Shepparton Irrigation Region Catchment Strategy Update 2003 (including Implementation Plan)

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Foreword

The first ten years of implementation of the Shepparton Irrigation Region Catchment Strategy has seen huge achievements both in terms of works and improved environmental outcomes, as well as a changing community approach and awareness to catchment management.

Our achievements and success would not have been possible without the time and money that the community has put in so far, nor without the significant investment by the Commonwealth and State Governments. This investment reflects the value and benefits that we can all see in improving the region.

The Shepparton Irrigation Region is probably the highest priority catchment in terms of water quality and salinity. This is timely in terms of the start of the National Action Plan for Salinity and Water Quality, whose priorities closely match those of the Shepparton Irrigation Region. However, we need to take a leading role in demonstrating that an irrigation region can be productive and healthy.

Water is clearly one of the most important issues in this catchment as well as the rest of Australia. The last 5 years have been the driest on record and although there have been some benefits in terms of reduced watertables and nutrient loads leaving the catchment, the lack of rain is having a serious impact on the region's social, environmental and economic assets.

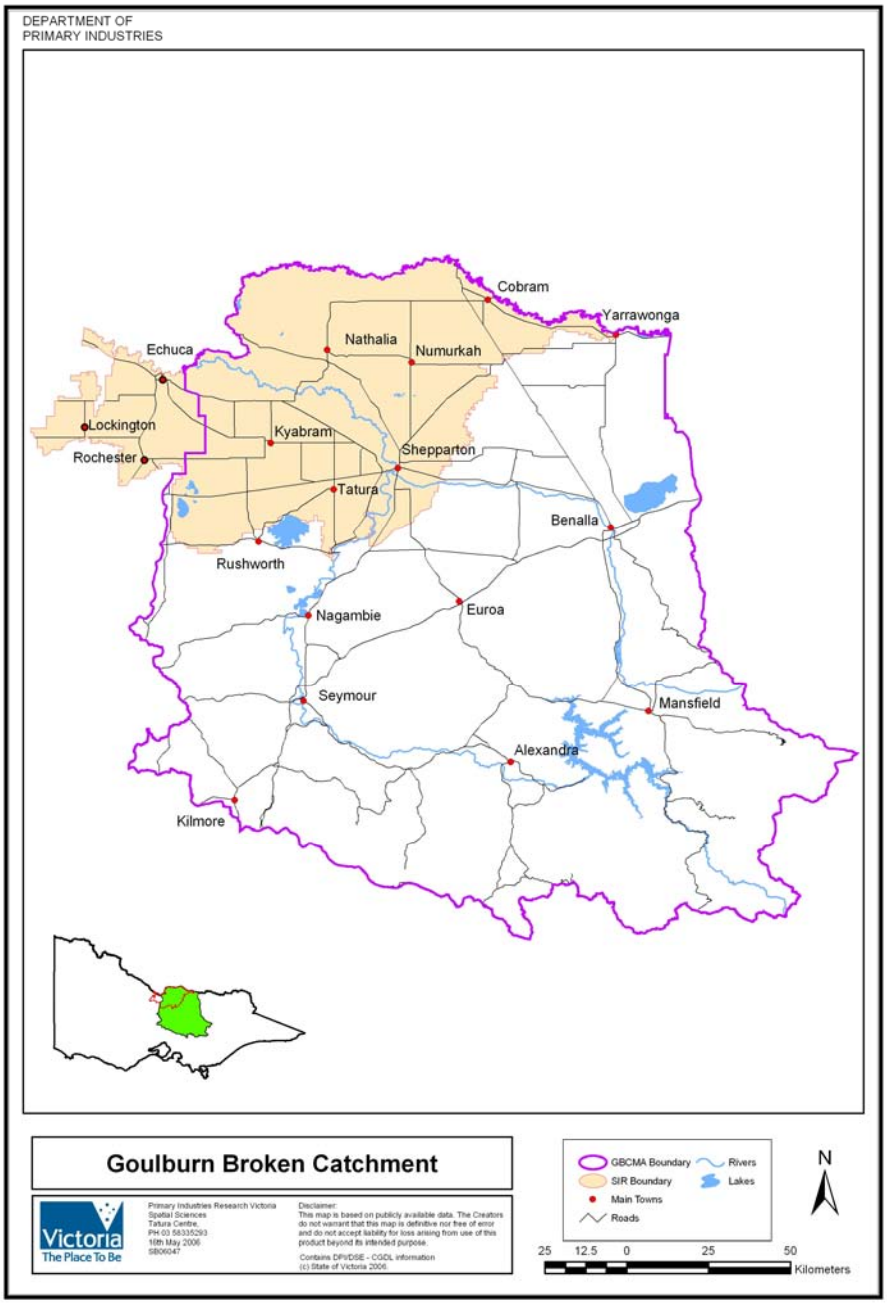
Water rights and environmental flows will be hotly debated over the next five years and the Shepparton Irrigation Region Implementation Committee needs to take a proactive approach in the water debate to ensure that all the regional community views are known and shared.

As has been the case from the start, the Shepparton Irrigation Region Catchment Strategy is a living plan; it is constantly being refined, modified and improved in order to remain responsive to the changes that are occurring.

I think that as we move towards the halfway point of the plan in 2006, we will begin to see some of the longer term outcomes being achieved. There are exciting challenges ahead for all of us.

Russell Pell

Chairman, Shepparton Irrigation Region Implementation Committee



Map of the Goulburn Broken Catchment with the Shepparton Irrigation Region

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Acknowledgments

Many people have helped the Shepparton Irrigation Region Implementation Committee prepare this 10 year update of the Shepparton Irrigation Region Catchment Strategy (SIRCS). Extensive input and feedback from the community has been sought throughout the review process.

Reviews of all Implementation Programs have been undertaken over the past three years and these have provided most of the information for this Review. Each review was overseen by Steering Committees:

- Surface Water Management Program Review Steering Committee
- Sub-surface Water Management Program Review Steering Committee
- Farm Program Review Steering Committee
- Environment Program Review Steering Committee

Members of these Committees, others involved in the reviews and of SIRIC are listed in Appendix 2.

Assistance in the development of this SIRCS has been provided by: Ken Sampson, Megan McFarlane, Rod McLennan, Chris Norman, Kylie Braszell and Andrea Smith.

1 Executive Summary

1.1 The Shepparton Irrigation Region's assets

The Shepparton Irrigation Region (SIR) is an intensively irrigated region of the Goulburn Broken Catchment. Approximately 317,000 of its 500,000 hectares are irrigated for the major industries of dairying, stone and pome fruit production. This in turn supports a large food processing industry. The SIR uses around 1.5 million megalitres of water a year and creates agriculture products worth an estimated $1 billion per year and, in turn, supports a food processing sector generating $1.7 billion per year in output.

The SIR has a population of 115,296 which is expected to grow to 147,400 by 2021. The region is culturally and linguistically diverse and includes communities from Southern Europe such as Greece and Italy, and more recent settlers from countries such as Iran, Iraq, Turkey and India.

The SIR's natural assets are its soils, water, biodiversity and air. These assets are interconnected and collectively support the region's social and economic assets. This interconnectedness means that a decline in the health of the soil asset, for example, can contribute to a decline in biodiversity and water assets.

1.2 Threats to the Region's natural assets

The threats facing the SIR include: salinity, loss of biodiversity, climate change, pest plant and animals, and issues of water quality and quantity decline. The future of the SIR depends on a healthy natural resource base to support agriculture, and continuing increases in production efficiencies.

1.3 What we achieved over the past ten years

Much has been achieved in the first ten years of the SIR Catchment Strategy (SIRCS) which is a 30 year plan. Full details of these achievements, including details of numerous awards for catchment management, can be found in "SIRCS Achievement Report, 1990-91 to 2000-01". Along with physical outcomes, the SIR has been very successful in what is now known as "community capacity building". The ability of the SIRCS to take the community with it has been a central plank of the success of the SIRCS.

1.4 Looking to the future

There are many challenges facing us in the future, most of which are discussed within this Strategy. Key will be finding a way to balance the competing needs of the environment and agriculture for what is expected to be a diminishing water resource. Issues such as climate change are only just beginning to be understood and appreciated. What is clear is that we will need to work together as a community to find new ways of farming and managing the environment.

It is against this background that the SIR Implementation Committee will work towards its vision of:

> *The natural resources of the SIR are being managed sustainably for current and future generations:*
>
> - *with abundant and well maintained environmental assets delivering a range of ecosystem services,*
> - *recognised locally and internationally for its high quality produce, and*
> - *with an enthusiastic and progressive community that is actively engaged in care of its natural resources.*

1.5 Changing landscapes

Best management practices for existing land uses will not make the difference alone. We need to identify how large-scale changes can be achieved, including more appropriately matching land use with land capability within the constraint of existing property rights. The changing demographics and land use across large tracts of the SIR mean there are opportunities for improving natural resource management by influencing these changes without impinging on property rights. On current trends across the SIR, we could expect to see a significant shift in land use patterns over the next 50 years and this will strongly affect the future landscape.

1.6 What we will achieve

With our current understanding of our assets and the risks they face, the SIRCS has set biophysical targets. These targets represent our best understanding of the issues and are always open to review. The following table summarises the actions we intend to take over the next year and over the remaining SIRCS planning timeframe of 20 years.

Management action	Present Levels* (June 2001)	2001-02 Targets* (one year)	2005-06 Targets* (five year)	Plan End Targets* (2020)
SURFACE WATER MANAGEMENT PROGRAM				
Surface water management (Primary) Area protected (ha)	14,653	17,060	23,300	76,000
Primary Drain Constructed (km)	149	164	224	314
Drain remodelling	39	47	79	282
Surface water management (Community)				
Area protected (ha)	48,100	52,730	64,380	210,200
Community Drains (km) – dependant on demand	479	507	619	2,102
Surface water management Diversion				
Nutrient removal systems – No.	13	23	63	200
Nutrient removal systems – Volume ML	2,315	3,000	7,500	30,000
Drain course declaration – km	15	30	75	562
Number of re-use schemes (no)	2,610	2,000	2,200	5,360
Water harvesting (ha)	0	725	3,630	3,630
Protection of remnant vegetation (ha)	4,704	tba	tba	
Protection of wetlands (ha)	3,995	5,580	10,557	
SUB-SURFACE WATER MANAGEMENT PROGRAM				
Sub-Surface (Private broadacre) Area protected (ha)	23,920	27,476	35,476	85,000
Private Pumps new (no)	196	206	281	365
Private Pumps existing pumped consistently (no)	395	395	395	395
Upgrades (no)	63	in above	in above	95
Metering (no)	685			765
Sub-Surface (Private horticulture)				
Area protected (ha)	770	770	890	1,000
Private Pumps (no) – new and upgrade	20	19	31	50
Tile (ha)	16	69	85	300
Sub-Surface (Public)				
Area protected (ha)	4,200	8,000	12,200	85,000
Public Pumps (no)	26	40	61	375
Salt Disposal (including surface)				
Evaporation Basins	2	4	12	50
Potential SDA (EC)	2.48	2.87	5.09	10.8
FARM PROGRAM				
Whole Farm Plans (no)	2,256	2,543	3,103	5,250
Landforming/Lasergrading (ha)	130,000	139,000	175,000	375,000
Farm Drains (ha)	92,000	97,000	-	106,000
Native Biodiversity – Wetlands				

Management action	Present Levels* (June 2001)	2001-02 Targets* (one year)	2005-06 Targets* (five year)	Plan End Targets* (2020)
Protection Private Land Environmental Incentives (ha)	254	258	274	400
Protection Public Land Works (ha)	3,865	4,200	5,540	6,500
Native Biodiversity – Vegetation				
Tree Growing Incentives (ha)	300	320	400	1,350
Protection Private Land Environmental Incentives (ha)	428	630	770	2,180
Protection Public Land Works (ha)	510	580	820	
Direct seeding of endangered and vulnerable EVC	N/A	2,161	10,810	43,240
Endangered and vulnerable EVC Remnants protected	N/A	100	500	2,000
Endangered and vulnerable EVC revegetation	N/A	150	750	3,000
Pest Plants – Targeted area for coordinated control programs (hectares)	50,000	100,000	100,000	200,000
Rabbits – Targeted area for integrated control programs (ha)	4,000	8,000	8,000	8,000
Foxes – Targeted area for coordinated control programs (ha)	4,000	15,000	15,000	15,000
WATERWAYS PROGRAM				
Fish ladders (no)	22	2		
Fishways (no)	In above	2		
Bank control	82	1,000		
Weed control (km)	36	500		
Protection of riparian land (km)	16	50		

**figures are cumulative*

1.7 Capacity building and Catchment Standards

The Shepparton Irrigation Region Implementation Committee has adopted the Catchment Standards developed by the Goulburn Broken Catchment Management Authority. In essence, these standards dictate how we go about the business of providing catchment management.

These standards are:

1. Partnerships fostered.
2. Priorities rigorous.
3. Costs shared fairly.
4. Large scale focused on.
5. Cultural heritage included.
6. Accountabilities clear (strong links with standard one above).
7. Adaptive Management Systems at all scales.

1.8 Supporting documents

The SIRCS provides the link between the Goulburn Broken Regional Catchment Strategy and the sub-strategies that together make up the SIRCS. The sub-strategies provide the detail on the issues and what actions when, how and where. The key sub-strategies deal with Surface and Sub-surface Water Management, Farm and Environment and River Health.

2 Why a Strategy and what is it?

The Shepparton Irrigation Region Catchment Strategy (SIRCS) is a 30 year plan to protect and enhance the natural and productive environment of the Shepparton Irrigation Region (SIR). This 2003 update celebrates successes of catchment management in the SIR to date and identifies key challenges to achieving SIR and broader Goulburn Broken Catchment visions. In doing this, the SIRCS provides the mechanism to leverage government investment in land and water management in the SIR.

The SIRCS was formerly known as Shepparton Irrigation Region Land and Water Management Plan.

The SIR is located in Northern Victoria (see Figure 2) and is part of the Goulburn Broken Catchment. It also contains part of the North Central Catchment which is managed by the SIRIC on behalf of the North Central Catchment Management Authority. The SIR is intensively irrigated with approximately 317,000 of its 500,000 hectares being irrigated. The major agricultural industries are dairying, and stone and pome fruit production, which support a large food processing industry. The SIR uses around 1.5 million megalitres of water annually, depending on seasonal allocations.

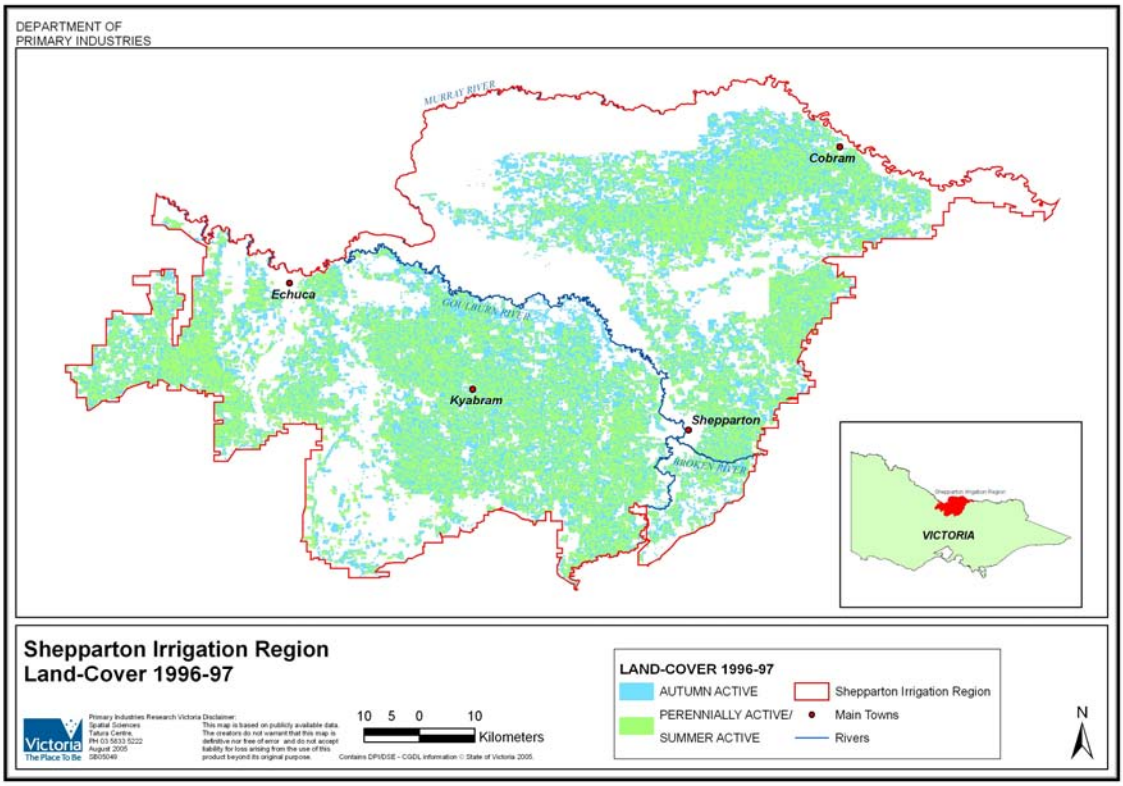


Figure 2 – SIR location

The Goulburn Broken Catchment Community's vision is listed in the Goulburn Broken Regional Catchment Strategy *2003* (GBRCS):

> *A catchment recognised locally, nationally and internationally for quality agricultural produce and where community values contribute to the benefits of abundant and well-maintained environmental assets used for tourism and recreational activities.*
>
> *The environmental footprint of irrigation and dryland farming will be significantly reduced, with farmers occupying less land and using less water whilst managing their resources more sustainably. New opportunities will arise for increasing the ecosystem services provided by the land retired from agriculture and by improved environmental flows.*
>
> *The region's economy will be robust, with much of the agricultural produce processed within the region, generating employment and wealth creation opportunities for a regional community actively engaging in natural resource management programs.*

The SIR Implementation Committee (SIRIC) has developed the following vision:

> *The natural resources of the SIR are being managed sustainably for current and future generations:*
> - *with abundant and well maintained environmental assets delivering a range of ecosystem services,*
> - *recognised locally and internationally for its high quality produce, and*
> - *with an enthusiastic and progressive community that is actively engaged in care of its natural resources.*

2.1 Policy and legislative framework

The SIRCS is governed by, and responds to, a variety of legislation and policy initiatives. The most important are detailed below.

The Goulburn Broken Catchtment Management Authority (GBCMA) was established in 1997 under the State's *Catchment and Land Protection Act 1994* to manage land and water resources in the Goulburn Broken Catchment.

The GBCMA is a statutory Authority under the *Water Act 1989* and the *Catchment and Land Protection Act 1994*, and operates according to specified protocols. The GBCMA has regular reporting requirements including an Annual Report which is audited by the Auditor General and tabled in parliament.

The SIR Implementation Committee is a committee of the GBCMA and reports to the GBCMA Board.

The *Water Act 1989* is the most significant state legislation for the SIR. The *Water Act*:
- provides for the integrated management of all elements of the water cycle;
- ensures water resources are conserved and properly managed for sustainable use and for the benefit of present and future Victorians;
- maximises community involvement in the making and implementation of arrangements relating to the use, conservation or management of water resources;
- provides formal means for protecting and enhancing environmental qualities of waterways and their in-stream uses; and,
- provides for the protection of catchment conditions.

The Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* is significant for the SIR. Actions occurring after July 2000 likely to have significant impact on matters of national environmental significance are subject to a rigorous assessment and approval process. An action includes a project development, undertaking or an activity or series of activities. Matters of national environmental significance identified in the Act are:

- World Heritage properties;
- Ramsar wetlands;
- nationally threatened species and ecological communities;
- migratory species;
- commonwealth marine areas; and,
- nuclear actions.

The second, third and fourth matters of national environmental significance may impact on the SIR.

The SIRCS complements and is aligned with a number of federal, state and regional strategies and plans that protect and enhance natural assets (see Table 1).

Jurisdictional Area	**Legislation, Policies and Programs**
International Agreements	JAMBA (Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment).
	CAMBA (Agreement between the Government of Australia and the Government of the People4's Republic of China for the Protection of Migratory Birds in Danger of Extinction of their Environment).
	Ramsar (Signatory to the Convention on Wetlands of International Importance).
	Agenda 21
	Bio-diversity Convention
Commonwealth Legislation	Environment Protection and Biodiversity Conservation Act 1999
	Aboriginal and Torres Strait Islander Heritage Protection Act 1987
	Native Title Act 1993
	Australian Heritage Commission Act 1975
Commonwealth Policy	National Strategy for Ecologically Sustainable Development (1992).
	Inter-governmental Agreement on the Environment (1992)

	National Greenhouse Response Strategy (1992)
	National Strategy for the conservation of Australia's Biological Diversity (1996)
	National Water Quality Management Strategy 1994
	Irrigation Water Use and Efficiency Program (part of MD2001 Program)
	Natural Heritage Trust (1996)
	The National Landcare Program
	Bushcare – the National Vegetation Initiative
	Murray-Darling 2001 Guidelines and Agreements
	The National Wetlands Program
Murray-Darling Basin Ministerial Council	Murray-Darling Act. (Commonwealth, Victorian Act 1993) and Agreement
	Salinity & Drainage Strategy (1989), (Schedule C of MDB Agreement)
	Natural Resources Management Strategy (1990)
	Water Diversion Cap (1993)
	Floodplain Wetland Management Strategy
	Irrigation Management Strategy (1992)
	Regional Economic Development Policy (1994)
	Algal Management Strategy (1994)
	Drainage Program (1990)
	Basin Sustainability Plan (1996)
Victorian Legislation	Water Act (1989)
	Catchment and Land Protection Act (1994)
	Environment Protection Act (1970)
	Land Acquisition Act (1985)
	Planning & Environment Act (1987)

	Flora and Fauna Guarantee Act (1988)
	Local Government Act (1989)
Victorian Policies	The State Environmental Protection Policy - Waters of Victoria (SEPP, 2003)
	Victorian Salt Action: Joint Action (1988)
	Native Vegetation Retention Controls (1989)
	Nutrient Management Strategy for Inland Waters
	Bio-diversity Strategy (1997)
	Victorian River Health Strategy (2002)
	Greenhouse Action: Responding to a Global Warning (1988)
Goulburn Broken Catchment	Goulburn Broken CMA Regional Catchment Strategy (1997)
	Goulburn Broken Water Quality Strategy (1996)

Table 1 - Main Commonwealth and State Legislation and Policy documents that influence natural resource management in the SIR

2.2 The scope of the Strategy

This SIRCS is the second update of the founding *Shepparton Irrigation Region Land and Water Salinity Management Plan* (SIRLWSMP, 1990) and is part of an ongoing cycle of continuous improvement.

The SIRCS sets the framework for natural resource management within the SIR. Detail of the threats and programs relating to the region's natural resource management is found in the supporting sub-strategies, action plans and technical papers. The region's sub-strategies are stand alone documents about either the threatening process, such as salinity and pest plants, or the asset that we want to protect, such as rivers and biodiversity.

Sub-strategies attempt to isolate issues to help us to understand and communicate them. The strong linkages between issues in natural resource management make the task of isolating issues very challenging. The sub-strategies set out a long-term program of works and describe the options and trade-offs for addressing particular issues.

Although strongly focussed on salinity management, the SIRCS integrates components of other Goulburn Broken Catchment-wide plans. This ensures that benefits of actions are maximised and that the SIRCS reflects the implementation framework that has evolved.

Figure 3 describes the relationships between the National and Local Strategies and Plans.

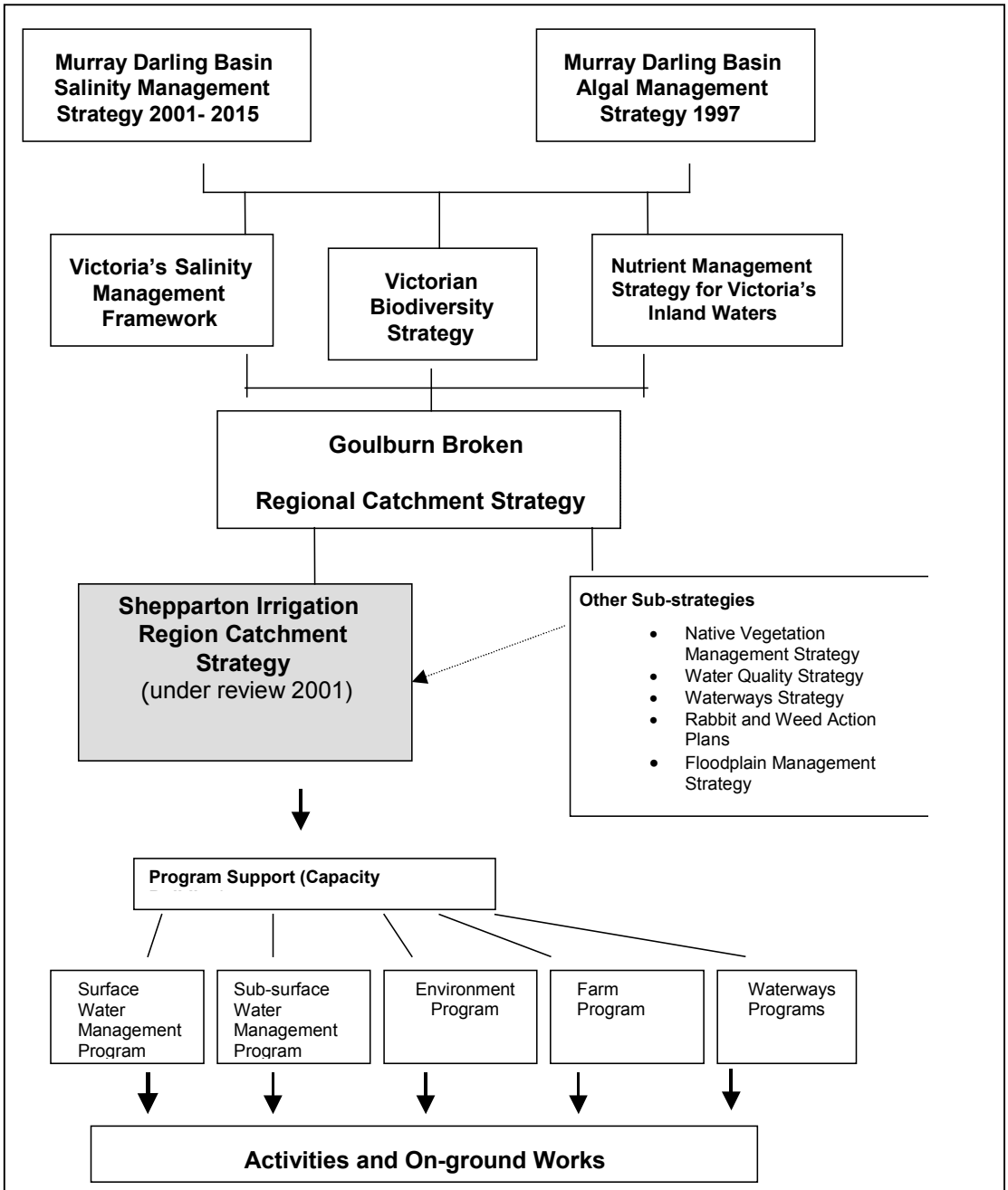


Figure 3 – The Strategies and Plans Relevant to the SIRCS

2.2.1 Evolution of the Plan

The evolution towards whole of catchment management is reflected in the contents of the SIRLWSMP and this SIRCS. The SIRLWSMP was salinity focused, whereas the SIRCS integrates a broad range of issues (see Table 2). Community expectations on the environment and government policy are changing. Along with rapid changes in technology and the economy, this creates the imperative for flexibility in designing regional strategies and plans. The SIRCS still has a major emphasis on combating the

causes of salinity, reflecting the significance of this threat to natural assets and the prosperity derived from them. Living with salt and managing it will be a fact of life for many decades. As a strong and prosperous SIR community depends on the security of the irrigation industry, which in turn relies on healthy river and land, and a secure water supply.

Period	Strategy	Natural Resource Management features	Institutional features
1987-90	SIR Land and Water Salinity Management Plan 1990	• Salinity focused • 'Environment' acknowledged as important, but not known what it meant or how would be included	• Empowering community leaders • Decentralised decisions • Multi-stakeholder participation • Implementation programs established • Local government and state agriculture and conservation agencies brought closely together
1996	SIR Land and Water Management Plan 1996	• SIRLWSMP rebadged (salinity dropped) to reflect holistic approach • Water Quality included as a major issue	• Implementation programs reviewed
2001-02	Reviews of implementation programs: • Surface Water Management 2002 • Sub-surface Water Management 2002 • Farm 2001 • Environment 2001	• Pest Plants and Animals included in Farm program	• Environment program to become totally integrated into other programs • River Health becomes a formalised program
2003	SIR Catchment Strategy 2003	• Floodplain Management, Climate Change and Soil Health included as issues	• Focus on natural assets formalised • First attempt to standardise resource condition and management action targets in line with national approach • Self-assessment of approach to catchment management using standard practice checklist

Table 2 - Evolution of Natural Resource Management Strategies

In addition to these sub-strategies, annual regional management plans contain even more detail about the work programs.

The SIRCS sets a comprehensive vision for the Region based on how it manages its natural resources to generate environmental as well as economic and social benefits. It is not expected that the GBCMA alone will achieve this vision. Other Commonwealth and State agencies, rural and urban water authorities, landholders, the broader community and local government will play a major role. The vision sets the context for how the GBCMA will interact with these stakeholders.

2.3 Process for developing the Strategy

The process for developing the SIRCS reflects the community engagement and partnership principles adopted by the GBCMA. The community was actively engaged during production of many background documents used to prepare this SIRCS (see Table 3). Appendix 2 lists SIR Implementation Committee and working group members, including organisations represented. Engagement is ongoing and efforts to engage while preparing this document represent a small fraction of the overall effort,

Main SIRCS information source*	FORUM										
	SIRIC	Technical Committee	Program Working Groups	Partnership Team	Targeted Groups (Reference, Steering Committees and Forums)	Biodiversity Committee	River Health & Water Quality Committee	Local Government	Board	General public	Commonwealth & State staff
SIRLWSMP 1990	Y	Y	Y	na	Y	na	na	Y	Y	Y	Y
SIRLWMP 1996	Y	Y	Y	na	Y	na	Y	Y	Y		Y
SIR Achievements Report 1990/91 – 2000/01	Y	Y	Y	Y					Y		Y
Surface Water Management Program Review 2002	Y	Y	Y	Y	Y	na	Y	Y	Y		Y
Sub-surface Water Management Review 2001	Y	Y	Y	Y	Y	na		Y	Y		Y
Farm Program Review 2001	Y	Y	Y	Y	Y			Y			Y
Environment Program Review 2001	Y	Y	Y	Y	Y	Y		Y	Y		Y
Water Quality Strategy 1996-2016	Y	Y	Y	na		na	Y	Y	Y	Y	Y
Native Vegetation Management Strategy 2000	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weed Action Plan 2001	Y	Y	Y	Y	Y	Y		Y	Y		Y
Waterways Implementation Plan 2002	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Floodplain Management Strategy 2002	Y	Y	Y	Y	Y			Y	Y	Y	Y
Rabbit Management Action Plan 2001	Y	Y	Y	Y	Y			Y	Y	Y	Y
Local Government Planning Schemes	Y	Y		Y					Y		Y
Goulburn Broken Regional Catchment Strategy 2003	Y	Y		Y	Y	Y	Y		Y	Y	Y
SIRCS itself	Y	Y	Y	Y	Y						Y

* There are extensive layers of information under these documents. Supporting information includes a range of technical or background reports, surveys, policy information and reviews.

Table 3 - SIRCS consultation process

Roles of Regional Stakeholders in the RCS

Goulburn Broken Catchment Management Authority (GBCMA)

The GBCMA is responsible for the preparation of the RCS and reporting on progress towards strategy targets and outcomes. The Authority is also responsible for works on waterways, regional drainage and floodplain management. GBCMA also coordinates Commonwealth and State natural resource management investment in the region. Through its Implementation Committees the Authority provides strong community ownership and input to the Strategy and its supporting sub-strategies.

Department of Sustainability and Environment (DSE)

DSE provides technical and extension support for the development and implementation of the RCS and its sub-strategies. The department is also responsible for State-wide landuse planning and the implementation of the *Planning and Environment Act, 1989.*

Department of Primary Industries (DPI)

Also provides technical and extension support for developing and implementing the RCS. Of particular importance is the research and development input provided by the department's research institutes.

Local Government

The catchment includes the municipalities of Moira, Campaspe and the Greater Shepparton City Council. Local Governments are central to the implementation of the Strategy through their responsibilities for land use planning, development approvals, rates and a variety of services such as road construction and maintenance.

Goulburn-Murray Water (G-MW)

G-MW provides irrigation, drainage, water supply and management of specific water supply catchments. They license surface and groundwater extractions. They play a major role in irrigation salinity management, water quality management and regional economic development. They also contribute significantly to the achievement of other riverine health outcomes.

Urban Water Authorities

Goulburn Valley Water provides water and wastewater services to urban communities in the region. The Authority manages specific water supply catchments and contributes to the water quality outcomes of the region by investment in improved wastewater management services.

Environment Protection Authority (EPA)

The EPA coordinates all activities relating to the discharge of waste into the environment and the generation, storage treatment, transport and disposal of industrial waste. They seek to control pollution and protect the quality of the environment. The EPA's efforts are guided by the State Environment Protection Policy Waters of Victoria.

Landholders

Achieving the Strategy outcomes requires changes in the way we manage our natural assets. Landholders are critical to the success of the Strategy. Under the *Catchment and Land Protection Act, 1994* Landholders are required to: 1) avoid causing or contributing to land degradation which causes or may cause damage to land of another owner; 2) conserve soil; 3) protect water resources; 4) eradicate regionally prohibited weeds; 5) prevent the growth and spread of regionally controlled weeds; and 6) prevent the spread of, and as far as possible eradicate established pest animals.

Landcare

Landcare groups enable the community to participate directly in natural resource management, particularly through identifying and setting direction for on-ground works and mobilizing community involvement in their local area.

Parks Victoria

Parks Victoria manage State and National Parks to ensure the conservation values of the parks and reserves network is protected.

Aboriginal Groups

Aboriginal cultural history is an important source of information for achieving the Strategy outcomes and aboriginal community engagement is a key area for the next five years.

Universities and TAFE

Universities and TAFE Colleges operating in the region must continue to provide a high level of service and to produce graduates with an extensive knowledge of natural resource management issues. They have an ongoing role in providing support to natural resource managers through student and staff involvement in catchment initiatives.

Trust for Nature

Trust for Nature is a non-profit organisation which works to protect remnant vegetation. The Trust focuses on its conservation covenant program and the purchase and re-selling of high conservation value land through its revolving fund. They assist community groups to purchase property, provide information and seek to add value to regional research.

VicRoads

VicRoads is responsible for maintaining and improving the condition and performance of Victoria's arterial roads, bridges and major culverts. VicRoads is actively involved in developing roadside management plans for its major roads. These plans will assist in managing roadside environments and include sections on pest plants and animals, retention of significant roadside areas, maintenance strategies and maintenance of firebreaks.

Industry

Through its operating practices and peak industry groups such as Murray Dairy, industry is able to exert strong influence over natural resource management outcomes.

Environment Groups

These groups are major contributors to the outcomes of the SIRCS by either involvement in shaping the direction of the RCS or by delivering on ground works. The groups include Greening Australia Victoria, the region’s Environment Alliance network, the Goulburn Valley Environment Group, and the Australian Trust for Conservation Volunteers.

3 Establishing the vision

3.1 The vision

The natural resources of the SIR are being managed sustainably for current and future generations:

- *with abundant and well maintained environmental assets delivering a range of ecosystem services,*
- *recognised locally and internationally for its high quality produce, and*
- *with an enthusiastic and progressive community that is actively engaged in care of its natural resources.*

3.2 Drivers for the region's natural resource management

The SIR is one of the few non-coastal areas in Australia that is thriving; however land use patterns are changing.

The world demand for food will continue to increase, driving an expansion of our agriculture sector. The SIR's population of 120,000 is growing, and the cultural and demographic mix changing (DSE, 2004). By 2021, we expect the population to be 147,400 with a more diverse cultural mix.

The region's population has a comprehensive understanding of the value of natural assets in terms of the ecosystem services those assets contribute to the region's productive capacity. Natural assets are interconnected and degradation of any natural asset may degrade other natural assets. Biodiversity assets, in particular, are under threat from salinity and intensification of agriculture.

Water is becoming increasingly scarce with strong competition between environmental, agricultural, urban and recreational demands.

Water markets and water reform programs will continue to be major drivers of land use change. The water market is driving the increase in water productivity (money generated per megalitre of water used). Development of the mechanism that enables water entitlements to be transferred has presented the opportunity to better match water and land use to land capability.

Water savings to meet Snowy River commitments and increased interest in establishing environmental flows for rivers and streams (including the Murray River) impacts on how our water is used. It also impacts on the confidence that the irrigation industry has in investing in its future in the region.

The prolonged drought that ended in 2003 is resulting in rapid structural adjustment of agricultural industries, especially dairying. Adjustment that would have taken 10 years is likely to take less than two. It is too early to predict what a typical dairy farm will look in a decade, although it is likely that farm entities will get larger as small farmers leave the industry.

Further options for managing salt disposal in the irrigation area will need to be developed. Drainage diversion remains an important part of managing salt exports but, as drainage flows decrease (because of increased water use efficiency), the salinity concentration will increase, which will reduce the water quality for diverters. This will require more effort in identifying other salt disposal options, such as greater use of evaporation basins within irrigation areas.

Progress in achieving implementation targets for natural resource management in dryland areas of the SIR is constrained by commodity prices: farmers are less likely to invest in natural resource management when their incomes are low.

3.3 Implications for the future of the region

Agricultural industries are becoming more efficient, with production levels doubling every 10 years (GBRCS 2003) and land used for agriculture decreasing. The choice to use land for rural living rather than agriculture is becoming common.

The SIR community's understanding of the importance of its biodiversity assets has grown significantly and there is an increased community expectation that these assets should be protected and rehabilitated from the effects of clearing, salinity, nutrients and pest plants and pest animals.

The shift in land use likely to occur over the next 50 years is likely to result in a mosaic that comprises:

- an intensive agricultural zone with a smaller ecological footprint – 'double the production from half the land';
- an increased 'conservation' zone where the land previously used for traditional agriculture is managed for nature conservation; and,
- rural living areas where land, particularly near urban centres, is converted to hobby farms and smaller farms where the main household income is from activities other than agriculture and which may offer additional conservation benefits.

3.4 The region's goals and the 'triple bottom line'

The SIRCS must demonstrate how the public and private investment in natural resource management will maximise the 'triple bottom line'. That is, how the economic, social and environmental outcomes from investment will be maximised and how potential trade-offs between these outcomes will be identified and considered.

Actions that are promoted by the SIRCS and its sub-strategies often generate environmental, economic and social benefits. In some cases, the actions might generate an economic or social benefit, but an environmental cost. It is important that these costs and benefits are made explicit so that investors and decision-makers can carefully consider the multiple benefits that can arise from investing in particular actions and the trade-offs that might be required.

The GB CMA has adopted the following triple bottom line goals:

Environment goal

To protect and enhance natural assets and their ecosystem processes and functions in a way that provides benefits for native biodiversity, social and economic aspects.

Social goal

To manage natural assets and their supporting infrastructure in a way that is responsive to the visions and values of communities of interest, is what the community wants to achieve socially, and that recognises the opportunities for management presented by existing and evolving social networks.

Economic goal

To manage natural assets and their supporting infrastructure in a way that is responsive to what the community wants and can afford to achieve economically and that recognises the opportunities for the further sustainable development of those assets.

3.5 Achieving the vision – setting the strategic directions

This section sets the strategic directions for the region's natural resource management programs. These directions will be developed further in subsequent sections of this Strategy.

3.5.1 The importance of long-term sub-strategies

In one sense, the challenges facing the SIR remain largely unchanged since the SIRLWSMP. This reinforces the need to develop and implement long-term plans and sub-strategies. The SIRCS is part way through its 30 year implementation. Progress to date represents significant investment by governments and the community. It is essential that investment in these sub-strategies continue in order to capture the benefits of the investment made to date.

Irrigation salinity

Irrigation salinity is the strategic planning theme that warrants the greatest emphasis by far and provides the framework around which other issues are addressed.

Under the terms of the *Murray Darling Basin Salinity and Drainage Strategy*, controlled salinity discharge from the Basin's irrigation areas is allowed in order to protect the land resource. Our community has developed its salinity management program within the constraints of salt disposal.

The region will continue to work with the Victorian Government to identify other salinity mitigation works that will enable an increase in the area of land protected within the irrigation area.

We are continually improving our understanding of the trade-offs between protecting regional assets from salinity and the Murray Darling Basin Ministerial Council's aspiration to protect downstream assets.

Attempts are being made to set extremely refined targets based on sub-catchments or End of Valleys across the Murray Darling Basin. In this way the Murray Darling Basin Ministerial Council is establishing salinity targets for all the Catchments that comprise the Murray Darling Basin. These targets have become necessary as new research has shown that the salt contributions from dryland catchments are much greater than initially thought.

The Ministerial Council uses Morgan in South Australia as the benchmark for salinity levels in the Murray River. There is on-going discussion about the appropriateness and achievability of the targets set for the SIR and trade-offs required within the Catchment to meet these targets.

The community recognises the need to maximise the benefits of the limited salt disposal credits available to the region and has investigated other options for salt disposal. Options include: conjunctive water use, serial biological concentration and evaporation basins.

The community has some acceptance of conjunctive water use, but there is a less acceptance of serial biological concentration options because they require a higher level of management, have high infrastructure costs and are marginally profitable. Evaporation basins have had limited community acceptance and, at this time, the community does not see them as part of their landscape.

Further work is needed on maximising the use of salt credits and developing opportunities for works that would generate further salt credits.

Dryland salinity

Dryland salinity is not the main focus of the SIRCS as the SIR has limited dryland and the issue is outweighed by irrigation salinity. Dryland salinity in the upper catchment has a large and growing impact on the SIR in terms of water salinity levels, both river and groundwater. The SIR Implementation Committee supports the work of the upper catchment in its endeavours to manage the issue.

Riverine health

The advent of the GBCMA in 1997 brought together the 'land' and 'water' managers and this accelerated integration. The GBMCA's role as a 'bed and banks manager' has become more holistic and includes consideration of instream, riparian and whole of catchment impacts on riverine health. Works are performed directly by the CMA under this program and indirectly by incentive programs for land managers.

One of the most important gains for biodiversity in the Catchment in the past decade has come from adjusting waterways management actions. Waterways managers now include biodiversity and salinity priorities within their works programs.

Waterways Management Grants (1999) for land managers include a scoring system based on a large range of environmental benefits. This self-targeting system results in works being taken up in the highest priority areas. The system was pioneered in the Catchment and is now being used in many places in Australia.

The Goulburn Broken Riverine Health Strategy (RHS, in prep.) is the first attempt to combine all elements of river management under one umbrella document. The RHS integrates waterway programs into a multidisciplinary framework and considers water quality, flow, wetlands, instream and riparian flora and fauna, pest plants and animals, waterway management and implementation, fisheries and recreation. Many organisations are involved in managing the riverine environment and no single organisation has primary responsibility. The CMA is best positioned to gather all relevant information despite the fact that most of the activities that impact on riverine health are performed by other organisations: the CMA has influence rather than control.

The *Goulburn Broken Water Quality Strategy 1996* aims to reduce the incidence of blue-green algal blooms and sets resource condition targets based on phosphorus levels. Implementation is well underway and aquatic biodiversity is one of the major beneficiaries. Work remains to clearly establish the link between phosphorus levels and impacts on aquatic biodiversity.

Floodplain management became the responsibility of the CMA at its inception in 1997. The heavy emphasis on developing a regional perspective and detailed technical understanding of flooding issues positions us well to integrate floodplain management into other programs. The *Goulburn Broken Regional Floodplain Management Strategy 2002* overarches the Floodplain Program and ensures floodplain areas and natural watercourses are protected from inappropriate development.

The CMA has advanced an innovative approach to addressing long-term flooding problems on the Lower Goulburn River floodplain that would have major benefits for biodiversity. Floodplains were converted to agricultural land in the early days of European settlement. Many important ecosystem services provided by these floodplains have been lost, and much of the agricultural land cannot be economically protected from flood damage.

The Lower Goulburn River Floodplain Project seeks to resolve a major flooding problem by rehabilitating the floodplain so that it functions more naturally. It involves adjusting levee banks and a possible buy-back of up to 9,700 ha from landholders. This project would also deliver huge biodiversity outcomes.

Biodiversity

From the Fringe to Mainstream - A Strategic Plan for Integrating Native Biodiversity 2004-2007 will be finalised in 2004. Implementation of this Strategy is expected to make it easier for key partners to make and show biodiversity benefits.

Biodiversity Action Planning is a new process that analyses and collates ecological information (based on bioregions) to influence decisions at several scales. Priority areas for protecting and enhancing biodiversity assets from farm to landscape scale are determined and can be overlayed on priorities for other issues such as salinity. This allows private and public land managers to understand the multiple benefits and trade-offs of various options. This process actively involves the local community in planning and implementing, and is well under way in several parts of the SIR.

We are also committed to working with partners to prioritise and implement actions from federal and state Strategies, such as Victorian Action Statements and the national recovery plans that contain very specific actions.

The SIRLWSMP (1990) recognised the 'environment' by including it as one of the key programs. Including the environment in major natural resource management programs, especially on private land, was an extremely new concept in 1990. Its inclusion in the Plan and then during the early stages of implementation predated the concept of integrated catchment management (ICM). Many lessons were learned which have been of enormous benefit to ICM in Australia.

Biodiversity now benefits enormously from investment in salinity mitigation and water quality control works. Surface Water Management, Sub-surface Water Management and the Farm Program include biodiversity factors at all stages of planning and implementation.

For example, the environment is a key criterion in prioritising construction of Surface Water Management Schemes. Environmental impacts are assessed and environmental protection and enhancement actions are negotiated with land managers when planning and installing groundwater pumps and Surface Water Management Schemes.

Soil health

Soil biodiversity concerns are helping to drive the development of a comprehensive soil health strategy. Understanding of soil health issues and integrated management is in its infancy compared with salinity and river management issues.

We are beginning to understand the role of soil health in habitat management (especially native vegetation). The cumulative impact of increasingly acid soils is starkly evident as increased acidity of rivers and streams. Through an increase in research and development effort over the past five years we are now appreciating the vulnerability of our soils and are starting to recognise the need to maintain soil biodiversity.

Pest plants and pest animals

The successful management of pest plants and animals underpins the outcomes of other sub-strategies. Weeds, in particular, have a major impact on the quality of remnant vegetation, which, in turn, is critical for biodiversity, riverine health and salinity management outcomes. Similarly co-ordinated control programs can reduce the impact of foxes on fauna while having economic benefits for graziers.

Significant progress has been made in recent years to include biodiversity values when planning pest plant and animal programs at catchment and local area scale.

The CMA's *Weed Action Plan 2001-05* establishes service levels for managing weed infestations depending on a number of criteria. A key criterion is whether the infestation is in an environmental priority area.

Interest in developing several local area plans in the dryland areas of the SIR was driven by weed and rabbit issues. These have evolved considerably to factor in other issues including biodiversity. Biodiversity Action Planning has informed several areas of decision-making and has helped strategically target high value native biodiversity sites in weed and fox control programs across tenures.

The Broken Boosey Conservation Management Network is a very recent initiative resulting from the Environment Conservation Council's Investigation into Box-Ironbark Forests and Woodlands. It is a very good example of integrating biodiversity priorities with pest plant and animal control programs on private and public land.

Climate change

Significant human intervention is needed to manage the increased pressure from greenhouse gases on the catchment. Climate change is expected to impact on water availability, salinity, native biodiversity, riverine health and agricultural systems.

The region has opportunities to assist in reducing greenhouse gas emissions and many of these opportunities are consistent with salinity, biodiversity and water quality programs. Through techniques such as revegetation and enhanced agricultural practices we can generate multiple benefits for the region.

In terms of biodiversity we need initially to gain a better understanding of environmental tolerances of important natural systems to climate change, identifying areas for protection and re-establishment of threatened communities.

Existing programs which aim to protect existing native vegetation and increase the area of native vegetation not harvested are a significant opportunity to provide carbon sinks.

The CMA's Greenhouse Gas Abatement Program submission 2002 also identified the potential for the farm forestry industry with wood production for timber and sustainable firewood supply. The submission indicates the extent of greenhouse gas abatement that could be provided through enhanced environmental plantings and agroforestry.

3.5.2 Landscape focus

Best management practices for existing land uses will not make the difference alone. We need to identify how large-scale changes can be achieved, including more appropriately matching land use with land capability within the constraint of existing property rights. The changing demographics and land use across large tracts of the SIR mean there are opportunities for improving natural resource management by influencing these changes without impinging on property rights. On current trends across the SIR, we could expect to see a significant shift in land use patterns over the next 50 years and this will strongly affect the future landscape. The result is likely to be a mosaic made up of:

- an intensive agricultural zone with a smaller ecological footprint – “double the production from half the land”;
- an increased “conservation” zone where the land no longer used for traditional agriculture is managed for nature conservation and ecosystem services; and
- rural living areas where land, particularly near urban centres, is converted to hobby farms and smaller farms where the main household income is from activities other than agriculture and which may offer additional conservation benefits.

An example of a landscape focus is the proposed rehabilitation of the Lower Goulburn Floodplain.

3.5.3 Water Savings

The SIR has many unique challenges in this regard. Water savings will come from major infrastructure projects such as irrigation supply system improvements or from a more environmentally sensitive and productive use of available water resources in irrigation production systems. To mitigate the adverse environmental impacts of inefficient use of water requires a better understanding of where particular land uses should best be located in the catchment, and the development of appropriate practices to better manage water in both irrigated and dryland contexts. In particular, quantification is needed of recharge rates under particular land uses and irrigation practices.

3.5.4 Salt Disposal

Under the Murray Darling Basin Salinity and Drainage Strategy 1988 agreement was reached on how to manage catchment activities which increase the amount of salt discharging to the River Murray. Any works which increase salt loads leaving the catchment require a Salt Disposal Entitlement (SDE). In essence these SDE's allow us to export salt which is then removed downstream. Currently, the SIR has been allocated 10.8 EC and our estimates are that implementation of the SIRCS will require 17.0 EC.

The SIR recognises the need to maximise the benefits of limited salt disposal credits available to the region and has investigated other options for salt disposal. Options include: conjunctive water use, serial biological concentration and evaporation basins. The community has some acceptance of conjunctive water use. There is a lesser degree acceptance of serial biological concentration options because they require a higher level of management, have high infrastructure costs and are marginally profitable. Evaporation basins have had limited community acceptance and at this time the community does not see them as part of their landscape. Further work is needed on maximising the use of salt credits and on developing opportunities for works that would generate further salt credits.

3.5.5 Market Based Approaches

Price signals have proven to be an effective mechanism for increased water use efficiency in irrigation areas. This type of approach needs to be considered by other sub-strategies. The development of Environmental Management Systems (EMS) provides an opportunity for markets to directly influence land management practices. EMS provides a mechanism for consumers to express preference for goods that are produced in a clean and green manner. SIRIC, through the CMA will work in partnership with the Victorian Farmers Federation, industry groups and agencies to develop an appropriate EMS for the region.

Market based approaches rely upon a strong understanding and ability to quantify the relationship between the works and the natural resource management outcome of those works. By improving this understanding the region can explore other market-based mechanisms such as:

- Using "auction" systems to reveal the price landholders are willing to accept for delivering catchment natural resource management benefits. This approach is not limited to individual landholders. The principles could be expanded to cover plantation investments by the private sector where an incentive could be offered,

the level of which is commensurate with the multiple natural resource benefits provided by the plantation.
- Developing “annuities” as a way of funding management actions that span a number of years.
- Developing a vegetation bank as a means of attracting large-scale private investment in vegetation works.

3.5.6 Pursuing Multiple Benefits

Many of the threatening processes that impact on the region’s assets can be considered to be diffuse source threats. It is not always possible to identify specific locations or actions to deal with these threats and management requires wide-scale adoption of works by many landholders across sub-catchments. The region has responded to this challenge by developing an environmental management grants approach where the level of incentive offered to a particular landholder is proportional to the total benefits generated by the agreed works. This concept will be expanded to other catchment works’ programs.

3.5.7 Improved Regulatory Framework

Where the threat to a natural asset can be clearly identified and attributable to individuals, then consideration needs to be given to supporting recommended management actions with regulation. The management of dairy shed effluent is one area where an increased regulatory effort is required. The SIRIC will work with the GBCMA, Murray Dairy, the UDV and the Environment Protection Authority to develop an appropriate program to take the region to 100% compliance with EPA guidelines.

Pest management is another area where regulation is considered vital. In the Goulburn Broken region, the *Catchment and Land Protection Act* 1994 is enforced where individual land managers fail to adequately manage pests on their land, compromising the coordinated efforts of the greater community. This approach underpins the implementation of the Goulburn Broken Region Weed Action Plan and the Goulburn Broken Rabbit Management Action Plan.

3.5.8 Enhancing Community Engagement

The SIR has robust community participation structures and processes and these are discussed in the later chapter on capacity building. We will explore new ways of engaging the community in addressing the substantial issues facing the region. Of particular interest is the use of “Deliberative Forums” - an approach that brings together a cross section of the community to review the best available technical evidence about a particular issue and to promote public debate on the processes for dealing with that issue.

3.5.9 Focus on Natural Assets and Ecosystem Services

The relatively new emphasis on asset management does not change the natural resource management issues that need to be considered when developing sub-strategies, but it does change how information is collated and shared. Our experience with developing an ecosystem services approach is very complementary to a focus on natural assets. The ecosystem services approach provides a framework for making management decisions that are truly holistic. We are at the leading edge of developing and implementing this framework.

3.5.10 Bioregional Planning

Biodiversity Action Planning is a new process that involves bringing together information on biodiversity assets. This information has become much more useful and available in recent years, and is often based on bioregions. All land managers including local landholders and groups, local government, DPI, DSE, Parks Victoria and the CMA then work in partnership to set priority areas for protection and enhancement of native biodiversity. These priority areas are built into the land management grants criteria.

3.5.11 Accountability and Integration

New Government programs and policies are emphasising the importance of integrated catchment management and regionally based funding programs. Integration of the sub-strategies into annual sub-catchment works programs ensures that conflicts between the sub-strategies actions and the multiple benefits that are generated by certain actions are identified. As a consequence of increased decision-making responsibilities being devolved to the regions, more robust monitoring, evaluation and reporting processes will be required.

4 What has been achieved in the first 10 years?

The implementation of the first ten years of the SIRCS has seen a number of remarkable achievements. This section contains a summary of the highlights and a full report on the achievements for each of the programs can be found in the *SIRCS Achievement Report "10 year Review" – 1990/91 to 2000/01*.

Several major reviews (including two Auditor General Audits) since the founding of the *Shepparton Land and Water Salinity Management Plan 1990* have found that progress has been excellent, with several achievements exceeding expectations.

Two major reviews of the components of this SIRCS were conducted in 1995 and 2000-02. In addition, the Auditor General undertook Salinity Performance Audits in 1993 and 2000-01. The Department of Natural Resources and Environment (now Department of Sustainable Environment, DSE) and the Murray Darling Basin Commission (MDBC) also commissioned an independent review of the environmental aspects of the surface drainage programs in Northern Victoria in 2001 (now known as the 'Nolan Review').

The 2000-02 review was comprehensive, systematic, and focussed on each implementation program and set strategic directions for the next five years. An enormous amount of work and discussion occurred with the community and partners, and the results are outlined in nine reports. More details of this review can be found in Appendix 1. The SIRLWSMP (1990) had a 30-year horizon and progress has been excellent, with several achievements exceeding expectations.

The Audit (VAGO, 2001) found that salinity management plans were generally moving in the right direction, with greater impact on irrigation than dryland salinity. There were a number of recommendations for improvement, to which the Goulburn Broken catchment community has been responding.

Although the high importance placed on salinity management in 1990 has not diminished, water quality, biodiversity, native vegetation, wetlands, floodplains, pest plants and river health have become prominent and catchment-wide sub-strategies with targets developed for each issue have been integrated into the decision-making framework established for salinity.

The key achievements could be described as:

- Turning community concern into community involvement and empowering the community to make decisions about their future.
- Undertaking important baseline research and investigations to inform community decision making
- Developing solutions in the form of a range of activities that lead to outcomes
- Working within the salt disposal, water cap and water quality limits set by the Murray Darling Basin Ministerial Council.
- Salinity management is well integrated and government funding levels are the main constraint to achieving targets.
- Especially big gains from integration have been made from actions that simultaneously address water quality and salinity problems. Water quality

management is exceeding targets and has demonstrated a major reduction of phosphorus and nitrogen loads at key regional sites.
- Native vegetation works are being taken up at high rates in high priority areas under continuing projects and new projects. Biodiversity is also benefiting from integrating biodiversity needs into complementary programs. Increased uptake of direct-seeding is also having significant positive impacts.
- Having a flexible plan that seeks better information and new directions where information and experience indicates (i.e. an adaptive approach).

4.1 Highlights of Progress Towards Long Term Outcomes

Activity	Progress towards Plan completion	% of 2020 Target Achieved since start of the SIRCS in 1990
Area protected through Surface Water Management Systems	630.9 km of Surface Water Management Schemes constructed (see Figure 4)	52%
Reduce Phosphorous loads from surface water management systems by 50 % by 2016	84.5 tonnes of Phosphorous removed (see Figure 5)	100%
Controlled disposal of salt equivalent of 10.8 EC at Morgan by 2020	2.48EC of salt disposed	23 %
Area Protected by new Private Pumps (non horticulture)	23,920 ha protected	46%
Area Protected by Horticulture Private Pumps	770 ha protected	77%

Table 4 – SIR progress towards long term outcomes June 2001

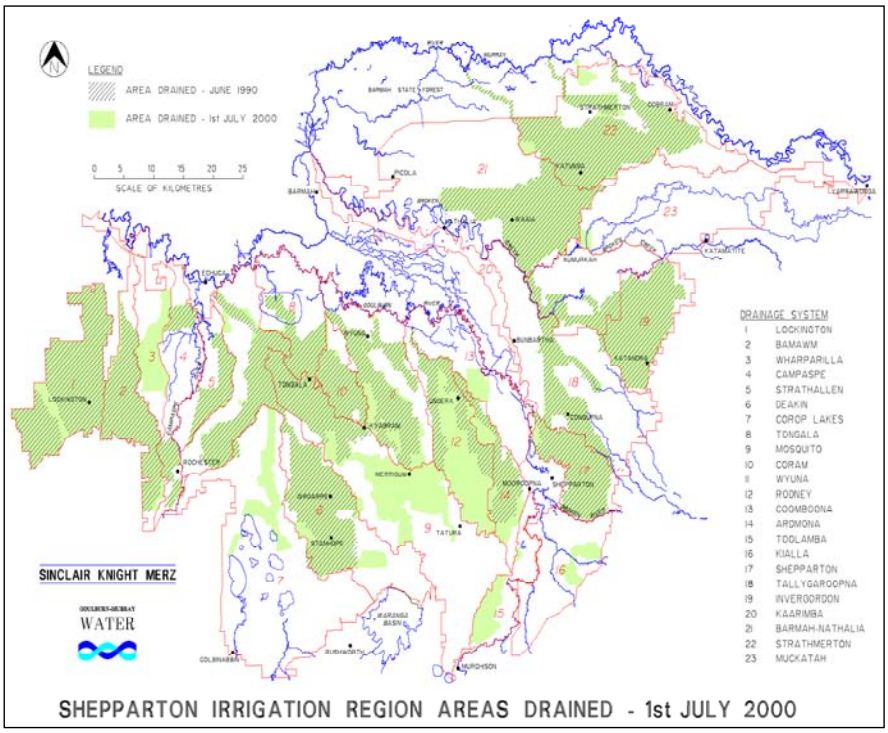


Figure 4 – SIR area drained, July 2000

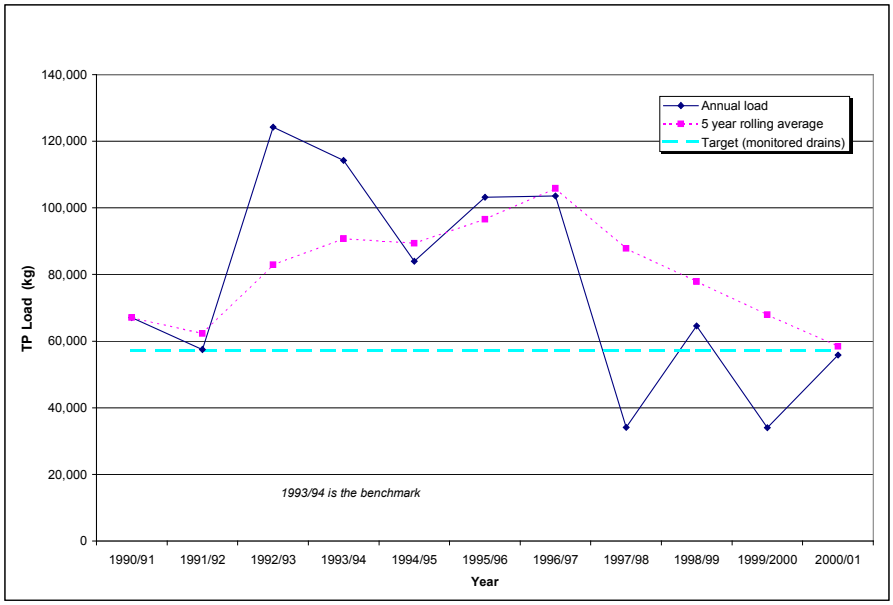


Figure 5 – Total Phosphorous loads from monitored drains in the Goulburn Broken Catchment (Deakin, Rodney, Toolamba, Murray Valley 6)

4.2 Highlights of Biophysical Achievements

Activity	Progress towards Plan completion	% of 2020 Target Achieved since start of the SIRCS in 1990
Construction Community Surface Water Management Systems	481 km constructed	41 %
Number of Reuse Systems constructed	2,610 systems constructed	49%
Area covered by a Whole Farm Plan	2,256 Whole Farm Plans covering 154,705 ha (see Figure 6)	41 %
Private Pumps installed (horticulture and non horticulture)	216 pumps installed (see Figure 7)	53%

Table 5 – Highlights of Biophysical Achievements within the SIR, June 2001

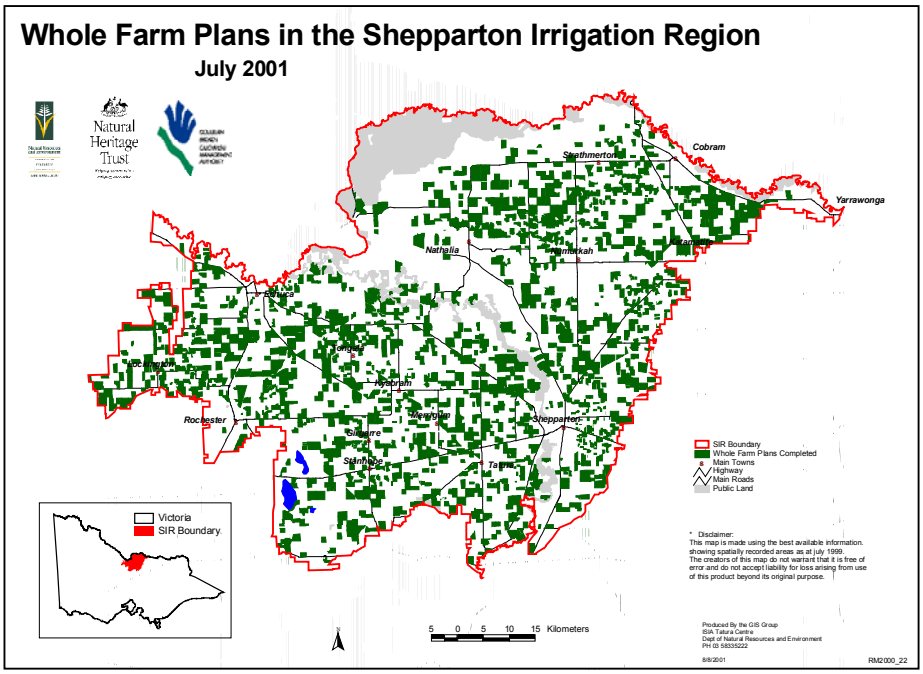


Figure 6 – Whole Farms Plans in the SIR July 2001

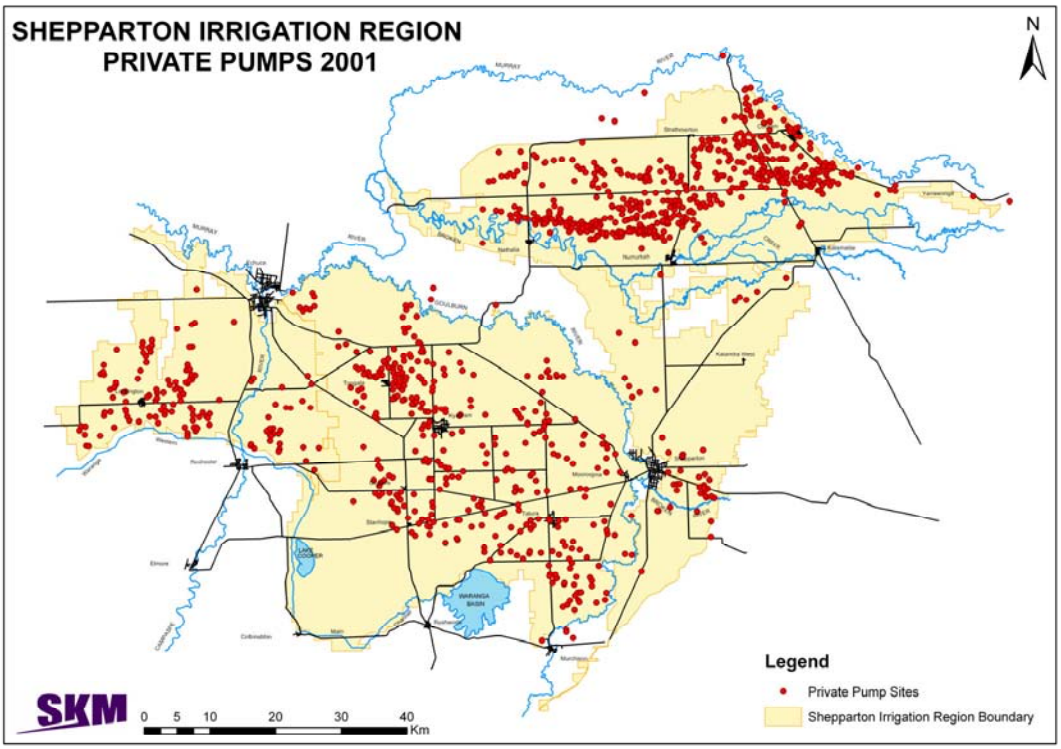


Figure 7 – Private Groundwater Pumps constructed in the SIR July 2001

4.3 Highlights of non Biophysical Achievements

- Inclusion of the catchment community at all levels of decision making.
- Integration of all Shepparton Irrigation Region Catchment Strategy (SIRCS) Programs (particularly the Environment and Waterways Programs) to achieve multiple benefits and to ensure efficiencies in investment in natural resource management.
- Flexible and adaptable programs to respond to seasonal and funding cycles.
- Strong involvement from all partners in the catchment, especially Local Government.
- National and international recognition of the SIRCS as an innovative and successful strategy that achieves long term and significant environmental, social and economic outcomes.
- Inclusion of Cultural Heritage issues within each of the programs, especially the Surface Drainage Program.

4.4 Summary of Investment to Date

There has been substantial investment in the SIRCS over the past ten years by governments and particularly the catchment community. Table 6 summarises investment known to date. It is difficult to track the funds spent on individual programs due to the continual change in guidelines from funding bodies and to changes in reporting requirements. However the total funds expended implementing the plan is accurate.

Program	**Total Cost 1990 to 2001 (2001 $,000)**	**Estimated Benefit Cost Ratio****
Surface Water Management	$57,560	1.20
Sub-surface Program	$28,953	2.63
Farm Program	$22,876	1.33
Environment Program	$4,031	-***
Waterways Program	$13,363	0.61 or 2.28****
Program Support and Monitoring	$21,871	
Total	**$148,654**	**1.42**
Community Contribution (estimated regional community and landholder expenditure)	**$383,030***	

Source: Program Annual Reports

Table 6 – Investment in the SIR, June 2001

*derived from a survey of farmers within the SIR and from records of government administered assistance programs
**Source – Economics of the Shepparton Irrigation Region Catchment Strategy, Mike Young, 2002
***Included in the Farm Program
****program economics provides a range of benefits that are dependent on time sensitive assumptions

5 Our approach to Catchment management

5.1 Asset-based approach to natural resource management

The region's asset-based approach to catchment management is summarised in Figure 8. The region's social assets, consisting of its people, (individually and as communities of interest), and its economic assets (physical and financial assets) depend upon ecosystem services provided by our natural assets.

Threats to natural assets are threats to our social and economic assets. Major threats include salinity, water quality decline arising from nutrients and sedimentation, pest plants and animals, greenhouse, soil acidity and soil health decline, and the loss of biodiversity. In this chapter we will establish the framework for catchment management and over the next few chapters we will:

- Describe the region's natural resource assets and the range of benefits those assets provide.
- Outline the threats to the assets
- Describe the management actions that will be pursued to address and manage the threats.
- Describe how these management actions are implemented through the region's sub-strategies and action plans
- Identify targets for management actions and resource condition over the next five years.

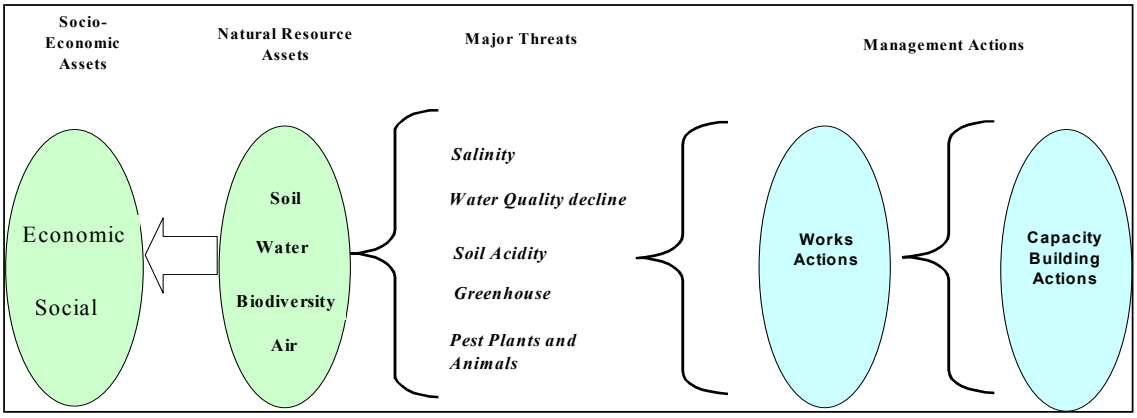


Figure 8 - Assets, threats and actions framework – Works Actions target both past and present causes that impact on natural assets

Our investment decisions centre on determining the appropriate mix of management actions that provides the best overall outcome for the region. Management actions are either works actions or capacity building actions.

Works actions are direct physical changes or structures such as removal of weeds, tree planting or construction of a fence. The types of works actions that result in a native biodiversity asset, for example, being "protected", "enhanced" or "established (restored)" are often common to achieving all three objectives. Indeed, many of these actions are common to achieving other natural resource management goals and objectives. Targets can be set for these works actions on a short-term (1-5 years) or long-term basis and these can be linked to the objectives.

Capacity building actions are programs that increase the capacity of the community and its agencies to implement a particular works action. A capacity building action can influence more than one works action; examples of capacity building actions include planning, extension and/or research and development.

The region's challenge is to select the most efficient, and economically feasible, mix of management actions that will lead to the overall improvement in the quantity and quality of the assets.

5.2 Understanding ecosystem services

Natural assets such as soil, water, air and biodiversity are the foundations of our ecosystem. These assets are valued in their own right as important resources that we strive to protect so that they are available for future generations. We are now beginning to appreciate the inter-connectedness of these assets and how protecting one provides benefits for other natural assets.

The term "ecosystem services" is used to describe the benefits that the natural assets provide (see Figure 9). For example natural assets provide clean water, recreation and lifestyle opportunities, replenishment of soil following a cropping cycle and maintaining habitat for wildlife (CSIRO).

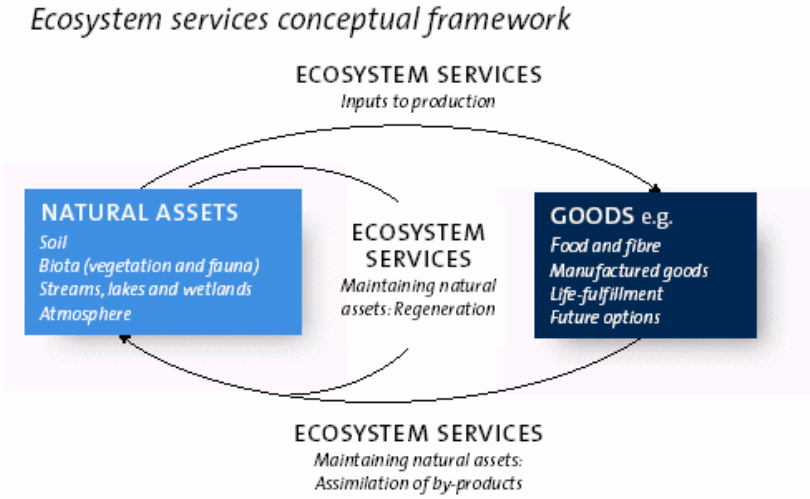


Figure 9 – Ecosystem Services

5.3 Program logic

Program logic is the term used to explain the links between Strategy outcomes, sub-strategy outputs (management actions), assumptions and annual investment planning (these are also known as Regional Management Plans). The links between these elements are illustrated in Figure 10.

In deciding on the appropriate mix of management actions, we make assumptions about the relationship between the management action and the impact of that action in terms of addressing the threat or enhancing the asset. In some case the assumptions have been well tested and we can move forward with confidence. In other cases we are less sure, but are confident that the actions generally produce positive natural resource management benefits. The latter group of actions is the subject of on-going research and development.

The assumptions we make are an important part of the Strategy. We are addressing threats and processes with many years, and sometimes decades, between the cause and effect. The management actions can take just as long before they have a significant impact on the threat.

This presents challenges for reporting to the community and government on progress towards achieving outcomes. Figure 10 illustrates the importance of assumptions for measuring outcomes.

A second area of complexity in measuring outcomes is attaching a “value” to the natural asset. As discussed in the previous section the region’s work with CSIRO on

Ecosystem Services will assist with valuing natural resource assets. Where the asset generates goods such as agricultural produce, the direct economic benefit can be readily measured in dollars. Many ecosystem services result in benefits that are measured in different "currencies", such as improved recreation and habitat values. The different currencies create a challenge when comparing values and communicating the "triple bottom line" of environmental, social and economic outcomes of a project.

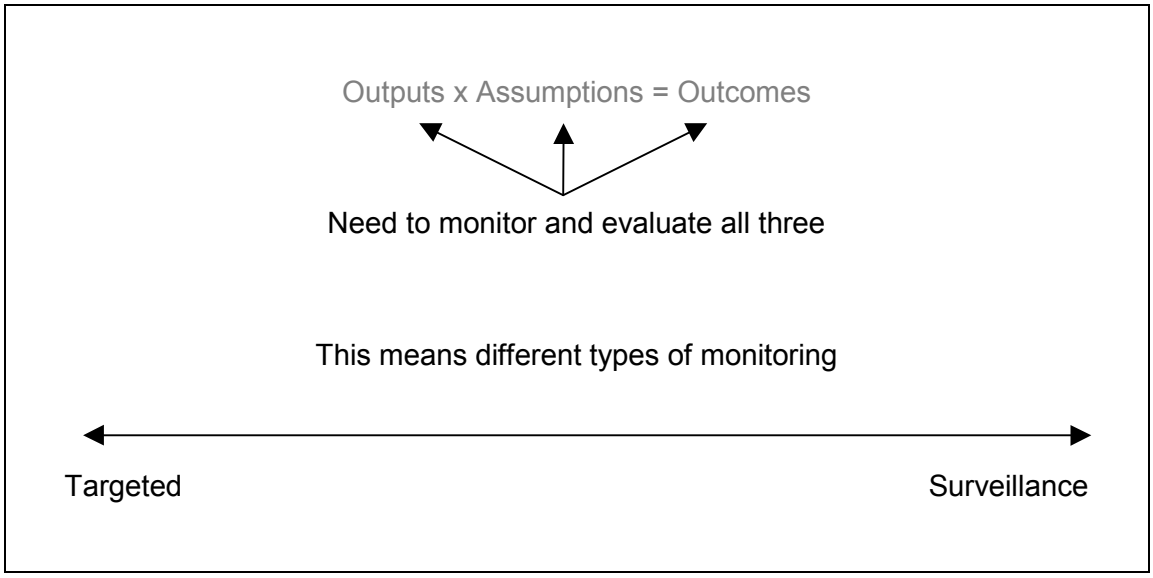


Figure 10 – Relationship of Outputs, Assumptions and Outcomes

5.4 The monitoring and evaluation framework

The uncertainty around investment decisions requires the region to have a strong monitoring and evaluation framework. Information generated from this framework enables the region to review progress and adapt programs in the light of better information.

Adaptive management systems are based on measurable targets. Targets define how far we want to go in a given direction by a certain time. Targets further help to establish a common sense of purpose and the framework for monitoring and evaluating progress. Targets need to be set so that they inform the appropriate level of decision-making, from broad Catchment-scale to site-specific decision-making. This means that there will be a spread from coarse (outcome-oriented) to fine (output-oriented) targets.

Investment in evaluation becomes important where there is little research or previous experience to demonstrate that the assumption that underpins management action are strong.

As part of the implementation of the Strategy, evaluation plans will be developed for the RCS, each sub-strategy and the Regional Management Plan.

Case Study – Coomboona Community Surface Water Management System

The Coomboona 3P Community Surface Water Management System (CSWMS) completed construction in 2001. The original outfall of the informal drain went through the State Forest; but the formalisation of this CSWMS has moved this outfall to avoid unseasonal water entering the forest. There is now a gravity and pumped outfall directly into the Goulburn River through the levee bank. It covers 1726 hectares, and includes 26 registered entries.

A community group has been actively involved in this catchment since 1974 with local drainage issues a priority and were known as the *North Undera Drainage Trust Inc.* In the past a network of depressions throughout the catchment had been providing a type of surface drainage to irrigation and rainfall. These depressions had been excavated to assist flows to the outfall. The catchment however, is very flat and many obstructions are evident along the depression. Formalisation of these depressions was the main goal when initiating the CSWMS.

During survey and design an Aboriginal mound was located and the drain was realigned to avoid it.

There were three main issues that were the focus of survey and design;

- The outfall needed to be modified so that it avoided outfalling into the State Forest. With negotiation, this was changed.

- There is a significant wetland located in the catchment called Coombs Wetland that needed protecting. A shallow drain with no banks was designed to go around the wetland, with overflow sills also incorporated.

- Many of the roads in the catchment had deepened roadside drains. A policy calling for these drains to be backfilled once the drain is constructed was written and endorsed by Surface Water Management Working Group and the City of Greater Shepparton.

This system has two outfalls. The main outfall is to the Goulburn River at the end of McIlroy Road. Although this outfall is against the fall of the land, it is a better option with less environmental impact than the natural outfall through the forest. The new outfall has two methods in which water leaves the catchment. There is a pipe underneath the levee bank which provides gravity outfall. In the event of high river levels, there is also a pumped outfall. The second outfall is the original natural outfall through the State Forest into the Goulburn floodplain. In high rainfall events (greater than a 1 in 2 year event) water will flow down the natural drainage line and into the State Forest.

Environmental Features

Since settlement, the area has undergone extensive clearing and development for agriculture and horticulture, which has led to the natural environment being significantly altered from pre 1788 conditions. The over-storey is primarily River Red Gum, which usually occur as small clumps or scattered individuals with some stands of Grey Box and a small pocket of Yellow Box trees.

The understorey within the catchment has been mostly removed with the few remaining shrubs and native grasses found along the roadside reserves, which generally maintain a very healthy over-storey.

Despite extensive clearing, a total of 62 native plant species were identified and the catchment was recorded as having quite good habitat value. This is primarily due to the roadside reserves and the close proximity of the highly valued Goulburn River corridor. Also many of the farm blocks are dry-land out-paddocks that have not been cleared to the same extent as many irrigated farms.

Numerous fauna species, primarily birds were recorded including the regionally significant Bush-Stone Curlew. Eastern Grey Kangaroo's were also sighted during the initial environmental assessment.

Wetlands

A total of six wetlands were identified within the catchment. Following negotiations between DPI staff and landowners, these wetlands now have structures in place to allow the return of more natural flooding regimes.

The wetlands have benefited from the construction of the Coomboona 3P CSWMS. Prior to construction these wetlands were inundated for inappropriately long periods and many large Red Gums were severely stressed. During the post construction survey in May 2002, it was apparent that many of these mature trees were regenerating and are now in quite good health.

In the spring of 2000 following a series of rainfall events remedial works were identified to stop the undermining of a wetland control structure. These works have since been undertaken and appear to have stabilised the structure. However the effectiveness of these works and the performance of the structure will also need to be inspected following a design or greater rainfall event. This ongoing inspection will be carried out as part of the ongoing Drain Management Plan.

Only one large Red Gum was removed during construction and it was negotiated to have this tree replaced with a ratio of 60:1. This replacement was undertaken by fencing off areas of land for natural regeneration rather than through tree planting. 12.6 ha of regenerated land has been fenced in this catchment. The drain was constructed along the proposed route with minimal disturbance to any natural vegetation.

It was suggested in the detailed environmental assessment that the present poor health of some of the over-storey was due to inappropriate inundation and that this may be improved by the new drainage scheme. Evidence of this improved health can be seen in the photos on the next page. However the district has not experienced any prolonged wet periods since the drain was constructed and it has not been possible to test this assumption. Four large Grey Box trees were protected from stock by the addition of the fencing.

Catchment development

1,404 ha (81%) of the catchment has undertaken Whole Farm Plans. Most of these occurred after initiation of this surface water management system.

Conclusion

This community group has successfully worked together for 26 years, firstly managing an informal drainage system, and then later with the assistance of the Community Surface Water Management System Incentive Scheme, to formalise their surface water management strategies with the construction of the Coomboona 3P CSWMS.

Figure 11 – Coomboona Community Surface Water System

Photo was taken in May 2002 and shows that many of these mature trees were regenerating and were improving from poor to good health.

Figure12 – Coomboona Community Surface Water System Regeneration

Figure 13 – Remodelled Surface Water Management System allowed trees to be saved

Note that there is no maintenance track. This section will be sprayed for weeds by hand.

6 SIR assets

The SIR lies within the Goulburn Broken Catchment of northern Victoria, and is a catchment of the Murray Darling Basin. It is intensively irrigated with approximately 317,000 of its 500,000 hectares being irrigated. The major agricultural industries are dairying, and stone and pome fruit production, which support a large food processing industry (see Table 7 and Figure 14). The SIR uses around 1.5 million megalitres (ML) of water annually, depending on seasonal allocations.

Descriptor	Dairying	Horticulture	Cropping and grazing	Grazing only	Total
No. of properties :	2147 (47%)	681 (12%)	861 (15%)	2176 (37%)	5865
Total property area (ha):	210,996 (47%)	21,144 (5%)	99,102 (22%)	115,758 (26%)	447,211*
Water usage (ML) :	959,821 (64%)	70,765 (5%)	175,862 (11%)	299,362 (20%)	1,505,810
Properties with reuse systems (no.) :	1,746 (81%)	87 (13%)	385 (45%)	610 (28%)	2,828 (48%)

Table 7 - Land use in the SIR (Source: 1997 G-MW Irrigated Farm Census)

*The actual area of the SIR is 500,000 ha, the difference being dryland or non-agriculture land.

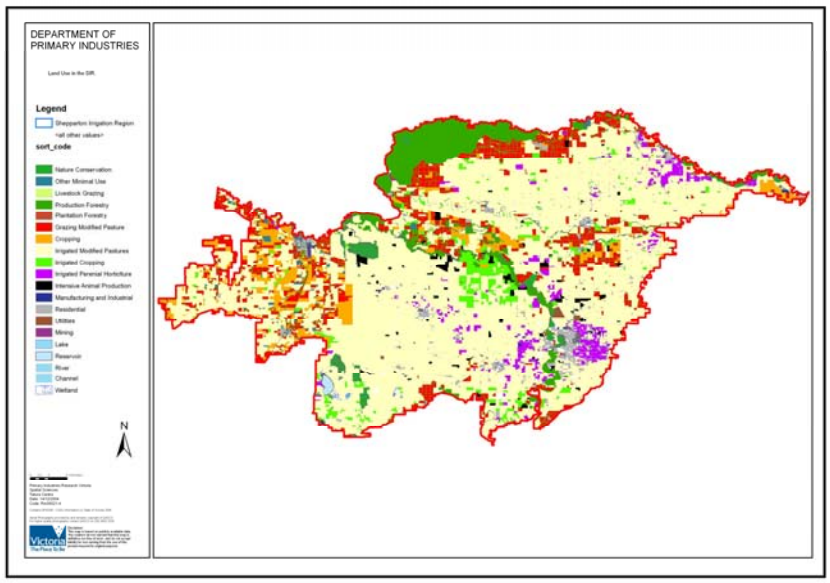


Figure 14 – Landuse with the SIR

6.1 Natural assets

The SIR's natural assets are its soils, water, biodiversity and air. These assets are interconnected and collectively support the region's social and economic assets. This interconnectedness means that a decline in the health of the soil asset, for example, can contribute to a decline in the biodiversity and water assets.

6.1.1 Soils

The health of the SIR's soils is critical for the region's continued prosperity. Soils within the irrigation area were comprehensively mapped during the 1940's to 1960's. See Figure 15.

Suitability of the soil types for growing various crops has been described in the soil technical bulletins (see Skene 1963, Skene & Harford 1964, Skene & Poutsma 1962, CSIRO 1952). While agronomic and cultural practices have changed significantly since these bulletins were produced, they still provide an excellent base for identifying the most suitable soils for growing high value crops.

Some crops may be successfully grown in specific soil types in Group IV or even V under the right management, but generally this is not the case. Conversely, some crops may not be suitable to particular soils in Group I, II or III due to inherent characteristics.

General descriptions of the Group I, II and III classification are given in Skene & Poutsma (1962) and reproduced below. Although not mentioned below, these soils are also well suited to viticulture, olives and other irrigated crops that were not considered during the original soil mapping project.

Group I

"*Very good soils, if given careful irrigation, for all horticultural crops, vegetables, tomatoes… Summer fodder crops, cereals, lucerne, and perennial and annual pastures also can be grown successfully".*

Group II

"Good soils for all horticultural crops (except citrus), pumpkins, peas, tomatoes, summer fodder crops, cereals, lucerne, and perennial and annual pastures".

Group III

"Good soils for apricots, apples, pears, plums, summer fodder crops, cereals, and perennial and annual pastures; fair soils for peaches, tomatoes, pumpkins, peas, beans and lucerne".

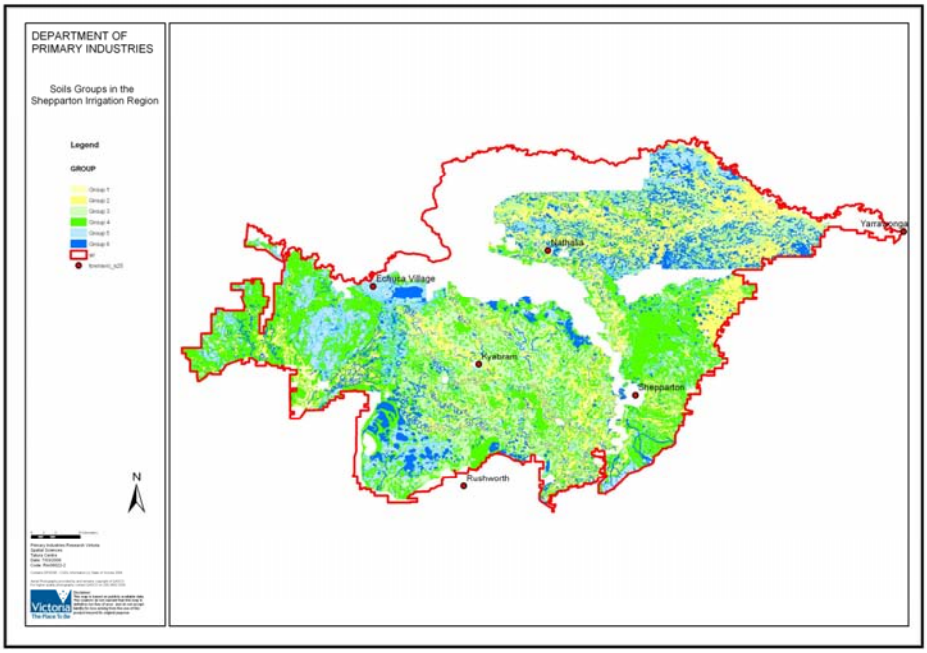


Figure 15 – Soil Types within the SIR

Soil biodiversity

The below-ground flora and fauna represents one of the most species rich components of terrestrial ecosystems but is often ignored because it is not well known or understood.

Recent research is also showing there is a strong link between above ground and below ground biodiversity. Healthy remnants and soil biodiversity go hand in hand. This is likely to influence how we revegetate.

6.1.2 Water

Quantity of water

The Goulburn Broken Catchment produces 11% of the Murray Darling Basin stream flow from less than 2% of the land area. It also imports water into the Catchment from the Murray River and exports water to adjacent Catchments for irrigation, urban and stock and domestic supply.

The SIR is one of Australia's major irrigated agriculture regions. The SIR uses between 40 and 45% of all water used in Victoria for irrigation. The SIR uses 1.5 million Megalitres of water annually, depending on seasonal allocations. The vast bulk of the water used in the catchment is supplied via the Goulburn River from Lake Eildon and from the Murray River via the Hume Dam.

The region contains the Murray Groundwater Basin. Groundwater is an important resource for many water users within the region. The SIR has more than 1,100 bores licensed to pump over 45,000 megalitres per year.

The abundant wetlands and rivers and streams are also obviously reliant on water. These assets are described in the following section under 'biodiversity'.

6.1.3 Biodiversity

Our understanding of the importance of biodiversity has grown significantly and there is an increased community expectation that biodiversity should be protected and rehabilitated from the effects of clearing, salinity, nutrients, pest plants and pest animals.

The SIR was once almost entirely covered in native vegetation, with red gum forests along the river corridors and open woodlands on the plains. Clearing has been extensive on the plains. Approximately 98% of native vegetation within the SIR has been cleared since European settlement (Source: Draft Goulburn Broken Native Vegetation Plan, 2000).

'Biodiversity' (or biological diversity) is 'the natural diversity of life: the sum of all our native species of flora and fauna, the genetic variation within them, their habitats and the ecosystems of which they are an integral part' (Victoria's Biodiversity Strategy 1997)

Our biodiversity has evolved over millions of years generating a diversity of species and complexity of interactions which underpin processes that provide a range of ecosystem services. Science cannot predict the impact of losing species or delivery of ecosystem services so risks and losses should be minimised.

Bioregions depict the patterns of ecological characteristics in the landscape and provide a meaningful framework to address, and report on, biodiversity conservation. The SIR includes large areas of the Victorian Riverina and Murray Fans bioregions (see Figure 16).

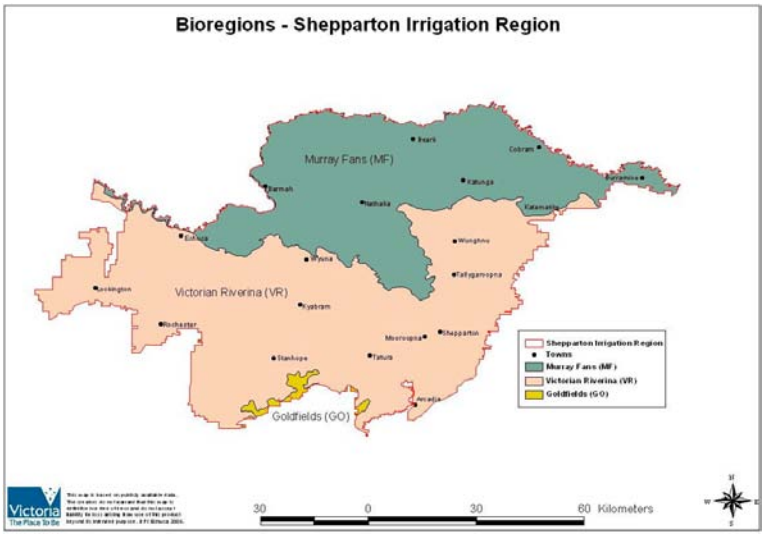


Figure 16 –Bioregions within the SIR

This section lists some of the key components of our biodiversity. The accompanying 'soils' and 'water' sections also list some components of the ecosystem that are critical for biodiversity. Biodiversity assets are described in detail in biodiversity action planning documents. The number of nationally and state listed threatened species and critical habitat is very large: it is not appropriate to include all of them in the SIRCS (refer to “From the Fringe to Mainstream: A Strategic Plan for Integrating Native Biodiversity 2004-2007”, GBCMA).

Native vegetation

Extent

- Between 2 and 3 % of native vegetation cover remains.
- Most remaining native vegetation is on public land in the Barmah Forest and along the Goulburn River corridor, and to a lesser extent, the Broken Creek corridor.
- The SIR contains two bioregions, the Victorian Riverina and Murray Fans. Both bioregions have been extensively cleared for intensive agriculture.
- The SIR has Threatened Ecological Communities listed under the *Environment Protection and Biodiversity Conservation Act*:
- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions, and
- Grassy White Box Woodlands.
- Many of the SIR's vascular and non-vascular plants are listed as threatened in Victoria.
- "Endangered" (less than 10% of original cover) and "vulnerable" Ecological Vegetation Classes with less than 15% cover are found right across the SIR.
- Many Ecological Vegetation Classes are well below the 30% of habitat and so accelerated rates of extinction of native species may be expected (Wierzbowski, P. et al, 2002).
- Most threatened species of flora are understorey (grasses, herbs and low shrubs).
- Cryptogams – many species, many unknown, conservation status unknown.

Condition

- The majority of the remaining vegetation on private land is of poor quality (limited diversity, lack of understorey, lack of ground litter, etc).
- The number of hollow bearing trees (fauna habitat) has been reduced in parallel with general native vegetation decline in extent.
- Box-Ironbark Forests have especially suffered loss of hollows which are important habitat for native flora.
- Vegetation cover remaining is polarised into two categories, larger blocks and corridors greater than 1,000 ha (Barmah Forest and the Goulburn River corridor) and very small fragments less than 1 ha.
- 98% of the remaining patches of vegetation in the Goulburn Broken are less than 1 ha. The figure is expected to be similar for the SIR.
- Threatened Ecological Vegetation Classes are mostly highly fragmented.

Trends

- Conservation status of many species is still declining due to populations being below threshold levels.

- Declines in extent have largely stabilised with small incremental losses still occurring (anecdotal evidence). Extent expected to increase in next few years due to accelerated action over past decade (replanting, direct seeding and grazing control programs).
- Isolated trees and small remnants on farmland declining due to removal and dieback (often called incremental loss).
- Dead trees with hollows are still being removed on private land.
- Hollows in current plantings won't form until at least 2100, which may be too late for many fauna species that need them.
- Understorey plantings and pest plant and animal control programs are increasing.
- Connectivity is improving after massive impact since European settlement, with revegetation efforts focussing on connectivity over past decade.
- Climate change is likely to impact on species which exist at the limit of their range.

Wetlands

- 1 wetland of international significance (Barmah).
- 7 wetlands of national significance.
- 61 wetlands of bioregional significance.
- 946 wetlands (greater than 1 ha each) cover an area of approximately 50,000 ha (including natural and man-made wetlands). (See Table 8.)
- There are many other high value wetlands along the floodplains of the middle reaches of the Goulburn River and its tributaries.
- 35% are naturally small in size (1-5ha).
- 40% of wetlands are greater than 100 ha in size.
- At least 17% of wetlands occur on public land with 60% on private land. The remaining 23% occurs on both public and private land. These are not only natural wetland ecosystems - man-made lakes and dams are included.

List	Wetland
International Ramsar Convention on Wetlands	Barmah Millewa Forest (Barmah Forest component – Millewa is in NSW).
Directory of Important Wetlands in Australia (1995-2000)	Barmah Millewa Forest, Broken Creek, Kanyapella Basin, Lower Broken River, Lower Goulburn River Floodplain, Muckatah Depression, and Wallenjoe Wetlands.
JAMBA and CAMBA	Habitat for listed species: Barmah-Millewa Forest, Broken Creek, Kanyapella Basin, Lower Goulburn River Floodplain, Muckatah Depression and Wallenjoe Wetlands.

Table 8 - Listed significant wetlands

Impact from European settlement to 2002:

- There has been an overall increase in the area of wetlands since European settlement: primarily as a result of the large increase in impoundments for water storage.

- Increased nutrient loads affect many wetlands and fringing vegetation, causing substantial declines in bird and fish populations.
- Many wetlands on the floodplains are no longer 'connected' as part of wetland systems due to infrastructure development.
- Controlled flows have substantially reduced wetting of floodplain wetlands.

Rivers and Streams

Rivers and streams are the lifeblood upon which most of the other Catchment's assets depend. The SIR has over 800 km of streams within the region, with approximately 530 km in the Goulburn River Basin and approximately 270 km in the Broken River Basin.

The Goulburn River below Eildon is one of only 18 declared Heritage Rivers in Victoria due to their very high nature conservation, recreational, social or cultural value. The Broken River and Broken Creek considered waterways of High Community Value.

Most of the SIR's streams are in poor condition as measured by the Index of Stream Condition (ISC). The ISC is a measure of a stream's change from natural or ideal conditions. The ISC considers streams on a representative reach basis and presents an indication of the extent of change in respect of five key 'stream health' indices:

- hydrology (change in volume and seasonal flow);
- physical form (stability, degradation/aggradation, influence of artificial barriers and abundance/absence of instream debris);
- streamside zone (plant species – native / exotic, spatial extent, width, continuity and links);
- water quality (assessment of total phosphorus, turbidity, conductivity and pH); and
- aquatic life (abundance and type of macro invertebrates).

The SIR has no streams that are regarded as 'ecologically healthy'. Criteria used to measure how 'ecologically healthy' a stream is include:

- riparian vegetation (structural intactness)
- cover of exotic vegetation
- in-stream physical habitat
- barriers
- longitudinal continuity
- bed condition

The Seven Creeks supports one of only two viable populations of Trout Cod.

Trends

- The condition of riparian zones and the condition of channel form has improved.
- Vegetation quality condition has improved in frontage zones subjected to action.
- Access for recreational pursuits has improved in a range of river reaches.

More information and context can be found in the Goulburn Broken Regional River Health Strategy March 2004.

Floodplains

Flooding is a natural phenomenon and floodplains represent important biodiversity values. Floods replenish wetlands, transport food supplies and trigger stages in the life cycles of many plants and animals.

Floodplains provide natural overland flow paths and storage areas where floodwaters remain for slow release as stream heights recede, thereby reducing the potential for channel erosion from high energy flows. Nutrients, debris and sediment settle out during this process, protecting waterways from high sediment and nutrient loads and contributing to floodplain productivity.

Construction of levees for flood protection and conversion of floodplains to agricultural land has led to a decline in ecosystem services provided by floodplains within the Catchment.

Native Fauna

The SIR has many species of native vertebrate fauna (birds, mammals, reptiles, amphibians and fish) and an unknown, very large number of invertebrates. Invertebrates are often forgotten but play an extremely important role in the health of the Catchment.

Many Ecological Vegetation Classes, and therefore species of fauna, exist beneath minimum threshold habitat levels. Many are below the 15% recommended by JANIS (1997) and are well below the 30% of habitat across the landscape below where accelerated rates of extinction of native species may be expected (Wierzbowski, P. et al., 2002). Much of our Catchment is well below this level, so we can expect further species decline if nothing is done (see Figure 17).

With the extensive clearing of native vegetation and fragmentation of habitat, populations of fauna (and flora) are often isolated which limits gene flow. The ability of species to adapt to new conditions, such as changing climate, is severely reduced if the gene pool is limited.

Fish and other aquatic species have been prevented from migrating because of structures on rivers and streams such as weirs, which has dramatically affected fish populations. The removal of several barriers in very recent years is expected to have a very positive effect on fish populations.

Some species are at particular risk from predation, such as the Brolga and Bush Stone-curlew.

Several SIR fauna species are 'Nationally Listed Species' under the *Environment Protection and Biodiversity Conservation Act, 1999*:

- Spotted Tree Frog
- Barred Galaxias
- Trout Cod
- Swift Parrot
- Superb Parrot
- Striped Legless Lizard
- Warty Bell Frog

Several terrestrial species are covered by migratory provisions and other species are covered by the marine provisions of the *Environment Protection and Biodiversity Conservation Act, 1999*.

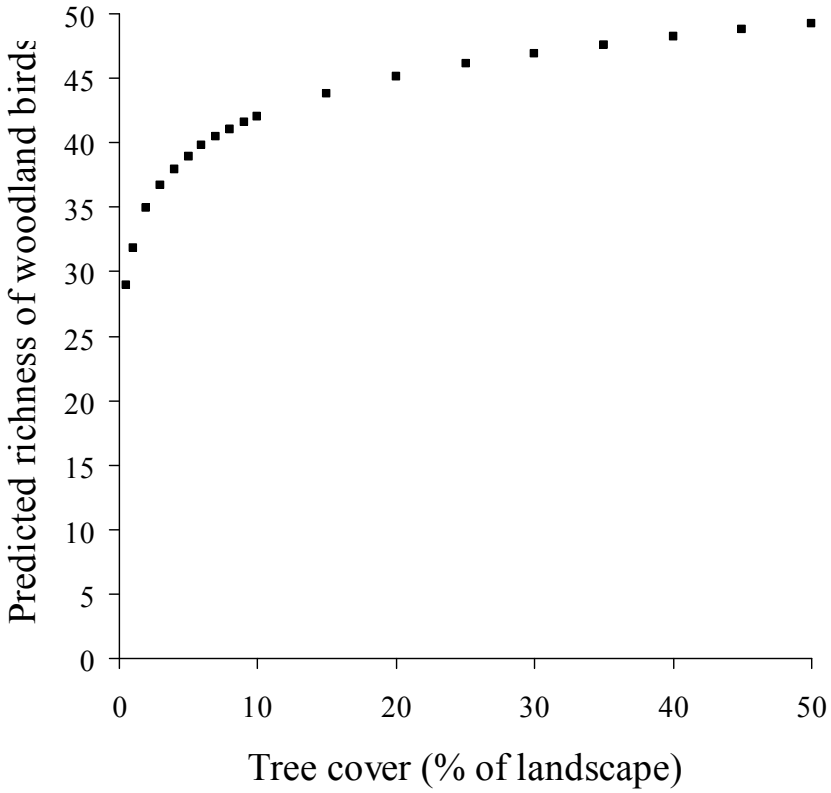


Figure 17 - Predicted richness of woodland birds versus tree cover, from Bennett and Ford, 1997

6.1.4 Atmosphere

In common with many other areas, the SIR community is only beginning to grapple with the question of how its industries and other land-uses affect the composition and function of the atmosphere. The SIR has a lot at stake in relation to climate change and stability. The SIR's primary industries - agriculture, fruit growing and dairy - would suffer negative impacts from climate change. The region is both a positive and negative contributor to climate stability. Contributions to greenhouse gas emissions are made through intensive dairy, cattle and sheep farming, while carbon sinks are provided in the catchment through existing vegetation and revegetation efforts.

6.2 Economic assets

The SIR is one of the few non-coastal areas in Australia that is thriving. The Region supports a range of economic assets that rely on the natural resource base. These include farm production, irrigation and drainage infrastructure, food processing, transport, retail, services, tourism and recreation assets. The human and intellectual capital - the skills, knowledge and experience of the regional community - drives the efficient production of output from these assets and leads to the development of new capacity and the creation of new economic assets.

6.2.1 The SIR's Economy

The SIR is widely regarded as the 'food bowl' of the Murray-Darling Basin. The main primary industries are horticulture, dairying, and cropping (see Table 9).

Agricultural industries are becoming more efficient and more intensive, with production levels doubling every 10 years (GBRCS, 2003) and the area of land used for agriculture decreasing.

The SIR supports a large fruit and vegetable food processing industry centered on Shepparton with value adding in other commodities such as milk products, wineries and meats. The SIR produces $1.048 billion (year 2000 $) Farm Gate Value of production with approximately $5.9 billion (year 2000 $) across all sectors of its economy. The dryland area of the Goulburn Broken Catchment contributes $1.9 billion (year 2000 $). This combined total is the most significant contribution to the Victorian economy of any non-metropolitan catchment in Victoria (Young, 2001). This economic activity is produced from a land area of 18% of the total area of Victoria, while the SIR is only 2%.

Between 1996 and 2001, capital investment in food, fibre and timber processing across the GB catchment was $630 million. The existing assets are being increased by about $100 million each year (or $1 billion over 10 years to 2001).

SIR Industry	$,000,000
Dairying – milk	440.85
Livestock slaughter	145.94
Fruit (exclude grapes)	167.66
Hay production	49.56
Wool	15.71
Cereal Grain	41.08
Vegetables	24.19
Pastures for seed	2.22
Egg production	1.00
Potatoes	3.50
Grapes	1.30
Beekeeping	0.94

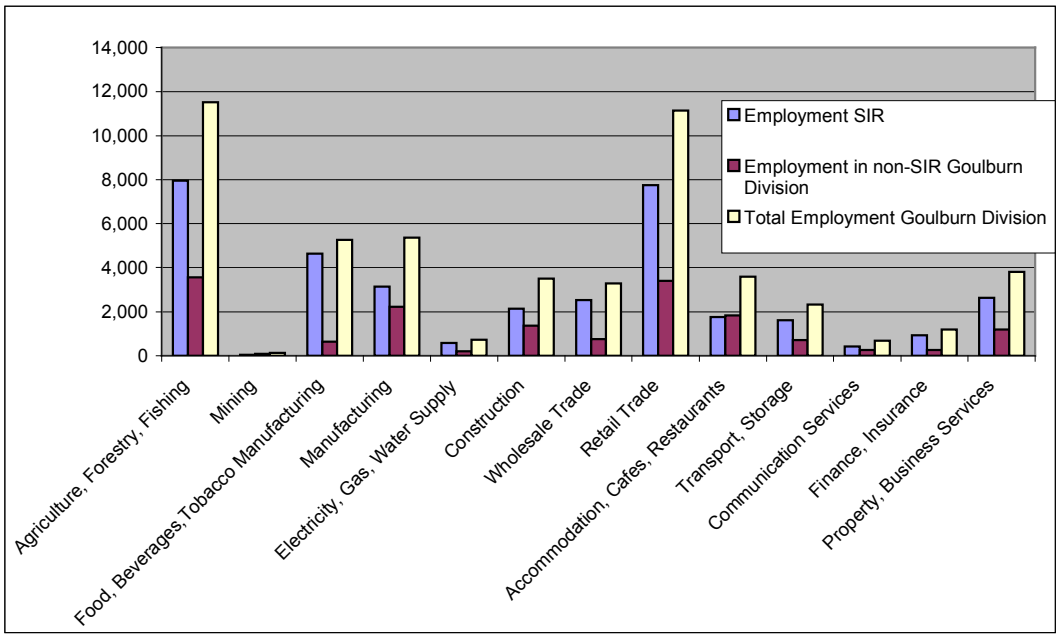
SIR Industry	$,000,000
Non-cereal grains	0.78
Total GVP (1996)	**894.73**
Estimated in 2000	**1,048**

Table 9 - Agriculture industry profile in the SIR

The world demand for food will continue to increase, driving an expansion of our agriculture sector.

6.2.2 Employment

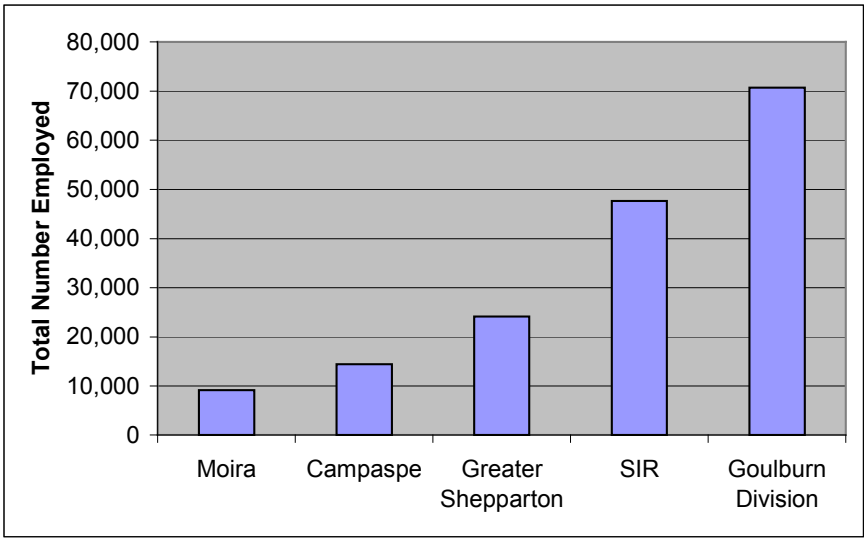
The Australian Bureau of Statistics collects data on employment sector across Municipalities and what are known as Divisions. The SIR belongs to the Goulburn Division. The boundaries of this Division are almost identical to the Goulburn Broken Catchment. Agriculture and manufacturing (mostly food processing) as an employer is obviously very important in the SIR, as is Retailing (see Figure 18).



Source: Australian Bureau of Statistics, Census, 2001

Figure 18 - Employment by Economic Sector in the SIR and Goulburn Broken Catchment

The SIR provides 68% of total employment, 69% of farm jobs, and 88% of the food, beverage and tobacco manufacturing in the Goulburn Division (ABS Census 2001) (see Figure 19).



Source: Australian Bureau of Statistics, Census, 2001

Figure 19 – Total Employment across the SIR and Goulburn Division

Tourism is increasingly important, as the Murray River remains a strong tourist attraction. Main tourism activities include wineries, camping, water skiing, four-wheel driving and fishing.

6.3 Social assets

The major rural towns and cities in the SIR include Shepparton, Mooroopna, Kyabram, Cobram, Echuca, Rochester, Yarrawonga, Numurkah, and Nathalia. The SIR's population of 120,000 is growing, and the cultural and demographic mix changing. By 2021, we expect the population to be 147,400 with a more diverse cultural mix. Rapid population growth is occurring in some parts. The Greater Shepparton City Council is predicted to grow at an average of 1% until 2031, while the Goulburn Division will grow by 0.9% and the State by 0.7% over the same period (Source: DSE, Victoria in Future 2004) (see Table 10). As with most regions, a greater proportion of the community is living longer.

Municipality	2001	2006	2011	2021	2031	% increase
Greater Shepparton City Council	58,150	62,026	66,023	73,947	81,378	1.0
Campaspe Shire Council	36,349	37,901	39,412	42,230	44,827	0.6
Moira Shire Council	26,810	27,880	29,039	31,222	33,263	0.6
Victoria	4,804,726	5,077,209	5,331,614	5,810,560	6,225,477	0.7

Source: Victoria in the Future, 2004, DSE

Table 10 - population predictions by local government area

The population swells considerably during the fruit harvest season from December to March, when approximately 10,000 itinerant workers from throughout Australia and overseas converge on the SIR.

The social assets of the SIR are the abilities, knowledge and skills of each individual resident as well as the capacity of communities that make up the SIR. Community and physical assets include:

- A diverse multicultural community. The region is a popular destination for migrants and this has resulted in a diversity of cultures. The region is now home to people of Italian, Greek, Turkish, middle-eastern and Indian descent.
- The strong regional centre of Shepparton.
- A close network of social organisations such as sporting clubs, community arts groups, environmental groups, welfare groups and family support groups.
- Strong community representation through a wide range of organisations such as councils, agricultural industry organisations, businesses, government agencies and social clubs.
- Good cross-section of educational facilities including primary and secondary schools, colleges and universities. La Trobe University has a strong presence through its campus at Shepparton.
- Public transport services.
- Resource centres such as libraries and internet access centres.
- Active community group networks such as Landcare Groups, Local Area Plan Groups, Field Naturalist Groups and Field and Game Branches.
- Hospitals, emergency services and religious organisations.
- Recreational fishing and tourism opportunities.

Aboriginal Occupation of the SIR

The SIR has a rich Aboriginal heritage. The Murray and Goulburn Valley supported a large aboriginal population for many thousands of years prior to the arrival of European settlers. The many watercourses and wetlands in the region provided a focal point for human activity. These pre-contact indigenous populations of northeast Victoria were hunter-gatherers who exploited natural resources (food and material culture resources) based on an intimate understanding of their sustainability and seasonal availability.

There are many thousands of pre and post contact Aboriginal heritage sites and places situated within in the SIR. Aboriginal scarred trees, occupation mounds, flaked stone artefacts, fresh-water shell middens and traditional Aboriginal burial sites are most common and are important and sensitive environments of the SIR's cultural landscape.

There is ongoing disagreement regarding the definition and nature of precontact Aboriginal cultural affiliations and associated territories in the region. The Yorta Yorta and Bangerang are the most cited and both Edward Curr (1883) and Norman Tindale (1974) classed them as distinct groups occupying separate territories on both sides of the Murray River.

The Bangerang culture and its many sub tribes are identified as extending from Toolamba and up to the Goulburn and Murray junctions (Curr, 1883: 103-106; 1887: 566; 1965: 105) while Tindale's (1974) more recent work identified four principal tribal groups in the Echuca region – the Joti Jota (Yorta Yorta), Kwat Kwat, Barababaraba, and the Pangerang (Bangerang).

These issues aside, it is clear that the combination of disease, violence, economic disenfranchisement and forced removal from country had a tragic effect on traditional Aboriginal occupation hunter-gatherer lifestyles resulting in a significant decline in population in the mid-nineteenth century.

Over 4,500 people of the Yorta Yorta Nation still live within the traditional country of Echuca, Shepparton and regional New South Wales/Victoria. In 2002 there were 4,000 Koori people living in Shepparton, making it the single largest community in both rural and urban areas of Victoria.

A variety of Indigenous organisations is prominent in the community and play an important role. These include the Koori Economic, Employment and Training Agency (KEETA), the Rumbalara Football Netball Club (a key organisation that runs many wellbeing and cultural programs), Yorta Yorta Nations, Bangerang Cultural Centre along with the DPI/DSE indigenous facilitators for the region.

Sustainability and the dairy industry

The Goulburn Broken Catchment contains about 24% of the nation's dairy farms and produces about 26% of the nation's milk. The Catchment's 1,600 dairy farms are located predominantly in the Shepparton Irrigation Region.

The milking herds range from less than 80 to more than 1,000 cows with the typical herd being 180 to 240 cows. The total herd has grown only slightly over the past five years, staying around 350,000 – 400,000 cows.

The industry has recognised the important contribution it can make to sustain the region's natural resources. Murray Dairy, the region's dairy industry group, has established a strategic plan for 2001 to 2006 that recognises environmental stewardship as part of the dairy industry's core business. The plan has established the following strategies:

1 Determine best practice for environmental stewardship:

- develop practices for the best management of effluent;
- create understanding of the role of trees by appropriately packaging and delivering available information; and
- develop whole-farm management strategies aimed at responsible stewardship.

2 Create awareness of the environmental impact of dairy farming and promote the adoption of best management practices:

- improve water use efficiency on-farm;
- improve dairy effluent management;
- improve nutrient management; and
- develop the methodology to allow milk companies to integrate environmental management systems into quality assurance programs.

3 Identify new and innovative technology or farming practices that:

- create positive effects on the environment;
- develop new irrigation practices and technology to increase water use;
- identify on-farm and off-farm drives for the adoption of improved irrigation practices and technology;
- identify alternative strategies to manage dairy effluent; and
- identify and develop opportunities for the dairy industry through land use changes within catchments.

4 Ensure new technologies and farm practices do not conflict with responsible stewardship of the environment:

- understand the environmental consequences of gene technology application; and
- ensure that any new irrigation technology or farming system does not increase greenhouse gas emissions.

5 Evaluate the impacts and industry responses to new and emerging issues:

- evaluate the industry contribution to greenhouse gases and develop energy-efficient production systems; and
- understand the influence of dairy farming on groundwater.

7 Identifying threats to the Catchment's natural assets

The SIR's natural assets are under threat while they generate enormous economic and social benefits. The threats are described in this section. The framework proposed is derived from *The Victorian River Health Strategy* that separates threatening activities (such as grazing) from impacts (such as weed invasion and reduced regeneration). This framework enables the threats causing the impacts to be targeted.

7.1 Categorising 'threat'

As shown in Figure 20, threatening activities (land and water use practice) threaten natural assets directly as well as indirectly via other threats they induce. These induced threats usually occur naturally, however, their impacts have increased dramatically. For example, the impacts of natural threats such as drought and kangaroo grazing are often exacerbated in environments that have been substantially modified.

Threats formally listed under Commonwealth and State legislation and action plans have not been categorised like this. They are a mixture of these two types of threat and the impact. For example, the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999 listed Key Threatening Processes (see www.ea.gov.au) that include processes related to feral goats, feral cats, feral rabbits, foxes, feral pigs, root-rot fungus, and land clearance. Potentially threatening processes (see www.dse.vic.gov.au) have also been listed under Victoria's Flora and Fauna Guarantee Act 1988. These include processes related to predation by cats and foxes, poisoning from lead shot in cartridges by hunting waterfowl, collection of native orchids, loss of hollow-bearing trees in Victorian native forests and removal of wood debris from Victorian streams.

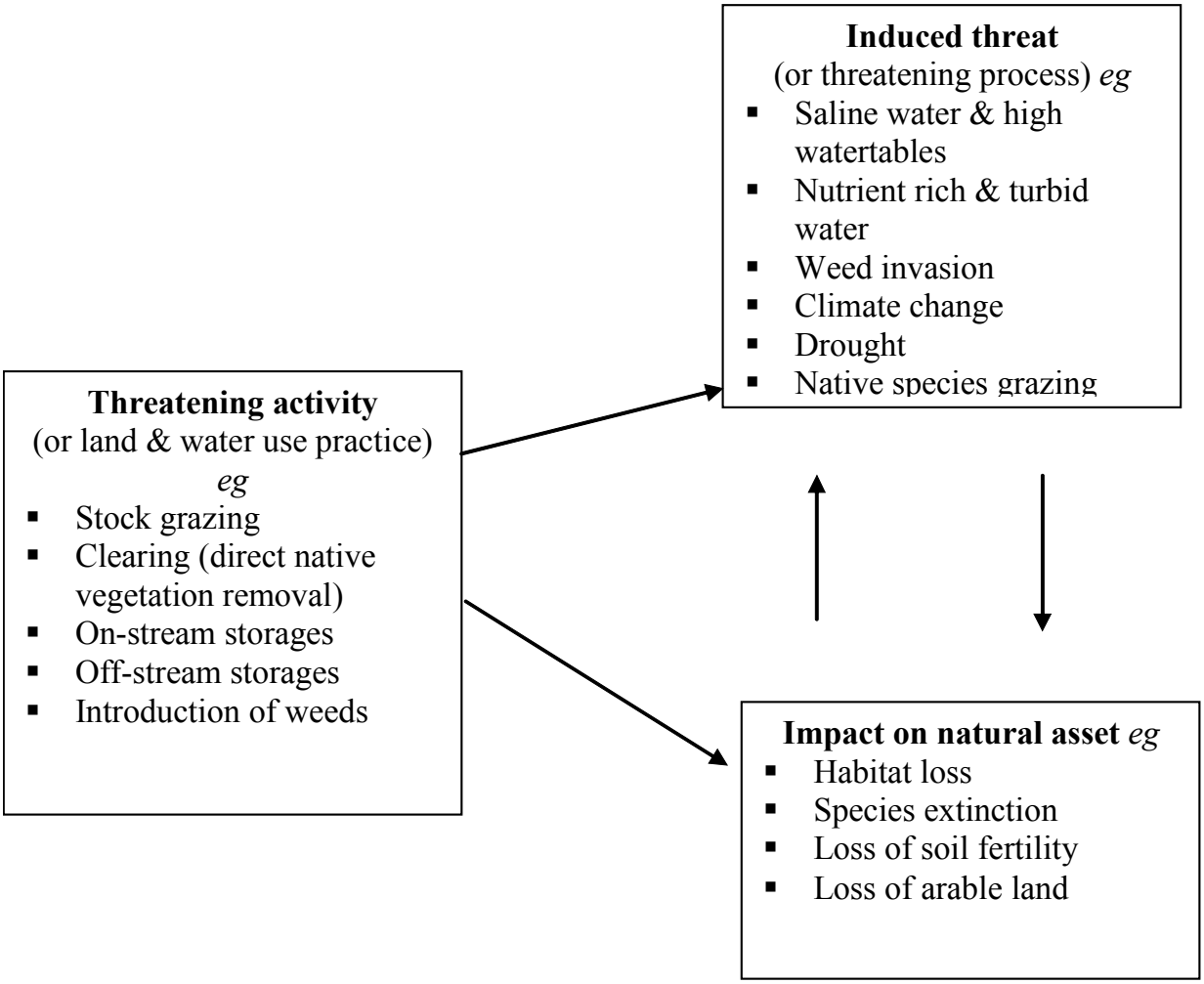


Figure 20 - Relationship between threatening activity, induced threat and impact on natural assets.

7.2 Identifying threat risk levels

An important step in developing priorities for action is to identify the greatest risks from all threats to the benefits flowing from our natural assets. Greater clarity is achieved when conducting this process by separating the relative impact that threats have had historically on specific assets from the risk the threats pose currently to these assets.

The Catchment community has a long history of conducting similar processes to identify risk, although the information has often been from different disciplines and so has not been in a form that can be readily communicated. We are committed to rectifying this.

An action can be focused on threatening activities or induced threats or impacts. It is critical to note the cyclical process in Figure 10: it is often important to address the induced threats or impacts because they can also induce greater risks. For example, the impact of habitat loss in the form of native vegetation can itself be a cause of the

induced threats of salinity and climate change which, in turn, can cause further habitat loss.

Table 11 lists major threats to natural assets and shows the type of table that will soon be completed in consultation with the community to confirm and communicate the greatest risks. It is envisaged that semi-quantitative ratings of risk will be used to complete such tables. Ratings will consider likelihood and consequence of the threat.

Threat and Impact	Overall Risk to Asset	Risk to Individual Assets				
		Soil	Water Quantity	Water Quality	Biodiversity	Air
A. Threatening Activity						
A1. Land and Water Use Practice						
1. Clearing (direct native vegetation removal)						
2. Stock grazing						
3. Cultivation, cropping and pasture management						
4. Irrigation						
5. Groundwater use						
6. Timber harvesting						
7. Firewood gathering						
8. Recreation						
9. Apiculture (bees)						
10. Infrastructure, road and rail						
11. Infrastructure, waterways and floodplain						
12. Fire management						
13. Culverts, regulators and on-stream water storages						
14. Off-stream storages						
15. Levees and floodplain development						
16. Mining						
17. Collection of plants						
18. Introduction of weeds						
19. Introduction of pest animals						
20. Transportation (of pathogens . especially phytophthora)						
21. Snag removal						
22. Effluent disposal						
A2. Potential land and water use in new areas						
23. Irrigation						
24. Subdivision, rural blocks						
25. Subdivision, peri-urban areas						
26. Infrastructure, road and rail						
27. Tourism						
28. Reforestation						
29. Introduction of Genetically Modified Organisms						
B. Induced Threat						
30. Saline water and high watertables, dryland						
31. Saline water and high watertables, irrigation						
32. Nutrient-rich and turbid water and suspended solids						
33. Colder than natural water						
34. Other water contaminants e.g. pH, pathogens, biocides, heavy metals						
35. Stream instability and bank erosion						
36. Changed flow pattern						
37. Weed invasion						
38. Pest animals						
39. Flood						
40. Fire						
42. Native species invading						
42. Native species invading						
43. Wind						
44. Earthquake						
45. Soil threats, various						
46. Drought						
47. Climate change						
C. Impact						
48. Habitat loss, various						
49. Reduced water yield						

Table 11: Risk matrix – threats and impacts. This is a concept matrix only. A similar matrix is to be completed during 2003.

7.3 Threat descriptions

7.3.1 Threats from land and water use practices

Stock grazing

Almost 90% of the SIR is privately owned (see Figure 21). Dairying (cattle grazing) and mixed cropping (including sheep and cattle grazing) are major agricultural pursuits and large areas of public land along streams are also licensed for grazing or are illicitly grazed. Grazing is causing active degradation of biodiversity values on-site and downstream over most private land and some public land areas.

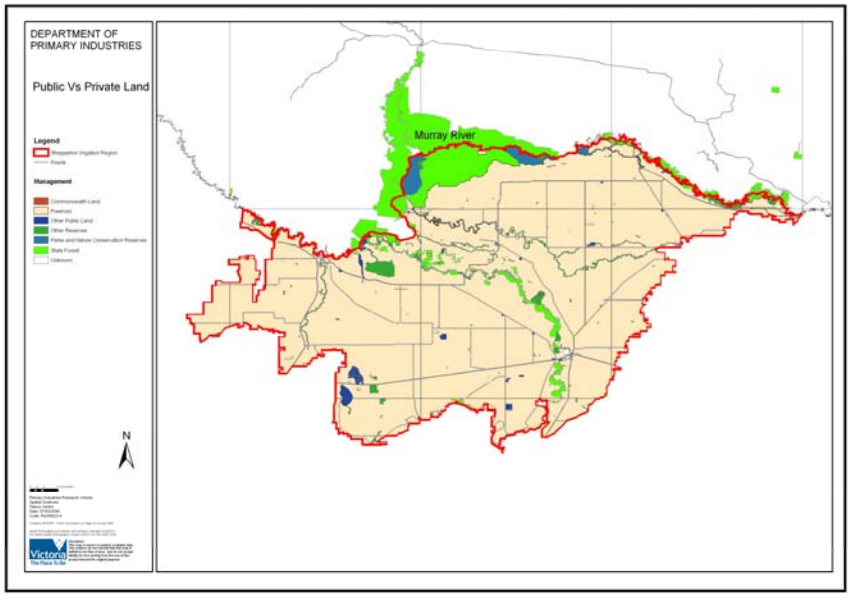


Figure 21 – Public versus private land within the SIR

Irrigation

64% of the SIR is irrigated. Poor irrigation practices can threaten the health of our soils: soils can become waterlogged, develop saline watertables, become less fertile and produce the greenhouse gas, nitrous oxide, in large quantities when drainage is inadequate. Poorly designed irrigation farms can also cause significant quantities of nutrients to flow into the river. At the farm scale, irrigation can cause wetlands and remnant vegetation to undergo changed hydrological cycles that significantly degrade them. Algal blooms in some wetlands are increasing as a result of increased nutrient levels. Land-forming can also directly impact on these features. With the development

of tradeable water entitlements, new areas of land are being developed for irrigation. These are areas of “good” soils which often have remnants of the most endangered native vegetation. If the development of new areas is not well managed this can place pressure on these last remaining areas through clearing and insensitive irrigation management.

Groundwater use

While rising groundwater levels is the major cause of salinisation of land and streams, groundwater within the Goulburn Broken is a significant water resource for irrigation and for industry and urban supply. In such circumstances, a balance is necessary between pumping to provide salinity control while protecting the groundwater resource and the rights of groundwater resource users.

Increasing demand for groundwater has been apparent in recent years because of a series of dry seasons and the cap on surface water diversions within the Murray Darling Basin. In some areas, increased demand is threatening the sustainability of the groundwater resource. These areas, such as the Murray Valley Deep Lead (Katunga Water Supply Protection Area) require higher level management.

Culverts, regulators and on-stream water-storage management

This threat is closely linked with the induced threat of changed flow patterns. Barriers within streams can prevent the migration of native fish species. SIRIC's programs in recent years have removed many of these barriers, although several small barriers remain, with priority zones for action being the upper Broken Boosey Creeks and Seven Creeks system.

The ecological functioning of many of our rivers systems has been changed by:

- development and use of the land adjacent to streams,
- recreational activities,
- the use of the natural river systems for transporting stored water to downstream developments, and
- flood mitigation works on the floodplains.

These changes have led to in-stream instability, bank erosion, loss of in-stream and riparian habitat values, and isolation of wetlands and billabongs from the stream.

Raised structures such as levees, channels, raised roads and railways, spoil banks and bridges have had a significant impact on flood behaviour, affecting flow distributions, flow velocities and depths. While they can have significant benefits in reducing flood damages, they can, however, have a number of 'dis-benefits', including:

- a reduction in riverine and floodplain habitats, leading to an isolation of wetlands and general fragmentation, leading to habitat decline, altered nutrient processes and further loss;
- an increase in flow concentration and stream power, leading to increased flow rates and flood levels, and stream and bank erosion;
- a reduction in the frequency of deposition of fertile material across the floodplains;
- intensification of land use in the protected areas of the floodplain, with a resultant increase in social disruption and flood damages when the levee fails;
- a reduction in soil moisture; and

- creating a false expectation of being immune from floods greater than the levees are designed to protect.

Floodplains were converted to agricultural land in the early days of European settlement. Many important ecosystem services provided by these floodplains have been lost, and much of the agricultural land cannot be economically protected from flood damage.

Cultivating, cropping and pasture management

Cultivation to prepare soils for cropping and pastures and to create mineral earth firebreaks (especially along roadsides) can damage existing native vegetation, prevent natural regeneration of remnant vegetation and encourage pest plants. This activity usually occurs on the best soils for agriculture – which equates to the most threatened Ecological Vegetation Classes. Land managers are becoming increasingly sensitive to biodiversity needs as awareness grows but the risk is still substantial.

7.3.2 Threats from potential land and water uses in new areas

Irrigation

With the advent of tradeable water entitlements in recent years, new areas are being irrigated. This land usually has the most arable soils, which often have remnants of endangered Ecological Vegetation Classes. This places these Ecological Vegetation Classes under direct threat of clearing and from insensitive irrigation management practices.

Introduction of genetically modified organisms (GMOs)

GMOs are likely to become an issue over the next few years. GMOs carry several risks that will need to be managed, including contamination of the gene pool of native species and invasion of native grasslands.

7.3.3 Induced threats

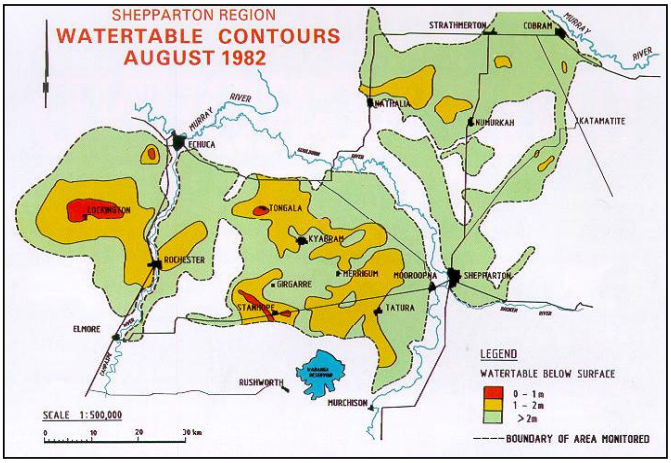
Saline water and high watertables

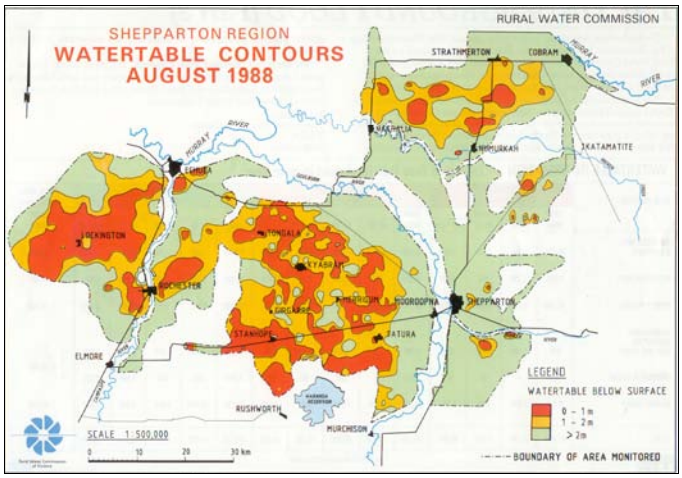
Salinisation of the SIR's land and water assets remains the greatest threat to our future prosperity and a major threat to our biodiversity. Salinity results from a hydrological imbalance where too much water reaches the groundwater systems. Habitat in the lowest parts of the landscape are under most immediate threat (streams and wetlands). Trees are at substantially increased risk when watertables are within 2 m of the surface (Kelly, 1994). Salt loads in rivers and streams also contribute to a decline in water quality.

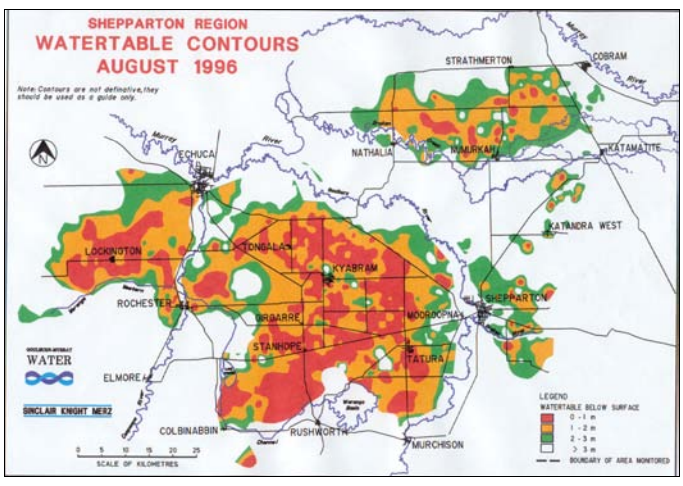
Further options for managing salt disposal need to be developed. Drainage diversion remains an important part of managing salt exports, but as drainage flows decrease (because of increased water use efficiency), the salinity concentration will increase, which will reduce the water quality for diverters. This will require more effort in identifying other salt disposal options, such as greater use of evaporation basins within irrigation areas.

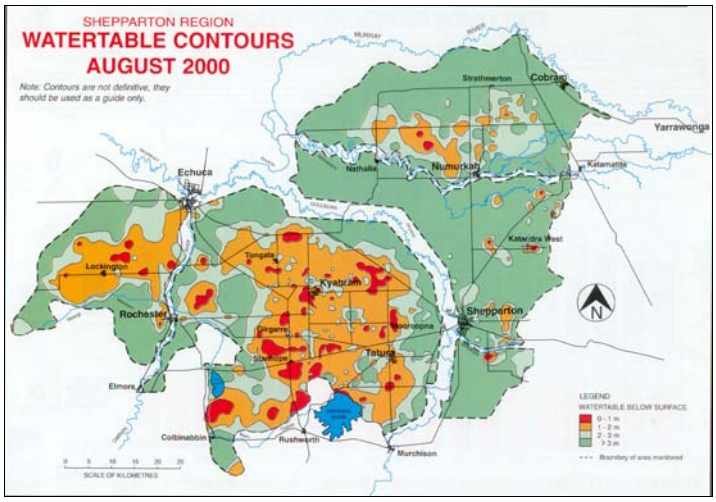
In 2001, 23.5% of the Shepparton Irrigation Region had a watertable within 2 metres of the surface (this varies from year to year depending on seasonal conditions) (see Figure 22). Watertable rise in the region was very rapid until 1995 when a peak of 47% of the area with watertable levels within 2 metres was reached and the watertable levels predicted for the year 2000 in the 1990 Plan surpassed. A combination of dry seasons and progress with salinity works led to the reduction.

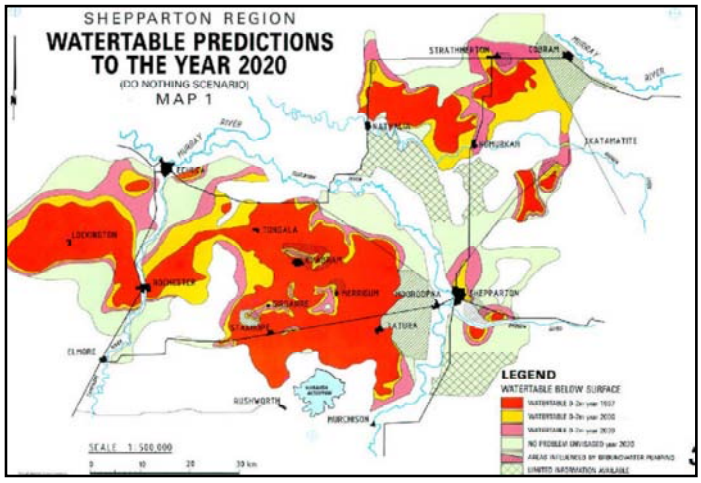
Without active management, 65% of the SIR will have a high watertable by 2020 and there will be severe salinisation, resulting in significant loss to economic assets and irreversible degradation of most major wetlands within the Shepparton area (Draft Shepparton Irrigation Region Land and Water Salinity Management Plan, 1989).











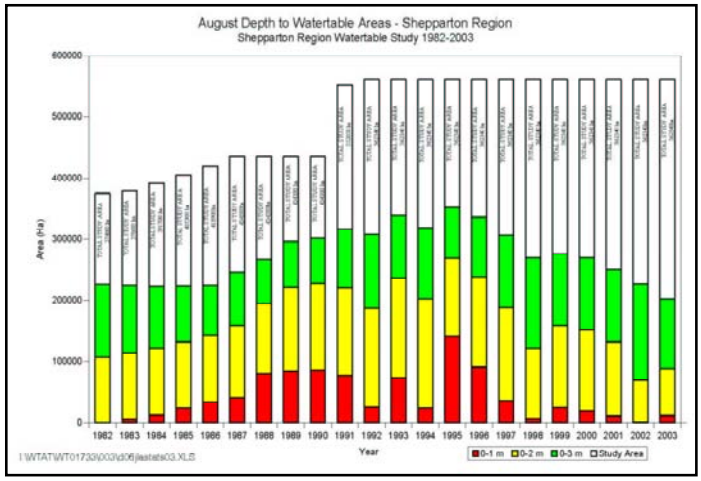


Figure 22 – Snapshot of Watertable Contours, 1982 - 2020

Nutrient-rich and turbid water

In addition to salt, the SIR generates 242 tonnes of phosphorus and 935 tonnes of nitrogen each year. Some 236 tonnes of phosphorus and 887 tonnes of nitrogen are exported from the region. The Goulburn Broken Catchment contributes 37% of the River Murray water flow above the Murrumbidgee, but 58% of the sediment (GBWQS 2002, p 57).

Because of the nutrient loads the risk of algal blooms is high.

Major sources of nutrients in the Goulburn Broken Catchment include irrigation drainage, sewage treatment plants, sediment mobilisation, urban stormwater and intensive animal industries.

In general farm chemicals do not seem to be a major issue in the SIR. However, they have been found in the off farm environment. For example, dommonly used pesticides in intensive horticulture within the SIR have been found in surface drainage water following application to soils. Studies of shallow well sites in the Tongala-Kyabram area have indicated contamination of groundwater with herbicides.

Changed flow patterns and water availability

We are using significantly less water, yet water is becoming increasingly scarce, with strong competition between environmental, agricultural, urban and recreational demands.

Water savings to meet Snowy River commitments and increased interest in establishing environmental flows for rivers and streams (including the Murray River) impacts on how our water is used.

Harvesting, storing and delivering water for urban and agricultural use has dramatically altered the flow patterns of our rivers and creeks, often reversing the seasons when high and low flows would naturally occur. This has had a direct impact on the SIR's aquatic biodiversity through changed watering patterns and quality of water.

The need to achieve water savings presents many unique challenges for the Catchment Community. Water savings will come from major infrastructure projects such as pipelining of irrigation supply systems or from better use of storages such as Lake Mokoan. Water savings will also come from a more environmentally sensitive and productive use of available water resources both in irrigation and rain-fed production systems. To mitigate the environmental impacts of inefficient use of water requires a better understanding of where particular land uses should best be located in the Catchment, and the development of appropriate practices to better manage water in both irrigated and dryland contexts. In particular, recharge rates under particular land uses and irrigation practices need to be quantified.

This threat is very closely linked with that of 'culverts, regulators and on-stream water storages'. These structures can cause wetlands and rivers to undergo changed hydrological cycles, including reduced river flows, increased nutrient input and increased sedimentation.

At the farm scale, irrigation can cause wetlands and remnant vegetation to undergo changed hydrological cycles that significantly degrade them. Algal blooms in some wetlands are increasing as a result of increased nutrient levels. Land-forming can also directly affect these features.

Climate Change

Increased global concern about climate change will influence the design of many SIR Catchment Strategy on-farm works programs. The Catchment is expected to undergo a significant change in climate because of increased concentrations of greenhouse gases.

Climate change has implications for the long-term sustainability of our environment. It will provide conditions that favour the survival and spread of pest species, increase the likelihood of fire, and directly affect the physiology of most plant and animal species.

Greenhouse gases are having an impact on Australia's weather patterns. Work by CSIRO predicts that by 2030, annual average temperatures will be 0.4 to 2.0^{O}C higher over most areas of Australia, (CSIRO, 2001). By 2070, this could be 1.0 to 6.0^{O}C. The number of winter days below 0 ^{O}C will decrease from the present average of 15 days to 6-13 days in 2030 and 0-9 days by 2070. Rainfall averages are likely to remain constant, but changes in variability are likely to occur with more frequent intense rainfall events.

Wetland and riverine environments currently impacted by reduced environmental flows will be under further pressure due to changes in rainfall patterns.

Irrigated production systems in the Catchment are conducive to the production of high levels of greenhouse gas emissions, particularly nitrous oxide from irrigated pastures and methane from grazing ruminants. Abatement of emissions is important, particularly in the face of intensification of irrigated production.

Soil Sodicity

Sodicity is the presence of sodium in sufficient concentrations to affect soil behaviour during wetting and drying phases, interfering with plant nutrient balances and be directly toxic to plant cells.

The large area of land in the SIR with shallow watertables is likely to become sodified in the future. Groundwater in this area is sodic and enters the soil, either through recycling of pumped water and applied to the soil surface, or via capillary rise from shallow watertables during dry periods.

Weed invasion

Emerging aquatic and pasture weeds for which there are currently limited options are of particular concern. Arrowhead is an example of this.

Fragmentation and lack of recruitment

Land clearing and other threatening activities such as stock grazing have resulted in broad tracts of land being largely cleared apart from small and isolated patches of native vegetation. While providing valuable habitat for the moment, these fragments are often too small to be viable in the long-term, being unable to survive impacts from threats such as weed invasion from surrounding cleared land because they cannot regenerate. Wetlands are also threatened similarly, often being disconnected from other habitat.

8 Deciding which actions to take

This section describes in general terms how decisions are made to determine which actions to take. Specific decision-making processes are discussed in the sub-strategies.

Generally, actions are taken to:

- reduce the risk of current and future threats; or
- remedy the impacts of past and current threats.

The criteria for deciding what action, amongst a range of actions, to take include:

- relative risk rating of all threats to benefits flowing from natural assets;
- costs and benefits of action, including details of who should pay; and
- government priorities and funding levels.

We are committed to working with partners to prioritise and implement actions on Federal and State lists, such as the Murray Darling Salinity and Drainage Strategy and Victorian Action Statements and National recovery plans that contain very specific actions.

8.1 Sub-strategies: historic emphasis and new issues

The Catchment community's understanding of which threats pose the greatest risk to assets and where the most difference can be made is reflected in the sub-strategies that have been developed over the past decade or more. These sub-strategies (and their associated investment plans and technical reports) contain a myriad of actions and it is not appropriate to list them all in this overarching document. Although often single-issue focused, the sub-strategies do take into account triple-bottom-line outcomes and the relationship with other natural resource management issues.

This update of the SIRCS highlights the fact that the actions described in the original SIRLWSMP 1990 are essentially correct: We must continue to address threats of salinity and high watertables, nutrients and pest plants and animals and ensure biodiversity assets are protected and enhanced. In all cases we must increase our efforts.

8.1.1 SIRLWSMP 1990 Preferred Plan

Several management options were analysed in the founding SIRLSWMP (1990):

- Do nothing or No Plan
- Farm Program Only (implementing only the Plan activities on farms, without connecting surface water management systems and groundwater pumps)
- Full Watertable Control (an integrated package of Farm, and Regional surface and subsurface drainage)
- Economic Guidelines (only those activities meeting strict economic criteria and
- Preferred (a balance between protecting the land and water resources within an economic framework)

The Preferred Plan represented a balanced option and was a package that included all of the farming community hence making implementation easier. This option also was most likely to have the support of local governments and other partner agencies. The Preferred Plan provided good coverage of surface water management systems for all but 40,000 hectares of the region, and was in areas where the most active and involved farm salinity groups were located.

The Plan focused on four major objectives:

1. The Environmental objective: the Plan is to address current and future environmental problems resulting from high water tables and salinity in the region. On balance, salinity control activities are to maintain and where possible, enhance existing ecological processes.

2. The social objectives: wherever possible, the plan is to provide the community with equal access to decision-making and financial resources required to implement salinity control works. The plan will reduce inequities resulting from uncontrolled salinity impacting differently on individuals.

3. Economic objective: where works are undertaken to protect the region from high water tables and salinity, the value of benefits, both measurable and non measurable, should exceed the costs.

4. The financial objective: the plan is to be both equitable and affordable to the individual, the regional community and the nation, now and in the future.

The Plan had six programs:

1. The Farm Program

2. the Surface Drainage Program

3. the Subsurface Drainage Program

4. the Environmental Program

5. the Monitoring Program

6. the Program Support Program.

The Plan was extensively reviewed in 1995 and a strategy produced for the second five years of Plan implementation. This review is the third review of the Plan and will provide direction for the next five years.

8.2 The multiple issues approach to decision-making

Selecting the appropriate action or mix of actions is difficult in natural resource management because the components of the environment are highly interconnected. Actions usually have an impact on other assets and threats as well as those specifically targeted. This can create further risk and opportunity. Integration of actions is particularly important for biodiversity, which is affected (either positively or negatively) by virtually every natural resource management action.

Historically, actions were selected to target specific threats or assets. Although it is still useful to do this, we are more aware of the other risks and opportunities that these actions present. Prioritisation principles differ slightly from asset to asset and threat to threat, usually reflecting the natural resource management discipline from which they are derived. Sub-strategies and background papers detail these principles. We are making substantial efforts to develop greater consistency and transparency in decision-making.

The focus for allocating investment is shifting away from discrete issues such as salinity and biodiversity to management actions that generate multiple issue benefits. This has major implications for all levels of planning and implementation and especially for monitoring and evaluation programs.

Deciding which onground works actions to take involves a rigorous assessment of criteria. Table 12 lists the source of justification of various actions and includes the government/landholder cost-share.

Onground works action	**Cost-share**		**Comment**	**Source**
	Government	**Landholder**		
Whole Farm Plans	50%	50%		*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
Surface Water Management Systems - Primary	Initial capital costs	O&M and depreciation		*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
Surface water management systems – Community				*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989*
Survey and Design	90%	10%		*Victorian Government Support for Salinity Management Plans* June 1990
Construction costs	50%	50%		

Water Harvesting	(30%)*	(70%)*	(In areas where surface drainage is not available)*, This incentive has been absorbed into the cost sharing arrangements for Community Surface Water Management Systems	*Victorian Government Support for Salinity Management Plans* June 1990
Land forming		100%	To be taken into account as part of the community contribution to the overall plan cost-share	*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
On-Farm Drainage		100%		*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
Farm Reuse	(30%)*	(70%)*	(In areas where surface drainage is not available)*, This incentive has been absorbed into the cost sharing arrangements for Community Surface Water Management Systems	*Victorian Government Support for Salinity Management Plans* June 1990
Sub-surface drainage private pumps	60% (80% 20%)*	40% (20% 80%)*	(Within priority areas Outside of priority areas)*	*(Victorian Government Support for Salinity Management Plans* June 1990)*

Sub-Surface Drainage Public Pumps	Initial capital costs	O&M and depreciation		*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
Extension	100%			*Shepparton Irrigation Region Land and Water Salinity Management Plan, Draft 1989* *Victorian Government Support for Salinity Management Plans* June 1990
Drainage Nutrient Removal	25% of the cost of constructing a system up to a maximum of $20,0000		Incentive to construct a water storage of at least 50ML with pump to divert water from G-MW Primary drains and then use the water for irrigation	Goulburn Broken Water Quality Strategy, Draft, 1997 Victorian Government Water Quality Funding
Revegetation			See EMG guidelines - Cost-share based on the multiple benefits generated (relates particularly to native vegetation and waterway protection)	Goulburn Broken Catchment Management Authority
Grazing management			See EMG guidelines. Cost-share based on the multiple benefits generated	Goulburn Broken Catchment Management Authority

Table 12 - Onground works actions and government/landholder cost-share

*original plan cost sharing/activity, changed due to Program Reviews and new information

8.3 Relative Investment

Decision-making processes have evolved to a relatively sophisticated level in the Goulburn Broken Catchment over the past two decades and involve a complex network of agency and community organisations.

The State and Commonwealth have split outputs (or actions) into four categories. These categories are being used for 2003-04 National Action Plan for Salinity and Water Quality/Natural Heritage Trust business planning. The Goulburn Broken would prefer to think of capacity building as any action that results in greater ability to deliver onground works. This includes both resource assessment and planning activities. The State and Commonwealth categories would be more appropriate if 'capacity building' was substituted with 'community education'. These categories closely relate to those the Shepparton Irrigation Region has used for over a decade (Northage and Brown 1995) to describe changing investment patterns over time.

1 Resource assessment,

2 Planning,

3 Capacity building, and,

4 Onground works.

Our community has developed an Australia-wide reputation as a leader in catchment management since being initially driven to combat the scourge of salinity in the 1980s. Although we are relatively 'mature' in our ability to deliver change, our capacity varies between issues (see Figure 23).

The *ideal* relative investment in each type of action depends on where we are up to in addressing the issue. Unfortunately, the reality is often different when investors impose guidelines that restrict the types of action that will be funded: this wastes scarce resources and this issue is being followed up with investors.

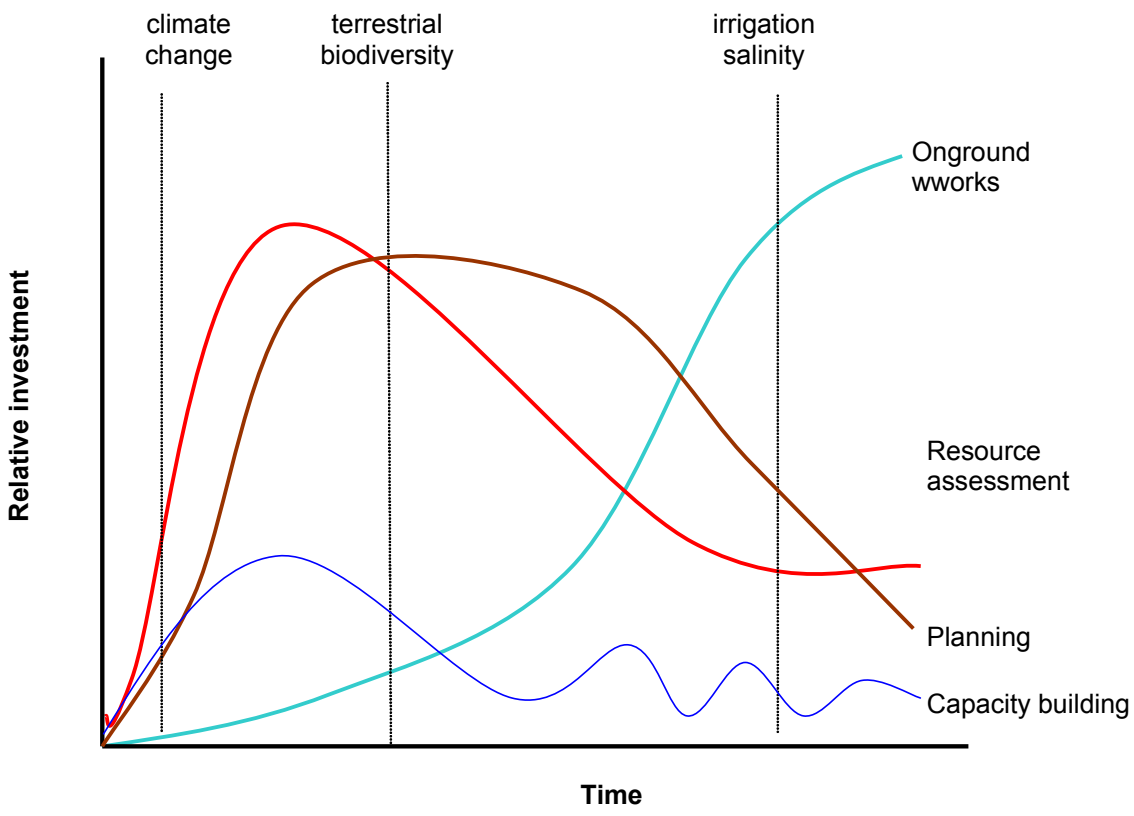


Figure 23 - Changing NRM investment patterns over time, showing Goulburn Broken 'maturity' of investment in climate change, terrestrial biodiversity and irrigation salinity.

Several systematic approaches to identify biophysical priorities for Catchment management are emerging in the Goulburn Broken Catchment and across Australia. Most of the criteria used for deciding on actions are implied in the information matrix (see Figure 24).

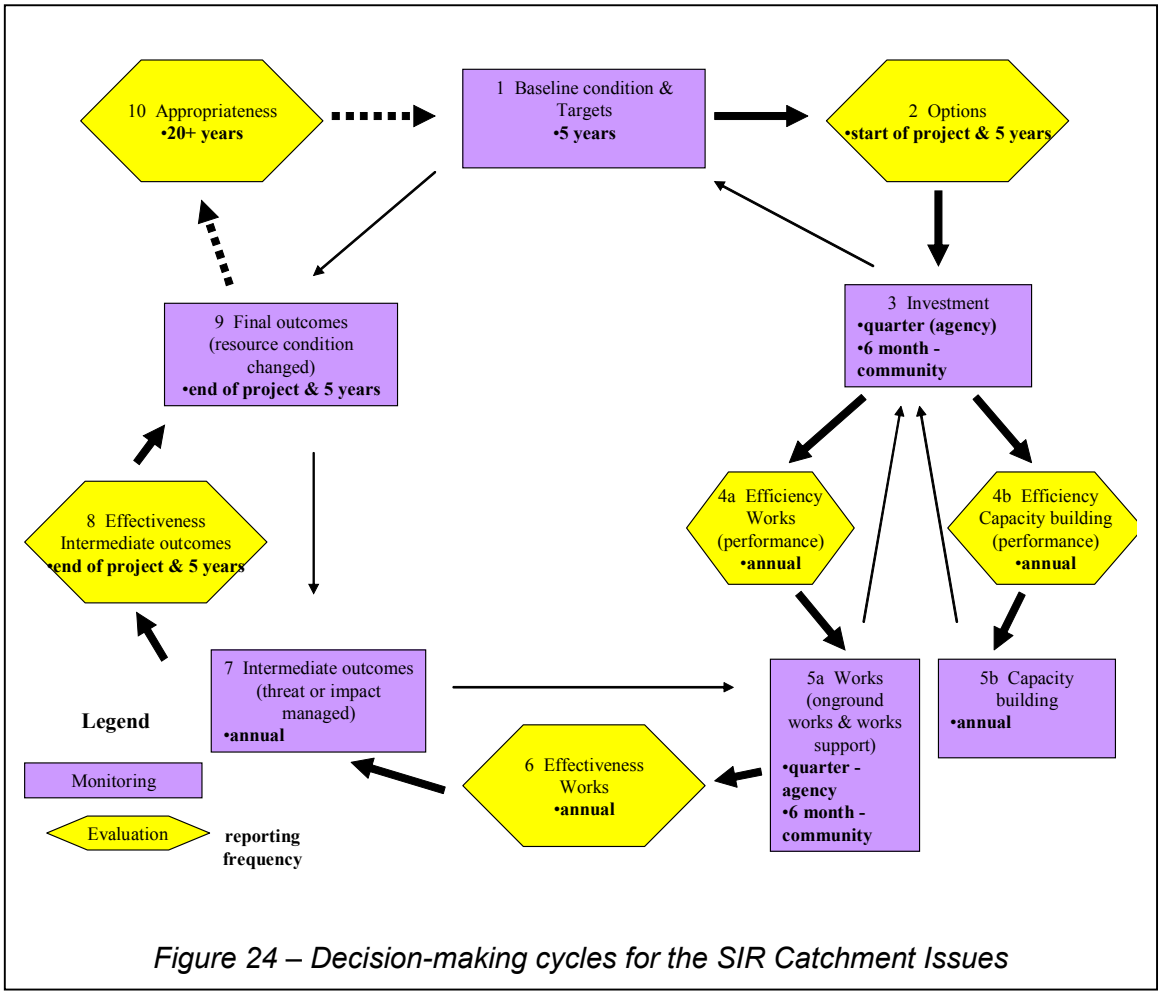


Figure 24 – Decision-making cycles for the SIR Catchment Issues

It is important to note that there is an additional step before those in this matrix which is usually beyond the control of the Catchment Community, being decided at State and Commonwealth levels: which types of issues do we invest in, for example, endangered species, salinity management, water quality, or greenhouse gas management? The question of which asset or threat type to invest in is, for the moment, largely a philosophical one. It is appropriate that we at least document what the decision-making is. This means constructing an investment profile so we can agree that the balance of investment in each asset-type (and threat-type) is 'reasonable'. Ultimately, we should be able to at least influence the way funds are allocated to Catchments and refine the balance of investment by adjusting those funds we do have control over.

Benefit-cost analyses to set priorities for salinity and water quality management have been pioneered in the SIR and continue to be refined. Similar approaches are being advocated by Australia's leaders in biodiversity decision-making such as Possingham *et al* (2002) to encourage debate on the methodology and refinement of the data. This might be a useful starting point for the SIR to develop more sophisticated management options.

Although information is often incomplete, major investments (involving decisions) are being made now, and these decisions must be documented as rigorously as possible so they can be improved. As these processes become formalised, the most critical issue to address is to ensure that any data gathering exercises are connected to a

decision-making process. This will streamline data gathering and result in more useful information. Criteria used to determine priorities such as 'highest value', 'greatest risk', 'benefits', 'costs, and 'ability to do something about' can be slotted into this framework.

9 Capacity building, values and principles

This section describes how we go about the business of Catchment management. It outlines the principles and values that guide the work and the capacity-building actions that are needed to enable our principles to be achieved.

Capacity building is about improving our understanding of the challenges facing the region and ensuring that the region's governance structures, partner agencies and the community are in a position to address these challenges.

Our catchment principles are underpinned by the values that the community would like to see promoted through the implementation of the Strategy. In particular, the values are:

Respect of the Community. Implementing natural resource management actions cannot occur without the support, guidance and active participation of the community.

Quality. The management actions and works actions promoted by the Strategy will be delivered to a high standard dictated by community expectations.

Learning and adapting. We must strive for excellence in our monitoring and evaluation processes. They must be transparent and invite community scrutiny, and we must achieve best practice in reviewing and adjusting our efforts to accommodate new research findings and revised community expectations.

Based on our experience over the past two decades and our review of National Standards for the National Action Plan and other government guidelines, we have identified seven catchment principles to guide the way we do business. These are summarised below. The principles are explained in more detail within this section and have been used to guide the development of capacity building priorities that are set out in Section 9.8. See Appendix 4 and 5 for further information and details of actions against each principle.

Integrated Catchment Management Practices

1. Partnerships fostered.

• Communication will be optimised.

• Roles will be defined.

• Our diverse communities and agencies actively engaged.

2. Rigorous priorities.

• Priorities based on the best available scientific, economic and sociological information.

• Causes of problems targeted in geographic areas that maximise community return on investment.

• Priorities for works consider risks and multiple benefits.

3. Costs shared fairly.

• Costs and benefits shared transparently and equitably.

• Triple bottom line accountability.

• Clear link with supporting legislation.

4. Large scale focused on

• Land use to change to better match land capability across broad areas.

5. Cultural heritage included

• Aboriginal and non-Aboriginal cultural values factored into all decisions.

6. Accountabilities clear (strong links with standard one above)

• Project proposals align with the priorities of the RCS.

• Progress reports clearly link to regional, state and national targets and needs.

7. Adaptive Management Systems at all scales.

• Management systems in place for individuals, sub-catchments, whole of catchment and industries.

9.1 Strategic partnerships

The success of the SIRCS depends on the actions and cooperation of a number of partners. In particular this includes:

- Landowners
- Goulburn-Murray Water
- The Departments of Sustainability and Environment, and Primary Industries
- Local Government
- Goulburn Valley Water
- Landcare Groups
- Local Area Plan Groups

9.1.1 Community Engagement and Public Participation

The SIR has an extensive community engagement network, as demonstrated in Figure 25. All of the Working Groups contain representation from local landowners, irrigators, environmentalists as well as agency staff.

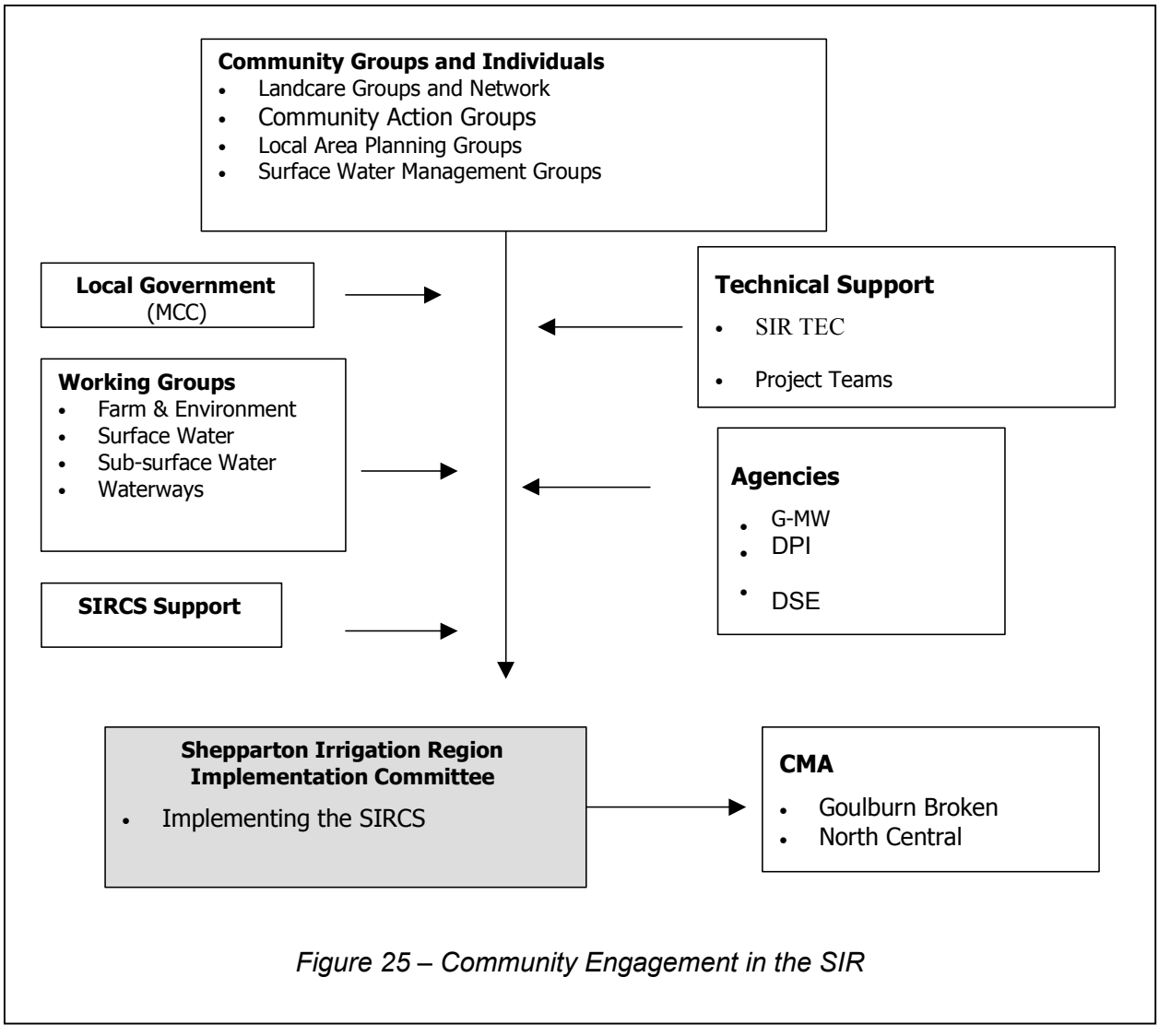


Figure 25 – Community Engagement in the SIR

9.2 Rigorous priorities

The priorities identified in the SIRCS and its sub-strategies are based on the best available scientific, economic and sociological information. Our aim is to maximise the community return on investment. To do this, we need to invest in research and development, and to take appropriate steps to identify and manage risks.

The focus for allocating investment is shifting away from discrete issues such as salinity and biodiversity to management actions that generate multiple issue benefits. This has major implications for all levels of planning and implementation and especially for monitoring and evaluation programs.

Our efforts to reduce and minimise the adverse impacts of irrigation will continue, through improving on-farm water use, by encouraging the adoption of new and existing technologies, by managing groundwater levels through intervention, and by seeking to return flows to stressed rivers where feasible. To do this effectively we will need to provide a mix of mechanisms to promote change, be adaptive in our approach and search for innovative solutions to the natural resource management issues addressed by the SIRCS.

9.3 Costs shared fairly

Cost-sharing is a key issue to be addressed by all sub-strategies. The region has well developed cost-sharing principles and arrangements that have been consistently applied to natural resource management programs. These principles will continue to be used to guide investment over the next five years. The principles are:

Duty of Care - natural resource users and managers have a duty of care to ensure that they do not damage the natural resource base. They are responsible for making good any damage incurred as a result of their actions.

Beneficiary Pays - when it is not possible to attribute damage, then primary beneficiaries should pay. Existing and future users are expected to pay for activities which provide private benefits. Contributions from secondary beneficiaries will be negotiated with the primary beneficiaries.

Government Contributions for Public Benefit - government contributes primarily for activities that produce public benefits. Governments may contribute to land and water management activities that have a private benefit, where the cumulative uptake of these activities provides significant public benefit and government support is required to facilitate this uptake.

Positive Benefit-Cost

Before Government will contribute to any land or water management activity, the activity must be technically sound, the benefits must justify the costs and it must be considered a priority activity.

Statewide Policy and Monitoring

Government will contribute to the cost of statewide planning, statewide resource monitoring and assessment, and research and investigations where they are crucial to sustainable land and water management.

The GB CMA has identified four groups of beneficiaries: the Federal, State and local governments (as representatives of the regional community) and the landholders. The CMA considers that the most appropriate policy is for the beneficiaries to share equally the 'Public' component of the costs. Landholders will continue to pay for the major proportion of the required farm activities.

In applying these principles, it is important that the final outcome is realistic and is administratively simple to implement. Section 8.2, Table 12 describes the cost-sharing arrangements for specific management actions (onground works) within the Catchment. These arrangements reflect previous Victorian Government investment decisions. The Victorian Government, in endorsing the SIRLWSMP (1990) provided endorsement for cost-sharing of the overall cost of implementing the plan – this was 41.5 % landowner, 41.5% State and Federal Governments and 17% Local Government.

Investment climate - The climate for investment is affected by numerous factors such as:

- the perceived need to invest;
- climate and seasonal variability;
- government priorities and initiatives; and,
- the economic position of the regional community.

Since implementation of the SIRCS began over ten years ago, there has been tremendous investment by all stakeholders, and this reflects the recognition of the importance of outcomes to the region and State. It is critical that this willingness to invest continues, and that the SIRCS remains responsive to investor requirements.

Governments in particular are becoming more interested in corporate governance issues: the way the community and CMAs do their business. Essentially these are the 'Standard Practices' (see Section 9) that are met and updated as a matter of course. Governments are also interested in ensuring that the strategies developed by communities to address issues are based on evidence, and it can be demonstrated that the actions are likely to lead to positive outcomes.

9.4 Focus on the large scale

This is a relatively new way of thinking, evolving from the recognition that a Best Management Practices approach will not achieve the results we desire. The Key Assets (see Sections 6 and 7) highlight the need to take a big picture approach to achieving the SIRCS outcomes.

This is about a whole new standard practice theme, reflecting a fundamental shift in focus. Although being more critical for the Dryland area of the GB Catchment, this shift is also very important in the SIR.

Although most natural resource management targets will be achieved through land and water managers adopting best management practices (which was the focus of most sub-strategies prepared in the 1980s and 90s), we now recognise that this approach must be supplemented by capturing opportunities for fundamental change in land use across broad areas of the catchment: we have called this new approach 'landscape change'.

9.5 Cultural heritage

In describing our social assets, it is clear that the region has a culturally diverse population. This diversity adds to the region's social assets and must be recognised in the way we do our business, including who we involve in our Committees.

The SIRIC has embraced indigenous capacity building and cultural heritage issues over the past ten years.

Aboriginal Affairs Victoria (AAV) conducts cultural heritage assessments as an integral part of the surface water works program. AAV is a member of the region's Surface Water Management Working Group. Construction of the region's surface drainage network pays particular attention to cultural heritage. Field surveys are undertaken as part of the program. These surveys have documented evidence of aboriginal occupation of the Goulburn and Campaspe River Basins, particularly where fresh water was readily available. A lack of adequate drainage following irrigation has lead to the deterioration of some of these heritage sites. The implementation of the surface water management program will assist with the protection and enhancement of these archaeological sites.

Training sessions have been held for SIRCS staff to improve the recognition of heritage sites. A locally prepared fact sheet has also been prepared containing locally relevant information about heritage sites.

The GBCMA commenced detailed negotiations with the indigenous community in 1999 and 2000 with the view to developing a Memorandum of Understanding within the SIR. Much work was carried out on the MOU, however this was unable to be finalized during the period of the Yorta Yorta Native Title Claim.

9.6 Clear accountabilities

The Catchment governance framework has evolved over the past five years and the institutional arrangements have matured. To get the full benefit from this system the roles all stakeholders must be specified and the information stakeholders need to make decisions must be readily available.

Accountabilities for Catchment management reach individual landholders where the community is increasingly expecting a duty of care from those landholders to protect the natural resource assets.

9.7 Adaptive management systems

As we have stated earlier, many of our management actions rely on assumptions about their relationship to outcomes. Each sub-strategy will be required to make explicit the assumptions they have used, and these will be tested and modified over time.

Testing these assumptions requires a robust monitoring and evaluation framework (see Section 5.4) and the ability to undertake research and development to analyse and understand the trends identified by the monitoring.

9.7.1 Monitoring

The region has a good biophysical monitoring network, but this network requires constant review and refinement. As our understanding of the region's natural resource management challenges improves we must modify and expand the network where appropriate. Details of the monitoring requirements for each sub-strategy are contained within those sub-strategies (see Sections 12 and 15). In some instances we will need to establish the monitoring framework, for example a monitoring framework for Biodiversity Assets in the catchment.

In other instances we will need to expand existing networks. The region is committed to meeting the reporting requirements of the NAP National Framework for Salinity and Water Quality and the Murray Darling Basin Ministerial Council end of valley targets. To do this we require on-going reviews of the region's surface and groundwater monitoring network. The last review undertaken by SKM (2002) found:

- **Salinity** The sites at Goulburn weir and Casey's weir are suitable for monitoring End of Valley salt loads required by the Murray Darling Basin Commission. The analysis of trends at Goulburn weir will be supported by results from stream salinity monitoring at Trawool.

- **Surface water** Stream salinity monitoring in the Catchment is adequate to describe the overall condition of the Catchment. There will be a need from time to time to enhance the network as our understanding of the salt accession processes improves.

- **Groundwater** A review of groundwater monitoring was carried out by Centre for Land Protection Research. The recommendations of that review have been implemented. It will be important to improve the monitoring network in the vicinity of the Plains Upland interface to allow us to understand more clearly what is happening in this area and how the problem of dryland salinity is likely to express itself.

Over 2003, the GBCMA will coordinate the development of a Monitoring and Evaluation Strategy that will support the implementation of the SIRCS.

9.7.2 Research and Development

A key theme emerging from the review and renewal of the SIRCS is the need for better information about the natural resource management challenges and better options for addressing these challenges. Detailed research and development needs have been identified in the sub-strategies.

We need to better understand the human systems that are integral to creating and managing these changes, in particular to understand and develop appropriate drivers for change, to develop appropriate policy mechanisms and institutional arrangements to support the change objectives, and to understand the impact of change management programs on land managers and communities.

We will continue to research the concept of 'ecosystem resilience' to help plan land use change. This includes consideration of future greenhouse impacts.

9.8 Capacity building requiring special emphasis

This section lists those types of actions that are recognised in the GBRCS (2003) and elsewhere as currently requiring special emphasis.

9.8.1 Complementing best practice approach with large scale land-use change

Standard practice category: Focus on the large scale

In the SIR we have commenced this. We have moved towards a group approach in delivering our programs – landcare groups, group groundwater investigations and community drainage catchment groups.

We have also split our surface drainage approach into sub catchments, commenced the development of a groundwater management plan, and developed Planning Scheme regulations. All of these are directed at catchment scale change.

9.8.2 Multiple issues approach to decision-making

Standard practice category: Rigorous priorities

The focus for allocating investment is shifting away from discrete issues such as salinity and biodiversity to management actions that generate multiple issue benefits. This has major implications for all levels of planning and implementation and especially for monitoring and evaluation programs.

Our efforts to reduce and minimise the adverse impacts of irrigation will continue, through improving farm water use, by encouraging the adoption of new and existing technologies, by managing groundwater levels through intervention, and by seeking to return flows to stressed rivers where feasible. To do this effectively we will need to provide a mix of mechanisms to promote change, be adaptive in our approach and search for innovative solutions to the natural resource management issues addressed by the SIRCS.

9.8.3 Market-based approaches

Standard practice category: Costs shared fairly

Price signals have proven an effective mechanism to increase water use efficiency in irrigation areas. This type of approach needs to be considered for biodiversity. The development of Environmental Management Systems (EMS) provides an opportunity for markets to directly influence land management practices, with consumers expressing preference for goods that are produced in a clean and green manner.

Market-based approaches rely on a strong understanding and ability to quantify the relationship between the works and the natural resource management outcome of those works. To improve this understanding the region needs to explore other market-based mechanisms such as:

- Using ‘auction’ systems to reveal the price landholders are willing to accept for delivering Catchment natural resource management benefits. This approach is not limited to individual landholders. The principles could be expanded to cover plantation investments by the private sector where an incentive could be offered,

commensurate with the multiple natural resource benefits provided by the plantation.
- Developing 'annuities' as a way of funding management actions that span a number of years.

9.8.4 Multiple benefit incentives

Standard practice category: Priorities rigorous and Costs shared fairly

The region has developed its environmental and waterways management incentives so that the level of incentive offered to a landholder is proportional to the number and level of benefits (including biodiversity) generated by the agreed works. This concept will be expanded to other Catchment works programs.

9.8.5 Improving regulatory framework

Standard practice category: Clear accountabilities

Where the threat to a natural asset can be clearly identified and attributed to individuals, consideration needs to be given to supporting recommended management actions with regulation. The management of dairy shed effluent in the irrigation area is one area where an increased regulatory effort is required. The CMA will work its Implementation Committees, Murray Dairy, the UDV and the Environment Protection Authority to develop an appropriate program to take the region to 100% compliance with EPA guidelines.

Pest management is another area where regulation is considered vital. In the Goulburn Broken region, the Catchment and Land Protection Act 1994 is enforced where individual land managers fail to adequately manage pests on their land, compromising the co-ordinated efforts of the greater community. This approach underpins the implementation of the Goulburn Broken Region Weed Action Plan and the Goulburn Broken Rabbit Management Action Plan.

9.8.6 Focus on natural assets and ecosystem services

Standard practice category: Focus on the large scale

The new emphasis on assets in natural resource planning across Australia does not change the issues that need to be considered when developing sub-strategies, but it does change how information is collated and shared. Our experience with developing an ecosystem services approach is very complementary to a focus on natural assets. The ecosystem services approach provides a framework for making management decisions that are truly holistic. We are at the leading edge of developing and implementing this framework.

9.8.7 Priority area projects

Geographic areas that can be identified as major contributors to a threatening process will receive priority attention. For example, the main tool for prioritisation in the Farm Program is through the Local Area Plans (LAP). The sub-catchments that are identified as high priorities for SIRCS activities will undergo the LAP development and implementation process. Priorities have been identified for Research and Development

and other prioritisation processes have been undertaken as part of identification of activities. The details can be found in the Farm Review Document

9.8.8 Enhancing community engagement

The SIR has robust community participation structures and processes. We will explore new ways of engaging the community in addressing the substantial issues facing the region. Of particular interest is the use of 'Deliberative Forums' – an approach that brings together a cross section of the community to review the best available technical evidence about a particular issue and to promote public debate on the processes for dealing with that issue. An example of this is the Irrigation Futures project. This project will bring together the regional community and other key stakeholders to develop a shared vision on irrigation for the Goulburn Broken Catchment, to make choices about the future by considering social, economic and environmental consequences, to use the best available knowledge to inform that decision process, and to build consensus on regional response options on irrigation.

9.8.9 Accountability and integration

New government programs and policies are emphasising the importance of integrated catchment management and regionally based funding programs. Integration of the sub-strategies into annual sub-catchment works programs ensures that conflicts between the sub-strategies actions and the multiple benefits that are generated by certain actions are identified. As a consequence of increased decision-making responsibilities being devolved to the regions, more robust monitoring, evaluation and reporting processes will be required.

Somewhat paradoxically, the SIRCS's relative maturity in terms of integration makes it very challenging to tease out and document the many issues it now addresses.

10 What we will achieve: goals, targets and actions

Given our understanding of risks and opportunities for natural assets as described in previous sections, we are able to set biophysical (including resource condition) targets for management. The confidence we have in the appropriateness of these targets varies between issues.

This section describes some of the general considerations in setting targets as well as listing the targets. More detail can be found in the sub-strategies that underpin the SIRCS. They have their origins in long-standing natural resource management programs operating within the region.

Sub-strategies are important because they help us to isolate issues in order to facilitate understanding and communication with the community. Integrated Catchment Management comes later, when the various approaches promoted by the issue-based documents are combined to ensure they are implemented efficiently and in a way that trade-offs and opportunities are identified to maximise the 'triple bottom line' from our investment.

This section describes the region's:

- Aspirational or long-term resource condition target.
- Medium-term resource condition targets we are aiming to achieve over the next 10 to 30 years.
- Management actions (works and capacity building actions) that will be implemented over the next five to ten years to achieve the resource condition targets.

The region has recognised this issue and has adopted a 'multiple-benefits' approach to planning and implementation at all scales. Investment levels are guided by the total benefits generated by a management action.

We will continue to refine our approach to Integrated Catchment Management with a greater emphasis over the next few years on Asset protection rather than threat abatement. Local Area Planning will continue to be a major tool for achieving community engagement drawing on local solutions to local issues. Other priority areas for action, that will have benefits to all assets, include: landscape and land use change; EPBC Act and what it means for the region; cultural and multicultural issues; environmental management systems; water rights and the farm dams legislation.

10.1 Different targets for different levels of decision-making

SIRIC's vision helps to guide decision-making, but more specific management targets provide greater clarity for guiding short and medium-term decision-making, which also provides a sharper focus for monitoring, evaluation and reporting. Targets are arranged as a hierarchical chain and relate specifically to levels of decision-making. Everyone involved in decision-making must be clear about the level of decision being made. (The terminology used for these targets follows agreed national standards (ANZECC National Standards and Targets Framework 2002) and are shown in Figure 26)).

It is important to define the link between long-term and short-term targets by articulating the assumptions (quantitatively where possible, including the confidence we have in the assumption). The assumptions then provide the basis for questions to be asked when evaluating success.

Targets listed are based on what the community regards as being achievable given a reasonable level of public and private investment. Targets are also made with the expectation that significant contributions will be from private sources such as volunteer labour.

Although short-term targets are based on long-term targets, there is not necessarily a linear relationship between them. We expect the uptake of works to accelerate as awareness grows and mechanisms that encourage external investment become available. Therefore we do not usually determine the short-term target by simply dividing the long-term target by the given time period.

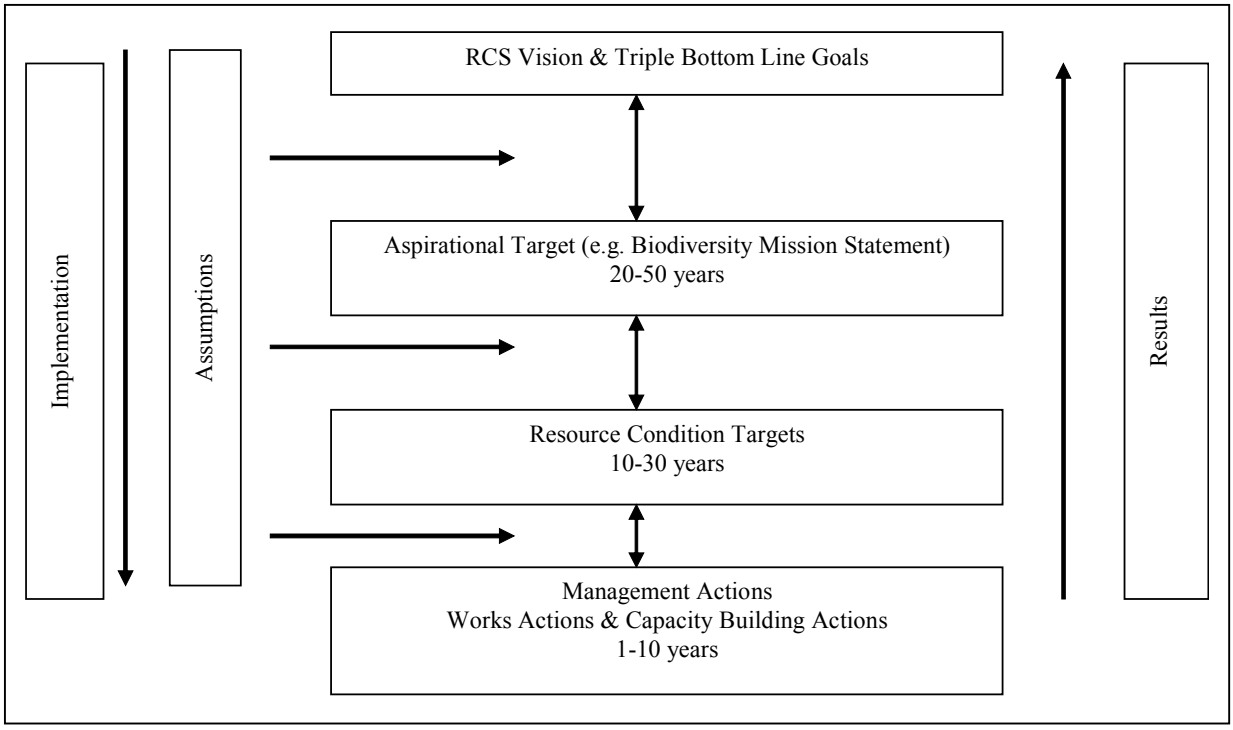


Figure 26 - Targets hierarchy

10.2 Salinity

Target-setting for salinity is relatively well understood, reflecting the maturity of the salinity program including its multi-state, multi-institutional and project-oriented history. The refining of these targets is ongoing and there is currently considerable debate about the setting of End of Valley targets. These are targets which will be set for river salinity at the end of each valley. For example, there will be a target for the Goulburn River where it enters the River Murray.

Resource condition targets are based on protecting two major assets from salinity: water (for consumptive and environmental benefits within the catchment and downstream) and land (for habitat and other benefits, especially agriculture).

Management actions to address salinity are undertaken by all SIRIC Programs except for River health (see Table13).

Resource Condition Target	Management Action Target	SIRIC Program
Maintain salinity impacts of the River Murray at Morgan from the Shepparton Irrigation Region at or below 17.0 ECs by 2020.	Regional surface water management* 2,464 km; *Contribution to goal: 1.3 EC added* • Primary surface water management system: 362 km • Community surface water management system: 2,102 km	Regional Surface Water Management
	Water efficiency management: • Regional channel distribution network (quantification in progress) • Adopt approved farm irrigation system: 300,000 ha • Install farm reuse system: 5,660 systems • Use groundwater: *unavailable volume* • Divert drainwater: 64,000 ML	Farm
Salinity impacts to be within Salt Disposal Entitlements.	Groundwater management: • Managed Groundwater disposal (via regional surface water management system): *Contribution to goal 15.7 ECs added.*	Sub-surface Water Management
Protect threatened assets within the 519,240 ha of SIR by reducing ground water accessions, soil salinisation and waterlogging by 2020. This means protecting 286,000 ha of land from surface water accessions by 2020.	Regional surface water management* 2,464 km; *see same Management Action target for addressing salinity in River Murray for further details (start of table)*	Surface Water Management
	Water efficiency management: • Adopt farm irrigation system: 300,000 ha; *see same Management Action target for addressing salinity in River Murray for further details (start of table)*	Farm
Provision of salinity mitigation activites and works to serve 213,000 ha	Salinity Mitigation *Contribution to goal: 213,000 ha by 2020.* • Operate existing pumps 45,000 ha • Install groundwater pumps – private 40,000 ha • Install groundwater pumps – public 85,000 ha • Install low capacity pumps & tile surface water management systems beneath 14,000 ha to protect productive capacity of 43,000 ha • Install evaporation basins	Sub-surface Water Management

**Single surface water management action achieves land protection and water quality outcomes*

Table 13 - Salinity Targets

10.3 River health

This project implements key actions towards the protection and enhancement of “River Health”.

There have been different levels of investment in preparing targets for each of these issues and it is expected that several of them will change over the next several years. For the purposes of this RCS, the major targets and actions of component documents have merely been collated. These have different contexts, terminology and timelines.

Vision:

“Healthy rivers, streams, wetlands, floodplains and adjacent land that support a vibrant range and abundance of natural environments, provides water for human use, sustains our native flora & fauna and provides for our social, economic and cultural values".

Program Objectives:

Instream and Riparian Flora and Fauna:

- to protect and enhance the value of instream and riparian communities and processes

Water Quality

- to improve the quality of water in the Goulburn and Broken Rivers and their tributaries

Riverine Assets

- prevent damage to the region’s environmental, social and economic assets

Capacity Building

- to implement an effective and efficient range of programs to protect and enhance riverine values

Aspirational Target	Resource Condition Target	Implementation Targets
Maintain the condition of all reaches (benchmark 2003) of rivers and streams rated as 'good' or 'excellent'.	Overall improvement in the condition of the region’s riverine environment. This will be assessed by applying a review of the “Index of Stream Condition” methodology.	10 km of stream subject to protection bank protection measures with improved condition.
Improve the overall condition (benchmark 2003) of rivers and streams rated as 'marginal', 'poor' and 'very poor' by 2050.	Reduction in nutrient contribution (11.2t TP) of 20%.	50 km of waterways and gullies stabilised.

340 km of stream to maintain current Index of Stream Condition (ISC) rating (riparian zone and channel form sub-indices) through protection.	30 habitat rehabilitation sites being the focus of enhanced instream habitat(protection zones).
150 km of stream with an improvement of one rating in the measurement of ISC rating (riparian zone and channel form sub-indices).	60 km (500ha) of streams under management agreements.
30 km of river where instream habitat values have been improved.	340 km (340ha) of streams being the focus of riparian protection. 150 km (150ha) of riparian land revegetated.
60 km increase in the length of river accessible to native fish.	Vegetation structure and composition in riparian land be improved by 330,000 in number.
There will be no further decline in the conservation status of any native freshwater species.	60 km of stream frontage subject to riparian weed control.
30 habitat rehabilitation sites (protection zones) achieved.	23 barriers modified or removed to provide fish passage.
150km of public stream frontages with improved Vegetation Quality conditions.	35km of waterway / floodplain linkages be re established.
All high valued social rivers protected.	Implement all programs outlined in the Region's Floodplain Management Strategy (July 2002) to ensure that the risk of damage to the region's assets are reduced.
All Heritage Rivers to be maintained at least in their current condition.	Provide 1 in 20 year flood protection for 30 high value public assets such as bridges by 2013.

All Ecological Healthy Rivers to be maintained at least in their current condition or improved.	Manage nutrient rich and turbid water through 6 urban stormwater projects to be undertaken by 2016.
Representative rivers to be maintained at least in their current condition.	Investigate further waste water management projects to be undertaken.
	Work with DPI and DSE to establish a framework for prioritising wetlands
	Continue to demonstrate how effective surface and sub-surface water management actions are in managing water quality.
	Develop Best Management Practices for urban stormwater management
	Develop Best Management Practices for intensive agriculture & local water quality management.
	Develop cost effective management practices to maintain water quality in streams to better understand nutrient cycling, particularly nitrogen and phosphorous in farming systems, and the processes by which these nutrients enter streams, become available to support algal growth and affect stream health.
	Develop a model to understand nutrient movement at a catchment scale and link land management practices with end of valley targets for water quality.

		Evaluate long-term sustainability of disposal of waste products from urban/industrial and irrigation drainage, particularly in relation to shallow watertable areas and nutrient/salinity loadings
	Reduce potential phosphorus loads by 65% by 2016 by reducing phosphorus loads from:	• irrigation surface water management systems by 50% (84.5 tonnes) • wastewater management facilities by 80% • urban stormwater • intensive agricultural industries and local water quality issues

Table 14 - River health targets.

10.4 Biodiversity

Table 15 lists biodiversity resource condition targets and five year high-level works management action targets for native vegetation, and threatened species of flora and fauna.

It is likely that targets for non-threatened fauna, non-vascular plants and invertebrates will also be set. Threatened species targets also cover some significant species that may not be listed as threatened, such as regionally declining species.

The Goulburn Broken mission statement for biodiversity is:

> *The community will work in partnership with Federal and State Governments and other agencies to protect and enhance ecological processes and genetic diversity to secure the future of native species of plants, animals and other organisms in the Catchment.*

Resource Condition Target	Management Action Target
Native vegetation	
Maintain extent of all native vegetation types at 1999 levels in keeping with the goal of 'net gain' listed in *Victoria's Biodiversity Strategy 1997.*	8,596 Ha by 2030
Improve the quality of 90% of existing (2003) native vegetation by 2030.	48,658 Ha by 2010
Increase the cover of all endangered and applicable vulnerable Ecological Vegetation Classes to at least 15% of their pre-European vegetation cover by 2030.	64,857 Ha by 2030
Threatened species	
Increase 2002 conservation status of 80% threatened flora and 60% threatened fauna by 2030.	Implement relevant Action Statements and Recovery Plans.

Table 15 - Biodiversity targets.

10.5 Soil Health

Resource condition targets for soil health have not yet been determined, reflecting the infancy in understanding the extent of the problems and what can be expected to be achieved. Soil health targets in terms of salinisation are much better understood (see previous section, "Salinity").

Management actions for soil health are undertaken by the Farm Program.

10.6 Pest Plants and Animals

The following targets guide the Catchment's approach to pest management:

- Prevent the establishment of new and emerging weeds.
- Contain and reduce the impact of existing weed infestations.
- Double the area of the Catchment declared 'rabbit free' by 2005.
- Reduce the impact of foxes and wild dogs on livestock industries and native fauna.

Implementation of management actions for Pest Plants and Animals is via the Farm Program. Table 16 outlines the targets for the program.

Aspirational Target	Resource Condition Target	Management Action Target
Landowners will take responsibility for pest plant and animal management on their own land and prevent impact on neighbouring properties. Pest plants and animal populations will be decreased to levels acceptable to the community.	• 100% infestations of State Prohibited Weeds treated annually until eradicated. • 100% known infestations of New and Emerging Weeds treated annually for containment/eradication. • 100% known satellite infestations of Regional Priority Weeds treated for containment or where possible, eradication. • 95% infestations of Regional Priority Weeds in priority project areas treated for containment or where possible, eradication. • 100% increase in area of the catchment declared "Rabbit Free" Reduction in impact of foxes and wild dogs on livestock industries and native fauna.	• Increase the level of Catchment Community responsibility for weed and rabbit control. • Develop a partnership approach to weed and rabbit management. • Ensure weed, rabbit, fox and wild dogs management works integrate with other natural resource management programs. • Align information from bioregional planning with pest plants and animals planning at a local area scale. • Use investment analysis and other tools to review the list of declared weeds. • Monitor and evaluate the effectiveness of weed and rabbit management in the region.

Table 16 - Pest plants and pest animals targets

10.7 Greenhouse

The SIR has opportunities to contribute to meeting Australia's greenhouse gas emission targets by investing in practices that reduce greenhouse emissions from our industries and by promoting the value of revegetation programs in providing carbon sequestration opportunities.

Greenhouse emissions from the SIR will be limited to nationally agreed levels. SIR and sub-SIR goals and targets will be determined.

Implementation details have yet to be determined. Management actions undertaken through the Surface Water Management and Farm Programs already play a large role in reducing greenhouse emissions. Table 17 outlines the targets for the program.

Aspirational Target	Resource Condition Target	Management Action Target
Greenhouse emissions from the Catchment will be limited to nationally agreed levels	Regional and sub-regional goals and targets will be determined.	• Identify and initiate programs to respond to the challenges presented by the increase in greenhouse gases and global warming. • Develop an understanding of the implications of climate change for Catchment's native biodiversity. • Build opportunities for enhancing native habitat into greenhouse gas abatement programs. • Identify the processes by which greenhouse gases are generated from irrigated production systems in the Catchment and evaluate the effectiveness of current recommended practices to mitigate the emissions.

Table 17 – Greenhouse targets

11 Implementation plan - summary

Implementation planning is the link between long-term strategic planning and short-term business planning. The implementation plan provides detailed descriptions of:

- implementation management structure: in this case, as implementation 'Programs' (see below);
- strategic directions within implementation Programs;
- Program responsibilities;
- management actions (with one and five year targets, benefits to other strategies and action responsibilities);
- assumptions (linking actions to outcomes); and,
- costs and benefits.

SIRIC uses this information to prepare business plans. These are required by Commonwealth and State investors and are presently called the Regional Catchment Investment Plan (proposal – how much money we want, and what we would like to spend it on) and the Regional Management Plan (accountability – what money we received and what we must spend it on). It is expected (hoped) that these two business plans will ultimately use identical information structures.

This section lists the implementation Program structure, the emphasis of each Program, and a benefit (in terms of $) and cost summary of implementing each Program.

11.1 Integrated implementation Programs

The sheer size and complexity of natural resource issues in the SIR creates a challenge for focusing implementation. The community has addressed this by establishing Programs that provide a focus on similar implementation themes (see Table 18).

Program	Mission statement*
Surface water management	By 2020, improve the health of natural resources and reduce the risk to investment in the SIR by providing and appropriate surface water management service in areas where the total benefits, including economic, social and environmental benefits are well in excess of the costs of the works.
Sub-surface water management	To protect and reclaim the SIR's land and water resources from salinisation where possible and justified.
Farm	To improve land management practices on private land within the SIR to protect and enhance the environment, to improve economic viability, and to help rural communities make informed decisions.

River health	To ensure the sustainable development of natural resource based industries, the protection of land and water resources and the conservation of natural, heritage and cultural values. To provide present and future generations with a living and healthy riverine system supporting the Basin's social, environmental and economic values
Implementation Support Program	To implement the SIRCS.

* Separate Program forums have used different language (vision, mission, objective, etc) and have structured statements slightly differently, reflecting the staggered development of these statements over several years. They have been collated here for the sake of clarity and to foster consistency as they are reviewed.

Table 18 - Program Mission Statements

Community and technical forums that support these Programs are very effective in integrating complementary and often conflicting natural resource needs. Table 19 shows the relative emphasis of each Program on achieving specific natural resource outcomes.

Separate comprehensive Program reviews in recent years resulted in two major structural changes:

- A review in 2002 found it was no longer appropriate to have a separate Environment Program, which had been in place since 1990, because the profile of biodiversity (the focus of the Program) was adequately entrenched and most gains for biodiversity were coming from integrating needs into other programs.
- Also during 2002, the River Health Program was formalised; an appropriate step in the evolution towards totally integrated catchment management.

Strategic planning theme outcome		**Integrated implementation Program**			
		Surface water management	**Sub-surface water management**	**Farm**	**River health**
Salinity	River	High	Very high	Medium	Medium
	Land	Very high	High	Very high	Low
Soils		High	High	Very high	Low
River health	Water quality (nutrients)	Medium	Medium	High	Medium
	Water quantity	Medium	High	High	High
	Wetlands	High	Medium	Medium	High

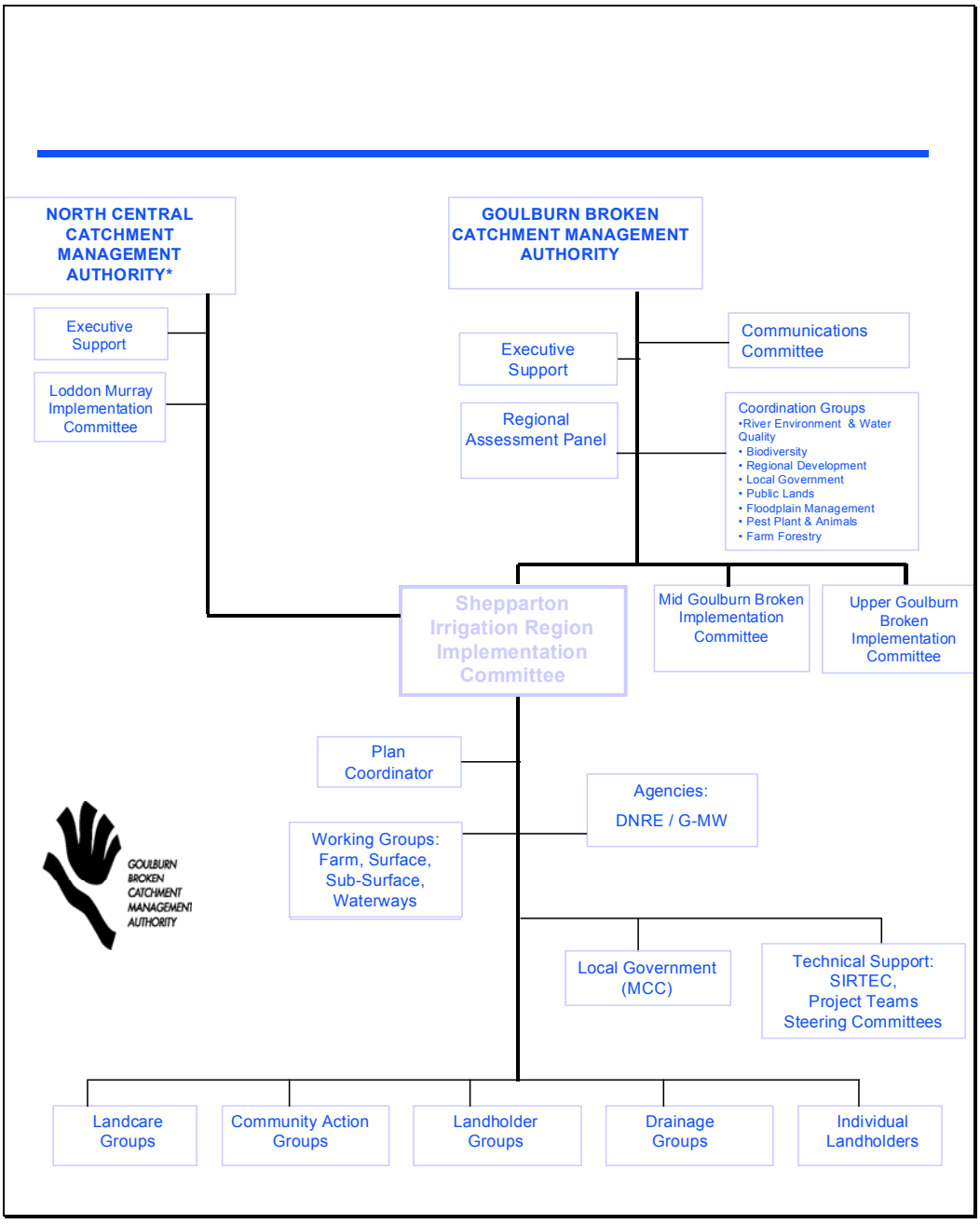
	Stream condition	Medium	Medium	Medium	Very high
Biodiversity	Native vegetation	Medium	Medium	High	High
	Fauna	Medium	Medium	High	Very high
Climate change		Medium	Medium	Medium	Low
Pest plants and pest animals		Low	Low	Medium	Medium

Table 19 - Relative emphasis on outcomes of each integrated implementation Program

Program	**Responsibility**	**Stakeholder representation**						
		Community	GMW	DPI	DSE	CMA	Local gov't	EPA
Surface water management	Surface water management working group	Y	Y	Y	Y	Y		
Sub-surface water management	Sub-surface water management working group	Y	Y	Y	Y	Y		
Farm	Farm working group	Y	Y	Y	Y	Y		
River health	SIRIC (implementation)	Y	Y	Y	Y	Y	Y	Y
	River Health and Water Quality Committee (policy and strategic advice and technical support)	Y	Y	Y	Y	Y	Y	Y
Implementation Program support	SIRIC	Y	Y	Y	Y	Y	Y	Y

Table 20 - Implementation Program responsibilities and stakeholder representation

Figure 27 shows the links between all levels of management in developing and implementing the SIRCS.



* The North Central CMA is only involved in the management of the Rochester Irrigation Area within the SIR.

Figure 27 - Management structure for implementing SIRCS

11.2 Management actions

Reviews during 2000-02 of the Surface Water Management, Sub-surface Water Management, Farm and Environment Programs each produced lists of actions to be undertaken over the next several years. These have been included in the lists of action under each Program in Section 12.

11.3 Economic analysis

The economic analysis of each of the SIRCS Programs has been undertaken to enable the programs' contribution to the SIRCS to be estimated (see Table 21). There are a number of assumptions that were made in the economic analysis. These assumptions and further details can be found in the paper Economics of the Shepparton irrigation Region, by Mike Young 200

Previous discussions (URS, 2002) regarding the integration of economics of all the SIRCS programs have expressed concern regarding the possibility of double counting of benefits between the various programs. The Farm Program economic analysis has been done with this concern in mind. In particular, the major salinity and waterlogging benefits often cannot be achieved unless there is surface and sub-surface water management infrastructure in place across the region. However the surface and sub-surface benefits also cannot be delivered unless the standard of irrigation layout on individual farms is such that best practices in land and water management can be implemented.

Program	$ millions (present Value @ 4%)			Benefit/Cost	
	Benefits	Costs	NPV	2002	1995
Farm Program**	578	435	142	1.3	1.07
Surface water management Program	353	295	58	1.2	1.70
Sub-Surface water management Program	299	114	185	2.6	1.66
River Health Program* low benefits	8	13	-5	0.6	
River Health Program* high benefits	29	13	16	2.3	
Program Support (over 50 years)		29	-29	0.0	
Total - (high waterways benefit)	1,260	886	373	1.4	1.17***
Total - (low waterways benefit)	1,239	886	352	1.4	1.17***

* Waterways program economics provided range of benefits that depended on assumptions regarding frequency of algal outbreaks and time required to achieve benefits from levees on Goulburn River (SKM/Read Sturgess).
** Includes Environmental Program for Public Lands
*** 1995 did not include the River Health program

Table 21 - Combined economics of SIRCS.

12 Implementation plan – Program details

Implementation planning is the link between long-term strategic planning and short-term business planning. The implementation plan provides detailed descriptions of:

- implementation management structure: in this case, as implementation 'Programs' (see below);
- strategic directions within implementation Programs;
- Program responsibilities;
- management actions (with one and five year targets, benefits to other strategies and action responsibilities);
- assumptions (linking actions to outcomes); and,
- costs and benefits.

12.1 Surface Water Management Program

12.1.1 Description

The removal of the native open woodland and the development of irrigated agriculture in the Shepparton Irrigation Region (SIR) have altered the natural hydrological balance. Rainfall, irrigation, plant growth, soil types and topography, are all factors, which impact on the hydrologic balance. The removal of most of the trees and the frequent application of irrigation water results in the soils of the region generally having a higher average moisture content. This in turn results in higher volumes of run-off being generated by rainfall events. This run-off overwhelms the natural surface water management systems and temporarily inundates large areas of farm land and native vegetation.

Ponded rainfall is a significant source of recharge to the watertable and therefore exacerbates soil salinisation. From a farm perspective, it results in prolonged waterlogging on farms with an adverse impact on productivity, and is a major constraint to landholder investment in sustainable agriculture and best management practice.

Some 286,040ha (60%) of the region was without effective surface water management at the commencement of the implementation of the Surface Water Management Strategy in 1990. To alleviate these problems, significant surface water management infrastructure works are required which will enable the removal of excess rainfall run-off from irrigated lands, provide an outfall for some ground-water pumps and create the opportunity to preserve or enhance wetlands and native vegetation.

12.1.2 Strategic Direction

The Surface Water Management Program is implemented following a number of principles these include:

- Being community driven,
- The provision of an appropriate surface water management service,
- Construction of drains within their natural catchments,
- Maximisation of environmental benefits,
- Identification and protection of aboriginal heritage sites,
- Maximisation of social benefits,
- Minimisation of downstream impacts,

- Monitoring of strategy outputs and outcomes, and
- Cost sharing based on beneficiary pays.

12.1.3 Assumptions

- Total SIR area (dryland and irrigation) is about 500,000 ha.
- The area of land protected by a community surface drain is approximately 104 hectares for every km of drain constructed.
- Surface water management systems reduce accessions to groundwater by 11.5 %.
- The Surface Water Management Systems are designed to provide for a 1 in 2 year rainfall event.
- Nutrient removal schemes intercept 5,185 ML/year, equivalent to the removal of 11 tonnes of phosphorus per year and 0.96 tonnes of nitrogen per year (at current capacity, this capacity is increasing annually).
- Any initial short term effects on downstream users from shallow surface water management should be minor, and should be offset by the long term benefits of reduced accessions to groundwater if there was no immediate downstream impact on the receiving stream.

See individual program reviews for further details on the assumptions.

12.1.4 Costs and benefits of the Surface Water Management Program

The economic evaluation of this Program was undertaken using the MDBC's Surface water management Evaluation Spreadsheet Model, using discount rates of 5% over 50 years (SMEC, 2001). The main changes in the economic analysis carried out in 2002 are:

- That there is an allowance for newly drained land to be developed for intensive horticulture

- The full costs of accompanying environmental assessments and works associated with drains are included

- The analysis was rerun at 4% over 50 years to accord with the Victorian Government's economic rate.

The current analysis adopts the salinity, waterlogging, flooding, reuse and road benefits used in the 1995 analysis and converts them to 1999 dollars. The additional landuse change net benefit has been included. The estimated unit costs for capital works, as well as on-going agency support costs, have been provided by G-MW and DPI/DSE.

This analysis also differs from the 1995 analysis in that the full cost of accompanying environmental assessments and works associated with Primary and Community Drains is included in the capital costs and monitoring is included as an annual operating cost as the integration of the Surface Water Management Program with the Environmental Program is complete.

The Program has a Net Present Value of $58.57 million and a Benefit/Cost ratio of 1.20.

12.1.5 Prioritisation

The construction for primary drains has been though a prioritisation process that looks at the economics, environmental aspects (including salinity, nutrients and biodiversity) and community response, all of which results in a rating index. Table 22 shows the results of the prioritisation process.

Surface water management area*	Area to be drained, ha	NPV $million	npv/ha	Environmental rating	Community Response Factor	Rating Index 100
Weighting Parameter			0.55	0.25	0.2	
Deakin	21,210	11.0	518	7	3	10.3
Mosquito	34,120	2.1	60	9	3	6.9
Campaspe	7,400	2.4	318	1	3	6.3
Corop Lakes	38,850	1.5	39	10	2	6.0
Barmah/Nathalia	27,340	1.4	51	6	3	5.7
Muckatah	34,640	-0.8	-24	6	3	5.0
Tallygaroopna	27,500	2.4	87	1	3	4.2
Kialla	5,970	0.2	27	1	0	0.6
Lockington	5,540	0.0	-2	0	0	0.0
TOTALS	**202,570**	**20.0**	**1074**	**41**	**20**	

* Catchments with only Community Surface Water Management System works remaining are not listed.

Table 22 - Surface water management priorities.

12.1.6 Surface Water Management Program management actions

	Management action*	One year target	Five Year target	End of plan target 1990 – 2020	Benefits to other strategies	Responsibility Primary (Secondary)
	Works					
1.1	Construction of primary drains	15 km	75 km	314 km	• Reduction of watertables leads to protection of remnant vegetation and wetlands • Drain design incorporates environmental features (eg remnant vegetation and wetlands)	SWMWG
1.2	Upgrading of primary drains (remodelling)	8 km	12 km	282 km		SWMWG
1.3	Construction of Community Surface Drains	Will depend on demand	Will depend on demand	2,102 km		SWMWG
1.4	Retrofitting of existing surface water management networks for environmental benefits	Still being assessed	Still being assessed	Still being assessed		SWMWG
1.5	Water Harvesting Systems	0	3,630 ha	3,630 ha	• Reduction in nutrients and salt entering the waterways	SWMWG and Farm and Environment WG
1.6	Nutrient Removal Systems	1,500 ML	7,500 ML	30,000 ML		SWMWG
1.7	Upgrading works on the Broken Creek	2 weirs	2 weirs	9 weirs	• Increased environmental flows leading to improved habitat and health of waterways	SWMWG and RH&WQC
1.8	**Protection of wetlands on private land**	1,244 ha	6,220 ha	41,977 ha	• Improved health of wetlands and waterways • Improved health of remnants • Reduction of nutrients and salt into waterways	SWMWG and Native Biodiversity WG
1.9	Protection of remnant vegetation on private land	Still being assessed	Still being assessed	4,357 ha		SWMWG and Native Biodiversity WG

	Management action*	One year target	Five Year target	End of plan target 1990 – 2020	Benefits to other strategies	Responsibility Primary (Secondary)
	Investigations					
1.10	Surface water management Course Declarations	15 km	75 km	562 km	• Improved management of waterways and surface water management lines	SWMWG
1.11	Preparation of Surface water management Plans					
1.12	Research and development to improve: • archaeological heritage and • environment assessments, • flow retardation and • environmentally sensitive techniques • **monitoring of wetlands and remnant vegetation**	§	§	Still being assessed	• Increased environmental flows leading to improved habitat and health of waterways • Improved health of wetlands and waterways • Improved health of remnants • Reduction of nutrients and salt into waterways	SWMWG and Farm WG
1.13	**Environmental Assessments for Primary Surface Water Management Systems**	36,800 ha	184,217 ha	Still being assessed		SWMWG and Native Biodiversity WG

§ - as funding and prioritisation process allow. * **Former Environment Program Actions are in bold.**

Table 23 - Surface water management Program actions and targets.

12.2 Sub-surface Water Management Program

12.2.1 Description

Prior to European settlement, groundwater levels in the SIR were more than 30 m below surface. Clearing of native vegetation and irrigation development have disrupted the natural hydrologic cycle, causing the Upper Shepparton Formation aquifers and enclosing clay aquitards to become saturated.

Groundwater levels are now at less than 2 m below surface over much of the SIR. Studies undertaken during the development of the Plan (1989) estimated that approximately 274,000 ha or 65% of the SIR that was monitored at the time, would be subject to groundwater levels within 2 m of surface by the year 2020. This level was almost reached in August 1996 (a wet winter) when approximately 268,000 ha were affected. The area declined to approximately 157,000 ha in August 1999 due to a combination of pumping and prevailing dry conditions and low water right since 1997.

12.2.2 Strategic Direction

There are a number of issues that the Sub-surface Water Management Program will need to address in the coming five years and they include:

- Securing Salt Disposal Entitlements
- Review Phase A program performance
- Public and private disposal basin management and cost sharing guidelines
- Protection of environmental features
- Impacts of increasing irrigation supply salinities
- Alternative disposal methods for moderate to high salinity groundwater
- The amount of pumping required for groundwater and/or salinity control
- Review the effectiveness of works
- Farm management of pumped groundwater
- Prioritisation of works at the surface water management catchment scale
- Reviewing the reliability of Plan projections
- Further investigations into tile drains and low capacity groundwater pumps in pasture

The issues identified for evaluation in the next 5 years are many, potentially complex and are inter-related in some cases. The program is subject to ongoing review and refinement in light of changing knowledge, technology and priorities.

12.2.3 Assumptions

- 1 ML of water pumped protects 1 ha of land.
- It is estimated that by the year 2020, provided that the sub-surface surface water management works proposed as part of the sub-surface water management program are implemented, the fully implemented surface water management plan will lead to a rise of 2.7 EC in the average water salinity in the River Murray at Morgan. If the subsurface groundwater control measures are not implemented this salt load would be significantly higher.
- Salt Disposal Allocations (SDAs) are not allowed for low salinity groundwater (less than 1,000EC), and has a progressive scale for increasing groundwater salinity from 1,000 to 2,000 EC. This policy recognises the possibility that salt export may already be occurring in these areas by leakage to deeper aquifers, and consequently targets the SDA to those areas, which are likely to have the greatest need.
- The area receiving salinity control from a Groundwater Control pump which operates for less than 6 months/year is assumed to be the same as would be achieved if it operated as a Salinity Control pump. If the pump operates for more than 6 months/year it is

assumed to provide salinity control to a larger area than it would if operated as a Salinity Control pump.

- The "Salinity Management Evaluation" model has been used to calculate the hypothetical volume of groundwater that may be reused at the irrigation application salinities of 450EC to 1050EC units, using groundwater salinities at existing levels, and long-term groundwater salinities of 2000, 4000, and 7000 EC units.
- To estimate potential groundwater usage a number of assumptions were made;
  - No pump where total area is less than 25ha
  - No pump if pumping less than 40ML
  - Maximum pumping rate of 150ML
  - Maximum average irrigation salinity of 500EC
- Irrigation usage from channel is 130% of water right (an average figure), not the actual water usage on the property
- The average salinity of groundwater is 100EC
- The groundwater salinity is 1500, 2500, 4000 or 6000 EC for all properties.
- Groundwater usage is additional to irrigation usage at 130% of water right, and is not a substitute for irrigation sales. This implies that water is used more intensively on the existing area of pasture on farms, or that there is some conversion of annual pasture or dry-land to perennial pasture or summer irrigated crops.
- Installation of low capacity groundwater pumps to protect existing horticultural area (mainly Shepparton East) – 1 pump protects 25 ha
- For the areas with no high water table problems and B type and 50% of the C type groundwater management areas where groundwater control will be installed that, the salt wash-off is proportional to the quantity of incoming salt. This incoming salt results from the application of irrigation water, which leads to about 100,000 tonnes of salt entering the Region per year.
- For the 50% of C type management area where groundwater levels will be high and control works minimal, the salt wash-off will be higher due to the build up of salt in the upper soil profile.
- Each new public pump protects 200ha.

12.2.4 Costs and benefits of the Sub-Surface Water Management Program

The economics of this program was undertaken, using the MDBC Drainage Evaluation Spreadsheet Model, using a discount rate of 5% over 50 years for each component of the Sub-surface Program (SKM, 2002). The components were:

- Private pasture pumps - existing and new pumps
- Public pasture pumps – reuse, basins and horticultural pumps/systems

The Benefit/Cost ratios were calculated as:

- Total pasture program – 2.41
- Horticulture program – 2.65

The analysis was rerun at 4% over 50 years to accord with the Victorian Government's economic rate. Producing a Net Present Value of $185.45 million and a Benefit /cost ratio of 2.63.

There is a critical link between this Program and the Surface Water Management Program in that the latter provides a disposal mechanism for saline groundwater which can, when mixed with non-saline surface water (irrigation or surface water management), be reused lower down the catchment.

The other benefit of the Sub-surface Program is the creation of an additional water resource where, as indicated above, the groundwater can be reused for productive purposes, thus reducing the amount of salt leaving the catchment.

The costs accounted for in the economic analysis include the capital costs of establishing groundwater management system infrastructure, the annual operating and maintenance costs and the downstream costs associated with obtaining salt disposal entitlements.

12.2.5 Prioritisation

In 1990 the original SIRLWSMP identified 5 priority areas for groundwater pumping, these were Harston, Ky Valley/Tongala, Tatura, Stanhope and Undera. The sub-surface program is also based on these management areas. A further eight priority areas were considered on the basis of severity of the problem, intensity of irrigation and probability of rapid implementation. Three other factors were included later and they were community willingness to be involved, external factors and environmental concerns.

12.2.6 Sub-Surface Water Management Program Management Actions

	Management Action*	One year target	Five Year target	Plan end target 2023	Benefits to other strategies	Responsibility Primary (Secondary)
	Planning					
2.1	Develop and adopt a cost effective strategy for installation of tile drains/low capacity pumps to protect non-horticultural areas	No target	Development of strategy and begin implementation	14000 ha to protect the productive capacity of 43000 ha	Reduction of watertables leads to protection of remnant vegetation and wetlands	SSWG
2.2	Develop and adopt a cost effective strategy to provide salinity and waterlogging control for new high value crops in the region	Development	Development	Implementation	Reduction in nutrients and salt entering the waterways	SSWG & FWG
2.3	Environmental assessments on Public Salinity Control Pumps	14 initial assessments and 6 detailed	71 initial assessments 30 detailed	Still being assessed	Improved health of wetlands and waterways Improved health of remnants	Native Biodiversity group
2.4	Environmental assessments on Evaporation Basins	0	3 Basins	Still being assessed	Reduction of nutrients and salt into waterways	Native Biodiversity group
	Works					
2.5	Consistent pumping and reuse by existing pumps	Complete metering and licence review for 395 pumps	395 pumps using 45,000 ML/yr to serve 45,000 ha	395 pumps using 45,000 ML/yr to serve 45,000 ha	Reduction in nutrients and salt entering the waterways Improved health of wetlands and waterways	SSWG
2.6	Installation of new private pumps broadacre	20 pumps	95 pumps reusing 10,820 ML /Yr to serve 10,820 ha	365 pumps reusing 40,000 ML/yr to protect 40,000 ha	Improved health of remnants	SSWG

	Management Action*	One year target	Five Year target	Plan end target 2023	Benefits to other strategies	Responsibility Primary (Secondary)
2.7	Installation of tile drains to protect existing horticulture areas (mainly at Shepparton East)	69.1 ha	85 ha	300 ha	Improved health of wetlands and waterways Improved health of remnants	SSWG
2.8	Installation of groundwater pumps to protect existing horticulture areas (mainly at Shepparton East)	12 pumps to serve 300 ha	31 pumps to serve 775 ha	40 pumps to protect 1000 ha	Increased environmental flows and improved habitat and health of waterways	SSWG
2.9	Install new public pumps discharging to regional channels or drains	40 pumps to serve 8000 ha	61 pumps to serve 12200 ha	375 pumps to protect 75000 ha	Improved health of wetlands and waterways Improved health of remnants	SSWG
2.10	Install new public pumps discharging to evaporation basins	Develop criteria and guidelines and install 1 basin	1 pump and basin to serve 200 ha	50 to serve 10000 ha		SSWG
2.11	Regulated discharge of pumped groundwater to River Murray to avoid or minimise salt accumulation within the Region's soils and aquifers	2.87 EC	5.09 EC	15.7 EC (including an allowance of 3.7 EC for tiles/low capacity pumps in non-horticultural areas)	Reduction in nutrients and salt entering the waterways	SSWG and SWMWG
2.12	**Protection of environmental features (such as remnant vegetation, wetlands and streams)**	Develop criteria and guidelines and install 1 pump	1 pump primarily serving an environmental Feature	Yet to be determined	Improved health of wetlands and waterways Improved health of remnants	SS WG & Environment WG

	Investigations					
2.13	Review performance of Phase A pumps schemes	Commenced	Completed		Reduction in nutrients and salt entering the waterways	SSWG
2.14	Priority Issues identified in the *Review of Strategy Development and Research Project Needs*	Develop list of priority R&D issues	Still being assessed	Still being assessed		SSWG
2.15	**Evaluate existing pump sites and add selected sites to native biodiversity M&E process**	6 initial (12 detailed)	30 initial (10 detailed)	Still being assessed	Improved health of wetlands and waterways Improved health of remnants Improved biodiversity	Native Biodiversity group

*** Former Environment Program Management Actions are in bold**

Table 24 - Sub-Surface Water Management Program actions and targets

12.3 Farm Program

12.3.1 Description and Strategic Direction

The Farm Working Group has developed seven sub-goals that provide more detail on the direction that the program will be taking in the next five years and these are to have:

- sustainable irrigated farming in the SIR
- sustainable management of non-irrigated land within the SIR
- reduced down stream impact of nutrients on water quality from irrigated farming and non irrigated practices
- enhanced natural ecosystems on private land and associated public land, with consideration to their relationship to surrounding systems
- reduced ground water accessions, soil salinisation and waterlogging
- reduced need for regional salt disposal
- build well supported, viable farming communities.

The Farm Program has continued to develop over the past 10 years to include a broader range of activities and groups such as pest plant and animal management, Landcare, planning such as through Local Area Plans, multiculturalism and farm forestry.

Emerging issues that the Farm Program will respond to include:

- Local Area Planning – complete the planning phase and assist groups in implementing their plans
- Targeting different cultural groups
- Undertaking risk management analysis
- Greenhouse gas emissions
- Land use
- Environmental Management Systems
- Rural Water Reform

12.3.2 Assumptions

- A reduction of 8.25 ML of runoff is achieved by an automatic irrigation system installed on an average property, which retains 0.003 tonnes of phosphorous and 0.13 tonnes of nitrogen on the farm.
- There is a reduction of 17.5 % of accessions to groundwater on the average farm laid out in accordance to a WFP (including laser grading 10 % and installation of farm surface water management 7.5 %).
- The installation of a farm surface water management reuse system saves 0.67 ML per hectare of surface water management and intercepts 0.4 kg/ML phosphorous, 1.6 kg/ML nitrogen and 300 kilograms of salt / ML (on an average area serviced of 60 hectares).
- Average farm has 5ML/ha irrigation and 5% average accessions.
- G-MW estimates that of the 271,900 ha of flood irrigated land in the Shepparton Irrigation Region, 80,263 ha was already lasergraded in 1986/87.
- G-MW estimate that 10-15% of properties had a surface water management reuse system installed and operating efficiently at the beginning of the Plan.
- GMW estimate 10% of properties have completed Whole Farm Plans at the beginning of the Plan.
- Local Area Plans will accelerate on-ground works.
- Small capacity, shallow farm drains can lead irrigation and rainfall runoff to surface water management reuse and/or the regional surface water management system. These drains act to reduce groundwater accessions by at least 7.5% if regional surface water management is available. Other benefits range from reduced waterlogging and improved farm productivity through to improved pasture/crop yields

and, if surface water management reuse is incorporated, increased irrigation water availability.

- Revegetation occurs at 5ha/landowner for tree growing grants and 1ha/landowner for private land environmental grants.
- Only 3.7% of the SIR is covered by remnant vegetation.
- Plantations have been shown to reduce the watertable in the immediate vicinity dramatically. However trees stressed by surface water logging are likely to dieback, and individual trees will have little impact on groundwater levels.
- High salinity levels also result in an alteration of the species diversity and distribution in a community.
- Trees and shrubs that are under stress from waterlogging will be more susceptible to insect attack and fungal attack which ultimately maybe the cause of death of the tree.

12.3.3 Costs and benefits of the Farm Program

A distinct difference between this economic analysis and previous analyses has been the recognition (widely accepted) that a major economic benefit from landforming and modern, efficient irrigation layouts, is the significant labour saving that enables managers to more effectively implement the best management practices that are necessary to deliver water use efficiency and minimize accessions to the watertable. Whilst it could be argued that labour saving is a private benefit, it is an integral component of a successful land and water management outcome, i.e. you have to have the time to implement the best practices. Automatic flood irrigation provides another labour saving best practice by consistently causing turn on and shut off of water at the right time, every time and avoids over-watering. Reuse systems catch any runoff from irrigation or rainfall events as well as any salt and nutrients contained in the water. The benefits of nutrient interception are not included in this analysis. They are included in the Goulburn Broken Water Quality Strategy.

The Net Present Value of the Program is $142.38 million and the Benefit/cost ration is 1.33.

12.3.4 Priorities

The main tool for prioritisation in the Farm Program is through the Local Area Plans. The sub-catchments that are identified as high priorities for SIRCS activities will undergo the LAP development and implementation process. Priorities have been identified for Research and Development and other prioritisation processes have been undertaken as part of identification of activities. The details can be found in the Farm Review Document.

12.3.5 Farm Program Management Actions

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
	Planning					
3.1	Development of a strategic process to incorporate strategic planning in the WFP process	Commenced	Complete			Farm and Environment WG
3.2	Statutory Planning referrals	200	1000	4,000	Protection of wetlands, waterways and remnants	Native Biodiversity WG
3.3	Develop strategy for targeting catchment programs to high recharge sites	Develop strategy	Implementation	TBA	Reduction in nutrients and salt entering the waterways	Native Biodiversity WG
	Extension					
3.4	Preparation of Whole Farm Plans - 10 % will be dryland properties (number)	140	700	5,250	Reduction in nutrients and salt entering the waterways Improved health of wetlands and waterways Improved health of remnants Increased extent of vegetation	Farm WG
3.5	Improving water use efficiency through the WFP process	Still being assessed	Still being assessed	Still being assessed	Reduction in nutrients and salt entering the waterways	Farm WG

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
3.6	Support for Local Area Plans (LAP) and Landcare to increase community capacity in natural resource management (Plans and Groups)	8 LAP 1 Landcare Network 46 landcare groups	LAP 1 Landcare Network 46 landcare groups	LAP 1 Landcare Network 46 landcare groups	Reduction in nutrients and salt entering the waterways Improved health of wetlands and waterways Improved health of remnants Increased extent of vegetation Reduction in pests	Farm WG
	Works					
3.7	Irrigated Farm Management – Landforming and managed to best available management practices (hectares)	9,000	45,000	375,000	Reduction in nutrients and salt entering the waterways	Farm WG
3.8	Installation of Irrigation Re-use Systems as part of development of all WFP (number)	50	250	2,788		Farm WG
3.9	**Revegetation (Plains Grassy Woodland and Riverine Grassy Woodland) as part of the development and implementation of WFP (ha)**	500	2500	50,000	Improved health of wetlands and waterways Improved health of remnants Increased extent of vegetation	(Farm WG) Native Biodiversity WG
3.10	Protection and enhancement of native vegetation through the LAP process (sites)	50	250	1,000		(Farm WG) Native Biodiversity WG

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
3.11	Install automatic irrigation systems (ha)	500	2500	20,000	Reduction in nutrients and salt entering the waterways	Farm WG
3.12	**No Victorian Rare or Threatened Species (VROTS) are harmed by the WFP process and that any identified VROTS have their viability enhanced**	Enhanced VROTS viability	Enhanced VROTS viability	Enhanced VROTS viability	Increased extent of vegetation Improved health of remnants Improved biodiversity	(Farm WG) Native Biodiversity WG
3.13	**Develop seed production areas in the SIR and development of a seedbank in the SIR**	1 area 0.2 tonnes seed	5 areas, 1.1 tonnes seed	Still being assessed		Native Biodiversity WG
3.14	**BMPs on Public reserves in the SIR**	No sites	Still being assessed	Still being assessed		Native Biodiversity WG
3.15	**Direct seeding of endangered and vulnerable EVC**	2,161 ha	10,810 ha	64,857 ha by 2030		(Farm WG) Native Biodiversity WG
3.16	**Endangered and vulnerable EVC Remnants protected**	100 ha	500 ha	2,000 ha		(Farm WG) Native Biodiversity WG
3.17	**Endangered and vulnerable EVC revegetation**	150 ha	750 ha	3,000 ha		(Farm WG) Native Biodiversity WG

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
3.18	Farm Forestry established (ha)	25 ha (100 tonnes harvested)	150 ha (500 tonnes harvested)	1,000 ha (10,000 tonnes harvested)	Increased extent of vegetation	Farm WG
3.19	Implementing the Weed Action Plan – targeted are for control (hectares per year)	100,000	100,000	200,000	Reduction in pests	(Farm WG) Native Biodiversity WG
3.20	Pest animal control (hectares/yr of targeted rabbit control) (hectares/yr of targeted fox control)	8,000 15,000	8,000 15,000	8,000 15,000		Farm WG & Native Biodiversity WG
3.21	Farm drains (ha)	5,000	14,000	106,000	Improved health of wetlands and waterways Improved health of remnants	Farm WG and SWM WG
	Investigations					
	Ten priority areas of research and development have been identified as requiring further investigation. These include: Development of a formal decision framework for integrated land and water management	§	§	N/A	Improved health of wetlands and waterways Improved health of remnants	Farm WG, Surface Water WG, RH&WQC

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
3.22	Increasing efficiency of water use Management of nutrient pollution and water Acceleration of adoption on farms of technologies and management practices Management of salinity and shallow watertables Greenhouse gas emission Biodiversity in irrigated landscapes Soil Health Structural adjustment End of valley targets for water quality and quantity	§ §	N/A	Increased extent of vegetation Reduction in pests Improvement in soil health		
3.23	**Investigate Bush Tender Trial in SIR**	Commence	Complete			Farm WG & Environment WG
3.24	**Investigate Farm Forestry contribution to native biodiversity**	Commence	Complete			Farm WG & Environment WG

	Management Action*	One year target	Five Year Target	End of strategy target 1990 -2020	Benefits to other strategies	Responsibility Primary (Secondary)
3.25	Other areas of investigation include: Investigate opportunities for incorporating farm forestry into the farm program Assessing what nutrient reductions the farm program can achieve Application of Environmental Management Systems (EMS) Investigations of the future of summer pastures	§	§	N/A	Improved health of wetlands and waterways Improved health of remnants Reduction in nutrients and salt entering the waterways Increased extent of vegetation	Farm WG, Surface Water WG, RH&WQC

§ as funding and prioritisation process allow.

* **Former Environment Program Actions are in bold.**

Table 25 - Farm Program actions and targets

12.4 River Health Program

12.4.1 Description and Strategic Direction

Rivers and streams within the region have undergone major changes since settlement. These changes, together with increased use of the streams and adjacent floodplains have resulted in many problems including:

- Increased stream and gully erosion.
- Increased rate and incidence of bank erosion.
- Threats to public and private assets by stream damage.
- Decline in the quality of water.
- Loss of riparian vegetation and decline in stream frontage condition.
- Decline in the condition of aquatic and terrestrial habitat.
- Loss of connectedness between rivers and floodplains.

Streams within the region are highly valued for a range of reasons: potable water supply, stock and domestic water supply, recreation (both passive and active), the presence of threatened and vulnerable fish species, aesthetic beauty, and biodiversity values for example. Stream health in the region is of vital importance, not only for the local region but also for communities over 500km downstream. Action is necessary to protect the environmental, social and economic benefits that the streams provide our communities.

12.4.2 Assumptions

Protecting riparian lands will result in an increase in Index of Stream Condition rating for Riparian Zone and Channel Form sub-indices.

Stabilising waterways and riparian zones for water quality by incorporating filter strips along streams will minimise phosphorous by 6.5kg/km in the SIR.

Reducing nutrient loads into the River Murray will reduce the risk of nutrients from the SIR causing or contributing to algal blooms downstream.

12.4.3 Costs and benefits of the River Health Program

The economic evaluation of the SIRCS River Health Program was conducted by Read Sturgess and Associates with SKM. The evaluation includes separate evaluations of:

- The Lower Goulburn River
- The Broken Creek and
- The Western Catchment

These reports discuss in great detail, the methodology for describing costs and, importantly, both priced and unpriced benefits. It also highlights the difficulty in predicting Blue-Green Algae outbreaks in the respective sub-catchments and the occurrence of flooding that may impact on the level of benefits from improved levees. The following tables describe the various impacts that are considered in the analysis and result in a range of possible benefits over the life of the River Health Program. It should also be noted that this Program is an integral component of the Whole of Catchment (Irrigated and Dryland) River Health Program.

12.4.4 Priorities

- Goulburn River – Heritage River
- Broken Creek – Wetland Values and Ecological Healthy River
- Seven Creeks Systems (Water Quality and stresses to Goulburn River)

More detailed analysis is currently being undertaken using a decision support database. Priorities will be updated when results are known.

12.4.5 River Health Program management actions

	Management Action	One Year Target	End Plan Target 2002 - 2012	Benefits to other strategies	Responsibility Primary (Secondary)
	Planning				
4.1	Development of a strategic process to the development of works and action plans	-	-	Alignment of common activities to other strategies	CMA - SIRIC (Community Stakeholders RH&WQC)
	Extension / Works				
4.2	Implement a strategic works and activity program based on regional priorities and local support.				CMA - SIRIC (Community Stakeholders RH&WQC)
	Sediment and Nutrient Initiatives			Reduction in sediment and salt loads into waterways	
	Bank Protection	1	10		
	Bank Protection	2	21		
	Grade Control (a.)	5	55		
	Grade Control (b.)	5	46		
	Grade Control (c.)	5	55		
	Aquatic biodiversity			Improvements in in-stream health	
	Establish SEAR's	3	30		
	Native Vegetation			Increased extent and quality of native vegetation	
	Fencing (protection)	35	341		
	Fencing (revegetation)	15	152		
	Revegetation (no plants)	30,000	333,188		
	Fish Migration			Improvements in in-stream health	
	Vertical Slot / m		3		
	Rock Ramp		14		

	Removal of barrier		5		
	Enhance / protect water quality		6	Reduction in sediment and salt loads into waterways	
	Implementation of Urban Stormwater Strategies		3	Reduction in sediment and pollutants loads into waterways	
	Vegetation management within riverine zones			Increased extent and quality of native vegetation	
	Management of woody weeds	100	1,000	Reduction in pest plants	
	Control / eradicate Aquatic Weeds	0			
	Contain / eradicate riparian weeds	2	200		
4.3	Community and recreation programs	various		Reduction in nutrients. Improved waterway health	CMA - SIRIC (Community Stakeholders RH&WQC)
	Investigations				
4.4	Benchmark Surveys			Reduction in nutrients. Improved waterway health	CMA - SIRIC RH&WQC
4.5	Application of ISC and other Monitoring				CMA - SIRIC (Other Stakeholders RH&WQC)
4.6	Benchmarks and performance monitoring		5% of program implementation		CMA - SIRIC (Other Stakeholders RH&WQC)
4.7	Research and Development				CMA - SIRIC (Other Stakeholders RH&WQC)

Table 26 - River Health Program actions and targets

12.5 Implementation Support Program

12.5.1 Description and strategic direction

This program contains the implementation actions for the SIRCS. Most of the actions are derived from section 9, the Catchment Management Standards.

12.5.2 Assumptions

- That building community capacity maximises the outcomes from the SIRCS.
- Including the community in the implementation and decision making of the SIRCS leads to better results.
- That making decisions based on the social, economic and environmental costs and benefits leads to a more balanced program.
- Fair cost sharing is more likely to attract investors.
- Large Scale or landscape change may be the only way to achieve some natural resource outcomes in some areas.
- Cultural Heritage is important and should be taken into account with activities that the SIRCS undertakes.
- That an adaptive management system will lead to better quality decisions, priorities and outcomes.

12.5.3 Costs and Benefits of Program Support

The analysis of this program involves the discounting, at 4%, of the expected Program Support costs over 50 years (current dollars).

The Implementation Support Program Costs include:

- DSE/DPI Program Management and Coordination
- G-MW Program Management and Coordination
- GB CMA Program Management and Coordination
- Community Support
- Community Education
- On-going Planning and Adaptive Management

These costs do not include the cost of agency staff directly involved in the delivery of the other implementation programs but does involve the key co-ordinating activities, planning and capacity building initiatives for the wider community. The analysis assumes an annual investment over the life of the Strategy of $1.36 million.

The success of the SIRCS over the last 12 years has been the capacity of management to support the agencies and the community representatives and landholders during the planning and implementation phases of the Shepparton land and water management programs (i.e. the SIRCS). A key social benefit has been the strong growth in the capacity of both agency and community people to understand the width and depth of the environmental, social and economic issues they have been asked to deal with and the interrelationship between all of them. Other economic and environmental benefits are already included in the previous four works programs.

12.5.4 Implementation Support Program management actions (capacity building)

Management actions – general implementation support

The actions in Table 27 have been generated from the list of standard practices (see Section 9).

CMA standard practice theme management action (capacity building)		Target 1990 - 2020	Benefits to other Strategies	Responsibility Primary (Secondary)
Strategic partnerships				
5.1	SIRIC, with community representation, will oversee the overall implementation of the SIRCS and will provide information and direction to the Implementation Committee. Actions will be undertaken by the program Working Groups with technical support from the RH&WQC, Biodiversity Committee and SIRTEC.	Ongoing	RCS	SIRIC
5.2	Local Governments involved in SIRIC (policy development) with a view to applying principles to their planning schemes and other strategic documents and amending where necessary.	3 Local Govts	RCS	SIRIC (Local Govt/
5.3	Agencies (including DSE, DPI, G-MW, DOI, and the Commonwealth) involved in SIRCS with a view to incorporating SIRIC goals into their policy and implementation of works.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI,GMW, GVW, DOI)
5.4	Assess opportunities for private industry to invest in natural resource management.	Ongoing	RCS	SIRIC (Industry)
5.5	To review staffing co-ordination to improve the effectiveness of delivering the SIRIC (including ensuring operating agreements are in place). Particularly with the potential incorporation of the Environmental Program into all SIRCS programs.	Ongoing	NVMS, Riverine Health and WQS	SIRIC (DPI)
5.6	Review and implement a Communications Strategy with particular emphasis on continuing to enhance community engagement	2002 and ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
5.7	Meet responsibilities in the RCS Operating Agreement and identify stakeholders that need to have an operating agreement (e.g. GVW). Clarification of SIRIC leadership role.	Ongoing		SIRIC
Rigorous priorities				
5.8	Compile list of opportunities for synergies between managing for salinity, biodiversity, water quality and other natural resource management issues.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI, RH&WQC)

CMA standard practice theme management action (capacity building)		Target 1990 - 2020	Benefits to other Strategies	Responsibility Primary (Secondary)
5.9	Annual priority setting process through community based IC to produce priorities document.	Annual	RCS, NVMS, Riverine Health and WQS, PPA Action Plans	SIRIC
5.10	Develop decision checklist for managing risk when planning and implementing SIRIC projects.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
Costs shared fairly				
5.11	Review cost-sharing arrangements annually.	Annual		SIRIC
5.12	Continue to improve the knowledge on the social, economic and environmental benefits and costs of implementing the SIRCS.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
5.13	Compile an inventory of SIR assets / values, threats and management opportunities. (Section 1 provides broad information on assets. The Statewide Assets Identification Project will provide more information.)	2004	RCS, NVMS, Riverine Health and WQS	SIRIC (G-MW, DPI)
Focus on the large scale				
5.14	Contribute and support the Local Area Planning and other planning processes.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI)
5.15	Contribute to the catchment investigations into large-scale land use change using land capability mapping.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI)
5.16	Contribute to the Lower Goulburn Floodplain Rehabilitation Scheme	Ongoing	RCS, NVMS, Riverine Health and WQS	CMA (RH&WQC & SIRIC)
Cultural heritage				
5.17	Include cultural heritage values all SIRIC activities.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI, AAV)
Clear accountabilities				
5.18	Review Operating Agreements pertaining to the SIRCS annually and include a review of staffing arrangements of organisations implementing the SIRCS recognising that overlap is acceptable if duplication is avoided.	Annual	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI, G-MW)
5.19	SIRIC monitors, evaluates and modifies works projects and	Annual and	RCS, NVMS,	SIRIC

	CMA standard practice theme management action (capacity building)	Target 1990 - 2020	Benefits to other Strategies	Responsibility Primary (Secondary)
	research projects directly related to implementation, including prepare annual works program and have an input into relevant IC works programs.	ongoing	Riverine Health and WQS	(and partners)
5.20	Provide input into CMA Business Plan, IC Schedules and other funding processes.	Annual	RCS	SIRIC (DPI, G-MW)
5.21	Reporting quarterly to the stakeholders (RH&WQC, Biodiversity Committee, CMA Board, Commonwealth, G-MW, DPI and DSE) on budgets and outputs.	Quarterly and ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
5.22	Reporting on an annual basis against longer term outcomes (aspirational) listed in section 4.	Annual	RCS, NVMS, Riverine Health and WQS	SIRIC
5.23	Review and Evaluate the SIRCS by linking goals and accountable actions of annual business planning process with goals and actions listed in this strategy.	Annual	RCS, NVMS, Riverine Health and WQS	SIRIC
5.24	Review the SIRCS every five years for inclusion in the 5 yearly review of the RCS	2007	RCS, NVMS, Riverine Health and WQS	SIRIC (and partners)
5.25	Collect, store and manage information to facilitate reporting to stakeholders (RH&WQC, ICs, DPI, DSE, G-MW, funders and community) including the report on Catchment Condition.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (and partners)
5.26	List duty of care for land and water managers.	2004	RCS, NVMS, Riverine Health	SIRIC
Adaptive management systems				
5.27	Continue to develop evaluation process including the documentation, analysis and review of assumptions	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
5.28	Continue with the monitoring program. Provide information and data to appropriate stakeholders.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI, G-MW)
5.29	Manage and incorporate all relevant research into the SIRCS issues.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC (DPI, G-MW)
5.30	Identify information gaps annually.	Annual	RCS, NVMS, Riverine Health and WQS	SIRIC (and partners)

CMA standard practice theme management action (capacity building)	Target 1990 - 2020	Benefits to other Strategies	Responsibility Primary (Secondary)
5.31 Undertake investigations on the following issues as identified in the SIRCS review process: • Development of biodiversity performance indicators • Potential use of and links with the *National Framework for Management & Monitoring of Australia's Native Vegetation* • Resource condition goals be set for native biodiversity for SIRCS and sub-programs • Resource condition goals be set for ecosystem services for each program • Study on the cumulative impact of changes in surface water management on native biodiversity • Water allocation and use • Land use planning (including social and environmental impacts) • Investigate environmental credits and trading systems • Use of information technology across all SIRCS programs • Understanding and applying ecosystems services project to the SIRCS • Investigate population trends, requirements and impacts on the SIR and implications for the SIRCS	Ongoing		SIRIC (other partners as required)
5.32 Investigate the development of a systems approach (such as Bayesian networks) to document processes and ensuring quality control.	2003	RCS, NVMS, Riverine Health and WQS	SIRIC
5.33 Provide input into holistic environmental planning processes at the farm, local and sub-catchment levels.	Ongoing	RCS, NVMS, Riverine Health and WQS	SIRIC
5.34 Future of the Environment Program, integration within all SIRCS	2003	NVMS and WQS	Native Biodiversity WG

Table 27 - Program Support (General) Actions and Targets

Management Actions – Biodiversity support

former Biodiversity Action Plan

The actions in Table 28 have been generated from the draft Biodiversity Action Plan (November 2002) that was produced in response to the Environment Program Review (2001).

Biodiversity Action Plan management action (capacity building)	Target (5 year)	Benefits to other Strategies	Responsibility Primary (Secondary)
Planning/Review			

	Biodiversity Action Plan management action (capacity building)	Target (5 year)	Benefits to other Strategies	Responsibility Primary (Secondary)
5.35	Implement recommendations of the Environmental Program Review	Completed	RCS, NVMS, Riverine Health	Native Biodiversity WG
5.36	Develop Wetland Management Plans	6 Plans	NVMS, Riverine Health	Native Biodiversity WG
5.37	Develop Terrestrial Management Plans	11 Plans	NVMS	Native Biodiversity WG
5.38	Review EMP Operational Guidelines and Environmental Assessment Processes	n/a	NVMS	Native Biodiversity WG
5.39	Review EMP Operational Guidelines and Environmental Assessment Processes	44 priority catchments	NVMS	Native Biodiversity WG
5.40	Develop an annual environmental water allocation for SIR Wetlands	Ongoing	NVMS, Riverine Health	Native Biodiversity WG
Extension				
5.41	Undertake tours, presentations, lectures	125 requests	RCS	Native Biodiversity WG
5.42	Engage community in Biodiversity Action Planning	5 BAP	NVMS, Riverine Health and WQS	Native Biodiversity WG
Monitoring and Evaluation				
5.43	Develop a comprehensive evaluation and reporting system	Completed	NVMS, Riverine Health, RCS	Native Biodiversity WG
5.44	Link 10 existing and 10 new environmental protection grant sites into a monitoring and evaluation process	10 existing and 10 new	NVMS	Native Biodiversity WG
5.45	Environmental Mandatory Monitoring	4 terrestrial & 3 wetland	NVMS, Riverine Health	Native Biodiversity WG

Table 28 - Implementation Program Support (environmental) actions and targets

12.5.5 Management action target summary (onground works)

Management action	Present Levels* (June 2001)	2001-02 Targets* (one year)	2005-06 Targets* (five year)	Plan End Targets* (2020)
SURFACE WATER MANAGEMENT PROGRAM				
Surface water management (Primary) Area protected (ha)	14,653	17,060	23,300	76,000
Primary Drain Constructed (km)	149	164	224	314
Drain remodelling	39	47	79	282
Surface water management (Community)				
Area protected (ha)	48,100	52,730	64,380	210,200
Community Drains (km) – dependant on demand	479	507	619	2,102
Surface water management Diversion				
Nutrient removal systems – No.	13	23	63	200
Nutrient removal systems – Volume ML	2,315	3,000	7,500	30,000
Drain course declaration – km	15	30	75	562
Number of re-use schemes (no)	2,610	2,000	2,200	5,360
Water harvesting (ha)	0	725	3,630	3,630
Protection of remnant vegetation (ha)	4,704	tba	tba	
Protection of wetlands (ha)	3,995	5,580	10,557	
SUB-SURFACE WATER MANAGEMENT PROGRAM				
Sub-Surface (Private broadacre) Area protected by new pumps(ha)	23,920	27,476	35,476	40,000
New Private Pumps (no)	196	206	281	365
Consistent Pumping of existing pumps	395	395	395	395
Area protected by existing pumps	45,000	45,000	45,000	45,000
Upgrades (no)	63	in above	in above	95

Management action	Present Levels* (June 2001)	2001-02 Targets* (one year)	2005-06 Targets* (five year)	Plan End Targets* (2020)
Metering (no)	685			765
Sub-Surface (Private horticulture)				
Area protected (ha)	770	770	890	1,000
Private Pumps (no) – new and upgrade	20	19	31	50
Tile (ha)	16	69	85	300
Sub-Surface (Public)				
Area protected (ha)	4,200	8,000	12,200	85,000
Public Pumps (no)	26	40	61	375
Salt Disposal (including surface)				
Evaporation Basins	2	4	12	50
Potential SDA (EC)	2.48	2.87	5.09	10.8
FARM PROGRAM				
Whole Farm Plans (no)	2,256	2,543	3,103	5,250
Landforming/Lasergrading (ha)	130,000	139,000	175,000	375,000
Farm Drains (ha)	92,000	97,000	-	106,000
Native Biodiversity – Wetlands				
Protection Private Land Environmental Incentives (ha)	254	258	274	400
Protection Public Land Works (ha)	3,865	4,200	5,540	6,500
Native Biodiversity – Vegetation				
Tree Growing Incentives (ha)	300	320	400	1,350
Protection Private Land Environmental Incentives (ha)	428	630	770	2,180
Protection Public Land Works (ha)	510	580	820	
Direct seeding of endangered and vulnerable EVC	N/A	2,161	10,810	43,240
Endangered and vulnerable EVC Remnants protected	N/A	100	500	2,000
Endangered and vulnerable EVC revegetation	N/A	150	750	3,000

Management action	Present Levels* (June 2001)	2001-02 Targets* (one year)	2005-06 Targets* (five year)	Plan End Targets* (2020)
Pest Plants – Targeted area for coordinated control programs (hectares)	50,000	100,000	100,000	200,000
Rabbits – Targeted area for integrated control programs (ha)	4,000	8,000	8,000	8,000
Foxes - Targeted area for coordinated control programs (ha)	4,000	15,000	15,000	15,000
WATERWAYS PROGRAM				
Fish ladders (no)	22	2		
Fishways (no)	In above	2		
Bank control	82	1,000		
Weed control (km)	36	500		
Protection of riparian land (km)	16	50		

* Figures are cumulative.

Table 29 - Management action target summary (onground works)

13 Bibliography

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15 Appendix 1: SIRCS Review 2000-01 (summary)

The SIRCS began implementation in 1990 under the original name of the Shepparton Irrigation Region Land and Water Salinity Management Plan (SIRLWSMP). Several management options were analysed including:

- Do nothing or No Plan,
- Farm Program Only,
- Full Watertable Control,
- Economic Guidelines, and
- Preferred.

The Preferred Plan was a package that included all of the farming community hence making agreement on cost sharing easier across rural and urban areas. This option also was most likely to have the support of local governments. The Preferred Plan provided good coverage of surface water management systems for all but 40,000 ha of the region, and was in areas where the most active and involved farm salinity groups were located.

The original plan has evolved and adapted over time to be a highly successful integrated natural resource management plan. The SIRLSWMP was reviewed after five years of implementation in 1995 and the strategic direction for the second five years was outlined.

Between the 1995 review and this 2002 review, the Auditor General undertook a Salinity Performance Audit (following on from their 1993 audit) in 2000/01. The review found that the salinity management plans were generally moving in the right direction, with there being greater impact on irrigation salinity than dryland salinity. There were a number of recommendations for improvement, to which the Goulburn Broken catchment has been responding.

The review and renewal process of the SIRCS began two years ago and has been comprehensive and systematic. The main tasks were a review of each program (including achievements and evaluation) and setting the strategic direction for the next five years. An enormous amount of work and discussion has occurred in the past two years with the community and partners, and the results are outlined in 9 reports. Five reports were developed for the Surface Water Management Program and one each for the Sub-surface, Farm, Environment and Waterways programs. The Waterway review was a component of the development of a Waterway Implementation Plan for the Goulburn Broken catchment.

The main findings for the SIRCS program reviews are summarised below.

15.1.1 Surface Water Management

The Surface Water Management Program was extensively reviewed between 2000 and 2002. This review process included two workshops with the community and agency representatives to determine:

- What happened in the past five and ten years, how the community responded and how they felt about the program and activities;
- What worked well and what did not, were the community involved and informed of progress and changes;
- The consequences of the activities;
- Future recommendations, what could be done better;
- Characteristics of best practice; and
- Identification of changes in the drivers for surface water management.

The results where the community identified main improvements were:

- Increased environmental monitoring to quantify the benefits and disbenefits of surface water management;
- Enforcement of planning controls over earthworks in and adjacent to natural surface water management courses;
- Application of new techniques and design features to old drains;
- A greater emphasis on timely education of individual landowners about surface water management issues and design standards before community meetings are held to initiate community surface water management schemes;
- A better transfer of knowledge on proposed works between vendors and purchasers of land; and
- Improved construction management skills for those charged with supervising the construction of Community Surface Water Management Systems.

The review also identified 9 main issues that warranted further discussion, investigation or resolution. These were related to level of service, design features, environmental assessment, cultural heritage, economic evaluation, community participation, documentation development controls, and project management. Some of these issues were resolved as part of the review process during 2000 – 02; others will continue to be addressed.

There have also been a number of changes that have occurred in the Surface Water Management Program as part of continuous improvement in implementation. Greater understanding and inclusion of environmental features such as wetlands and remnant vegetation by the irrigation community has resulted in a more balanced program of works. Roles of state and local governments have changed. GMW is constantly reviewing and improving its design and construction practices.

At roughly the same time as the above review process, DNRE and the MDBC commissioned an independent review of the surface water management programs in Northern Victoria. This review is known as the Nolan Review and concluded that “the surface water management programs are providing significant environmental benefits… and are also performing at a high level in regard to practices and approaches being taken to achieve beneficial environmental outcomes”.

The Nolan Review also made some recommendations for improvement of the program, which have been included in the Surface Water Management review and are now being addressed.

15.1.2 Sub-surface Program

The 2002 Sub-surface program review built on the audits of the Farm Exploratory Drilling Service (FEDS) and public pump program undertaken in 1996 and 1998 respectively. There were a number of outcomes from both audits as well as several recommendations. The IC responded to the public pump audit in some detail and has continued to working through the relevant recommendations.

The most critical long-term issues for the sub-surface program (and SIRCS) is the securing of Salt Disposal Entitlements (SDE) for future implementation. Means of securing SDE may include alternative disposal methods, enhanced reuse, changes in surface water management and requirements, purchase of SDE or salt interception schemes.

Other issues that generated recommendations were:

- Review Phase A program performance;
- Public and private disposal basin management and cost sharing guidelines;
- Protection of environmental features;
- Impacts of increasing irrigation supply salinities;
- Alternative disposal methods for moderate to high salinity groundwater;
- The amount of pumping required for groundwater and/or salinity control;
- Review the effectiveness of works;
- Farm management of pumped groundwater;
- Prioritisation of works at the surface water management catchment scale; and
- Plan resource requirements.

15.1.3 Farm Program

The Farm Program is an important component of the SIRCS. The Farm Program has evolved in the past five years in response to changing funding and community requirements. Stronger links have been fostered between the community, agencies and researchers. This has resulted in more comprehensive interaction between these stakeholders and relevant areas of research are informing the Farm Working group on policy formation and decision making.

Through the development of Whole Farm Plans (WFPs), a lot of other works are undertaken in other programs, such as surface water management, groundwater pumping and revegetation. Often the WFPs are the starting point of a long-term commitment to works over many years.

One of the main components of the Farm Program Review was the review of the Whole Farm Plan Incentive Scheme in 2000 (also carried out in 1990 and 1995). The main aims were to assess the effectiveness of the incentives, identify any improvements, determine the level of works that have been undertaken and compare the survey results for 1990, 1995 and 2000.

A survey of 100 landowners who had received a WFP incentive showed 96 % of landowners were satisfied with the scheme and 57 % would not prepare a WFP if there were no WFP incentives. A number of suggestions for improvement of the scheme were identified and are currently being worked through by the Farm Program.

WFPs are not the only activity in the Farm Program, other activities include: support of the Local Areas Plans, research and development, landforming activities, protection and enhancement of native vegetation and pest plant and animal management. The review identified a number of institutional issues that had become important and required further work such as:

- Local Government Planning Scheme amendments;
- Transferable water entitlements (and the relationship to land suitability); and
- Environment Protection and Biodiversity Act and it implications

A number of emerging issues that the Farm program will respond to were identified and include:

- Local Area Planning, the support, future requirements and evaluation;
- Multicultural Issues and targeting specific groups;
- Risk management; and
- Environmental Management Systems.

15.1.4 Environment Program

There were 58 recommendations from the review of the Environment Program. The main recommendations were:

- That the concept of an isolated “Environment Program” be replaced with a system of Environmental Best Practice that is integrated into each of SIRIC’s programs.
- That the Goulburn Broken Biodiversity Mission Statement be adopted
- That the goals, sub-goals, objectives and targets of all SIRCS programs be reviewed for consistency, responsibilities and alignment with the broader Goulburn Broken CMA goals.
- That staff working in native biodiversity continue to refine definitions of "protection" and "enhancement" for the purpose of recording progress in line with federal and state progress on this issue.
- That representative examples of native biodiversity assets that are otherwise threatened by high water tables and salinity be given elevated importance.
- That remnant vegetation and wetlands within high water table areas of the SIR be prioritised so that high priority sites are afforded greater protection from rising watertables.
- That the Monitoring Program becomes more closely aligned with the goals of the SIRIC's activities.
- That a study of the cumulative impact of changes in surface water management on native biodiversity be conducted, including the impact of surface water management schemes and laser grading. (Perhaps most important Recommendation)
- That senior staff within NRE convene a forum to resolve tensions in statutory planning issues, with an emphasis on developing a common vision
- Development of operating agreements
- The second generation Salinity Management Plans, currently under development, allow for the full integration of water quality and native vegetation strategy implementation on a surface water management catchment basis. This should include establishing water quality and other environmental goals, such as key performance measures. In particular, there is a need for unified implementation arrangements for salinity and nutrient management…. (Nolan Review)

- That the principles be enhanced to include the installation of sub-surface surface water management works to protect environmental features where necessary, feasible and consistent with Plan criteria (from Sub-surface review)
- That the tree growing grants process be reviewed, including targeting, benefits and cost-share.
- That the development of biodiversity performance indicators be considered as the focus for a research project
- That a net environmental gain evaluation be undertaken of works such as CSDs and regional drains at their completion.

The most significant issue facing the Environment Program is the future of the program. There has been increasing demands in recent times from the community and governments funding natural resource management works for delivery of "triple bottom line" outcomes, i.e. those that take into account social, economic and environmental costs and benefits. The SIRCS has for the past ten years, naturally been tending towards an integrated approach to implementation that includes delivery of environmental outputs and outcomes as part of normal implementation practices.

The Environment Program is a structural anomaly, environmental issues are not considered as an isolated issue, but is one of the several important outcomes that all of the other programs deliver. Indeed, all of the programs are delivering multiple outcomes, including environmental outcomes.

There are two issues that are important when considering a structural change: How to ensure that the environment best practices are maintained and how to manage the change for the environment team so that roles are clear and positive links are maintained. This is the focus currently.

15.1.5 Waterways / River Health Program

Waterway management in the SIR (and the wider catchment) has undergone some significant changes in the past five years. In 1996, the Lower Goulburn Waterway Management Authority undertook works, developed policy and provided strategic directions for waterway management. Between 1996 and 2001 there have been a number of different arrangements which culminated in 2002 with a catchment wide River Health and Water Quality Committee overseeing all riverine matters.

As part of the 2002 Regional Catchment Strategy review, a new Riverine Health Sub-Strategy has been developed. Under this sub-strategy is a Waterway Implementation Plan (WIP), which documents the works to be undertaken in each of the Implementation Committee areas. As part of the development of the WIP, an internal review of past waterways implementation has been undertaken.

The main changes and inclusions are:

- Targets developed for the three ICs
- Roles and Responsibilities defined
- Costings developed for works
- Five year work plans developed

15.1.6 Setting the Strategic Direction

The overall SIRCS was also reviewed in terms of strategic direction. This was achieved through a series of workshops with the Implementation Committee and other stakeholders. Several scenarios for the SIR were discussed and analysed to arrive at what actions might be needed over the next ten years, as well as what principles were important. Community engagement processes were regarded as critical in the success of the SIRCS, and processes were identified to ensure that community engagement was effective.

Gaps between the current SIRCS and the future SIRCS were identified and these included:

- Understanding ecosystems services and what it means
- Land use change and tools to assist priority setting
- Community engagement, multicultural issues
- Social research issues
- Developing new partnerships
- Using technology to assist planning, monitoring and benchmarking
- Knowledge and information management
- Water use efficiency
- Triple bottom line
- Documentation of existing processes, including assumptions
- Future of land which is retired from production
- Biodiversity and lack of information

The identification of gaps also led to the development of priorities and priority projects. Some of the main priorities were:

- Water allocation and use
- Land use planning
- Larger scale
- Knowledge and information management
- Future of the Environment Program
- Research and development
- Waterways

Further details on these priorities are outlined in more detail in Section 12 including priorities identified for each of the SIRCS programs.

15.1.7 Community Involvement in the Review

This is detailed in section 2.3.

15.1.8 Evaluation of the SIRCS

An evaluation of the SIRCS is not an easy task given that:

- the original SIRLSWMP and the SIRLWMP did not identify specific evaluation questions and there was no explicit evaluation framework,
- some of the targets have changed since the five and ten year review, and

- as the strategy has become more integrated, reporting on progress is more complex and difficult.

An evaluation of the SIRCS for the past ten years has been undertaken to the best degree possible given the above constraints. The positive comments are as follows:

- The works and physical changes that have occurred across the SIR have been very substantial as highlighted in the various tables.
- A shift to a more integrated program has been happening in the last few years.
- The reporting is comprehensive and the inclusion of the assumptions section helps the reader appreciate the basis for much of the connection between the on-ground actions and the broader outcomes.
- The program support area is fundamental to the success of the SIRCS and is a strength of the strategy.

Suggestions for improvement are:

- Specifying whether targets reported on are original or modified,
- Simple questions such as “has the strategy achieved what it wanted” need to be addressed,
- More explanation as to why targets are ahead or behind,
- More information on the investment. For example how much has been spent, where has it been spent and is it in the right balance,
- Some performance targets for the SIRIC and SIR Technical Committee could improve a successful system,
- A planned approach to systematically reviewing how the programs are planned, and implemented could enhance the continued improvement of the SIRCS.

16 Appendix 2: SIRIC and working group memberships

Shepparton Irrigation Region Implementation Committee

Russell Pell (Chair), Peter Gibson (Deputy Chair), Allen Canobie, Bruce Cumming, Steve Farrell, Pat Feehan, Peter McCamish, Athol McDonald, Ann Roberts, Nick Roberts.

Program Review Steering Committees

Surface Water Management Program

The Surface Water Management Steering Committee oversaw the 10 year review of this program and SMEC Victoria Pty Ltd was engaged to undertake the review and strategic plan for the next five years. Committee membership is: Allan Canobie, Geoff Coburn, Stuart Critchell, Pat Feehan, Geoff Lodge, Ross Plunkett, Ken Sampson, Noel Russell, Carl Walters and Geoff Witten.

The 'Nolan Review' (2001), an independent assessment of the environmental aspects for the Surface Water Management Program, also provided some valuable information and direction to the review process.

Sub-Surface Water Management Program

The Sub-Surface Water Management Steering Committee oversaw the 10 year review of this program and Sinclair Knight Merz was engaged to undertake the review and strategic plan for the next five years. The Sub-Surface Water Steering Committee membership is: Ken Sampson, Stuart Critchell, Kevin Chapman, John Avard, Ian Whatley, Peter Dickinson, Terry Hunter, Derek Poulton, Heinz Kleindienst, Bill Trewhella, Bruce Cumming and Matt Bethune.

Farm Program

The Farm Steering Committee oversaw the 10 year review of this program and Innovative Outcomes was engaged to undertake the review and strategic plan for the next five years. The Farm Steering Committee membership is: Bruce Cumming, David Lawler, Chris Norman, Ken Sampson, Alex Sislov, Andrea Smith and Bob Wildes.

Environment Program

The Environmental Management Steering Committee oversaw the 10 year review of this program and Brian Garrett and Associates and Rod McLennan and Associates Pty Ltd were engaged to undertake the review and strategic plan for the next five years. The Environment Steering Committee membership is: Melva Ryan, Ken Sampson, Rolf Weber, Chris Norman.

17 Appendix 3: Definitions

AAV	Aboriginal Affairs Victoria
CaLP	Catchment and Land Protection
CMA	Catchment Management Authority
COAG	Coalition of Australian Government
CSIRO	Commonwealth Scientific Industry Research Organisation
DPI	Department of Primary Industries
DSE	Department of Sustainability and the Ennvironment
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPBCA	Environmental Protective Biodiversity Conservation Act
GBCMA	Goulburn Broken Catchment Management Authority
GGAP	Greenhouse Gas Abatement Program
GMP	Groundwater Management Plan
G-MW	Goulburn Murray Water
SIRIC	Shepparton Irrigation Region Implementation Committee
LAP	Local Area Plans/Planning
LWMP	Land Water Management Plan
LWRRDC	Land and Water Rural Research & Development Corporation (Land and Water)
MDBC	Murray Darling Basin Commission
NHT	National Heritage Trust
O&M	Operations and Maintenance
PPA	Pests Plants and Animals
RCS	Regional Catchment Strategy
SDA	Salt Disposal Allocation
SIR	Shepparton Irrigation Region
SIRAP	SIR Action Plan
SIRCS	SIR Catchment Strategy (2003)
SIRIC	SIR Implementation Committee
SIRTEC	SIR Technical Committee
SIRLWMP	SIR Land and Water Management Program 1995
SIRLWSMP	SIR Land and Water Salinity Management Program 1989
SKM	Sinclair Knight Mertz Consulting
SPAC	Salinity Program Advisory Committee
SPPAC	Salinity Pilot Program Advisory Council
TWE	Trading Water Entitlement
UDV	United Dairy Farmers of Victoria
VFF	Victorian Farmers Federation
WFP	Whole Farm Plan
WUE	Water Use Efficiency

18 Appendix 4: High-level SIRCS management actions (capacity building)

	CMA standard practice	High-level SIRCS Capacity building action	Responsi-bility	To be achieved by
1	**Strategic partnerships**			
1	Involve agency and community stakeholders in key decision-making forums.	SIRIC, with community representation, will oversee the overall implementation of the SIRCS and will provide information and direction to the Implementation Committee. Actions will be undertaken by the program Working Groups with technical support from the RH&WQC, Biodiversity Committee and SIRTEC.	SIRIC Working groups RH&WQC Biodiversity Committee SIRTEC	ongoing
2	Tailor RCS actions for inclusion in community organisation and government agency plans.	Local Governments involved in SIRIC (policy development) with a view to applying principles to their planning schemes and amending where necessary.	Municipal Catchment Coordinator	ongoing
		Agencies (including DPI, DSE, G-MW, the Commonwealth) involved in SIRCS with a view to incorporating SIRIC goals into their policy and implementation of works.		
3	Include private industry sponsorship in natural resource management.	Assess opportunities for private industry to invest in natural resource management..		
4	Develop staffing synergies between organisations implementing the RCS, recognising that overlap is acceptable if duplication is avoided.	To review staffing co-ordination to improve the effectiveness of delivering the SIRIC (including ensuring operating agreements are in place). Particularly with the potential incorporation of the Environmental Program into all SIRCS programs.		
5	Develop targeted awareness campaigns of natural resource management issues.	Review and implement a Communications Strategy with particular emphasis on continuing to enhance community engagement.		

	CMA standard practice	High-level SIRCS Capacity building action	Responsi-bility	To be achieved by
6	Prepare Operating Agreement that defines roles and responsibilities.	Meet responsibilities in the RCS Operating Agreement and identify stakeholders that need to have an operating agreement.		
2	**Rigorous priorities**			
7	Develop Catchment-scale perspective for each issue using tools such as Catchment-scale priority maps, Catchment-scale targets, and a list of opportunities.	Compile list of opportunities for synergies between managing for salinity, biodiversity, water quality and other natural resource management issues.		
8	Check feasibility of proposed actions through involvement of community in long and short-term priority setting processes.	Annual priority setting process through community based IC to produce priorities document.		
9	Check feasibility of proposed actions through formalised risk and opportunity management process.	Develop decision checklist for managing risk when planning and implementing SIRIC projects.		
3	**Costs shared fairly**			
10	Develop cost-sharing arrangements by identifying • benefits and beneficiaries • costs • contributors to costs	Review cost-sharing arrangements annually.		
		Continue to improve the knowledge on the social, economic and environmental benefits and costs of implementing the SIRCS.		
11	Develop an investment plan by compiling information on inventory of assets, threats and opportunities.	Compile an inventory of SIR assets / values, threats and management opportunities. (Section 1 provides broad information on assets. The Statewide Assets Identification Project will provide more information.)		

CMA standard practice		High-level SIRCS Capacity building action	Responsi-bility	To be achieved by
4	**Focus on the large scale**			
12	Develop options for large tracts of land where existing land-use is no longer appropriate.	Contribute and support the Local Area Planning and other planning processes.		
		Contribute to the catchment investigations into large-scale land use change using land capability mapping.		
		Contribute to the Lower Goulburn Floodplain Rehabilitation Scheme		
5	**Cultural heritage**			
13	Include cultural heritage values in risk and opportunity management processes.	Include cultural heritage values all SIRIC activities.		
6	**Clear accountabilities**			
14	Define roles and responsibilities of all partners, especially Commonwealth and state agencies.	Review Operating Agreements pertaining to the SIRCS annually and include a review of staffing arrangements of organisations implementing the SIRCS recognising that overlap is acceptable if duplication is avoided.		
15	Establish a system of short-term *accountable targets* and *actions* and long-term *aspirational targets* and *actions* for each issue based on national and state guidelines.	SIRIC monitors, evaluates and modifies works projects and research projects directly related to implementation, including prepare annual works program and have an input into relevant IC works programs.		
		Provide input into CMA Business Plan, IC Schedules and other funding processes.		
16	Produce progress reports that are regular, clear, meaningful, and link to regional, state and national targets and needs.	Reporting quarterly to the stakeholders (RH&WQC, Biodiversity Committee, CMA Board, Commonwealth, GMW and NRE) on budgets and outputs.		

	CMA standard practice	High-level SIRCS Capacity building action	Responsi-bility	To be achieved by
		Reporting on an annual basis against longer term outcomes (aspirational) listed in section 4.		
		Review and Evaluate the SIRCS by linking accountable goals and accountable actions of annual business planning process with goals and actions listed in this strategy.		
		Review the SIRCS every five years for inclusion in the 5 yearly review of the RCS		
17	Include data management issues in all projects, including data source, custodianship and gaps.	Collect, store and manage information to facilitate reporting to stakeholders (RH&WQC, ICs, DPI, DSE, G-MW, funders and community) including the report on Catchment Condition.		
18	Identify duty of care for land and water managers and recommend changes where legislation is lagging community expectations.	List duty of care for land and water managers.		
7	**Adaptive management systems**			
19	Include monitoring and evaluation as key components of all projects, including listing and analysis of assumptions.	Continue to develop evaluation process including the documentation, analysis and review of assumptions		
20	The Board monitors, evaluates and modifies projects related to policy direction that has Catchment-wide implications, or delegates this responsibility to Co-ordination Committees.	Continue with the monitoring program. Provide information and data to appropriate stakeholders.		
		Manage and incorporate all relevant research into the SIRCS issues.		

	CMA standard practice	High-level SIRCS Capacity building action	Responsi-bility	To be achieved by
		Identify information gaps annually. Undertake investigations on the following issues as identified in the SIRCS reviews.		
21	Use existing systems such as the Code of Forest Practice as a basis for progressing a systems approach, and develop similar systems where these don't exist.	Investigate the develop of a systems approach (such as Bayesian networks) to document processes and ensuring quality control.		
22	Individual site and property plans will reflect broader catchment needs.	Provide input into holistic environmental planning processes at the farm, local and sub-catchment levels.		
		Future of the Environment Program, integration within all SIRCS		

Table 30 - High-level capacity building actions for SIR

19 Appendix 5: High-level SIRCS management actions (capacity building) Self Assessment

Strategic partnerships

Communications

SIR Implementation Committee developed a Communications Strategy in 1999, and it is through the use of effective communication that the SIRCS is a highly successful and dynamic plan. Effective communication is an extremely important area in which the IC sees as vital for the successful implementation of the catchment plan as well as the sustainable future for the community in this region.

This Communication Strategy has been developed to ensure effective and simple two way communication processes are implemented so we have a community that is fully aware and involved in the plans activities. When the community has a high level of understanding of why the plan is necessary what it is going to achieve and how they are to become actively involved, will mean this communications strategy will have achieved its major aim.

The strategy has identified target audiences, delivery systems, key messages, responsibilities, monitoring evaluation and reporting.

The Communications Strategy is currently under review in 2002 and is focussing on defining messages, identifying audiences and developing actions. It is intended that this Communication Strategy will be consistent with overarching CMA and state Communications Strategies.

Roles and Responsibilities

The Goulburn Broken CMA has had an Operating Agreement with DPI/SE for the past few years. The CMA is currently reviewing what Operating and Service Level Agreements are required. This will formalise what has been agreed to in the RCS and sub-strategies such as the SIRCS.

To date roles and responsibilities have largely been implied and understood through the Implementation Committee and the various working groups that implement the four works programs. These responsibilities are detailed in the action tables in section 12 for each of the programs, including program support. Further details of responsibilities can be found in the detailed program reviews.

Community Consultation and Involvement

The community has driven the development and implementation of the SIRCS (and also the original SIRLWMP). Community involvement has been so integral to the management of natural resources in the catchment that it is hard to imagine any other alternative. It is also difficult to document every single process where the community has been involved, except to say that the community is involved at every level, in every

function. Some of the more notable engagement processes are outlined below, particularly in reference to the program reviews undertaken between 2000 and 2002.

Community consultation and involvement in all parts of the SIRCS will continue to be a key element of implementation.

Surface Water Management

Best Practice

In 2000, the Surface Water Management Review undertook a series of comprehensive community surveys and workshops to prioritise surface water management works and to review and identify current best practices in surface water management.

The results of the workshops were changes and amendments to the program in the areas of:

- Level of service
- Design features
- Environmental Assessments
- Cultural Heritage evaluation
- Economic evaluation and cost-sharing
- Community Participation and Community Leadership
- Documentation, eg guidelines, responsibilities
- Development controls
- Works project management

Prioritisation

In 2000, a revised prioritisation of works method was developed with community input. The method included three weighted parameters: economic (55 %), environmental (25%) and community response (20%) factors. The environmental and community response weightings were both 10% in the previous 5 year review in 1995. This increase has come as no surprise to the catchment community as they reflect the change in community expectations and values in the past five years.

Implementation

The community is closely involved in discussions on surface water management system alignment. This is the case for both primary systems and community surface drains, in the case of the community surface drains; these discussions and negotiations can take years to work though.

Sub-surface Drainage

The Sub-surface review was overseen by a Sub Surface Steering Committee with community representatives and also close linkages were maintained with e the Sub-surface Working Group, also with community representation. A workshop in August 2001 involving the community, developed priorities, reviewed other program issues and identified communication requirements.

Farm Program

The Irrigated Farm Census conducted in 1997 provided some good information from the irrigation community about what types of farm improvements were occurring, including the level of activity outside the SIRCS. A Whole Farm Planning review was undertaken in 2000 on a sample of 100 landowners. The review assessed the effectiveness of the program, identified improvements and determined the levels of works undertaken.

The Farm Review in 2001 involved the community in the following ways:

- Steering Committee with community representation,
- A workshop with 20 community members,
- Consultation with 72 landholders who had prepared WFP's regarding their satisfaction with Whole Farm Plans and the WFP Incentive Scheme (96% Satisfaction, 75% have begun implementation, and most will take 6-10 years to complete),
- One workshop involving 30 Sustainable Irrigated Agriculture and Land Management staff. These workshops reflected staff experiences with working with the community,
- Drawing on the extensive liaison with the Goulburn Murray Landcare Network Executive and Landcare Groups so that their perspective could be included in the review process,
- East Shepparton Landcare Group and Ethnic Council involvement to raise Multicultural awareness within the community which has been reflected in the review,
- LAP initiative to establish 8 groups has involved extensive community consultation and participation, and indirectly knowledge and information from this process has been included in the review.

Waterways/River Health

The three main waterway health strategies relevant to the SIR are for the Lower Goulburn River, the Broken Creek and the Western Catchment. Each of these strategies included extensive consultation with the community and other stakeholders. This year the River Health and Water Quality Committee, which oversees management of the waterways and water quality in the catchment and reports to the ICs, has been developing a catchment wide Waterways Implementation Management Plan and an overarching broader and strategic Riverine Health Strategy. Consultation with the community and stakeholders is underway as both of these documents are developed and finalised.

The RH&WQC is a community based committee of the Goulburn Broken CMA.

Overall

Community consultation is and has been a continuous activity. It is part of all implementation and decision making processes, at all levels within the SIRCS and this has been the case since the original Salinity Pilot Program was established in 1985. Community involvement and consultation is one of the main principles on which the SIRCS has been established and implemented.

The SIR community has been involved and consulted from the beginning of the original 1985 Salinity Pilot Program, the 1989 SIRLWSMP, the 1995 SIRLWMP and the current SIRCS. The community has been involved in the decision making that has occurred in

the development of the plans at a technical level as well as the strategic and vision levels. The community has also been involved in the development and implementation of other Goulburn Broken strategies such as the Native Vegetation Management Strategy, Landcare Support Strategy and the Water Quality Strategy

The SIR community is involved at many levels for the SIRCS, both above and below the main SIR Implementation Committee through:

- various state and commonwealth committees and reference groups
- the Goulburn Broken CMA Board
- the Biodiversity and River Health and Water Quality Committees
- the Implementation Committee
- the Programs (as described above)
- various Program Working Groups
- Local Area Planning Groups
- numerous project committees

As part of this 2002 review, a foresighting process, whereby the community and other stakeholders analysed various future scenarios for the SIR.

SIRIC believes that real involvement and inclusion of the community at all levels and at all times is the one of the main drivers of success of the program. The SIRCS is able to remain focussed on outcomes that are in line with community expectations and it is intended that community engagement principles will remain of paramount importance.

Local Government

A major feature of the SIRCS has been the involvement of **Local Government** in implementation. Local Government has been represented on the Plan since the beginning. Several significant achievements have resulted from this partnership with the 3 municipalities which were in the area covered by the SIR. The municipalities support the Municipal Catchment Coordinator (MCC) - to co-ordinate their activities in natural resource management.

Significant involvement by the municipalities includes:

- a jointly fund a position for a Local Government Municipal Catchment Coordinator
- development of the Earthwork Planning Controls (Uniform Planning Regulations)
- adoption of the Regional Catchment Strategy into their Planning Schemes and
- a financial contribution to the salinity program (paid in recognition of the benefits to council assets through the salinity program).

The Implementation Committee works closely with **Local Government** to incorporate wider natural resource issues into their strategic plans and planning schemes. To help local government, landholders, and surveyors and designers to take proper account of natural surface water management systems when developing land, sets of maps were produced to describe the passive and active flow paths throughout the Shepparton Irrigation Region.

As part of the RCS review, a project is looking at alignment of the RCS (and its sub-strategies including SIRCS) and the Municipal Planning Schemes. It is expected that a better outcomes will be achieved for common issues.

Rigorous priorities

There are numerous priority setting processes that occur both at the strategic and annual levels. As part of the SIRCS review process, all programs were required to undertake a prioritisation process for identified activities. Towards the end of the review process, the overall priorities were also identified including works priorities and information gap (or R&D) priorities.

It is worth noting that some activities cannot be prioritised directly as they are dependant on landowner willingness to invest time and resources (eg Community Surface Drains and Whole Farm Plans). However, the IC has other tools, such as directing extension staff to high priority locations, to increase uptake of required activities.

Strategic Priority Setting

Surface Water Management Program

The Surface Water Management Program has a detailed and comprehensive priority setting process for the primary drains and other public infrastructure which includes looking at three weighted parameters as follows:

Factor	Weighting 1995	Weighting 2001
Economic Factor	80 %	55 %
Environmental Factor	10 %	25 %
Community Response Factor	10 %	20 %

Table 31 - Weightings for the Surface Water Management priorities

The 2000 prioritisation process resulted in an increase of the environment factor from 10 % in 1995, to 25 % noted above. This reflects the increased importance that the community is now placing on environmental considerations. Similarly there is a recognition that community response is critical to success of on-ground works. In effect, what we are seeing is a more balanced approach to prioritisation in the program.

Further details of this process can be found in the detailed program review documents.

Sub-surface Drainage

The Sub-surface Draiange Program favours private works where feasible rather than public works and also favours working with recognised landholder groups to maximise regional benefits. In recent years, added priority has been given to private works to meet demand brought about by prevailing dry conditions and limited surface water allocations.

Private Works

Private works are further prioritised by confirming that the property is subject to high groundwater levels (August 1996) and, if needed, giving priority to:

- properties with known salinity problems;
- properties which have potential to provide salinity control to adjoining properties with known salinity problems; and
- properties where some lowering of the generally high watertable level can be achieved.

The reference watertable map for prioritisation is reviewed and adjusted accordingly every year (base year August 1996). The August 1998 – 2001 maps are not considered to be representative due to prevailing dry conditions since 1997. Consequently, the 1996 map was adopted as representative under normal conditions.

Public Works

Where private works are not feasible due to high groundwater salinities and limited reuse potential, site investigations for public pumps are scheduled on the basis of order in which the application is received and accepted. Further prioritisation has not been required to date, as extension activities have been managed to achieve the target of four public pump sites per year on average.

An informal prioritisation process for extension activities was undertaken in the past on completion of FEDS investigations. A more structured and focussed prioritisation process based on a number of parameters was adopted in August 1998 on a preliminary assessment of:

- salinity problems;
- disposal options;
- key landholder support;
- hydrogeological conditions;
- land use;
- surrounding landholder support; and
- environmental benefits.

The information is collected during the FEDS investigation and ranked in order to focus resources.

Eighteen main issues have been identified in the Sub-surface review and these issues have been prioritised as low, medium or high.

Farm Program

Research and Development activities have been prioritised with 10 issues that have been identified as requiring further work. These are listed in more detail in the table of action in Table 25 and in the Farm review (Innovative Outcomes 2001). Emerging issues have been identified but not prioritised. Works have not been prioritised due to heavy reliance on WFPs, which are mainly undertaken according to landowner willingness.

Waterways

Priority setting provides a more efficient investment of resources into riverine restoration and management. Priority setting for waterways is based on three essential tenets

- Prevention is better than cure. This implies a risk-based approach to priority setting.
- Most environmental gain for the buck. This identifies the best opportunities for restoration and opportunity for program integration.
- Willingness of the community and land managers to be involved.

Using these priority setting principles, resources will be targeted towards:

- Protecting Rivers that are of highest value from any decline in condition
- Maintaining the condition of ecologically health rivers (rarity, naturalness, diversity or importance to other systems)
- Achieving a net gain in the environmental condition of the remainder of rivers
- Enhancing / improving the condition of streams threatening those detailed above
- Supporting programs where stakeholder support/participation is high

The Waterways program is currently developing a waterways prioritisation database in conjunction with DPI/DSE.

Overall Strategy

The SIR Implementation Committee undertook as part of a “foresighting” process to prioritise the emerging issues for the SIR. A lot of the priorities were of a research and development nature. The priorities included:

- Water allocation and use
- Land use planning, including the social and environmental issues
- Larger scale projects such as Lower Goulburn Rehabilitation Scheme
- Retaining nutrients within the farm system
- Summer pastures
- Future of the Environment Program
- Research and development, including lack of information to inform decision making at the catchment and farm level
- Waterways, including consideration of water quality and river health
- Alternative funding sources and partnerships
- Financial benefits of SIRCS actions
- Environmental credits and trading systems
- Retaining farm works and public ground water pumping program
- Clarification of SIRIC’s leadership role.
- Continuing to enhance community engagement
- Use of information technology
- Understanding and applying ecosystems services project to SIRCS
- Population, demographics and impacts on SIRCS and community

These priority issues will be pursued over the next five years, further details can be found in the Foresighting Workshop Notes. Activities derived from the above priority issues are also identified in the relevant implementation program or the overall Support Program.

Annual Priority Setting Process

Each year, the SIRIC reviews the priorities for activities and outcomes for each of the high priority issues and produces a SIR Priority document. This document then provides a guide to both community groups and organisations as to the priority activities for the coming year's investment process.

The priorities are updated using the best technical and scientific information available, usually based on the relevant plan or sub-strategy. Obviously, the Priorities Document for the 2003/04 year developed at the end of 2002 will be closely based on the recently reviewed SIRCS. Input from the community is through the various plan Working Groups as well as the Implementation Committee.

It should be noted that not all of the SIR priorities are funded in any one year, because of changing and new investment criteria of various funding sources and limited funding.

Focus on the large scale

The SIRCS is about achieving large scale land use change. The major goals of the strategy talk about having 100 % of the farms with Whole Farm Plans and most of the area drained. These are activities that result in significant land use changes and significant land management changes. A lot of these changes are made through the adoption of best management practices. This type of landscape change is occurring slowly over many years at a pace set by the community.

The Lower Goulburn Floodplain Rehabilitation Scheme is a different type of landscape change. It is a bold plan that looks at addressing the total environmental, social and economic picture of current land use and land management practices. It also involves the compulsory acquisition of some 10,000 hectares of floodplain, which has very serious implications socially and politically.

Local Area Planning is another way in which the community may be able to be involved in large scale land use change. These plans are about achieving larger scale land use and management change in high priority areas. SIRIC will continue to investigate and be involved in other large scale land use change and this will involve closer ties with local governments.

Other landscape changes that have been identified that will require further investigation are:

- Water savings to enhance environmental flows and sustainable regional development.
- Market based approaches including Environmental Management Systems.
- Multiple benefits from investments – build on environmental management grants include other market-based mechanisms – 'auction' systems, 'annuities' & vegetation banks.
- Priority area projects - improved regulatory framework eg dairy shed effluent.
- Enhancing community engagement through the use of 'Deliberative Forums'.
- Expanding salt disposal options for the irrigation areas.
- Exploring opportunities for the region to support greenhouse gas abatement programs.
- Greater role for Local Government – aligning the RCS and Local Planning Schemes

Cultural Heritage

All SIRCS activities comply with the Cultural Heritage Act. 1984. Protection of cultural heritage is one of the main principles of the SIRCS in general and the Surface Water Management and Waterways Programs in particular. The principle adopted in implementing the SIRCS is that heritage sites are respected and identified.

Heritage assessments along the proposed alignments for works and over the surrounding areas are a crucial part of the overall SIR Surface Water Management Strategy. Implementation staff work with Aboriginal Affairs Victoria and local aboriginal communities to identify these sites and agree on the measures to ensure their preservation. The SIRCS has been the major mechanism of identifying and documenting these sites in the region. Prior to implementing the SIRCS, the extent of aboriginal cultural and heritage sites was poorly documented. The waterways program also identifies aboriginal sites as part of the implementation of the works program.

DPI/DSE has a new indigenous facilitator to assist them and the GBCMA work with local indigenous communities.

Clear accountabilities

Reporting processes

- detailed Annual Reports are prepared each year for government and community distribution, which detail the achievements of all aspects of the Plan.
- a summary document which is widely distributed within the region each year.
- Quarterly reporting to the Goulburn Broken CMA Board and DSE/DPI on budget and outputs
- inclusion at all stages of Plan development, refinement and implementation of all relevant sections of the community in the decision making process
- Five year review and reporting process for the SIRCS.

Audits and Reviews

The SIRCS has been audited externally and reviewed numerous times in the ten years of implementation. Audits and reviews include:

- Auditor General's Review of the entire SIRCS in 1993/4.
- 5 Year Review of the Plan in 1995.
- Farm Exploratory Drilling Service audit in 1996.
- Audit of the Public Pump Program in 1998.
- Severe external scrutiny during the Muckatah planning appeal process and a number of Victorian Civil and Administrative Tribunal hearings.
- NHT mid-term review in 1999.
- Auditor General's Review of the entire SIRCS in 2001.
- Nolan Review of the Surface Water Management Program in 2001.
- a number of reviews by Federal departments and funding bodies (MDBC, Environment Australia, DPIE, and the Commonwealth Environment Protection Agency).

The results of the audits have been positive and supportive of the SIRCS and the independent Nolan Review found that:

"overall, and in comparison to approaches being taken elsewhere, current Northern Victorian surface water management programs are providing significant environmental benefits. The surface water management programs are also performing at a high level, in regard to practices and approaches being taken to achieve beneficial environmental outcomes for the agricultural environment.

The surface water management programs (i.e. design, construction, and operation) are currently operating with a high level of environmental sensitivity. Drain design, construction and operational practices are considered to be 'best practice' compared to elsewhere in Australia and overseas. There is a high degree of innovation and continual improvement."

The audits have made various recommendations for improvement in the programs, and all recommendations are taken up and pursued as time and resources allow.

It is envisaged that such external audits will continue throughout the remainder of the implementation of the SIRCS. External audits are welcomed by the Implementation Committee as a means of testing the SIRCS and the outcomes that the strategy is seeking to achieve.

Adaptive management systems

Risk Management Framework

The Goulburn Broken CMA has adopted DSE's Risk Management Strategy Framework and will be working through the framework in the context of the Regional Catchment Strategy. SIRIC will also apply the same Risk Management Framework to the SIRCS.

Background

The activities underpinning the SIRCS must not only be directed to achieving its aims and objectives in an efficient and effective manner, but also to identifying and managing those risks that prevent it from achieving these aims and objectives.

SIRIC will use DSE's Risk Management Strategic Framework and Process in implementing its SIRCS. This has been adapted from the Australian/New Zealand Standard for Risk Management (AS/NZS 4360:1995) and is based on a 6-step approach being applied to the objectives of the Regional Catchment Strategy. These steps are illustrated below;

Identify Risks
↓
Assess Likelihood and Consequence
↓
Identify and Assess Controls
↓
Rank Risks
↓
Treat Risks
↓
Monitor and Review
↓

Approach

Using the above framework, it is recommended that a dedicated session at a future SIRIC or SIRTEC meeting (involving all the key partners) brainstorm the key risks and document their likelihood and consequence. Follow-up work will result in the development of a risk management plan. This document could then be the basis for discussions with the Program Working Groups and the CMA Board.

Initial Identification of Risks to SIRCS

Preliminary identification of risks to the SIRCS achieving its outcomes has been undertaken. These are:

- Government funding is reduced.
- Government funding is withdrawn.
- Insufficient funds to implement the salinity, water quality, and associated biodiversity and river health issues.
- Scientific basis for part or all of the SIRCS is wrong.
- Risks related to losing key project staff and loss of output during their replacement.
- Technical skills of current staff, contractors & landholders insufficient.
- Insufficient people with the right technical skills available to implement the plan.
- Risks associated with changes in NRM policy by Government (State & Federal).
- Organisation capacity does not keep pace with the resources available to implement the SIRCS.
- Risks associated with SIRCS directions no longer being a priority for government.
- Climate and weather impacts impacting on landowners ability to be involved.
- Strategies being implemented through the SIRCS actually lead to a deterioration in catchment health including biodiversity decline and loss of species.
- Insufficient diversity of people engaged and participating. Leading to in-completed ownership, participation and possible conflict in implementing the works plans.
- Risks associated with implementing actions that results in legal action or intellectual property disputes.

A risk management plan will continue to be developed according to the steps outlined above.

Monitoring

We must monitor our strategy implementation performance. We need to know what is happening and if we are achieving results; we need to report to stakeholders and to those who are paying for strategy implementation. The success of strategy implementation is determined by assessing progress against targets for individual actions.

In the SIR and wider catchment, biophysical monitoring is mainly centred around water quality and waterways indicators. The Water Quality Strategy contains further details of the numerous water quality programs. There are a number of monitoring programs operating within the SIRCS and these are:

- Shepparton Drain Salt Load Monitoring Program
- Victorian Water Quality Monitoring Network (plus Wetlands monitoring)
- Major Storages Operational Monitoring Program

- Mandatory Environmental Monitoring Program
- MDBC Routing Monitoring
- Index of Stream Condition
- Waterwatch
- District Watertable Surveys

The most difficult element with monitoring natural resources is that the complexity of the systems involved does not allow for easy comparison of actions and outcomes. Certain assumptions are made, which need to be constantly tested and reviewed.

A new project funded from Water For Growth program that is currently underway in the SIR is the Bayesian Networks project. This project aims to analyse the current water resources practices to assist in decision making. The project will be strongly linked to monitoring systems, documentation and analysis of assumptions as well as evaluation of the SIRCS in general and the Programs in particular.

Assumptions

The SIRCS is based on numerous assumptions at all levels of the strategy. For example, there is an assumption that one kilometre of Community Surface Drain protects 104 hectares of land. This assumption is used to estimate the area of the SIR that is protected by surface water management, which is one of the main strategy outcomes. The main assumptions that have been made in this strategy have been identified for each of the programs in section 12. Further details of the strategy assumptions are currently being documented as part of the Bayesian Network project. Work will still continue in this area as some of the levels at which the assumptions have been made are sorted.

The reasons why documentation of the assumptions is important are:

- That some context for the levels (targets, goals or activities) is made
- Some degree of confidence can be attached to an assumption (i.e. whether an assumption is based on good science and data or whether it is a ‘best guess’
- The community and funder can make better judgements between investments
- The assumptions underpin the monitoring and evaluation of the SIRC.

A Bayesian Network project is underway in the SIR that has identified and documented all the assumptions within the SIRCS. The documentation of the assumptions should contribute to improved monitoring and evaluation processes.

Evaluation Framework

Evaluation is making a judgement about the value or worth of something. In the case of the GB RCS, there are a range of scales and timeframes over which this must be done. This framework is set out to allow evaluation to occur on three fronts:

- accountability (are things achieved that were set out to be achieved?)
- improvement (how can the process be improved to achieve the outcomes sooner, more quickly, more cheaply or achieve greater outcomes?)
- condition (are there changes in catchment conditions that alert us to a new threat?).

Issues

There are a number of issues that were considered in the development of the evaluation framework and these include:

- Assumptions
- Logic
- Time
- Questions
- Related Processes

Evaluation Framework

A prerequisite for the evaluation is that the pathway between the outcomes of the RCS, the sub-strategies and actions under the RCS are documented with the basis/assumptions for the connecting logic. From there, the sequence of steps to complete the evaluation matrix is as follows;

- identify who the key stakeholders are for each part of the strategy, sub-strategy and a plan being evaluated
- establish their key questions
- determine what success would look like in answering their questions
- select appropriate measures that can demonstrate success or otherwise
- set targets for each measure/indicator/indices
- define the methodology for data capture (spatial and temporal collection, data sources, capture processes)
- identify who will collect, collate and analyse data
- determine how the evaluation is conducted, by whom and how it is fed back into the planning process to allow changes (if needed) to be made to the strategy or plan (which is relevant).

Annual Evaluation Review

An annual review of the evaluation process should be conducted to ensure:

- the evaluation is doing justice to stakeholders views/values
- the program learns from what it is doing
- the evaluation is useful to those involved
- it is persisting through implementation
- it remains relatively simple and effective.

Research and Development and Information Gaps

Research and development is regarded as a high priority for the SIRCS. All of the Program Reviews identified (and prioritised) emerging issues and or research and development information gaps. The lists of issues are comprehensive and a summary can be found in the action tables for each program in Section 12. Further details can be found in the individual review documents, and for the Sub-surface Water Management Program, a thorough Research and Development identification and prioritisation process has been undertaken.

It is important to note that with the potential restructure of the Environment Program, research and development requirements for this program have mostly become part of the overall SIRCS Support Program, Section 12.