



A Management Plan for the Improvement of Urban Stormwater Quality for the Mildura Rural City Council.

Volume 1 - Executive Summary

November 2001



Mildura Rural City Council

A Management Plan for the Improvement of Urban
Stormwater Quality for the Mildura Rural City Council

Volume I: Executive Summary

Final

November 2001

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Mildura Rural City Council

Sunraysia Rural Water Authority

First Mildura Irrigation Trust

Department of Natural Resources and Environment

Mallee Catchment Management Authority

Environment Protection Authority

Lower Murray Water

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1. Introduction

Sinclair Knight Merz was contracted by the Mildura Rural City Council (Council) to assist with the development of an Urban Stormwater Quality Management Plan (SWMP) which will guide the Council in improving environmental management and quality of stormwater runoff from urban areas throughout the municipality. This plan was conducted as part of a broader drainage strategy for the Sunraysia region that was aimed at developing a blueprint for urban development in the region up to the year 2050.

The Stormwater Management Plan has been developed in a number of stages as guided by the requirements of the Victorian Stormwater Action Program (VSAP) and involved close consultation with Council and other stakeholders. The outcomes from this process have been compiled into a number of reports (Issues Papers 3, 5 and 7 in this series relate to the Sunraysia Drainage Strategy and not directly to the Stormwater Management Plan):

- ❑ **Issues Paper no. 1 – Background.** This report provided an overview of the urban stormwater and irrigation drainage system in the Sunraysia region
- ❑ **Issues Paper no. 2 – Threats and Values.** This report provided details of the values of the environments that receive urban stormwater runoff and the threats to those values from urban stormwater runoff. As part of the assessment process, the threats and values associated with irrigation drainage in the region were also assessed.
- ❑ **Issues Paper no. 4 – Risk Assessment.** This report described the risk assessment and prioritisation process necessary to determine the priority management issues that would become the focus of actions aimed at improving the quality of urban stormwater runoff.
- ❑ **Issues Paper no. 6 – Stormwater Management Actions.** This report summarised management actions aimed at addressing the priority issues identified in Issues Paper no. 4.

The contents of these reports formed the basis for stakeholder consultation at Project Working Group workshops. Based on the discussion at these workshops, the reports have been revised and compiled into 2 separate volumes that form the final stormwater management plan in the format required by VSAP:

- ❑ **Volume I: Executive Summary** (this report) provides an overview of why and how the plan was developed and details management actions and recommendations that Council can use to improve stormwater management.
- ❑ **Volume II: Background** provides more detailed background and information that clearly describes the methodology followed and more detail on the assessment of threats, values and strategy development and includes all appendices.

1.1 Why develop a stormwater management plan?

When it rains water runs off streets, carparks, the roofs of houses and other surfaces into the nearest waterway or wetland. This runoff can enter waterways via a subsurface network of pipes or as surface runoff. Most urban areas have a system of pipes with entry points to drain stormwater, however in outer urban and rural areas there may be no pipes infrastructure and stormwater is drained via open gutters.

Unlike sewage, 'stormwater' is not treated in anyway before it enters waterways. In urban areas, stormwater accumulates pollutants as it flows over hard surfaces. These pollutants include nutrients, sediments, litter, oils and grease and other toxicants and can negatively impact upon the water quality in urban waterways. Because stormwater is not treated prior to entering waterways, activities in the catchment have a direct influence on the quality of stormwater and hence the quality of water in our rivers, creeks, lakes and wetlands.

Stormwater runoff has been identified as a major contributor to degradation in many urban environments. As such, the State Government of Victoria through the Environment Protection Authority (EPA), Catchment Management Authorities and other agencies are supporting local Councils in the development of stormwater management plans for urban areas in their municipalities. The Victorian Stormwater Committee has been established to assist with the development of stormwater management plans, the objectives of which are to:

Identify actions to improve the environmental management of urban stormwater and protect the environmental values and beneficial uses of receiving environments

Stormwater management plans identify the values of receiving environments and the threats to those values from stormwater, prioritises the key management issues and recommend actions to address those issues.

2. The stormwater planning process

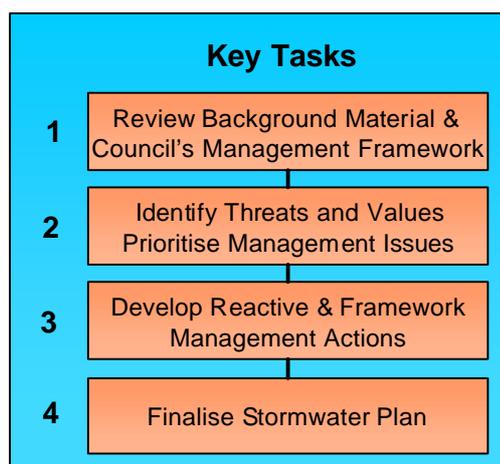
The methodology for developing stormwater management plans has been established by the Victorian Stormwater Committee in conjunction with the Environment Protection Authority (EPA), Melbourne Water, Catchment Management Authorities and the Department of Natural Resources and Environment (NRE) and are defined in the Best Practice Environmental Management Guidelines. These guidelines are being followed in the development of the SWMP for Mildura Rural City Council.

The key tasks followed in the development of this stormwater management plan consisted of:

- 1) The identification and review of background issues;
- 2) The review of local government management and operations as it relates to stormwater management;
- 3) The identification of values of environments receiving urban stormwater;
- 4) The identification of threats to receiving environments from stormwater inputs;
- 5) A risk assessment and prioritisation process to determine the priority stormwater management issues;
- 6) The development of reactive management strategies for managing stormwater that addressed the priority management issue;
- 7) The development of Council management actions that will lead to an improvement in the ability of the Mildura Rural City Council to better manage stormwater quality; and,
- 8) The provision of indicative costings, responsibilities and timelines for implementation of the strategies identified in the stormwater management plan.

These tasks were conducted in four stages as outlined in Figure 2.1. All stages, in the process involve stakeholder input with four workshops conducted to separately discuss each stage of the plan.

■ **Figure 2.1. The stormwater planning process**



The final SWMP is a document that Mildura Rural City Council can use to better manage urban stormwater quality and improve the health of the Murray River, wetlands and drainage basins. To be most effective, the plan must:

- Have Council-wide (Council and Officers) commitment to the plan and its implementation;

- ❑ Set priorities for the Council’s management of urban stormwater;
- ❑ Include clearly stated strategic objectives;
- ❑ Incorporate a risk-based assessment of issues and threats;
- ❑ Include strategies with clear actions that address priority risks, together with measurable environmental outcomes wherever possible;
- ❑ Follow the principle of continuous improvement; and
- ❑ Encourage all stakeholders.

This report is **Volume I** of ‘*A Management Plan for the Improvement of Stormwater Quality for the Mildura Rural City Council*’. It provides an executive summary of the key tasks involved in the preparation of management actions. In particular, this report presents a summary of the values of the waterways and wetlands that receive urban stormwater runoff in the Mildura area, a summary of the threats to those values from stormwater runoff and a risk assessment to prioritise the key management issues in the region. These priority management issues are the focus of actions required to improve stormwater management and water quality and to protect and enhance the values of waterways in the region. In addition, a review of Council’s management framework has been conducted and actions aimed at improving Council’s operations and management with respect to stormwater are also identified. More detail describing the process of the plan development can be found in **Volume II: Background**.

3. The Mildura Rural City Council area

The Mildura Rural City Council is the largest municipality in Victoria covering 22,330 sq km in the State's north west. This study focuses on the urban centres in the greater Mildura area that include; Mildura (current population 25,000), Merbein (3,000), Irymple (2,000) and Red Cliffs (3,000) (Figure 3.1). Dryland and irrigation farming form the main economic base of the region with service and value-adding process industries and tourism providing significant economic and employment benefits.

The Murray River and associated floodplain lakes and wetlands are the main natural waterbodies in the region. However, drainage basins, created to provide disposal of stormwater and irrigation drainage water, are also important aquatic environments in the region. These waterways and wetlands support a diverse range of flora and fauna including many species of conservation significance. They are also the focus of recreational activities and tourism and provide significant public amenity for the Mildura community. The Murray River is the main source of water for domestic, industrial and irrigation supply.

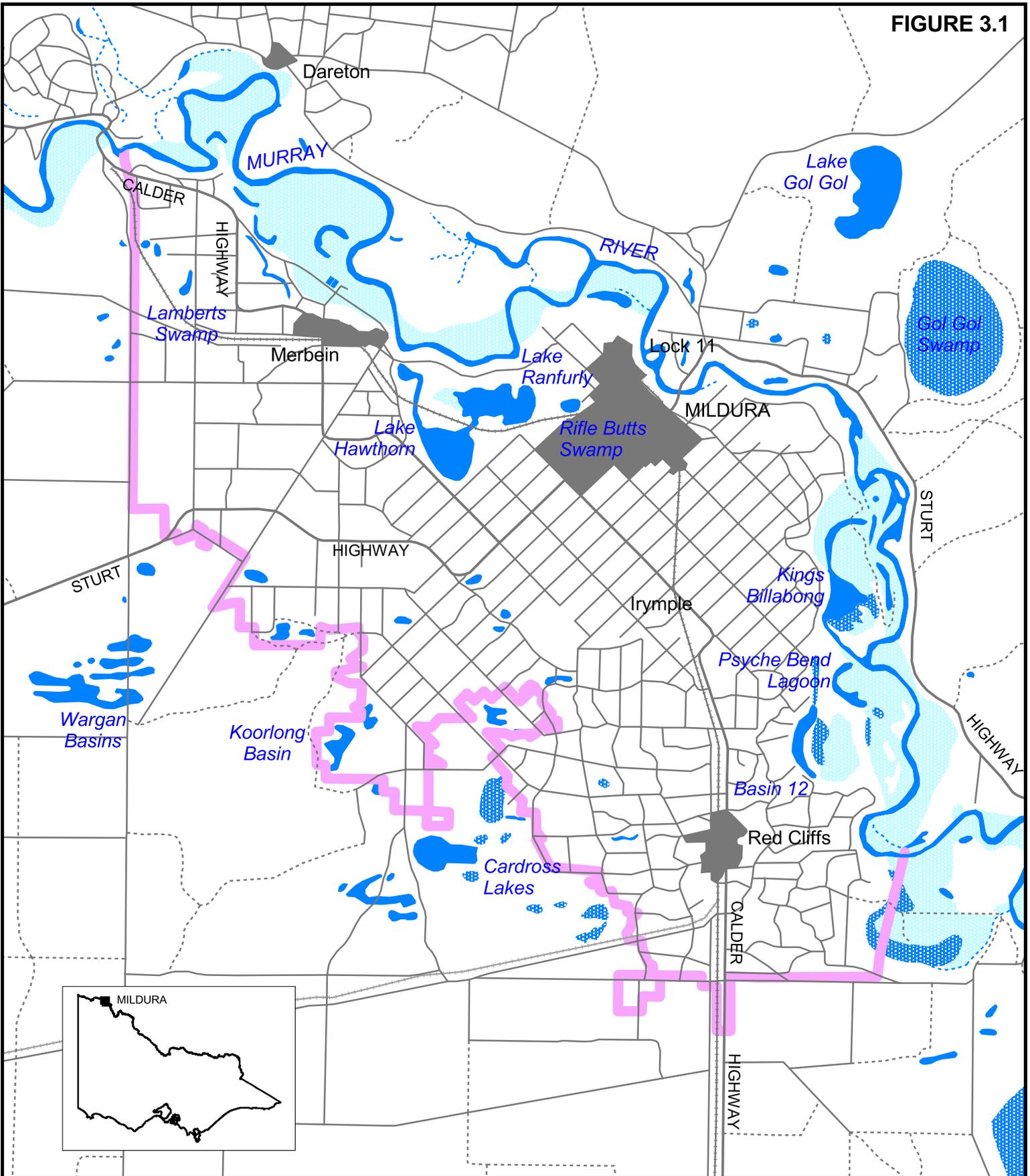
There is a range of threats to the aquatic environments in the district. Elevated nutrients and salinity in stormwater and agricultural drainage water pose a significant threat to the ecological values of many waterbodies. Saline groundwater poses threats to wetlands and the Murray River. In the urban areas, sediment, nutrients and litter in stormwater runoff from industrial, commercial and residential areas and roads pose the major threat to values associated with aquatic environments.

Significant urban expansion is predicted for the Mildura region over the next 50 years with irrigated lands being converted to residential development. This poses significant drainage issues as changes in drainage infrastructure are required. Urban areas around Irymple have no natural drainage and require stormwater to be pumped from landlocked catchments to drainage basins.

3.1 Waterways in the Mildura region

Stormwater drainage options fall into two categories, river disposal and basin disposal, these are summarised in Table 3.1. Figure 3.2 shows a breakdown of urban subcatchments (subcatchments A to AB) in Mildura and Irymple and the specific receiving environments they drain to.

FIGURE 3.1



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**Sunraysia Drainage Strategy and
 Urban Stormwater Management Plan**

STUDY AREA

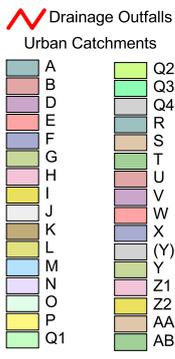
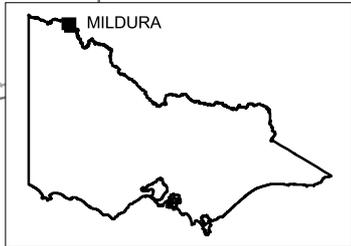
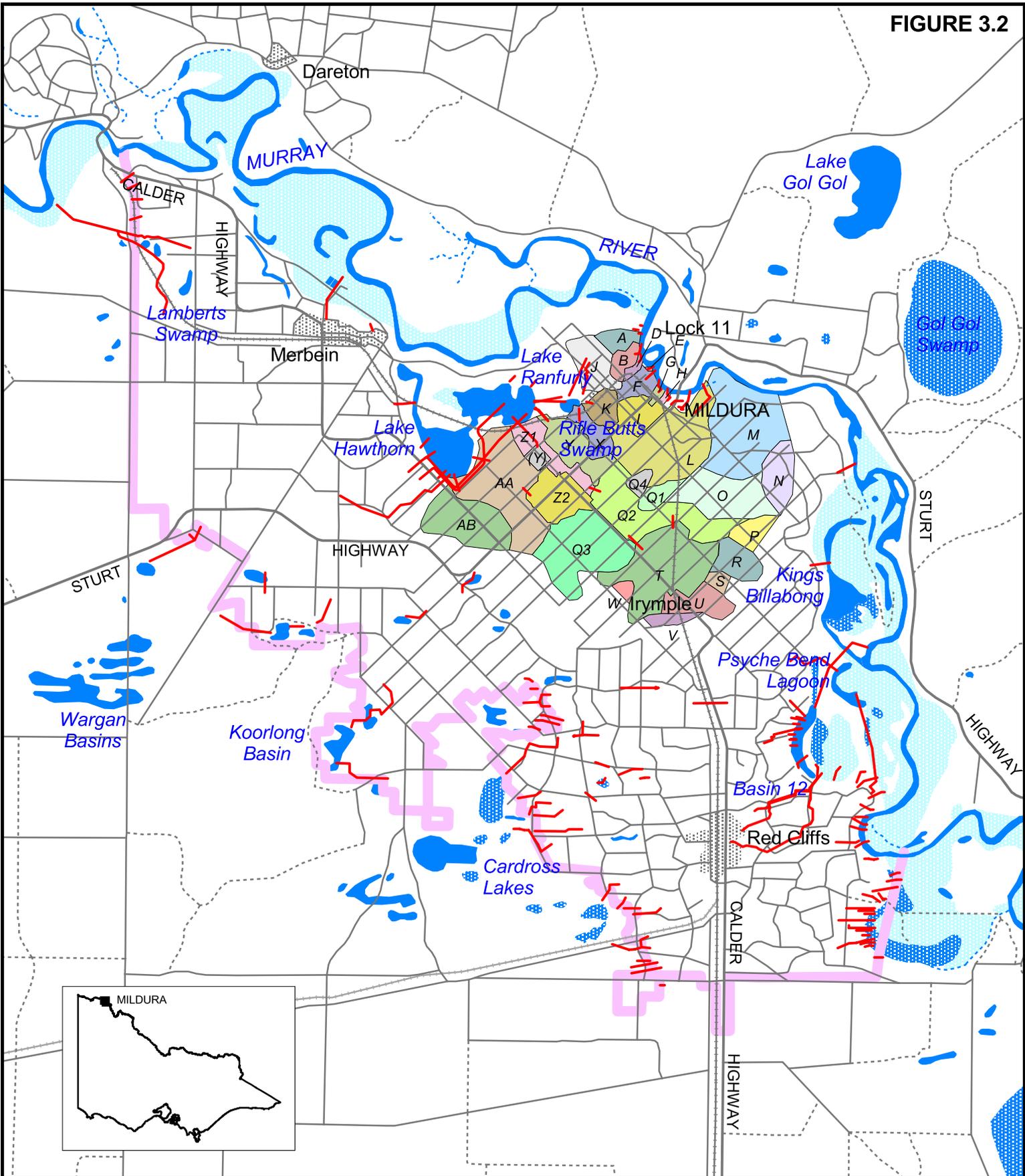
0 1 2 3 4 5 Kilometers

■ **Table 3.1. Summary of environments receiving urban stormwater runoff**

Waterbody	Description
River Disposal	
Murray River	The Murray River is the only natural waterway in the region and forms the northern boundary of the study area. The Murray River rises in the Australian Alps and flows west across the riverine plains for 800km before reaching the Sunraysia region. Downstream of Mildura, the Murray River is joined by the Darling River before turning south through South Australia. The Murray River is regulated along most of its length to supply water for irrigation throughout northern Victorian and southern New South Wales. At Mildura, Lock 11 has created the Mildura weir pool that backs water up from Mildura to past Red Cliffs. Stormwater from Mildura is discharged to the Murray River above and below Lock 11 (Subcatchments A, B, D, E, F, G, H, I, L, M & N).
Kings Billabong	Kings Billabong is a large floodplain wetland located east of Irymple. It is held at an artificially high level by pumping water from the Murray River into the billabong to facilitate water supply to the FMIT system and to prevent saline groundwater intrusions. It receives irrigation drainage water and stormwater runoff from rural residential areas (Subcatchments N, P, R, S).
Basin 12	Basin 12 is a floodplain wetland that has become the main disposal basin for irrigation drainage and urban stormwater runoff from the around Red Cliffs. At high levels, Basin 12 discharges to the Murray River via pipeline.
Merbein Common	Merbein Common contains a number of floodplain billabongs downstream of Lock 11. Urban stormwater from Merbein is discharged directly to the floodplain, however runoff is unlikely to reach the Murray River except during high flows. Stormwater runoff directed to the floodplain may contribute increased salt to the groundwater table, however the overall impact of stormwater placing pressure on groundwater salinity and salt loads to the Murray River at Merbein is likely to be small.
Basin Disposal	
Rifle Butts Swamp	Rifle Butts Swamp is a small wetland that receives urban stormwater runoff from Mildura (subcatchments J, K, & X). It then flows by gravity to Lake Ranfurly East. Rifle Butts Swamp is totally reliant on stormwater inputs to maintain aquatic habitat values.
Lake Ranfurly East	Lake Ranfurly is a large, shallow wetland on the ancestral floodplain west of Mildura. It is separated into two waterbodies by a causeway and isolated from the Murray River by levees. Lake Ranfurly East receives urban stormwater runoff from Mildura and Irymple (subcatchments Q1, Q2, Q4, T, U, V, Y, Z) and also saline groundwater from the Mildura-Merbein Groundwater Interception Scheme. Lake Ranfurly West receives saline groundwater from the groundwater interception scheme. Water from both lakes is pumped further inland for evaporative disposal at the Wargan Basins.
Lake Hawthorn	Lake Hawthorn is a large wetland also on the ancestral floodplain west of Mildura. It receives some urban stormwater runoff, irrigation drainage and rural surface runoff and is pumped to Wargan Basins. During high river flows some water from Lake Hawthorn is discharged directly to the Murray River. As more irrigated land is urbanised, Lake Hawthorn will receive more urban runoff and less irrigation drainage water. (Subcatchments Z2, AA, AB, Q3)
Other basins	There are several other drainage basins within the study area (eg Cardross Lakes, Koorlong Basin, Lamberts Swamp, etc) that receive irrigation drainage water from sub surface drainage systems. These basins have a range of environmental values, however they do not directly receive urban stormwater runoff.

For the purposes of this study, sub-catchments have been identified based on the basin they drain to, the Murray River has been separated into inputs above Lock 11 and inputs below Lock 11 as different values and threats are associated with the Murray River in these two locations. Lock 11 and the Mildura Weir form the Mildura Weir Pool and most of the urban stormwater inputs to the Murray River occur upstream of Lock 11. The weir has raised water level by approximately 3 meters and produces a stilling effect for approximately 60km up stream.

FIGURE 3.2



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Sunraysia Drainage Strategy and Urban Stormwater Management Plan

URBAN CATCHMENTS



4. Stormwater Management Issues

The prioritisation of management issues that become the focus for actions is a key step in the development of the Stormwater Management Plan. This process involves the identification of the values of environments receiving stormwater runoff, the threats to those values from stormwater and a risk assessment process aimed at identifying and prioritising specific management issues.

4.1 Values of receiving environments

Environments that receive stormwater runoff are valued for a wide range of reasons. They have intrinsic environmental and ecological values but also have other characteristics valued by the community. The values of receiving environments have been identified based on the following categories:

- Environmental (Instream and riparian habitat, flora and fauna)
- Cultural and Heritage (Indigenous and non-indigenous)
- Amenity (Active and passive recreation, visual landscape and tourism)
- Economic (Water supply for irrigation, stock, domestic and industrial purposes)
- Stormwater (Flood conveyance, water quality treatment and potential for reducing inputs of nutrients and salt to the Murray River).

The above values have been determined for each waterbody. This determination has been based on an extensive review of the literature including journal articles, technical reports and water quality data, field work, consultation with stakeholders and other relevant experts, and consultation and discussion with the Project Reference and Working Groups. The key values associated with each waterbody are described in Table 4.1. Further detail on specific values and ranking determinations can be found in Volume II. For the purposes of this study, values have also been determined for some key basins that receive irrigation drainage water but do not directly receive urban stormwater runoff.

■ **Table 4.1. Key values for each receiving environment**

Receiving Environment	Key values
Significant environments receiving urban stormwater runoff	
<p>Murray River</p> 	<ul style="list-style-type: none"> ▪ The Murray River above and below Lock 11 provides significant instream and riparian habitat values. A range of threatened species are supported by the river and floodplain environments and parts of this system are listed on the Register of the National Estate and the Directory of Important Wetlands in Australia. ▪ The Murray River environment is also significant for its cultural and heritage values and there are numerous archaeological sites highlighting the links with indigenous cultures. ▪ The River environment is highly valued for its recreational, tourism and amenity values. ▪ The region is highly dependent on the River as a source of high quality water for irrigation, domestic and industrial use.
<p>Kings Billabong</p> 	<ul style="list-style-type: none"> ▪ As with the Murray River, Kings Billabong has significant instream and riparian values. There is a long record of indigenous contact with the area as well as more recent non-indigenous heritage values associated with irrigation development in the region. ▪ Kings Billabong is listed on the Directory of Important Wetlands in Australia and supports a range of threatened flora and fauna. ▪ The wetlands is a popular for recreational activities including swimming, boating fishing and camping and provides high landscape amenity to rural residential development along the west shoreline. ▪ Water is pumped from the Murray River to Kings Billabong from where it is then pumped into the FMIT irrigation supply system.
<p>Basin 12</p> 	<ul style="list-style-type: none"> ▪ Basin 12 provides habitat values for a range of bird species and offers visual amenity for residential areas, however more active recreational opportunities are low. ▪ Basin 12 is used for irrigation and urban stormwater drainage, however inflows appear to be declining due to improved irrigation practices.
<p>Rifle Butts Swamp</p> 	<ul style="list-style-type: none"> ▪ Rifle Butts Swamp provides a moderate level of habitat for birds. ▪ If managed appropriately, Rifle Butts Swamp offers high amenity values to the community as urban development expands around the wetland. ▪ By directing urban stormwater to Rifle Butts Swamp, inputs to the Murray River are reduced. ▪ The values associated with Rifle Butts Swamp are maintained by stormwater inputs.
<p>Lake Ranfurly East</p> 	<ul style="list-style-type: none"> ▪ Lake Ranfurly East provides significant habitat for many bird species, including species listed under State Government threatened species legislation. It is listed on the Directory of Important Wetlands in Australia for its significant bird habitat. ▪ While the area around the Lake Ranfurly is degraded, there are opportunities for improved amenity for local residential communities. ▪ By directing urban stormwater to Lake Ranfurly, inputs to the Murray River a reduced.
<p>Lake Hawthorn</p> 	<ul style="list-style-type: none"> ▪ Lake Hawthorn provides habitat for birds and some fish species ▪ Lake Hawthorn also provides some recreational opportunities and visual amenity for surrounding residents. ▪ By directing stormwater runoff the Lake Hawthorn, salt and nutrient inputs to the Murray River are reduced.
Significant environments receiving irrigation drainage water	
<p>Cardross Lakes</p> 	<ul style="list-style-type: none"> ▪ Cardross Lakes are significant for supporting one of the most diverse small native fish populations in the State, and in particular the endangered Purple Spotted Gudgeon. ▪ Inflows to Cardross Lakes are declining and reduced water levels in the lakes pose a threat to the native fish species present.
<p>Wargan Basins</p> 	<ul style="list-style-type: none"> ▪ Wargan basins provide significant habitat for a range of bird species and offer a range of passive recreational activities such as bird watching and nature conservation. ▪ The basins are listed on the Directory of Important Wetlands in Australia and support populations of waterbird listed under international migratory bird agreements.

For all waterbodies and all values, a qualitative ranking of Low, Moderate, High or Very high has been assigned. This ranking is based on knowledge of the systems, the types of plant and animal species present, the presence of cultural and heritage sites, opportunities for recreation and tourism, economic benefits and the benefits associated with reducing nutrient and salinity inputs to the Murray River. These rankings are summarised in Table 4.2 and more details can be found in Volume II.

■ **Table 4.2. Summary of values for each receiving environment.**

Receiving Environment	Environmental		Cultural		Amenity			Economic	Drainage	
	Instream	Riparian	Indigenous	Non-indigenous	Recreational	Amenity	Tourism	Water Supply	Flood reductions	Salt & nutrient reductions to Murray River
Environments receiving urban stormwater runoff (& irrigation drainage)										
Murray River	V high	V high	V high	V high	V high	V high	V high	V high	High	Low
Kings Billabong	V high	V high	V high	V high	V high	V high	V high	High	Low	Mod.
Basin 12	High	High	Mod.	Low	Mod.	Mod.	Low	Low	High	V high
Rifle Butts Swamp	Mod.	Mod.	Mod.	Low	Low	Mod.	Low	Low	High	Mod.
Lake Ranfurly East	V high	High	High	Low	Low	High	Low	Low	High	V high
Lake Hawthorn	V high	High	Mod.	Low	High	High	Mod.	Low	V high	V high
Environments receiving irrigation drainage										
Cardross Lakes	V high	V high	Low	Low	Low	Low	Low	Low	Mod.	Mod.
Koorlong Basins	Low	Mod.	Mod.	Low	Low	Low	Low	Low	Mod.	V high
Lamberts Swamp	Low	Low	Low	Low	Low	Low	Low	Low	Low	V high
Lake Ranfurly West	V high	High	High	Low	Low	Low	Low	Low	Low	V high
Wargan Basins	V high	High	Mod.	Low	Mod.	High	Low	Low	V high	V high
Psyche Bend Lagoon	Low	Low	Mod.	Low	Low	Low	Low	Low	Mod.	V high

4.2 Threats from stormwater

There is a range of threats to receiving environments from stormwater runoff and rural drainage. Specific threats include sediment, nutrients and other pollutants in runoff, illegal and accidental discharges, waterway degradation and inflows from upstream reaches. These threats can be grouped according to landuse and particular catchment activities. Threats have been assigned a ranking according to their significance i.e. Very high, High, Moderate, Low. This ranking is based on the potential pollutants or impacts on the values of receiving environments and the probability of an impact occurring. For some receiving environments some threats are not present and have therefore not been included in the assessment process. Threats to the values of each of the receiving environments are summarised in Table 4.3 and further detail on the determination of threat rankings can be found in Volume II.

■ Table 4.3. Threats to receiving environments from stormwater and rural drainage (na: threat not applicable to that environment).

Activity/landuse threat	Stormwater & Irrigation Receiving Environment							Irrigation drainage Receiving Environments					
	Murray River below Lock 11	Murray River above Lock 11	Kings Billabong	Basin 12	Rifle Butts Swamp	Lake Ranfurly East	Lake Hawthorn	Psyche Bend Lagoon	Cardross Lakes	Koolong Basins	Lamberts Swamp	Lake Ranfurly West	Wargan Basins
Residential runoff	V high	V high	High	High	V high	V high	High	Low	Low	Low	Low	Low	na
Industrial runoff	Mod.	V high	na	Mod.	Mod.	High	Low	na	na	na	na	na	na
Commercial / institutional runoff	Mod.	V high	na	Mod.	High	V high	Low	na	na	na	na	na	na
Construction sites – lot	High	High	High	Mod.	High	High	High	na	na	na	Low	Low	na
Development sites	High	High	High	Low	V high	V high	V high	na	na	na	na	Low	na
Major highways, arterial & rural road runoff	High	V high	Mod	High	High	V high	High	na	Low	Low	Low	Low	na
Sullage and septic tank overflows	High	High	V high	High	Mod.	Mod.	High	Low	High	High	High	Low	na
Sewer overflows	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	na
Open spaces, parks and recreational areas	Mod.	High	Mod.	High	High	High	High	Low	Low	Low	Low	Low	na
Upstream inflows	High	High	High	na	na	na	na	na	na	na	na	na	V high
Irrigation drainage	V high	V high	High	V high	Mod.	V high	V high	High	V high	V high	V high	V high	Mod.
Rural surface runoff	V high	V high	High	V high	Low	High	V high	Mod	V high	V high	V high	V high	High
Unstable & degraded waterways	Mod.	High	High	Mod.	Mod.	Mod.	Mod.	High	Mod.	Low	Low	Mod.	Low

The greatest threats from stormwater and drainage water in the study area are due to:

- ❑ Excess nutrients in stormwater runoff from residential and industrial areas entering the Murray River;
- ❑ Runoff from roads;
- ❑ Septic tank effluent;
- ❑ Litter in stormwater runoff from commercial areas;
- ❑ Poor sediment control on development and construction sites;
- ❑ Damage to cultural sites, riverbanks, riparian vegetation and wetland areas through degradation by changed flow, erosion, uncontrolled vehicle access, vandalism and rubbish dumping; and,
- ❑ Groundwater recharge and seepage into the Murray River and floodplain wetlands.

Irrigation drainage and runoff from agricultural lands also pose a significant threat to the values of receiving environments. Agricultural runoff can carry nutrients, sediment, salt and pesticides. In the Mildura area most irrigation drainage and urban stormwater drainage systems are separate, although the receiving environments suffer from the combined impacts of stormwater and irrigation drainage water. Although irrigation drainage has been identified as a threat to values of receiving environments, measures to address irrigation drainage and runoff from dryland agricultural areas are outside the scope of strategies developed in this plan.

4.3 Priority stormwater management issues

Priority management issues are identified using a risk assessment process described by the Victorian Stormwater Action Committee. The risk assessment is based on a formula that takes into account the value of the receiving environment, the stormwater threat and a sensitivity factor of the receiving environment to specific threats:

$$\text{Risk} = \text{Threat} \times \text{Value} \times \text{Sensitivity}$$

Values and threats are ranked on a 1 to 4 scale with 1 being low, 2 medium, 3 high and 4 very high as indicated in the previous sections. The sensitivity rating is also based on a 1 to 4 scale with 1 being low sensitivity through to 4 being very high sensitivity. The sensitivity factor allows for the fact that some stormwater threats may be high and the value of the receiving environment also high, however the true impact, or sensitivity is low.

The risk assessment produces an overall risk score from 1 to 64 for individual threat/value combinations. The higher the risk score, the greater the management priority thus the risk scores are used to identify the highest priority management issues. The total score provides an indication of cumulative impact of a particular threat across a range of values and can be used to further aid the prioritisation process.

This process has been applied to each of the receiving environments in the study area. Management issues with a risk score of greater than 32 are listed in Table 4.4. These represent the high (scores 32 & 36) and very high (scores 48 & 64) priority management issues.

In addition to the priority management issues that relate specifically to urban stormwater runoff, a range of threats associated with irrigation and agricultural drainage were identified, these are identified in Table 4.5. For several water bodies (eg. Lake Ranfurly East and West, Cardross Lakes etc), there is a high risk to ecological values from drainage inflows or groundwater interception scheme inflows. While these inflows have been identified as a risk, it also needs to be acknowledged that these inputs may be contributing to the maintenance of particular values. For example, inflows to Lake Ranfurly from the Mildura-Merbein Groundwater Interception Scheme support waterbird habit and reduce the impact of saline groundwater on the Murray River while a decrease in drainage inflows to Cardross Lakes has been identified as a threat to the native fish populations present in the Lakes. Other regional studies such as the Sunraysia Salt Interception Study and a management plan for the Cardross Lakes are dealing with the management of some of these issues.

The priority management issues associated with urban stormwater runoff become the focus of reactive management strategies in the Stormwater Management Plan. While the prioritisation process has identified a large number of priority risks, many of the actions that can be developed to address these risks will address a number of risks at once. Although the risk assessment process has also identified threats to receiving environments from irrigation drainage, strategies to address these threats have not been developed as part of this stormwater management plan which addresses only urban issues.

■ **Table 4.4. Priority management issues**

Risk Score	Total score	Catchment	Greatest Threat	Value Most Threatened
64	352	Murray River above Lock 11	Industrial Runoff (Etiwanda Drain)	Ecological, recreational, water supply
64	336	Murray River above Lock 11	Road runoff (Deakin Ave, 7 th St, Sturt Hwy)	Ecological, water supply
64	308	Kings Billabong	Sullage and septic tank overflows	Ecological, recreational
48	312	Murray River above Lock 11	Degraded waterways (At drain outflows)	Riparian, cultural
48	304	Murray River above Lock 11	Commercial runoff (Pine Av Drain-subcatchment F)	Ecological, recreational, visual amenity, water supply
48	288	Murray River above Lock 11	Residential runoff	Ecological, recreational, visual amenity, water supply
48	272	Murray River below Lock 11	Residential Runoff (Merbein & Washington Ave)	Ecological, recreational, water supply
48	240	Murray River above Lock 11	Construction site runoff – development	recreational, water supply
48	237	Kings Billabong	Degraded waterways	Indigenous cultural
48	220	Wargan Basins	Quality of inflows from Lakes Hawthorn & Ranfurly	Ecological
48	204	Murray River above Lock 11	Sullage and septic tank overflows	Primary and secondary Recreational activities
48	204	Murray River below Lock 11	Sullage and septic tank overflows	Primary and secondary Recreational activities
48	160	Lake Ranfurly East	Residential runoff	Ecological
48	148	Lake Hawthorn	Construction runoff – development	Ecological
48	128	Lake Ranfurly East	Commercial runoff (15 th Street precinct)	Ecological
48	128	Lake Ranfurly East	Construction runoff – development	Ecological
48	116	Lake Ranfurly East	Roads (15 th Street and Deakin Ave)	Ecological
48	99	Lake Ranfurly East	Industrial runoff (Irymple)	Ecological
36	216	Murray River below Lock 11	Construction site runoff – development	Ecological, recreational, water supply
36	216	Murray River below Lock 11	Quality of upstream inflows	Ecological, recreational, water supply
36	216	Murray River above Lock 11	Quality of upstream inflows	Ecological, recreational, tourism, water supply
36	210	Kings Billabong	Construction runoff – rural residential development	Ecological, recreational, visual amenity
36	207	Kings Billabong	Quality of inflows from the Murray River	Ecological, recreational, water supply
36	204	Murray River above Lock 11	Construction site runoff – lot scale	Recreation, visual amenity, water supply
36	198	Kings Billabong	Rural residential runoff (Cureton Ave / Cooks Rd)	Ecological, recreational, visual amenity
36	192	Murray River above Lock 11	Open spaces, parks and gardens	Ecological, recreational
36	171	Kings Billabong	Construction runoff – lot scale	Ecological, visual amenity
36	156	Murray River below Lock 11	Road runoff	Ecological
36	147	Lake Hawthorn	Residential runoff	Ecological
36	102	Lake Hawthorn	Sullage and septic tank overflows	Ecological, recreational
36	102	Lake Hawthorn	Road runoff (Calder Hwy)	Ecological
36	96	Wargan Basins	Degraded waterways	Ecological
36	66	Lake Hawthorn	Construction site runoff – lot scale	Ecological
36	57	Lake Ranfurly East	Open spaces, parks and gardens	Ecological
32	176	Murray River below Lock 11	Degraded waterways	Indigenous Cultural, riparian
32	160	Murray River below Lock 11	Industrial runoff (Merbein)	Riparian / floodplain
32	112	Rifle Butts Swamp	Residential runoff	Ecological
32	80	Rifle Butts Swamp	Construction site runoff - development	Ecological

■ **Table 4.5 Management issues associated with irrigation drainage impacts**

Score	Catchment	Threat	Value
64	Murray River above Lock 11	Nutrients and salt in drainage inflows (northeast drain, Red Cliffs)	Ecological, recreational, water supply
64	Cardross Lakes	Decreased drainage inflows & increased salinity	Ecological
48	Murray River below Lock 11	Nutrients and salt in drainage inflows (northwest & west drain, Yelta private diverters)	Ecological, recreational, water supply
48	Lake Hawthorn	Changed quality and quantity of drainage inflows	Ecological
48	Lake Ranfurly East	Changed quality of drainage inflows (eg GWIS)	Ecological
48	Lake Ranfurly West	Changed quality of drainage inflows (eg GWIS)	Ecological
36	Kings Billabong	Changed irrigation drainage inflows (FMIT drain)	Ecological, recreational
36	Basin 12	Changed irrigation drainage inflows	Ecological

5. Reactive stormwater management strategies

5.1 Strategies

There are two types of stormwater management strategies, **Reactive Management Strategies** (this section) that are developed in response to current threats that relate to priority management issues identified in Section 4, and **Management Framework Strategies** that are developed in response to deficiencies identified in the review of Council's management framework (Section 6).

Reactive Management Strategies can be broadly grouped into the following categories:

- ❑ Education and awareness;
- ❑ Structural treatment measures;
- ❑ Non-structural treatment measures;
- ❑ Source controls;
- ❑ Site specific strategies and plans;
- ❑ Information and data collection; and
- ❑ Regulation and enforcement.

While Management Framework Strategies typically address areas of Council operation related to:

- ❑ Strategic planning activities;
- ❑ Planning and local approvals processes;
- ❑ Service delivery levels and improved operations and management activities;
- ❑ Opportunities for improved coordination and communication; and,
- ❑ Training and education programs.

The following sections summarise the Reactive Management Strategies developed to address each priority management issue. For each priority management issue a strategy objective with a number of actions has been developed. Actions have been categorised according to the following themes:

- ❑ Planning controls (P);
- ❑ Operations and management (O);
- ❑ Regulation and enforcement (R);
- ❑ Education and training (E);
- ❑ Coordination and communication (C); and,
- ❑ Infrastructure solutions and structural control measures (I).

Some of the actions identified in these categories will be effective at addressing a range of issues or threats in a number of locations across the municipality (eg. Education and training, monitoring, regulation and enforcement) while others are specific actions aimed at addressing specific issues (eg. structural control measures). Some structural measures, for example wetlands and gross pollutant traps, will be effective at addressing a number of threats in the one catchment.

For each of the priority management issues, strategies and actions are summarised in the following tables (Table 5.1). Provided with each action is an indication of capital and ongoing cost, the authority responsible for implementation and other participating stakeholders, and suggested timeframe for implementation. Where a previously

described action addresses a new strategy, linkages are indicated and the costs have not been included as costs only apply once.

Costs for structural measures are based on market prices for supply and installation of suitable structural devices given the pipe size and catchment area, they do not include land acquisition costs. Costs for non-structural measures are typically based on an hourly rate for staff and time involved. Costs are indicative only and will change from time to time, more detailed costing for each action will be required as actions are implemented. In accordance with the VSAP guidelines, land acquisition costs have not been included and in most instances will be low as structural measures are often sited on land that is currently Council owned.

Costs may be significantly reduced if Council staff undertake some of the tasks or by modifying current procedures within Council. The lead agency assigned to each action is not necessarily responsible for the cost, they are just an indication of the agency in the best position to initiate the action.

The establishment of a suitable monitoring program to assess the effectiveness of actions at improving stormwater quality is required as part of the implementation actions identified in this stormwater management plan. Suggestions for a suitable monitoring program including costs are presented in Section 5.2.

■ **Table 5.1. Reactive Management Strategies to address the priority management issues listed in Table 2.4.**

Table legend

- **Theme:** P, Planning,
 O, Operations and management
 E, Education and training
 C, Coordination and communication
 R, Regulation and enforcement
 I, Infrastructure and structural control measures
- **Time:** The time (year) from commencement of the plan by which each particular action should be implemented

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
64	A1	Objective A1 – Industrial runoff to Murray River above Lock 11: <i>To work with the EPA and local industries (particularly those in the Etiwanda catchment) to minimise the risk that runoff from industrial areas has on the environmental, recreational and water supply values of the Murray River above Lock 11.</i>						
	A1.1	Council should establish long term consultation and coordination with the EPA.	O, C	1		\$2,000	MRCC, EPA	Industry groups
	A1.2	Council should initiate workshops for emergency and operations staff both within and external to Council (ie Council emergency response officers, local fire brigade, police, SES personnel etc) to inform workers of the Councils Emergency Response Plan and to outline appropriate management response activities which minimise the impacts associated with discharges from industry to the stormwater system.	O, E	1	\$5,000		MRCC, EPA	Industry groups, EPA, emergency services
	A1.3	Council should, in consultation with the EPA and emergency services, update its Emergency Response Plan to ensure that actions to protect the stormwater drainage system and urban waterways from accidental or deliberate discharges are incorporated in the plan.	O	1	\$20,000	\$2,000	MRCC	EPA, emergency services
	A1.4	Council should initiate workshops and information sessions with industry representatives to highlight best practice stormwater management.	E, O	1	\$5,000		MRCC, EPA	Industry groups
	A1.5	Install in-line Gross Pollutant Trap on combined San Mateo / Etiwanda Drain. (Currently proposed as part of marina & wetland project).	I	3	\$250,000	\$5,000	MRCC	
	A1.6	Construct a wetland for treating runoff from San Mateo and Etiwanda Drains. (Currently proposed)	I	5	\$800,000	\$10,000	MRCC	
	A1.7	Develop literature and guidelines targeted at industry to highlight issues associated with stormwater runoff and identify areas where industry can help reduce stormwater impacts using best practice management.	E	1	\$15,000	\$3,000	MRCC	EPA
	A1.8	Coordinate with the EPA to conduct site audits and inspections to ensure industries are complying with relevant State legislation and codes of practice for industrial waste management.	O	1	\$5,000	\$20,000	EPA, MRCC	
	A1.9	Encourage large industries and new development proposals to develop Environmental Management Plans.	O	3	\$30,000		EPA	MRCC

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
64	A2	Objective A2 – Road runoff from Deakin Av, 7th St and Sturt Hwy to Murray River above Lock 11: <i>To work with Vic Roads to reduce the impact of road runoff from major roads on the environmental, recreational and economic values of the Murray River above Lock 11.</i>						
	A2.1	Establish liaison with Vic Roads to ensure new roads and road upgrades incorporate water sensitive road design features such as grass swales and collector traps.	P	1		\$1,000	MRCC	Vic Roads
		Council should initiate workshops for emergency and operations staff.	See Action A1.2					
		Update Council's Emergency Response Plan.	See Action A1.3					
		Construct Etiwanda wetland.	See Action A1.6					
	A2.2	Investigate options for retro fitting major highways with grass swales and detention structures designed to isolate spills.	P, I	3	\$15,000		MRCC, Vic-Roads	
	A2.3	Investigate options for addressing risk to LMWA water supply intake from spills on the Chaffey Bridge as identified in a report by GHD	O, I	1	\$10,000		MRCC	LMWA, Vic Roads, NSW Roads Board
64	A3	Objective A3 – Sullage and Septic tank effluent from Kings Billabong Low Density Residential Zone <i>To minimise the risk of sullage and septic tank effluent from entering Kings Billabong in runoff from low density housing on the western shoreline along Cureton Ave and Cooke St. Sullage and septic tank effluent can contribute excess nutrients and pathogens that would impact upon the environmental, recreational and water supply values of Kings Billabong.</i>						
	A3.1	Ensure future development in this zone complies with EPA guidelines for onsite wastewater systems. (EPA Publications 629, 746, 747 & SEPP Waters of Victoria) eg Land Capability Assessments.	P	1		\$1,000	MRCC	EPA
	A3.2	Develop educational material targeted at residents with septic tanks to highlight the need for regular maintenance.	E	1	\$6,000	\$2,000	MRCC	EPA,
	A3.3	Construct a wetland on the combined outfall from the rural residential area between Cooke St and Cureton Ave to treat sullage, septic tank overflows and surface runoff prior to discharge to Kings Billabong.	I	5	\$300,000	\$10,000	MRCC	NRE
48	A4	Objective A4 – Degraded waterways (Murray River and Kings Billabong): <i>To reduce the degradation of riparian and instream habitat along the Murray River and Kings Billabong associated with inadequate stormwater infrastructure and uncontrolled access.</i>						
	A4.1	Liase with NRE, Parks Victoria and the Mallee CMA to manage access to floodplain in order to reduce impact of uncontrolled vehicle access, illegal dumping, live stock grazing etc. Ensure that stormwater impacts are considered in recommendations in Floodplain Management Plans, Frontage Plans and Wetland Management Plans.	O, E	1		\$5,000	MRCC	NRE, CMA
	A4.2	Protect riparian vegetation through the establishment of a riparian vegetation protection overlay within local planning provisions.	P	3	\$5,000		MRCC	
	A4.3	Inspect all drain outflows along weir pool foreshore and assess for erosion and damaged infrastructure and prepare works plan to rectify problem areas.	O	1	\$5,000		MRCC	
	A4.4	Conduct works program for rectifying eroding banks around stormwater outlets (indicative cost).	O, I	1	\$50,000	\$10,000	MRCC	
	A4.5	Erect signs to raise community awareness of damage that can be done to waterways and vegetation through uncontrolled access, illegal dumping, grazing etc. Link this action with other CMA and NRE initiatives and strategies to promote general awareness of environmental issues.	E	3	\$50,000	\$2,000	MRCC	CMA, NRE

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
48	A5	Objective A5 – Commercial runoff from Pine Av Drain (Catchment F) to Murray River above Lock 11: <i>To minimise the amount of litter generated in the central business district in Mildura and prevent litter from entering the Murray River above Lock 11 in stormwater runoff from this area.</i>						
	A5.1	Conduct workshops for Council staff and contractors involved in waste management services, street cleaning and parks and gardens management to promote the initiatives identified in the Stormwater Management Plan across all levels of Council operation.	E, O	1	\$10,000		MRCC	
	A5.2	Install a Gross Pollutant Trap on the outfall from Pine Ave Drain to the Mildura Weir Pool.	I	1	\$180,000	\$7,500	MRCC	
	A5.3	Develop educational material, including street and side entry pit signs and stencils to highlight linkages between what's dropped in the street and the impacts upon the Murray River	E	3	\$25,000	\$5,000	MRCC	CMA
48	A6	Objective A6 - Residential runoff above Lock 11: <i>To work with the local community to minimise the generation of pollutants generated in residential areas and to reduce the impact of residential runoff on environmental, recreational and water supply values of the Murray River above Lock 11.</i>						
	A6.1	Promote the use of rainwater tanks for watering gardens and investigate feasibility of using grey water for flushing toilets, including an assessment of options for reducing cost to residents associated with adopting water conservation measures eg discounts on rainwater tanks, rates rebate if grey water recycling systems are installed.	P,E	3	\$10,000	\$1,000	MRCC	EPA
		Initiate workshops for Council staff and contractors.						See Action A5.1
	A6.2	Use the local media to highlight the development of the Stormwater Management Plan and to launch new guidelines and brochures aimed at raising community awareness of stormwater issues.	E	1	\$2,500		MRCC	EPA, CMA
	A6.3	Continue to promote Waterwatch and Ecorecycle programs through local schools and ensure stormwater issues are incorporated into these programs.	E	1	\$5,000	\$5,000	MRCC	EPA, CMA, EcoRecycle Victoria
		Install an in-line Gross Pollutant Trap on the San Mateo / Etiwanda Drain.						See Action A1.5
	A6.4	Assess the potential for litter escape from residential road side recycling bins used around the Municipality, review bin types and instigate a program for converting to enclosed bins if necessary.	O, P	1	\$5,000		MRCC	Other Councils
		Construct Etiwanda wetland.						See Action A1.6
	A6.5	Development educational material for residents that promote best practice management and encourage waste reduction. Material can target car washing in streets and driveways, over-use of fertilisers on gardens etc.	E	1	\$20,000	\$5,000	MRCC	EPA, CMA
48	A7	Objective A7 - Residential Runoff below Lock 11: <i>To work with the local community to minimise the generation of pollutants generated in residential areas and to reduce the impact of residential runoff on environmental, recreational and water supply values of the Murray River below Lock 11.</i>						
		Promote rainwater tanks and grey water reuse.						See Action A6.1
		Initiate workshops for Council staff and contractors.						See Action A5.1
	A7.1	Investigate the feasibility of re-routing the stormwater outflow from Merbein to LMWA treatment ponds.	I	3	\$10,000		MRCC, LMWA	
		Use the local media to highlight the development of the Stormwater Management Plan.						See Action A6.2
	A7.2	Install an in-line Gross Pollutant Trap on the stormwater outflow from Merbein township to the Murray River floodplain at Merbein Common.	I	5	\$110,000	\$5,000	MRCC	
	A7.3	Install an in-line Gross Pollutant Trap on the stormwater outflow from Catchment A to the Murray River below Lock 11	I	3	\$80,000	\$5,000	MRCC	
	A7.4	Install an in-line Gross Pollutant Trap on the stormwater outflow from Catchments B & D to the Murray River below Lock 11.	I	3	\$110,000	\$5,000	MRCC	
		Continue to promote Waterwatch and Ecorecycle programs through local schools.						See Action A6.3
		Assess the potential for litter escape from residential recycling bins.						See Action A6.4
		Development educational material for residents that promote best practice management and encourage waste reduction.						See Action A6.5

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
48	A8	Objective A8 - Runoff from urban development sites (all catchments): <i>To work with developers and improve communication and coordination between Council planning staff and external authorities to reduce the amounts of sediment in runoff from urban development sites across the Municipality.</i>						
	A8.1	Conduct workshops and staff training to ensure that all relevant Council planning staff and external authorities understand referral requirements & procedures under the Planning and Environment Act 1987	P, O	1	\$5,000		MRCC	Referral authorities
	A8.2	Conduct workshops for Council staff involved in internal referrals process to ensure appropriate conditions that support best practice management are incorporated into planning permits (eg Sediment control techniques).	P	1	\$5,000		MRCC	
	A8.3	Determine applicability of different Water Sensitive Urban Design (WSUD) principles given unique characteristics in Mildura for all new developments (eg detention systems, re-use for watering, swales etc) and require adoption of appropriate WSUD principles for new development through reference to appropriate guidelines eg Best Practice Environment Management Guidelines.	P, E	3	\$20,000	\$2,000	MRCC	Referral authorities
	A8.4	Conduct workshops and information sessions for developers, builders, contractors and consultants to highlight MRCCs requirements for best practice management and to fully inform developers of information requirements on planning applications.	P, E	1	\$10,000		MRCC	Referral authorities
	A8.5	Require developers to prepare sediment and erosion control plans for all new developments. This actions links with Actions 8.3, 8.4 & 8.6.	P	1	\$20,000	\$3,000	MRCC	EPA, CMA
	A8.6	Increase frequency of audits and inspections of development sites and ensure appropriate infringement notification and enforcement of planning permit conditions.	R	1		\$30,000	MRCC	
	A8.7	Continue with plan to employ a dedicated Council officer for dealing with urban development and planning issues. Ensure this person is fully conversant with best practice stormwater management principles.	P	1	\$20,000	\$75,000	MRCC	
	A8.8	Require developers to regularly clean gutters and drainage system during maintenance period to protect Council drain from sedimentation. (Cost is borne by developers).	P, O	1			MRCC	Referral authorities
48	A9	Objective A9 - Inflows to Wargan Basins from Lakes Hawthorn and Ranfurly: <i>To ensure the quality of inflows to Wargan Basins are not significantly impacted upon by stormwater runoff.</i>						
	A9.1	Addressed by managing urban inflows to Lakes Hawthorn and Ranfurly (Strategies 11-14, 19, 20)	C				MRCC, GMW	SRWA, FMIT
48	A10	Objective A10 - Sullage and septic tank overflows (all catchments): <i>To work with the local community to raise the awareness of the environmental impacts of septic tank systems and to reduce the impacts of sullage and septic tank effluent on environmental, recreational and water supply values in all catchments.</i>						
		Ensure future development complies with EPA guidelines for onsite wastewater systems. (EPA Publications 629, 746, 747 & SEPP Waters of Victoria).	See Action A3.1					
	A10.1	Document unsewered areas and report on potential for environmental problems. Ensure reporting requirements of EPA publication 629 are met.	O	1	\$10,000	\$500	MRCC	LMWA
		Education for residents on septic tank maintenance.	See Action A3.2					
	A10.2	Investigate potential for sewerage of or local treatment for problem areas	P,O	5	\$15,000	\$2,000	MRCC, LMWA	

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
48	A11	Objective A11 - Residential runoff to Lake Ranfurly East: <i>To work with the local community to minimise the generation of pollutants in residential areas and to reduce the impact of residential runoff on environmental and amenity values of Lake Ranfurly East.</i>						
		Promote rainwater tanks and grey water reuse.						See Action A6.1
		Initiate workshops for Council staff and contractors.						See Action A5.1
	A11.1	Retrofit old sewerage treatment lagoons on outflow to Lake Ranfurly from 15th Street Drain to provide improved wetland treatment. Investigate the possibility for including outflow from Catchment Y as part of this action.	I	3	\$60,000	\$5,000	MRCC	GMW, SRWA, FMIT
		Use the local media to highlight the development of the Stormwater Management Plan.						See Action A6.2
	A11.2	Install Gross Pollutant Trap on the 15th Street Drain prior to discharge to Lake Ranfurly East. (May be difficult due to condition of piped drainage system and the need for upgrades in the 15th Street catchment, trash racks on the outfall may provide the best opportunity for managing gross pollutants at this location).	I	3	\$150,000	\$7,500	MRCC	
		Continue to promote Waterwatch and Ecocycle programs in schools.						See Action A6.3
		Assess the potential for litter escape from road side recycling bins.						See Action A6.4
		Development educational material for residents that promote best practice management and encourage waste reduction.						See Action A6.5
48	A12	Objective A12 - Commercial Runoff from 15th Street precinct to Lake Ranfurly East: <i>To minimise the impact of litter and road runoff from the Commercial precinct along 15th Street on the environmental and amenity values of Lake Ranfurly East.</i>						
		Retrofit old lagoons on outflow to Lake Ranfurly from 15th Street Drain to provide wetland treatment.						See Action A11.1
		Install Gross Pollutant Trap on the 15th Street Drain prior to discharge to Lake Ranfurly East.						See Action A11.2
		Develop educational material, including street and side entry pit signs and stencils to highlight linkages between what's dropped in the street and the impacts upon the Murray River.						See Action A5.3
48	A13	Objective A13 - Road runoff from Deakin Av & 15th St to Lake Ranfurly East: <i>To reduce the impact of road runoff from major roads on the environmental, recreational and economic values of the Lake Ranfurly East.</i>						
		Establish liaison with Vic Roads to ensure new roads and road upgrades incorporate water sensitive road design features such as grass swales and collector traps.						See Action A2.1
		Council should initiate workshops for emergency and operations staff.						See Action A1.1
		Update Council's Emergency Response Plan.						See Action A1.2
		Retrofit old lagoons on outflow to Lake Ranfurly from 15th Street Drain to provide wetland treatment.						See Action A11.1
		Investigate options for retro fitting major highways with grass swales and detention structures designed to isolate spills.						See Action A2.2
48	A14	Objective A14 - Industrial runoff from Irymple: <i>To work with the EPA and local industries to minimise the risk that runoff from industrial areas in Irymple has on the environmental, recreational and amenity values of Lake Ranfurly East.</i>						
		Establish long term consultation and coordination with the EPA.						See Action A1.1
		Initiate workshops for emergency and operations staff						See Action A1.2
		Update Council's Emergency Response Plan.						See Action A1.3
		Initiate workshops and information session with industry representatives to highlight best practice stormwater management.						See Action A1.4
	A14.1	Maintain trash racks and pumps at Irymple retarding basin	I	1		\$5,000	MRCC	
		Develop literature and guidelines targeted at industry.						See Action A1.7
		Retrofit old lagoons on outflow to Lake Ranfurly from 15th Street Drain to provide wetland treatment.						See Action A11.1
		Coordinate with the EPA to conduct site audits and inspections.						See Action A1.8
		Encourage large industries and new development proposals to develop Environmental Management Plans.						See Action A1.9

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
36	A15	Objective A15 - Upstream inflows to weir pool: <i>To coordinate with other authorities to minimise the impacts of upstream inflows in the Murray River from adversely impacting upon the water quality in the Mildura Weir Pool and Kings Billabong.</i>						
	A15.1	Continue liaison with MDBC and GMW to investigate options for pulsing flows through Euston Weir pool to reduce the potential for algal blooms as recommended by the Mallee Water Quality Strategy & MDBC flows projects.	C	1		\$2,500	MRCC, MDBC, GMW	CMA, NRE
	A15.2	Establish long term consultation with regional authorities and upstream Councils to highlight the impacts that upstream activities have on water quality in Mildura as recommended in Mallee Water Quality Strategy.	C	1		\$5,000	MDBC, MRCC	CMA, NRE, other Councils
36	A16	Objective A16 – Runoff from lot scale construction sites (all catchments): <i>To work with builders and developers to reduce the amounts of sediment and litter in runoff from lot scale construction sites throughout the Municipality.</i>						
	A16.1	Encourage improved stormwater management at the lot scale by promoting best practice management literature and guidelines (eg Best Practice Environmental Management Guidelines, Construction Techniques for Sediment Pollution Control).	E	1		\$3,000	MRCC	DOI, EPA, Industry
		Conduct workshops for developers, builders, contractors and consultants to advice on best practice management techniques.	See Action A8.4					
	A16.2	Develop and enforce a new local law based on the Department of Infrastructure Code of Practice for the Protection of Council Assets and Control of Building Sites.	R	1	\$5,000	\$20,000	MRCC	
36	A17	Objective A17 - Rural residential runoff from Kings Billabong LDRZ: <i>To work with the local community to minimise the impact of runoff from the Kings Billabong Low Density Residential Zone to Kings Billabong.</i>						
		Promote rainwater tanks and grey water reuse.	See Action A6.1					
		Use the local media to highlight the development of the Stormwater Management Plan.	See Action A6.2					
		Continue to promote Waterwatch and Ecorecycle programs through local schools.	See Action A6.3					
		Initiate workshops for Council staff and contractors.	See Action A5.1					
		Assess the potential for litter escape from residential road side recycling bins.	See Action A6.4					
		Development educational material for residents that promote best practice management and encourage waste reduction.	See Action A6.5					
		Construct a wetland on the combined outfall from the rural residential area between Cooke St and Cureton Ave to treat sullage, septic tank overflows and surface runoff prior to discharge to Kings Billabong.	See Action A3.3					
36	A18	Objective A18 - Runoff from open spaces, parks and gardens (all catchments): <i>To work within Council to minimise the amounts of nutrients and sediment in runoff from Council managed open spaces, parks and gardens across the Municipality.</i>						
	A18.1	Council should revise the operational and maintenance procedures for open space management in order to reduce fertiliser application rates to parks and garden, improve water use efficiencies through improved irrigation practices and promote the use of plants with low nutrient and watering requirements etc.	O	1	\$10,000	\$5,000	MRCC	
		Initiate workshops for Council staff and contractors.	See Action A5.1					
	A18.2	Council should investigate options for re-use of stormwater for irrigating parks and gardens. Stormwater detention systems could be incorporated into new development and used for watering nature strips, parks and gardens.	P,O	3	\$20,000		MRCC	

Table 5.1 Cont...

Risk	Action	Action	Theme	Time	Cost		Lead agency	Participating stakeholders
					Capital	Ongoing		
36	A19	Objective A19 - Residential runoff to Lake Hawthorn: <i>To work with the local community to minimise the impact of residential runoff on the environmental and amenity values of Lake Hawthorn.</i>						
		Promote rainwater tanks and grey water reuse.						See Action A6.1
		Use the local media to highlight the Stormwater Management Plan.						See Action A6.2
	A19.1	Incorporate wetland treatment, grass swales and local detention systems on the proposed 16th street drain	P, I	1	\$300,000	\$10,000	MRCC	
		Continue to promote Waterwatch and Ecorecycle programs in schools.						See Action A6.3
		Initiate workshops for Council staff and contractors.						See Action A5.1
		Assess the potential for litter escape from residential recycling bins.						See Action A6.4
		Development educational material for residents that promote best practice management and encourage waste reduction.						See Action A6.5
	A19.2	Investigate options for retrofitting Centenary Park Retarding Basin to provide low flow wetland treatment of stormwater runoff.	P, I	3	\$50,000	\$10,000	MRCC	
36	A20	Objective A20 - Road runoff in Lake Hawthorn, the Murray River below Lock 11 & other areas: <i>To minimise the impact of road runoff from major highways and other roads across the Municipality.</i>						
		Establish liaison with Vic Roads to ensure new roads and road upgrades incorporate water sensitive road design features such as grass swales and collector traps.						See Action A2.1
		Council should initiate workshops for emergency and operations staff.						See Action A1.1
		Update Council's Emergency Response Plan.						See Action A1.2
		Investigate options for retro fitting major highways with grass swales and detention structures designed to isolate spills.						See Action A2.2
32	A21	Objective A21 - Industrial runoff from Merbein to Murray River: <i>To work with the EPA and local industries to minimise the risk that runoff from industrial areas in Merbein has on the environmental, recreational and recreational values of the Murray River and Merbein Common wetlands.</i>						
		Establish long term consultation and coordination with the EPA.						See Action A1.1
		Initiate workshops for emergency and operations staff						See Action A1.2
		Update Council's Emergency Response Plan.						See Action A1.3
		Initiate workshops and information session with industry representatives to highlight best practice stormwater management.						See Action A1.4
		Investigate the feasibility of re-routing the stormwater outflow from Merbein to LMWA treatment ponds.						See Action A7.1
		Install an in-line Gross Pollutant Trap on the stormwater outflow from Merbein township to the Murray River floodplain at Merbein Common.						See Action A7.2
		Develop literature and guidelines targeted at industry.						See Action A1.7
		Coordinate with the EPA to conduct site audits and inspections.						See Action A1.8
		Require large industries and new development proposals to develop Environmental Management Plans.						See Action A1.9
32	A22	Objective A22 - Residential runoff to Rifle Butts Swamp: <i>To work with the local community to minimise the impact of residential runoff on the environmental and amenity values of Rifle Butts Swamp.</i>						
		Promote rainwater tanks and grey water reuse.						See Action A6.1
		Use the local media to highlight the development of the Stormwater Management Plan.						See Action A6.2
		Continue to promote Waterwatch and Ecorecycle programs in schools.						See Action A6.3
		Assess the potential for litter escape from road side recycling bins.						See Action A6.4
		Development educational material for residents that promote best practice management and encourage waste reduction.						See Action A6.5
	A22.1	Install in-line Gross Pollutant Traps on drain outfalls from Catchments J, K & X.	I	5	\$250,000	\$15,000	MRCC	
	A22.2	Investigate feasibility of collection and reuse of stormwater and drainage runoff on the Mildura golf course.	O	1	\$10,000		Golf Course Mngt.	MRCC

5.2 Monitoring

Several routine water quality monitoring programs currently exist in the region; the Statewide Victorian Water Quality Monitoring Program and monitoring of irrigation drains and drainage basins by regional water authorities. There is also some ad hoc monitoring associated with scientific and research studies and community programs such as Waterwatch. While these monitoring programs can provide some data on the water quality status in the region, they are not targeted at monitoring stormwater quality. As such, a suitable monitoring program that specifically targets stormwater quality needs to be developed in consultation with the EPA, Mallee CMA, regional water authorities and other experts in water quality monitoring and environmental assessment, for example staff from Lower Basin Laboratory. The first stage in developing a monitoring program is to identify the water quality parameters that are likely to respond to changed stormwater management practices. For example, constructed wetlands are designed to reduce nutrient and sediment loads in stormwater so a suitable suite of parameters for monitoring constructed wetlands would need to include nitrogen, phosphorus and suspended solids in the inflow and outflow to wetlands. To be most effective at monitoring the impact of improved stormwater management practices, monitoring of stormwater flow needs to be established some time prior to management strategies being implemented in order that a response can be detected when the new management actions are implemented.

Costs for developing and implementing a monitoring program are dependent on the number of samples and suite of parameters analysed. An initial cost of \$15,000 would be required to establish a suitable monitoring program that identifies sample locations, parameters and frequency of sampling. The actual sampling costs are dependant on the number of locations sampled, the frequency of sampling and the number of parameters analysed. Laboratory analysis costs for a suite of suspended solids, biological oxygen demand (BOD), nutrients (total nitrogen and phosphorus, oxidisable nitrogen and soluble phosphorus) and heavy metals (eg. lead, cadmium, copper, iron and zinc) are approximately \$200/sample. The measurement of in-situ parameters such as turbidity, dissolved oxygen, salinity and pH would require the purchase of a suitable meter or meters. An approximate cost for implementing a routine stormwater-monitoring program based on sampling 10 locations once a month would be \$30,000 including travel and expenses. This cost could be reduced if fewer parameters are analysed or if a system for cost sharing with other monitoring programs in the region is identified.

For monitoring to be most effective, it is important that a suitable sampling program is established at an early stage in the implementation of this stormwater management plan.

6. Council Management Framework Strategies

6.1 Strategies

Council's day to day planning and management activities can have a significant effect on stormwater quality. A review of Council's management procedures was undertaken as they relate to stormwater management. This involved a review of the planning approval process, waste management and levels of service, local laws, enforcement and regulation. The review was aimed at identifying areas within Council's management structure where improvements can be made that will have a beneficial impact on stormwater management and quality thus reducing impacts on receiving waterways.

Details of Council's management framework review can be found in **Volume II**. The priority issues identified in the review can be grouped into specific areas of Council management as summarised below. The issues are the focus for management actions aimed at improving the way Council manages stormwater.

Strategic planning

- ❑ The Municipal Strategic Statement (MSS) and Local Planning Policies contain reference to environmental management, however this can be improved to incorporate Best Practice urban stormwater management actions developed as part of this strategy (Revision of the MSS is due in 18 months).

Approvals and Referrals Process

- ❑ There are issues associated with referrals process for planning applications that relate to the level of detail provided by proponents, a lack of consistency in conditions and permit requirements, particularly from external authorities and inadequate enforcement of permit conditions.
- ❑ Council needs to ensure the referral process is clearly understood by all authorities.
- ❑ Outline roles, responsibilities and triggers for internal referrals.
- ❑ Develop standard condition requirements relating to sediment and litter control on development and construction sites.
- ❑ Incorporate aspects of stormwater best practice management into subdivision development guidelines.

Operations

- ❑ Establish process for routine inspection and maintenance of drainage infrastructure.
- ❑ Implement best practice environmental management in day to day Council operations and maintenance activities.

Education and training

- ❑ Implement training and education programs for Council staff and contractors to improve awareness of stormwater management issues, roles and responsibilities.
- ❑ Clarify roles, responsibilities and jurisdictions amongst Council and Agencies in the region.

Regulation and enforcement

- ❑ Improve regulation and enforcement mechanisms, particularly with respect to the enforcement of planning permit conditions and inspections of development sites during the maintenance period.
- ❑ Determine ability of Council to adequately enforce local laws, identify impediments such as resourcing and delegation of powers.
- ❑ Develop Local Laws to deal with runoff and litter from construction sites.

Many of the issues identified in the risk assessment process and the Council management review are closely linked. Council management can directly influence some of the activities that are creating threats to receiving environment values. For example, tighter controls on planning permit conditions that reduce sediment inputs to the stormwater system will have a major beneficial impact upon the quality of stormwater entering receiving environments. It is important that the linkages between the priority risks and Council management are acknowledged so that actions within Council will have a direct improvement on stormwater management at the source rather than solely through reactive measures. The final SWMP provides Council with the strategic framework required to ensure that best practice stormwater management is at the forefront of Councils operations.

Based on the review of Council's management framework, a number of recommendations have been made to incorporate Best Practice Stormwater Management into Council's planning and management activities, these are summarised in Table 6.1. Many of these recommendations can be implemented by modifying or improving existing Council planning and management practices. Where recommendations require changes to Council's Municipal Strategic Statement, planning scheme and other strategic and corporate documents scheme, these changes can be made when opportunities arise as part of scheduled regular revisions.

■ **Table 6.1 Council management framework actions**

Action	Description	Priority
<p>Strategy B1– Assign responsibility for stormwater management <i>To assign responsibility within Council for implementing the Mildura Rural City Council Urban Stormwater Quality Management Plan and establish long term and Council wide commitment to stormwater management in the Mildura region.</i></p>		
B1.1	Council should assign responsibility for implementation of the <i>Mildura Rural City Council Stormwater Quality Management Plan</i> to the appropriate Council officer (eg Environment Officer - Action B1.3).	Very high
B1.2	Define roles and responsibilities for stormwater management within Council and establish an Implementation Committee to assist the responsible Officer in implementation of the stormwater management plan. Prepare a detailed timetable for implementation based on funding availability and review this schedule regularly.	Very high
B1.3	Establish a position within Council for an Environmental and Stormwater Management Officer who would be responsible for implementing the environmental programs including the Stormwater Management Plan. Duties would include: <ul style="list-style-type: none"> ▪ Environmental assessment of new development proposals; ▪ Implementation of stormwater education and training programs for Council staff; ▪ Facilitation of stormwater workshops and information sessions for industry and development groups; ▪ Coordination of educational material, literature and guidelines for the local community, schools etc to raise stormwater awareness; and, ▪ Monitoring and review of the stormwater management plan implementation. <p>The Environmental and Stormwater Management Officer would ideally have skills in environmental and stormwater management, water sensitive urban design, education and communication.</p>	Very high
B1.4	Identify funding sources and apply for funding to implement actions identified in the stormwater management plan. Relevant sources of funding include: <ul style="list-style-type: none"> ▪ Victorian Stormwater Action Program implementation grants scheme; ▪ Natural Heritage Trust & Murray-Darling 2001 funding programs for on ground works; and, ▪ EcoRecycle Victoria funding for waste management, recycling and education programs. 	Very high
B1.5	Clarify roles, responsibilities and jurisdiction with regards to stormwater management amongst Council and Agencies in the region.	Very high
B1.6	Council, with assistance from the EPA, the Mallee CMA and regional water authorities should develop and implement an urban water quality monitoring program to determine if management actions are effective at improving stormwater quality. Indicative costs for such a program include approximately \$15,000 to establish a suitable program, identify appropriate sites and identify relevant parameters for measurement. Approximately \$30,000 per year would be required to implement a suitable water quality monitoring program which would include routine monitoring and targeted studies in particular problems areas.	Very high
B1.7	Council should develop a program to assess and review the implementation and effectiveness of stormwater initiatives identified in the Stormwater Management Plan. Reviews should be conducted every 12 months and plans and documents revised as necessary.	Very high

Table 6.1 Cont/..

Action	Description	Priority
Strategy B2 - Strategic Planning		
<i>To ensure best practice stormwater management is incorporated in Council's strategic documents to support Council's objectives for improved stormwater quality and environmental management</i>		
B2.1	Council should incorporate reference to best practice stormwater management in the Corporate Plan to highlight Council's commitment to improved environmental management.	Very high
B2.2	Council should ensure that State Planning Policy Framework Clause 15.01 Protection of Catchments, Waterways and Groundwater is referred to as part of the development approvals process.	Very high
B2.2	<p>Council should amend the Mildura Planning Scheme Local Provision to include reference to the <i>Mildura Rural City Council Stormwater Quality Management Plan</i>. Specific amendments includes updates to:</p> <p>Clause 21.01-2 Settlement Amend to encourage Water Sensitive Urban Design and best practice stormwater management for new development.</p> <p>Clause 21.04-4 Environment Amend to ensure that best practice stormwater management is identified as a strategy for achieving Objectives within this clause. The Referred Documents lists should be updated to include the <i>Mildura Rural City Council Stormwater Quality Management Plan</i>.</p> <p>Clause 21.04-7 Infrastructure Amend overview to include reference to best practice stormwater management objectives and encourage the use of Water Sensitive Urban Design principles for new drainage infrastructure. The Referred Documents lists should be updated to include the <i>Mildura Rural City Council Stormwater Quality Management Plan</i>.</p> <p>Amendments to the Mildura Planning Scheme should be made as opportunities arise during scheduled revision. In the meantime, Council can use the State Planning Policy Framework Clause 15.01 to guide decision making.</p>	Very high
B2.3	Council should identify appropriate Water Sensitive Urban Design principles suitable for the Mildura region that can be effectively incorporated into new development and upgrades of existing infrastructure. These principles should be disseminated to land developers for incorporation into designs for new urban development (also see Action B4.3 & A8.3).	High
Strategy B3 – Planning Referrals and Approvals Process		
<i>To ensure an effective referrals and approvals process for planning permit applications for new development.</i>		
B3.1	Council should improve the management of the referrals process by assigning a dedicated Council Officer to manage the referrals process.	Very high
B3.2	Council should coordinate with External Referral Authorities to ensure all authorities are familiar with the approvals and referrals process contained within Section 55 of the <i>Planning and Environment Act 1987</i> and Clause 66 of the Mildura Planning Scheme. It is important that referral authorities are familiar with the requirements of the act to ensure consistency in the referrals and approvals process (also see Action A8.1).	Very high
B3.3	Council should ensure that all proposals where there is likely to be an increase in stormwater discharge are referred internally to an appropriate Officer for assessment of potential environmental impacts and to ensure the best practice stormwater management objectives are incorporated into the development proposal. The most appropriate internal Officer would be the Environmental and Stormwater Management Officer (also see Action A8.2).	Very high
B3.4	Council should establish a protocol for pre planning application meetings between applicants, Council and referral authorities to ensure that proponents fully understand the application requirements and are familiar with the best practice stormwater management requirements outlined in the stormwater management plan (also see Action A8.4).	Very high

Table 6.1 Cont/.

Action	Description	Priority
<p>Strategy B4 - Incorporate Best Practice Stormwater Management in land use planning and urban design <i>To ensure best practice stormwater management and water sensitive urban design is incorporated into all stages of urban development including planning application, design and construction stages and to encourage improved water use efficiencies and stormwater management within the broader community.</i></p>		
B4.1	Council should ensure that conditions relating to sediment and litter control on development and construction sites are appropriate for the Mildura region.	Very high
B4.2	Council should ensure that techniques for sediment control, stormwater treatment and water sensitive design are readily available to the land development industry. Awareness of the <i>Best Practice Environmental Management Guidelines</i> , the <i>Mildura Rural City Council Stormwater Quality Management Plan</i> and other relevant guidelines could be raised through the preparation of a brochure and information and training sessions for the land development industry. Reference to techniques for best practice stormwater management should also be incorporated into the Council's <i>Subdivision Development Guidelines</i> .	Very high
B4.3	Council should require that Water Sensitive Urban Design principles appropriate for the region (Action B2.3) are incorporated into all new development proposal prior to approval. Council staff and referral authorities can then assess proposals based on their proposed water sensitive design principles.	Very high
B4.4	Council should ensure that new development proposals and changes in land use are sympathetic to the natural and cultural environment and that any increase in stormwater runoff is minimised and treated using wetlands, sediment traps and local detention measures prior to discharge to receiving environments.	Very high
B4.5	Council should encourage the use of household rainwater tanks for watering gardens and investigate the feasibility of household grey water recycling for toilet flushing (Action A6.1).	High
<p>Strategy B5 – Incorporate Best Practice Stormwater Management in Council's day-to-day operations and management <i>To demonstrate Council's commitment to stormwater management by incorporating best practice management into Council's day to day operations and management</i></p>		
B5.1	Council should formalise and document the process for routine inspection and maintenance of the stormwater drainage system. This documentation should assess asset condition, identify known problem areas and establish a regular maintenance program. It should also incorporate Actions A4.3 & A4.4 .	Very high
B5.2	Council should amend the regular practices of its operations where these can contribute to improved stormwater management as identified in Actions A18.1 & A18.2 .	Very high
B5.3	Council should avail itself of relevant literature and technical guidelines relevant to stormwater management and subscribe to relevant industry associations eg the Stormwater Industry Association Inc. (phone: 1800 761 777) who produce regular newsletters with information about new initiatives, techniques, seminars etc relevant to urban stormwater management.	Very high
B5.4	Council should establish a commitment to long term monitoring of the effectiveness of stormwater initiatives implemented under this plan (see Action B1.7).	Very high
<p>Strategy B6 – Education and Training <i>To implement effective education and training programs for Council staff and facilitate training for external agencies and stakeholders to improve stormwater management in the Mildura region</i></p>		
B6.1	Council should implement training and education programs for Council staff and contractors to improve awareness of stormwater management issues, roles and responsibilities as identified in Action A5.1 .	Very high
B6.2	Council should facilitate training and education programs for Council staff and emergency services involved in emergency response to highlight requirements for the protection of stormwater quality and receiving environments under actions within the Emergency Response Plan (also see Action A1.2).	High
B6.3	Council should facilitate training sessions for Council staff and referral authorities involved in the planning approvals and referrals process to ensure all parties are conversant with the requirements of the Planning and Environment Act 1987 (also see Action B3.3).	
B6.4	Council should facilitate workshops and information sessions for the Land and building development industry to inform them of Council's requirements for best practice stormwater management and highlight the options available to developers to satisfy Council's stormwater management objectives (Links with actions identified in Strategies A8, B3 & B4).	Very high

Table 6.1 Cont/..

Action	Description	Priority
Strategy B7 – Regulation and Enforcement		
<i>To make effective use of existing regulations and establish new Local Laws to support Council in their efforts aimed at reducing the impacts of stormwater runoff and the protection of Council assets and the local environment.</i>		
B7.1	Council should ensure sufficient resources are available to adequately inspect and enforce planning permit conditions on development sites. This requires that suitably qualified technical staff be available for regular inspections of development sites during the maintenance period.	Very high
B7.2	Council should assess the capacity to implement new Local Laws, particularly with regard to resources for enforcement and powers of delegation.	High
B7.3	If capacity to implement new Local Laws exists then Council should expand Environmental Local Law No. 3 to include a new Local Law controlling sediment and litter on building construction sites. The Department of Infrastructure has prepared a Code of Practice <i>Protection of Council Assets and Control of Building Sites</i> to assist Council with the development and enforcement of relevant Local Laws aimed at the protection of local environments.	High
Strategy B8 – Coordinate Best Practice Management with other Authorities and Groups		
<i>To ensure Council effectively communicates and coordinates with other authorities, stakeholders and community groups on a regional and State level and to ensure Council is kept up to date on new initiatives and developments in urban stormwater management.</i>		
B8.1	Council should coordinate with other Authorities such as the EPA, NRE, Mallee Catchment Management Authority and regional water authorities to ensure effective stormwater management across the region.	Very high
B8.2	The Council Stormwater Management Officer should participate in broader regional and State based forums on stormwater management to ensure the Mildura Rural City Council remains up to date on relevant stormwater initiatives across the State.	Very high
B8.3	Council should coordinate with other Councils and State agencies to identify opportunities for improved stormwater management and ensure a more coordinated outcome for State based projects.	High
B8.4	Council should liaise with community groups who have interest in stormwater and environmental management and ensure they are consulted at appropriate times during the implementation of the stormwater management plan.	High

6.2 Best practice guidelines and documents

A range of best practice guidelines and documents are available to the Council, other stakeholders and people involved in the development and construction industry to aid in best practice management. There are also organisations that provide regular information on stormwater management issues, seminars and technological advances. The following list provides details of these information sources.

Guidelines

DOI (2000). A code of practice for protection of Council assets and control of building sites. Department of Infrastructure (Available at www.doi.vic.gov.au).

EPA (1991). Construction techniques for sediment pollution control. Environment Protection Authority Publication no. 275 (Available from www.epa.vic.gov.au)

EPA (1998). Development approvals in sewered and unsewered areas. Environment Protection Authority Publication no. 629 (Available from www.epa.vic.gov.au)

EPA (2001). Land capability assessment for onsite domestic wastewater management. Environment Protection Authority Publication no. 746 (Available from www.epa.vic.gov.au).

Lawrence, I. and Breen, P. (1998). Design guidelines: Stormwater pollution control ponds and wetlands. Cooperative Research Centre for Freshwater Ecology (Available from www.freshwater.canberra.edu.au).

Mitchell, G., Mein, R., and McMahon, T. (1999). The reuse potential of urban stormwater and wastewater. Cooperative Research Centre for Catchment Hydrology Industry Report 99/14 (Available from www.catchment.crc.org.au).

Victorian Stormwater Committee (1999). Urban stormwater: Best practice environmental management guidelines. CSIRO Publishing: Melbourne.

Walker, T. and Wong, T. (1999). Effectiveness of street sweeping for stormwater pollution control. Cooperative Research Centre for Catchment Hydrology Technical Report 99/8 (Available from www.catchment.crc.org.au).

Wong, T., Breen, P., Somes, N. and Lloyd, S. (1998). Managing urban stormwater using constructed wetlands. Cooperative Research Centre for Catchment Hydrology Industry Report 98/7 (Available from www.catchment.crc.org.au).

Wong, T., Breen, P. and Lloyd, S. (2000). Water sensitive urban road design – design options for improving stormwater quality of road runoff. Cooperative Research Centre for Catchment Hydrology Technical Report 00/1 (Available from www.catchment.crc.org.au).

Victorian State Government (1995). Victoria's litter reduction strategy (Available from www.epa.vic.gov.au).

Useful Internet Pages

CRC for Catchment Hydrology www.catchment.crc.org.au
Department of Infrastructure www.doi.vic.gov.au
Victorian Environment Protection Authority www.epa.vic.gov.au
NSW Environment Protection Authority www.epa.nsw.gov.au

Associations

Stormwater Industry Association Inc. 1800 761 777
(director@stormwater.industry.com)

7. Implementation and review

The effectiveness of the stormwater management plan is dependent upon the Council's ability to implement the recommendations of the plan. The implementation framework provides Council with guidance on how to resource and coordinate the implementation of the stormwater management plan. The following provides a framework for assisting Council with successful implementation of the stormwater management plan.

7.1 Responsibility for Implementation

Implementation of the stormwater management plan should follow the recommended actions identified in the plan. In order to effectively coordinate the implementation of these actions Council must assign a staff member with responsibility for coordinating implementation. In Mildura, the coordinator's role could be assigned to the new position of Environment and Stormwater Management Officer (**Action B1.3**).

To assist the Coordinator, an Implementation Committee should also be established. This committee would ideally consist of representative from all sections of Council relevant to stormwater management including, planning, engineering and infrastructure, parks and gardens, waste management services and health services. Relevant personnel from outside agencies, such as the Mallee CMA and the EPA could also be included in the Implementation Committee. The Implementation Committee's role would be to oversee and coordinate the progressive implementation of the stormwater management plan.

It is also recommended that the Reference Group and Project Working Group established for the development of this stormwater management plan be combined and used to act in a review role during the implementation of the plan.

7.2 Implementation process

A suggested time frame for implementation has been provided for each of the actions identified in the Reactive Management Strategies. Typically, low cost actions have been recommended for immediate implementation while higher cost actions are recommended for implementation over a longer period of time depending upon funding availability.

The implementation of actions can be flexible depending upon funding availability, however it is recommended that a schedule for implementation be established to assist in determining funding requirements over the implementation stages of the plan. The implementation schedule should be dynamic and updated as works are completed, additional works are required, or as new issues arise. The implementation schedule should be reviewed on an annual basis, prior to the preparation of Council's Works Programs. This is to identify progress of works to date, the works to be implemented in the following year and the funding and budgetary requirements for these works.

7.3 Monitoring and review

The effectiveness of the stormwater management plan should be measured with a comprehensive monitoring and review program (Table 7.1). There are two levels to this program:

- 1) Review of the implementation of actions and progress against the plan objectives; and
- 2) Monitoring of the effectiveness of actions at improving the quality of stormwater runoff and protection and enhancement of the values of receiving environments.

The stormwater management plan should be reviewed and revised regularly to ensure that the objectives, issues and options identified within the Plan are still relevant and provide the necessary information for Council's improvement program.

The Plan should be updated as required, but within 3 years from completion or the last revision (with the exception of the Implementation Schedule which is updated annually, as discussed above).

When reviewing/revising the stormwater management plan, the following aspects should be considered:

- Results from any water quality monitoring programs and environmental studies;
- The effectiveness of options implemented during the previous years;
- Whether short term management objectives have been satisfied;
- Any additional objectives that are required;
- Improved understanding of stormwater issues and impacts within local catchments;
- Any issues not previously addressed that need to be considered; and
- Whether additional management options need to be developed.

The effectiveness-monitoring program should be a comprehensive program for monitoring water quality and other parameters in the region that are impacted upon by stormwater runoff (See Section 5.2). Council should consult with the EPA, the Mallee CMA and other water quality experts to ensure a suitable and effective monitoring program is established. The program should consist of routine water quality monitoring and targeted programs aimed at problem areas or at determining if specific actions are effective at reducing the impacts of stormwater runoff. Detailed reporting should be conducted to inform the community and other stakeholders of the effectiveness of the actions in the stormwater management plan at improving water quality. Initially, reporting could be conducted 6-monthly as the plan is implemented and then annually once actions have been implemented, to report on progress and effectiveness of actions at addressing stormwater issues.

Results from the water quality monitoring program should feed-back into the review of the stormwater management plan. For example, an examination of the litter collected in litter traps could help Council in identifying the source of such litter eg fast food outlets, which can then be used to develop targeted education programs in particular areas.

■ **Table 7.1. Review and Monitoring schedule for implementation of the Mildura Rural City Council Urban Stormwater Quality Management Plan (3-year rolling schedule).**

Year Quarter	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Implementation Committee meeting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water quality monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Review/revise Implementation Schedule & prepare works plan		✓				✓				✓		
Revise Stormwater Management Plan												✓

7.4 Funding options

The full implementation of all actions identified in the stormwater management plan requires a significant funding commitment. Many of the actions may be implemented at a cost much reduced from that indicated through modification to current Council procedures and the use of in-house resources, for example in the development of education material and initiation of workshops and information sessions. However, there is still a need to ensure stormwater management actions are identified in Council’s annual budget and that funding opportunities outside Council are also identified.

Actions identified in the stormwater management plan should be incorporated into Council’s capital works program and budget. Separate funding lines could be established for existing and new works. The capital works program and budget should be reviewed and revised where current projects can be modified to incorporate actions identified in the plan. For example, best practice management techniques should be incorporated into any current drainage or road upgrades. Cost sharing initiatives should be identified and established with other agencies. For example, Council and the Mallee CMA could jointly fund community education programs.

There is also a range of funding options outside of Council’s own budget. The Victorian Government through the Victorian Stormwater Action Program (VSAP) is providing grants to local Councils for the implementation of actions identified in stormwater management plans. This stormwater management plan has been prepared according to VSAP guidelines such that funding can be requested for actions identified in this plan. Funding under the VSAP grants program is available for actions such as education programs, structural treatment measures, assistance with planning scheme amendments, feasibility studies and monitoring programs and upto 50% of the eligible cost can be provided. Funding is not available for providing salaries to Council staff, however salaries are considered an ‘in-kind’ contribution.

In the Murray-Darling Basin, funding under the Natural Heritage Trust - Murray Darling 2001 Program is available for on-ground works that will result in a reduction of nutrients, salt and sediment inputs to rivers and wetlands. However, this funding program is due to finish at the end of 2001 and a new program has not yet been established. Funding is also available through organisations such as EcoRecycle for actions relating to waste management, recycling and education programs.

New funding opportunities arise from time to time and the designated Stormwater Coordinator should ensure they are familiar with all funding options.

8. Summary

The *Management Plan for the Improvement of Urban Stormwater Quality for the Mildura Rural City Council* provides Council with the strategic basis for improved stormwater management and hence improved environmental condition for waterways and wetlands in the Mildura area. The plan has been developed according to the requirements of the Victorian Stormwater Committee and in close consultation with the Council and stakeholders through regular meetings and workshops. This has ensured that the actions identified in the plan are considered by the Council and stakeholders to be the most relevant for addressing urban stormwater issues in the Mildura region. Adherence to the requirements of the Victorian Stormwater Committee also ensures that the plan provides the appropriate support necessary for successful funding for actions identified in the plan.

The plan identifies a mix of reactive and management strategies that once established will improve the quality of urban stormwater runoff and protect and enhance the values of waterways and wetlands in the Mildura region. Overall benefits will include improved water quality, reduced risk of algal blooms, enhanced recreational opportunities and water supply protection.

The success of initiatives identified in the plan is dependent on Council's commitment to establish the recommended framework for implementation. This includes the appointment of a suitably qualified Environmental and Stormwater Management Officer to coordinate the implementation of the plan, identify internal and external funding opportunities, and coordinate the establishment of a rigorous monitoring and review program. The ultimate success of the plan will be evident when stormwater management is fully integrated into Council's management framework.