

Glossary of Terms

Aquifer

A layer of underground sediments which holds water and allows water to flow through it.

Baseflows

The component of streamflow supplied by groundwater discharge.

Biodiversity

Biological diversity is the variety of all life forms – the different plants, animals and micro-organisms, the genes they contain and the ecosystems of which they form a part.

Biosolids

Stabilised organic solids derived from sewage treatment processes that can be managed and used safely for nutrient, soil conditioning, energy or other value.

Bulk entitlement (BE)

The right to water held by water and other authorities defined in the Water Act. The BE defines the amount of water that an authority is entitled to from a river or storage, and may include the rate at which it may be taken and the reliability of the entitlement.

Cap

An upper limit for the diversion of water from a waterway, catchment or basin.

Carbon sinks

Area of forest or plant growth which absorbs high amounts of carbon dioxide accumulating in the Earth's atmosphere.

Catchment

An area of land where run-off from rainfall goes into one river system.

Catchment management authorities (CMAs)

Catchment management authorities are the caretakers of river health, responsible for regional and catchment planning and coordination, and waterway, floodplain, salinity and water quality management.

Channel automation

Computerised system which automates the ordering, delivery and measurement of supply in water irrigation channels. The system involves remotely controlled regulators and gates.

COAG

The Council of Australian Governments is the peak intergovernmental forum in Australia, comprising the Prime Minister, State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association (ALGA).

Desalination

The removal of salt from water sources.

De-snagging

Removal of trees and branches that fall into and lodge in rivers.

Ecosystem

A dynamic complex of plant, animal, fungal and micro-organism communities and the associated non-living environment interacting as an ecological unit.

Effluent

As applied to sewage treatment, wastewater which flows from treatment works.

Environment

Surroundings in which an organisation operates including air, water, land, natural resources, flora, fauna, humans and their interdependence.

Environmental flow

The streamflow required downstream of a water storage to maintain appropriate environmental conditions in a waterway.

Environmental Water Reserve

The share of water resources set aside to maintain the environmental values of a water system and other water services which are dependent on the environmental condition of the system.

Essential Services Commission

Independent economic regulator, established by the State Government of Victoria to regulate prescribed essential utility services supplied by the electricity, gas, water, ports, grain handling, rail freight industries and aspects of the insurance industry.

Estuaries

Zones where a river meets the sea, influenced by river flows and tides and characterised by a gradient from fresh to salt water.

Fit for purpose

Water which requires no further treatment for intended use.

Floodplain

The relatively smooth valley floors adjacent to and formed by alluviating rivers which are subject to overflow during flood events.

Greenfield residential developments

New urban development areas.

Greenhouse effect

The warming of the earth's surface caused by greenhouse gases in the lower atmosphere. These gases regulate the earth's temperature – making it capable of sustaining life – by retaining some of the heat that otherwise would radiate back into space.

Greywater

Household water which has not been contaminated by toilet discharge and includes water from bathtubs, dish washing machines, clothes washing machines and kitchen sinks.

Groundwater

All subsurface water, generally occupying the pores and crevices of rock and soil.

Headworks

Dams, weirs and associated works used for the harvest and supply of water.

Hydrology

The science dealing with surface and groundwaters of the earth; their occurrence, circulation and distribution; their chemical and physical properties; and their reaction with the environment.

Irrigation district

An area with definite geographic boundaries within which water is allocated for irrigation under the control of a local or State authority or other body.

Nutrient

Plant food, generally refers to nitrogen and phosphorous in water.

Outfall

The site of discharge of a liquid from a pipe. Applied particularly to the point at which a sewer discharges to a treatment works or receiving water body.

Permissible annual volume (PAV)

The volume of water that can be extracted via licences as authorised by the Minister for Water.

Pollution charges

Charges or levies applied to activities that cause pollution.

Potable

Suitable for drinking.

Recharge

Restore with new supply.

Reclaimed water

Water recovered from sources that are considered to be waste or unwanted supplies.

Recycled water

Water derived from sewerage systems, or industry processes, that is treated to a standard that is appropriate for its intended use.

Regulated systems

Those where the flow of the river is regulated through the operation of large dams or weirs.

Reticulation

The network of pipelines used to take water into areas of consumption. Includes residential districts and individual households.

Rising block tariffs

Proposed pricing structure where a higher price per kilolitre applies above a specified level of consumption and seasonal prices, or incentive schemes such as rebates, are given for using alternative sources of supply.

Riparian

Vegetated corridor along streams and rivers.

River

Large stream of water flowing to sea or lake or marsh or another river.

River basin

The land which a river and its tributaries drain.

Sales water

Lower-reliability water offered to irrigators on a seasonal basis, in proportion to their base rights, after provision has been made to meet the base rights in the following year.

Salinity

The total amount of water-soluble salts present in the soil or in a stream.

Sedimentation

Process where solid particles in water sink to the bottom, forming sediment.

Sewage

The waterborne wastes of a community.

Sewerage

A physical arrangement of pipes and plant for the collection, removal, treatment and disposal of liquid waste.

Spills

An uncontrolled release of water into river systems.

Stormwater

Untreated rainfall run-off from urban areas.

Stream

Body of water flowing in bed, river or brook.

Stream Flow Management Plan

A plan developed with community input to ensure that the water resources of the area are managed sustainably.

Sustainable diversion limit (SDL)

The maximum volume that can be diverted from a sub-catchment during winter while protecting the environment.

Third pipe systems /dual reticulation

Systems used to supply recycled water for uses such as garden watering and toilet flushing.

Tradeable pollution permits

Licences to cause pollution which are tradeable from one business to another.

Triple bottom line (TBL)

Integrated approach to the achievement of environmental, social and economic outcomes.

Unregulated system

A river system where no major dams or weir structures have been built to assist in the supply, or extraction, of water.

Water authorities

Authorities charged with supplying water to towns and cities across Victoria, for urban, industrial and commercial use. They administer the diversion of water from waterways and the extraction of groundwater.

Water cycle

The circuit of water movement from the oceans to the atmosphere and to the earth and return to the atmosphere through various stages and processes such as precipitation, interception, run-off, infiltration, percolation, storage, evaporation and transportation.

Water entitlement

The volume of water authorised to be used under a licence to take and use water or a water right.

Water mining

Process of recycling wastewater for uses such as public space irrigation.

Water right

Rights to water held by irrigators in an irrigation district.

Water supply protection areas

An area declared under Section 27 of the *Water Act 1989* to protect the area's groundwater or surface water resources through the development of a management plan which aims for equitable management and long-term sustainability.

Waterway

The *Water Act 1989* defines what a waterway is and it includes a river, creek, stream, watercourse and a natural channel where water regularly flows, whether or not the flow is continuous.

Wetlands

Inland, standing, shallow bodies of water which may be permanent or temporary, fresh or saline.

Yield

The quantity of water that a storage or aquifer produces.

Appendix A: Permissible Annual Volumes



Groundwater Management Area	PAV ¹ (ML/yr)	Groundwater Management Area	PAV ¹ (ML/yr)
Alexandra	900	Kinglake	3,830
Balrootan	980	Lancefield	1,485
Barnawartha	2,100	Leongatha	6,500
Colongulac	14,271	Little Desert	1,100
Corinella	2,550	Merrimu	450
Cut Paw Paw	3,650	Moe	8,193
Ellesmere	1,900	Moorabbin	4,305
Frankston	3,200	Mullindolingong Zone 1	3,317
Gellibrand	0	Mullindolingong Zone 2	3,663
Gerangamete ²	n/a	Murmungee	16,710
Giffard	3,000	Nepean	5,000
Glenormiston	5,042	Newlingrook	74,970
Goorambat	4,888	Nhill	1,200
Goroke	2,200	Orbost	1,200
Heywood	21,763	Paaratte	4,606
Jan Juc	6,804	Portland	20,683
Kaniva TCSA	1,100	Rosedale	9,000
Kialla	2,795	Tarwin	1,300
		Wa De Lock Zone 1	11,500
		Wa De Lock Zone 2	17,000
		Wa De Lock Zone 3	1,200

Notes

1. Reference – Audit of permissible annual volumes for 35 Victorian Groundwater Management Areas, May 2004.
2. There is no PAV for Gerangamete GMA as the entitlement is managed under a Groundwater Licence.

B Appendix B: Operating Strategy for the Thomson and Macalister Rivers

The West Gippsland Catchment Management Authority, will develop an Operating Strategy for the management of the Environmental Water Reserve, in consultation with Melbourne Water, Southern Rural Water, the Gippsland Coastal Board and Department of Sustainability and Environment. The Operating Strategy will be submitted for the endorsement of the Minister for the Environment and the Minister for Water by March 2005.

The strategy will allow for an adaptive approach to the provision of environmental flows where the provision of various flow components can be changed in response to new information or climatic conditions.

The Operating Strategy will:

- aim to maximise the effectiveness of the Environmental Water Reserve to achieve the ecological objectives described in Tables B.1 and B.2;
- provide, as water becomes available, the recommended environmental flows outlined in Figure B.1;
- include the revised rules for the improved effectiveness of the current minimum environmental flow provisions; and
- include the climate-based trigger rules that aim to provide the recommended flows, described in Figure B.1 for the Macalister River, in about 85 per cent of years.

West Gippsland CMA will manage, monitor and assess the adequacy of the improved Environmental Water Reserve.

Revised rules for the current environmental flow provisions

Minimum flow provisions are currently defined for the Thomson and Macalister Rivers. Based on the most recent assessment of the environment's flow needs, the current environmental flow provisions can be rearranged to improve their ecological effectiveness. The additional water to boost the environmental flows can then be used to complement these base flows.

Southern Rural Water (in consultation with their customers), Melbourne Water, West Gippsland Catchment Management Authority and the Department of Sustainability and Environment will review and revise the rules associated with these environmental flow releases to improve ecological effectiveness. The revised rules will not impact in anyway on water available for irrigators or residents of Melbourne. They will apply from 1 September 2004 until additional environmental flows become available, at which time the environmental flows will be managed according to the Operating Strategy.

For the Thomson River, the revised rules will apply until the additional 10,000 megalitres of environmental water becomes available. On the Macalister River, they will apply until the climatic-based trigger rules are employed. However, the expectation is that where appropriate, the revised rules will be included in the Operating Strategy. For instance, in the case of the Macalister River, the revised rules will apply in the dry years when flows on the Macalister River revert back to the current entitlements.

Climatic-based trigger rules

Water resources modelling has indicated that the recommended environmental flows could be provided in many years with no impact on irrigators' reliability of water supply. This is because Lake Glenmaggie is a relatively small dam in comparison to its inflows and will fill and spill in most years. In other words, in many years the current practice of releasing only minimum flows in autumn and winter as the dam fills could be changed to allow larger environmental flow releases without compromising the filling of the dam or affecting irrigators' access to water.

However, in those drier years when Lake Glenmaggie does not fill, or only just fills, any prerelease of water for the environment will dramatically affect the reliability of supply to irrigators. The use of climate-based triggers will inform when water can be released for the environment and the dam will still fill.

Southern Rural Water, in consultation with their customers, and the West Gippsland Catchment Management Authority will develop climate-based trigger rules for the Macalister River for inclusion in the Operating Strategy by March 2005. The trigger rules will be based on scientific advice and will aim to provide for a flow regime described in Figure B1. The trigger rules will be refined as water is recovered for the environment, with the intent of achieving the recommended flows in 85 per cent of years.

Bulk entitlement amendment

By March 2005, the Thomson and Macalister bulk entitlement holders will apply to the Minister for Water to amend their bulk entitlements in line with the Government's decision. The new bulk entitlements will:

- define the new passing flow provisions;
- describe the application of trigger rules for releases from Lake Glenmaggie; and
- outline a process for altering the bulk entitlements as water is recovered for the environment.

At the same time, the Minister for the Environment will submit an application for a new bulk entitlement for the environment for the Thomson River. In the first instance the bulk entitlement will be for an average volume of 10,000 megalitres a year and will be increased to 18,000 megalitres a year as water is recovered. The entitlement will be expressed as a capacity share of Thomson reservoir that provides for an average volume of 10,000 megalitres per year and a storage volume of 10,000 megalitres per year. Environmental water will also be able to be stored using airspace in the reservoir.

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Appendix B: Operating Strategy for the Thomson and Macalister Rivers

Table B.1 Environmental Objectives for the Thomson River¹

Objective	Flow Related Event	Flow Description Component	Timing
Restore or maintain natural macroinvertebrate community	Stream-bed habitat availability	Low Flow, High Flow	All year
	Large woody debris inundation (habitat)	Low Flow, High Flow	All year
Maintain/enhance native fish community structure	Habitat availability	Low Flow, High Flow	All year
	Large woody debris inundation (shelter and food source)	Low Flow, High Flow	All year
	Localised fish movement between habitats	Low Flow Freshes High Flow Freshes	Anytime
	Migration trigger	High Flow High Flow Freshes	May/June and Sep/Oct
Exotic fish management	Fish migration (grayling) regional scale complete connectivity required between zones	Low Flow, High Flow	May/June and Oct/Nov
	Bank/bed exposure for carp egg drying*	Low Flow	Spring/Summer
Maintain/restore distinctive riparian vegetation community and structure, with zonation up the bank	Habitat inundation – provision of moisture to benches	High Flow Freshes	Winter/Spring
	Habitat inundation – variability to provide zonation	High Flow Freshes to Bankfull Flow	Winter/Spring
	Habitat regeneration – deposition of sediments on benches	High Flow Freshes	Winter/Spring
	Habitat disturbance – bank/bench inundation to provide regeneration niches	High Flow	Winter/Spring
	Flows that provide higher moisture levels in soils in lower rainfall areas	High Flow High Flow Freshes	Winter/Spring Winter/Spring
	Delivery of seed from upper catchment	High Flow	Winter/Spring
	Replacement of exotic grasses with native shrubs and ground cover	Prolonged inundation of bank and benches to disadvantage terrestrial species	Prolonged Bankfull Flow
Maintain litter/carbon cycling inputs to river	Bank/bench inundation to provide inputs of dissolved and/or fine particulate organic matter	High Flow Freshes	Autumn or Spring
	Periodic inundation of banks, occasionally with enough power to move woody debris	High Flows to Bankfull Flow	Anytime
Maintain stream substrate condition	Substrate scour to remove accumulations of fine sediment	Low Flow Freshes High Flow Freshes	Anytime
	Scour biofilms	High Flows	Winter/Spring
Improve water quality	Flushing of stagnant pools	Low Flow Freshes	Summer
Maintain channel form diversity	Disturbance	High Flow/ Bankfull Flow	Winter/Spring
Restore biodiversity of floodplain wetlands	Restore natural wetland hydrology and connectivity	Overbank	Winter/Spring

¹ Earth Tech, 2003: Thomson River Environmental Flow Requirements and Options to Manage Flow Stress, West Gippsland Catchment Management Authority.

* This objective was not explored further in the determination of environmental flow recommendations and needs to be reviewed in the light of current carp management research when these data become available.

Table B.2 Environmental objectives for the Macalister River²

Objective	Flow Related Event	Flow Description Component	Timing
Rehabilitate macroinvertebrate community	Habitat availability	Low Flow	Summer/Autumn
	Disturbance	Low Flow	Summer/Autumn
		High Flow Freshes Bankfull Flow	Winter/Spring
Maintain self-sustaining populations of Flathead Gudgeon**, Southern Pygmy Perch**, Australian Smelt, Short-Finned Eel, and Tupong	Movement by drift	Low Flow Freshes	Summer/Autumn
		High Flow Freshes	Winter/Spring
	Habitat availability	Low Flow; High Flow	All year
Restore self sustaining populations of Long-Finned Eel and Australian Grayling and River Blackfish**	Recruitment	High Flow Freshes	Winter/Spring
	Movement	Low Flow Freshes	Summer/Autumn
		High Flow	Winter/Spring
Rehabilitate submerged aquatic vegetation	Habitat availability	Low Flow; High flow	All year
		Recruitment	High Flow Freshes
	Movement	Low Flow Freshes High Flow	Summer/Autumn Winter/Spring
Rehabilitate emergent and marginal aquatic vegetation	Recruitment	Low Flow	Summer/Autumn
		High Flow Freshes	Winter/Spring
	Disturbance	Low Flow Freshes High Flow Freshes	Summer/Autumn Winter/Spring
Rehabilitate native riparian vegetation	Drying	Low Flow	Summer/Autumn
	Succession/zonation	Low Flow Freshes	Summer/Autumn
		High Flow Freshes Bankfull Flow	Winter/Spring
Limit encroachment of undesirable plant species	Disturbance	High Flow Freshes	Winter/Spring
		Bankfull Flow	
Maintain water quality in pools	Slowed decline	Low Flow	Summer/Autumn
	Mixing	Low Flow freshes	Summer/Autumn
Rehabilitate nutrient cycling processes	Drying	Low Flow	Summer/Autumn
	Entrainment	High Flow Freshes Bankfull Flow	Winter/Spring
Rehabilitate channel form	Sediment movement	High Flow Freshes Bankfull Flow	Winter/Spring
	Channel forming	Bankfull Flow	

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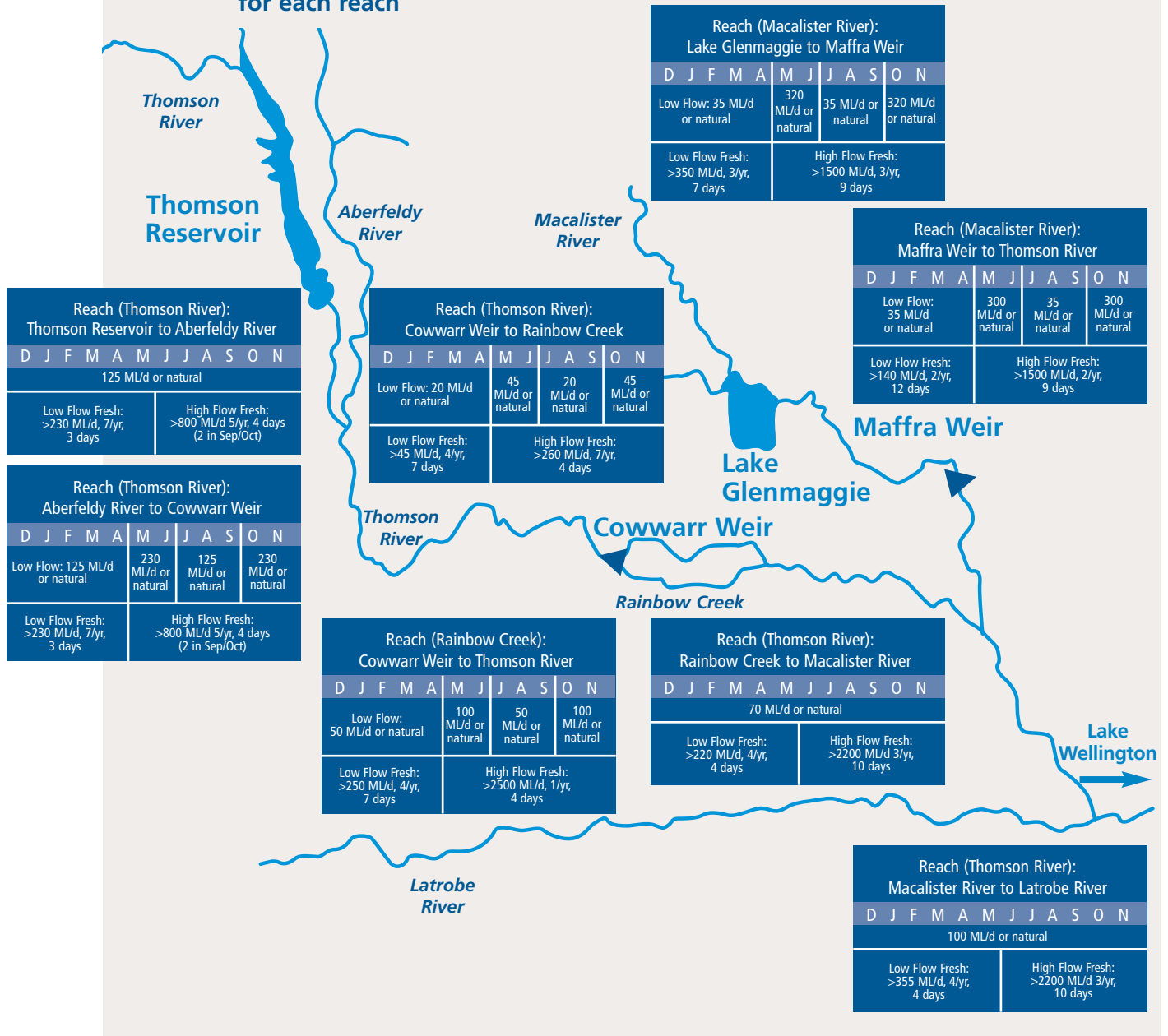
² Sinclair Knight Merz, 2003: Macalister River environmental flows assessment, Final Report.

** Movement component not required.

Appendix B: Operating Strategy for the Thomson and Macalister Rivers

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Figure B.1 Thomson River and Macalister River schematic: Environmental flow provisions for each reach



The flow provisions (outlined in this schematic) vary from the Task Force’s recommended flow provisions³ in two minor respects:

1. In the reach below Thomson Reservoir, the minimum base Autumn (May/June) and Spring (October/November) flows are reduced from 230 ML/d to 125 ML/d. These higher base flows, which are required for fish migration, were considered superfluous as Thomson Reservoir blocks fish passage at the top of this reach. The compromise option was independently assessed by scientists who found this option should provide for healthy native fish populations and a more generally healthy river system.
2. Based on climatic conditions, the flow provisions for the Macalister River will be provided in 85 per cent of years (wetter years). As discussed earlier the Task Force recommended such trigger rules should be developed.

³ Copies of the Task Force report as well as a report summarising the technical information, which informed the Task Force, can be obtained from the West Gippsland Catchment Management Authority. The reports are available on their website (www.wgcm.vic.gov.au) or the CMA can be contacted directly by phone (03) 5175 7899 or by mail: PO Box 1374 Traralgon 3844.

Appendix C: Responsibilities Associated with the Operational Management of the EWR

Type of Environmental Water Reserve (EWR)	Management tasks required
Run of the river, groundwater baseflows and flood flows provided through conditions on consumptive use	<ul style="list-style-type: none"> • Liaise with storage managers to negotiate most effective release pattern for EWR. • Negotiate with storage managers during drought. • Liaise with groundwater managers to negotiate most effective groundwater extraction regime. • Undertake complementary habitat, floodplain and water quality improvements. • Provide input to Sustainable Water Strategies on: <ul style="list-style-type: none"> – high priority rivers where current EWR is inadequate; and – where SFMPs and/or GMPs are required for high value, water-stressed unregulated rivers or wetlands. • Input to BE, GMP and SFMP processes from a river health perspective. • Comment on annual reports on implementation of management plans for Water Supply Protection Zones (including groundwater and surfacewater). • Monitor and report on environmental condition. • Engage with community on environmental flow issues.
Allocation for the Environment (i.e. held in storage)	<ul style="list-style-type: none"> • Develop operating strategy for allocation including: <ul style="list-style-type: none"> – liaise with key stakeholders (eg land managers, DSE regional staff, water authorities, local government); – identify target ecosystems for which allocation can be used; – environmental objectives for target ecosystems; – environmental water requirements of target ecosystems; – identify priorities for use; – identify flow-sharing amongst target ecosystems; – storage conditions; and – identify volume that is tradeable, if any, and conditions under which this would be traded temporarily and consultation required. – roles and responsibilities including: <ul style="list-style-type: none"> - preparation of water accounts; - instructions to storage manager; and - operation of regulators. – accountabilities. • Develop agreed annual environmental flow plan which will: <ul style="list-style-type: none"> – identify target ecosystems to be watered; – provide instructions to storage managers; – provide instructions to relevant target ecosystem managers; – identify water, if any, available for temporary trade; and – identify water, if any, to be purchased on the temporary market. • Liaise with storage manager for provision of water according to annual EF plan. • Liaise with target ecosystem managers on regulator operation and management.

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Appendix C: Responsibilities Associated with the Operational Management of the EWR

Type of Environmental Water Reserve (EWR)

Management tasks required

- Provide advice to Minister through Secretary DSE on any temporary trade.
- Pay costs associated with the management of the EWR where required.
- Monitor and report on environmental condition.
- Provide advice on refinements to operating guidelines and whether Environmental Water Reserve is adequate.
- Undertake works in target ecosystems to improve the effectiveness of environmental flows.
- Provide input to Sustainable Water Strategies on priorities for enhancement of EWRs in high priority river and wetland systems.

D Appendix D: Broad Functions and Responsibilities of a CMA

Note: These responsibilities apply to CMAs in regional Victoria. Different arrangements exist in the Port Phillip and Westernport Region (see chapter 7).

Functional areas	Major responsibilities
Integrated regional planning and coordination	<p>Integrated planning and investment</p> <ul style="list-style-type: none"> Review the Regional Catchment Strategy (RCS), setting priorities and targets for land and water management. Develop/review relevant substrategies for the management of priority issues identified in the RCS, including special areas plans as required (in accordance with the <i>Catchment and Land Protection Act 1994</i>). Develop a Regional Catchment Investment Plan and provide advice to Governments on regional priorities and programs for the implementation of the agreed RCS. Manage the relevant investment of State and Commonwealth funds in the region’s natural resource management programs. <p>Community engagement and key stakeholder involvement</p> <ul style="list-style-type: none"> Establish processes for ongoing community engagement and input into the development and implementation of the RCS, its substrategies, investment plans and work programs including supporting Implementation Committees as a key plank in the community engagement processes. <p>Coordination of implementation of RCS</p> <ul style="list-style-type: none"> Consult with local government in the implementation of the RCS and contribute to strategic and statutory planning undertaken by local government. Develop strategic partnerships with regional service deliverers for implementation of the RCS and coordinate the implementation of the RCS. Oversee the management of community grants to implement the RCS. <p>Business management and reporting</p> <ul style="list-style-type: none"> Develop a corporate plan, quarterly investment reporting, provide an annual report on its activities and report on expenditure and resource condition.
Community caretaker of rivers and water resources <ul style="list-style-type: none"> Core functions (including statutory functions) 	<p>Integrated planning for the management of river health and water resources</p> <ul style="list-style-type: none"> Develop Regional River Health Strategies (RRHSs) including setting priorities and targets for river health and water resources. Develop water quality, floodplain management and waterway action plans for priority areas. Implement SEPP (Waters of Victoria) through the RRHSs and RCSs. Input to the development of Sustainable Water Strategies. <p>Community engagement and key stakeholder participation</p> <ul style="list-style-type: none"> Undertake community engagement and participation in river health programs. Coordinate community education programs. Implement strategic partnerships with rural and urban water authorities for implementation of the RRHS. <p>Liaison with local government</p> <ul style="list-style-type: none"> Include waterway and floodplain requirements in statutory planning processes. Act as a referral authority for floodplain management. Provide technical advice on flooding and river health.

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D Appendix D: Broad Functions and Responsibilities of a CMA

Functional areas	Major responsibilities
Community caretaker of rivers and water resources	River health, floodplain and drainage management <ul style="list-style-type: none"> • Develop detailed water quality management plans and work programs. • Coordinate implementation of water quality plans. • Develop regional floodplain management works programs. • Undertake regional flood studies. • Develop and coordinate implementation of regional plans for drainage management. • Manage specific drainage schemes (where relevant). • Manage gazetted waterways. • License works on waterways. • Manage Environmental Water Reserve (see responsibilities in Appendix C). • Provide input into Sustainable Water Strategies and other water allocation processes on priorities for enhancing the Environmental Water Reserve. • Administer grants for catchment dams, water resource efficiency and other water resource programs. • Act as a referral authority for new irrigation and commercial dams. • Liaise with DSE on licence conditions for Crown frontages. • Coordinate and report on implementation of Heritage River plans (where required). • Monitor and evaluate performance and resource condition monitoring and evaluation. • Report on river health and river health programs, including 5-yearly benchmarking of river condition.
On-ground river and water protection and restoration	<p>In priority areas identified in RRHS, undertake activities to meet Government's targets for river health, including:</p> <ul style="list-style-type: none"> • Detailed community engagement and involvement on river health programs/projects. • Major innovative programs aimed at river health protection and restoration, and floodplain management. These may include but are not limited to activities including: <ul style="list-style-type: none"> – riparian restoration including weed management, revegetation and fencing; – instream habitat restoration; – installation of fishways; – floodplain management; – stabilisation of bed, banks and gullies; – improvement of environmental flows in rivers and wetlands; – improving effectiveness of environmental flows in rivers and wetlands; – incentive programs for landholders; – extension activities; – partnerships to improve stormwater management; – reconnecting rivers and floodplains; – management of sand and sediment; and – control of exotic species. • Large-scale restoration programs for rivers and water resources following natural disasters, e.g. floods and wildfires (as required).

E Appendix E: Scenario Analysis Summary

No Scenario	Scenario description	Decision	Outlook
1. Retrofit third pipe systems throughout Melbourne	This scenario considers potable water replacement for toilet flushing and garden watering with Class A recycled water in all existing and new residential development, including the CBD, and in commercial and industrial premises by targeting the larger water consumers in industrial and recreational sectors.	Not to proceed throughout the whole of Melbourne. Will proceed in areas where third pipe systems are approved optimal servicing arrangement.	Water authorities are evaluating opportunities for third pipe systems on a case-by-case or area-by-area basis in new and existing developments, as part of growth corridor planning and in accordance with the planning framework in the White Paper.
2. Mandating third pipe systems in all new growth areas	This scenario considers mandating the use of third pipe systems in all new residential developments within the urban growth boundaries specified by Melbourne 2030 (DOI, 2002). Recycled water would substitute potable water for toilet flushing, and garden and public open space watering.	Not to proceed in all new development areas. Will proceed in new development areas where third pipe systems are approved optimal servicing arrangement.	Water authorities to determine role as part of growth corridor planning and in accordance with the planning framework in the White Paper. Will be mandated in new developments where part of approved optimal servicing arrangements included as demonstration projects.
3. Target existing high volume water users	This scenario examines the feasibility of targeting existing high water volume users to use recycled water in place of their existing potable source. The 200 largest users consume around 10 per cent of the total water consumption in Melbourne.	Further investigate.	Water authorities investigating in accordance with the planning framework in the White Paper. Metropolitan water authorities already facilitating top 200 users to prepare water management plans to conserve water.
4. Mandating recycled water use near treatment plants and supply systems	This scenario explores the opportunity to mandate the use of recycled water in areas close to sources of recycled water including treatment plants and trunk recycled water infrastructure for non-potable use provided public health, safety and environmental risks are managed.	Use will be strongly encouraged where markets are close to supply systems of recycled water.	Water authorities are evaluating opportunities for third pipe systems in accordance with the planning framework in the White Paper.
5. Placing recycled water into potable water supply system	This scenario presents the option of further treating and pumping all the discharge from the Western Treatment Plant into Greenvale and Winneke reservoirs, and from the Eastern Treatment Plant into Cardinia Reservoir. The treated water would be mixed with the existing potable water and the mixture further treated to ensure potable standards are met, and supplied to much of the western and south eastern suburbs of Melbourne.	Not to proceed. Not supported as not socially acceptable and sufficient water is available for drinking purposes.	Water authorities to continue to monitor developments elsewhere.
6. Placing recycled water into the water supply system and increase use of bottled water for drinking	In this scenario all discharge from the WTP and ETP is pumped into reservoirs as in scenario 5, however the discharge from both treatment plants would be treated to an enhanced standard suitable for human contact but not to WHO drinking water standard. (i.e. same bacterial quality as drinking water but higher nutrients, TDS, colour). Recycled water would be mixed with fresh potable water in the reservoirs and the shandy would be used for all purposes except drinking. The public would be supplied with bottled water through supermarket retail distribution outlets for drinking and cooking purposes.	Not to proceed. Not supported as not socially acceptable and sufficient water is available for drinking purposes.	Water authorities to continue to monitor developments elsewhere.
7. Water mining	This scenario considers mining of water from sewers, which is the local treatment of raw sewage to provide recycled water for nearby beneficial uses such as open space watering, industrial uses. In an urban environment the expectation is that it is treated to a Class A standard (unrestricted use).	Plan and implement as per respective water authority plans.	Water authorities currently investigating in accordance with the planning framework in the White Paper.

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Appendix E:

Scenario Analysis Summary

No Scenario	Scenario description	Decision	Outlook
8. Use of greywater	This scenario considers the use of greywater, which is defined in a residential context as treated sewage from the kitchen, laundry and bathroom but excluding toilet wastewater. Greywater use is becoming increasingly popular with the community, particularly with the current drought.	Address regulatory framework and roles and responsibilities, and proceed on a case-by-case basis.	Developers may consider appropriate for multi-unit and high-rise developments. Individual households will implement on-site greywater recycling in accordance with regulatory requirements. With regard to internal use of alternative supplies such as greywater, gaps in regulatory framework and roles and responsibilities need to be addressed to ensure public safety.
9. Vision for Werribee Plains: Balliang	The area north-west of the Western Treatment Plant has the potential to use recycled water for agriculture, intensive horticulture, new urban development and to improve Werribee River flows for environmental and recreational use. This scenario considers the Balliang project which investigates the provision of recycled water to the Balliang District, which is bounded by the Brisbane Ranges, the You Yangs and the Werribee River.	Further investigate.	The Government will: <ul style="list-style-type: none"> • undertake an assessment as part of the Sustainable Water Strategy for the Central region; and • examine recycling opportunities in Balliang, Moorabool Valley and Bacchus Marsh.
10. Eastern irrigation, Cranbourne – Koo Wee Rup Corridor	This scenario considers the Eastern Irrigation Scheme which is based on the provision of recycled water from the Eastern Treatment Plant to horticultural, agricultural, manufacturing and recreational industries in the Cranbourne to Koo Wee Rup corridor.	Project (in part) being implemented.	Melbourne Water and Earth Tech will supply Class A recycled water to Cranbourne/Five Ways area for agricultural and open space customers. Supply scheduled to commence by end 2004. Residential third pipe systems are also being planned by South East Water.
11. Thomson River environmental flows	The Thomson River has been classified as an environmentally 'Stressed River' downstream of the Cowwarr Weir. This scenario considers treated water from the Eastern Treatment Plant being further treated by polishing through a dual membrane treatment plant and discharged to a location just below the Thomson Dam.	Further investigate.	A variant to this scenario, the Sustainable Water Resources Scenario – East of Melbourne, is being examined instead. It involves substitution of recycled water for non-potable use, rather than direct addition of recycled water to the waterway. The scenario would free up surface water for drinking and environmental flows.
12. Werribee Irrigation District Recycled Water Scheme	The original scenario in the <i>Green Paper Technical Report No.1 Water Recycling Scenarios for Melbourne</i> was referred to as 'Werribee River Environmental Flows'. The objective of the scenario was to substitute irrigation water with recycled water from the Western Treatment Plant (WTP) to free up surface water for the degraded Werribee River downstream of Melton Reservoir which requires environmental flows to improve the ecological health of the river. Farmers in the Werribee Irrigation District use around 11,000 megalitres to 13,000 megalitres annually sourced from the Werribee Basin and used primarily for agriculture and horticulture. The current drought has severely constrained surface water and groundwater supplies to the district which has triggered the urgent development of the scheme to provide greater long term security of supply.	Project being implemented.	Southern Rural Water and Melbourne Water are implementing the scheme to supply up to 8,500 megalitres recycled water annually from WTP commencing in 2004. Farmers have already expressed interest in most of this volume. Farmers are giving up access to sales water which will be held in trust for five years before being allocated to the environment.
13. Pumping Melbourne's recycled water north of Divide option 1	This scenario involves recycling 100 per cent of the suitably treated sewage from the ETP and WTP by pumping it across the Bay from ETP to combine the flow with the WTP. This combined flow would then be pumped north to the Great Dividing Range and discharged into existing irrigation channels.	No further evaluation.	Water authorities investigating other options for beneficial use.
14. Pumping Melbourne's recycled water north of Divide option 2	This scenario considers diverting sewage from the northern parts of Melbourne, treating the sewage to produce high quality recycled water and transferring this water into the Goulburn Valley. The recycled water would be used to supplement current irrigation schemes in the region to the north and west of the State.	No further evaluation.	Water authorities are investigating other options for beneficial use.
15. Stormwater harvesting	This scenario involves increasing the use of retarding basins as a source of storage of stormwater and 'harvesting' the stormwater for use. Stormwater would be treated through combinations of pollution traps, settling ponds and environmental wetlands and where appropriate more sophisticated processes would be utilised.	Further investigate.	Water authorities will investigate opportunities as part of developing Water Supply-Demand Strategies. Greatest opportunities are likely to be in new development areas, but will need to ensure environmental flows and beneficial uses are protected.

No Scenario	Scenario description	Decision	Outlook
16. Increased utilisation of rainwater tanks	Rainwater tanks are a traditional source of domestic water supply for isolated properties and small communities, but they are not commonly used in urban areas. This scenario considers rainwater tanks in the Melbourne region which have the potential to provide substitutes for potable water where water is used for garden watering and/or toilet flushing.	Continue with current process, and address regulatory framework and roles and responsibilities.	Some developers considering option in new residential developments. Five star home system being established which includes option of rainwater tank or solar hot water service (subject to Regulatory Impact Statement). With regard to internal use of alternative supplies such as from rainwater tanks, gaps in regulatory framework and roles and responsibilities need to be addressed to ensure public safety and savings can be delivered.
17. Utilisation of stormwater to reduce salinity in sewage flow to WTP	High salt levels exist in the sewage that flows into the Western Treatment Plant at Werribee. This scenario considers diluting the sewage flow with stormwater flows.	No further evaluation.	Melbourne Water and City West Water have completed a salinity reduction options paper and are further investigating favourable options such as cleaner production and treatment.
18. Desalination	This scenario considers the potential for desalination in Melbourne, which involves converting seawater into potable water.	Further investigate.	The Government will investigate the environmental, social and economic costs of large scale application of desalination.
19. Aquifer storage and recovery	This scenario considers the use of treated recycled water for temporary storage in aquifers for later use when there is demand. Recycled water can be stored in a bubble within an aquifer with little intrusion from groundwater effectively acting as a stand-alone storage due to the different characteristics (such as salinity and density) of the recycled water and the groundwater.	Further investigate.	The Government and water authorities will investigate the potential for aquifer storage and recovery of alternative supplies (e.g. stormwater and recycled water) in Melbourne.

Abbreviations

BE	Bulk (Water) Entitlement
CBD	Central Business District
CMA	Catchment Management Authority
COAG	Council of Australian Governments
CPI	Consumer Price Index
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CUAC	Consumer Utilities Advocacy Centre
D&S	Domestic and Stock
DHS	Department of Human Services
DPI	Department of Primary Industries Formerly Department of Natural Resources and Environment (DNRE)
DSE	Department of Sustainability and Environment Formerly Department of Natural Resources and Environment (DNRE)
EC	Electrical Conductivity
EF	Environmental Flow
EPA	Environment Protection Authority
ESC	Essential Services Commission
ETP	Eastern Treatment Plant
EWR	Environmental Water Reserve
GL	Gigalitre = 1,000,000,000 litres or (1 million cubic metres)
GMP	Groundwater Management Plan
KL	Kilolitre = 1,000 litres (or 1 cubic metre)
MDBC	Murray-Darling Basin Commission
ML	Megalitre = 1,000,000 litres (or 1,000 cubic metres) The approximate amount of water contained in one 50 metre Olympic sized swimming pool
NSW	New South Wales
PAV	Permissible Annual Volume
RCS	Regional Catchment Strategy
RRHS	Regional River Health Strategy
RWA	Rural Water Authorities
SA	South Australia
SDL	Sustainable Diversion Limit
SFMP	Stream Flow Management Plan
SWS	Sustainable Water Strategy
TBL	Triple Bottom Line
TDS	Total Dissolved Solids
WHO	World Health Organisation
WTP	Western Treatment Plant

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