



INFORMATION BULLETIN

# GUIDELINES FOR MANAGED AQUIFER RECHARGE (MAR) – HEALTH AND ENVIRONMENTAL RISK MANAGEMENT

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This document has been prepared to be consistent with:

- the Draft *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Managed Aquifer Recharge*
- the current Victorian regulatory framework.

It will need to be updated incorporating further development or changes to the above.

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## **1 INTRODUCTION**

These Guidelines have been developed to support the use of the *Draft Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Managed Aquifer Recharge (AGWR 2C)* in Victoria. Proponents of a MAR scheme should refer to the AGWR 2C and these Victorian guidelines when investigating and planning a MAR scheme.

These Victorian guidelines provide information about requirements and roles and responsibilities specific to Victoria. Other documents referred to in these guidelines are outlined in the references.

Improving the way we use our water resources is vitally important for ensuring a sustainable future for Victoria. Alternative water sources such as rainwater, stormwater, greywater, treated sewage and industrial water, are recognised as valuable sources of water and, when used appropriately, reduces the strain on our limited water resources.

In circumstances where the availability of these alternative water sources and demand for use do not occur concurrently, there is a need to store these waters for recovery and use at a later date.

Water storage and recovery may be provided in suitable aquifer systems by the process of 'managed aquifer recharge' (MAR). There has been an increasing interest in using MAR as a mechanism to store and later supply an alternative water source for uses such as landscape irrigation.

As interest increases, it is important that MAR is facilitated via a regulatory framework that includes guidance for protecting public health and the environment, while maintaining or enhancing beneficial uses of aquifers for future generations.

These guidelines aim to:

- facilitate safe and sustainable development and operation of MAR schemes;
- outline the relevant regulatory framework and make the approval process for MAR schemes more efficient and transparent;
- ensure efficient investment to achieve public health and environmental protection that is consistent with state requirements.

These guidelines are targeted at MAR scheme proponents and/or operators, regulatory authorities/agencies, regional water corporations responsible for the approval of MAR schemes, water corporations, consultants, developers, local councils, catchment management authorities and other government agencies/authorities with a water management role.

These guidelines do not cover aquifer recharge projects undertaken by water management authorities for aquifer replenishment and/or to support groundwater-dependent ecosystems. However, the risk management principles outlined within these guidelines and the AGWR 2C can still be applied where appropriate in developing and managing such schemes.

These guidelines apply to MAR schemes that have both an intentional recharge and planned extraction components.

It should be noted that to protect the quality of groundwater and ensure aquifer sustainability, many of the source waters may require some level of treatment (known as pre-treatment) prior to recharge. For trials and testing purposes of certain schemes, reticulated drinking water may be used as recharge water over limited time periods.

## 2 REGULATORY FRAMEWORK

### 2.1 LEGISLATION

#### Acts

The relevant Acts which relate to MAR schemes in Victoria are as follows.

#### *Water Act 1989*

The *Water Act 1989* provides the framework for allocating surface water and groundwater throughout Victoria.

Some regional water corporations (Southern Rural Water, Goulburn-Murray Water, Grampians Wimmera Mallee Water and Lower Murray Water) have delegated responsibility to licence and approve: disposal of matter via a bore; extraction and use from an aquifer; and the construction and operation of dams and bores.

#### *Environment Protection Act 1970*

The *Environment Protection Act 1970* (EP Act) provides a legislative framework for the protection of the environment in Victoria. Under the EP Act discharges to the environment must be managed so that they do not adversely affect the receiving environment (air, land, surface water or groundwater).

#### *Catchment and Land Protection Act 1994 (CALP Act)*

The *Catchment and Land Protection Act 1994* (CALP Act) allows the Minister for Water to determine areas of Victoria which are catchment and land protection regions, and have them declared as 'special water supply catchment areas'.

#### *Safe Drinking Water Act 2003*

If the protected beneficial use of the aquifer includes potable water supply, or the aquifer is currently being used to supply drinking water, then the provisions of the *Safe Drinking Water Act 2003* should be considered. The purpose of this Act is to make provision for the supply of safe drinking water, and:

- requires water suppliers and water storage managers to prepare and implement risk management plans
- provides for auditing
- ensures that drinking water supplied meets quality standards specified
- requires disclosure of public information concerning quality of drinking water.

Where MAR takes place in a catchment from which a water supplier (as defined in the *Safe Drinking Water Act 2003*) supplies drinking water, the scheme manager should ensure that the water supplier is consulted.

#### Regulations

The *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007* outline the premises and activities that are scheduled and therefore require works approval and/or licence under the EP Act.

The Regulations also provide for exemptions from these works approval and licensing provisions for certain activities and premises. Included in the list of exemptions is 'an effluent reuse scheme or activity' that is undertaken in a manner acceptable to the Environment Protection Authority (EPA).

While the use of sewage and wastewaters from scheduled premises such as paper mills and certain milk factories is captured as a scheduled activity within the regulations, the use of other source waters including rainwater and stormwater is not.

EPA has powers under the EP Act to issue a pollution abatement notice if an unscheduled MAR activity, (e.g. where the source water is stormwater) has caused or is likely to cause pollution.

#### Policies

The EP Act provides for State Environment Protection Policies (SEPPs) that identify beneficial uses to be protected through the setting and attainment of environmental objectives. SEPP's relevant to MAR schemes are:

- *State Environmental Protection Policy (Waters of Victoria) 2003* (SEPP WoV)
- *State Environmental Protection Policy (Groundwaters of Victoria) 1997* [SEPP (GoV)]

The aim of SEPP WoV is to facilitate sustainable surface waters by identifying the environmental values and beneficial uses of waters and setting environmental objectives to protect them.

The aim of SEPP (GoV) is to maintain and where necessary, improve groundwater quality sufficient to protect existing and potential beneficial uses of groundwater throughout Victoria. SEPP (GoV) is particularly relevant to MAR. Although MAR is not explicitly listed as an activity in SEPP (GoV), clauses 10(3) and 20(1) apply to MAR schemes. Those clauses require aquifer water quality to be maintained and allow for discharge to an aquifer for recharge purposes.

Appendix A contains more information on the implications of SEPP (GoV) to MAR schemes.

### 2.2 GUIDANCE DOCUMENTS

Where the recharge water is derived from sewage (blackwater and greywater), the scheme manager must ensure that the scheme also meets the requirements specified under the *Guidelines for Environmental Management: Use of reclaimed water* (EPA publication 464) and *Guidelines for Environmental Management: Dual pipe water recycling – Health and environmental risk management* (EPA publication 1015), and any other relevant EPA Guidelines. These can be accessed at [www.epa.vic.gov.au/publications](http://www.epa.vic.gov.au/publications)

## 3 ROLES AND RESPONSIBILITIES

### 3.1 WATER CORPORATIONS

Victoria's water industry includes sixteen regional water corporations, Melbourne Water Corporation and three metropolitan water businesses. Their roles and responsibilities related to MAR schemes are discussed below.

#### 3.1.1 Regional water corporations

Four of the regional water corporations providing rural services (Southern Rural Water, Goulburn-Murray Water, Grampians Wimmera Mallee Water and Lower Murray Water) are of particular relevance to all MAR schemes, as they are responsible for management, control and licensing of groundwater in accordance with the *Water Act 1989*. In the Victorian MAR guidance, these regional water corporations are in charge of the approval process for MAR schemes. (Refer to Appendix C for contact details). They may refer certain aspects of a scheme to other agencies for advice as required.

#### 3.1.2 All Water Corporations

Water Corporations supply water and sewerage services and may have other roles such as waterway management, drainage or floodway management functions. If the protected beneficial use of the aquifer includes potable water supply, or where the aquifer is currently used to supply drinking water, then the provisions of the *Safe Drinking Water Act 2003* may apply. The proponent will need to contact the relevant water corporation for more information.

#### 3.1.3 Melbourne Water

Under the *Water Act 1989*, Melbourne Water has waterway management, floodway and drainage management functions as well as water storage and sewage treatment responsibilities within the Melbourne metropolitan area.

Under this Act it may be necessary for a MAR proponent to obtain the consent of Melbourne Water for any proposal within the Melbourne metropolitan area, which may impact upon waterways, floodways, drainage, or use source water from a Melbourne Water asset including but not limited to sewage, recycled water, surface water or stormwater within Port Phillip and Western Port catchment.

### 3.2 ENVIRONMENT PROTECTION AUTHORITY (EPA)

EPA administers the *Environment Protection Act 1970* and State Environment Protection Policies including SEPP (GoV). EPA develops environmental Guidelines that encourage best practice and result in the development of safe and sustainable water recycling

schemes. If MAR schemes are associated with a scheduled premises, then the proponent must obtain the necessary approval from EPA. Scheduled premises are listed in the *Environment Protection (Scheduled Premises) Regulations 2007*.

### 3.3 DEPARTMENT OF HUMAN SERVICES (DHS)

DHS only has a role in MAR where it is associated with a Class A recycled water scheme. DHS endorsement is required for schemes associated with Class A recycled water, under the *Guidelines for Environmental Management: Use of reclaimed water* (EPA publication 464.2) and *Guidelines for Environmental Management: Dual pipe water recycling – Health and environmental risk management* (EPA publication 1015).

DHS endorsement is focused on the capability of a recycled water scheme's treatment plant to produce recycled water that is safe for uses, and the associated monitoring and control of the treatment plant.

### 3.4 LOCAL COUNCILS

Local councils are responsible for planning, protecting public health and the environment within their municipality. Local councils may be involved in MAR schemes where they have responsibility for drainage functions or involvement in planning and building permits.

### 3.5 DEPARTMENT OF SUSTAINABILITY AND ENVIRONMENT (DSE)

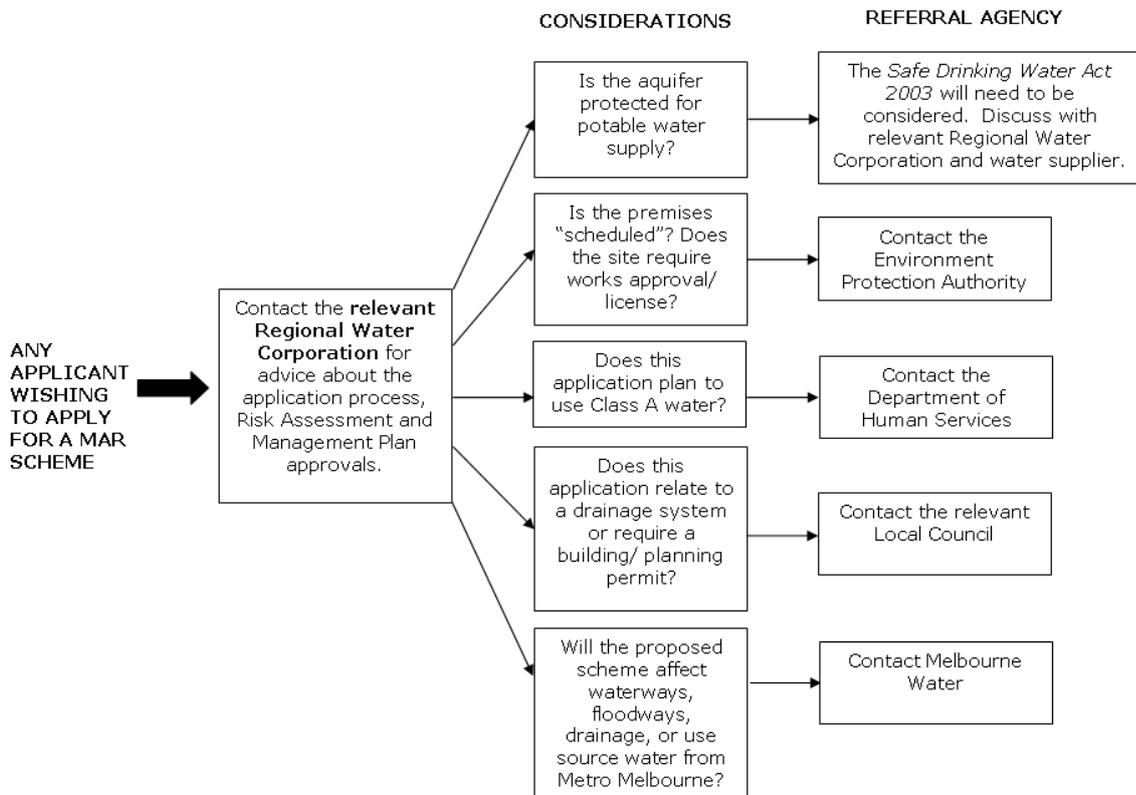
DSE is Victoria's lead government agency responsible for the promotion and management of sustainability of the natural and built environment. The DSE oversees the administration of the *Water Act 1989*, which is the framework for allocating surface water and groundwater throughout Victoria. They also oversee the *Water Industry Act 1994*, the *Catchment and Land Protection Act 1994* and the *Planning and Environment Act 1987*.

DSE plans to undertake a review of the groundwater allocation framework, which will consider allocation arrangements for MAR schemes.

### 3.6 CATCHMENT MANAGEMENT AUTHORITIES (CMAS)

Under the *Catchment and Land Protection Act 1994* (the CaLP Act) Victoria is divided into 10 regions each with its own CMA. The CMAs apply a whole of catchment approach, which ensures the protection and restoration of land and water resources, the sustainable development of natural resource based industries and the conservation of our natural and cultural heritage. CMAs also administer permits for works on waterways under the *Water Act 1989*.

**MAR REFERRAL PROCESS**



Note: Regional water corporations may seek advice from any relevant agency throughout the applications and approval process. If Regional water corporations are the proponent of a MAR scheme they should refer the proposal to EPA, DHS and relevant council(s).

**3.7 MAR SCHEME MANAGERS**

The applicant appoints a MAR scheme manager who must be identified in the management plan. As a minimum, they are responsible for:

**Risk assessment**

- The scheme manager needs to identify all uses of the aquifer in the risk assessment for a MAR scheme. This is particularly important where MAR schemes take place in a catchment that is used for the provision of water to prescribed food and accommodation premises.
- Demonstrating an understanding of existing schemes and strategies pertaining to land and water management and the potential for conflict with the proposed MAR scheme.
- Presenting risk assessment outcomes including identifying all uses of the catchment in the risk assessment.
- Referring to applicable guidance, policy and legislation where necessary.
- Demonstrating the proposed scheme will not detrimentally impact upon existing MAR schemes, other groundwater users or the environment.

**Consultation**

- Ensuring the relevant authorities, agencies, stakeholders and communities have been consulted.
- Engagement with suppliers and users.
- Ensuring users of recovered water from a MAR scheme are using the water appropriately and are informed of the potential risks associated with misuse.

**Management plan**

- Ensuring that a suitably qualified person develops the management plan.
- Developing, implementing and reviewing the management plan underpinning the production of water that is safe for use.
- Having an expert review the management plan.
- Ensuring the management plan demonstrates the scheme will be operated and managed in accordance with these guidelines, which will form the basis of the approval under the *Water Act 1989*.
- Keeping a register for the MAR scheme. This register should include information on the MAR scheme including the quality and quantity of water used for recharging the aquifer, quality and

quantity of water recovered and supplied from the MAR scheme, and end uses of the recovered water.

- Identify monitoring and reporting requirements for the MAR scheme.

Where MAR takes place in an aquifer that is used for the provision of drinking water for supply by a water supplier as defined in the *Safe Drinking Water Act 2003*, the MAR scheme manager should ensure that the water supplier is consulted.

Compliance with these guidelines and the management plan forms a critical component in relation to the use of MAR for water recycling. Non-compliance can potentially expose parties to legal action and create environmental and health risks.

To assist in the management of these risks, agreements should be developed between the MAR scheme manager, the supplier and the users of water recovered from a MAR scheme. The agreements should include mechanisms to address a failure of a party to meet their responsibilities, such as the supplier or scheme manager restricting or ceasing supply. In the case of residential users, the agreements could be structured generically, such as with 'customer charters' rather than individual contracts.

The management plan should detail these mechanisms and identify any specific responsibilities established in the agreements.

Refer to the AGWR 2C for more information on developing a management plan.

### 3.8 SUPPLIERS

The supplier manages the distribution of water recovered from a MAR scheme. A supplier must ensure:

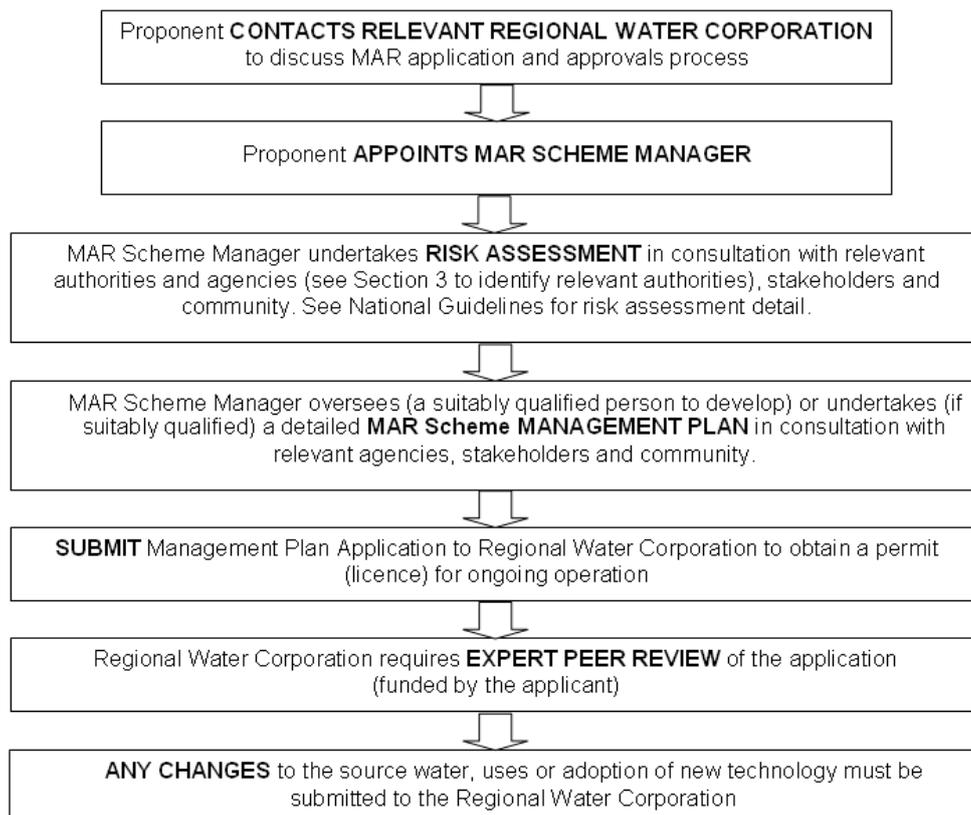
- an extraction license has been obtained from the relevant regional water corporation
- the supply water that comes from a MAR scheme has been approved by the relevant regional water corporation
- the approved management plan has been followed for the treatment, recharge and recovery of water
- water produced is suitable for its purpose.

The supplier must ensure that any dual pipe schemes used for distribution and supply of the recovered water from a MAR scheme is in accordance with *Guidelines for Environmental Management: Use of reclaimed water* (EPA publication 464) and *Guidelines for Environmental Management: Dual pipe water recycling – Health and environmental risk Management* (EPA publication 1015).

### 3.9 USERS

Users of water recovered from a MAR scheme are responsible for using water in accordance with the management plan. With respect to residential users, scheme managers are responsible for communicating the appropriate use of recovered water.

#### SUMMARY OF THE MAR APPLICATION AND APPROVAL PROCESS



## 4 MAR SCHEME DEVELOPMENT AND MANAGEMENT

The use of MAR as a means for water recycling requires minimising public health and environmental risks associated with the scheme to an acceptable level, and ensuring capacity of the aquifer to sustain the scheme without degradation or impact on other uses or users.

The AGWR 2C preventative risk management framework is supported in Victoria. An assessment of the MAR scheme is required to identify all hazards and hazardous events. These hazards can pose risks in each component of the MAR scheme from source water capture to the end use of the recovered water and application of appropriate management controls (preventive measures) to minimise risk to an acceptable level.

The assessment is best guided using a preventive risk management framework such as Hazard Analysis and Critical Control Point (HACCP), which is also used by the *Australian Drinking Water Guidelines* (NHMRC, NRMCC 2004).

### 4.1 MAR SCHEME DEVELOPMENT AND ASSESSMENT PROCESS

All MAR schemes in Victoria require approval from the relevant regional water corporation (see Appendix C for contact details). Each MAR proposal is required to undergo a risk assessment process to obtain approval. This will identify the level of risk associated with the scheme and the relevant preventive measures required to ensure that the scheme is safe and sustainable.

The MAR scheme development and risk assessment process is described in AGWR 2C.

Information on specific approval application requirements can be obtained from the relevant regional water corporation.

### 4.2 MANAGEMENT PLAN

The approval of a MAR scheme will be based upon a management plan, and demonstration that performance objectives identified within AGWR 2C will be met. The development of management plans and risk assessment are covered in AGWR 2C, further details of the management plan are given below.

MAR scheme management plan is an important document for ensuring the safe and sustainable operation of the system. The management plan is approved to permit (license) the scheme for ongoing operation, and will specify the scheme/licence review and audit requirements. Review and reassessment of the scheme and management plan will be required if changes occur to the source water, uses or adoption of new technology.

The primary objectives of the management plan are to:

- ensure that all aspects of the scheme which could pose a risk to human health and the environment have been identified and addressed through the application of a preventive risk management system
- demonstrate that the performance objectives of these Guidelines can be complied with, by detailing the operational controls and preventive measures that will be implemented to manage risk
- provide a framework to assess the ongoing sustainability of the scheme.

The management plan generally includes the:

- process diagram of the entire MAR system for capture, pre-treatment, injection, storage, recovery, post-treatment and end use
- identified hazards and hazardous events and risk posed by the hazards
- preventive measures, operational procedures and process controls
- critical control points, quality control points and associated critical limits
- incidence response procedures
- monitoring information including baseline, operational, validation (refer to section 4.3) and verification data
- both internal and external reporting requirements
- audit and review requirements
- training programs and records for employees and contractors.

It is also important that the roles and responsibilities are clearly documented within the management plan including clear lines of accountability and reporting and, specifically, actions to address any non-compliance with these guidelines. (Details on the roles and responsibilities for a MAR scheme are provided in Section 3.)

The development of a management plan should be underpinned by a preventive risk management system such as HACCP, which is also used by the *Australian Drinking Water Guidelines* (NHMRC, NRMCC 2004). Depending on the inherent risk of the scheme identified in the maximal risk assessment the management plan may need to include HACCP principles or HACCP plan. The operational controls and preventive measures identified in the HACCP process are required to be fully documented in the management plan.

### 4.3 VALIDATION MONITORING

The validation of critical limits is essential for substantiating that the system can be controlled to meet the water quality objectives and that associated monitoring activities will be able to effectively indicate

this. Validation must occur before supply of recycled water can commence.

The first stage of validation is to consider data that already exists. This can include data from scientific literature, existing guidance, historical data (for example, from other schemes) and supplier knowledge.

The second stage of validation is to determine whether additional testing is required, for example, whether specific on site studies are necessary and to collect and analyse the appropriate data. As validation is not used for the day to day management of the system, parameters that may be inappropriate for operational monitoring can be used.

#### **4.4 OPERATIONAL ISSUES AND THEIR MANAGEMENT**

AGWR 2C discusses operational issues and their management in detail. Operational issues include clogging, salinity of recovered water, recharge water quality requirements for sustained MAR operations and interactions with other groundwater users.

#### **4.5 SUSTAINABILITY APPRAISAL**

MAR proponents are encouraged to assess the MAR scheme against a broad range of criteria to ensure the scheme is sustainable, some of which is already considered as part of a routine assessment of MAR schemes. The sustainability of a proposed scheme can be assessed with regard to the balance of the scheme's potential environmental, social and economic impacts. Factors relevant to MAR include:

- use of energy, raw materials and water resources
- impact on air, water and soil quality, aquifer and aquitard, landscape, wild life and habitats

- social impact
- economic impact including financial viability.

If the proponent wishes to undertake a more in-depth sustainability assessment of the MAR scheme, then the following could be considered:

- responsible procurement of energy
- energy-efficient system design, equipment and processes
- minimum adverse impacts on the environment over the life cycle of the project
- efficient management of environmental emissions through adoption of practices aimed at waste minimisation and cleaner production (refer to [www.epa.vic.gov.au/waste/role.asp](http://www.epa.vic.gov.au/waste/role.asp) for further information)
- beyond basic consultation, the concerns of the stakeholders of the proposed scheme are addressed
- the effect of the proposed scheme on safety, amenity and noise levels are acceptable in the public environment
- avoiding unnecessary expenditure that may be caused by over-design or over-treatment.

Further information on life cycle management (LCM), an integrated concept to assist in businesses managing the total life cycle of products and services towards more sustainable consumption and production patterns, and tools to help businesses adopt a life cycle approach in their business decision making can be obtained from EPA's web page: [www.epa.vic.gov.au/lifecycle/default.asp](http://www.epa.vic.gov.au/lifecycle/default.asp).

## 5 MAR SCHEME APPROVAL AND REFERRAL PROCESS

Table 1: Referral process for EPA – scheduled premises

Referral agency	Site requires works approval/licence	Site has exemption from works approval/licence	Site uses Class A water
Regional water corporation	Will refer scheme Non-statutory referral	Will refer scheme Non-statutory referral	Will refer scheme Non-statutory referral
DHS	Will refer scheme Statutory referral	-	Will refer scheme Statutory referral
Local Council	Will refer scheme Statutory referral	-	-
Other agencies	See section 3 – Roles and responsibilities		

### 5.1 REGIONAL WATER CORPORATION APPROVAL AND REFERRAL PROCESS

#### 5.1.1 Approval

Under the *Water Act 1989* all MAR schemes in Victoria require approval from the relevant regional water corporation, who are responsible for managing groundwater resources (see Appendix C for contact details) and will administer the framework applicable for MAR.

It is recommended that the relevant regional water corporation requires expert review of the application to ensure that it adequately addresses these Guidelines. This review would be funded by the proponent and the peer reviewer would be approved by the relevant regional water corporation.

Advice about particular application requirements can be obtained from the relevant regional water corporation.

Where the regional water corporation is the proponent of a MAR scheme, the proposal should be referred to EPA, DHS and the relevant council(s).

#### 5.1.2 Referral

There are no statutory referrals under the *Water Act 1989* for MAR applications, however the relevant regional water corporation may refer to other agencies for advice on MAR proposals. The following referrals will occur:

- Scheduled activity<sup>1</sup>
  - refer the scheme to EPA.
  - refer the scheme to DHS if it includes Class A water
- Unscheduled activity
  - EPA will act as a referral agency if requested by the relevant regional water corporation

For information on referral and responsibilities of other agencies, refer to section 3, Roles and Responsibilities.

### 5.2 EPA APPROVAL AND REFERRAL PROCESS

#### 5.2.1 Approval

In cases where a scheme is associated with a scheduled premises, the proponent must also seek approval for the scheme from EPA.

The approval requirements may vary depending on the scheme, so advice from EPA should be sought on specific requirements.

#### 5.2.2 Referral

EPA will act as referral agency for the relevant regional water corporation. Statutory and non-statutory referral processes under the EP Act are clarified in the Table 1. Schemes requiring works approval will also be publicly advertised as required by the EP Act.

EPA may refer proposals that use Class A water to DHS. In Victoria, the Department of Human Services (DHS) must endorse Class A water recycling schemes, where recycled water is derived from sewerage systems or industry processes. DHS endorsement focuses on the validation, operation and control of treatment processes to ensure they are capable of reliably achieving specific log reductions of pathogens to produce water that is safe for use. DHS does not recognise natural attenuation in aquifers as a means of achieving the log reductions required for Class A schemes.

<sup>1</sup> Premises are scheduled under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007*, No. 77/2007

## **6 RISKS AND HAZARDS**

When preparing for a MAR scheme approval, information on hazards and hazardous events should be compiled based on existing information. Further investigations will be required as part of the assessment process. This will help enable hazard identification and assessment of risks posed by the scheme to the aquifer or end uses. The rigour of assessments shall be commensurate with the level of risk posed by the scheme.

### **6.1 MAJOR HAZARDS, PREVENTATIVE MEASURES AND MONITORING**

For information on all major hazards and the relevant preventive measures for mitigating risk and monitoring requirements, refer to AGWR 2C and AGWR Phase 1.

### **6.2 RISK IDENTIFICATION, MANAGEMENT AND MITIGATION**

Preventive risk management systems are being increasingly used by the water industry to assure water quality. These systems underpin the *Australian Drinking Water Guidelines* (NHMRC & NRMCC 2004), the *Victorian Safe Drinking Water Act 2003* and *Australian Guidelines for Water Recycling: Management of Health and Environmental Risks (Phase 1)* and AGWR 2C. The management of incidents and emergencies is also covered in AGWR 2C.

Note: Monitoring is integral to MAR risk assessment, forms a central component of risk management frameworks such as HACCP, and is covered in AGWR 2C. Schemes must be monitored to ensure they are consistent with the intent of Victorian legislation. Water quality testing of groundwater in the area directly impacted by the storage of recharge water should be undertaken at the end of a MAR cycle/s, and as required by the relevant regional water corporation, to ensure the most sensitive criteria for any of the protected beneficial uses of the aquifer are met.

## APPENDIX A: IMPLICATIONS OF SEPP GOV IN THE DEVELOPMENT OF MAR SCHEMES

The goal of SEPP (GoV) is to maintain and where necessary improve groundwater quality to protect existing and potential beneficial uses of groundwater throughout Victoria. Key principles on which the policy is based are:

- groundwater is an undervalued resource;
- protecting groundwater is fundamental to protecting the environmental quality of surface water
- aquifers should be protected to the greatest extent practicable from serious or irreversible damage from human impacts.

These form the core criteria by which EPA can make determinations on the impact of any activity on groundwater quality.

SEPP (GoV) identifies the beneficial uses of groundwater that are to be protected based on the inherent capacity to support a use as indicated by salinity (TDS). Table 2 below is a reproduction from the Table 2 in SEPP (GoV) and displays the groundwater segments, defined by TDS, and their respective protected beneficial uses.

SEPP (GoV) also establishes indicators and objectives for determining whether these beneficial uses are protected. The objectives define pollution of groundwater on behalf of the government (e.g. water

corporations would use SEPP to define pollution under section 76 of the *Water Act 1989*).

MAR was not envisaged at the time of drafting SEPP (GoV), and is therefore not explicitly addressed. Nevertheless, SEPP (GoV) provides the framework for the assessment of MAR.

Clause 20(1) prohibits direct discharge of waste to prevent groundwater pollution, but allows for an exemption for a range of activities. These include aquifer recharge, which SEPP (GoV) defines as 'the process of water being added to a groundwater system comprised of a geological structure or formation, or part thereof, permanently or intermittently permeated with water or capable of transmitting water'. While MAR is not explicitly addressed, it is EPA's view that clause 20(1) applies to the recharge component of MAR schemes, and provides a suitable framework for assessing all components of MAR.

Under clause 20(1) there is a requirement to demonstrate to the satisfaction of the relevant regional water corporation that the groundwater quality objectives of SEPP (GoV) will be met. The relevant protection authority also needs to be satisfied that there will be no detrimental impact on any beneficial uses of land, groundwater or surface water.

**Table 2: Protected beneficial uses of segments**

Beneficial uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1000)	B (1001-3500)	C (3501-13,000)	D (more than 13,000)
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water supply					
<i>desirable</i>	✓				
<i>acceptable</i>		✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks and gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

## APPENDIX B: WATER ALLOCATION FRAMEWORK

This section provides details of the current water allocation framework and its implications to MAR activities.

Under the *Water Act* 1989 (the Water Act), regional water corporations listed in Appendix C have been delegated the responsibility for licensing the taking and use of groundwater in Victoria. Part 4, Division 2, of the Water Act provides for licensees to take and use water. Such a licence may be required for the collection of water (and storage of water) prior to its introduction into an aquifer. A licence will also be required to drill a bore (section 67).

### GROUNDWATER OWNERSHIP

Groundwater is defined within the EP Act to mean 'any water occurring in or obtained from an aquifer and includes any matter dissolved or suspended in any such water'. Under the Water Act, water introduced or recharged into an aquifer becomes 'groundwater'.

Under the Water Act, the Crown owns and controls all water, except where the Act provides individuals with rights over water. As a result, most actions in relation to water require some form of licence or permit.

However, as at 2008 the Water Act did not allow MAR proponents or operators to be given priority rights, to either a portion or all of the recharged groundwater. Thus there was a lack of certainty.

In 2008, the Department of Sustainability and Environment (DSE) plans to undertake a review of the groundwater allocation framework, which will consider allocation arrangements for MAR schemes.

### GROUNDWATER USE AND PROTECTION

Section 22A of the Water Act provides that the Minister may, by Order, declare the maximum total volume of water, whether surface water, groundwater or both, which may

be taken in an area. This maximum is described as the Permissible Consumptive Volume.

Section 27 of the Water Act provides for the Minister to declare an area to be a water supply protection area (WSPA). The area may be declared to be a WSPA for the protection of groundwater resources in an area or the surface water resources in the area, or both.

### GROUNDWATER ALLOCATION CAPS

In many groundwater areas it is not possible to obtain a groundwater allocation where allocations are capped under a water supply protection area groundwater management

plan or through the Permissible Consumptive Volume. MAR proponents need to speak to the relevant regional water corporation about the applicable conditions in WSPAs.

A MAR proponent has the same rights as other potential licence holders and hence must apply for a licence to extract in the same way as others must, and may be subject (under some WSPA groundwater management plans) to a reduced annual allocation in drought conditions.

### UNDERGROUND DISPOSAL

Section 76 of the Water Act outlines the power of the Minister to approve underground disposal. A person may apply to the Minister for approval to dispose of any

matter underground by means of a bore. The Minister may approve the application subject to conditions or refuse to approve the application and specify the reasons for refusal.

If, in the Minister's opinion, the disposal would cause the pollution of groundwater or be detrimental to the aquifer or bore or interfere with the function of the bore as a State observation bore, the Minister must refuse the application.

Any disposal to an aquifer would also need to comply with Clause 20 of the SEPP (GoV). Additionally, section 3(2) of the EP Act states that where the provisions of the EP Act are inconsistent with any provisions of any other Act (such as the *Water Act* 1989), the EP Act provisions will prevail.

### CONSENT

It is an offence to do anything without the consent of the relevant Authority that may interfere with a waterway or interfere with any drainage regime.

## APPENDIX C: REGIONAL WATER CORPORATIONS

### **Southern Rural Water**

88 Johnson Street  
(Post Office Box 153)  
MAFFRA, Victoria, Australia 3860  
Tel: (03) 5139 3100  
Fax: (03) 5139 3150  
E-mail: [srw@srw.com.au](mailto:srw@srw.com.au)  
Website: [www.srw.com.au](http://www.srw.com.au)

### **Goulburn-Murray Water**

40 Casey Street  
(PO Box 165)  
TATURA, Victoria, 3616  
Tel (03) 5833 5500  
Fax (03) 5833 5501  
Email [reception@g-mwater.com.au](mailto:reception@g-mwater.com.au)  
Website: [www.g-mwater.com.au](http://www.g-mwater.com.au)

### **Lower Murray Water**

741-759 Fourteenth Street  
(PO Box 1438)  
MILDURA, 3500  
Tel: (03) 5051 3400  
Fax: (03) 5051 3480  
Email: [admin@lmw.vic.gov.au](mailto:admin@lmw.vic.gov.au)  
Website: [www.lmw.vic.gov.au](http://www.lmw.vic.gov.au)

### **Grampians Wimmera Mallee Water**

11 McLachlan Street  
(Post Office Box 481)  
HORSHAM, 3400  
Tel: 1300 659 961  
Fax: (03) 5381 9881  
Email: [info@gwmwater.org.au](mailto:info@gwmwater.org.au)  
Website: [www.gwmwater.org.au](http://www.gwmwater.org.au)

## GLOSSARY OF TERMS AND ABBREVIATIONS

<b>ADWG</b>	<i>Australian Drinking Water Guidelines</i> , published by NHMRC and NRMMC, 2004.
<b>AGWR Phase 1</b>	<i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)</i> , published by NRM, EPHC and AHMC, 2006.
<b>AGWR 2A</b>	<i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Augmentation of Drinking Water Supplies</i> , published by NHMRC, EPHC and AHMC, 2008.
<b>AGWR 2B</b>	<i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Stormwater Harvesting and Reuse – Draft for Public Comment</i> , prepared by NHMRC, EPHC and AHMC, 2008.
<b>AGWR 2C</b>	<i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Managed Aquifer Recharge - Draft for Public Comment</i> , prepared by NHMRC, EPHC and AHMC 2008.
<b>AHMC</b>	Australian Health Ministers' Conference
<b>ANZECC</b>	Australian and New Zealand Environment and Conservation Council (replaced by NRMMC in 2001)
<b>ARMCANZ</b>	Agricultural and Resource Management Council of Australia and New Zealand (replaced by NRMMC in 2001)
<b>ASR</b>	Aquifer storage and recovery
<b>ASTR</b>	Aquifer storage, transfer and recovery
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>DHS</b>	Department of Human Services
<b>EPA</b>	Environment Protection Authority
<b>EPHC</b>	Environment Protection and Heritage Council
<b>GEM</b>	Guidelines for Environmental Management
<b>HACCP</b>	Hazard analysis and critical control point
<b>MAR</b>	Managed aquifer recharge
<b>NHMRC</b>	National Health and Medical Research Council
<b>NRMMC</b>	Natural Resource Management Ministerial Council
<b>PIC</b>	Plumbing Industry Commission.
<b>SEPP</b>	State environment protection policy
<b>SEPP (GoV)</b>	<i>State Environment Protection Policy (Groundwaters of Victoria)</i>
<b>WHO</b>	World Health Organization
<b>WSPA</b>	Water Supply Protection Area

<b>Term</b>	<b>Definition</b>
Attenuation	In accordance with SEPP (GoV), attenuation means the reduction in concentration of contaminants in a solution passing through a porous medium by natural mechanisms including removal by ion exchange, chemical precipitation, adsorption filtration or biodegradation and hydrodynamic dispersion (mixing with surrounding water). In relation to MAR, these Guidelines recognise the definition in AGWR 2C MAR; 'the reduction in contaminant or pathogen concentration as a result of treatment processes, including passive subsurface treatment. These Guidelines focus on sustainable treatment processes such as biodegradation. Adsorption is another attenuation process however, when sorption sites are exhausted, breakthrough of contaminants will occur. In these Guidelines, adsorption is only relied on to the extent that it extends the time available for biodegradation.
Aquifer	A geological structure or formation, or part thereof, permeated with water or capable of being permeated permanently or intermittently with water and transmitting water.
Aquifer storage and recovery (ASR)	The recharge of an aquifer via a well for subsequent recovery from the same well.
Aquifer storage transfer and recovery (ASTR)	The recharge of an aquifer via a well for subsequent recovery from another well, to allow a minimum residence time in the aquifer before recovery.
Aquitard	A geological layer that has low permeability and confines or separates aquifers.
Beneficial use	A use of the environment or any element or segment of the environment which (a) is conducive to public benefit, welfare, safety, health or aesthetic enjoyment and which requires protection from the effects of waste discharges, emissions or deposits or of the emission of noise or (b) is declared in State environment protection policy to be a beneficial use.
Catchment	An area which, through run-off or percolation, contributes to the water in a stream or stream system
Catchment management	The coordinated management of land and water resources, using catchments as a basis.
Class A recycled water	A health-based microbial standard for recycled water quality that is defined in this guideline. Class A criteria do not include environmental quality parameters such as salinity or nutrient limits.
Critical control point	A point, step or procedure at which control can be applied and that is essential for preventing or eliminating a hazard, or reducing it to an acceptable level.
Cross-connection	A physical connection between the recycled water and drinking water supply systems.
Disinfection	The process designed to kill most microorganisms in water, including essentially all pathogenic (disease-causing) bacteria. There are several ways to disinfect, with chlorine being most frequently used in water treatment.
Drinking water	Water intended primarily for human consumption. Also known as potable water.
Dual pipe scheme	An urban water recycling scheme where recycled water is provided to householders for certain uses via a reticulation system that is separate from the drinking water supply. Sometimes referred to as a 'third pipe scheme'.
Effluent	The out-flow water or wastewater from any water processing system or device.

<b>Term</b>	<b>Definition</b>
Environmental values	Particular values or uses (sometimes called beneficial uses) of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and that require protection from the effects of contaminants, waste discharges and deposits. Several environmental values may be designated for a specific water body.
Filtration	Process in which particulate matter in water is removed by passage through porous media.
GEM	Guidelines for Environmental Management. Publications released by EPA to provide a best practice framework for managing environmental obligations.
Greywater	All household wastewater excluding that derived from the toilet and urinals.
Groundwater	Any water contained in or occurring in a geological structure or formation or an artificial land fill.
Groundwater-dependant ecosystem (GDE)	A diverse and important component of biological diversity, taking into account ecosystems that use groundwater as part of survival. GDEs can potentially include wetlands, vegetation, mound springs, river base flows, cave ecosystems, playa lakes and saline discharges, springs, mangroves, river pools, billabongs and hanging swamps.
Guideline	Numerical concentration limit or narrative statement recommended to support and maintain a designated water use.
HACCP	Hazard Analysis and Critical Control Point. An industry-recognised preventive risk management system that identifies, evaluates and controls hazards associated with the production of safe food or water.
Hazard	A biological, chemical, physical or radiological agent that has the potential to cause harm.
Hazardous event	An incident or situation that can lead to the presence of a hazard.
Indicator	Measurement parameter or combination of parameters that can be used to assess the quality of water; a specific contaminant, group of contaminants or constituent that signals the presence of something else (eg Escherichia coli indicate the presence of pathogenic bacteria).
Injectant	The water injected (pumped or fed by gravity) into an ASR or ASTR injection well.
Industrial water	Wastewater produced from processes at industrial or commercial premises. It includes all waterborne waste from these facilities except sewage.
Injection well	A well that admits water into an aquifer, either by pumping or under gravity.
Managed aquifer recharge	The intentional recharge of water into an aquifer either by injection or infiltration and recovery by planned extraction.
Monitoring	Systematically keeping track of something, including sampling or collecting information and documenting it.
Multiple barriers	Use of more than one preventive measure as a barrier against hazards.
Native groundwater	Groundwater that was present prior to recharge operations.
Nutrient	A substance that provides nourishment for an organism. For the purposes of stormwater run-off, the key nutrients are nitrogen and phosphorus.

<b>Term</b>	<b>Definition</b>
Observation well	A narrow bore, well or piezometer whose sole function is to permit water level and quality measurements.
Operational monitoring	The planned sequence of measurements and observations used to assess and confirm that individual barriers and preventive strategies for controlling hazards are functioning properly and effectively.
Pathogen	A disease-causing organism (e.g. bacteria, viruses and protozoa).
Pollutant	Substance that damages the quality of the environment.
Potable (drinking) water	Water suitable on the basis of both health and aesthetic considerations for drinking or culinary purposes.
Pre-treatment	Any treatment (eg detention, filtration) that improves the quality of water prior to injection.
Preventive measure	Any planned action, activity or process that is used to prevent hazards from occurring or reduce them to acceptable levels.
Quality	The totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs; the term 'quality' should not be used to express a degree of excellence (AS/NZS ISO 8402:1994).
Rainwater	Water collected directly from roof run-off.
Recharge	Replenishing of groundwater naturally by precipitation or runoff, or artificially by spreading or injection.
Reclaimed water	Alternative but less accurate term for treated sewage (recycled water preferred).
Recycled water	Water that has been derived from sewage, greywater, stormwater or industrial water and treated (where necessary) to a standard that is appropriate for its intended use.
Reuse	Utilisation of water for domestic, commercial, agricultural or industrial purposes, which would otherwise be discharged to wastewater or stormwater systems.
Risk	The likelihood of a hazard causing harm in exposed populations in a specified time frame, including the magnitude of that harm.
Risk assessment	The overall process of using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of their consequences (adapted from AS/NZS 4360:1999).
Risk management	The systematic evaluation of the water supply system, the identification of hazards and hazardous events, the assessment of risks, and the development and implementation of preventive strategies to manage the risks.
Run-off	Surface overland flow of water resulting from rainfall or irrigation exceeding the infiltration capacity of the soil.
Salinity	The content of salt in soil or water. Generally expressed in electrical conductivity (EC), although Total Dissolved Solids (TDS) is also used to indicate salinity.

<b>Term</b>	<b>Definition</b>
Scheduled premises	Any premises prescribed by regulation or of a class prescribed by regulation as premises at or from which waste is or is likely to be discharged, emitted or deposited to the environment, noise is or is likely to be emitted or waste is or substances which are a danger or potential danger to the quality of the environment or any segment of the environment are reprocessed, treated, stored, contained, disposed of or handled; or any activity which is conducted which creates a state of potential danger to the quality of the environment or any segment of the environment.
Scheme manager	The body identified as responsible for the management of MAR schemes.
Scheme proponent	An organisation or person that facilitates the development of a MAR scheme.
SEPP	State environment protection policy. SEPPs are adopted by Government, and gazetted pursuant to the <i>Environment Protection Act 1970</i> . SEPPs describe environmental objectives for defined environmental segments (for example, groundwater).
Sewage	Any waste containing human excreta or domestic wastewater.
Source water	Water as harvested, before any treatment, prior to recharge.
Stakeholder	A person or group (e.g. an industry, a government jurisdiction, a community group, the public) that has an interest or concern in something.
Standard (e.g. water quality standard)	An objective that is recognised in environmental control laws enforceable by a level of government.
Storage	A natural or artificial impoundment used to hold water before its treatment and/or distribution (e.g. reservoir or aquifer).
Stormwater	Urban surface water runoff most commonly captured from rain events.
Surface water	All water naturally open to the atmosphere (e.g. rivers, streams, lakes and reservoirs).
User	A person, community, group or organisation that uses water recovered from a MAR system.
Validation (of processes)	The substantiation by scientific evidence (investigative or experimental studies) of existing or new processes and the operational criteria to ensure capability to effectively control hazards.
Water recycling	A generic term for water reclamation and reuse. It can also be used to describe a specific type of 'reuse' where water is recycled and used again for the same purpose (eg recirculating systems for washing and cooling), with or without treatment in between.

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