Department for
Water Resources

Southern Fleurieu Water Resource Forum: water resource assessments

Report DWR 2001/004

Government of South Australia

Southern Fleurieu Water Resource Forum: water resource assessments

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Department for Water Resources

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FOREWORD

South Australia's water resources are fundamental to the economic and social wellbeing of the State. Water resources are an integral part of our natural resources. In pristine or undeveloped situations, the condition of water resources reflects the equilibrium between rainfall, vegetation and other physical parameters. Development of surface and groundwater resources changes the natural balance and causes degradation. If degradation is small, and the resource retains its utility, the community may assess these changes as being acceptable. However, significant stress will impact on the ability of a resource to continue to meet the needs of users and the environment. Degradation may also be very gradual and take some years to become apparent, imparting a false sense of security.

Management of water resources requires a sound understanding of key factors such as physical extent (quantity), quality, availability, and constraints to development. The role of the Resource Assessment Division of the Department for Water Resources is to maintain an effective knowledge base on the State's water resources, including environmental and other factors likely to influence sustainable use and development, and to provide timely and relevant management advice.

Bryan Harris
Director, Resource Assessment Division
Department for Water Resources

ABBREVIATIONS

General

yr year

Measurement

Units of measurement used in this volume are those of the International System of Units (SI) and are not included here. Units outside the SI which have been authorised for use within Australia's metric system, and units having general application are given.

ha hectare (area; 10^4 m^2 *or* 10^{-2} km^2)

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ABSTRACT

An assessment of the water resources of the southern Fleurieu Peninsula has been carried out following concerns amongst local government and the community regarding the use and management of water resources in the region. This report discusses the current status of the water resources, a framework for assessment, data availability and past studies.

Four main issues were identified. These are regional water resources, local water development 'hot spots', sustainable development and monitoring requirements. Closer management of the water resources is required and discussions are needed to determine what measures should be taken.

INTRODUCTION

An assessment of the water resources of the southern Fleurieu Peninsula has been carried out following concerns amongst local government and the community regarding the use and management of water resources in the region. Catchments were assessed by grouping them into five water resources zones (Figs 1, 2). These are the Upper Fleurieu, Myponga, Coastal Fleurieu, Northern Inland Fleurieu and Southern Inland Fleurieu Zones. The available water resources, impacts of development, monitoring networks and management issues were addressed for each zone. A framework for water resource assessment, data availability and past studies are also discussed.

The Southern Fleurieu Peninsula Water Resources Region incorporates the District Councils of Yankalilla and Victor Harbor, and Alexandrina Council, and comprises of more than 50 catchments with surface and groundwater resources of variable yields and quality (Figs 1, 2). It is located outside the recently formed River Murray and Onkaparinga Catchment Water Management Boards, but includes a portion of the proclaimed Mount Lofty Ranges Watershed.

Assessments of the available water resources and their proposed management are not widely regulated for the southern Fleurieu Peninsula. The drilling of water bores is regulated across South Australia under the *Water Resources Act 1997* and approval is required to construct some types of farm dams under the *Development Act 1993.* Within the Mount Lofty Ranges Watershed, the capture of surface water is regulated under the Water Resources Act.

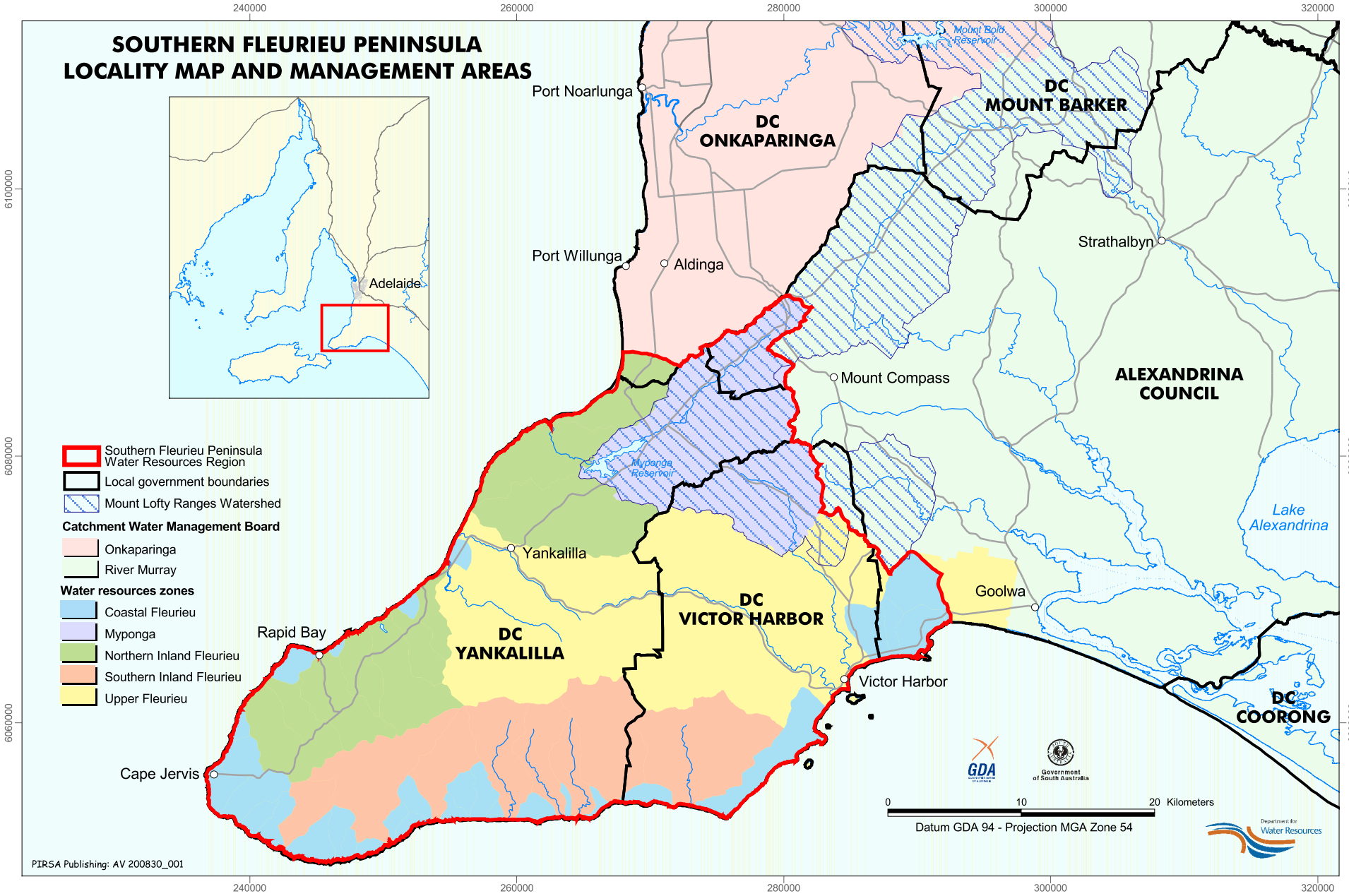
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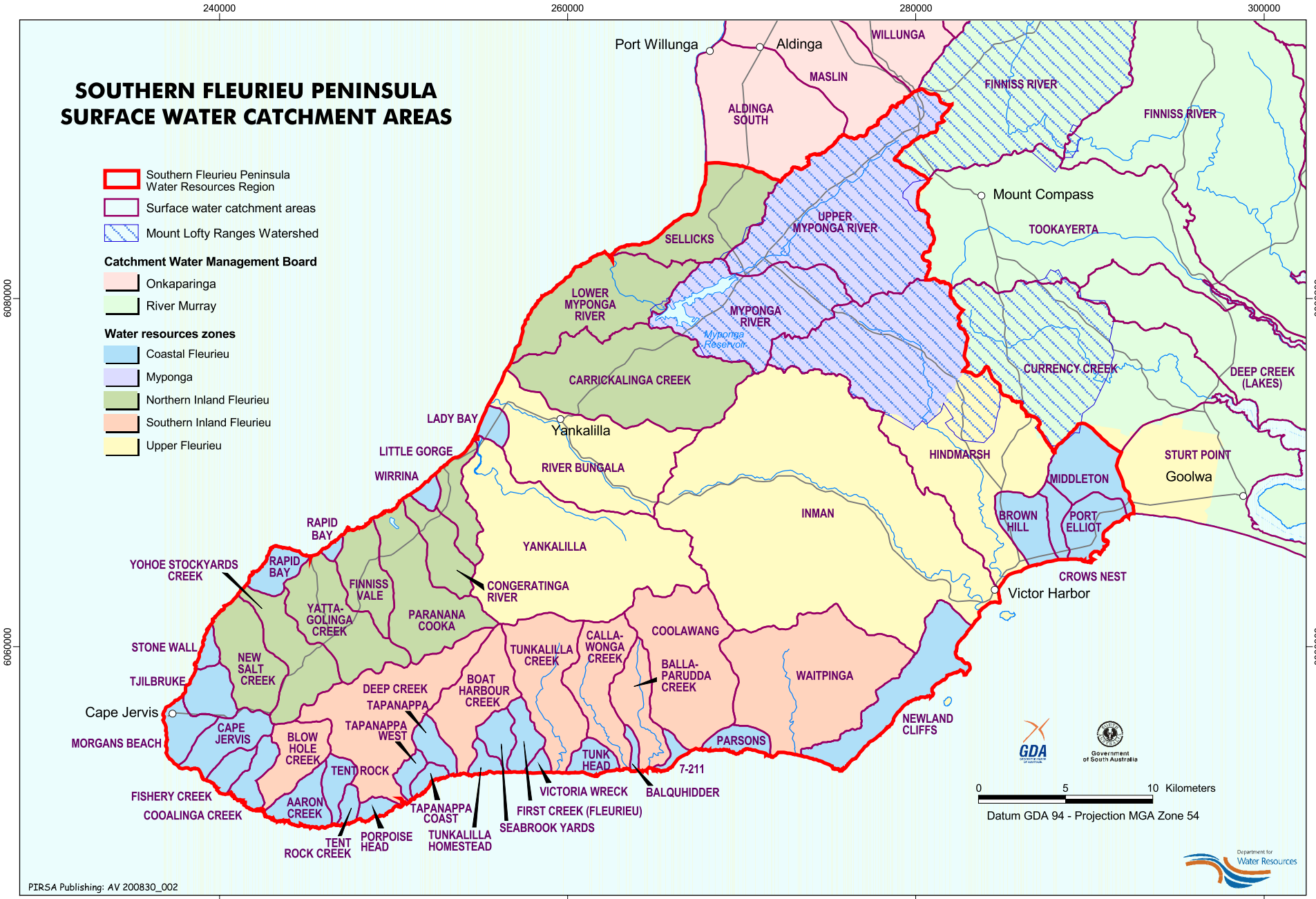
Figure 1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CURRENCY CREEK
DEEP CREEK (LAKES)
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Yankalilla
LITTLE GORGE
WIRRINA
RIVER BUNGALA
HINDMARSH
STURT POINT
Goolwa
MIDDLETON
INMAN
BROWN HILL
PORT ELLIOT
RAPID BAY
YANKALILLA
YOHOE STOCKYARDS CREEK
FINNISS VALE
CONGERATINGA RIVER
CROWS NEST
Victor Harbor
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PARANANA COOKA
STONE WALL
TUNKALILLA CREEK
CALLA-WONGA CREEK
COOLAWANG
NEW SALT CREEK
BALLA-PARUDDA CREEK
WAITPINGA
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TAPANAPPA
BOAT HARBOUR CREEK
Cape Jervis
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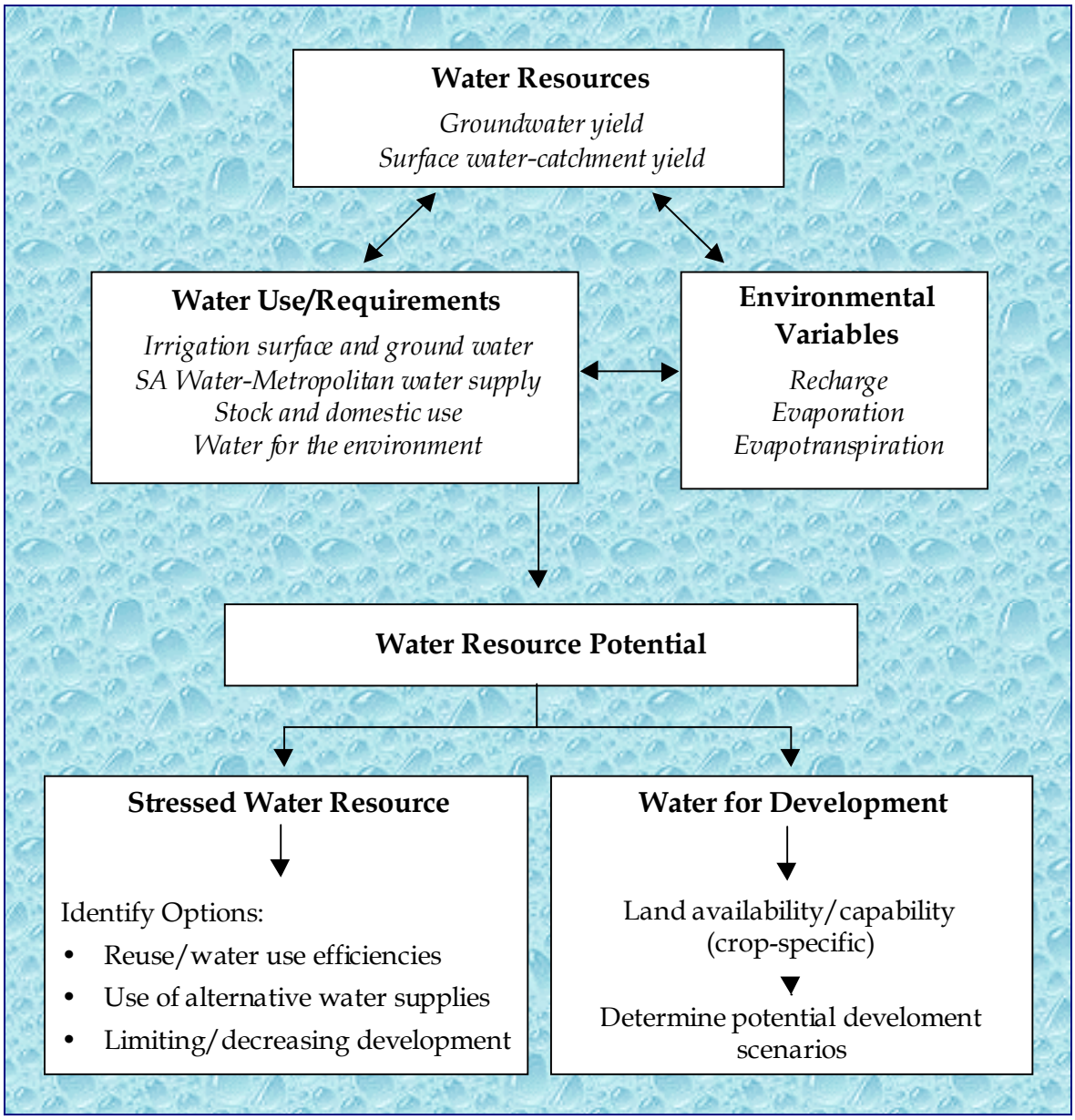
Figure 2

FRAMEWORK FOR WATER RESOURCE ASSESSMENT

To determine the sustainability of water use within the Southern Fleurieu Peninsula Water Resources Region, several assessments are required, which are outlined in Figure 3. These assessments identify the surface and groundwater resources for each river catchment and make comparisons between current water use and the sustainable limit of this use. The outcome of such assessments would be a water-balance model, which would indicate whether the water resources in each catchment were over used, or whether there was potential for further water resource development.

Figure 3: Water resource assessment process (Source: South Central Regional Network Water Resources Project)



Water-balance models illustrate the natural extent and interaction of surface and groundwater resources and their level of development. An important aspect of the water-balance model would be its ability to differentiate between surface and groundwater consumption in each catchment for each category of water use (Fig. 3).

The model should also include artificial transfers into or out of the catchment, the use of any reclaimed water, the extraction or impoundment of water and the resulting impact on the resource. Pursuant to the Water Resources Act, environmental water requirements must also be accommodated as a valid water use and their evaluation is needed to accurately determine the sustainable limit for surface water or groundwater development.

Constructing a water-balance model will enable the estimation of the available water resource of each catchment and indicate whether the sustainable limits for surface and groundwater use have been reached or exceeded. The model could then be used as an adaptive management tool in:

- considering development scenarios
- linking water resource availability to land capability
- highlighting the need for alternative management options
- forming the basis of a water allocation framework.

This preferred assessment process relies on the availability of suitable data for each of the components of the water-balance model. Many other parts of Australia have deficiencies and gaps in the data available in order to complete this rigorous assessment. Gaps have been filled with estimates where possible and appropriate. The main points to be considered for the data sets relevant to Southern Fleurieu Peninsula Water Resources Region are:

- Estimations of farm dam locations and capacities within the Mount Lofty Ranges are available, but they are limited by location and storage capacity accuracy.
- Reliable gauged streamflow records are only available for the Myponga River, Hindmarsh and Inman Catchments. The latter two are located in the Upper Fleurieu Water Resources Zone (Fig. 2) and data has only been recorded for a short period. In other areas, catchment runoff estimates have been made without the benefit of gauged water quantity information.
- Groundwater levels in the Hindmarsh Tiers and Myponga groundwater basins (Myponga Zone) were regularly monitored from 1976 to 1995. Also, some other areas have monitored groundwater.
- Irrigation water use data is approximate and estimated, and therefore is inaccurate. The data is determined by either landholder estimates or theoretical estimates of crop water use, combined with estimates of irrigated crop areas based on land-use data, which was collected for another purpose. The irrigated crop area estimates are inferred from total crop areas. In many cases it was not possible to differentiate between surface water and groundwater resources as the source for irrigation.

The information available does not support a detailed water-balance assessment for all catchments within the Southern Fleurieu Peninsula Water Resources Region. However, with additional data collection and professional, informed assumptions, indicative catchment based assessments can be made. Carmichael (2000) completed a study with a groundwater emphasis on the two largest river catchments in the southern Fleurieu Peninsula — the Hindmarsh and Inman (including Currency Creek in the Lower Murray) — using water-balance methodologies successfully applied in the Mount Lofty Ranges. Carmichael's findings are summarised below.

The Department for Water Resources is also pursuing several projects to enhance water resources information in the Mount Lofty Ranges region, which incorporates

parts of the Southern Fleurieu Peninsula Water Resources Region. A review of water monitoring is aimed at improving the information base required to manage our water resources. Other projects are aimed at improving understanding of resources characteristics, water use patterns and environmental water requirements. These projects will assist in the determining of the levels and types of sustainable development that can take place in the region.

Summary of assessment of the Hindmarsh and Inman Catchments

This section summarise Carmichael's (2000) assessment of water resources and recharge in the Hindmarsh, Inman and Currency Creek Catchments.

HINDMARSH CATCHMENT

The estimated total water use in the Hindmarsh Catchment was 6000 ML, of which over 95% was used for irrigation. Groundwater extractions supplied ~90% of the total annual irrigation demand.

Recharge to groundwater from rainfall was estimated to be ~17 000 ML/yr. In the Mount Lofty Ranges, estimates of annual recharge have been used to determine the sustainable yield of groundwater resources. Carmichael recommended that sustainable yields be limited to below 75% of annual recharge to protect the resource and make allowances for the environmental requirements of streams. By applying this approach to the Hindmarsh River, sustainable yield may be estimated at between 8500 and 13 000 ML/yr assuming a rate of recharge of 50% and 75% respectively.

The current level of groundwater use is ~5500 ML/yr, which is considerably <50% of the annual recharge required for the entire catchment.

INMAN CATCHMENT

Irrigation in the Inman Catchment totalled ~1300 ML/yr. The water extracted from watercourses and farm dams was 90% of the total. Carmichael stated that impacts on streamflow due to surface extraction and farm dam capture were yet to be evaluated in all catchments on the southern Fleurieu Peninsula.

The Inman groundwater resource is relatively saline and only an estimated 10% (100 ML) of irrigation water was supplied by bores. The sustainable yield for this catchment was estimated at between 12 300 and 18 500 ML/yr, assuming a limit of 50% and 75% of annual recharge respectively. Groundwater use is well below sustainable limits.

WATER RESOURCE ASSESSMENTS

Upper Fleurieu Zone

WATER RESOURCES

The Inman and lower Hindmarsh Catchments are included in the Upper Fleurieu Zone. Catchments within the zone have moderate surface water resources (South Central Regional Network, 1999). Median annual rainfall varies from 520 mm near the coast to 990 mm in upland regions. The median annual runoff for catchments within this zone is estimated to range between 90 and 130 mm.

Groundwater resources are variable; yields and groundwater quality depend on the geological formation hosting the bore. Yields range from <5 to >20 L/s. Salinity ranges between 2200 and 3200 mg/L, which is considered the upper limit for many irrigated crops.

WATER USE

Irrigation demand is predominantly sourced from groundwater in the lower Hindmarsh Catchment, and surface water in other catchments within the zone. Improved pasture for dairying has dominated irrigation activity. The 1999 land-use data shows a small increase in irrigated agriculture including dairy farming, viticulture and horse keeping.

IMPACTS

Increases in land sub-divisions have occurred, which may require greater access to water resources for stock and domestic use, small-scale irrigated agriculture or aquaculture.

MONITORING

Gauging station AW501503 measures flow from 84% of the Inman Catchment. The average annual flow recorded is ~8000 ML, although annual flows for the previous three years have not exceeded 4500 ML due to below average rainfall.

WASTEWATER

The 1998–99 annual discharge was ~800 ML from the Victor Harbor Wastewater Treatment Plant (owned and operated by the SA Water Corporation). Treated effluent from the plant is chlorinated and discharged into the Inman River. Some of the effluent has been used by the Victor Harbor Golf Club to irrigate fairways.

Further re-use of effluent is limited by its quality, which is significantly poorer than recycled water from most other wastewater treatment plants in the Mount Lofty Ranges. Median salinity levels are ~1300 mg/L and nutrient loads are high. Effluent quality is being improved through implementation of Environment Protection Authority licence conditions, including an environment improvement program. This will enable effluent to be used more extensively throughout the Victor Harbor area and reduce discharge into the Inman River.

MANAGEMENT ISSUES

Given the relatively high rainfall and runoff in the Upper Fleurieu Zone, the development of surface water resources is likely to be dominant. Issues associated with farm dam construction and watercourse extraction need further consideration. Groundwater use is likely to be limited due to high salinity levels and variable bore yields.

Increased diversions and farm dam development within the Inman Catchment will reduce surface runoff and exacerbate current water quality issues downstream of the Victor Harbor wastewater treatment plant.

Options for improved management of the wastewater treatment plant are currently under consideration by SA Water in conjunction with the Environment Protection

Authority and the District Council of Victor Harbor. Management options include the relocation of the plant and the installation of filtration systems.

Myponga Zone

WATER RESOURCES

The upper Hindmarsh Catchment, also known as the Hindmarsh Tiers groundwater basin, is included in the Myponga Zone. Catchments within the zone have fair surface water resources (South Central Regional Network, 1999). Median annual rainfall varies from 640 mm near the coast to 880 mm within the upper Hindmarsh Catchment. Median annual runoff for catchments within this zone is estimated to range between 130 and 165 mm.

Groundwater resources for the Myponga Zone are considered good. Individual bore yields and groundwater salinity depend on the geological formation hosting the bore. Yields can exceed 10 L/s from the Tertiary limestone aquifer and salinities are generally <1500 mg/L, which is suitable for most irrigated crops.

WATER USE

Irrigation demand is predominantly sourced from groundwater (~85% in the upper Hindmarsh Catchment). Application rates are consistent across the zone at ~8 ML/ha, which is dominated by improved dairy pasture.

The Myponga Zone lies within the Mount Lofty Ranges Watershed, which means that the use of surface water is regulated under the Water Resources Act and permits are required in order to construct farm dams.

IMPACTS

The effect of grazing and dairy farming along tributaries of the Myponga Reservoir may have a significant negative impact on the quality of the reticulated water supply.

MONITORING

Gauging station AW502502 measures water quantity and quality for the catchment above Myponga Reservoir, ~50% of the catchment. The recorded median annual flow is ~10 000 ML, although over the last three years annual streamflow has not exceeded 5700 ML/yr due to below average rainfall. The water quality is very good with an average salinity of <500 mg/L.

Hindmarsh River offtake AW501500 measures streamflow from the upper 50% of the catchment. Prior to 1994–95, water was diverted from the gauging weir into the Hindmarsh Reservoir, however, since the commissioning of the Myponga Filtration Plant the diversion has not been used and the station now monitors the present Hindmarsh streamflow.

An extensive observation well network operates in this zone, comprising 39 wells within the upper Hindmarsh and Myponga River Catchments. Groundwater levels were monitored from 1976 to 1995. Irrigation pumping produces an annual variation in groundwater level of 5–6 m, while longer term fluctuations are associated with variations in annual rainfall.

Pre-irrigation groundwater levels during spring show little change in the Myponga River Catchments over the period of monitoring. Natural variability in rainfall produces fluctuations of 1–2 m over several years. In the upper Hindmarsh, fluctuations of 2–3 m are associated with annual rainfall. The last three years have been characterised by dry winters resulting in a decline in groundwater levels, however, this decline is currently not considered sufficient to cause alarm.

Given recent irrigation developments, the resumption of groundwater monitoring is considered necessary to evaluate the long-term sustainability of the groundwater resource.

WASTEWATER

During 1997, the Myponga Wastewater Treatment Plant discharged 9 ML of effluent. An effluent irrigation scheme was commissioned in that year to irrigate adjacent land during summer.

MANAGEMENT ISSUES

The Myponga Zone requires the closest management of all water resource zones on the southern Fleurieu Peninsula.

Irrigation is the greatest consumer of water resources with 90% supplied by groundwater. This represents the highest use within any of the water resource zones, however, groundwater consumption is below the sustainable limit.

The groundwater resource requires monitoring to assess localised drawdown and long-term trends associated with surface water interactions and variations in annual rainfall.

Accurate measurements of the consumption levels by different users are required and environmental water requirements need consideration.

Surface water capture is regulated by a farm dam permit system under the Water Resources Act, however, extractions from watercourses are unregulated.

Coastal Fleurieu Zone

WATER RESOURCES

Surface water resources in the Coastal Fleurieu Zone are considered poor due to relatively low rainfall and runoff levels (South Central Regional Network, 1999). Median annual rainfall varies from 460 mm near the coast to 800 mm in upland regions. The median runoff is highly variable between catchments, estimated to range between 60 to 140 mm/yr.

Groundwater resources are fair, although salinity levels may limit abstraction volumes (South Central Regional Network, 1999). Yields and salinity are dependent on the geological formation hosting the bore. Well yields range from <1 to >10 L/s. Salinity levels are generally between 2200 and 5000 mg/L, which is considered above the upper limit for many irrigated crops.

WATER USE

Land-use information from 1993 indicated that irrigation was restricted to small developments in the Wirrina and The Links Catchments. The 1999 land-use data indicates that irrigation has increased but remains a small proportion of the overall irrigation levels in other catchment areas. Irrigation is predominantly used for improved pasture, but small areas of horticulture and viticulture have been developed that also rely on the supply of irrigation water.

Conservation parks are located within these catchments and their environmental water requirements need to be considered for the future.

IMPACTS

Increases in land sub-divisions have occurred, which may require greater access to water resources for stock, domestic use, small-scale irrigated agriculture or aquaculture.

MONITORING

There are no surface water or groundwater monitoring stations within the catchments of the Coastal Fleurieu Zone.

WASTEWATER

No wastewater facilities operate within the catchments of the zone.

MANAGEMENT ISSUES

Land capability for intensive agriculture is limited by steep topography, localised waterlogging, the occurrence of acid sulfate soils and salinity. Future agricultural development should be restricted by these influences, constraining the development of irrigation and reducing the requirement to regulate water use.

Northern Inland Fleurieu Zone

WATER RESOURCES

Surface water resources in the Northern Inland Fleurieu Zone are considered fair to good (South Central Regional Network, 1999). Median annual rainfall varies from 520 mm near the coast to 990 mm in upland regions. The median annual runoff for catchments within this zone is estimated to range between 90 and 150 mm.

Groundwater resources are considered good (South Central Regional Network, 1999). Yields and groundwater salinity depend on the geology hosting the bore and the yields range from 3 to >20 L/s, while salinity levels are generally >2200 mg/L, which is considered the upper limit for many irrigated crops.

WATER USE

Irrigation demand in this zone is predominantly sourced from surface water. Less than 5% of the total area was irrigated in 1993, which was dominated by improved pasture for dairies and horse keeping. The 1999 land-use data shows a small increase in irrigation, mainly for dairying and to a lesser extent horse keeping, vineyards and horticulture.

IMPACTS

Increases in land sub-divisions have occurred, which may require greater access to water resources for stock, domestic use, small-scale irrigated agriculture or aquaculture.

MONITORING

There are no surface water or groundwater monitoring stations within the catchments of the Northern Fleurieu Zone.

WASTEWATER

No wastewater facilities operate within the catchments of the zone.

MANAGEMENT ISSUES

Given the relatively high rainfall and runoff in the Northern Fleurieu Zone, development of surface water resources is likely to be dominant issues. Issues associated with farm dam construction and watercourse extraction need further consideration. Groundwater use for some irrigated crops will be limited by variable bore yields and high levels of salinity.

Land capability for intensive agriculture is limited by steep topography, localised waterlogging, the occurrence of acid sulfate soils and salinity. Future agricultural development should be restricted by these influences; constraining the development of irrigation and reducing the requirement to regulate water use.

Conservation reserves have been proclaimed within this zone and environmental water requirements of these areas need to be considered.

Southern Inland Fleurieu Zone

WATER RESOURCES

Surface water resources in the Southern Inland Fleurieu Zone are considered fair to excellent (South Central Regional Network, 1999). Median annual rainfall varies from 580 mm near Cape Jervis to 990 mm in upland regions. The median annual runoff for catchments in this area is estimated between 80 and 160 mm.

Groundwater resources are fair and suitable for agriculture (South Central Regional Network, 1999). Individual bore yields and salinity depend on the geology hosting the bore. Yields range from <1 to >10 L/s, while levels of salinity range between 2000 and 5000 mg/L, which is considered above the upper limit for many irrigated crops.

WATER USE

Irrigation demand in the zone is predominantly sourced from surface water. Estimations of water use volumes were based on 1993 land-use data made by South Central Regional Network (1999; app. 2, table 5). Less than 5% of the total area was irrigated in 1993, this use was dominated by improved pasture for dairies. The 1999 land-use data shows an increase in irrigation, including dairying, viticulture and horse keeping.

IMPACTS

Increases in land sub-divisions have occurred, which may require increased access to surface or groundwater, either for stock and domestic use or, in many cases, small-scale irrigated agriculture or aquaculture.

MONITORING

No water surface or groundwater monitoring stations occurs within the catchments of the Southern Inland Fleurieu Zone.

WASTEWATER

No wastewater facilities operate within the catchments of the zone.

MANAGEMENT ISSUES

Given the relatively high rainfall and runoff in the Southern Inland Fleurieu Zone, the development of surface water resources is likely to be dominant issues. Issues associated with farm dam construction and watercourse extraction need further consideration. Groundwater use for some irrigated crops will be limited by low bore yields and high salinity levels.

Conservation reserves have been proclaimed within this zone and environmental water requirements of the areas need to be considered.

CONCLUSIONS

Closer management of the water resources of the southern Fleurieu Peninsula is required and discussions are needed to determine what measures should be taken. Four main issues have been identified:

- Regional water resources — According to information currently available, surface and groundwater resources are not over-committed on a regional scale. As in other parts of the State, fluctuations in groundwater levels are causing to concern in the southern Fleurieu Peninsula. These fluctuations are considered to be largely due to natural variation in annual rainfall.
- Local water development 'hot spots' — In some catchment areas, the availability of useful quantities of good quality water for irrigation could lead to rapid development of local water resources, potentially causing water sharing issues to arise (e.g. as in the Hindmarsh Tiers groundwater area). The rate of development and the implications for sustainable use of these water resources needs to be carefully monitored.
- Sustainable development — There is limited availability of land suitable for irrigation development in some areas, particularly in the coastal catchments. Changes in land use merit careful consideration in the development assessment process, largely implemented by local government.
- Monitoring requirements — Continued monitoring of land use (especially land under irrigation), water use and water resources is required. The Department for Water Resources will be reviewing its monitoring procedures within the region as part of the Mount Lofty Region monitoring review.

APPENDIX

SURFACE WATER CATCHMENTS WITHIN THE SOUTHERN FLEURIEU WATER RESOURCES REGION

Upper Fleurieu Zone	Myponga Zone	Coastal Fleurieu Zone	Northern Inland Fleurieu Zone	Southern Inland Fleurieu Zone
Bungala	Hindmarsh, upper	7–193	Carrickalinga Creek	Ballaparudda Creek
Hindmarsh, lower	Myponga River	7–211	Congeratinga River	Blow Hole Creek
Inman	Upper Myponga River	Aaron Creek	Finnis Vale	Boat Harbour Creek
Yankalilla		Balquhidder	Little Gorge	Callawonga Creek
		Brown Hill	Lower Myponga River (includes Carrickalinga Head)	Coolawang Creek
		Cape Jervis	New Salt Creek	Deep Creek
		Cooalinga Creek	Paranana Cooka	Tunkalilla Creek
		Crows Nest	Sellicks	Waitpinga
		First Creek (Fleurieu)	Yattagolinga Creek	
		Fishery Creek	Yohoe Stockyards Creek	
		Links, The (Lady Bay)		
		Middleton		
		Morgans Beach		
		Newland Cliffs		
		Parsons		
		Porpoise Head		
		Port Elliot		
		Rapid Bay		
		Seabrook Yards		
		Stone Wall		
		Tapanappa		
		Tapanappa Coast		
		Tapanappa West		
		Tent Rock		
		Tent Rock Creek		
		Tjilbruke		
		Tunkalilla Head		
		Tunkalilla Homestead		
		Victoria Wreck		
		Wirrina		

REFERENCES

Carmichael, V., 2000. *An assessment of water resources and recharge in the Hindmarsh River – Inman River and Currency Creek Catchments.* University of Adelaide, Department of Civil and Environmental Engineering, Adelaide.

South Central Regional Network, 1999. *Towards sustainable water resource management for the Adelaide Hills and Fleurieu.* Draft report. Environment Protection Agency, Adelaide.