Waihou Valley Scheme Asset Management Plan

Draft

Volume 1

Prepared by:
Ghassan Basheer

For:
Environment Waikato
PO Box 4010
HAMILTON EAST

11 October 2002

Document #: 815971
Executive Summary

The Waihou Valley Scheme (WVS) is a comprehensive scheme providing flood control, river management and drainage improvements within the entire Waihou River and lower Thames Coast catchments. 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 WVS as well as other similar schemes. Environment Waikato has developed the original Asset Management Plan (AMP) of the WVS 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 developments within asset management of the WVS since 1997 includes:

- the preparation of asset management guidelines for the different types of assets,
- WVS differential rating system for funding the scheme works,
- development of the asset management accounting policies,
- latest asset valuations and condition and performance assessments,
- development of the asset management information systems,
- review of the current service levels
- extension of the services to meet the local communities demand for the services provided.

B. Assets Description
The WVS assets comprise approximately 176 km of stopbanks, 75 floodgates, 20 pump stations, 2272 hectares of scheme land and associated river, drainage and erosion control works covering 729 km of the rivers, major tributaries and drains. It also incorporates the extension of the river management services into the upper catchments, where soil conservation activities cover more than 9000 Ha of land, of which approximately 560 Ha is scheme land.

The scheme assets are designed to protect land from tidal flooding in the Firth of Thames, flooding of the Waihou, Ohinemuri and Thames Coast rivers, 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. An effective minimum of a 100-year level of protection to rural and urban areas from flood flows in major rivers.

ii. An effective minimum 100-year level of protection from high tides to all areas adjacent to the estuarine/tidal portion of the river system.

iii. Gravity and/or pump assisted outlets to the major rivers and tributaries capable of adequately handling runoff resulting from a 10-year return period storm, (or appropriate combination of climatic conditions) for rural sub-catchments and a 50-year return period storm for significant urban areas.

iv. Effective catchment, river and stream management to ensure the stability of rivers and tributary streams channels are maintained.

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 existing service level of the scheme, confirmation of the level of service provided by the scheme pumps in Paeroa, and to upgrade the level of protection of the Tararu Stream in Thames to a higher standard.

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 $XX with an accumulated depreciation of $XX. 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 $2,650,665 per annum (including catchment and river management costs) and the renewal costs to be $1,040,113 per annum. The total funding requirements for the asset management of the scheme is found to be $3,484,820 per annum on average (including funding of new capital projects) for the period 2003 – 2014. However, this will vary and is expected to increase with increased inflation and as significant renewal works become due in the medium – long term.

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 aspects 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
Chapter 7 outlines the practices that are employed in managing the assets within the WVS, including the accounting and financial systems and requirements and the information system (Conquest II) used for monitoring and managing specific assets and planning associated work. The Conquest II system has recently been upgraded and improved to provide links to financial and geographical information systems to provide a more integrated management tool.

H. Monitoring and Improvement Programme
Chapter 8 describes the range of performance monitoring, measurement and review systems that are implemented to ensure maintenance of the require levels of service within the WVS. Specific improvements to the management process are identified, programmed and cost-estimated.
Table of Contents

EXECUTIVE SUMMARY 1

1 INTRODUCTION 1

2 BACKGROUND 3
2.1 Purpose of the Plan 3
2.1.1 Relationship with other documents 3
2.1.2 Organisational structure 4
2.1.3 Reasons for scheme ownership and legislative requirements 5
2.1.4 Corporate mission, goals and objectives 6
2.1.5 Preparation approach of this asset management plan 6
2.2 Scope of the scheme 7
2.2.1 Scope of the scheme 7
2.2.2 Assets covered 8
2.2.3 Key stakeholders 8

3 LEVELS OF SERVICE 9
3.1 Customer expectations 9
3.1.1 Customer liaison group 10
3.2 Current and desired levels of service 10
3.2.1 Current level of service 10
3.2.2 Service level review 13
3.2.3 Desired level of service 14

4 FUTURE DEMAND 15
4.1 Demand forecast 15
4.2 Changes in technology 15
4.3 Demand management plan 16

5 LIFECYCLE MANAGEMENT PLAN 17
5.1 Background data 17
5.1.1 Physical parameters 17
5.1.2 Asset condition and performance 17
5.1.3 Scheme environmental condition and performance 20
5.1.4 Asset condition and performance monitoring 22
5.1.5 Waihou scheme property management 22
5.1.6 Asset valuations 23
5.1.7 Historical data 24
5.2 Scheme maintenance plan 24
5.2.1 Scheme management 24
5.2.2 Maintenance plan 25
5.2.3 Standards and specifications 26
5.2.4 Summary of future maintenance costs 27
5.3 Renewal/replacement plan 28
5.3.1 Renewal plan 28
5.3.2 Renewal standards 29
5.3.3 Summary of future renewal costs 30
5.3.4 Total scheme costs 32
5.4 Risk management 32
5.4.1 Emergency response 32
5.4.2 Insurance and disaster recovery 33
5.5 Creation / acquisition plan 33
5.5.1 Selection criteria 34
5.5.2 Standards and specifications 34
5.5.3 New capital works costs 34  
5.6 Disposal plan 34  

6 FINANCIAL SUMMARY 35  
6.1 Financial statements and projections 35  
6.2 Financial projections 35  
6.3 Funding strategy 36  

7 ASSET MANAGEMENT PRACTICES 38  
7.1 Accounting/financial systems 38  
7.1.1 Accounting treatment 38  
7.1.2 Expenditure definitions 38  
7.2 Asset management systems 39  
7.3 Information flow requirements and processes 40  
7.3.1 Key information flows 40  
7.3.2 Renewals decision making using asset management data 40  
7.3.3 Project prioritisation 40  

8 PLAN IMPROVEMENT AND MONITORING 41  
8.1 Performance measures 41  
8.2 Improvement programme 41  
8.3 Monitoring and review procedures 42  

9 REFERENCES 43  

Tables  
Table 1 Key documents forming part of this Plan 4  
Table 2 Summary of assets within each Scheme Management Reach 11  
Table 3 Summary of condition survey results 2002/2003 19  
Table 4 Summary of asset management monitoring activities 22  
  Table 5 Asset replacement values 23  
Table 6 Summary of asset management maintenance activities 26  
Table 7 Average annual monitoring and maintenance costs 27  
Table 8 Summary of asset management renewal and replacement activities – c.f. Assumptions overleaf 28  
Table 9 Proposed renewal programme 29  
Table 10 Replacement / renewal cost estimate assumptions 30  
Table 11 Summary of projected revenue and expenditure 35  
Table 12 Projected reserves position 36  
Table 13 Asset attributes in Conquest II system 39  

Figures  
Figure 1 Waihou Catchment Plan 2  
Figure 2 Organisational structure 5  
Figure 3 Scheme management reaches 12  
Figure 4 Predicted scheme maintenance costs 2003/04 – 2014/15 28  
Figure 5 Predicted renewal costs (based on life cycle) 2003 - 2102 31  
Figure 6 Planned renewal programme (smoothed) 2003 - 2102 31  
Figure 7 Lifecycle predicted renewal costs 2003 - 2013 31  
Figure 8 Predicted scheme total costs 32  
Figure 9 Targeted Revenues by Classification 37
1 Introduction

The Waihou Valley Scheme is a comprehensive catchment and river management scheme, covering a total catchment area of 214,497 ha (including the Thames catchment of 17,680 ha). The scheme is designed to provide drainage improvements and flood protection to 40,000 ha of flood prone land in the lower Thames Valley / Hauraki Plains area and to provide erosion control, significant watershed protection / retirement and soil conservation measures throughout the total catchments.

Environment Waikato (EW) is responsible for the management and maintenance of the Waihou Valley 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 Waihou Valley Scheme design report was completed in 1965. Construction of works began in 1971 and was officially completed in 1995 at a cost of approximately $174 million in today's terms (September 2002 costs - CCI 4400). The completed Scheme works comprise about 176 km of stopbanks, channel excavation, 75 floodgates, 20 pump stations and soil conservation works covering more than 500 hectares of planting on scheme land and over 4,300 Ha over the whole catchment, and approximately 400 km of different types of fencing.

Environment Waikato manages the Scheme in accordance with the provisions of the Asset Management Plan for the Waihou Valley Scheme, which was initially adopted by Council in August 1997, after extensive public consultation. The Audit Office requires Local Authorities to review the Asset Management Plans at a minimum of five yearly intervals. In addition, the Local Government Amendment Act 2002, requires that Asset Management Plans be updated to reflect the Community Outcomes achieved by the levels of service provided by Local Authorities.

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

- Update of the plan information, confirmation of the current levels of service, costs of the service and funding requirements.
- Inclusion of all developments in relation to asset management policies and practices, which have occurred over the last five years.
- Identification of future funding requirements for asset management of the scheme.

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 and performance assessment of the assets, 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 Waihou 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 Waihou 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 Waihou Valley Scheme, within a single document.

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 of the developments and changes which have been undertaken in asset management practices since the plan was adopted in 1997.

- Review the service levels and costs of the operation, maintenance, management and renewal of the components of the Waihou Valley Scheme to 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 2003- 2004</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>
<td>EW - Asset Management</td>
</tr>
<tr>
<td>Environment Waikato: Pump Station Management Guidelines</td>
<td>Generic management of the pump stations</td>
<td>EW - Asset Management</td>
</tr>
<tr>
<td>Environment Waikato: Asset Condition and Performance Report, 2002/03</td>
<td>Results of asset condition and performance studies</td>
<td>EW- Asset Management</td>
</tr>
<tr>
<td>Opus International Consultants Ltd: Valuation of Infrastructural Assets, Environment Waikato</td>
<td>Valuation methodology and results for flood protection schemes.</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 Waihou Valley Scheme assets. The group consults with the Waihou Valley Scheme Liaison Subcommittee and reports to the Waikato Regional Council’s Operations Committee. Management is undertaken through two units, which are the Rivers and Drainage Technical Services Unit and the Operations 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 Waihou Valley 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 Waihou Valley Scheme under the following Acts and Agreements of Parliament:

- Soil Conservation and Rivers Control Act, 1941
- Land Drainage Act, 1908
- Local Government Act, 2002
- 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 Waihou Valley 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 Waihou Valley 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 Waihou Valley Scheme Asset Management Plan (EW, August 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 Waikou Valley Scheme is an integrated catchment and flood protection Scheme comprising stopbanks, floodway and flood storage ponding zones, drainage outlets, pump stations, channel enlargement and clearance works and soil conservation works. The Waikou River and its major tributary the Ohinemuri River have a combined catchment area of approximately 200,000-Ha (Figure 1). The catchment is divided into five zones, namely the Plains Zone, Middle zone, Southern Zone, Mountain zone and Urban Areas.

1. Plains Zone
   Main river and tributaries between the sea and Te Aroha. In this zone the main works have been the stopbanks and drainage improvements. This is where the bulk of the benefits have accrued and expenditure has occurred. The land use is predominantly dairy farming and the area suffered from severe flooding prior to the Scheme.

2. Middle Zone
   Between Te Aroha and Okauia Springs. In this zone the main works have been the clearing of all the streams of willows and other vegetation to improve the flow of water and give minor drainage improvements. The area has also been replanted with more suitable species and access improved. The predominant land use is still dairying. There was little flooding in this zone from main river channel prior to the scheme as the river is confined in a relatively narrow channel and flood plain. There were some problems with erosion and stability of the tributary streams at the base of the Kaimai Range. These tributaries cause severe local flooding from time to time.

3. Southern Zone
   Between Okauia Springs and Putaruru. In this zone the main works have been the planting and stabilisation of all the streams in the erodible soils in the zone. This land has the capability to produce large quantities of sediment in the main river if erosion gets out of control. Historically, drystock farming was widespread in this area however the predominant land use is now dairying. The main problems have been the erosion of the streams in the zone although the main effect of this has been the accretion of the stream bed levels in the lower reaches.

4. Mountain Zone
   The eastern boundary of the Scheme is formed by the mountains of the Coromandel and Kaimai Ranges, and the Mamaku Plateau. In this zone the main works have been fencing to maintain and enhance watershed protection forest in the upper catchment areas and to promote changes in land use from marginal grazing to forestry or indigenous regeneration, where appropriate. Regional land use controls, which require consents for the clearance of indigenous vegetation, are assisting in the maintenance of the current area of watershed protection forest. The main problems in this zone have been the level of sediment and debris that is produced during severe storm events and the control of feral animal pests.

5. Urban Areas
   The Scheme provides protection to urban areas throughout the catchments including Paeroa, Thames and Te Aroha. The main streams of Thames and Te Aroha have had their flood capacities upgraded to generally provide protection to the 50 year return period level. These works were a change of scope from the original works required.
These five areas are all interrelated and each has its own distinctive character in terms of land use, benefits and flooding.

2.2.2 Assets covered

This Plan covers those assets and works that make up the Waihou Valley 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 176 km).

Reinforced concrete, steel and timber structures such as floodgates, pump stations, debris control structures and concrete channels (including 75 floodgates and 20 pump stations).

Waterways and river channels involving excavations, gradient control and erosion control structures, plantings and fencing. (Approximately 729 km of rivers, tributary streams, and artificial channels).

2000 hectares of Crown Land associated with the Waihou Valley 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.

Soil conservation works including approximately 400 km of fencing, 213 ha of willow and poplar planting, 564 ha of protection / production forestry, 10 major erosion control structures, 50 minor erosion control structures and 90 gully stabilisation works within the Hinuera pumice sands in the Matamata area.

- Catchment and River Management, including oversight and consistent maintenance and management of upper catchment streams and rivers comprising an area in excess of 4,300 Ha.

2.2.3 Key stakeholders

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

The key stakeholders for the Waihou Valley Scheme are as follows:

i 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, especially the Hauraki Maori Trust Board.

ii Territorial Local Authorities (Hauraki District Council, Thames District Council and Matamata Piako District Council).

iii Other Departments and interest groups such as (DoC, Transit NZ, Fish and Game, etc.).

iv Environment Waikato Regional Council (EWRC).

v Audit Department.
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, and to manage water tables to ensure the productivity of the land. The scheme area is prone to flooding from three different sources, which are:

- The sea
- The major rivers (Waihou, Ohinemuri and Thames Rivers) and their tributaries
- Runoff from local catchments.

The scheme works provide flood protection by three integrated mechanisms:

- 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 tide and river floods.
- A system of floodgated drainage outlets and pump stations to discharge runoff from local catchments into the flood-way during and after flood events.
- Soil conservation planting and erosion control works, which aim at stabilising upper tributary channels and catchments, thereby reducing the amount of runoff and sediment input into the main floodway 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. Similarly, the implications of unstable catchments include increased runoff, stream bank erosion and in-filling of stream and river channels, which increases flow peaks and reduces channel capacities and ultimately cause higher flood levels.

Description of the service levels is provided in more detail in section 3.2 below.

The level of service that the scheme is required to provide is not fixed indefinitely 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 WVS was designed in 1965 and reviewed in 1984. 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 Waihou Valley 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. The staff of Environment Waikato carries out consultation and liaison with landowners, 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 Waihou Valley 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 current service levels are summarised as follows:

a) An effective minimum of a 100-year level of protection to rural and urban areas from flood flows in major rivers.

b) Gravity and / or pump assisted outlets to the major rivers and tributaries capable of adequately handling runoff resulting from a 10-year return period storm, (or appropriate combination of climatic conditions) for rural sub-catchments and a 50-year return period storm for significant urban areas.

c) An effective minimum 100-year level of protection from high tides to all areas adjacent to the estuarine/tidal portion of the river system.

d) Effective catchment, river and stream management to ensure the stability of rivers and tributary streams channels are maintained.
The WVS assets are grouped within six management reaches to ensure consistency of the service level provided and for ease of management. These reaches are:

I. Kauaeranga River and Thames
II. Waihou River Mouth to Confluence (Ohinemuri River Confluence)
III. Ohinemuri River and Paeroa
IV. Waihou River Confluence to Te Aroha
V. Waihou River Te Aroha to Okauia
VI. Waihou River Okauia South

The assets included within each reach are shown in Table 2 below.

Table 2 Summary of assets within each Scheme Management Reach

<table>
<thead>
<tr>
<th>Reach</th>
<th>Asset Group</th>
<th>Quantity</th>
<th>Service Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kauaeranga River and Thames</td>
<td>Stopbanks</td>
<td>5,930 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spillway</td>
<td>750 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floodgates</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural Channel</td>
<td>26,000 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artificial Channel</td>
<td>400 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>38 km</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>51 ha</td>
<td>Plantings, vegetation and erosion control works</td>
</tr>
<tr>
<td>Mount to Confluence</td>
<td>Stopbanks</td>
<td>115,650 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spillway</td>
<td>1,570 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Detention Dams</td>
<td>665 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floodgates</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural Channel</td>
<td>138,550 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>57,425 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>218 ha</td>
<td>Plantings, vegetation and erosion control works</td>
</tr>
<tr>
<td>Ohinemuri River</td>
<td>Stopbanks</td>
<td>16,170 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floodgates</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural Channel</td>
<td>142,500 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artificial Channel</td>
<td>3,900 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>102,139 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>13 ha</td>
<td>Plantings, vegetation and erosion control works</td>
</tr>
<tr>
<td>Confluence to Te Aroha</td>
<td>Stopbanks</td>
<td>36,000 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floodgates</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pump Stations</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural Channel</td>
<td>61,700 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>26,200 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>24 ha</td>
<td>Plantings, vegetation and erosion control works</td>
</tr>
<tr>
<td>Te Aroha to Okauia</td>
<td>Stopbanks</td>
<td>50 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural Channel</td>
<td>133,300 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>94,694 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>Plantings, vegetation and erosion control works</td>
<td></td>
</tr>
<tr>
<td>Okauia South</td>
<td>Natural Channel</td>
<td>222,900 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fences</td>
<td>68,700 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil conservation</td>
<td>254 ha</td>
<td>Plantings, vegetation and erosion control works</td>
</tr>
</tbody>
</table>

Note: Soil conservation assets and fences listed above represent these assets on the AMIS (Conquest II). The actual quantities are more than the above and further work is being undertaken to update the information system and locate the assets. (Refer to document number (809998). This update is part of the Plan Improvement (Chapter 8) of this Plan Review.

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

The design parameters and service levels of the flood-ways were reviewed in 1995 (Royds Consulting, Waihou Valley Scheme End of Scheme Review, August 1995). The independent review of the WVS confirmed that the scheme design levels of service would be provided by the assets built. The review included recommendations to complete construction of certain stopbanks, and these have completed over the last seven years. A full review of the scheme design is not required at this stage as the scheme has been monitored and maintained to the specified standards. This was confirmed by the performance of the scheme during the July 1998 flood event and other events over the last 5 years. Certain aspects of the scheme have been under review, especially the Tararu stream in Thames, Paeroa pumps and re-powering of significant pump stations. The Scheme assets and works currently provide five integrated levels of service as follows:

Tidal protection level of service: The scheme includes stopbanks along the foreshores of the Firth of Thames designed to protect land against inundation from the sea. These stopbanks join with the Piako foreshore banks protecting land within both catchments. The service level is defined in terms of (AEP, or Annual Exceedence 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 sea level with an annual probability of less than (1% AEP) is 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 the 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 Waihou and Ohinemuri Rivers and tributaries. Flood-ways are designed to accommodate flood flows to defined levels generated by specified rainfall events 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 Exceedence Probabilities) 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 10% (10-year event) to an AEP of 1% (100-year event). It should be noted that all stopbanks on the main stem of the Waihou River within the tidal reach provide flood protection against the high sea tide up to an AEP of 1% (100-year). The stopbanks are designed with freeboard heights of 900 mm along the main channels and lower reaches of the tributaries, and 600 mm along the tributaries above the influence of the main channels, except for those designed to be overtopped diverting floods into the ponding area of the Hikutaia.

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 and 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 of the Waihou 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. The 10-year rainfall event is based on a rainfall depth of 38 mm/day over the catchments of the floodgate.
**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 of 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 depth of 19 mm/day over the catchments of the pump station on the left bank (West) of the Waihou, and 25 mm/day on the right bank (East), where there are significant hill catchment areas. A higher level of service is provided by pumps serving urban areas, which are designed to pump a 50 year event. It should be noted that the original design did not specify the extent and period of ponding within urban areas. This has been investigated for the Paeroa Township and service level options are being considered by the community.

**Catchment and river management:** Catchment and river management services, within the WVS are aimed at ensuring stream channels and catchment stability are intact. This in turn reduces peak runoff rates, enhance local drainage, reduce erosion and enhance water quality. The soil conservation assets including block plantings, riparian planting, Hinuera gullies stabilisation works, fencing and other erosion protection works and structures are spread throughout the whole catchment.

### 3.2.3 Desired level of service

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

- To retain the existing service levels provided by the scheme.
- Confirmation of the level of service provided by the scheme pumps in Paeroa.
- Upgrading the level of protection of the Tararu Stream in Thames to a higher standard.
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 Waihou Valley 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 changes in weather patterns, changes of land use and the 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, and changes in the use of the land from predominantly dairy to other forms of production. More frequent inundation that might arise from changing weather patterns may also impact on the demands on the scheme. These changes will need to be reflected in the management of the scheme assets and the AMP. The current demand includes the following:

- Over the last two years, a number of events have caused flooding and damage to property within the lower Tararu reach. The Tararu stream is designed to provide a 10-year protection within the channel, however the community is requesting this level be reviewed and upgraded.

- The Paeroa drain flood pumps were designed for a 50 year event with some ponding. Parts of the ponding areas have been developed over the years reducing the ponding areas and thus increasing water levels. Also, no standby pumps were provided for situations when pumps are under repair. A review of the level of service and its reliability is currently under consideration.

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. Other factors, 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 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 the 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 Waihou Scheme is divided into six reaches, each including assets groups acting together to provide the design levels of service. These were outlined by reach 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 Waihou Valley Scheme, assets components and parameters are held on the Asset Management Information System (Conquest II) at the Hamilton Office of Environment Waikato. Within this database is information on the assets age, location and other specific classes of information (Physical and Financial).

In general the scheme assets comprise:

- 177 km of stopbanks
- 729 km of river, natural stream and artificial channels.
- 75 Floodgate structures
- 20 Pump stations
- 2272 hectares of scheme land.
- Approximately 560 Ha of soil conservation planting, fencing and erosion protection structures on scheme land.

5.1.2 Asset condition and performance

The Asset Management Guideline Documents set out the monitoring and maintenance requirements for different types of asset, and include requirements for condition and performance assessments, under which assets are assessed, as outlined below (Sections 5.1.2.1 and 5.1.2.2), and graded for condition and performance.
5.1.2.1 Asset performance

The 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 have 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 grade is calculated for each asset, with any deficiencies noted for inclusion in the maintenance programme of the year following the inspection. The performance grade is measured using the following scale:

1) Near new condition
2) Normal maintenance required
3) Backlog maintenance required
4) Major renewal required
5) Asset unserviceable

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. 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.

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 condition grade is measured using the following scale:

1) Near new condition
2) Normal maintenance required
3) Backlog maintenance required
4) Major renewal required
5) Asset unserviceable
Assets that have a condition rating of 4 or 5 are identified as requiring urgent attention to ensure a reliable level of service can be provided by them.

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 further investigations and works are proposed to rectify these.

5.1.2.3 **Current assets condition and performance**

The 2002/03 Asset Condition and Performance (ACP) Report summarises the performance of the stopbanks, channels and structures of the Scheme. The report is based on condition and performance assessments undertaken as described above.

Table 3 below provides a summary of the condition assessment results of all the Scheme assets, as per the 2002/03 ACP report.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Condition Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Stopbanks/Spillways</td>
<td>41%</td>
</tr>
<tr>
<td>Detention Structures</td>
<td>82%</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>15%</td>
</tr>
<tr>
<td>Floodgates</td>
<td>5%</td>
</tr>
<tr>
<td>Channels</td>
<td>10%</td>
</tr>
<tr>
<td>Other Structures</td>
<td>16%</td>
</tr>
</tbody>
</table>

The table shows that most stopbanks are in good and near new condition, although a small number have been identified as being in need of renewal. Detention structures are mostly in near new condition, while channels vary between good and fair condition (i.e. condition grade 2 to 3). Pump stations, floodgates and other structures are mostly in good condition.

The crest level survey undertaken in 2002 showed that nearly 2 km of stopbanks within the scheme are close to, or below, the design flood level, i.e., the stopbank has lost at least 75% of the design freeboard height. Such stopbanks, which have been assigned conditions 4 & 5, require topping-up.

The structures audit programme facilitated the detailed inspection of 30 floodgates within the WVS in the year up to the 2002/03 ACP Report. Based on this inspection it was concluded that the scheme is in above average condition. None of the structures inspected were in need of major renewal works, with only minor structural and mechanical work required to maintain the acceptable standards.

Overall, the performance of WVS assets is ranked as being of high level. To ensure the continued functioning of the assets, the normal operation and maintenance programmes are to be continued in the future.

5.1.2.4 **Recommended Works**

The **(majority of the?)** stopbanks that were found to have lost the acceptable minimum freeboard height have been topped up since the production of the 2002/03 ACP Report as part of an emergency maintenance program. These include the Onetai
There is no outstanding work arising from the Report. OR Outstanding work arising from the Report includes: XXXX

5.1.3 Scheme environmental condition and performance

Environment Waikato has undertaken an assessment of the existing Waihou Valley 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, this is largely attributed to the protection offered by the scheme works, and hence to the scheme itself.

5.1.3.1 Scheme environmental effects

The Waihou catchment has been drained and significantly modified over more than 100 years. The scheme has contributed to this modification since the late 1960’s. The report identifies the existing key natural features of the catchment ecosystem including the following:

- Freshwater wetlands
- Kahikatea forest fragments
- Totara forest fragments
- Kaimai Range – western face
- Mamamku Plateau – western face and headwaters
- Firth of Thames
- Waihou River Fishery

The Waihou Valley Scheme has recognised the importance ecosystem through the following works:

- Undertaking extensive soil conservation, erosion control and riparian planting within the upper catchments of the tributary streams and gullies of the Waihou River.
- Fencing, planting retirement of scheme land adjoining the Waihou River.
- Fencing the margins of the estuaries of the Firth of Thames within the scheme works areas.
- Using hanging flap gates with long hanger bars for all floodgate structures, which allow fish passage most of the times.
- Continuous management and maintenance of all the works above and progressive extension of fencing and planting programmes to cover more stream banks and margins.

However, the scheme is recognised as a contributor to the overall degradation of the ecosystem due to land development. These effects include:

- Effects on water quality by the scheme works.
• Degradation of habitat values as a result of deterioration of water quality and vegetation clearance within floodways (land strips adjacent to riverbanks), and associated drainage and catchment areas.

• Regular maintenance and monitoring of the floodgates to maintain fish passage.

• Change in habitats and biological communities over time as a result of sedimentation and other human induced impacts.

5.1.3.2 Current practices and mitigation measures

As part of the Waihou Scheme Programme, 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 the scheme activities are avoided, remedied or mitigated. The following measures are currently undertaken:

• The continuous maintenance and management of the Waihou soil conservation works is a significant contribution in the stability of the catchment and its waterways and ultimately improved water quality and habitat.

• 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, environmental impacts are mitigated and/or minimised, and other factors such as oil spills are avoided.

• Fencing and planting of waterway margins within scheme land is currently underway, and the scheme properties rental income is mainly used for this project over the next five years.

• Reintroducing and planting flax along the river.

• The scheme has fenced all the mangrove areas along the scheme works.

• Promoting fencing and planting of stream banks within the Waihou River Catchment. These works result in reduction of erosion, suspended sediments and aggradation of watercourses. It also protects the riparian margins, resulting in 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 ecosystem in its design. The scheme is also progressively improving its management processes and work methods with the objective of minimising the ongoing environmental effects.

However, the catchment and river is highly modified and in many areas is significantly degraded. The WVS has a role in the present situation, and there are opportunities for improvement that can be achieved. Generally, a number of improvements can be achieved without compromising the performance and services provided by the scheme.

Environmental improvements generally take place over a long period of time. It is anticipated that with the application of the Environmental Guidelines and following best practice, the overall catchment environment can be further improved and/or enhanced.

It is proposed that regular assessment of the environmental performance of the scheme be undertaken, in addition to applying best practice as provided in the Environmental Guidelines document and Operational Practice Guidelines currently being developed. Specific measures and initiatives have been recommended and adopted for the WVS, and are outlined in the assessment provided in Appendix I.

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><strong>Stopbanks</strong></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><strong>Floodgates</strong></td>
<td>Condition Survey</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>Structure Audit</td>
<td>10 years</td>
</tr>
<tr>
<td><strong>Pump Stations</strong></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><strong>Channels</strong></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><strong>Catchment Services</strong></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 **Waihou scheme property management**

The total area of land acquired for the Scheme is approximately 2272 hectares, which is partly owned by the Crown and the balance by Environment Waikato. The fair market value of that land as at 1 July 2001 is estimated to be approximately $7.5 million. It is estimated that it would cost approximately $42.9 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. 174 licences are issued (as at January 2003), covering approximately 1510 hectares, with a licence fee income of approximately $297,000 for the year commencing 1 June 2003. Five-year licences are issued, all
expiring 31 May 2005, and licence fees are reviewable annually on 1 June. Under the terms of the standard licences, rates are payable by Environment Waikato and licensees are responsible for weed control, fertiliser application, most fence maintenance and supply of water. A few special licences are issued, containing some appropriate non-standard conditions, where necessary for particular circumstances.

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.

Two areas of Scheme land (Kuaoiti and Ryans Block) are planted and managed for production woodlots. Management costs are met from the Waihou Valley Scheme Property Management account and proceeds from harvesting will be returned to the Scheme.

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. Revaluations are undertaken every three years on the basis of Depreciated Replacement Cost (DRC). The initial valuation was undertaken as at 1 July 1998.

An asset valuation is undertaken on behalf of the Environment Waikato Regional Council every three years. The most recent 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 were the most up-to-date values available during the preparation of this Plan, and have been reproduced in Table 5 below. Values for this table will need to be extracted from above report – Hardcopy only – location unknown

<table>
<thead>
<tr>
<th>Table 5 Asset replacement values</th>
</tr>
</thead>
<tbody>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Stopbanks</td>
</tr>
<tr>
<td>Channels</td>
</tr>
<tr>
<td>Floodgates</td>
</tr>
<tr>
<td>Pump Stations</td>
</tr>
</tbody>
</table>
5.1.6.2 Valuation method

The valuation methodology used 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, topsoiling, fencing, royalties to landowners, design and construction supervision and administration.

The replacement value for all parcels of land owned by the EWRC for the Waihou Valley 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 2272 hectares and the market value as at July 2001 is estimated to be approximately $7.5 million. Please refer to the Infrastructural Assets Accounting Policies Guidelines within Appendix XX.

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 have been based on the recommendations within the International Infrastructure Management Manual 2000, 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 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, plus any planned and unplanned works.

- 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 (ripar, 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>
</tbody>
</table>
| Floodgates        | Outlet Channel de-silting by boat-pump or digger                            | As required(**)
|                   | Operational Reliability Inspection                                          | 3-4 Weeks (*) |
|                   | Weed control for outlet channel and structure                                | 6 Monthly |
|                   | General maintenance includes lubrication of the flaps and lifting gear, and minor replacements. | Yearly |

(*) 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. Most floodgates within the Waikou Valley Scheme need to be de-silted only once to four times a year, although this can increase up to 12 times a year in the Lower Waikou, while those in the upper reaches require de-silting only once every two or five 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)
- Environment Waikato Channel Management Guidelines (EW, 200X)

These reports are located at the Hamilton and Paeroa Offices of Environment Waikato.

A Channel Management Guideline document is not currently available. The channel maintenance programme is therefore 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 Waihou Valley Scheme since its construction. Table 7 provides the annualised maintenance costs of the different components of the Scheme. These are based on the long-term projected scheme works requirements.

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>176 km</td>
<td>Condition survey (yearly)</td>
<td>$19,398.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crest Level survey (5-10 years)</td>
<td>$12,098.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (10 years)</td>
<td>$16,342.16</td>
</tr>
<tr>
<td>Main Channels</td>
<td>154 km</td>
<td>Condition Survey yearly</td>
<td>$25,518.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X-Section Survey (10 years)</td>
<td>$9,725.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance</td>
<td>$66,059.60</td>
</tr>
<tr>
<td>Tributary Channels</td>
<td></td>
<td>Condition Survey yearly</td>
<td>$61,622.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X-Section Survey (10 years)</td>
<td>$31,447.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance</td>
<td>$164,979.22</td>
</tr>
<tr>
<td>Floodgates</td>
<td>75</td>
<td>Condition Survey (yearly)</td>
<td>$2,089.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structures Audit (10 years)</td>
<td>$4,448.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Inspections (2-3 weeks)</td>
<td>$59,216.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outlet Channel De-silting (as required)</td>
<td>$39,397.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vegetation Control (spray) (6 months)</td>
<td>$5,832.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (yearly)</td>
<td>$10,508.93</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>20</td>
<td>Condition Survey (yearly)</td>
<td>$678.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structures Audit (10 years)</td>
<td>$1,596.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Inspections (3-4 weeks)</td>
<td>$28,895.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (yearly)</td>
<td>$12,407.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ultrasonic Check (2 years)</td>
<td>$3,389.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Submerged parts Inspection (2-5 years)</td>
<td>$5,128.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Charges</td>
<td>$300,000.00</td>
</tr>
<tr>
<td>Property</td>
<td></td>
<td>Property Management</td>
<td>$30,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property Rates</td>
<td>$60,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property Maintenance</td>
<td>$135,000.00</td>
</tr>
<tr>
<td>Catchment Services</td>
<td></td>
<td>Management</td>
<td>$192,249.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring</td>
<td>$51,250.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Works</td>
<td>$436,996.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Maintenance (blockage removal and erosion control)</td>
<td>$59,549.48</td>
</tr>
<tr>
<td>Management</td>
<td>Scheme</td>
<td>General Management and Planning</td>
<td>$104,326.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer Services</td>
<td>$32,961.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liaison Subcommittee Reporting</td>
<td>$25,148.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operations Committee Reporting</td>
<td>$56,336.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Maintenance</td>
<td>$18,959.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Condition and Performance Reports</td>
<td>$6,635.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigations and Design</td>
<td>$25,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AMP Reviews</td>
<td>$10,471.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asset valuations</td>
<td>$3,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AM Development (Special Projects)</td>
<td>$50,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others (Accommodation, Communication and Electronic Documentation)</td>
<td>$64,000.00</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Scheme</td>
<td>Disaster Recovery Insurance</td>
<td>$71,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Telemetry Warning Systems</td>
<td>$25,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency Response</td>
<td>$130,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scheme Reserves</td>
<td>$42,000.00</td>
</tr>
<tr>
<td>Finance</td>
<td>Scheme</td>
<td>Rates Collection</td>
<td>$140,000.00</td>
</tr>
<tr>
<td>Total Scheme</td>
<td></td>
<td></td>
<td>$2,650,664.58</td>
</tr>
</tbody>
</table>
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 Waihou Valley 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>5 Years</td>
</tr>
<tr>
<td>Natural Channel</td>
<td>Channel excavation (Desilting)</td>
<td>10 Years</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Pipes and inlet / outlet structures</td>
<td>80 years (1)</td>
</tr>
<tr>
<td></td>
<td>Components (flaps, winches, lifting gear)</td>
<td>20 years</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Minor electrical components replacement</td>
<td>2 years</td>
</tr>
<tr>
<td></td>
<td>Replace/refurbish weed-screens and switchboards</td>
<td>20 years</td>
</tr>
<tr>
<td></td>
<td>Pumps overhaul and refurbishment</td>
<td>25 years</td>
</tr>
<tr>
<td></td>
<td>Pumps, motors</td>
<td>50 years</td>
</tr>
<tr>
<td></td>
<td>Pipes and inlet / outlet structures</td>
<td>80 years (1)</td>
</tr>
<tr>
<td></td>
<td>Pump buildings</td>
<td>100 years</td>
</tr>
</tbody>
</table>

Note (1): Inlet / outlet structures have a renewal lifecycle of 100-years, but must be replaced at the same time as the pipes for practical reasons.
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></td>
<td></td>
</tr>
<tr>
<td>Embankments</td>
<td>Clay foundation</td>
<td>Topping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channels</td>
<td>Earth Channel</td>
<td>Desilting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channels</td>
<td>Natural</td>
<td>Desilting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floodgate Valves</td>
<td>Flaps and lifting Gear</td>
<td>Replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipes and Structures</td>
<td>All Types</td>
<td>Replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumps</td>
<td>All Types</td>
<td>Overhaul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switchboards</td>
<td>All Types</td>
<td>Replace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumps &amp; Motors</td>
<td>All Types</td>
<td>Replace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screens</td>
<td>All Types</td>
<td>Replace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structures and Pipes</td>
<td>All Types</td>
<td>Replace</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above programme is based on the renewal cycles in Table 8, the construction date of the assets, and previous renewal activities.

5.3.2 Renewal standards

Renewal of embankments includes topping the stopbanks to their design crest level, which is equal to the design flood level plus a freeboard. Embankment renewal works are undertaken when they have settled to the point that they have lost more than three-quarters (75 percent) 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 currently valued as assets, 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 20 years, while the life cycle (replacement periods) of the inlet / outlet structures and the pipes are assumed to be approximately 80 years. The structures are estimated to have a life of 100-years, but renewal has been assumed to coincide with that of the pipes 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. For the same reasons as given above, the inlet and outlet structures will be replaced at the same time as the pipes.

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</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>$72,694.00</td>
<td>15</td>
<td>38.95</td>
<td>$2,831,431.30</td>
<td>$188,762.09</td>
</tr>
<tr>
<td>Embankment</td>
<td>Clay and Sand Foundation</td>
<td>1 km</td>
<td>$72,694.00</td>
<td>30</td>
<td>136.39</td>
<td>$9,914,829.16</td>
<td>$330,494.31</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Flaps and Lifting Gear</td>
<td>1 unit</td>
<td>$6,600.00</td>
<td>20</td>
<td>242</td>
<td>$1,597,200.00</td>
<td>$79,860.00</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Pipes and Inlets / Outlets</td>
<td>1 unit</td>
<td>$90,000.00</td>
<td>80</td>
<td>75</td>
<td>$6,660,000.00</td>
<td>$84,375.00</td>
</tr>
<tr>
<td>Floodgates</td>
<td>Wing Walls</td>
<td>1 unit</td>
<td>$30,000.00</td>
<td>80</td>
<td>150</td>
<td>$4,440,000.00</td>
<td>$56,250.00</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Screens</td>
<td>1 unit</td>
<td>$7,168.80</td>
<td>20</td>
<td>27</td>
<td>$193,557.60</td>
<td>$9,677.88</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Switchboards</td>
<td>1 unit</td>
<td>$32,588.76</td>
<td>20</td>
<td>20</td>
<td>$651,775.20</td>
<td>$32,588.76</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Pumps</td>
<td>1 unit</td>
<td>$250,000.00</td>
<td>50</td>
<td>27</td>
<td>$6,750,000.00</td>
<td>$135,000.00</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Buildings</td>
<td>1 unit</td>
<td>$25,000.00</td>
<td>100</td>
<td>20</td>
<td>$500,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Pump Overhaul</td>
<td>1 unit</td>
<td>$21,501.08</td>
<td>25</td>
<td>27</td>
<td>$580,529.16</td>
<td>$23,221.17</td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Intake / Outlet Structures</td>
<td>1 unit</td>
<td>$80,000.00</td>
<td>80</td>
<td>40</td>
<td>$3,200,000.00</td>
<td>$40,000.00</td>
</tr>
<tr>
<td>Earth Channel</td>
<td>Desilting</td>
<td>1 km</td>
<td>$4,288.79</td>
<td>5</td>
<td>4.30</td>
<td>$18,441.80</td>
<td>$3,688.36</td>
</tr>
<tr>
<td>Natural Channel</td>
<td>Desilting</td>
<td>1 km</td>
<td>$926.28</td>
<td>10</td>
<td>552.70</td>
<td>$511,952.19</td>
<td>$51,195.22</td>
</tr>
</tbody>
</table>

Total annualised replacement / renewal cost $1,040,112.78

Further assessment of the renewal / replacement programme costs for the full lifecycle of assets over the next 100 years has been undertaken on the basis of the renewal programme and cost assumptions in Tables 9 and 10 respectively. Figure 5 shows the renewal / replacement cost required over the next 100 years.

It is obvious that the works required 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, leading to coincidental renewal / replacement. Therefore, it is proposed to plan asset replacement and refurbishment where possible to smooth costs, 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 major structures. To bridge the gaps between funding and expenditure cash flows, some degree of short-term reserving and raising of loans may be required at various points in the life cycle. Figure 6 shows a proposed planned renewal / replacement programme.

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.
5.3.4 Total scheme costs

The total scheme costs is the total maintenance and depreciation costs. On average, this equates to approximately $3,690,777 per annum based on current costs and assumptions (excluding new capital works). Figure 8 below provides the predicted total scheme costs for the period 2003 – 2013.

Figure 8 Predicted scheme total costs

5.4 Risk management

The risks associated with managing the Waihou Valley 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 its most needed can be severe and directly affecting 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 two 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 Waihou catchment. The system includes seven rainfall recording station and eight 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 on line 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, Environment Waikato 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 Waihou Valley Scheme 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.

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 Waihou Valley Scheme range in age from 10 to 30 years. This is longer than the design life of some of the components. Therefore, current practice 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>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<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>280,000</td>
<td>293,000</td>
<td>302,000</td>
<td>280,000</td>
<td>280,000</td>
<td>280,000</td>
</tr>
<tr>
<td>Royalty Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waihou Scheme Rate</td>
<td>2,566,000</td>
<td>2,382,000</td>
<td>2,585,000</td>
<td>2,648,000</td>
<td>2,710,000</td>
<td>2,773,000</td>
</tr>
<tr>
<td>General Rate</td>
<td>450,000</td>
<td>509,000</td>
<td>488,000</td>
<td>542,000</td>
<td>655,000</td>
<td>581,000</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>3,296,000</td>
<td>3,184,000</td>
<td>3,375,000</td>
<td>3,470,000</td>
<td>3,677,000</td>
<td>3,634,000</td>
</tr>
<tr>
<td>Expenditure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catchment Oversight</td>
<td>12,000</td>
<td>11,000</td>
<td>23,000</td>
<td>23,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Conservation Works</td>
<td>582,000</td>
<td>610,000</td>
<td>713,000</td>
<td>663,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>River &amp; Flood Protection</td>
<td>2,648,000</td>
<td>2,992,000</td>
<td>2,962,000</td>
<td>2,849,000</td>
<td>3,060,000</td>
<td>3,010,000</td>
</tr>
<tr>
<td>Total Expenditure</td>
<td>2,648</td>
<td>2,992</td>
<td>-181</td>
<td>0</td>
<td>1,287</td>
<td>-62,000</td>
</tr>
<tr>
<td>Net Surplus / Deficit</td>
<td>648</td>
<td>192</td>
<td>-181</td>
<td>0</td>
<td>1,287</td>
<td>-62,000</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 over their lifecycle to zero value.

3) The valuations of assets are based on either:

   a) The age of the asset at the time of the valuation, or

   b) 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.

4) Any over / under-capitalisation of capital / renewal work will be adjusted for in the three yearly revaluation cycle.

5) Channel and stopbanks are treated as individual assets broken down into 100 metre lengths.

6) 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>Reserves</th>
<th>2000-1 (x1,000)</th>
<th>2001-2 (x1,000)</th>
<th>2002-3 (x1,000)</th>
<th>2003-4 (x1,000)</th>
<th>2004-5 (x1,000)</th>
<th>2005-6 (x1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Cash Position – Loan to EW</td>
<td>1,192</td>
<td>918</td>
<td>556</td>
<td>-255</td>
<td>-1,392</td>
<td>-183</td>
</tr>
<tr>
<td>Revenue Reduces Amount Owning</td>
<td>3,296</td>
<td>3,184</td>
<td>3,375</td>
<td>3,470</td>
<td>2,774</td>
<td>3,634</td>
</tr>
<tr>
<td>Expenditure – Increases Amount Owning</td>
<td>-2,648</td>
<td>-2,992</td>
<td>-3,556</td>
<td>-3,470</td>
<td>-3,796</td>
<td>-3,696</td>
</tr>
<tr>
<td>Depreciation – Inflow from Maintenance</td>
<td>1,113</td>
<td>1,024</td>
<td>1,161</td>
<td>1,076</td>
<td>1,146</td>
<td>-1,146</td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td>-977</td>
<td>-1,885</td>
<td>-670</td>
<td>-1,570</td>
<td>-669</td>
<td>-669</td>
</tr>
<tr>
<td>Repayment of Loan</td>
<td>-1,058</td>
<td>-1,101</td>
<td>-1,121</td>
<td>-643</td>
<td>-643</td>
<td>-643</td>
</tr>
<tr>
<td>Cash Position - Loan to EW (Loan form EW)</td>
<td>918</td>
<td>556</td>
<td>-255</td>
<td>-1,392</td>
<td>-183</td>
<td>-411</td>
</tr>
</tbody>
</table>

6.3 Funding strategy

The Waihou Valley Scheme provides flood protection, river management, land drainage and soil conservation in the Waihou River Valley. Details of the area covered by this Scheme can be obtained from the Classification Report. The Scheme was implemented under the Scheme Deed of Agreement by special order process in 1980 by the Hauraki Catchment Board.

Under the new Local Government (Rating) Act 2002, section 16(4)(b), this Separate Rate will become a targeted rate, and each classification will become a category for which a differential rate is set.

The Scheme is also funded by other income (grazing licences) - 8 percent, and the balance after other income by targeted rates - 83 percent, and general rate - 17 percent.

---

1 Waihou Valley Scheme, Asset Management Plan. Policy Series 1997/17
The Waihou Valley Scheme rate is established on a benefit classification basis using equalised land value.

The land which falls within the Scheme is given a “classification” corresponding to a level of benefit the land receives from the Scheme. The classifications are A-F Rural, G Non-Rateable and U1-U4 Urban (as per the below graphs). Further details of the classifications are included in the Funding Document.

The total revenue requirement is allocated to the classifications, based on the equalised land value of the land of each classification and calculated rate in the dollar. The totals for 2002/03 and 2003/04 are indicated in Figure 8.

**Figure 9 Targeted Revenues by Classification**

As all Territorial Local Authorities within the Waihou Rating area have the same valuation date, equalisation is undertaken every three years.

The amount of rates attributed to a property is determined by multiplying the land value of the land in within each classification by the rate per dollar.

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 are 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 replicate 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 Policies/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 Policies/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 Policies/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></td>
<td>Ownership etc</td>
</tr>
<tr>
<td></td>
<td>Status existing/proposed</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. A project to make asset data available on the web through a web query system was developed and made available for operation in 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 became fully operational in 2003, and has links established to GIS.

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;

- Further 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 $50,000 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 $7,000.

- Review the asset management guidelines for managing all types of assets. These will undertaken over the next five years and expected to cost $7,000 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.

♦ Assets Condition and Performance annual reports.

♦ Ten-Yearly Structures audits.

♦ Crest level surveys of stopbanks (5 - 10 years).

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