

South Australian–Victorian Border Groundwaters Agreement Review Committee



Twenty Seventh Annual Report

To 30 June 2012

Adelaide and Melbourne

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PREFACE

The Border Groundwaters Agreement Review Committee's Annual Report for 2011–12 fulfils the requirement under clause 30(1) of the Border Groundwaters Agreement to report on its activities during the year to 30 June 2012. This report has been compiled with reference to reports from South Australia and Victoria.

Clause 30(2) requires the Review Committee to forward a copy of the report to the appropriate Minister in each Government.

Section 11 of the Victorian *Groundwater (Border Agreement) Act 1985*, and Section 13 of the South Australian *Groundwater (Border Agreement) Act 1985* provides that the relevant Minister shall cause a copy of the annual report to be laid before the Parliament within fourteen sitting days of the receipt of the report.

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1. The year in summary

Along the South Australian–Victorian border, groundwater is the only reliable water source. It is used extensively in both States for irrigation, industry use and urban water supply, as well as farm stock and domestic use.

While groundwater supplies are relatively secure for the short term, the Border Groundwaters Agreement Review Committee (Review Committee) has sought to improve the technical understanding and management responses affecting the ongoing sustainable and equitable use of groundwater along the border.

Tertiary Limestone Aquifer - Province 1

The Tertiary Limestone Aquifer¹ is a high yielding and renewable resource and is replenished by rainfall. Parts of Province 1 are experiencing long-term declines in groundwater levels. Land use is a significant factor to this decline of groundwater levels in the area. In 2008 the Review Committee recommended that a new management approach is needed to achieve long-term sustainability. The estimated quantities of water utilised by plantation forestry is a significant component of the regional water balance. Without change in the current land and water use, these groundwater levels will continue to decline over parts of Province 1. The Review Committee recommended that the States develop a consistent approach to account for the water used by plantation forests. The Review Committee also recommended that the States address the immediate threats of declining trends in groundwater in particular sea-water intrusion along the South Australian coast, aquifer depletion at Lake Mundi and inter-aquifer connectivity.

Substantial progress has been made in respect to inter-aquifer connectivity and a report has been drafted on sea-water intrusion.

Inter-aquifer connectivity

The National Water Commission provided funding to the governments of South Australia and Victoria to undertake a joint project to investigate the inter-aquifer connectivity of the Tertiary Limestone Aquifer and Tertiary Confined Sand Aquifer in Province 1.

The Review Committee guided the project to ensure consistency of approach across the border. The project formally began in February 2010 and the final project report was provided to the National Water Commission by the two State departments in June 2012.

The project entailed drilling test wells and conducting pumping tests at eight sites and modelling. The project has provided significant science on the source of water to the deeper Tertiary Confined Sand Aquifer in the southern part of the South Australian – Victorian border.

The results of the project indicate that there is a moderate to very good hydraulic connection between the Tertiary Confined Sand Aquifer and the Tertiary Limestone Aquifer. In doing so, the project has achieved its principal objective. The results point to the two aquifers being more highly connected than previously understood. This information is now being considered by the Review Committee.

¹ The Tertiary Limestone Aquifer is generally the Gambier Limestone in the Otway Basin and the Murray Group Limestone in the Murray Basin (Figure 3).

Sea-water intrusion

The Review Committee received a draft of a technical report prepared by the Department for Water addressing its recent investigation into sea-water intrusion. The Review Committee is undertaking a technical assessment of the report prior to its release.

Tertiary Limestone Aquifer - Province 2

The Review Committee undertook the five year review of the management prescriptions in Province 2 during the year.

The Review Committee determined to retain the current management prescriptions, unchanged. These prescriptions relate to the permissible distance from the State border, the permissible annual volume of extraction, permissible rate of potentiometric surface lowering and permissible levels of salinity.

Groundwater in the Tertiary Limestone Aquifer is not being significantly replenished by modern recharge across most of Province 2. As such the groundwater resource is considered non-renewable for water allocation and management purposes. This understanding of the resource arose from the Committee's review of Province 2 in 2007. The Review Committee proposed a management strategy based on this understanding, that is Victoria and South Australia develop a common policy for using the non-renewable groundwater resources in Province 2 of the Designated Area. Both States agreed and work began on developing a common policy in 2010/11. The Review Committee is facilitating the discussions and this work continues to be progressed. The existing operations under the Agreement shall continue until the new common policy is developed and agreed.

Tertiary Limestone Aquifer - Province 3

Groundwater is not being replenished by modern recharge in Province 3. It has been managed as a non-renewable resource since 2001. The aquifer is confined and distant from recharge areas. Consequently the aquifer does not respond to seasonal recharge from rainfall. Intensive groundwater development began after 2001, utilising the large amounts of groundwater in storage. Since then long-term water level trends and seasonal draw down of water levels have been observed. The observations are consistent with pressure response of pumping in a confined aquifer. A cone of depression has formed with its centre located at Peebinga, an area of intensive groundwater extraction.

The Tertiary Limestone Aquifer is responding as expected to the level of use, in terms of drawdown and salinity. The full potential response of the aquifer is yet to be realised as the combined groundwater extraction in the South Australian–Victorian border has been less than the Permissible Annual Volume. Further drawdown in groundwater levels are anticipated if groundwater extractions increase.

There is no immediate risk of increased groundwater salinity due to either the lateral movement of saline groundwater or the vertical leakage of saline water from the Pliocene Sands Aquifer. There is a need to continue monitoring salinity in the aquifer.

Murray-Darling Basin Plan

The Murray-Darling Basin Authority (the Authority) is preparing a Basin Plan for water resource management that will place new limits on the quantity of water that can be taken

from the basin. The Authority's initial views on these limits were set out in the draft Basin Plan.

The draft Basin Plan proposed to set management arrangements that will overly the current arrangements in the northern part of the South Australia–Victoria border area. The Review Committee was concerned that some of the proposals, if adopted, would limit the operation of the Agreement. The Review Committee recommended the adoption of a number of modifications that would avoid some of the limits of the Basin Plan that would otherwise occur.

Condition of the resource

The Review Committee finalised its detailed review of groundwater level trends in the South Australian-Victorian Designated Area. Groundwater levels remained at about the same level as last year for most parts of the Designated Area. This represents a recovery of water levels in some areas which had experienced long term declines.

2. About the Agreement and the Review Committee

The South Australian–Victorian Border Groundwaters Agreement

The groundwater resource along the South Australian–Victorian border is shared between the States. In recognition of the need to cooperatively manage these resources, the two States entered into the Border Groundwaters Agreement (the Agreement) in 1985. The Agreement was updated in 2006 and both States have agreed to a full review of the Agreement and its operation.

The Agreement establishes a Designated Area, extending 20 kilometres either side of the border, and from the coast to the River Murray. The Agreement applies specifically to this Designated Area. The Designated Area is divided into 22 management zones with 11 zones in each State (Figure 1).

The Agreement provides that the available groundwater shall be shared equitably between the two States and applies to all existing and future bores within the Designated Area. Bores that extract groundwater for domestic and stock purposes are not covered by the Agreement.

Extraction licences or permits may not be granted or renewed within the Designated Area other than in accordance with the management prescriptions set out in the Agreement. The prescriptions limit water use to a Permissible Annual Volume for total withdrawals from all aquifers or each aquifer, to a permissible rate of potentiometric surface lowering and to a permissible level of salinity. The prescriptions also provide that, where appropriate, casing of new wells shall be sealed between aquifers to prevent inter-aquifer contamination.

The allocation of water is the responsibility of the licensing agencies in each State, in accordance with the relevant groundwater management plan or water allocation plan prepared under the States' respective water resources legislation.

The approach taken by the States in developing management plans has included objectives to better quantify the resource, to establish appropriate mechanisms for allocating the resource or, if needed, to restrict the use of the resource. Plans are developed through consultative committees to maximise community and industry involvement in making and implementing the arrangements.

The management areas relevant to the Designated Area are set out in Table 1. The location of the zones relevant to State water administration areas are shown in Figure 4.

Table 1: Management areas relevant to the Designated Area

South Australia	Victoria
Noora Prescribed Wells Area Mallee Prescribed Wells Area Tatiara Prescribed Wells Area Lower Limestone Coast Prescribed Wells Area	Murrayville Water Supply Protection Area West Wimmera Groundwater Management Area Glenelg Water Supply Protection Area

Border Groundwaters Agreement Review Committee

The Review Committee, with membership from both States, is established under the Border Groundwaters Agreement as the operating body for the effective implementation and administration of the Agreement.

The Review Committee is required at intervals of not more than five years to review the management prescriptions – that is, the Permissible Annual Volume, the Allowable Annual Volume for sub-zones, the permissible distance, the permissible rate of potentiometric surface lowering (drawdown) and the permissible level of salinity (if any such levels have been declared). The review of Province 2 was carried out this year. The next reviews are; 2013 – Province 1 and 2015 – Province 3.

The Agreement provides that the Review Committee shall have the power to alter the permissible distance, Permissible Annual Volume, Allowable Annual Volume and to declare a period of restriction. The relevant State Ministers have the power to alter the permissible rate of potentiometric surface lowering and the permissible level of salinity, on the recommendation of the Review Committee².

The Agreement provides that the Review Committee may also:

- coordinate, or cause to be carried out, surveys, investigations and studies concerning the use, control, protection, management or administration of the groundwater in the Designated Area
- make recommendations to the Contracting Governments or to any authority, agency or tribunal of the Contracting Governments concerning any matter which, in the opinion of the Review Committee, may in any way affect the investigation, use, control, protection, management or administration of the groundwater within the Designated Area
- review the Agreement and, if in its opinion, amendments thereto are necessary or desirable, make recommendations to the Contracting Governments accordingly.

The Review Committee met five times during the year:

1 July 2011	Melbourne
19 October 2011	Adelaide
9 February 2012	Melbourne
27 April 2012	Adelaide
29 June 2012	Melbourne.

During the year membership of the Review Committee comprised:

South Australia		Victoria	
Mr A Johnson	member	Mr R Nott	member
Dr L Mensforth	member	Dr J Cooke	member
Mr H Hopton	deputy member	Mr J Martin	deputy member

Mr A Johnson was President of the Review Committee up to the first meeting of 2012, from which Dr J Cooke was President. Mr J Martin resigned as deputy member on 29 February 2012.

² A full list of Government Gazette notices relating to the current prescriptions is provided in Appendix A of this report.

3. General Information

Groundwater resources in the South Australian–Victorian border region

There are two main aquifer systems along the border comprising the Tertiary Confined Sand Aquifer and the overlying Tertiary Limestone Aquifer (Figure 3). A thin Pliocene Sands Aquifer overlies the Upper Tertiary Aquitard in parts of the area.

The Tertiary Limestone Aquifer is the principal source of groundwater throughout the Designated Area, with water being used for a range of purposes – municipal supplies for towns such as Mount Gambier, individual domestic and stock water supplies, industry and irrigation of agricultural crops and recreational grounds.

Groundwater salinity in the Tertiary Limestone Aquifer is mostly less than 3000 EC (about 1700 mg/L TDS) in the Designated Area, except in the north where it exceeds 30 000 EC (about 18 000 mg/L TDS).

In the Designated Area, the Tertiary Limestone Aquifer has been subdivided into three hydrogeological provinces as shown in Figure 2 and described below:

Province 1 occurs largely in the Otway Basin and is characterised by Quaternary calcareous sandstone overlying the Tertiary Limestone Aquifer (Gambier Limestone) forming one unconfined aquifer system

Province 2 is located in the Murray Basin where the Tertiary Limestone Aquifer (Murray Group Limestone) is unconfined and either outcrops at the surface, or is overlain directly by the Pliocene Sands Aquifer

Province 3 is in an area of the Murray Basin where the Tertiary Limestone Aquifer (Murray Group Limestone) is confined by the Upper Tertiary Aquitard. A thin Pliocene Sands Aquifer overlies the Upper Tertiary Aquitard in some parts of this province.

Management approach

At the outset of the Agreement in 1984 the groundwater shares (Permissible Annual Volumes) between the two adjacent State Designated Area zones were equal. As more has been learned about the groundwater resources and the risks to the resources from use, the limits have been amended to ensure the protection of the existing entitlements and the protection of the resource from undue depletion or degradation.

In accordance with its role to advise the States, as outlined in the previous section, the Review Committee has taken the following management approach for each province.

Tertiary Limestone Aquifer – Province 1

The Tertiary Limestone Aquifer is a high yielding and renewable resource and is replenished by rainfall. Parts of Province 1 are experiencing long-term declines in groundwater levels. The current mix of land use and groundwater extractions is out of balance (in that outflows and extractions exceed inflows) and is not sustainable in the long term. The estimated quantity of water utilised by plantation forestry is a significant component of the regional water balance being some three times that used for irrigation purposes in Province 1. Without a change in the current land and water use, groundwater levels will continue to decline over parts of Province 1.

In 2008, following its management review of Province 1 (Border Groundwaters Agreement Review Committee 2008), the Review Committee recommended that a new management approach is needed to achieve long term sustainability. It was the view of the Review Committee at that time that this may require reductions in the area under plantation forestry and the volume extracted via bores under groundwater entitlements. In the meantime the Review Committee proposed a management strategy to address four key issues. These are:

- water accounting
- inter-aquifer connectivity
- sea-water intrusion
- aquifer depletion.

Both States are addressing the need to account for plantation forestry on water resources. The Review Committee proposed that an integrated water accounting system encompassing all major water users is essential. It recommended the States develop a consistent approach to account for the water used by plantation forests.

There are two issues of immediate concern to be resolved with the declines observed in 2008. These were: the potential for sea-water intrusion along the South Australian coast, and the other is the effect of the declines on groundwater users in the shallow and thin aquifer around the Lake Mundi area in Victoria. The Review Committee recommended that each of the States undertake studies into the risks and measures to address any adverse impacts. As a precaution the Review Committee divided Zone 1A into two sub-zones to help prevent any further intensification of extractions in Sub-zone 1A South.

Inter-aquifer connectivity

The deeper Tertiary Confined Sand Aquifer is exhibiting declines similar to those observed in the Tertiary Limestone Aquifer even though there is little water being extracted from the Tertiary Confined Sand Aquifer. This may indicate a higher degree of connection between the two aquifers than previous models indicated. The Review Committee recommended that the States undertake studies on the interaction of the aquifers to determine whether the two aquifers should be managed together or separately.

The National Water Commission provided funding to the governments of South Australia and Victoria to undertake a joint project to investigate the inter-aquifer connectivity of the Tertiary Limestone Aquifer and Tertiary Confined Sand Aquifer in Province 1.

The Review Committee guided the project to ensure consistency of approach across the border. The project formally began in February 2010 and the final project report was provided to the National Water Commission by the two State departments in June 2012.

The project entailed drilling test wells and conducting pumping tests at eight sites and modelling. The project has provided significant science on the source of water to the deeper Tertiary Confined Sand Aquifer in the southern part of the South Australian – Victorian border.

The results of the project indicate that there is a moderate to very good hydraulic connection between the Tertiary Confined Sand Aquifer and the Tertiary Limestone Aquifer. In doing so, the project has achieved its principal objective. The results point to the two aquifers being more highly connected than previously understood. This information is now being considered by the Review Committee.

Sea-water intrusion

The Review Committee received a draft of a technical report prepared by the Department for Water addressing its recent investigation into sea-water intrusion. The Review Committee is undertaking a technical assessment of the report prior to its release.

Tertiary Limestone Aquifer – Province 2

Groundwater in Tertiary Limestone Aquifer is not being significantly replenished by modern recharge across most of Province 2. As such the groundwater resource is considered a non-renewable for water allocation and management purposes.

In the area of concentrated extractions in Zones 5A, 6A, 5B and 6B (Frances and Neuarpur) groundwater levels are declining due to extraction (~0.2 m/y since 1996). These declines in groundwater levels appear to be manageable, with respect to the capacity of the resource in the short term. However, as part of its management review of Province 2 in 2007 (Border Groundwaters Agreement Review Committee 2007) the Review Committee advised the States of the need to develop a common policy for the long-term management and use of groundwater on the basis that this is a non-renewable resource.

In the northern part of Province 2 (northern part of Zone 7A, Zone 8A, Sub-zone 9A South and the northern part of Zone 6B, Zones 7B, 8B and 9B) the groundwater level trends are generally stable reflecting the limited development and extraction. The extraction ‘threshold point’ between stable water level trends and declining levels is not able to be quantified. As a precaution against further declines, the Review Committee:

- reduced the Permissible Annual Volumes for Zones 7A, 7B, 8A, and 8B to the allocated volumes for each zone at that time
- established sub-zones in Zone 6A and set an Allowable Annual Volume at the level of current allocations for Sub-zone 6A South.

The Review Committee continues to seek discussion between the relevant regional management authorities towards developing a common policy approach for managing the groundwater as a non-renewable resource. During the year the Review Committee undertook the five year review of the management prescriptions in Province 2. The Review Committee determined to retain the current management prescriptions, unchanged, until the new common policy is developed and agreed.

Tertiary Limestone Aquifer – Province 3

Groundwater is not being replenished by modern recharge and has been managed as a non-renewable resource since 2001. The aquifer is confined and distant from recharge areas. Consequently the aquifer does not respond to seasonal recharge from rainfall. Intensive groundwater development began after 2001 and the observed long-term water level trends and seasonal drawdowns are consistent with pressure response of pumping in a confined aquifer. A cone of depression has formed with its centre located at Peebinga, an area of intensive groundwater extraction.

The Tertiary Limestone Aquifer is responding as expected to the level of use, in terms of drawdown and salinity. The full potential response of the aquifer is yet to be realised as groundwater extraction in Victoria has been less than the Permissible Annual Volume. Further drawdown in groundwater levels are anticipated if groundwater extractions increase.

There is no immediate risk of increased groundwater salinity due to either the lateral movement of saline groundwater or the vertical leakage of saline water from the Pliocene Sands Aquifer. There is a need to continue monitoring salinity in the aquifer.

There is potential for localised increased drawdown, which if developed would impact on the users of groundwater for domestic and stock groundwater purposes, increase the risks of partial dewatering of the aquifer or accelerating water quality change. As part of its management review of Province 3 in 2010 (Border Groundwaters Agreement Review Committee 2010) the Review Committee recommended that the States adopt management measures to prevent uncontrolled localised drawdown arising from intense groundwater extraction.

Tertiary Confined Sand Aquifer

Management prescriptions for the Tertiary Confined Sand Aquifer in the Designated Area remain unchanged since 2001.

Pliocene Sands Aquifer

The Pliocene Sands Aquifer overlies the Tertiary Limestone Aquifer in the Murray Basin mainly in the northern part of the Designated Area. The groundwater in the Pliocene Sands Aquifer is generally saline. In 2007, the Review Committee determined a Permissible Annual Volume for the Pliocene Sand Aquifer in Zone 11A to provide for salinity mitigation extractions for the Murtho Salt Interception Scheme. The scheme intercepts groundwater that would enter the Murray River.

Permissible Annual Volumes and Allowable Annual Volumes

The Permissible Annual Volumes for each aquifer in each zone at 30 June 2012 are set out in Table 2.

Table 2: Permissible Annual Volumes at 30 June 2012

South Australia				Victoria		
Permissible Annual Volume			Zone	Zone	Permissible Annual Volume	
Pliocene Sands Aquifer (ML/y)	Tertiary Limestone Aquifer (ML/y)	Tertiary Confined Sand Aquifer (ML/y)			Tertiary Limestone Aquifer (ML/y)	Tertiary Confined Sand Aquifer (ML/y)
2144	3700	0	11A	11B	1823	0
	14 000	320	10A	10B	6720	560
	11 944	570	9A	9B	5960	630
	5663	340	8A	8B	3500	330
	8803	350	7A	7B	5782	350
	8758	360	6A	6B	10 811	360
	18 943	540	5A	5B	12 201	570
	22 102	710	4A	4B	14 000	300
	24 054	1900	3A	3B	16 500	1000
	25 000	2900	2A	2B	25 000	5100
	31 812	9200	1A	1B	45 720	14 500

The Allowable Annual Volumes for the sub-zones that have been determined for the Tertiary Limestone Aquifer in Zones 1A, 6A and 9A at 30 June 2012 are set out in Table 3. The locations of these sub-zones are shown in Figure 5.

Table 3: Allowable Annual Volumes for the Tertiary Limestone Aquifer for year ending 30 June 2012

South Australia	
Allowable Annual Volumes	
Tertiary Limestone Aquifer (ML/y)	Sub-zone
2400	9A North
8109	9A South
4658	6A South
12 507	1A South

In 2009 the Review Committee amended the Permissible Annual Volumes relating to Zones 7A, 8A and 9A to assist in implementing of the water allocation plan for the Tatiara Prescribed Wells Area. These are staged amendments that occur until to 2012. The reasons for the amendments are provided in Appendix B.

Allocations and volumes extracted

The allocations and the volumes extracted³ for the Tertiary Limestone Aquifer are listed in Tables 4 and 5.

Table 4: Permissible Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2012

South Australia					Victoria				
Tertiary Limestone Aquifer				Zone	Zone	Tertiary Limestone Aquifer			
Permissible Annual Volume (ML/y)	Licensed Allocations					Permissible Annual Volume (ML/y)	Licensed Allocations		
	Licences	Volume Allocated (ML)	Volume Extracted (ML)				No. of Licences	Volume Allocated (ML)	Volume Extracted (ML)
3700	16	6627 ⁴	2346	11A	11B	1823	3	1600	723
14 000	49	10 756	8541	10A	10B	6720	23	6718	3419
11 944	11	11 455	8077	9A	9B	5960	3	5500	708
5663	41	6090 ⁴	918	8A	8B	3500	7	3180	0
8803	104	9299 ⁴	5075	7A	7B	5782	15	5782	1957
8758	55	8761 ⁴	5581	6A	6B	10 811	14	10 811	3234
18 943	126	18 943	15 101	5A	5B	12 201	36	12 201	5808
22 102	174	22 102	12 780	4A	4B	14 000	12	2339	164
24 054	260	24 052	9963	3A	3B	16 500	5	515	96
25 000	128	19 976	10 204	2A	2B	25 000	39	24 127	3842
31 812	349	31 812	21 835	1A	1B	45 720	16	4409	1782

³ Note that the 'volume extracted' is the volume of groundwater extracted under a permit/licence and does not take into account the volume extracted for domestic and stock use or the impacts of plantation forests. The Agreement does not apply to bores for domestic and stock purposes.

⁴ The license conversion process is progressing and the outcome will be reported in next years annual report.

Table 5: Allowable Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2012

South Australia				
Tertiary Limestone Aquifer				Sub-Zone
Allowable Annual Volume (ML/y)	Licensed Allocations			
	Licences	Volume Allocated (ML)	Volume Extracted (ML)	
2400	3	3150 ⁴	986	9A North
8109	8	8305 ⁴	7091	9A South
4658	18	4563 ⁴	1288	6A South
12 507	65	12 507	11 245	1A South

Many of the zones are fully committed in the Tertiary Limestone Aquifer, in that the volumes licensed have reached the Permissible Annual Volumes. There is un-allocated water in the Tertiary Limestone Aquifer in Zones 2A, 1B, 3B and 4B. The un-allocated water in Zone 2A is held in the South Australian Minister's reserve. There is a moratorium on new licences and permanent transfers of groundwater entitlements in Zones 1B, 2B, 3B and part of Zone 4B under Victoria's water legislation.

As detailed in the 2009-10 annual report, the Review Committee, at the request of South Australia, amended the Permissible Annual Volume for Zones 11A and 10A set an Allowable Annual Volume for Sub-zone 9A North to enable the volumetric conversion of licences. The allocations in these zones have not yet been adjusted.

Table 6: Permissible Annual Volumes, allocations and volumes extracted for the Tertiary Confined Sand Aquifer at 30 June 2012

South Australia				Victoria					
Tertiary Confined Sand Aquifer				Zone	Zone	Tertiary Confined Sand Aquifer			
Permissible Annual Volume (ML/y)	Licensed Allocations					Permissible Annual Volume (ML/y)	Licensed Allocations		
	No. of Licences	Volume Allocated (ML)	Volume Extracted (ML)				No. of Licences	Volume Allocated (ML)	Volume Extracted (ML)
0	0	0	0	11A	11B	0	0	0	0
320	0	0	0	10A	10B	560	0	0	0
570	0	0	0	9A	9B	630	0	0	0
340	0	0	0	8A	8B	330	0	0	0
350	0	0	0	7A	7B	350	0	0	0
360	0	0	0	6A	6B	360	0	0	0
540	0	0	0	5A	5B	570	0	0	0
710	1	63	1	4A	4B	300	0	0	0
1900	2	1031	82	3A	3B	1000	0	0	0
2900	3	1455	18	2A	2B	5100	0	0	0
9200	5	1421	972	1A	1B	14 500	0	0	0

The allocations and volumes extracted for the Tertiary Confined Sand Aquifer are listed in Table 6. A moratorium exists on issuing groundwater licences for the Tertiary Confined Sand Aquifer in Zones 1B, 2B and 3B, pending the outcome of the investigation of the interaction between the Tertiary Limestone Aquifer and the Tertiary Confined Sand Aquifer.

The allocation and volume extracted for the Pliocene Sands Aquifer are listed in Table 7.

Table 7: Permissible Annual Volume, number of licences, volume allocated and volume extracted for the Pliocene Sands Aquifer at 30 June 2012

South Australia				
Pliocene Sands Aquifer				
Permissible Annual Volume (ML/y)	Licensed Allocations			Zone
	No. of Licences	Volume Allocated (ML)	Volume Extracted (ML)	
2144	1	2144	0	11A

While the Agreement does not apply to bores for domestic and stock purposes, the large number of bores in the Designated Area indicates the important role groundwater plays for these purposes. The estimated number of domestic and stock bores for each zone is listed in Table 8.

Table 8: Number of domestic and stock bores

South Australia		Victoria	
Number of Domestic and Stock Bores ¹	Zone	Zone	Number of Domestic and Stock Bores ²
16	11A	11B	17
166	10A	10B	243
25	9A	9B	47
62	8A	8B	113
749	7A	7B	104
391	6A	6B	56
1370	5A	5B	162
896	4A	4B	339
1155	3A	3B	79
632	2A	2B	577
1648	1A	1B	625

Note 1: The numbers of domestic and stock bores are derived from spatial analysis of the State SAGEODATA borehole records. It does not necessarily indicate the bores in use

Note 2: The numbers of domestic and stock bores are best estimates made in 2004, based on State database records.

Permissible distance from the border

The permissible distance is the distance from the border within which all applications for a permit or licence must be forwarded to the Review Committee for approval. The permissible distances at 30 June 2012 are specified in Table 9.

Table 9: Permissible distances at 30 June 2012

South Australia			Victoria		
Tertiary Confined Sand Aquifer	Tertiary Limestone Aquifer	Zone	Zone	Tertiary Limestone Aquifer	Tertiary Confined Sand Aquifer
Distance (km)	Distance (km)			Distance (km)	Distance (km)
3	3	11A	11B	3	3
3	3	10A	10B	3	3
3	1	9A	9B	1	3
3	1	8A	8B	1	3
3	1	7A	7B	1	3
3	1	6A	6B	1	3
3	1	5A	5B	1	3
3	1	4A	4B	1	3
3	1	3A	3B	1	3
3	1	2A	2B	1	3
3	1	1A	1B	1	3

Permissible potentiometric surface lowering

The Agreement provides for a rate of drawdown that must not be exceeded. The prescribed permissible potentiometric surface lowering rates for each zone are shown in Table 10.

Table 10: Permissible potentiometric surface lowering rates at 30 June 2012

South Australia		Victoria	
Rate (m/y)	Zone	Zone	Rate (m/y)
0.65	11A	11B	0.65
0.65	10A	10B	0.65
0.65	9A	9B	0.65
0.05	8A	8B	0.65
0.05	7A	7B	0.05
0.05	Sub-zone 6A North	6B	0.20
0.20	Sub-zone 6A South		
0.20	5A	5B	0.20
0.25	4A	4B	0.25
0.25	3A	3B	0.25
0.25	2A	2B	0.25
0.25	1A	1B	0.25

Permissible salinity

The Agreement allows for the setting of Permissible salinity levels. Following the reviews of Province 1, Province 2 and Province 3 (Border Groundwaters Agreement Review Committee 2008, 2010 and 2012) the Review Committee has determined that there is no need to recommend that permissible salinity levels should be set.

Reports from the States

The Agreement requires that the Contracting Governments provide an annual report to the Review Committee detailing the number of permits or licences issued, volumes authorised, and details of potentiometric surface levels in each zone. In addition, the States also reported on a number of other activities that related to groundwater management in the Designated Area, as follows.

South Australia – Volumetric licence conversion

The South Australian Government is undertaking a program to convert water licences from area-based to volume-based. The program is being implemented through a staged revision of the water allocation plans. In respect to the Designated Area the Water Allocation Plan for the Tatiara Prescribed Wells Area was adopted and came into effect on 7 June 2010. The water allocation plan for the Mallee Prescribed Wells Area was adopted on 2 May 2012. A draft water allocation plan for the Lower Limestone Coast is currently being prepared for Ministerial consideration for community consultation.

South Australia – Plantation forestry

The *Natural Resources Management (Commercial Forests) Amendment Act 2011* was passed by the South Australian Parliament and was given assent in November 2011. The Act enables the inclusion of plantation forest into water allocation plans where it is considered to be a necessary action for water accounting and management.

Victoria – Western Region Sustainable Water Strategy

The Victorian Government released a comprehensive water management plan for Victoria's western region on the 10th November 2011. The Western Region Sustainable Water Strategy maps out the region's water resources and the challenges and opportunities facing all water users over the next 50 years. The strategy aims to make the best use of water resources in different parts of the region, to protect the environment and be ready to manage the challenges of a variable climate and future droughts.

Victoria – West Wimmera groundwater management

The groundwater management strategy for the West Wimmera came into effect in June 2011. This strategy reflects the new understanding as recommended by the Review Committee (BGARC 2007) that the resources be managed as non-renewable resources for groundwater allocation and management purposes.

Condition of the resource

The Review Committee finalised its detailed review of groundwater level trends in the South Australian-Victorian Designated Area (SKM 2012). Groundwater levels remained at about the same level as last year for most parts of the Designated Area. This represents a recovery of water levels in some areas which had experienced long term declines.

Details of the potentiometric levels trends from representative observation bores for the Tertiary Limestone Aquifer and the Tertiary Confined Sand Aquifer are shown in Figures 6 and 7.

4. Funding

In South Australia:

- The Department for Water⁵ is responsible for the overarching management and planning of the State's water resources and for meeting State priorities and interstate and national obligations. The State government agency undertakes investigation, monitoring, allocation, licensing and management of water resources.
- The South Australian Murray-Darling Basin Natural Resources Management Board and the South East Natural Resources Management Board undertake community-based policy, management and water allocation planning.

In Victoria:

- the Department of Sustainability and Environment is responsible for the overarching management of the State's water resources and requirements to meet State priorities and interstate and national obligations. The Department investigates groundwater and undertakes groundwater monitoring and preparation of the State Water Accounts;
- Grampians Wimmera Mallee Water Corporation and Southern Rural Water Corporation are responsible for licensing groundwater extractions and bore construction overseeing investigations and conducting additional groundwater monitoring. The corporations provide direct contact with groundwater users in allocating the resource, managing areas of intense development and resolving complaints.

Table 12 sets out the level of funding for 2011–12. The figures for Victoria include the Water Corporations' licensing and administration costs. The South Australian costs include licensing and administration costs, but exclude costs incurred by the Natural Resources Management Boards to develop Water Allocation Plans.

Table 12: Funding for 2011–12

State	Investigations	Monitoring	Resource Management	Agreement Management	Total
Victoria	\$33,463	\$130,495	\$99,196	\$61,401	\$324,318
South Australia	\$118,000	\$293,988	\$356,224	\$101,140	\$869,352
Totals	\$151,463	\$424,483	\$455,420	\$162,541	\$1,193,670

⁵ On 1 July 2012 the Department of Water and the Department of Environment and Natural Resources amalgamated to form the Department of Environment, Water and Natural Resources and carries on the role of the previous department.

FIGURES

Figure 1: The Designated Area and zones



Figure 2: Hydrogeological provinces

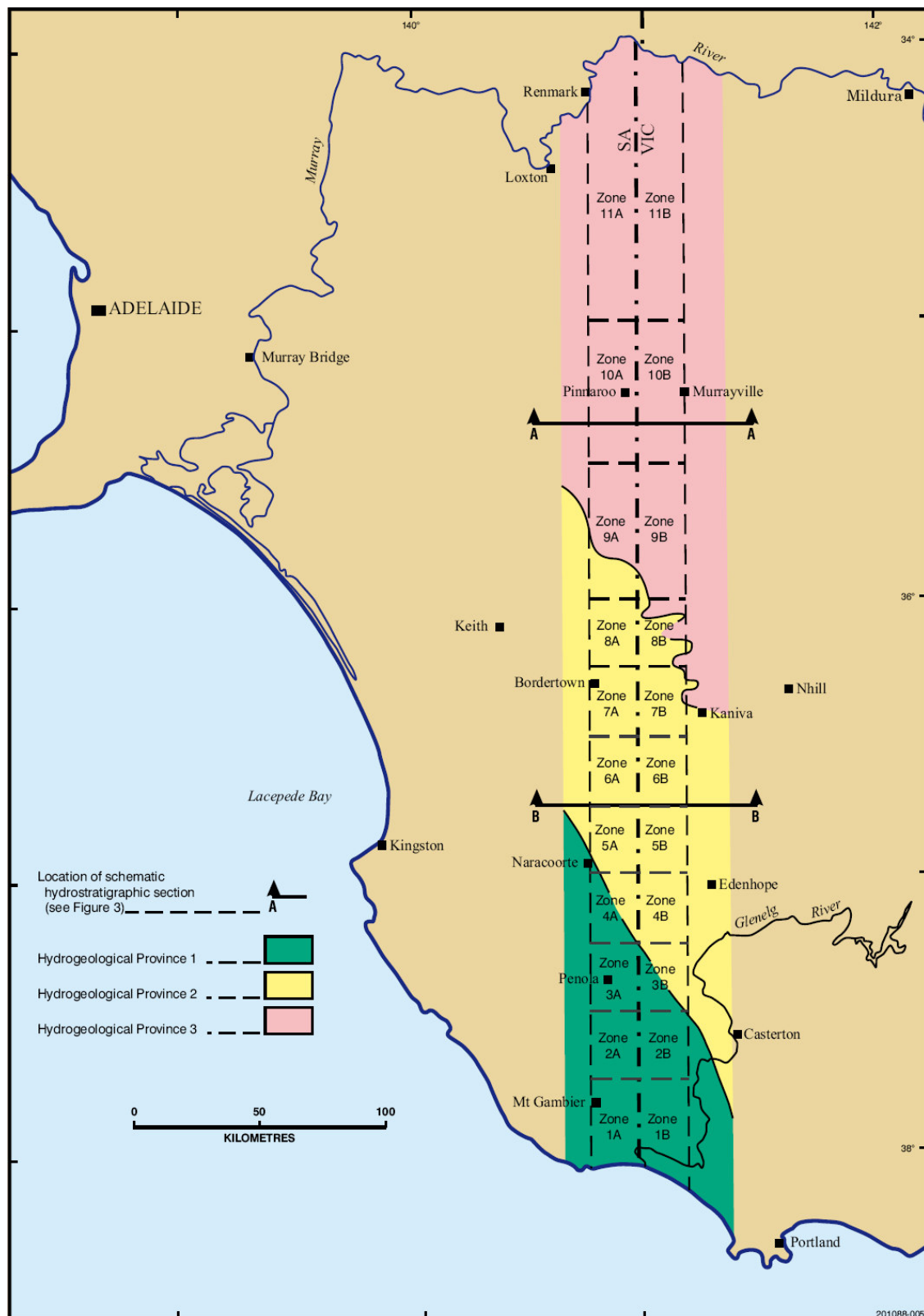


Figure 3: Schematic Hydrostratigraphic cross-sections relating to Figure 2

(The locations of the cross-sections are shown in Figure 2)

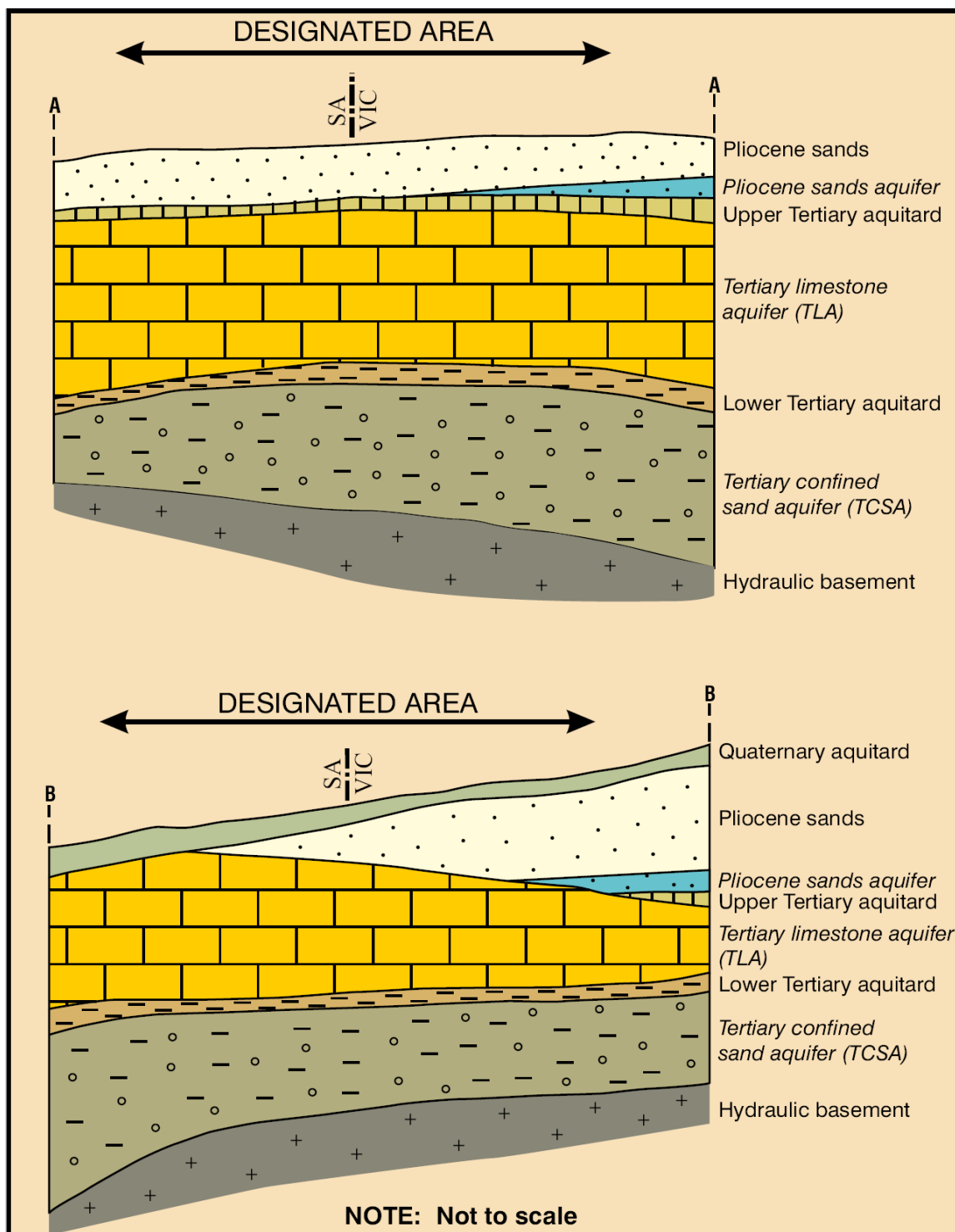


Figure 4: Relationship of management areas in South Australia and Victoria to the Designated Areas

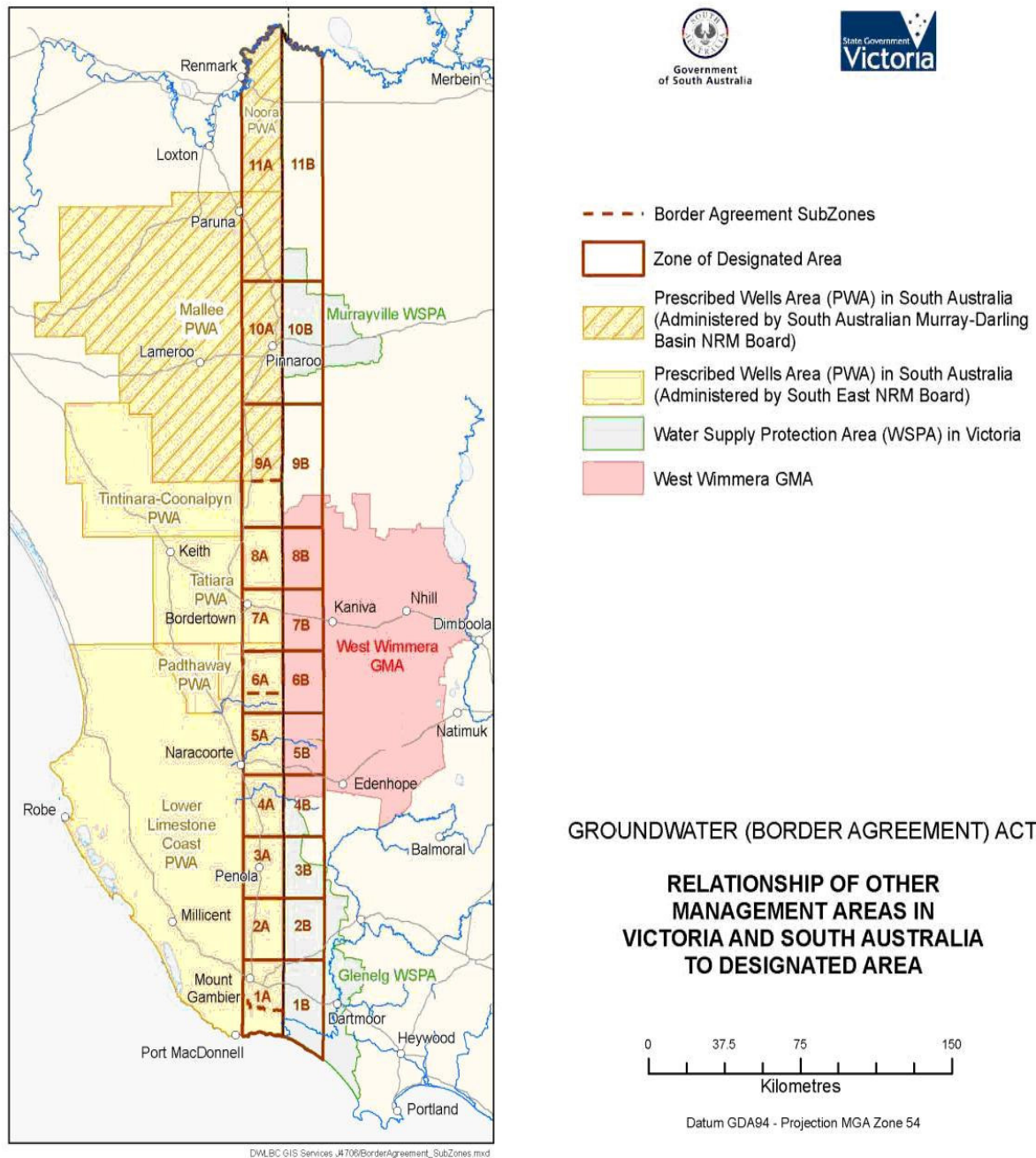
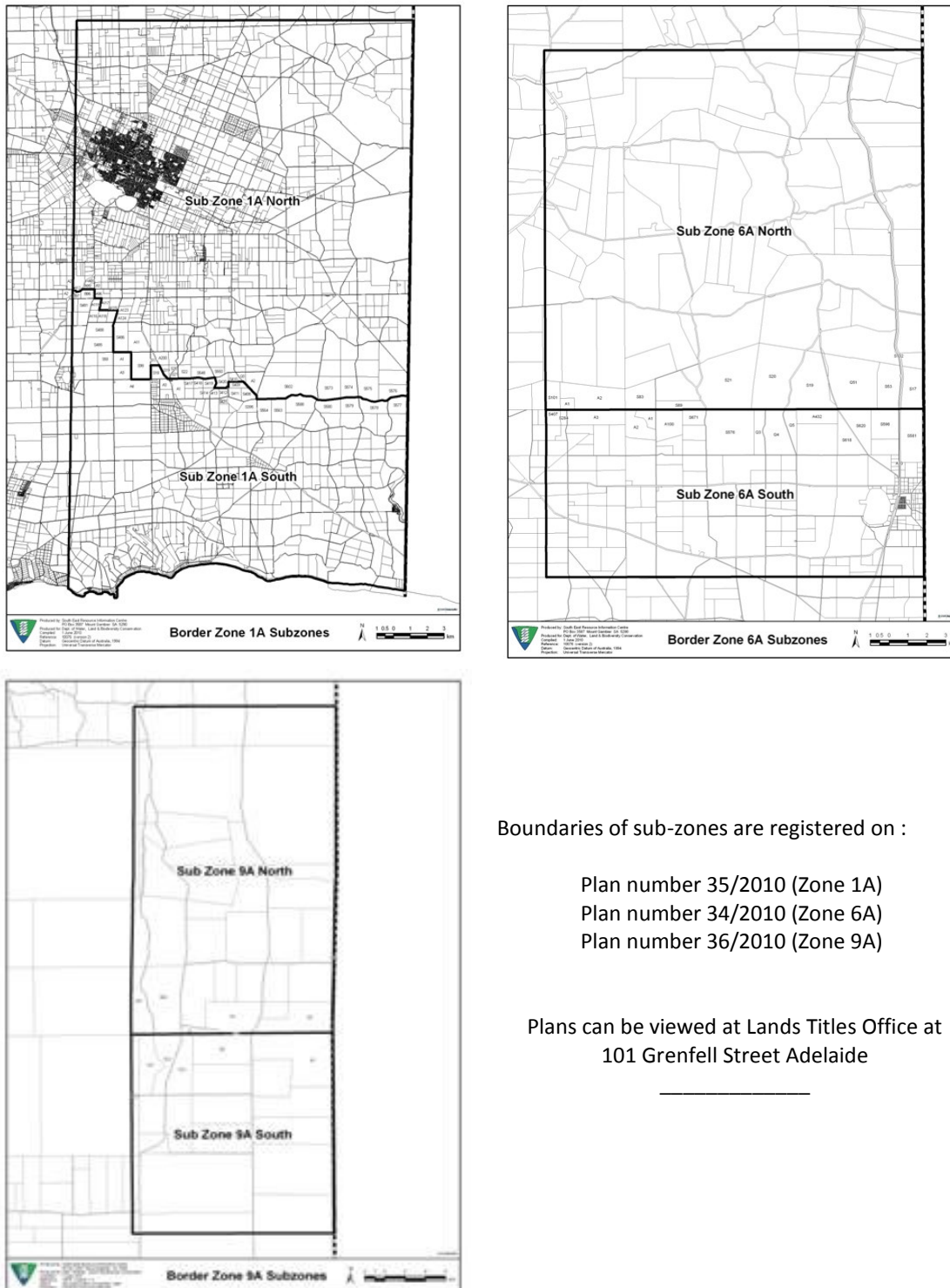


Figure 5: Sub-zone boundaries for Zones 1A, 6A and 9A

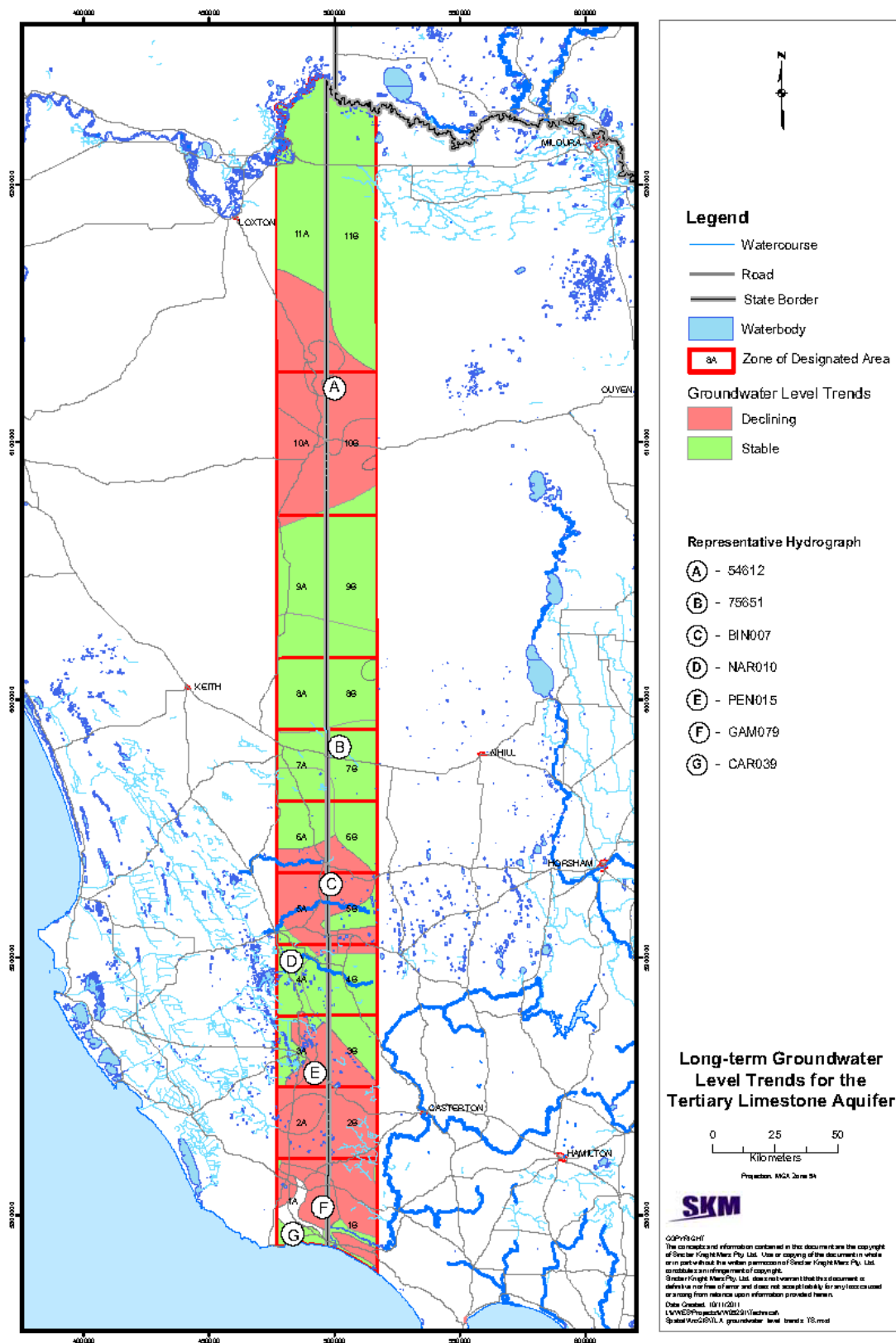


Boundaries of sub-zones are registered on :

- Plan number 35/2010 (Zone 1A)
- Plan number 34/2010 (Zone 6A)
- Plan number 36/2010 (Zone 9A)

Plans can be viewed at Lands Titles Office at
101 Grenfell Street Adelaide

Figure 6: Map of long term groundwater-level trends for the Tertiary Limestone Aquifer with some representative hydrographs



Sample of groundwater level hydrographs as located in opposite map (Fig. 6)

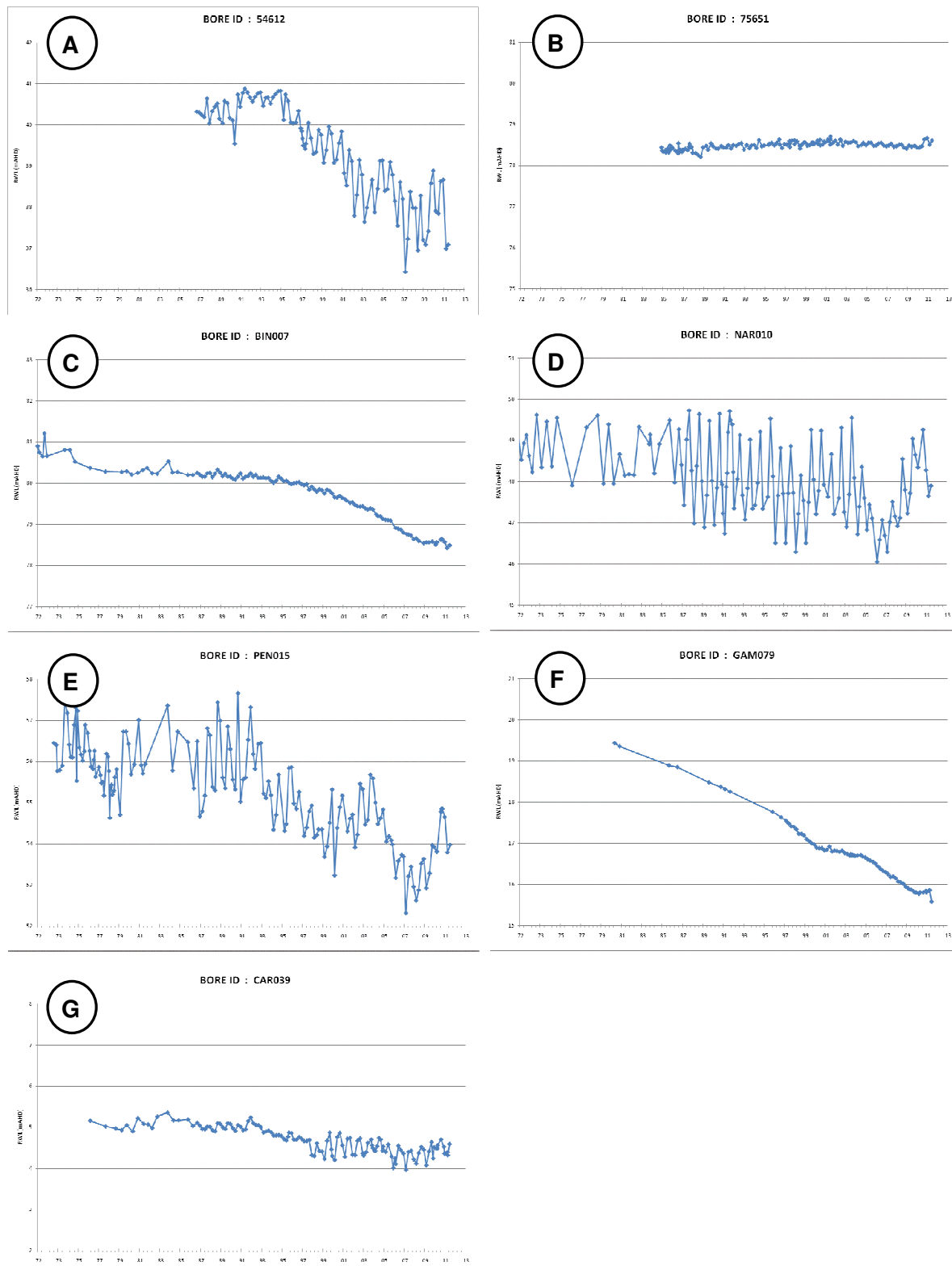
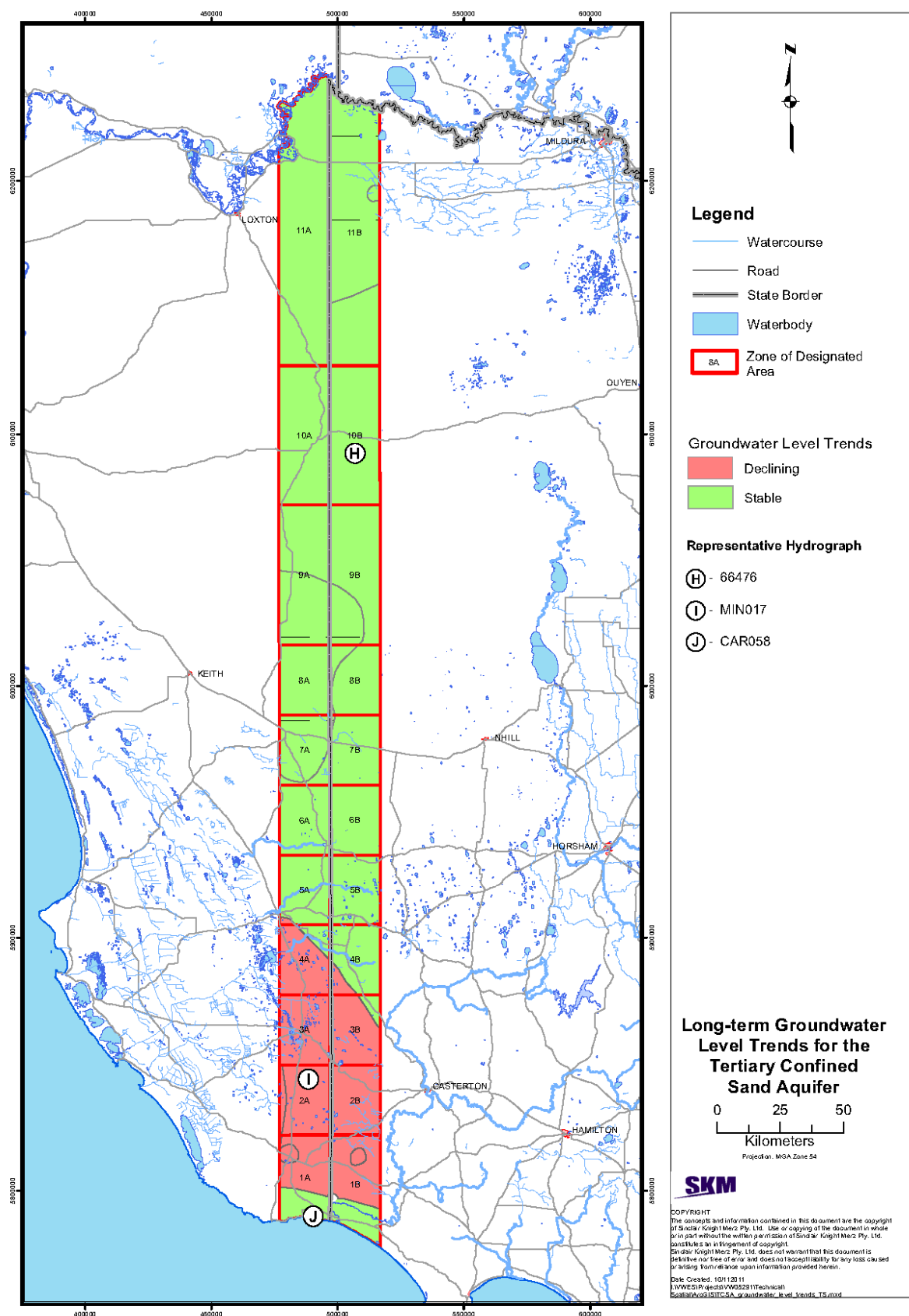
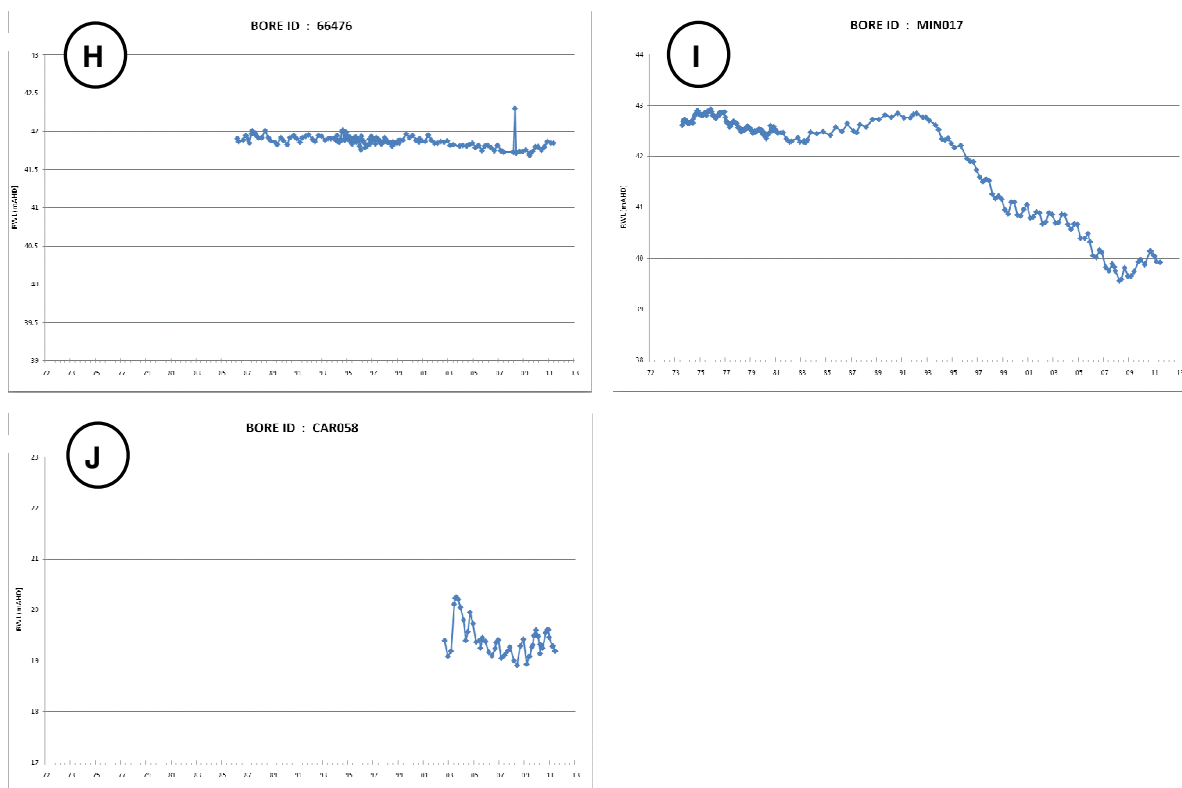


Figure 7: Map of long term groundwater-level trends for the Tertiary Confined Sand Aquifer with some representative hydrographs



Sample of groundwater level hydrographs as located in opposite map (Fig. 7)



GLOSSARY

Aquifer – A geological structure or formation or an artificial landfill permeated or capable of being permeated permanently or intermittently with water.

Allowable Annual Volume – The allowable volume of extraction specified for a particular sub-zone or aquifer within a sub-zone as has been determined by the Review Committee under clause 28(7) of the Agreement.

Designated Area – The area comprising part of the State of South Australia and part of the State of Victoria as specified in the First Schedule of the Act. This is an area 40 km wide and centred on the South Australia–Victoria Border and is the area to which the *Groundwater (Border Agreement) Act 1985* applies.

EC (ECU)– Electrical conductivity; 1 EC unit = 1 micro-Siemen per centimetre ($\mu\text{S}/\text{cm}$) measured at 25°C; commonly used as a measure of water salinity as it is quicker and easier than measurement by TDS.

Permissible Annual Volume - The Permissible Annual Volume of extraction specified for a particular zone or aquifer in a particular zone in the Designated Area.

Permissible distance – The distance from the border in which all applications for licences must be referred to the Review Committee to determine whether the licence should be issued.

Permissible potentiometric surface lowering – An average annual rate of potentiometric surface lowering (drawdown) within a zone as prescribed under the Agreement or has been agreed by the Minister for each Contracting Government.

Permissible salinity – A certain level of salinity within a zone as has been agreed by the Minister for each Contracting Government.

Prescribed Wells Area – An area declared to be prescribed under the South Australian *Natural Resources Management Act 2004*. Prescription of a water resource requires that future management of the resource be regulated via an approved water allocation plan and extraction of water be licensed.

TDS – Total dissolved solids, measured in milligrams per litre (mg/L); a measure of water salinity.

Tertiary Limestone Aquifer – Comprises aquifers in the Murray Group, Heytesbury Group, Coomandook Formation, Bridgewater Formation and Padthaway Formation, called collectively the Tertiary Limestone Aquifer, the base of which is identified as marl or black carbonaceous silt, sand or clay.

Tertiary Confined Sand Aquifer – Comprise aquifers in the Wangerrip Group and Renmark Group, below the Tertiary Limestone Aquifer.

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

REFERENCES

Border Groundwaters Agreement Review Committee (2001). *Five Year Management Review Report 1996 – 2000*. September 2001.

Border Groundwaters Agreement Review Committee (2007). *Management Review of the Tertiary Limestone Aquifer in Province 2 of the Designated Area*. December 2007.

Border Groundwaters Agreement Review Committee (2008). *Management Review Tertiary Limestone Aquifer and Tertiary Confined Sand Aquifer in Province 1 of the Designated Area*. May 2008.

Border Groundwaters Agreement Review Committee (2010). *Management Review Tertiary Limestone Aquifer in Province 3 of the Designated Area*. January 2010.

Border Groundwaters Agreement Review Committee (2010). *Management Review Tertiary Limestone Aquifer in Province 3 of the Designated Area*. January 2010.

SKM (2012). Review of groundwater level trends in the SA-Vic Designated Area.

APPENDICES

APPENDIX A

Notices in Government Gazette relating to the current amendments to the prescriptions

The Agreement requires that notices of the amendments be made in papers circulating in the area and the Government Gazette. The amendments took effect from the date nominated in the notice. The list of the notices in Government Gazette relating to the current amendments to the prescriptions is provided below.

South Australia

Publish date of Gazette	Notice
22 May 2008	Alteration of Permissible Annual Volumes for Zone 11A (sets a Permissible Annual Volume for the Parilla Sands Aquifer, Tertiary Limestone Aquifer and Tertiary Confined Sands Aquifer) (Note the Permissible Annual Volume for Tertiary Limestone Aquifer was superseded by the notice on 1 July 2010)
15 October 2009	Alteration of Permissible Annual Volume – Zone 6A
15 October 2009	Alteration of permissible distance – Zones 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A, 9A, 10A and 11A
15 October 2009	Notice of the alteration of Permissible Annual Volume – Zones 7A, 8A and 9A. (Note the Permissible Annual Volume for Zone 7A was superseded by the 1 July 2010 notice and Permissible Annual Volume for Zone 8A was superseded by 2 December 2010 notice)
1 July 2010	Sub-zoning of the Tertiary Limestone Aquifer in Zone 1A (also sets an Allowable Annual Volume for Sub-zone 1A South)
1 July 2010	Sub-zoning of Tertiary Limestone Aquifer in Zone 6A (also sets an Allowable Annual Volume Sub-zone 6A South and sets a permissible rate of potentiometric surface lowering for Sub-zones 6A South and 6A North)
1 July 2010	Sub-zoning of the Tertiary Limestone Aquifer in Zone 9A (also sets an Allowable Annual Volume Sub-zone 9A South and Sub-zone 9A North)
1 July 2010	Alteration of permissible rate of potentiometric surface lowering -Zone 5A
1 July 2010	Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zones 1A, 3A, 4A, 5A, 7A, 10A and 11A
2 December 2010	Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zone 8A

Victoria

Publish date of Gazette	Notice
15 October 2009	Alteration of Permissible Annual Volume – Zones 7B and 8B
15 October 2009	Alteration of permissible distance – Zones 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B, 10B and 11B
15 July 2010	Alteration of Permissible Annual Volume - Zones 5B and 6B
15 July 2010	Alteration of permissible rate of potentiometric surface lowering - Zones 5B and 6B

APPENDIX B

Permissible Annual Volumes and Allowable Annual Volumes for the Tertiary Limestone Aquifer relating to the Tatiara Prescribed Wells Area

South Australia adopted a revised Water Allocation Plan on 7 June 2010 for the Tatiara Prescribed Wells Area which covers part of Province 2. The plan provides for the conversion of the existing area based irrigation allocations to volumetric entitlements and this will greatly aid the management of groundwater extraction. The Review Committee amended the Permissible Annual Volumes and Allowable Annual Volumes in the relevant zones to assist in implementing this program. This involved raising the Permissible Annual Volumes and Annual Volumes and stepping them down over three years. The conversion will be completed by 1 July 2012. The alterations to the Permissible Annual Volumes and Allowable Annual Volume for the period from 1 July 2011 is set out in the table below. A detailed explanation of the amendments is contained the Review Committee's 25th Annual Report.

Table C1: Permissible Annual Volumes and Allowable Annual Volume for the Tertiary Limestone Aquifer for Zones 7A, 8A, 9A and Sub-zone 9A South from 1 July 2011 onwards

South Australia		
Permissible Annual Volumes for zones and Allowable Annual Volume for sub-zones for Tertiary Limestone Aquifer (ML/y)		
Zone/Sub-zone	Effective 1 July 2011	Effective 1 July 2012
Zone 9A	11 944	11 595
Sub-zone 9A South	8109	7760
Zone 8A	5663	5121
Zone 7A	8803	8259

