

Executive Summary

This is a plan to address salinity in the West Gippsland region over the next 5 years. The plan details a package of management actions to reduce and prevent the effect of salinity on the region's assets. The plan also details a time frame for adoption, cost sharing arrangements and roles and responsibilities for implementation.

The plan is an initiative of the West Gippsland Catchment Management Authority as part of its regional natural resource management program. This plan builds on and updates the existing Lake Wellington Catchment Salinity Management Plan (1993) and the draft South Gippsland Salinity Strategy (2000). The West Gippsland Salinity Management Plan was written by Sinclair Knight Merz on behalf of the West Gippsland CMA.

EXTENT AND CAUSES OF SALINITY

There are just over 24,000 hectares of mapped land salinity in the region and approximately 26,500 hectares of wetland or lake salinity that has at least some induced origin. There are still gaps in the mapping of land and water salinity so these areas of salinity are likely to be an underestimate.

Salinity is caused by the following processes:

- Irrigation and land clearing causing an increase in the volume of groundwater recharge resulting in an increase in water table levels bringing salt close to the surface;
- Sea water intrusions to the low lying tidal floodplains in South Gippsland and the Gippsland Lakes through the permanent entrance at Lakes Entrance; and,
- Irrigation with saline water causing an increase in soil salinity.

THE EFFECT OF SALINITY ON THE REGION'S ASSETS

Salinity has significant economic, environmental and social costs to the region's assets.

The key economic impacts of salinity are the loss in agricultural production (between approximately \$7.6 million and \$8.6 million per year currently and increasing to between approximately \$8.4 million and \$9.5 million per year in 2020) and damage to infrastructure (between approximately \$1.6 million and \$2.2 million per year currently and increasing to between approximately \$3 million and \$3.8 million per year in 2020). Also, the loss of environmental amenity, particularly the degrading of wetlands and rivers, can result in a decrease in tourism and the associated economic benefits to the local community. Read Sturgess (1999) estimated that the environmental and economic value of the wetlands may already have decreased by one third from the estimated value of the non-salinised state.

The main social impacts are the flow-on effects from reduced agricultural output including:

- Increased economic stress on farmers and their families;
- Increased unemployment;
- Decreased economic and social well being of towns due to reduced farmer spending.

Environmental impacts of salinity are greatest for wetland and lake assets in the region. For instance, the opening of the permanent ocean entrance to the Gippsland Lakes at Lakes Entrance has resulted in the salinisation of Lake Wellington and many adjoining wetlands. Also, there are approximately 3,740 ha of native vegetation within mapped saline areas including 1,160 ha of native vegetation classified as rare, vulnerable, endangered or depleted. Overall, stream water salinity generally complies with the environmental guidelines stated in the EPA's State Environment Protection Policy (Waters of Victoria) except for some tributaries of the Latrobe River in the Latrobe Valley/Rosedale area (Anderson's Creek, Bennetts Creek, Sheepwash Creek), Merrimans Creek at Seaspray, the Perry River and two drains in the Macalister Irrigation District (Bundalaguah Drain and Nuntin Creek).

THE FUTURE WITHOUT A PLAN

If there is no additional investment in salinity mitigation and rainfall returns to average, groundwater levels are likely to rise over much of the region. Predictions of the change in area of less than 2 metres depth to water table over the next 15 years range from no expected change in the Maffra Salinity Management Area to a 22% increase in the Port Albert Salinity Management Area. The predicted changes in high water table areas for the Nambrok, Clydebank, Heyfield, Bengworden and Foster Salinity Management Areas are in between these two.

Economic estimates suggest that the economic impact on agriculture and infrastructure is likely to rise from the current estimate of between \$9.2 million and \$10.8 million per year to between approximately \$11.4 million and \$13.3 million per year (a 23% increase).

THE STRATEGY

Our vision for salinity management is to reduce the impact of salinity on the health and wealth of our catchments and communities by contributing to improvements in the condition and quality of our water, infrastructure, biodiversity, land and production assets.

The long term 30 year aspirational targets for the region are to:

- reduce land salinity by 50% from 2003 levels in areas of irrigation induced salinity;
- reduce land salinity by 20% from 2003 levels in areas of dryland or ocean induced salinity; and,
- comply with the salinity requirements of the State Environment Protection Policy for surface water quality for priority sites (Waters of Victoria – EPA, 1996);
- decrease the average salinity of Lake Wellington by 30%; and,
- increase the time period where the water salinity of wetlands adjacent to Lake Wellington is below 1,500 μ S/cm by 50%.

There are five major programs to address the different types of salinity affecting West Gippsland – the Irrigation Salinity Management Program, the Dryland Salinity Management Program, the Ocean Induced Salinity Management Program, the Surface Water Salinity Program and the Community and Agency Engagement Program. Each type of salinity is addressed through a number of sub-programs addressing the causes of the salinity (such as reducing recharge by planting trees) or the symptoms (such as enhancing discharge by groundwater pumping) or learning to live with salt in the landscape.

The Irrigation Salinity Management Program is divided into five sub-programs that reduce recharge, enhance discharge or live with the problem (Table ES1). The two key priority actions are to increase groundwater pumping (both groundwater control pumps and private pumps) and to increase irrigation efficiency. These are similar priorities to those successfully employed through the Lake Wellington Catchment Salinity Management Plan. However, the key difference in this new plan is the slightly stronger focus on recharge control methods as a priority over groundwater pumping methods. Although groundwater pumping has been extremely successful in reducing the effects of salinity in the Macalister Irrigation District and surrounds, this method addresses the symptoms and does not encourage farmers to address the main cause of the problem.

Increasing irrigation efficiency has additional benefits including reducing nutrient loads to rivers/lakes and water savings. However, groundwater pumping still plays an important role in salinity mitigation as it has an almost immediate effect on the watertable, whereas recharge control will take significantly longer to have an impact and therefore is part of the longer term solution.

Another key difference is that this plan places a greater importance on improving the productivity of saline land and reducing the effect of salinity on wetlands adjacent to Lake Wellington. Also, the plan provides a review of the current cost sharing arrangements for the conversion of flood to spray irrigation and the operation of public groundwater control pumps based on an analysis of the beneficiaries and economics of these actions.

The Dryland Salinity Management Program is divided into six sub-programs that reduce recharge, enhance discharge or live with the problem (Table ES2). Addressing dryland salinity in the region is in its infancy compared to the relatively mature programs to address irrigation salinity. A long term strategy is outlined to develop sub-catchment plans to address not only dryland salinity but also other natural resource management issues.

The first step in this process is to investigate groundwater flow systems contributing to dryland salinity. Only when the groundwater flow systems are well understood can targeted land management changes be legitimately recommended. Land management changes to address dryland salinity are likely to focus on revegetation activities implemented through existing native vegetation and farm forestry programs.

This plan advocates the use of Whole Farm Planning as being the key over-arching planning tool for on-farm natural resource management activities. A review of Whole Farm Planning extension is proposed in the plan. While targeted land management changes are being planned, improving the productivity of saline land through salt tolerant crops and pastures is a key recommended activity.

The Ocean Induced Salinity Management Program focuses on two key tasks (Table ES3). The first is to investigate and, if appropriate, implement options for reducing the inflow of saline ocean water into Lake Wellington and surrounding wetlands (eg engineering structure in McLennan Straits). The second is to develop and implement drainage plans for key coastal areas of South Gippsland as recommended in the West Gippsland Rural Floodplain and Drainage Plan. Much of these coastal areas are protected from the influx of ocean water by sea walls. Drainage plans would determine whether these sea walls should be maintained, enhanced or dismantled depending on the social, economic and environmental costs and benefits.

Many of the management actions detailed in the irrigation, dryland and ocean induced salinity programs have a positive benefit on wetlands and surface water. **The Surface Water Salinity Program** focuses on two key tasks related to surface water and wetland salinity not covered in the other programs (Table ES4). The first is to conduct an audit of all private and public wetlands in the region (including billabongs) and prioritise the key wetlands affected by salinity for further work. The second is to implement the changes to environmental flows proposed for the Thomson and Macalister Rivers and contribute to environmental flow determination in other key rivers such as the Latrobe, Tarra and Avon Rivers.

The Community and Agency Engagement Program focuses on improving communication with the community and regional agencies as well as communicating results from implementation of the Plan (Table ES5). Proposed activities include communication strategies developed for all research and investigation activities and integration of salinity issues into current community based programs such as Waterwatch, Saltwatch and LandCare. A Local Government Engagement Plan is also proposed to ensure Local Government are appropriately involved in salinity planning activities.

A number of monitoring, evaluation and reporting tasks are recommended in the plan to achieve the following objectives:

- To determine the progress towards the resource condition targets and the aspirational targets;
- To inform investors on the success or otherwise of salinity control works;
- To allow new programs to develop taking into account previous successes and failures.

SYNERGIES AND CONFLICTS WITH OTHER NATURAL RESOURCE MANAGEMENT ISSUES

Some of the key multi-benefits achieved from implementing salinity control options include:

- Increased irrigation efficiency saves water and reduces runoff resulting in decreased nutrient loads being discharged to rivers and the Gippsland Lakes.
- Tree planting and maintenance of existing native vegetation maintains or increases biodiversity, reduces soil erosion, provides a sink for greenhouse gases, provides shelter for stock, reduces nutrient loads to the rivers and Gippsland Lakes and contributes to 'Net Gain' in extent and quality of native vegetation.
- Decreasing the salinity of wetlands increases biodiversity.
- Farm forestry and private groundwater pumping for irrigation provides an additional revenue source for farmers.

The key conflicts with other natural resource management issues include:

- Groundwater pumping and disposal of saline water into drains conflicts with the aims of the nutrient reduction program in the Macalister Irrigation District to increase drain diversion.
- Groundwater pumping for salinity control aims to reduce groundwater levels over the long term whereas groundwater resource management programs aim to ensure long term sustainability of the resource.
- Recharge control can conflict with groundwater resource management/use because less water is recharging the aquifer and less groundwater is available for ongoing use.

■ Table ES1: Management Action summary for the Irrigation Salinity Management Program

Sub-program	Sub-program objective	On-ground Action	Mechanisms					Salinity Management Area						Priority		
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	Clydebank	Nambrok	Heyfield	Mafra	Boisdale		Bengworden	Port Albert
Irrigation Management	To ensure Irrigation Farm Planning is the overarching planning tool for the adoption of more efficient irrigation and other environmental benefits	Irrigation Farm Plans over an additional 21,000 ha over 10 years (approx 20 to 30 IFPs/yr)						✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
		Convert 800 ha/yr from flood to spray irrigation on the higher permeability soils		✓	✓			✓	✓	✓	✓	✓				Priority 1
	To reduce irrigation recharge	More efficient flood irrigation on low permeability soils		✓	✓	✓		✓	✓	✓	✓	✓				Priority 1
		New irrigation developments to be water and energy efficient		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
	To reduce salt being applied to pastures through irrigation water	Ensuring salinity of irrigation water is sufficiently low to prevent reduction in pasture growth		✓					✓	✓	✓	✓	✓	✓	✓	Priority 2
Vegetation	To reduce recharge To prevent further increases in recharge	Perennial pastures and trees established in dryland areas affected by irrigation induced salinity	✓	✓	✓				✓					✓	✓	Priority 3
		Maintaining and managing existing native vegetation		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
Sub-surface drainage	To decrease area of high watertable by increasing discharge	Operation of existing 19 Groundwater Control Pumps on an as needs basis					✓		✓	✓						Priority 1
		Continue investigating and implementing 7 new Groundwater Control Pumps	✓				✓		✓	✓	✓					Priority 2
		Begin investigating 5 new sites for Groundwater Control Pumps	✓				✓		✓	✓						Priority 2
		Encourage greater private pumping in areas of shallow water table		✓		✓			✓	✓	✓	✓	✓	✓	✓	Priority 2
		Review the need for additional 'free flowing bores' into drains	✓						✓	✓						Priority 4
Surface drainage	Improve surface drainage in areas not currently drained Improved water quality	Review the need for additional surface drainage	✓						✓	✓	✓	✓	✓			Priority 4
		Assess viability of community drains	✓						✓	✓	✓	✓				Priority 4
Living with salt	To manage saline land to best productive use	Rehabilitate once saline land	✓				✓		✓	✓						Priority 2
		Plant salt tolerant crops and pastures in saline areas	✓	✓			✓		✓	✓	✓	✓	✓	✓		Priority 3
		Review the need for alternative uses of saline land and water	✓						✓	✓	✓	✓	✓	✓	✓	Priority 4

Sub-program	Sub-program objective	On-ground Action	Mechanisms						Salinity Management Area							Priority	
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	Clydebank	Nambrok	Heyfield	Maffra	Boisdale	Bengworden	Port Albert		
Monitoring, evaluation and reporting	To monitor and report on watertable levels	Continuation of current observation bore monitoring	✓						✓	✓	✓	✓	✓	✓	✓	Priority 1	
		Create yearly watertable depth maps for all irrigated SMAs, analyse and report to stakeholders, 5 yearly reports on trends	✓	✓						✓	✓	✓	✓	✓	✓	✓	Priority 1
		Create annual watertable depth map for Sale township	✓	✓						✓							Priority 1
	To monitor and report on soil salinity around pumps	Continue program of soil salinity monitoring around Groundwater Control Pumps	✓							✓	✓						Priority 1
		5 yearly reports on soil salinity around Groundwater Control Pumps		✓						✓	✓						Priority 1
	To ensure vegetation establishment has multi-benefits	New vegetation establishment to be compared to areas identified for salinity action		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1

■ **Table ES2: Management Action summary for Dryland Salinity Management Program**

Sub-program	Sub-program objective	On-ground Action	Mechanisms					Key Management Areas for Implementation						Priority			
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	Foster	Port Albert	Bengworden	Rosedale	Reeve		Stratford	Trafalgar	Walhalla
Whole Farm Planning	To ensure Whole Farm Planning is the overarching planning tool for on-farm NRM activities	Guidelines and database of information developed. Review of Whole Farm Planning across West Gippsland						✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
Salinity Mapping and Investigation	To determine area affected by salinity	Determine extent of land affected by salinity	✓						✓		✓	✓	✓				Priority 1
		Determine extent of urban salinity	✓							✓		✓					Priority 1
	To investigate processes	Investigate groundwater flow systems	✓						✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
	To investigate suitability of management options	Quantify impacts of management options	✓						✓	✓	✓	✓	✓	✓			Priority 1
		Assess land capability and economics of implementation	✓						✓	✓	✓	✓	✓	✓			Priority 1
		Build capacity and review adoption methods	✓	✓					✓	✓	✓	✓	✓	✓			Priority 1
	To develop site specific actions	Develop on-ground actions for each saline area addressing NRM issues	✓						✓	✓	✓	✓	✓	✓			Priority 1
Perennial pasture	To determine area covered by perennial pastures	Determine extent of perennial pastures in key recharge areas	✓						✓	✓	✓	✓					Priority 1
	To reduce recharge and prevent further increases in recharge	Increase area of perennial pasture	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 3
Trees and native vegetation	To reduce recharge To prevent further increases in recharge	Determine groundwater flow systems causing salinity and identify key recharge areas	✓						✓	✓		✓					Priority 1
		Increase farm forestry in strategic recharge areas	✓	✓			✓	✓	✓	✓	✓						Priority 1
		Revegetate key recharge areas in line with West Gippsland Native Vegetation Plan	✓	✓			✓	✓	✓	✓	✓						Priority 1
		Maintain and manage existing native vegetation in line with West Gippsland Native Vegetation Plan		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
Groundwater pumping	To decrease area of high watertable by increasing discharge	Investigate potential public groundwater control pumping sites	✓				✓		✓		✓						Priority 4
		Investigate potential TEDS sites	✓				✓		✓	✓	✓	✓					Priority 4

Sub-program	Sub-program objective	On-ground Action	Mechanisms						Key Management Areas for Implementation						Priority	
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	Foster	Port Albert	Bengworden	Rosedale	Reeve	Stratford		Trafalgar
Living with salt	To manage saline land to best productive use	Plant salt tolerant crops and pastures in saline areas	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 3
		Review rehabilitation and buy back potential for saline land	✓									✓				Priority 3
Monitoring, evaluation and reporting	Watertable monitoring and reporting	Continuation of current observation bore monitoring, implementation of monitoring review recommendations for S Gippsland, Monitoring of new bores to be drilled in Seaspray and Port Albert	✓					✓	✓	✓	✓	✓	✓	✓		Priority 1
		Creation of yearly watertable depth maps for South Gippsland and Port Albert and Seaspray townships, analyse and report to stakeholders, 5 yearly reports on trends	✓	✓					✓	✓	✓	✓	✓	✓		Priority 1

■ Table ES3: Management Action summary for Ocean Induced Salinity Management Program

Sub-program	Sub-program objective	On-ground Action	Mechanisms						Salinity Management Area				Priority	
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	Foster	Port Albert	Bengworden	Reeve		Wellington
Surface drainage (structures)	To prevent saline ocean inflows to Lake Wellington and/or adjacent wetlands	Assess the feasibility of a control structure in McLennan Straits	✓									✓	✓	Priority 4
		Assess the feasibility of control structures in key wetlands	✓								✓	✓	✓	Priority 4
Surface drainage (sea walls)	To prevent saline sea water from entering low lying coastal areas	To develop drain management plans for coastal areas of South Gippsland including reviewing the role of sea walls	✓						✓	✓				Priority 4

■ **Table ES4: Management Action summary for Surface Water Salinity Management Program**

Sub-program	Sub-program objective	On-ground Action	Mechanisms					Salinity Management Area										Priority				
			Investigation	Extension	Financial incentives	Policy/regulation	On-ground works	Landuse Planning	Clydebank	Nambrok	Heyfield	Maffra	Boisdale	Wellington	Bengworden	Port Albert	Rosedale		Reeve	Stratford	Trafalgar	
Salinity mapping	To determine the extent and significance of surface water and wetland salinity	Map wetland salinity as part of West Gippsland audit of wetlands	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1	
		Complete characterisation of surface water quality issues and prioritisation of key river reaches for implementation of management options	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
Environmental flow assessments	To provide technical input to environmental flow assessments	Complete environmental flow assessments	✓					✓	✓	✓	✓	✓	✓					✓			Priority 3	
Monitoring, evaluation and reporting	To monitor and report on surface water salinity	Continuation of current surface water monitoring	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1	
		Complete 2 yearly report on compliance with SEPP to receiving waters pumps are discharging to, 5 yearly reports for other waterways	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 1
	To monitor and report on salinity in Clydebank Morass	Continued spot salinity monitoring of Clydebank Morass. More intensive monitoring may be required prior to salinity control option implementation	✓						✓													Priority 1
		Yearly reporting on salinity and trends to commence once control options are implemented	✓	✓					✓													Priority 1
	To monitor and report on salinity in Dowd Morass	Continued monitoring of bores in and around Dowd Morass, and current continuous salinity and level monitoring	✓														✓					Priority 1
		Yearly reporting on salinity and trends to commence once control options are implemented	✓	✓													✓					Priority 1
	To monitor and report on salinity in other wetlands	Monitoring of other wetlands to be addressed following prioritisation	✓						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Priority 3

■ **Table ES5: Management Action summary for Community and Agency Engagement Program**

Sub-program	Sub-program objective	On-ground Action	Mechanisms						Priority
			Investigation	Extension	Financial incentives	Policy/ regulation	On-ground works	Landuse Planning	
LGA engagement	To develop a Local Government Authority engagement plan	Local Government Authority engagement plan completed and implemented				✓			Priority 1
Community education	To integrate community education on salinity with existing programs	Salinity education integrated with field days, Saltwatch, Waterwatch and the Farm Planning process		✓					Priority 1
Project communications strategies	To develop and implement communication strategies for all key research and investigation projects and strategic planning activities	Field days, press releases, radio interviews, workshops, forum etc				✓			Priority 1
	Publicise successes of the Salinity Program			✓				Priority 1	
SMP Communications strategy	Develop a communications strategy for this plan	Communications strategy developed and implemented				✓			Priority 1
Educational resources	Make educational resources available for agency staff and landholders about salinity causes, processes and management.	Agency staff and landowners alerted to the information available		✓					Priority 1

The total cost of implementation of the Salinity Management Plan is shown in Table ES6. This table shows an approximate cost of the activities that are currently funded outside the plan and those that are recommended for funding through the plan. The costs are calculated as a present value and are indicative only and should be reviewed in the context of new information and policies.

■ **Table ES6: Summary of the total cost of the recommended salinity program**

Programs	Yearly government expenditure outside salinity management plan						Yearly government expenditure by salinity management plan					
	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010
Irrigation program	\$979,750	\$934,750	\$944,750	\$960,750	\$970,750	\$960,750	\$628,750	\$670,250	\$803,250	\$585,250	\$590,250	\$537,250
Dryland program	\$259,000	\$458,000	\$483,000	\$250,000	\$250,000	\$225,000	\$129,150	\$294,150	\$306,150	\$261,150	\$246,150	\$256,150
Ocean induced program	\$0	\$100,000*	\$70,000*	\$50,000*	\$50,000*	\$50,000*	\$0	\$45,000	\$25,000	\$25,000	\$25,000	\$5,000
Surface water salinity program	\$250,000*	\$605,000*	\$55,000*	\$55,000*	\$55,000*	\$55,000*	\$5,000	\$35,000	\$45,000	\$10,000	\$10,000	\$10,000
Community and Agency Engagement	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$27,000	\$19,000	\$19,000	\$19,000	\$19,000
TOTAL STATE AND FEDERAL GOVT CONTRIBUTION*	\$1,238,750*	\$2,097,750*	\$1,427,750*	\$1,210,750*	\$1,220,750*	\$1,185,750*	\$739,900	\$1,043,900	\$1,168,900	\$869,900	\$858,900	\$784,900
TOTAL LOCAL GOVT CONTRIBUTION	\$0	\$0	\$0	\$0	\$0	\$0	\$23,000	\$27,500	\$29,500	\$30,500	\$31,500	\$42,500
GRAND TOTAL	\$1,238,750	\$2,097,750*	\$1,427,750*	\$1,210,750*	\$1,220,750*	\$1,185,750*	\$762,900	\$1,071,400	\$1,198,400	\$900,400	\$890,400	\$827,400

*Estimated