Sunraysia Drainage Strategy

Summary and Future Directions

June 2002

Department of Natural Resources and Environment

GOULBURN-MURRAY WATER

SunRISE

First Mildura Irrigation Trust

Lower Murray Water

Mildura Rural City Council

EPA Victoria

Murray-Darling Basin Commission

mallee catchment management authority

Sunraysia Rural Water Authority

SUNRAYSIA DRAINAGE STRATEGY

Foreword

Dear Sunraysia Citizen,

On 1 June 2000 the Sunraysia Drainage Task Force was formed by the Mildura Rural City Council to assess the current and future requirements of Sunraysia's urban and rural drainage systems.

The initial milestone of the project was the completion of a Current Situation Report (Dec 2000). Sinclair Knight Merz was then commissioned, through joint EPA and local stakeholder funding, to deliver an Urban Stormwater Quality Management Plan (late 2001) and overarching Sunraysia Drainage Strategy (early 2002). The Sunraysia Drainage Strategy provides a long-term 'blue print' for the future management of surface, sub-surface and stormwater drainage in the Sunraysia Region.

This **'Summary and Future Directions'** document provides a précis of the key elements of the Sunraysia Drainage Strategy.

Drainage in the Sunraysia Region is managed and influenced by a number of organisations. The Sunraysia Drainage Strategy is therefore purposely written with direct linkages to other regional and State Strategies/Plans which are all necessary to ensure that the best result for the Region is achieved from any remedial or new drainage works undertaken.

With the Plan and Strategy now complete, the project is entering a new phase. Over the up-coming months a 'Sunraysia Drainage Coordinating Group' will be formed to lead the next phase of the project. The Sunraysia Drainage Coordinating Group will include representatives from each of the key drainage management organisations in the Region.

It will be the role of this Group to facilitate the implementation of the Strategy, ensuring that proposed works and measures are adequately resourced and carried out in a logical, agreed and coordinated priority order. The Group will operate within, and not negate, the current responsibilities and operations of the participating organisations.

The Sunraysia Drainage Task Force welcomes any comments on the Sunraysia Drainage Strategy. Please direct these comments, preferably in writing, to the Mildura Rural City Council, as indicated on the last page of this document.

On behalf of the Task Force I would like to specifically thank those people who provided input to the Sunraysia Drainage Strategy and I look forward to seeing the positive outcomes to be achieved as implemented.

Yours sincerely,

Cr Brian Grogan
Chairman/Convenor
Sunraysia Drainage Task Force

What does this document contain?

This document details the key elements of the **Sunraysia Drainage Strategy** (SDS). It addresses questions such as 'What is the SDS?', 'What are the aims of the SDS?', 'What are the primary issues relating to drainage in the Sunraysia Region?', and 'How will the SDS address these issues?'.

What is the Sunraysia drainage strategy?

The urban areas around Mildura are growing rapidly at a rate of 40 ha/yr. A coordinated master plan must therefore be developed to ensure that these areas are cost effectively and sustainably developed, and serviced with drainage, through the establishment of a clear planning framework and management principles.

The SDS provides the master plan of how existing and future urban and rural development, in the Sunraysia Region, will be serviced with drainage infrastructure (both surface and sub-surface), with a planning horizon to the Year 2050.

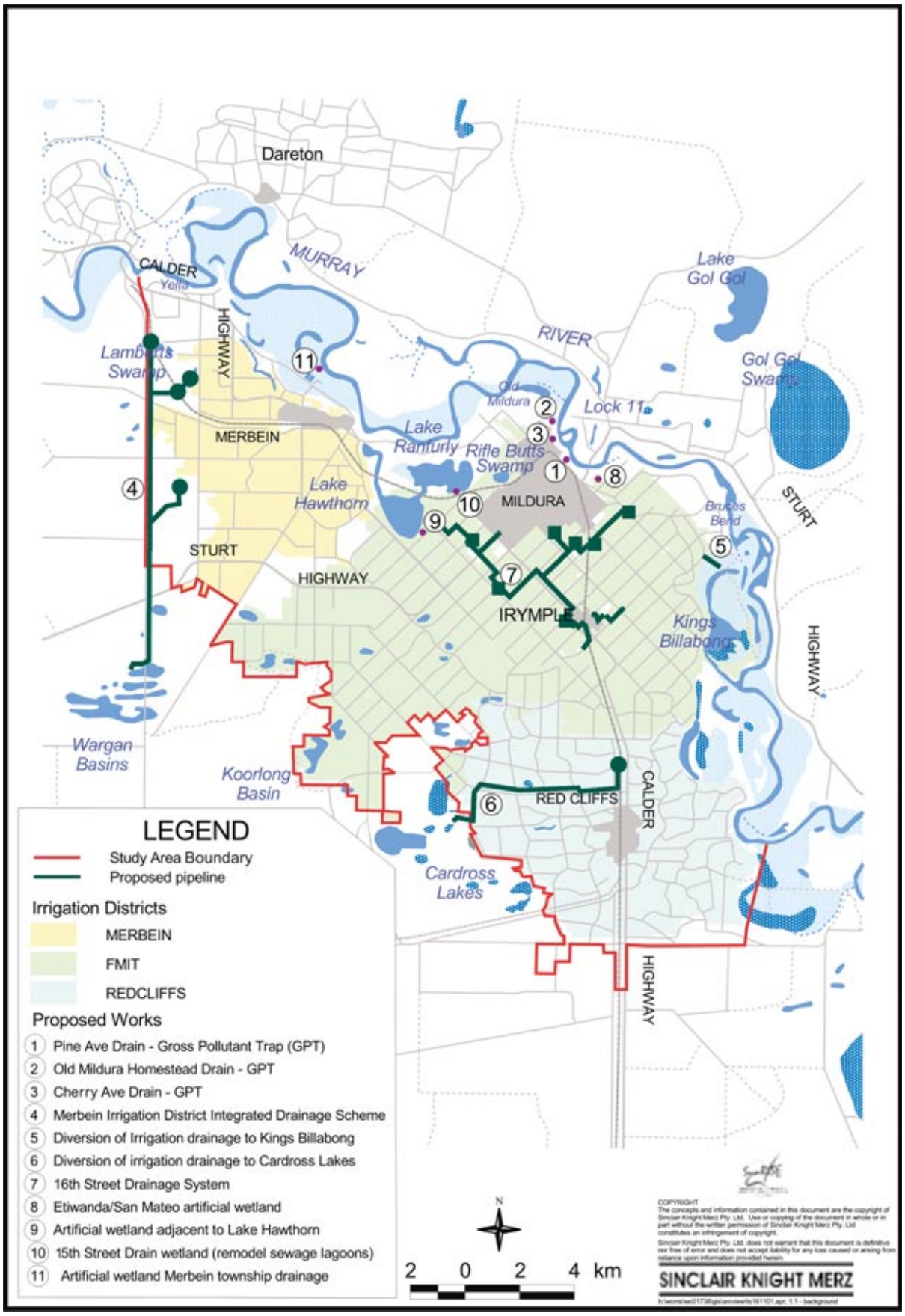
The SDS includes all of the elements of the recently developed, and more operationally focussed, Urban Stormwater Quality Management Plan (USQMP), which provides the basis to ensure that environmental values are maintained and any adverse effects on receiving waters are minimised.

What is the area covered by this strategy?

The Strategy broadly covers the urban centres of Mildura, Irymple and Red Cliffs, with a combined population of over 30,000 people, as well as, the three neighbouring irrigation Districts, namely, First Mildura Irrigation Trust (FMIT), Red Cliffs Irrigation District, Merbein Irrigation District, together with the adjacent irrigation areas provided with water by private diversion from the River Murray.

A map of the study area, which covers some 18,000 ha, is shown in **Figure 1**.

Figure 1 — Map of the Study Area and Proposed Key Works



How was the strategy developed?

The SDS is the result of nearly two years of investigation and consultation between the key drainage management agencies and the local community. The process was initiated in June 2000 with a public forum and the preparation of a background report, titled the 'Current Situation Report', which outlined a number of the key drainage issues for the Sunraysia Region.

In July 2001, a contract was let for the preparation of the SDS and USQMP. That contract, which was let to Sinclair Knight Merz, was overseen by the Sunraysia Drainage Task Force, comprising the following key stakeholder organisations and reference groups listed below. Strategic advice was provided by Hydro Environmental.

- Mildura Rural City Council (Chair)
- Mallee Catchment Management Authority
- Sunraysia Rural Water Authority
- First Mildura Irrigation Trust
- SunRISE 21
- Department of Natural Resources and Environment
- Murray Darling Basin Commission
- Environment Protection Authority
- Goulburn-Murray Water Authority
- Lower-Murray Water

The USQMP was completed in November 2001 and has subsequently been adopted by the Mildura Rural City Council. The SDS, which incorporates the key elements of the USQMP, has recently been signed-off by the Sunraysia Drainage Task Force. Community input to the USQMP and SDS was provided through a regional workshop and two public meetings.

What are the key existing drainage features in the Sunraysia region?

Urban Drainage System

The SDS straddles four urban centres in Merbein, Mildura, Irymple and Red Cliffs. These centres cover a total area of some 2,040 ha and on average annually discharge 2,200 ML of stormwater, carrying nutrients, sediment, chemicals, heavy metals and rubbish collected from urban areas, to the River Murray and inland basins. **Table 1** presents an overview of the area of each of the urban centres, the average volume of water discharged through the urban stormwater system and the primary disposal outfall location. All of the properties within the intense urban areas have access to drainage, whereas those properties in rural residential areas and rural cluster housing generally have limited access to surface drainage.

Table 1 — Overview of the Urban Stormwater systems in the Sunraysia Region

Urban Centre	Total Area (ha)	Annual Discharged Volume (ML/yr)	Outfall Location
Merbein	145	124	• River Murray Floodplain
Mildura/Irymple	1,609	1,815	• River Murray (691 ML) • Inland Basins (1,124 ML)
Red Cliffs	285	261	• Basin 12 and Psyche Bend Lagoon

There is currently little sub-surface drainage in the existing urban area. The majority of the sub-surface drainage that is in place in the urban area is generally located in areas that have been converted from irrigation development to urban development, without the sub-surface drainage system being fully removed.

Rural Drainage System

There is currently little surface stormwater drainage infrastructure in rural areas in the Sunraysia Region. Runoff from roads and rural properties following rainfall events tends to pond in localised areas and infiltrate through the soil profile. Due to this lack of infrastructure, localised flooding has been highlighted as an important issue at a number of locations.

The rural sub-surface drainage systems service the Irrigation Districts of Merbein, Red Cliffs and FMIT, as well as adjacent irrigation areas provided with water by private pumping from the River Murray.

The topography, geology and landuse of the area result in high watertables and significant water quality changes in the River Murray. A comprehensive network of sub-surface drainage and interconnecting drainage pipelines has therefore been installed to service the majority of the irrigated rural area. Most of the irrigation drainage is discharged, either directly or indirectly to the River Murray, or to inland basins. There are some irrigated areas however, that still dispose to drainage shafts that directly convey all drainage water to the groundwater system (e.g. in the south west of the Merbein Irrigation District).

Table 2 presents an overview of the irrigation drainage system, including the area irrigated, average annual drainage discharge volume and estimated annual salt load discharged.

Table 2 — Overview of the Rural Drainage system in the Sunraysia Region

Location	Total Area (ha)	Actual Irrigated Area (ha)		Average Annual Drainage Discharge Volume (ML/yr)		Average Annual Salt Load (t/yr)	
		River	Basin	River	Basin	River	Basin
Irrigation Districts							
Merbein	3,565	986	1,732	1,380	2,425	1,656	2,910
SRWA	5,435	1,108	2,718	1,555	3,801	1,866	4,561
FMIT	11,597	1,201	5,080	1,681	7,112	2,018	8,534
Sub-total	20,597	3,295	9,530	4,616	13,338	5,540	16,005
Private Diverters							
Yelta Irrigators	461	359	0	503	0	603	0
Merbein Irrigators	1,062	175	749	245	1,049	294	1,258
Mildura / Red Cliffs Irrigators	574	883	498	1,236	697	1,483	837
Sub-total	2,097	1,417	1,247	1,984	1,746	2,380	2,095
TOTAL	22,694	4,712	10,777	6,600	15,084	7,920	18,100

Other features considered by the strategy?

Natural Ecosystem

Urban stormwater and rural drainage currently discharges to 11 inland waterbodies as well as to the River Murray. Each of these receiving environments has specific environmental, cultural and economic values that are directly impacted by current and future drainage management practices. **Table 3** presents a summary of current environmental, cultural, amenity and economic values of each of these systems.

Urban stormwater and rural drainage can pose significant threats to the values highlighted above, through the discharge of nutrients, chemicals, salt, heavy metals, sediment and litter. Changes to the volume of flow can also have a significant impact on these values, particular where a waterbody is reliant on the water to support existing flora and fauna. It is essential that the water quality and quantity requirements of each of these environments are appropriately assessed to ensure that the existing values are maintained, and where possible, enhanced through future drainage management decisions.

Water Quality

Routine water quality monitoring is undertaken at various sites along the River Murray, and on several urban stormwater and rural drainage outfalls to the River Murray and inland Basins.

Based on current water quality guidelines (i.e. the ANZECC and EPA guidelines), the water quality of the River Murray, over the reach adjacent to the SDS area, is generally considered to be poor with respect to nutrient concentrations but relatively good with respect to salinity. The main source of nutrients in drainage water from the region is excess nutrients captured in urban stormwater runoff and sub-surface drainage in rural areas.

The presence of excessive nutrient concentrations, coupled with low River Murray flows and warm temperatures, can result in the development of algal blooms. Between 1991 and 1999 a total of 31 separate algal blooms were recorded in the River Murray.

While the salinity of the River Murray is considered relatively good when compared with existing guidelines, the Sunraysia Region, along with other regions in the Murray-Darling River Basin, are under increasing pressure to reduce the quantity of salt reaching the River Murray through direct drainage discharge and groundwater intrusions. The MDBC Salinity Management Strategy indicates that without intervention the average salinity of the River Murray at Morgan will increase by 118 EC between the years 2000 and 2015. To control, or reverse, this trend actions are required by all those who discharge salt, or cause salt to be discharged, either directly or indirectly, to the River Murray.

There is little routine monitoring of the water quality in the basins that currently receive urban stormwater and rural drainage within the Sunraysia Region. Adhoc monitoring does suggest however, that nutrient concentrations and the salinity of these inland basins are often elevated, potentially resulting in detrimental impacts to the environmental values of these waterbodies.

Table 3 — Summary of the current values of receiving water bodies and the River Murray

Receiving Environment	Environmental		Cultural		Amenity			Economic
	Instream	Riparian	Indigenous	Non-indigenous	Recreational	Amenity	Tourism	Water Supply
Environments receiving urban stormwater and rural drainage								
Murray River	**V high**	**V high**	**V high**	**V high**	**V high**	**V high**	**V high**	**V high**
Kings Billabong	**V high**	**V high**	**V high**	**V high**	**V high**	**V high**	**V high**	**High**
Basin 12	**High**	**High**	Mod.	Low	Mod.	Mod.	Low	Low
Rifle Butts Swamp	Mod.	Mod.	Mod.	Low	Low	Mod.	Low	Low
Lake Ranfurly East	**V high**	**V high**	**High**	Low	Low	**High**	Low	Low
Lake Hawthorn	**V high**	**V high**	Mod.	Low	**High**	**High**	Mod.	Low
Environments receiving rural drainage								
Cardross Lakes	**V high**	**V high**	Low	Low	Low	Low	Low	Low
Koorlong Basins	Low	Mod.	Mod.	Low	Low	Low	Low	Low
Lamberts Swamp	Low	Low	Low	Low	Low	Low	Low	Low
Lake Ranfurly West	**V high**	**V high**	**High**	Low	Low	Low	Low	Low
Wargan Basins	**V high**	**V high**	Mod.	Low	Mod.	**High**	Low	Low
Psyche Bend Lagoon	Low	Low	Mod.	Low	Low	Low	Low	Low

Groundwater and Salt Interception

Prior to European settlement, regional watertables were generally 15–20 metres below the natural surface across the Region. When more water is applied to the irrigated crop than is required for the crop's growth, this excess water passes through the rootzone. If this water does not enter the sub-surface drainage system then it ends up as groundwater and may contribute to higher watertables. Over time, land clearing and irrigation have resulted in the formation of perched watertables and the development of a saline regional groundwater mound under the Sunraysia Region. In many areas today watertables are less than five metres below the natural surface.

The development of the regional groundwater mound in the Sunraysia Region has caused many challenges in both the rural and urban areas, including, waterlogging, land salinisation, infrastructure deterioration and an increase in the amount of salt entering the River Murray through saline groundwater intrusion.

To off-set the impact of the growing regional groundwater mound on the River Murray, the Mildura-Merbein Groundwater Interception Scheme was constructed in 1981. The scheme, which operates along a 15 km reach of the River Murray between Mildura and Merbein, comprises a series of groundwater pumps, which intercept the groundwater before it reaches the River. Groundwater intercepted by this scheme is then pumped to Lake Ranfurly East and West prior to being transferred further inland to Wargan Basins (refer to **Figure 1**).

What are the aims of this strategy?

Strategy Aim 1

To provide the basis for a coordinated and whole of catchment approach to the management of drainage in the Sunraysia Region

Driving Issues

- Lack of long term security, direction and integration in the management of drainage in the Sunraysia Region.
- Lack of coordination in the design, construction and operation of drainage infrastructure for new urban developments in the Sunraysia Region.

Overarching Principle

Principle 1.1
Each drainage stakeholder will independently maintain their current asset management and operational responsibilities, unless otherwise agreed.

Principle 1.2
All drainage outputs and outcomes in the Sunraysia Region will be better integrated.

Key Strategy Elements

- **Establishment of an overarching management coordinating body**

  Formation of the 'Sunraysia Drainage Coordinating Group' (SDCG) to cooperatively coordinate the implementation of the SDS, and other drainage works and measures.

- **Formal commitment by key stakeholders to the implementation of the SDS**

  Development and signing of a formal agreement between key drainage management agencies to clarify roles and responsibilities, to facilitate the on-going commitment of resources to the implementation of the SDS, and to achieve a cooperative approach to addressing drainage issues across the Region.

- **Ensure local and regional Strategies/Plans are compatible with the content of the SDS and vice versa**

  Key elements of the SDS, and where appropriate the USQMP, will be referenced in the Mallee CMA's Regional Catchment Strategy, and the Strategic Plans of the MRCC, FMIT and SRW. The process for incorporating these elements into these documents is still to be finalised.

- **Appointment of an 'Environmental and Drainage Management' Officer**

  An 'Environmental and Drainage Management' officer will be employed to support the SDCG by carrying out the day to day responsibilities associated with the implementation of the SDS (e.g. responsibilities will include the initiation of the 'Community Awareness Program' (**refer to Aim 2**)) *(refer to Table 4, Ref. No. W9 for estimated costs).*

- **Coordinated approach to asset management and funding**

  A coordinated approach to asset management will be achieved through the formation of the SDCG and incorporation of the key elements of the SDS into the Strategic Plans of the organisations responsible for drainage.

  Maximum effort will be applied to securing funding from within, and outside, the Sunraysia Region to support drainage works and measures.

- **On-going and formal review of the SDS**

  The works and measures outlined in the SDS are not 'set in concrete'. It is recognised that priorities can change as new issues emerge, new policies and strategic directives are forged, and different funding opportunities arise. As required, the SDS will be amended to reflect revised regional, State and national directives, and changes in the Strategic Plans of the key drainage stakeholders.

  A detailed review of the SDS and the USQMP will be undertaken in 3–5 years time to assess Strategy achievements and identify changes to targets brought about by the introduction of new issues and priorities.

- **Review MRCC Planning Scheme**

  Based on the projected drainage needs outlined in the SDS, the MRCC Planning Scheme will be reviewed to ensure that adequate land is reserved for current and future, rural and urban, surface and sub-surface drainage needs. This will include provision for retention basins, pipelines, pump stations, wetlands and other drainage water management measures, where appropriate.

- **Development of drainage management plans**

  Drainage management plans will be prepared for key existing and future drainage systems. These plans will include details of operation and maintenance procedures, monitoring requirements and, where appropriate, risk mitigation strategies.

- **Maintain and update rural and urban Drainage Implementation Strategy**

  To ensure development is not inhibited a drainage implementation strategy with a 40–50 year vision will be maintained.

- Protection of drainage outfall rights

  Appropriate agreements will be developed to ensure drainage outfalls are secure and appropriately managed, any conditions are clearly understood by the respective managing organisations and the outfalls are sustainable in the longer term.

- **Monitoring Program**

  Management decisions need to be based on the best available information. It is therefore essential that appropriate drainage monitoring networks are in place to provide accurate information on drainage flows and quality. Such information is important in assessing factors such as:

  - future drainage water reuse opportunities
  - change in surface runoff and groundwater levels to enable actions to be taken to protect environmental values and minimise any impact on the downstream beneficiaries of drainage water
  - sizing of drainage pipes and pumps *(refer to Table 4, Ref. No. W10 for estimated costs)*.

Strategy Aim 2

To plan and provide the basis for appropriate drainage infrastructure to service and manage existing and future stormwater runoff in urban areas

Driving Issues

- Inadequate drainage infrastructure to meet existing and future short and long term urban stormwater runoff needs.

Overarching Principles

Principle 2.1
The management of any change in runoff due to changing landuse should be the responsibility of the landowner/developer.

Principle 2.2
Infrastructure to support the drainage of urban development should be planned in a coordinated way to ensure urban development is not inhibited.

Key Strategy Elements

- **Development of a 'Drainage Implementation Strategy'**

  The SDS presents future drainage works and measure at a concept level. Prior to the implementation of these works and measures, detailed designs of each of the concepts will need to be undertaken and incorporate the principles and guidelines for water sensitive urban design. The detailed designs will include estimates of the costs in terms of dollars and other resources.

- **Revised 'Drainage Urban Design Standards'**

  Local drainage systems for existing and new residential development should be capable of safely handling flows from a peak rainfall event which occurs on average once every five years, without interference to traffic and the social amenities of the area.

  The drainage system for existing and new industrial and commercial development should be capable of handling flows and groundwater accessions from a peak rainfall event that occurs on average once every 10 years.

  Regional drainage systems should be designed such that the inconvenience and duration of flooding, from a rainfall event that occurs on average once every 50 years, is acceptable.

  The floor levels of all new habitable buildings should be at least 300mm above the flooding levels expected from a peak rainfall event that occurs on average once every 100 years. This applies to locally generated flow as well as flow from the River Murray.

- **Facilitation of urban expansion in and around Mildura and Irymple**

  To enable further urban development, in and around Mildura and Irymple, the concept of constructing a major pipeline (along 16th Street) with a series of strategically placed retarding basins will be further explored.

  The existing planning scheme will be reviewed to enable the uninhibited construction of a major drainage water management system west and south of Mildura. This will include a major pipeline along 16th Street and associated retarding basins, pump stations, connecting spur pipelines and wetlands *(refer to Table 4, Ref. No. W1 for estimated costs).*

- **Identification of drainage 'hot spots'**

  Through field investigations and community consultation in urban areas, sites will be identified where the ponding and slow removal of drainage water following a rainfall event is considered an issue. These sites will be mapped, prioritised, and works and measures will be defined, costed and justified to address these issues as funds become available in the future.

- **Preparation of stormwater management 'Best Practice' guidelines**

  'Best Practice' guidelines will be prepared to highlight the issues associated with stormwater runoff from residential, industrial and commercial sites. These Guidelines will address both on and off-site measures.

- **Initiation of Community Awareness Program**

  One of the key tasks of the new 'Environmental and Drainage Management Officer' will be to oversee the 'Environment and Stormwater Management Awareness Campaign'. Activities to be undertaken through the Program include:

  - An audit of industrial stormwater discharges
  - Facilitation of community education workshops
  - Promotion of 'Environmental Management Plans' (EMPs) across the industry.

- **Development of emergency response plans**

  Emergency response plans will be prepared for the management of public drainage assets in urban areas including, drainage pump failure, management of the contamination of drainage water, flooding and surveillance activities necessary to support the SDS. These plans will set in place procedures to minimise the potential impacts of system failure and contamination.

Strategy Aim 3

To plan and provide the basis for appropriate sub-surface drainage infrastructure in urban areas

Driving Issue

- Lack of sub-surface drainage in existing and proposed future urban development areas where there is evidence of high watertables.

Overarching Principle

Principle 3.1
The need for sub-surface drainage in urban areas is to be assessed, and where necessary provided, by the proponent of the landuse change or otherwise be incorporated as part of existing or future salinity management plans.

Key Strategy Elements

- **Need for sub-surface drainage in urban areas to be identified**

  For new areas of urban development, developers will be required to seek advice from appropriately qualified personnel regarding the need to install sub-surface drainage to protect infrastructure, prevent waterlogging and prevent land salinisation, and minimise impacts on the River Murray. If it is deemed that sub-surface drainage is required, the cost of installing the sub-surface drainage is to be borne by the developer.

  In areas of existing urban develop, sub-surface drainage is to be installed in areas where there is evidence of high watertables resulting in localised waterlogging and land salinisation. Such areas may include:

  - topographic low points and swales
  - areas where this is relatively little topsoil over the underlying clay
  - areas where the Blanchetown clay is present.

  Where possible, new sub-surface drainage in urban areas will be connected to the existing sub-surface drainage system for disposal. The means of financing of the installation of sub-surface drainage in areas of existing urban development is still to be determined.

- **Development of appropriate monitoring programs**

  A suitable monitoring and reporting process will be developed to ensure that existing and future sub-surface drainage infrastructure is appropriately managed and effective *(refer to Table 4, Ref. No. W10 for estimated costs)*.

- **Community Education**

  Education Programs will be implemented to promote ‘good management and use of water’ in existing and newly developed urban areas to minimise accessions to the watertable and the sub-surface drainage system.

Strategy Aim 4

To plan and provide the basis to manage stormwater runoff in rural areas to minimise local flooding impacts

Driving Issue

- Isolated flooding of rural areas following high rainfall events.

Overarching Principle

Principle 4.1
Most stormwater runoff, and all tailwater and/or irrigation induced rainfall runoff will be managed on-farm in rural areas.

Key Strategy Elements

- **Revised 'Drainage Design Standards'**

  Drainage infrastructure beneath major highways and railways should be capable of handling flows from a peak rainfall event which occurs on average every 100 years. This standard may be reduced to a 50 year event for less important stretches of highway and railways (*Note: Level of importance will generally be based on the volume of traffic and the standards determined by relevant State Government agencies*).

  Drainage infrastructure beneath other rural roads should be capable of handling flows from a peak rainfall event which occurs on average once every 10 years. This standard may be reduced to a 5-year event for less important *roads (Note: Level of importance will generally be based on the volume of traffic*).

- **Identification of drainage 'hot spots'**

  The SDS does not include the construction of a surface drainage system in rural areas, instead, through field investigations and community consultation, sites will be identified in rural areas, where the removal of drainage water following significant rainfall events is considered an issue. These sites will be mapped, prioritised, and works and measures will be defined to address the issues in the future. Possible works and measures include:

  - installation of culverts
  - construction of small, property scale, on-site detention facilities to reduce peak flows
  - controlled disposal of stormwater to the sub-surface drainage system (with the approval of the responsible Authority)
  - construction of low levees, or floodwalls, around residential housing
  - relocation of buildings.

- **Identification of future design flood levels and incorporation of these levels in building regulations**

  If flooding is to be appropriately managed, it is essential that drainage management agencies have a clear understanding of possible future flooding levels resulting from local and upstream storm events. Planning measures can be then put in place to minimise any adverse impacts from these events.

Strategy Aim 5

To plan and provide the basis for appropriate sub-surface drainage infrastructure to irrigated land

Driving Issues

- The high volumes of irrigation water which by-pass the plant rootzone either entering the sub-surface drainage system or recharging the groundwater system.
- Increased awareness/education of irrigators of the need to be more efficient water users.
- Lack of coordination between the rural and urban stormwater drainage systems.

Overarching Principle

Principle 5.1
Irrigation practice should be such that accessions to the watertable, and hence sub-surface drainage flows, are minimised.

Key Strategy Elements

- **Adoption of 'Best Management Practices'**

  Eduction and training programs, and incentives will be used to encourage irrigators to improve their on-farm irrigation management practices to minimise the volume of sub-surface drainage leaving the farm, resulting in a reduction in salt and nutrient export.

- **Management of existing and future sub-surface drainage**

  Irrigation land within the Irrigation Districts will continue to be serviced by the existing infrastructure which will be maintained, replaced and, as necessary, enhanced to provide an agreed design standard of service.

  The existing Authority operational drainage system will be extended, as appropriate, to service new 'within District' irrigation development.

  The management of sub-surface drainage for those areas adjacent to the existing Irrigation Districts and supplied by private diverters will be further investigated with an aim of ensuring the impact on the environment and downstream water users is minimised.

- **Maintain existing 'Drainage Design Standards'**

  The current drainage design standards for existing irrigation development are considered adequate.

  Drainage design standards for works and measures to service future irrigation development should be consistent with existing design standards.

- **Development of emergency response plans**

  Emergency response plans will be prepared for the management of public pumps, chemical spills, etc. included as part of the rural sub-surface drainage system. These plans will consider existing monitoring of pump operation (including volume pumped and the quality of the water pumped) and set in place procedures to minimise the potential impacts of pump failure and contamination.

Strategy Aim 6

To provide the basis to manage drainage water in an environmentally and socially sustainable manner

Driving Issues

- Protection of the beneficial uses of receiving waters by:
  - minimising the discharge of salt and nutrients from drainage systems to the River Murray and inland waterbodies
  - minimising the discharge of litter, other debris and contaminants from the urban stormwater system, to the River Murray and inland waterbodies
- The impact of reducing drainage flows on the environmental value of inland waterbodies

Overarching Principle

Principle 6.1
The net environmental, social and economic values will be on balance maintained, and where possible, enhanced when implementing future drainage works and measures.

Key Strategy Elements

- **Installation of Gross Pollutant traps**

  Three gross pollutant traps will be installed in the following drains to prevent litter and other debris from reaching the River Murray:

  - Pine Avenue drain
  - Old Mildura Homestead drain
  - Cherry Avenue drain *(refer to Table 4, Ref. No. W7 for estimated costs)*

  Gross pollutant traps will be an integral part of the design of any new surface drainage infrastructure.

- **Reduction of salt to the River Murray**

  It is estimated that the implementation of the drainage works and measures outlined in the SDS will result in an 8 EC reduction in the salinity of the River Murray at Morgan. The type of works that will be undertaken to assist in achieving this aim include:

  - Diversion of drainage from existing irrigation development in parts of Red Cliffs to Cardross Lakes *(refer to Table 4, Ref. No. W2 for estimated costs)*
  - Diversion of drainage from existing irrigation development in parts of FMIT to a wetland at the northern end of Kings Billabong (refer to Table 4, Ref. No. W3 for estimated costs)
  - Pumping of drainage water from the Merbein West and North West drains, and drainage water currently being disposed of to Lamberts Swamp and drainage shafts in the Merbein Irrigation District, to Wargan Basins (refer to Table 4, Ref. No. W4 for estimated costs).

Any potential detrimental impacts to the environmental values of the receiving waterbodies will be assessed and taken into consideration prior to deciding to divert any additional irrigation drainage water to inland waterbodies.

- **Reduction of nutrients to the River Murray and inland waterbodies**

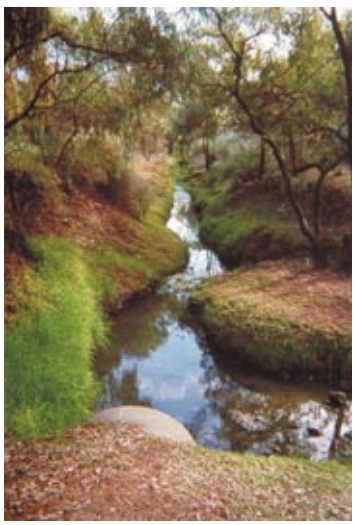
  The volume of nutrients entering the River Murray will be reduced through undertaking the following works and measures:

  — Construction of an artificial wetland to treat drainage water from the urban drains servicing the Etiwanda and San Mateo catchments *(refer to Table 4, Ref. No. W8 for estimated costs)*

  — Construction of an artificial wetlands to treat drainage water from the urban areas currently discharging to Lake Hawthorn

  — Remodelling of the existing disused sewage lagoons on the shores of Lake Ranfurly to form a wetland to treat drainage water from the urban areas currently discharging to Lake Ranfurly East via 15th Street Drain (refer to Table 4, Ref. No. W6 for estimated costs).

  — Connecting the outfall from the Merbein town drainage system directly to the River, via an ephemeral wetland.

  Any new drainage water outfalls will include wetlands or other nutrient reduction measures.

- **Protection of significant waterbodies**

  Off-setting works and measures, such as the possible provision of make up water, are to be put in place to combat any detrimental impact on receiving water bodies caused by reduced or changing drainage volumes. These changes in volume of drainage water may be caused by such things as, improved irrigation management practices and conversion of irrigation to urban landuse. For example, there is evidence to suggest that reduction in drainage flows to Lake Hawthorn and Cardross Lakes, both identified as having 'Very High' environmental values, will result in a lowering of water levels and an increase in the water salinity in the lakes.

- **Adoption of 'Best Management Practices'**

  Education and training programs, and cost sharing incentives will used to encourage irrigators to improve their on-farm irrigation management practices and minimise the volume of sub-surface drainage leaving the farm. This will result in a reduction in salt and nutrient export.

Strategy Aim 7

To provide the basis to ensure the uptake of 'Water Sensitive Urban Design Principles', including the reuse of drainage water

Driving Issue

- Lack of existing reuse of irrigation drainage water and urban stormwater in the Sunraysia Region.

Overarching Principle

Principle 7.1
Any change in runoff characteristics should be minimised in accordance with the following hierarchy:

- avoidance
- reuse
- treatment
- containment
- disposal.

Any changes should therefore be managed on-site as a first priority.

Key Strategy Elements

- **Adoption of 'Water Sensitive Urban Design Principles'**

  'Water Sensitive Urban Design Principles' will be considered for any new development or re-development in the Sunraysia Region.

- **Promotion of Reuse of Water**

  There is currently little reuse of irrigation drainage water and urban stormwater in the Sunraysia Region. Enormous opportunities therefore exist to make use of this water resource. Reuse schemes can take many different forms and vary in size from the collection of rainwater in a tank for domestic use, through to the use of irrigation drainage discharged to an inland waterbody. The underlying principle is recognising that drainage water is a 'resource'.

  While the SDS does not specifically highlight works and measures to capture drainage water from urban and rural areas, it does identify a number of future reuse opportunities. These include:

  — Capturing runoff from residential gardens
  — Capturing irrigation runoff
  — Capturing stormwater runoff.

  Where appropriate, reuse of drainage water will be encouraged in rural and urban areas, particularly in new urban developments, where there is often more opportunity to incorporate such schemes into the original design.

  Any potential adverse impacts on the environmental values of the receiving waters will be taken into consideration when implementating future reuse schemes.

Strategy Aim 8

To plan and provide the basis to obtain sufficient financial resources to install, sustainably manage, and, as appropriate, enhance drainage assets

Driving Issues

- Existing charges are inadequate to cover the costs of installing, managing and enhancing drainage assets.
- Financial contributions from State and Federal Government funding bodies, external to the Sunraysia Region, are often not being sought or maximised.

Overarching Principle

Principle 8.1
Appropriate cost recovery measures should be put in place such that drainage systems can be sustainably managed to provide agreed standards of service.

Key Strategy Elements

- **New Charges for Developers**

  The existing financial contributions from developers for new developments and re–developments are insufficient to pay for the cost of constructing appropriate drainage in rural and urban areas. The existing charges will be reviewed, and a revised payment structure will be established to ensure that there are sufficient financial resources available to install appropriate drainage systems in the future.

- **Development of a drainage tariff**

  The costs associated with drainage infrastructure do not end once a drain is constructed or a pump is installed. The drainage system needs to be operated, maintained and when appropriate, replaced to ensure its future effectiveness. Payment for these activities is currently inadequate. A revised payment structure will be established to cover the off-site on-going maintenance costs associated with the drainage system. The details of the revised cost recovery process are yet to be determined and will apply separately to urban and rural drainage.

- **Lobbying of other funding bodies**

  Where appropriate, other external funding bodies (e.g. State Government and Federal Government) will be approached to assist in funding the implementation of specific works and measures under the SDS. This will be particularly relevant to works and measures that are unrelated to urban development but may have significant off-site State and national benefits. For example, the diversion of irrigation drainage from disposal shafts in the Merbein Irrigation District to Wargan Basins.

- **Development of drainage asset guidelines**

  'Asset Management Guidelines' will be developed for the design, installation, operation and maintenance, and replacement of drainage assets

  Development of asset management and rating systems to ensure adequate maintenance is undertaken to sustainably provide appropriate surface, sub-surface and flood management works in the Sunraysia Region.

What is going to happen and when?

While the planning horizon for the SDS is the Year 2050, implementation of many of the works and measures is expected to occur over the next 20 years. A guide to the type of works and measures that will be implemented over the next year (immediate), three years (short term), 3–10 years (medium term) and 10–20 years (long term) is presented below. The timing of these works and measures is, of course, subject to relevant stakeholder organisation funding applications being successful.

Immediate (One Year)

- Formation of the Sunraysia Drainage Coordinating Group (SDCG)
- Installation of a gross pollutant trap on the Pine Avenue drain
- Identification and prioritisation of urban and rural drainage 'hot spots'
- Undertake works and measures to address high priority urban and rural drainage 'hot spots'
- Conversion of disused lagoons on the shores of Lake Ranfurly to a wetland to treat drainage water discharged via the 15th Street drain
- Development of the 16th Street Drainage System concept
- Development of water sensitive urban design concept
- Appointment of an 'Environmental and Drainage Management' Officer
- Development of drainage discharge and management agreements
- Review of a water quality and quantify monitoring program
- Development of emergency response plans for urban and rural drains
- Identification of future local, State and Federal funding arrangements and opportunities for drainage works and measures in the Sunraysia Region

Short-Term (1–3 years)

- Installation of more gross pollutant traps on urban drains
- Construction of artificial wetlands (e.g. Etiwanda and San Mateo catchments)
- Commencement of work on initial stages of the 16th Street Drainage System
- Construction of Merbein Irrigation District Integrated Drainage Scheme
- Installation of water quality and quantity monitoring sites at strategic drainage outfalls
- Review the Mildura Rural City Council Planning Scheme
- Development of drain management plans

Medium-Term (3–10 years)

- Diversion of drainage from existing irrigation development in parts of Red Cliffs to Cardross Lakes
- Diversion of irrigation drainage from FMIT to Kings Billabong
- Construction of further stages of the 16th Street Drainage System to meet the needs of urban development

Long-Term (10–20 years)

- Completion of the 16th Street Drainage System as development demands

The works and measures outlined above represent the high priority activities at the time of developing the SDS. The implementation process however is not static, if additional high priority and cost effective items emerge then they will be integrated into the program as implementation of the SDS proceeds.

What is the cost of implementing the key works and measures?

The SDS and USQMP outlines nearly $60 million in works and measures to be implemented across the Region. **Table 4** provides an indication of the estimated capital costs and annual operation and annual maintenance costs of implementing a number of the significant packages of work.

Table 4 — Estimated Capital and Operational and Maintenance Costs of Implementing Key Works and Measures

SDS Ref No.	Key Works and Measures	Estimated Capital cost ($)	Additional estimated annual Operation and Maintenance cost ($)
W1	Construction of the 16th Street Drainage System to facilitate urban expansion in and around Mildura and Irymple(1)	$47,100,000	$450,000
W2	Diversion of drainage water from Red Cliffs Irrigation District to Cardross Basin	$1,640,000	$20,000
W3	Diversion of drainage water from FMIT to Kings Billabong	$400,000	$10,000
W4	Major drainage system to service Merbein Irrigation District	$4,630,000	$50,000
W5	Merbein town drainage to the River Murray	$60,000	$10,000
W6	Conversion of disused sewage lagoon to Wetland—Lake Ranfurly /15th Street	$60,000	$10,000
W7	Installation of three gross pollutant traps	$282,000	$20,000
W8	Construction of an artificial wetland to treat drainage water from the Etiwanda and San Mateo catchments	$800,000	$10,000
W9	Employment of an 'Environmental and Drainage Management' Officer	$52,000	$52,000
W10	Installation of water quality and quantity monitoring sites (approx. 10 sites)	$100,000	$50,000
TOTAL		**$55,124,000**	**$682,000**

(1) The 16th Street Drain Project will be implemented in a series of Stages over 20 to 30 years

A significant part of the cost outlined above relates to meeting the needs of future development. As such, it is expected that developers will largely meet these costs. Every effort will also be made to obtain State and Federal Government funds to assist in meeting the remaining costs of these works and measures which are important to the future wellbeing of the community in the Sunraysia Region.

Where do I obtain further information?

Further details, supporting the information presented in this document, can be found in the following publications:

- A Management Plan for the Improvement for Urban Stormwater Quality for the Mildura Rural City Council — **Volume 1: Executive Summary**
- A Management Plan for the Improvement for Urban Stormwater Quality for the Mildura Rural City Council — **Volume 2: Background**
- Sunraysia Drainage Strategy — **Volume 1: The Strategy**
- Sunraysia Drainage Strategy — **Volume 2: Background and Issues Papers**

A copy of these publications can be viewed at the Mildura Rural City Council office, the Mildura Municipal library, or on the Mildura Rural City Council website.

Any questions or requests for further information should be directed to the following organisations:

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Fire Station Arcade
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SUNRAYSIA DRAINAGE STRATEGY – STUDY AREA