Southern Rural Water

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Groundwater Management Plan

Warrion Water Supply Protection Area

Approval

I, Tim Holding, Minister for administering the Water Act 1989,
approve this plan in accordance with section 32A (6) of the Water Act 1989.

Tim Holding, MP

Minister for Water

Date: 30/08/2010

Preface

Groundwater Management Plans are prepared for areas where more intensive monitoring and /or management is needed to ensure the aquifers and environment are suitably protected.

In 2009, the Minister for Water appointed a community-based consultative committee to develop a Groundwater Management Plan for the Warrion Water Supply Protection Area.

This committee consisted of:

Doug Chant (Chairman)	**Licence holder**
Peter Delahunty	**Licence holder**
John Miller	**Licence holder**
Rod Angus	**Licence holder**
Jim Burns	**Licence holder**
Doug Richens	**Licence holder**
Jack Hester	**Licence holder**
Greg Williams	**Corangamite Catchment Management Authority**
Stewart Anderson	**Colac Otway Shire Council**
Penny Winbanks	**Southern Rural Water**

During the development many others attended meetings as observers to provide perspective and invaluable opinions. These included:

Chris McAuley	**Department of Sustainability & Environment**
Simone Wilkie	**Corangamite Catchment Management Authority**
Elissa McNamara	**Southern Rural Water**
Craig Parker	**Southern Rural Water**
Lucas Snow	**Southern Rural Water**

The committee has developed this plan following extensive discussion, consideration of relevant technical work and in response to public submissions.

Glossary

Term/Acronym	Description
Act	**Water Act 1989**
AHD	**Australian Height Datum or mean sea level.**
Aquifer	**Geological structure or formation permeated or capable of being permeated permanently or intermittently with water**
Corporation	**Southern Rural Water Corporation**
Department	**The Department of Sustainability and Environment**
Discharge lake	**Where groundwater enters the lake and leaves through evaporation resulting in concentration of salts.**
Entitlement	**The total amount of groundwater authorised to be taken each year under a groundwater licence**
GDE	**Groundwater Dependant Ecosystem**
GMS	**Groundwater Management System (GMS) is a database of groundwater information managed by the Corporation and the Department**
Groundwater Licence	**Licence issued under section 51 of the Act to allow the take and use of groundwater**
Management Plan	**The Warrion WSPA Groundwater Management Plan**
ML	**Megalitre (One million litres)**
PCV	**Permissible Consumptive Volume**
Protection Area	**The Warrion Water Supply Protection Area**
Recharge lake	**Where surfacewater infiltrates the aquifer**
Through-flow lake	**Where groundwater moves from one side of the lake to the other and the salinity of the lake is more in line with the groundwater in the area.**
Works Licence	**Issued under section 67 of the Act and is required for construction or alteration of a bore**
WSPA	**Water Supply Protection Area**

Contents

1 Introduction

This management plan has been prepared under Division 3 of Part 3 of the Water Act 1989 for the Warrion Water Supply Protection Area and relates to the groundwater resources of the protection area. The Warrion WSPA was declared by the Minister in August 2000.

While observation bores have indicated a recent downward trend, water levels have remained fairly static in the Protection Area over the last 20 years. At present metered groundwater usage is well below total groundwater licence entitlements, however if rainfall decreases, reliance on groundwater may increase resulting in continued decline.

Major uncertainty remains in relation to the extent of groundwater/surfacewater connectivity, the impacts of pumping and climate variability in the Protection Area. The management plan is based on the most up to date technical information and monitoring results, with an expectation that further investigations will inform future management requirements.

Under this management plan, no restrictions are placed on current licence holders ability to access their full entitlement however if the Corporation (Southern Rural Water) deems it necessary they may restrict extraction in the future to ensure the sustainability of the resource.

No new licences will be issued under the Plan with the exception of those specified within the prescriptions of this Plan. However to ensure current licence holders have the flexibility to adjust operations to changing circumstances and encourage new enterprises both temporary and permanent trading will be allowed.

The metering program will provide information on the location and volume of groundwater used in the area and this information in conjunction with a monitoring program will provide crucial information to inform any future management decisions.

An annual report will be produced by 30 September each year on the implementation of the management plan and this report will be made publicly available so that the community will be aware of how the groundwater resource in the area is being managed. The report will alert groundwater users and the wider community to any emerging issues.

2 Objective of the Management Plan

The objective of the management plan as set out in the Water Act 1989 is to make sure that “the water resources of the area are managed in an equitable manner so as to ensure the long-term sustainability of those resources.”

More specific objectives of this Plan are:

- To support an appropriate monitoring and metering program to improve knowledge, understanding and management of the resource;
- To manage potential threats to the health and condition of the groundwater resource and preserve the environmental values of associated water resources and groundwater dependent ecosystems;
- To establish clear and transparent licensing rules which provide flexibility and security for both established and potential enterprise; and
- To set up a structure to allow continual community engagement.

3 The Environment

3.1 Environmental Objective

An objective of the Water Act 1989 is to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning, quality of water and the other uses that depend on environmental condition.

In this management plan the objective will be achieved by:

- prohibiting the issue of new groundwater licences that would result in the current level of groundwater allocations increasing beyond the declared PCV (for exceptions see Prescriptions 3, 5 and 6);
- protecting groundwater discharges to lakes and wetlands by maintaining the groundwater gradients towards the surrounding lakes;
- establishing a monitoring program that monitors water levels in bores adjacent to groundwater dependent ecosystems (GDEs) such as the lakes where surface water and groundwater may interact;
- monitoring the salinity of groundwater across the protection area to guard against potential degradation of the groundwater resource by saline intrusion from lakes; and
- outlining suggested technical projects to further our understanding of the water resources within the Protection Area.

3.2 Acid Sulphate Soils

Acid sulphate soils (ASS) occur naturally in some inland and coastal regions. If left undisturbed these soils are harmless, however if the soil profile is drained and becomes dry, the iron sulphides within the soil react with the oxygen in the air to produce sulphuric acid. This can lead to plant and animal deaths, corrosion of building materials and even water supply contamination.

While potential ASS sites were identified within the Protection Area, no actual ASS have been identified at the single site sampled to date. Investigations so far have not confirmed whether these potential ASS are likely to generate acid if the soil profile was de-watered or the degree of connection to the basalt aquifer from which groundwater is extracted. However the Corporation will continue to work with other Agencies to understand the level of risk and develop appropriate management strategies (see Section 14).

4 Physical Characteristics of the Protection Area

The Protection Area is located north of Colac, approximately 150 km west of Melbourne. Lake Corangamite and Cundare Pool are on the western and northern boundaries respectively forming natural hydrogeological boundaries. The eastern boundary is the Colac-Cressy Road, beyond which there is limited groundwater development in the basalt aquifer. The eastern boundary passes through a region of low groundwater flow that occurs between Lake Beeac and Lough Calvert. The southern boundary runs along the Lake Colac shoreline and the Princes Highway south of the ridgeline between Robertsons Hill and the Basins. This boundary is south of an inferred groundwater divide that occurs along the ridgeline. Figure 1 shows a map of the area including licensed bore location with representation of associated volume.

The principal aquifer in the Protection Area is unconfined and is predominantly composed of fractured basalt and scoria material surrounding the eruption centres of Warrion Hill, the Red Rock Complex and Robertsons Hill. The basalts are relatively thin and generally less than 30 metres thick. The Hanson Plains Sand aquifer underlies the volcanic material, and although it is limited in extent, it may be hydraulically connected. Anecdotal evidence from some landholders suggests that in some areas the Hanson Plains Sand may be a source of groundwater, although it has been reported that this water is generally more saline.

Groundwater recharge from rainfall rates across the area can vary greatly. The volcanic cones and shallow craters, with their surrounding areas of stony rises may have infiltration rates of up to 30% of rainfall, however on the plains infiltration rates have been estimated at 5%.

This irregularity contributes to the variability of groundwater quality throughout the Protection Area. In areas of high recharge groundwater is relatively fresh (500 mg/LTDS) and brackish towards the boundary of the Protection Area (2000 mg/LTDS). Groundwater discharges to the Lake Corangamite and Lake Colac are brackish to saline due to relatively high evaporation rates and low rainfall.

Volcanic activity in the low lying areas has produced hummocky and undulating landforms and the region is dotted with lakes and wetlands which are believed to interact with groundwater to differing extents. Water levels in the lakes may be affected by a combination of the variability in rainfall and groundwater extractions. Lack of data on groundwater/surface water interactions makes it difficult to draw conclusions on relationships between the two systems.

A technical assessment undertaken by Sinclair Knight Merz (SKM) in 1998 estimated the Permissible Annual Volume (PAV) or sustainable yield to be 19,928ML, based on assumed rainfall recharge less the inferred discharge to the lakes and wetlands. A review of this work by Nolan ITU recommended amending the PAV to 16,130ML.

In 2001, Nolan ITU undertook another review of the PAV and determined that it should be reduced further to 14,100ML per year, and in 2008 the Minister declared a Permissible Consumptive Volume (PCV) of 13,836ML. PCVs in groundwater systems are set to reflect historical use and may not be a measure of sustainable yield (the previous PAV), and a recent assessment (Hyder 2009) indicates that recharge estimates used to calculate the original PAV may be significantly over-estimated. For this reason the Plan recommends a review of the sustainable yield.

5 Groundwater Level Trends

Groundwater levels are monitored using bores in the State Observation Bore Network (Figure 3). Prior to 2002 the water level trends were generally steady; however a declining trend has been recorded in recent years. Between 2004 and December 2009 levels have dropped approximately 2 metres when comparison is made between winter levels from year to year. This equates to an average decline of 40 centimetres per year in bores close to the centre (i.e areas of highest extraction) of the WSPA.

Groundwater levels vary throughout the year depending on seasonal climate conditions and the extent of groundwater pumping. During the irrigation season water levels drop however they usually recover during the wetter months, although groundwater recharge in the Warrion WSPA may been affected in recent years by slightly reduced rainfall and/or deviation from historical rainfall patterns.

Rainfall within the Protection Area has decreased slightly in recent years. Records began in 1898 at the Warrion Hill gauge (90080) and the average rainfall per year until 2009 has been calculated as 585mm/year. However, since 1996 the average recorded rainfall has been reduced to 557mm/year. While this may not be significant, the timing and duration of rain events also needs to be considered in terms of groundwater recharge. Metered usage (Section 8) indicates that while use varies substantially from year to year, the long term usage trend is relatively stable, suggesting the climate variation may be impacting the groundwater levels.

The plan recognises that groundwater levels may be seriously affected if current usage and rainfall trends continue. Metering information and water level monitoring will identify any trends and the results, together with necessary management actions will be reported in the annual report.

Figure 1 - Map of the Warrion WSPA, including licensed bore location by volume (ML)

6 Groundwater Salinity

Due to the proximity of saline lakes, there is a threat of saline intrusion into the aquifer. Under natural conditions the interface between saline water and fresh water is restricted to a relatively small area although seasonal variations will occur. A saline wedge is evident in such circumstances and this wedge may move towards extraction points over time. This may have long term effects on the usability of groundwater in affected areas.

In 2004 the Department constructed monitoring bores near Dreeite close to Lake Corangamite to monitor the saline water wedge. Figure 2 is a diagrammatical representation of the monitoring bores. At Sites A and B, brackish groundwater is encountered through the entire profile. Comparatively, at Site C located on top of a stony rise, shallow groundwater is significantly less saline, suggesting that fresh water is likely to be recharging groundwater in this area. These bores will be periodically monitored to determine if the salt water wedge is encroaching inland from the lake.

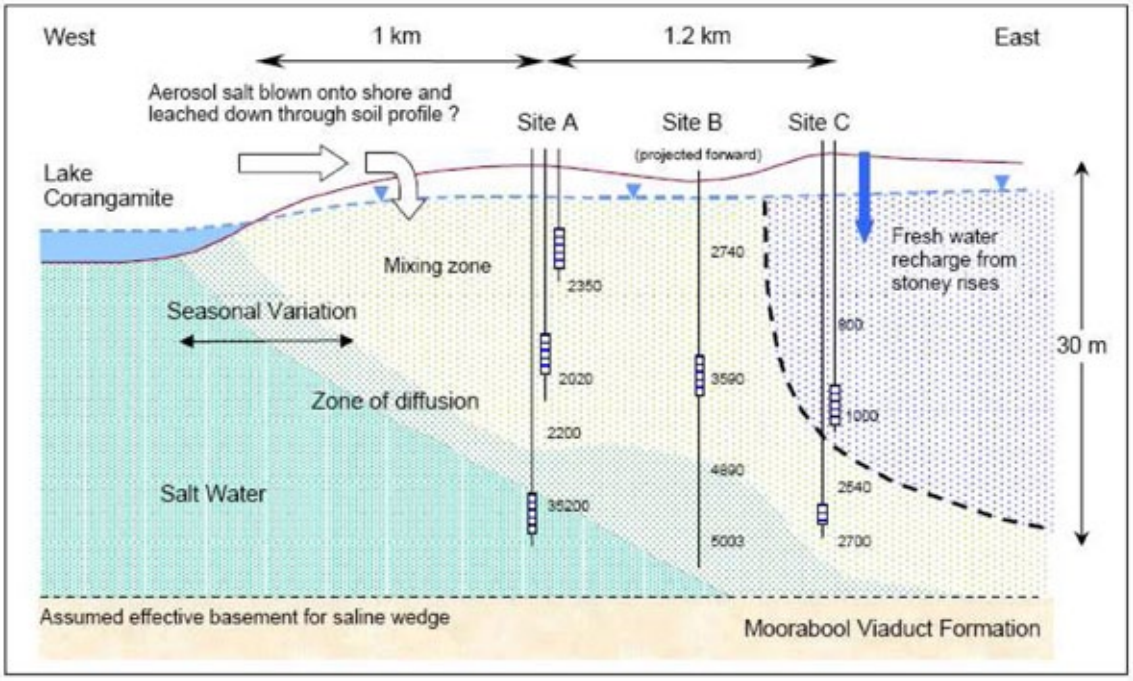

Figure 2 - Diagrammatical representation of a salt water wedge near Lake Corangamite showing groundwater salinities

Between 1999 and 2001 the Corporation undertook an extensive water quality monitoring program in the Protection Area from 26 State observation bores and private bores. Results from this together with salinity monitoring since 2004 have shown no significant regional trends.

The Woady Yaloak diversion scheme (WYDS) diverts water away from the lake prior to it flowing in. Under the operating rules of the diversion scheme, maximum volumes flowing down the Woady Yaloak River below a particular salinity level are diverted away from Lake Corangamite and into the Barwon Basin, irrespective of lake level. The potential impact of the WYDS under the current operating rules is that it could be causing the increasing salinity of Lake Corangamite and the underlying aquifer. This system needs to be managed taking into account its potential role in groundwater salinisation.

Regular water quality monitoring will be undertaken throughout the area to observe any changes in the salinity of the groundwater resource.

7 Surface Water - Groundwater Interaction

Groundwater systems may interact with lakes and wetlands in a number of ways and to varying extents. In the Protection Area there are a number of lakes and wetlands including a RAMSAR listed site and others of national and international significance, which are thought to interact with groundwater. These lakes and wetlands provide habitat for many species of water birds and other fauna and flora.

At present there is uncertainty around the classification of the lakes within the Protection Area. Some research suggests Lake Corangamite is a through-flow lake, while others believe it to be a discharge lake. Lake Colac has been identified as a through-flow and recharge lake, while evidence suggests that the Red Rock Complex was once a discharge lake that now acts as a recharge lake which acts to stabilise surrounding declining groundwater tables (Adler & Lawrence 2003, Hyder 2009). Table 2 outlines the most recent classification of the lakes.

Table 2 - Classification of lakes in Warrion WSPA

Lake	Significance	Classification
Lake Corangamite	**RAMSAR, National & Regional**	**Discharge or Through-flow**
Lake Colac	**Regional**	**Recharge or Through-flow**
Lake Martin	**National**	**Through-flow**
Lake Cundare	**RAMSAR & National**	**Through-flow**
Lake Beeac	**RAMSAR & National**	**Through-flow**
Red Rock Complex	**Not Applicable**	**Discharge or Discharge pre 2003, Recharge post 2003**

A recent review of the technical work supporting the Warrion GMP (Hyder 2009) concluded that this uncertainty would not affect the assumptions made within the Plan in most cases. The inferred change in classification of the Red Rock Complex - from a discharge lake to a recharge lake - may require further consideration in the future and investigations will be necessary to determine the extent of the relationship and the impact of extractions.

The plan maintains groundwater flow toward the surrounding lakes to protect groundwater quality (section 3.1,10.3 &10.4). This also protects groundwater discharge relationships to either through-flow or discharge lakes.

Additional groundwater level monitoring may provide valuable information to assist future reviews of resource management.

8 Groundwater Entitlements and Use

8.1 Licensed Water Use

The dairy industry is the dominant water dependent farming enterprise within the Warrion WSPA. However, groundwater is also used for irrigation, commercial and domestic & stock purposes.

There are 126 chargeable groundwater licences (this does not include temporary trades) in the Protection Area that entitles licence holders to extract 13,834.8 ML each year. In 2008, the Minister declared a Permissible Consumptive Volume (PCV) for the Warrion WSPA. At the time of writing the PCV is 13,836ML/year.

There are 106 licences for irrigation/commercial use, 20 dairy use licences and an estimated 730 bores which are used solely for domestic and stock use where a licence to take and use the water is not required. Figure 1 shows the location of licensed bores in the Protection Area.

Southern Rural Water installed meters on most operational irrigation bores by 2001. Table 3 shows groundwater use since the installation of meters, including estimates of domestic and stock and dairy use. Groundwater extraction volumes vary from year to year, increasing slightly over time. The observed increase may represent an actual change in use, or reflect improved metering. However, in any given year, metered use is no more than 48% of the licensed entitlement.

Table 3 - Groundwater Use in the Warrion WSPA

Purpose	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Irrigation & Commercial [1]	3207	5914	4310	4280	3710	2994	6630	3943
Dairy use [2]	260	260	260	260	260	260	260	260
Domestic & Stock [3]	1460	1460	1460	1460	1460	1460	1460	1460
Total	4927	7634	6030	6000	5430	4714	8350	5663

1. **Based on metered data collected by SRW**
2. **Based on an estimated usage of 13ML per/yr for unmetered dairy licences. This estimate was taken from a study conducted by the DPI.**
3. **Based on 2ML per D&S bore, number of bores (730) taken from Victorian Water Accounts 07/08.**

Groundwater level declines have been observed over the past five years. However, whether groundwater pumping is affecting wetlands and lakes remains uncertain. Groundwater extractions close to lake and wetland systems may have a greater impact on their water levels than extractions at a greater distance. Section 14 outlines further investigations to better understand these relationships.

Should groundwater extractions increase above historic levels and result in more significant groundwater level declines, a review of the management plan may be necessary.

8.2 Domestic & Stock Access

A person has the right to take water, free of charge and without a take and use licence, for domestic and stock use from a bore on their property (Section 8, Water Act 1989). However, landholders must apply for a Works Licence through Southern Rural Water to construct, alter or decommission a bore for any purpose, including domestic and stock.

Domestic and stock bores may not be recorded on the States groundwater database. Southern Rural Water recommends all domestic and stock bores should be registered. The benefit of registering your bore is two-fold:

- It allows Southern Rural Water to notify you of, and consider your interests during any licence transfer application that may occur near your bore; and
- It allows for more robust water accounting which is crucial to understanding the water balance of an area.

While the Water Act protects an individual's right to access water for domestic and stock purposes, it does not guarantee the available quality or quantity of the water. Domestic and stock bores are generally shallow and have a greater sensitivity to fluctuations in groundwater levels over time. This may result in bores needing to be deepened so that access to groundwater can be maintained.

It is the responsibility of the bore owner to ensure that the bore is properly maintained. Bore owners should regularly check the condition of their bores and pumps to avoid bore failure due to inadequate infrastructure or bore condition.

The annual report will include a summary of reported bore or pump failures in domestic and stock bores due to declining groundwater levels.

9 Administration and Enforcement of the Management Plan

The Corporation has the duty of administering and enforcing the management plan. To keep the community informed on the condition of the resource, monitoring and metering results and other issues arising, the Corporation will appoint a reference group and meet on an annual basis to discuss the implementation of the management plan.

10 Restrictions and Prohibitions on the Issue and Transfer of Licences

10.1 General

Due to the uncertainty associated with the interaction between groundwater and surfacewater and the potential for this to negatively impact on surrounding wetlands and lakes, a precautionary approach of limiting allocations to current licence volume will be adopted. This level of allocation may be reviewed in the future if necessary.

For licensing administration purposes new groundwater licences sometimes need to be issued. They may need to be issued to allow for groundwater licences to be amalgamated, divided or where there is a requirement for a new bore or different property to be included on a groundwater licence. It may also be necessary to issue licences in some cases as a result of licence transfers and/or to reflect historical use, in the case of dairy licences. However, no new groundwater licences will be issued if the total of all groundwater licence entitlements exceeds the PCV determined for the area.

New works licences may also need to be issued and the Corporation will make appropriate assessments and attach relevant conditions in accordance with the provisions of the Act that includes an assessment of extraction rate, distance to existing bores and other factors.

10.2 State Water Register

State government policy requires that all groundwater and surfacewater licences be migrated to the State Water Register. This will standardise the conditions on all licences. Schedule 2 contains a summary of standard licence conditions. However this is not a comprehensive list. Licences within the Warrion WSPA will have a standard licence term of 15 years applied when transferred to t he register.

10.3 Restrictions on the taking of Groundwater

The PCV determines the maximum volume of water that can be extracted from the Protection Area; however the management plan does not place specific restrictions on the taking of groundwater.

Continual monitoring of water levels will enable the Corporation to identify any groundwater level declines at an early stage. The metering program and rainfall data will provide additional information to help understand the behaviour of the groundwater system. Salinity monitoring will also help determine if groundwater extractions are adversely impacting on groundwater quality.

If necessary the Corporation is able to temporarily qualify rights to groundwater under section 33AAA of the Act if a water shortage occurs because regional drawdown is affecting access to groundwater by users; if continued pumping generates groundwater flow from surrounding lakes that may cause an increase in salinity; and/or salinity monitoring at the designated bores (Schedule 1) indicates a sustained increasing trend.

Any restrictions applied, along with the reason for their application, will be included in the annual report.

10.4 Licence Transfers

The management plan does not prescribe conditions in relation to the transfer of groundwater licences, but transfers of water entitlement into areas that abut the lakes should be discouraged. If at any time the risk or threat to the aquifer is seen to increase, the Corporation may determine management zones and apply restrictions to trading as necessary.

Applications for licence transfers, whether permanent or temporary, will be determined by the Corporation in accordance with the relevant provisions of the Act and/or supplementary policies. A summary of the outcomes of application transfers (including rejected transfers and associated reasons) will be included in the annual report.

10.5 Dairy Licences

In 2004 the Government released a White Paper – Our Water, Our Future which indicated that dairy use licences had in the past been issued with groundwater licence entitlements that would normally be associated with domestic and stock use.

In dairies, water is used for yard washing, shed wetting, milk cooling and cleaning equipment. The amount of water used can vary greatly depending on the setup, production volume and practices. Work by the Department of Primary Industries indicates that the average water use in a large dairy is in the vicinity of 13 ML/year. The estimate for dairy use indicated in Table 2 is based on this figured, not current licence entitlement.

At the moment most dairy farmers either have a licence for a nominal volume of 2 to 4ML, or no licence at all. In early 2010, DSE announced an amnesty to allow farmers to either upgrade their licence to reflect how much water they actually use, or apply for a licence if they don't have one. This program will result in more accurate water accounting to inform future management decisions.

When renewing dairy licences, the Corporation will make an assessment of the amount of groundwater used in each dairy. Any adjustments to licences will be made in accordance with any State-wide policy approved by the Minister for Water.

Prescription

1. **All groundwater licences in the Protection Area will be migrated to the State Water Register within 6 months of ministerial approval of the Management Plan.**

2. **No new groundwater licences will be issued except as described in Prescriptions 4, 5 and 6.**

3. **The total licence entitlement in the Protection Area must not exceed 13834.8ML (licence entitlement at time of writing), or any volume adjusted in accordance with Prescriptions 4 to 6 inclusive.**

4. **If a groundwater licence is surrendered, revoked or not renewed the total entitlement in Prescription 3 will be reduced by that licence volume and capped until such time as a review of the management plan and sustainable yield is undertaken. After which, the PCV will be reduced accordingly, or the volume will be available through a public process.**

5. **The Corporation may issue a licence which may lead to the total groundwater licence entitlement in Prescription 3 being exceeded to overcome an administrative oversight or other anomaly, provided it does not exceed the PCV (13,836 at time of writing).**

6. **The Corporation may issue or amend a groundwater licence in accordance with any state-wide policy. The volume described in Prescription 3 and the PCV (by application to the Minister) will be adjusted accordingly.**

7. **The Corporation must report the details of any licence referred to in Prescriptions 4 to 6 in the annual report.**

11 Metering Program

11.1 General

Metering water use enables better management of the water resource. It provides vital information on the amount of water used and the location of where it is used which aids in the sustainable management of the resource. It also ensures that the water is shared equitably and licensees stay within their licence entitlement. Metering also provides benefits to the farming operation and can lead to greater water use efficiencies.

11.2 Installation of Meters

A flow meter must be installed in compliance with national standards on all licensed operational groundwater bores, as adopted in State Government and Corporation metering policy.

The Corporation will also meter any bore constructed or any new licence issued after the approval of this Plan that is subject to a groundwater licence irrespective of the volume authorised to be taken from the bore.

11.3 Maintenance of Meters

Meters need to be maintained in accordance with National Metering Standards to ensure accurate readings can be taken. Both the Corporation and the licensee have a responsibility to ensure meters are properly maintained.

11.4 Meter Readings

Meters shall be read twice a year where possible and the collected data is to be maintained on a database. In some instances the Corporation may request the licensee to read the meter and the licensee must comply with the request.

Prescription

8. **All meters will comply with the national standards as adopted in State Government and Corporation metering policy.**

9. **The Corporation must:**

    a) ensure all meters within the Protection Area are read twice per year, in or around January and June;

    b) determine the volume of water extracted from the bore since the meter was last read; and

    c) within 30 days after the meter is read, record the amount of water used on a database.

10. **The Corporation may request the Licensee to read a meter and to provide Corporation with the meter reading:**

    a) the Licensee must comply with the request; and

    b) For the purposes of this clause the Corporation must provide a phone number, email address, pre-paid mail or similar method for the licensee to lodge the meter read.

12 Monitoring Program

12.1 General

Groundwater monitoring provides information to enable sustainable management of the resource. Observation bore data:

- supports analysis of annual and long term water level response to groundwater pumping;
- demonstrates regional and local seasonal drawdown patterns;
- provides information for future resource assessments;
- supports analysis of potential management issues, such as potential interference between bores;
- supports analysis of changes in groundwater water quality throughout the Protection Area; and
- provides groundwater quality trends close to saline lakes.

The Corporation will annually review monitoring data against the plan objectives. It will discuss any proposed changes to monitoring locations, frequency or data types with the Department and a Warrion WSPA Reference Group. The Department and the Corporation will agree the revised monitoring program, maintenance requirements and associated costs. The annual report will include the revised monitoring program and a summary of monitoring costs and activities.

Prescription

11. The Department must ensure that monitoring bores are properly maintained and replaced if necessary; and

12. The Department and the Corporation must ensure that data collected from monitoring bores are entered into the groundwater management system, within 60 days of them being received.

12.2 Groundwater Level Monitoring

The Management Plan aims to effectively manage the groundwater resources of the Protection Area. Monitoring is therefore critical to understanding:

a) how the aquifer responds in the long-term to the management arrangements introduced under this management plan; and

b) the interaction of the aquifer with the broader hydrological system.

At the time this Management Plan was prepared 30 observation bores were monitored on a monthly basis (see Schedule 1). The monitoring bores, shown in Figure 3, are geographically distributed over the Protection Area and target various depths to monitor the aquifers as follows:

a) 25 bores monitoring the Basalt Aquifer

b) 5 bores monitoring the underlying Tertiary Sediments Aquifer.

Figure 3 - Map of State Observation Bores in the Protection Area (June 2010)

Prescription

13. The Department and the Corporation must ensure that water level monitoring is carried out at appropriate locations throughout the Protection Area to:

a) assess annual and long term impact on water levels from groundwater pumping;

b) monitor regional and local seasonal drawdown; and

c) provide information for future resource assessments.

12.3 Salinity Monitoring

Regular water quality monitoring will be carried out on selected bores in the Protection Area to determine whether there are any changes in the general salinity of groundwater within the area. Water quality monitoring will also be carried out on observation bores drilled near Lake Corangamite to determine if saline water below the lake is moving inland.

Water samples will be taken in accordance with appropriate standards and the samples will be analysed by a suitably accredited laboratory. The Corporation will ensure that all water quality monitoring data are entered into the groundwater management system within 60 days of them being received.

At the time this plan was approved water quality monitoring of the relevant bores listed in Schedule 1 was undertaken twice a year. Additional water quality monitoring may be necessary if there are significant declines in groundwater levels or deterioration in water quality is detected.

Prescription

14. The Corporation must ensure that water quality monitoring is carried out at appropriate locations throughout the Protection Area to provide information that allows the necessary assessment of any changes in the salinity of the groundwater.

13 Annual Report

By 30 September every year the Corporation will prepare an annual report in relation to the Management Plan. The report will be submitted to the Minister for Water and the Corangamite Catchment Management Corporation; presented to the appointed reference group and will be publicly available.

In the fifth annual report the Corporation will make comment on the need to review the management plan. If any subsequent review recommends that the management plan should be amended the Minister for Water may propose to amend the plan. However, under the Act, the Minister must first publish notices of the proposed amendment and consider submissions and must also appoint a consultative committee to advise on the proposed amendment.

The annual report will also contain details about the groundwater monitoring strategy to be undertaken in the following year.

14 Recommendations For Further Technical Investigations

While significant progress in understanding the nature and behaviour of Warrion aquifer has occurred, the management plan highlights the remaining knowledge gaps and seeks to outline a possible future works program to further increase our understanding of the groundwater system. As a priority the following work should be undertaken:

- Clarification and review of sustainable yield estimates for the aquifer;
- Comprehensive assessment of groundwater-surfacewater interactions, particularly in reference to the lakes;
- Further conceptualisation and assessment of the groundwater resource, including whole of aquifer definition and boundary review; and
- Assessment of the potential of groundwater carryover in the Warrion WSPA.

Other technical assessments which may provide insight or support to a review of the Warrion GMP are:

- Analysis and investigation of potential threats to groundwater resources such as Acid Sulphate Soils and climate change; and
- Assessment of current environmental overlays that protect the quality of the aquifer to ensure they are suitable and provide sufficient protection.

Southern Rural Water, in conjunction with DSE, will facilitate an appropriate works program subject to funding availability and engage with relevant agencies and stakeholders, such as the Warrion WSPA Reference Group, local councils, the Catchment Management Authority and other authorities when undertaking future technical work.

The need for these investigations will be based on technical evaluation of monitoring data and highlighted to the Minister in the annual report.

15 References

Adler, R., (2003). Groundwater-Surface Water Interactions of the Red Rock Complex, Victoria, Australia. Honours Thesis. School of Earth Sciences, University of Melbourne.

Adler, R., and Lawrence, C. R., (2003). The Drying of the Red Rock lakes Complex, Australia and its Implications for Groundwater Management. Publication for the School of Earth Sciences, University of Melbourne.

Hyder Consulting (2009) Review of technical work to inform the Warrion WSPA Groundwater Management Plan. Consultancy report for Southern Rural Water.

Nolan ITU (2001), Groundwater Technical Report – Warrion GMA. Unpublished.

Nolan ITU (1998), Review of the Permissible Annual Volume - Warrion Groundwater Management Area.

Nolan-ITU (1998a), Basal Bore Monitoring Assessment – Warrion Groundwater Management Area.

SKM (2007) Warrion WSPA – Prevention of saline intrusion into groundwater reserve/Environmental Water Reserve – Triiger levels. Report for Southern Rural water

SKM (2004). Report on the drilling and construction of groundwater bores to identify and monitor potential saline intrusion near Dreeite, East of lake Corangamite. Consultancy Report for Southern Rural Water.

SKM (Sinclair Knight Merz) (1998), Permissible Annual Volume Project – The Warrion Groundwater Management Area. Department of Natural resources and Environment Victoria, January 1998.

SKM (Sinclair Knight Merz) (2001), Groundwater Salinity Risk in the Warrion WSPA.

SKM (Sinclair Knight Merz) (2000), Basal Bore Monitoring Assessment: Warrion Groundwater Management Area.

SRW (Southern Rural Water), (1999) Licenced Irrigator Survey (unpublished).

Technical Audit Panel (2003) Audit Report – Draft Warrion Groundwater Management Plan September 2002.

Schedule 1

Water level and salinity monitoring bores in the Protection Area at the time the Management Plan was approved.

	Bore location co-ordinates GDA 94 MGA Zone 55			Monitoring frequency	
Bore Number	**Eastings**	**Northings**	**Aquifer Monitored**	**Water level**	**Salinity**
26686	713462	5766227	Basalt	monthly	biannually
26687	729572	5760637	Tertiary sediments	monthly	-
36058	726302	5778817	Basalt	monthly	biannually
57694	727022	5770277	Basalt	monthly	-
57697	724922	5778777	Basalt	monthly	biannually
110984	712023	5766378	Tertiary sediments	monthly	biannually
110985	712022	5766377	Basalt	monthly	biannually
142660	716932	5759501	Basalt	monthly	-
142666	720392	5760947	Basalt	monthly	-
142668	717862	5761392	Basalt	monthly	biannually
142670	718392	5764407	Basalt	monthly	-
142671	716762	5767337	Basalt	monthly	-
142689*	717752	5772677	Basalt	monthly	biannually
142691	717487	5775997	Basalt	monthly	biannually
142693	720407	5770987	Basalt	monthly	-
142696	724212	5770582	Basalt	monthly	-
142699	726947	5767467	Basalt	monthly	-
142702	722612	5767577	Basalt	monthly	-
142703	726272	5763987	Basalt	monthly	-
142705	726272	5763987	Tertiary sediments	monthly	-
142712	725932	5760062	Basalt	monthly	-
142714	722262	5765502	Basalt	monthly	-
142717	722262	5765502	Basalt	monthly	-
142720	722262	5765502	Tertiary sediments	monthly	-
146931	713322	5754676	Tertiary sediments	monthly	biannually
S9018529/1*	717851	5772897	Basalt	monthly	biannually
S9018529/2*	717840	5772886	Tertiary clays	monthly	biannually
S9018529/3*	718455	5773367	Basalt	monthly	biannually
S9018529/4*	718986	5773007	Basalt	monthly	biannually
S9018529/5*	718989	5773002	Basalt	monthly	biannually

* Indicates that bores are monitored to identify any saline intrusion from Lake Corangamite.

Schedule 2

Summary of Standard S51 Licence Conditions from State Water Register

- Water may only be taken under this licence if it is taken by the methods expressly approved by this licence.
- The licence holder must at all times provide the Authority with safe access to inspect all works and appliances used to take water under this licence.
- Water may only be taken under this licence if it is taken at the location specified in the licence under “extraction point details”.
- The volume of water taken under this licence, in any twelve-month period from 1 July to 30 June, must not exceed the licence volume, less any volume that has been temporarily transferred to another person or location.
- The maximum volume that may be taken under this licence in any one day is [insert number here] megalitres per day.
- The Authority may determine water allocations at 1 July or during the course of the subsequent twelve-month period that are less than 100% of the licence volume, in which case the licence volume is correspondingly reduced for that twelve-month period.
- Unless otherwise directed by the Authority, water may be taken at any time between 1 July and 30 June.
- When directed by the Authority, water must be taken in accordance with the rosters and restrictions determined by the Authority, and advised to the licence holder.
- Water must be taken in accordance with the rosters and restrictions as set out in the management plan, local management rules or other document that is available on the Authority’s website, and before taking water under this licence the licence holder must check the restrictions that currently apply.
- Water may only be taken under this licence if it is taken through a meter approved by the Authority.
- Meters must be installed, in accordance with the specifications set by the Authority, at the licence holder’s expense.
- The works referred to in the licence must not be made operational until the licence holder provides the Authority with safe access to meters for the purpose of reading, calibration or maintenance.
- The licence holder must at all times provide the Authority with safe access to meters for the purpose of reading, calibration or maintenance.
- The licence holder must notify the Authority within one business day if the meter ceases to function or operate properly.
- The licence holder must not, without the consent of the Authority, interfere with, disconnect or remove any meter used for the purposes of the licence.
- Water taken under this licence may only be used on the land, and for the purposes, specified in the licence.
- The licence holder must, if required by the Authority, monitor and record water levels in the bore(s) before and after pumping; the licence holder must also provide this information in writing as directed by the Authority.
- The licence holder must, at the licence-holder’s expense, if required by the Authority, conduct a pumping test and obtain a hydrogeological report, to the Authority’s specification, on the potential for bore operation to interfere with any bore; aquifer, groundwater dependent ecosystem or waterway.
- The licence holder must, if required by the Authority, provide the Authority with the results of water quality tests on samples of water pumped from the bore.
- The licence holder must provide the Authority with safe access to the licensed bore and works for the purposes of obtaining water level measurements, water samples and any other information or data pertaining to the operation of the bore, the works and the aquifer.
- The licence holder must, if required by the Authority, cease taking water entirely, or cease taking water for a given period, or reduce the quantity of water taken during any period if, the Authority reasonably believes, or in accordance with the assessment in a Groundwater Management Plan, the use or disposal of water under this licence may injure or adversely affect any other person or an aquifer or the environment.
- The licence holder must, if required by the Authority, enter into a formal agreement to supply water to any party affected by interference from bore operation.

* Please note this is a summary only - not all conditions are listed.

COPY OF RECORD IN THE VICTORIAN WATER REGISTER

TAKE AND USE LICENCE

under Section 51 of the Water Act 1989

The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.

This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the take and use licence.

Water used under this entitlement is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

The Authority does not guarantee, by the granting of the licence, that the licensee will obtain any specific quantity or quality of water. The Authority is not liable for any loss or damage suffered by the licensee as a result of the quantity of water being insufficient or the quality of the water being unsuitable for use by the licensee at any particular time or for any particular purpose.

This take and use licence entitles its holders to take and use water as set out under the licence description, subject to the conditions that are specified.

Standard quality and quantity disclaimer for Section 51 Licences.

Southern
Rural Water

Managing Water. Serving Communities.