systems reviews, development and upgrades necessary to improve performance.

- **Risk management**: including insurance, flood warning systems and emergency response provisions.

- **Accommodation and communications**: including offices, depots, and telecommunication systems necessary to provide the services.

The costs of these activities and management requirements are detailed in Table 7 section 5.2.4 below.

5.2.2 Maintenance plan

The annual planned maintenance programme includes the standard routine monitoring and maintenance activities and works. It also includes any planned and unplanned
works that

- The standard monitoring maintenance works are those, which must be undertaken to ensure that the assets are operational at all times. Such works include monitoring inspections, audits and surveys, removal of blockages from outlet channels and floodgate flaps, weed spray and lubrication of mechanical components.

- Planned maintenance works are identified through the annual condition survey of the assets, and historical in-house knowledge along with the crest level surveys, cross section surveys and structures audit reports. These works are prioritised and scheduled within the maintenance programmes of the following years. The priorities are based on the risks associated with not undertaking the works and the availability of funds necessary to complete the work. In general, all necessary works are undertaken within the same year.

- Unplanned maintenance is any urgent maintenance work identified during the operational inspections, or through customer feedback and liaison. These are investigated and assessed first. When the risks of delayed maintenance can cause operational failures, then works are added to the annual maintenance programme and undertaken within the same year. Generally, such works are initiated as a result of floods.

Table 6 below provides a summary of the current maintenance works programme.

**Table 6  Summary of asset management maintenance activities**

<table>
<thead>
<tr>
<th>Item/activity</th>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel / Flood-way</td>
<td>Vegetation growth control (weed spraying)</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>General maintenance including erosion protection (rip-rap, fencing &amp; planting) and blockage removal</td>
<td>As required</td>
</tr>
<tr>
<td>Stopbanks</td>
<td>General maintenance of stopbanks includes remedial works for erosion of batters &amp; access.</td>
<td>10-yearly</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>General maintenance includes lubrication, electrical tests, animal pest control, weed control and replacement of minor items (seals, bulbs, etc)</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Operational reliability inspections</td>
<td>Monthly (*)</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Outlet channel de-silting by boat-pump or digger</td>
<td>As required(**)</td>
</tr>
<tr>
<td></td>
<td>Operational reliability inspection</td>
<td>3- 4 weeks (*)</td>
</tr>
<tr>
<td></td>
<td>Weed control for outlet channel and structure</td>
<td>6 monthly</td>
</tr>
<tr>
<td></td>
<td>General maintenance includes lubrication of the flaps and lifting gear, and minor replacements.</td>
<td>Yearly</td>
</tr>
</tbody>
</table>

(*) The pumps and floodgates reliability inspection is more frequent in the winter period than in the summer. For floodgates, it’s also dependent on the location of the floodgates, as those floodgates in the lower tidal reaches require more frequent checks.

(**) The frequency of de-silting the floodgate outlets depends on the location of the structures. Floodgates in the lower Piako area need to be de-silted 8-12 times a year, while the ones in the upper reaches are de-silted once every two years.

### 5.2.3 Standards and specifications

The maintenance, management, standards and specifications and summary of future costs of the stopbanks, floodgates and pump stations is described in detail in the following reports:

- Environment Waikato Stopbank Management Guidelines (EW, 1995)
- Environment Waikato Floodgate Management Guidelines (EW, 1997)
- Environment Waikato Pump Station Management Guidelines (EW, 1997)
These reports are located at the Hamilton and Paeroa Offices of Environment Waikato.

As there are no current channel management guidelines the maintenance programme is based on historical experience in management of the Scheme channels. Maintenance of the channels involves erosion control and planting, aquatic weed spraying and removal of debris blocking the channel. These are completed on an annual basis, or on as required based on annual inspections.

5.2.4 Summary of future maintenance costs

The cost of all works and administration associated with the maintenance programme has been annualised. The estimates are based on the assumptions for undertaking all the routine monitoring and maintenance works in a planned manner. These cost estimates have been based on the accumulated experience in management of the Piako River Scheme over the last 35 years.

Table 7 below provides the annualised maintenance costs of the different components of the Scheme. These are based on the projected scheme works programme for the period 2003 – 2013. Figure 3 provides the expected maintenance costs of the scheme over the next 12 years.

Note that the figures are based on 2002 cost estimates and inflation is not applied at this stage. All costs will be increased by some percentage every year to reflect the inflation in the previous year.

Table 7: Average annual monitoring and maintenance costs

<table>
<thead>
<tr>
<th>Assets</th>
<th>Quantities</th>
<th>Actions</th>
<th>Average Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankments</td>
<td>165.665 km</td>
<td>Condition survey (yearly)</td>
<td>$16,801.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crest Level survey (5-10 years)</td>
<td>$11,421.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (10 years)</td>
<td>$14,097.58</td>
</tr>
<tr>
<td>Main Channels</td>
<td>257 km</td>
<td>Condition Survey (yearly)</td>
<td>$17,513.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X-Section Survey (10 years)</td>
<td>$16,458.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance</td>
<td>$110,941.27</td>
</tr>
<tr>
<td>Tributary Channels</td>
<td></td>
<td>Condition Survey (yearly)</td>
<td>$5,241.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X-Section Survey (10 years)</td>
<td>$2,662.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vegetation Control (spray) (yearly)</td>
<td>$30,980.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance</td>
<td>$20,709.28</td>
</tr>
<tr>
<td>Floodgates</td>
<td>59</td>
<td>Condition Survey (yearly)</td>
<td>$1,643.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structures Audit (10 years)</td>
<td>$3,114.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Inspections (2-3 weeks)</td>
<td>$34,880.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outlet Channel De-silting (as required)</td>
<td>$49,304.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vegetation Control (spray) (6 months)</td>
<td>$4,393.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (yearly)</td>
<td>$18,267.02</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>32</td>
<td>Condition Survey (yearly)</td>
<td>$1,085.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structures Audit (10 years)</td>
<td>$2,860.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Inspections (3-4 weeks)</td>
<td>$52,537.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (yearly)</td>
<td>$39,852.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ultrasonic Check (2 years)</td>
<td>$3,410.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Submerged parts Inspection (2-5 years)</td>
<td>$3,504.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Charges</td>
<td>$110,000.00</td>
</tr>
<tr>
<td>Property</td>
<td></td>
<td>Property Management</td>
<td>$39,666.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property Rates</td>
<td>$27,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property Maintenance</td>
<td>$45,416.67</td>
</tr>
<tr>
<td>Catchment Oversight</td>
<td>Whole Catchment</td>
<td>Management</td>
<td>$8,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liaison Subcommittee Reporting</td>
<td>$15,314.40</td>
</tr>
<tr>
<td>Information and Advice</td>
<td>Whole catchment</td>
<td>Information and Advice</td>
<td>$22,000.00</td>
</tr>
</tbody>
</table>
### New Works Management Scheme

<table>
<thead>
<tr>
<th>New soil conservation works and upper streams maintenance</th>
<th>$45,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Management and Planning</td>
<td>$76,901.60</td>
</tr>
<tr>
<td>Customer Services</td>
<td>$23,708.20</td>
</tr>
<tr>
<td>Operations Committee Reporting</td>
<td>$38,645.04</td>
</tr>
<tr>
<td>Data Maintenance</td>
<td>$11,094.40</td>
</tr>
<tr>
<td>Condition and Performance Reports</td>
<td>$4,293.68</td>
</tr>
<tr>
<td>Investigations and Design</td>
<td>$25,261.60</td>
</tr>
<tr>
<td>AMP Reviews</td>
<td>$7,342.87</td>
</tr>
<tr>
<td>Asset valuations</td>
<td>$4,979.55</td>
</tr>
<tr>
<td>AM Development (Special Projects)</td>
<td>$60,000.00</td>
</tr>
<tr>
<td>Others (Accommodation, Communication and Electronic Documentation)</td>
<td>$58,000.00</td>
</tr>
<tr>
<td><strong>Total Scheme Maintenance Costs</strong></td>
<td><strong>$1,238,087.42</strong></td>
</tr>
</tbody>
</table>

### Risk Management Scheme

| Disaster Recovery Insurance                               | $25,000.00 |
| Telemetry Warning Systems                                 | $33,686.00 |
| Emergency Response                                        | $34,000.00 |
| **Total Scheme Maintenance Costs**                        | **$77,000.00** |

**Total Scheme Maintenance Costs** $1,238,087.42

---

**Figure 4** Predicted Scheme Maintenance Costs

---

**5.3 Renewal/replacement plan**

**5.3.1 Renewal plan**

Capital / Renewal expenditure covers major works required to upgrade the assets to their original design standards (topping of stopbanks, excavation of channels, replacement of components of floodgates and pumps stations).

Table 8 lists typical frequency of renewal and replacement works for the Piako River Scheme activities.
Table 8  Summary of asset management renewal and replacement activities

<table>
<thead>
<tr>
<th>Item/activity</th>
<th>Description</th>
<th>Estimated frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankments</td>
<td>Renewal of stopbanks (marine mud and peat foundation)</td>
<td>15 years</td>
</tr>
<tr>
<td></td>
<td>Renewal of stopbanks (sand and clay foundation)</td>
<td>30 years</td>
</tr>
<tr>
<td>Earth Channels</td>
<td>Channel excavation (Desilting)</td>
<td>6 years</td>
</tr>
<tr>
<td>Natural Channel</td>
<td>Channel excavation (Desilting)</td>
<td>20 years</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Inlet/ Outlet Structures</td>
<td>80 years</td>
</tr>
<tr>
<td></td>
<td>Pipes</td>
<td>60-80 years</td>
</tr>
<tr>
<td></td>
<td>Components (flaps, winches, lifting gear)</td>
<td>20 years</td>
</tr>
<tr>
<td></td>
<td>Erosion protection works</td>
<td>30-50 years</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Minor electrical components replacement</td>
<td>2-5 years</td>
</tr>
<tr>
<td></td>
<td>Replace/refurbish weedscreens, switchboards, flaps</td>
<td>20 years</td>
</tr>
<tr>
<td></td>
<td>Pumps Overhaul and Refurbishment</td>
<td>10-15 years</td>
</tr>
<tr>
<td></td>
<td>Pumps, motors</td>
<td>50 years</td>
</tr>
<tr>
<td></td>
<td>Pipes</td>
<td>60-80 years</td>
</tr>
<tr>
<td></td>
<td>Inlet/ Intake/outlet structures</td>
<td>100 years</td>
</tr>
</tbody>
</table>

A general renewal and replacement programme is prepared for the whole scheme, to establish the annual renewal expenditure and depreciation funding requirements. The programme is not fixed and will be refined as time goes by, based on the detailed technical information gathered through structures audits, detailed inspections and measures, crest level and cross section surveys. Significant works that are urgent, or are considered to constitute an immediate threat to the scheme integrity will replace these in the proposed programme. Table 9 below provides the proposed long-term renewal programme.

Table 9  Proposed renewal programme

<table>
<thead>
<tr>
<th>Asset</th>
<th>Type</th>
<th>Activity</th>
<th>Renewal dates</th>
<th>Next renewal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment</td>
<td>Marine mud and peat foundation</td>
<td>Topping</td>
<td>2003-2012</td>
<td>2018-2027</td>
</tr>
<tr>
<td>Embankments</td>
<td>Clay foundation</td>
<td>Topping</td>
<td>2012-2017</td>
<td>2032-2038</td>
</tr>
<tr>
<td>Channels</td>
<td>Earth channel</td>
<td>Desilting</td>
<td>2003-2008</td>
<td>2009-2014</td>
</tr>
<tr>
<td>Channels</td>
<td>Natural</td>
<td>Desilting</td>
<td>2002-2004</td>
<td>2022-2024</td>
</tr>
<tr>
<td>Floodgate Valves</td>
<td>Flaps and lifting gear</td>
<td>Replacement</td>
<td>2002-2021</td>
<td>2022-2041</td>
</tr>
<tr>
<td>Pipes and Structures</td>
<td>All types</td>
<td>Replacement</td>
<td>2033-2052</td>
<td>2103-2122</td>
</tr>
<tr>
<td>Pumps</td>
<td>All types</td>
<td>Overhaul</td>
<td>2003-2012</td>
<td>2043-2052</td>
</tr>
<tr>
<td>Switchboards</td>
<td>All types</td>
<td>Replace</td>
<td>2006-2025</td>
<td>2026-2045</td>
</tr>
<tr>
<td>Pumps &amp; Motors</td>
<td>All types</td>
<td>Replace</td>
<td>2023-2032</td>
<td>2073-2082</td>
</tr>
<tr>
<td>Screens</td>
<td>All types</td>
<td>Replace</td>
<td>2002-2021</td>
<td>2022-2042</td>
</tr>
<tr>
<td>Structures and Pipes</td>
<td>All types</td>
<td>Replace</td>
<td>2070-2079</td>
<td></td>
</tr>
</tbody>
</table>

The above programme is based on the renewal cycles in table 8. The assumptions made are:

- All scheme assets were constructed in the period 1960-1980.
- The cycles start from the financial year 2003-2004
- All embankments require topping over the next 15 years.
• Earth channels require desilting every 5 years.
• All pump stations require replacement in 50 years.
• All pump structures/intakes/outfalls/pipes and buildings require replacement in 80 –
  100 years.
• All floodgate structures and pipes require replacement in 60 – 80 years.
• All components (flaps/ lifting gear/ screens/ pumps/ switchboards) require
  refurbishment and/or replacement every 10 – 20 years.

5.3.2 Renewal standards

Renewal of embankments includes topping the stopbanks to their design crest level. The
stopbank crest level is equal to the design flood level plus a freeboard (300-mm for
most of the Piako River Scheme Stopbanks). Embankment renewal works are
undertaken when they settle, losing more than half their freeboard height.

Channel renewals include excavation of the silt accumulating in the bed and reducing
the channel’s capacity. Some sections of the natural river channels require excavation
of certain reaches, where deposition of silt reduces their flow capacity. While these
channels are not valued currently, excavations will be capitalised and desilting will be
undertaken on regular basis in the future.

Renewals of floodgates include replacement of flaps and lifting gear every twenty
years. While the life cycle of the inlet/outlet structures are approximately 100 years and
the pipes approximately 80 years. The proposed programme suggests full replacement
at 80 years for practical reasons. (The end pipes at inlets and outlets are part of the
structures and can’t be replaced without breaking the structures).

Renewal of pump station includes replacement to original design requirements. Again
the pipes will be replaced with the outlet structures for practical reasons. However, the
steel pipes will be replaced with the intake structures.

Generally, all replacements and renewals shall be to the original design standards or to
the service level agreed with the beneficiaries at the time.

5.3.3 Summary of future renewal costs

Renewal, refurbishment and all other non-uniform costs are spread equally over the
expected life of individual assets. The annualised expected life cycle costs have then
been used as the basis for planning future funding requirements. The works on some
assets to maintain design level of service occurs on a continual basis (such as
stopbanks and channels) while other assets have to be replaced from time to time
(floodgate and pump station components). Renewal and replacement works are funded
from the depreciation reserves fund.

So as to establish the depreciation funding requirements, assumption for refurbishment
and replacement cost were made on the basis of current costs. These costs are
annualised to establish the annual depreciation funding required over the life cycle of
the scheme assets. These assumptions and costs are shown in Table 10 below.

Table 10 Replacement/renewal cost estimate assumptions

<table>
<thead>
<tr>
<th>Asset group</th>
<th>Type/ component</th>
<th>Unit</th>
<th>Cost ($)</th>
<th>Cycle (year)</th>
<th>Total quantity</th>
<th>Total cost/ cycle</th>
<th>Cost/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment</td>
<td>Mud and peat foundation</td>
<td>1 km</td>
<td>$46,046.00</td>
<td>15</td>
<td>77.09</td>
<td>$3,549,686.14</td>
<td>$236,645.74</td>
</tr>
<tr>
<td>Embankment</td>
<td>Clay and sand foundation</td>
<td>1 km</td>
<td>$46,046.00</td>
<td>30</td>
<td>88.575</td>
<td>$4,078,524.45</td>
<td>$135,950.82</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Flaps and lifting gear</td>
<td>1 unit</td>
<td>$4,400</td>
<td>20</td>
<td>71</td>
<td>$412,400.00</td>
<td>$15,620.00</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Inlet/outlet &amp; pipes</td>
<td>1 Unit</td>
<td>$60,000.00</td>
<td>80</td>
<td>59</td>
<td>$3,540,000.00</td>
<td>$44,250.00</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Wing walls</td>
<td>1 Unit</td>
<td>$30,000.00</td>
<td>80</td>
<td>59</td>
<td>$1,770,000.00</td>
<td>$22,125.00</td>
</tr>
<tr>
<td>Pump stations</td>
<td>Screens</td>
<td>1 unit</td>
<td>$7,168.80</td>
<td>20</td>
<td>41</td>
<td>$293,920.80</td>
<td>$14,696.04</td>
</tr>
</tbody>
</table>
Further assessment of the renewal/ replacement programme costs for the full lifecycle of assets over the next 100 years on the basis of the renewal programme and cost assumptions in Tables 9 and 10 respectively, was established. Figure 5 below shows the renewal/ replacement cost required over the next 100 years.

**Figure 5  Predicted renewal costs (based on life cycle) 2003 - 2102**

It is obvious that the works will significantly vary from one year to another, as many assets have the same life span and were built in the same periods of time. Therefore, it is proposed to plan asset replacement and refurbishment where possible to balance income and expenditure cashflows and avoid the need for either funding shortfalls from loans or building up large capital replacement funds. This may not always be possible, particularly in regard to some of the Schemes major structures. To bridge the gaps between funding and expenditure cash flows, some degree of reserving and raising of loans may be required at various points in the life cycle. Figure 6 shows a proposed planned renewal/ replacement programme.
Figure 6  Planned renewal programme 2003 - 2102

Decisions to replace/renew assets are made by Council based on Asset Management staff reports justifying the need for capital expenditure. Figure 7 provides the cost of the proposed assets replacement/renewal programme over the next 12 years.

Figure 7  Figure 7 Lifecycle predicted renewal costs 2003 - 2013

5.3.4  Total scheme costs

The total scheme costs are the total maintenance and depreciation costs. On average, this equates to approximately $1,928,251 per annum based on current costs and assumptions. Figure 8 below provides the predicted scheme costs for the period 2003 – 2013.
5.4 Risk management

The risks associated with managing the Piako River Scheme are significant, as the assets are subject to flooding on annual basis. The consequences of failure of the assets to provide the level of service when they are most needed can be severe and directly affect the well being of the communities protected by these assets.

Besides the responsibility of managing and maintaining the scheme, Environment Waikato has a wider responsibility for managing the natural hazards throughout the whole region as required by the Resource Management Act and Civil Defence Act. To ensure that the risks of managing the scheme are minimised, Council undertakes three main activities, which are incorporated and provided for in the asset management plan. These are as follows:

5.4.1 Emergency response

The main risk to the scheme is that of flooding. Two activities are carried out through the emergency response plan, which are:

- **Flood warning systems:** Environment Waikato provides a flood monitoring and warning system within the Piako catchment. The system includes three rainfall recording stations and five water level and flow gauging stations. These are located strategically within the catchment and along the main rivers. In addition, a station for recording the sea levels and tidal influences is situated within the Firth of Thames.

  The whole system is telemetered and is controlled and monitored remotely from the computer systems in Environment Waikato offices. The information gathered is also provided online to the public through Environment Waikato’s web site and is updated every three hours under normal conditions. However, during flood events, results are updated on hourly basis. Different warning levels are triggered remotely with events with the rise of water levels. The emergency management team is responsible for the continuous monitoring and response to any alarms, which
trigger a flood situation. Flood duty officers are on duty 24 hours a day/ seven days a week.

- **Flood Response:** During flood events asset management staff undertake a series of activities in response to the event. These include monitoring of flood levels, forecasting the flows and level rise and providing information to the general public and key stakeholders.

On the ground, inspections of the stopbanks and structures are undertaken throughout the whole event period. Performance of the assets is recorded, and actions to reduce risks of failure are carried, which include sand bagging seepage areas and low spots in stopbanks, and ensuring that pump stations are operating to remove local catchment runoff from protected areas.

Daily reports on the scheme performance, remedial actions and response to inquiries are documented. Key stakeholders are kept informed of all the operations and risks at all time since the early stages of the floods.

### 5.4.2 Insurance and disaster recovery

The scheme is always subject to a major disaster (earthquake or major above design flood) which could severely damage or destroy a large number of assets. Management of such risks is important and is provided for to a certain extent within the scheme and as follows:

- **Disaster recovery fund:** Central government policies on assisting with the restoration to river systems form part of its wider policies for dealing with natural disasters. The recovery plan provides that in a major disaster local and central government should share the costs of recovery in a 40:60 proportions respectively. This provision is subject to a number of conditions, of which the cost of damage has to cross a threshold of 0.002% of the total capital value of the whole regional assets. This threshold for Environment Waikato is approximately ($850,000) and is not likely to be exceeded unless the event is far beyond design parameters.

- **Insurance:** Environment Waikato is a member of the Local Authority Protection Programme (LAPP) scheme. The scheme is a mutual scheme consisting of regional and territorial authorities throughout New Zealand designed to insure against the balance of liability not covered by the central government (i.e. 40% of the recovery costs). Recently, this scheme was reviewed and the excess was lowered down to approximately $330,000. While the scheme has provided for the premiums of this insurance scheme, it has not addressed the funding of the excess amount. In the interim, it is proposed to utilise the depreciation reserves to cover the excess, or draw from Environment Waikato’s Reserve Funds as a loan to cover these costs. However, both of these need to be paid back including any interest. It is proposed to research funding options to cover the excess amount and build a special reserve for this purpose in the future.

### 5.5 Creation / acquisition plan

With possible future changes in land use and increased expectations of the Scheme, or a reduction in costs of new works there may be demand for new services, or an increase in the level of service provided under the current Scheme. New Capital Works to either upgrade the level of service provided by the existing assets and / or to create new assets are considered if they meet the selection criteria.

Project for acquisition starts with obtaining the necessary Resource Consents and ends with commissioning of the asset.

#### 5.5.1 Selection criteria

The following criteria shall apply when evaluating proposals for new works:
a) That the works be technically feasible in engineering terms.
b) That the work be cost effective in economic terms - i.e. the benefits outweigh the costs.
c) That the works do not compromise the performance or integrity of existing Scheme defences.
d) That there must be a demand for the works from the beneficiaries of the work.
e) That funding of both capital works and maintenance works be generally in accordance with the provisions set out in Section 6.2 of this document and the Piako River Scheme Differential Rating System.
f) That the areas affected by the works shall be classified (or reclassified where the area has an existing classification under the Scheme) in regard to the level of benefit received on the same basis as the remainder of the Scheme.
g) That the representative view of all Scheme beneficiaries be considered in respect of the potential impacts of new works on existing Scheme arrangements. (Refer to the Piako River Scheme Differential Rating System).

5.5.2 Standards and specifications

The new assets shall meet the service level criteria defined within the Scheme and will be constructed according to the guidelines for the assets within the scheme.

5.5.3 New capital works costs

For new capital works, the cost of preliminary investigations, involving limited technical evaluation and technical advice may be met from Environment Waikato’s Scheme management funds subject to the approval of the Operations Committee. The costs of detailed design work, construction, and other capital costs will be met by the beneficiaries in accordance with funding policies outlined above. The final decision on whether to proceed with proposed works will ultimately need to rest with the beneficiaries of the work on the basis of commercial viability.

New acquisitions will be added to the fixed asset register. The opening value will be the price of the asset (if fair and equitable). If the asset is acquired for a nominal or nil value then the opening value will be based on the valuation outlined in the stopbank, floodgate and pump station management guidelines.

5.6 Disposal plan

Assets within the Piako River Scheme range in age from 30 to 50 years. This is longer than the design life of many of the components. Therefore, current practise is to identify the assets with a design life of zero within the Asset management system, inspect the components and revise the design life as required. The design life of a stopbank is started again within the system when it is upgraded or the crest level is topped up to the design standard.

The formal process for disposal of Scheme assets follows is as follows:

- Asset identified as obsolete due to change in technology, change in site conditions, change in community demand and/or failure of the asset to provide the service.
- Different options to dispose the asset are sought and a cost /benefit analysis carried out. Most cost-effective option to dispose the asset will be undertaken.
- Liaison Subcommittee and Council Operations Committee approval sought.
- Disposal process starts and this might include consents for disposal of the works.

Currently, there is no plan to dispose any scheme asset; however replacement of some components is undertaken in a planned manner, as well as renewal and replacement of assets.
6 Financial summary

6.1 Financial statements and projections

An Annual Plan is prepared every year by Environment Waikato. This is constructed within the Long-term Financial Strategy that is reviewed every three years. Both of these planning mechanisms are conducted within the legal requirements of the Local Government Act 1974 and after consultation with the wider community.

The annual plan ensures financial resources are available for the projects laid out for the coming period. The expenditure estimates are designed to include as detailed estimate as possible with regards to future expenditure requirements for maintenance and depreciation. These costs are both fully expensed in the income statement for the period concerned.

The depreciation, which is a non-cash transaction, is then transferred to a Depreciation Reserve which in turn is used to fund Fixed Asset replacements.

6.2 Financial projections

Table 11 below provides a summary of the projected Revenue and Expenditure for the next four years as detailed in the Annual Plan 2002/03.

Table 11 Summary of projected revenue and expenditure

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property rental</td>
<td>101,773</td>
<td>101,585</td>
<td>103,000</td>
<td>103,000</td>
<td>103,000</td>
<td>103,000</td>
</tr>
<tr>
<td>Piako scheme rate</td>
<td>1,203,747</td>
<td>1,579,421</td>
<td>1,586,929</td>
<td>1,584,030</td>
<td>1,583,415</td>
<td>1,581,977</td>
</tr>
<tr>
<td>General rate</td>
<td>214,149</td>
<td>206,910</td>
<td>271,223</td>
<td>271,350</td>
<td>271,350</td>
<td>271,350</td>
</tr>
<tr>
<td>Total revenue</td>
<td>1,519,669</td>
<td>1,887,916</td>
<td>1,961,152</td>
<td>1,958,380</td>
<td>1,957,765</td>
<td>1,956,327</td>
</tr>
<tr>
<td>Expenditure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catchment oversight – land &amp; soil</td>
<td>0</td>
<td>0</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Soil conservation works</td>
<td>15,294</td>
<td>7,110</td>
<td>32,000</td>
<td>32,000</td>
<td>32,000</td>
<td>32,000</td>
</tr>
<tr>
<td>Catchment oversight – flood protection</td>
<td>0</td>
<td>0</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Info &amp; advice – flood protection</td>
<td>0</td>
<td>0</td>
<td>31,000</td>
<td>31,000</td>
<td>31,000</td>
<td>31,000</td>
</tr>
<tr>
<td>River &amp; flood protection</td>
<td>1,514,141</td>
<td>1,375,015</td>
<td>1,837,000</td>
<td>1,837,000</td>
<td>1,837,000</td>
<td>1,837,000</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>1,529,435</td>
<td>1,382,125</td>
<td>1,913,000</td>
<td>1,913,000</td>
<td>1,913,000</td>
<td>1,913,000</td>
</tr>
<tr>
<td>Net surplus / deficit</td>
<td>(9,766)</td>
<td>505,791</td>
<td>48,152</td>
<td>45,380</td>
<td>44,765</td>
<td>43,327</td>
</tr>
</tbody>
</table>

If the capital expenditure in a particular year is less than the depreciation expense, the difference is stored in the reserve. If the capital expenditure is greater than the depreciation the difference will be funded from the reserves.
The following key assumptions are made:

1. Maintenance costs are based on historical expenditure, condition grading and resulting necessity for works.
2. If assets are not renewed (no capital or renewal work was carried out) their value will deteriorate annually to zero value.
3. The valuations of assets are based on either:
4. The age of the asset at the time of the valuation, or
5. If the age is unknown then the length of time since the last capital / renewal work was carried out to bring the asset back up to its original service standard and value.
6. Any over / under-capitalisation of capital / renewal work will be adjusted for in the three yearly revaluation cycle.
7. Channel and stopbanks are treated as individual assets broken down into 100 metre lengths.
8. No part of the asset deteriorates at any faster rate than the rest of the asset.

Table 12 below provides a summary of the projected Reserve Position for the next four years as detailed in the Annual Plan 2002/03.

### Table 12 Projected reserves position

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Cash Position – Loan to EW</td>
<td>190,336</td>
<td>676,650</td>
<td>1430622</td>
<td>1,571,388</td>
<td>1,589,145</td>
<td>1,636,201</td>
</tr>
<tr>
<td>Opening Reserves – loan to EW</td>
<td>(508,197)</td>
<td>(465,107)</td>
<td>40,684</td>
<td>138,836</td>
<td>234,216</td>
<td>328,981</td>
</tr>
<tr>
<td>Revenue Reduces Amount Owing</td>
<td>1,343,133</td>
<td>1,577,673</td>
<td>1,636,929</td>
<td>1,634,030</td>
<td>1,633,415</td>
<td>1,631,977</td>
</tr>
<tr>
<td>General Rate Contribution – Reduces Amount Owing</td>
<td>228,380</td>
<td>206,910</td>
<td>271,223</td>
<td>271,350</td>
<td>271,350</td>
<td>271,350</td>
</tr>
<tr>
<td>Expenditure – Increases Amount Owing</td>
<td>1,528,623</td>
<td>1,483,125</td>
<td>1,810,000</td>
<td>1,810,000</td>
<td>1,810,000</td>
<td>1,810,000</td>
</tr>
<tr>
<td>Closing Reserve–Loan to EW (owing to EW)</td>
<td>(465,107)</td>
<td>40,684</td>
<td>138,836</td>
<td>234,216</td>
<td>328,981</td>
<td>422,308</td>
</tr>
</tbody>
</table>

### Capital

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Available Capital</td>
<td>687,756</td>
<td>1,141,757</td>
<td>1,389,938</td>
<td>1,432,552</td>
<td>1,354,929</td>
<td>1,307,220</td>
</tr>
<tr>
<td>Depreciation – Inflow from Maintenance</td>
<td>704,953</td>
<td>675,954</td>
<td>720,000</td>
<td>720,000</td>
<td>720,000</td>
<td>720,000</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>250,982</td>
<td>427,773</td>
<td>677,386</td>
<td>797,623</td>
<td>767,709</td>
<td>737,790</td>
</tr>
<tr>
<td>Closing Available Capital</td>
<td>1,141,757</td>
<td>1,389,938</td>
<td>1,432,552</td>
<td>1,354,929</td>
<td>1,307,220</td>
<td>1,289,430</td>
</tr>
<tr>
<td>Cash Position Loan to EW</td>
<td>676,650</td>
<td>1,430,622</td>
<td>1,571,388</td>
<td>1,589,145</td>
<td>1,636,201</td>
<td>1,711,738</td>
</tr>
</tbody>
</table>

### 6.3 Funding strategy

Maintenance and renewal/replacement costs within the Piako River Scheme are funded through a combination of the Scheme Differential Rate, the Regional General Rate and the Piako Scheme berm rental. The Piako River Scheme Differential Rating System was adopted in August 1999 and was phased in over 2 years with full implementation in July 2001.
The report entitled “The Piako River Scheme Differential Rating System” prepared in August 1999 outlines the details of the classifications used to obtain revenue from beneficiaries within the scheme and how the benefit is distributed over the scheme components. This report is available on request from Environment Waikato Regional Council.

The Piako Scheme Differential rate is collected from the beneficiaries of the scheme via a differential rate. The differential rating provides funding for long-term maintenance, and to more accurately spread the costs in proportion to the benefit received under the scheme. The Piako Differential Rating system has identified and assessed the extent of benefit for:

- Land receiving protection from tidal flooding.
- Land receiving protection from river flooding.
- Land receiving drainage benefits.
- Residential land receiving direct benefit.
- Commercial / industrial land receiving direct benefit.
- Land receiving indirect benefit.

Fifteen percent of the required revenue is to be collected by way of the General Regional Rate and charged to the region as a whole. Income is also generated through the rental of property associated with the Piako River Scheme for grazing purposes.

For new capital works, the scheme contributes 25% of the total capital works costs, while the direct beneficiaries should contribute the remainder 75% of the cost. The scheme share is funded from the depreciation funds of the whole scheme in the development and construction period. The newly protected land is then re-classified for the benefits received and rated accordingly.

7 Asset management practices

7.1 Accounting/financial systems

The treatment of infrastructural assets is outlined in the document Infrastructural Assets – Accounting Policies / Guidelines. This document is attached as Appendix II. The document is reviewed every year as part of the year end financial report preparation. The following provides a summary of the document:

- The Scheme will be valued in accordance with the procedures and methods set out in the New Zealand Infrastructure Asset Management Manual. The Scheme will be revalued every three years and this will be based on Optimised Depreciation Replacement Cost method.
- The Optimised Replacement Cost model considers technology changes, over-design, redundancy and system configuration to identify a benchmark alternative asset that efficiently replicates the current asset, while providing the same level of service. ODRC equals this replacement cost, after deducting an allowance for wear/consumption to reflect the remaining economic cost.

Currently the Financial / Accounting system is run within the finance department of Environment Waikato Regional Council. Manual linkages exist between the Conquest Asset Management system and the financial management system. This is currently being automated.

7.1.1 Accounting treatment

The accounting standards/guidelines that govern the financial and accounting aspects of managing the scheme are defined within the International Infrastructure
Management Manual. This manual currently considers the New Zealand Society of Accountant’s “New Zealand Accounting Standards” as having the authoritative support for the financial reporting of infrastructure assets, in particular:

Financial Reporting Standard 3 (FRS-3)

“Expenditure relating to an item of property, plant or equipment may be incurred subsequent to the acquisition, development or construction of the item. Such expenditure must be capitalised, either wholly or in part, when:

a) it is probable that the expenditure increases the economic benefits over the total life of the item beyond those most recently assessed in determining the basis of the item’s carrying amount; or
b) the expenditure was necessarily incurred to enable the future economic benefits embodied in the item to be obtained and the expenditure would have been included in the cost of the item when the item was initially recognised had the expenditure been incurred at that time.

All other subsequent expenditure must be recognised as an expense in the period in which it is incurred.” Financial Reporting Standard 3 (FRS-3) para 6.1

7.1.2 Expenditure definitions

All costs incurred through the ownership of infrastructural assets and that directly relate to the running of those assets fall into two categories, Capital/Renewal expenditure or maintenance expenditure. Under the generally accepted accounting practice (GAAP) which are reflected in SOLGM the following definitions need to be applied to the treatment of costs against infrastructure assets:

• **Maintenance expenditure** – “Costs which are repairs and maintenance should be expensed.” (para 5.2.3 Infrastructure Assets Accounting Polices/Guidelines)

• **Renewal expenditure** – “Costs which restore and sustain the intended service potential of the network is renewal expenditure and should be capitalised.” (para 5.2.2 Infrastructure Assets Accounting Polices/Guidelines) An example of this work is the desiltation of artificial channels to return them to the design standard. Renewal expenditure is treated in exactly the same way as capital expenditure. For accounting treatment any work performed on an asset that has previously been classified, as renewal costs will be, subject to these guidelines, now be classified as capital expenditure.

• **Capital expenditure** – “Costs which add to the service potential of the network as a whole.” (para 5.2.1 Infrastructure Assets Accounting Polices/Guidelines) These expenses should be capitalised and depreciated.

All maintenance costs are written off in the year of expenditure. All capital and renewal costs are capitalised to the value of the asset to counter depreciation of the asset value. The cost of capital improvements will be added to the book value of the asset in the financial year the work is carried out and depreciated over the asset’s remaining life.

7.2 Asset management systems

Environment Waikato uses the Conquest II Asset Management System which holds information on the location of all assets, their components, condition, value, replacement costs, estimated replacement dates, outstanding or expected maintenance demands, past performance, and related financial funding issues.

Attributes stored within Conquest II are shown in Table 13:
### Table 13 Asset attributes in Conquest II system

<table>
<thead>
<tr>
<th>General description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership etc</td>
<td><strong>Status existing/proposed</strong></td>
</tr>
<tr>
<td>Valuation</td>
<td>Acquisition detail</td>
</tr>
<tr>
<td></td>
<td>Valuation detail</td>
</tr>
<tr>
<td></td>
<td>Depreciation detail</td>
</tr>
<tr>
<td></td>
<td>Replacement value</td>
</tr>
<tr>
<td></td>
<td>Expected life</td>
</tr>
<tr>
<td></td>
<td>Residual value</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
<tr>
<td>Inspection</td>
<td>Inspected by</td>
</tr>
<tr>
<td></td>
<td>Inspecting organisation</td>
</tr>
<tr>
<td></td>
<td>Inspection date</td>
</tr>
<tr>
<td></td>
<td>Follow up details</td>
</tr>
<tr>
<td>Priority parameters</td>
<td>Condition Summary</td>
</tr>
<tr>
<td></td>
<td>Risk level</td>
</tr>
<tr>
<td></td>
<td>Consequence of failure</td>
</tr>
<tr>
<td></td>
<td>Overall Quality</td>
</tr>
<tr>
<td></td>
<td>Maintenance Standard</td>
</tr>
<tr>
<td></td>
<td>Utilisation</td>
</tr>
<tr>
<td></td>
<td>Utilisation trend</td>
</tr>
<tr>
<td></td>
<td>Financial Class</td>
</tr>
<tr>
<td>Attribute sets</td>
<td>Condition detail</td>
</tr>
<tr>
<td></td>
<td>Weighting of Condition data</td>
</tr>
<tr>
<td></td>
<td>Dimension detail</td>
</tr>
<tr>
<td></td>
<td>Environment detail</td>
</tr>
<tr>
<td>User defined asset attributes</td>
<td>Text data</td>
</tr>
<tr>
<td></td>
<td>Numeric data</td>
</tr>
<tr>
<td></td>
<td>Date data</td>
</tr>
<tr>
<td></td>
<td>Check boxes</td>
</tr>
<tr>
<td></td>
<td>Lists</td>
</tr>
</tbody>
</table>

The system is currently used as a database for assets including condition grades and associated costs. Further development of the system includes works orders and linkages to the Asset Management GIS (Geographic Information System) layers. Currently, a project aiming at making all data available on the web through a web query system is being developed and is due for operation by March 2003.
7.3 Information flow requirements and processes

7.3.1 Key information flows

The Conquest II system is to be used for all key information flows. Currently, the system holds information on each asset and component including condition data, monitoring data, design data, service levels, valuation and depreciation, information. The system is used to produces reports and summaries for planning and budgeting purposes. The Conquest II system is due to be fully operational (not including links to GIS) by June 2003.

7.3.2 Renewals decision making using asset management data

The asset condition report produced every year ranks the scheme assets in terms of condition and performance grades. These are used to assess the need for maintenance, renewal and replacement works.

Based on the asset management data, the renewal works programme is prepared every year including stopbank topping, replacement/refurbishment of floodgates and pump stations components and de-silting of earth channels. The works are prioritised and works undertaken accordingly after obtaining the Council’s approval on the works programme.

7.3.3 Project prioritisation

In prioritisation of the works, the following criteria are applied:

a) Is there any risk to human life from keeping the asset in that condition? If yes, action immediately. If no, go to (b).

b) If the integrity of the structure is not maintained, what are the risks? If structural failure is likely to happen under design flood condition, then undertake remedial works before the flood season. These might be minor works designed to patch defects on the basis that further appropriate designed and planned works are undertaken. If no, plan the maintenance over the coming years. If many works are required and budgets do not allow, go to (c).

c) If a number of works are planned, then risks will be assessed on the basis of the area of land and assets protected, the condition of that structure and its ability to stand the design loads, and also the estimated costs of the remedial and/or renewal works.

Currently the decision making process involves consideration of the Conquest Asset Management system outputs. It is proposed to move towards an optimised decision making process which would take into account risk assessments and use the system to determine financial and risk consequences of decisions.

8 Plan improvement and monitoring

8.1 Performance measures

Effectiveness of the Plan is determined by reporting back against performance measures in financial and/or service delivery terms. Currently, performance is outcome based, including quality, cost and time for the management of all projects. The audits currently included within the works monitoring and management programmes include:

Structural Audits; These are undertaken for all floodgates and pump station assets on 10-yearly basis. The objective is to determine the capability of these asset or group of assets to meet their required design/performance standards.
Stopbanks Audit; Crest level surveys are undertaken for all stopbanks and dams on 5-yearly basis for stopbanks on peat or marine mud foundations, and 10-yearly basis for stopbanks on sand and clay foundations. These are to ensure that the flood retaining structures will stand floods up their design standards.

Channel Audits; Cross section surveys and hydraulic analysis are undertaken for the main rivers and tributaries to measure changes of riverbed morphology their impacts on the levels of protection offered by Scheme works. Where such changes are identified and considered significant re-evaluation of the Scheme’s hydraulic performance will be undertaken.

Procedural Audits; These include routine checks on the effectiveness of maintenance and management procedures, implementation of the asset management plan.

Flood Audits; These include checking performance of assets during floods and reviews emergency response procedures.

Financial Audits; These are undertaken annually by the Audit Department for all the scheme accounts, programmes to ensure that they are in line with the Asset Management Plans and comply with legal requirements and procedures.

8.2 Improvement programme

Studies and reports, which have so far been identified as needing to be carried out in order to improve the accuracy and confidence in the plan, are as follows;

♦ Development of the asset management information system including work order, financial interface and linkages to the GIS. It is proposed to complete this development by the financial year 2004/2005. The cost to the scheme will be approximately $30,000 per annum.

♦ Develop and adopt an asset management guidelines document for the management of natural and artificial (man made) channels. This is planned for the year 2003/2004 and will cost the scheme approximately $5,000.

♦ Review the asset management guidelines for managing all types of assets. These will be undertaken over the next five years and expected to cost $5,000 per annum.

♦ Research funding options for the disaster recovery and insurance scheme excess amount in order to build a reserve fund to manage the financial risks associated with disastrous events.

8.3 Monitoring and review procedures

The monitoring and review procedures include:

Annual Audit New Zealand Report on the AMP and the financial audits. Updates of the asset data within the asset management information system, especially through the re-valuation process every 3 years and structural audits and surveys as explained 8.1 above.

The next Asset Management Plan review will be undertaken in the year 2007/2008 and will incorporate an update of the information and development.
9 References


Waitoa River Flood Control, 1999, Montgomery Watson.


Environmental Assessment Report of the Piako River Scheme, Ghassan Basheer, Environment Waikato DOCS # 788115.