Early trends in groundwater trade in Victoria

Final report prepared for the Victorian Department of Environment, Land, Water and Planning

October 2017
Contents

Executive summary .................................................................................................................. 5

1. Introduction ....................................................................................................................... 11

2. Fundamentals of groundwater trade .............................................................................. 12
   2.1. Features that support water trading ........................................................................... 12
   2.2. Basic concepts in groundwater administration ....................................................... 13

3. Development and administration of groundwater trade ............................................. 15
   3.1. Historical development of groundwater trade in Victoria ........................................ 15
   3.2. Current administrative and policy settings .............................................................. 17
   3.3. Potential benefits of groundwater trade ..................................................................... 24

4. Groundwater trade activity and trends ......................................................................... 26
   4.1. Permanent and temporary trade ............................................................................... 26
   4.2. Groundwater trading by basin and groundwater management unit ......................... 28

5. Drivers of observed groundwater trade ........................................................................ 41
   5.1. Characteristics required to support trade ................................................................. 41
   5.2. Supply and demand side drivers of trade ................................................................. 46
   5.3. Management and administrative factors .................................................................... 47
   5.4. Insights from social research .................................................................................... 49

6. Considerations for the future ......................................................................................... 51
   6.1. Transparency ............................................................................................................ 51
   6.2. Access to markets ..................................................................................................... 51
   6.3. Unbundling .............................................................................................................. 51
   6.4. Trade rules ............................................................................................................... 51
   6.5. Management zones ................................................................................................. 52
   6.6. Trade approvals and processing .............................................................................. 53
   6.7. Education and information for market participants .................................................. 53

7. Conclusions ...................................................................................................................... 54

8. References ......................................................................................................................... 55
Tables
Table 1 Total volume of groundwater traded, and number of trades, 2011-12 to 2015-16.... 27
Table 2 Overview of price data for groundwater trades, 2013-14 to 2015-16...................... 27
Table 3 Permanent groundwater trade by groundwater basin, 2011-12 to 2015-16............. 29
Table 4 Temporary groundwater trade by groundwater basin, 2011-12 to 2015-16.......... 30
Table 5 Number of groundwater licences by basin...................................................... 44

Figures
Figure 1 Groundwater management basins ................................................................. 17
Figure 2 Groundwater trading zones in Victoria .......................................................... 19
Figure 3 Overview of permanent groundwater trade options in Victoria, based on 2016 rules 21
Figure 4 Overview of temporary groundwater trade options in Victoria, based on 2016 rules 22
Figure 5 Total volume of groundwater traded, and number of trades, 2011-12 to 2015-16... 26
Figure 6 Permanent groundwater trade by groundwater basin, 2011-12 to 2015-16........... 28
Figure 7 Temporary groundwater trade by groundwater basin, 2011-12 to 2015-16........... 29
Figure 8 Permanent groundwater trade for significant GMUs in the Goulburn Murray Basin, 2011-12 to 2015-16 ........................................................................... 31
Figure 9 Temporary groundwater trade for significant GMUs in the Goulburn Murray Basin, 2011-12 to 2015-16 ........................................................................... 32
Figure 10 Permanent groundwater trade for significant GMUs in the Wimmera Mallee Basin, 2011-12 to 2015-16 ................................................................. 33
Figure 11 Temporary groundwater trade for significant GMUs in the Wimmera Mallee Basin, 2011-12 to 2015-16 ................................................................. 34
Figure 12 Permanent groundwater trade for significant GMUs in the Gippsland Basin, 2011-12 to 2015-16 ................................................................. 35
Figure 13 Temporary groundwater trade for significant GMUs in the Gippsland Basin, 2011-12 to 2015-16 ................................................................. 35
Figure 14 Permanent groundwater trade for significant GMUs in the Otway Torquay Basin, 2011-12 to 2015-16 ................................................................. 37
Figure 15 Temporary groundwater trade for significant GMUs in the Otway Torquay Basin, 2011-12 to 2015-16 ................................................................. 38
Figure 16 Permanent groundwater trade for significant GMUs in the Central Basin, 2011-12 to 2015-16................................................................. 39
Figure 17 Temporary groundwater trade for significant GMUs in the Central Basin, 2011-12 to 2015-16................................................................. 40
Figure 18 Restrictions on groundwater licences, June 2017........................................... 43
Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELWP</td>
<td>Department of Environment, Land, Water and Planning (Victoria)</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitre</td>
</tr>
<tr>
<td>GMA</td>
<td>Groundwater Management Area</td>
</tr>
<tr>
<td>GMU</td>
<td>Groundwater Management Unit</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre</td>
</tr>
<tr>
<td>PCV</td>
<td>Permissible Consumptive Volume</td>
</tr>
<tr>
<td>RWC</td>
<td>Rural Water Corporation</td>
</tr>
<tr>
<td>WSPA</td>
<td>Water Supply Protection Area</td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifer</td>
<td>A geological structure or formation permeated or capable of being permeated permanently or intermittently with water.</td>
</tr>
<tr>
<td>Declared Water System</td>
<td>A water system that has been declared in accordance with section 6A of the Water Act 1989. In declared water systems water rights and take and use licences have been converted into unbundled entitlements.</td>
</tr>
<tr>
<td>Gigalitre (GL)</td>
<td>One thousand megalitres.</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Any water occurring in or obtained from an aquifer and includes any matter dissolved or suspended in any such water.</td>
</tr>
<tr>
<td>Groundwater Management Area (GMA)</td>
<td>A defined area where groundwater resources of a suitable quality for irrigation, commercial or domestic and stock use are available or expected to be available.</td>
</tr>
<tr>
<td>Groundwater management unit (GMU)</td>
<td>Either a Groundwater Management Area (GMA) or a Water Supply Protection Area (WSPA).</td>
</tr>
<tr>
<td>Megalitre (ML)</td>
<td>One million litres.</td>
</tr>
<tr>
<td>Permissible consumptive volume (PCV)</td>
<td>The total volume of water that may be taken in an area or from the system during a period specified in the Order.</td>
</tr>
<tr>
<td>Rural Water Corporation (RWC)</td>
<td>Water corporations with groundwater licensing responsibilities: Goulburn-Murray Water; Grampians Wimmera Mallee Water; and Southern Rural Water.</td>
</tr>
<tr>
<td>Take and use licence</td>
<td>A licence (granted under section 51 of the Water Act 1989) that grants the holder the right to take and use water from waterways, dams, springs and soaks, works of an authority, or groundwater (as applicable).</td>
</tr>
<tr>
<td>Unbundle, or unbundling</td>
<td>Separation of traditional entitlements previously called water rights or take and use licences in declared water systems into a water share, water use licence and delivery share or a works licence.</td>
</tr>
<tr>
<td>Water Supply Protection Area (WSPA)</td>
<td>An area declared under Section 27 of the Water Act 1989 to protect the area’s groundwater or surface water resources through the development of a</td>
</tr>
</tbody>
</table>
management plan which aims for equitable management and long-term sustainability.

<table>
<thead>
<tr>
<th>Works licence</th>
<th>A licence to construct, operate, alter, decommission or remove works associated with the extraction of water (i.e. bores, pumps and dams). Each licence is subject to conditions set by the Minister and specified on the licence.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water season</td>
<td>Twelve-month period from 1 July to 30 June.</td>
</tr>
</tbody>
</table>

Sources: Victorian Water Act 1989, Victorian Water Accounts, Victorian Water Register, DELWP.
Executive summary

Background and purpose

This is the first report to be published by DELWP which centres on groundwater trade in Victoria. It aims to document early trends in groundwater trade bringing together what is already published in DELWP annual reports. It is a baseline for further studies and policy development. It documents fundamental concepts in water trading, describes the development and administration of groundwater markets, early trends in groundwater trade activity and drivers of observed trade, and discusses considerations for groundwater policy and management.

While the report provides an overview of the development, operation, and results of groundwater markets to date, it does not provide a detailed critique of policy related issues or solutions. This is the subject of a separate assessment of the effectiveness of Victoria’s water markets being undertaken by DELWP.

The report summarises work previously undertaken by DELWP and does not represent primary research. It is largely based on work undertaken by DELWP in the twelve months preceding the report’s release, including two groundwater trade workshops held in 2016, internal research and analysis undertaken or commissioned by DELWP. Aither has completed some original analysis in order to present data on groundwater trade activity and trends, and to help explain the drivers of trends observed in the data.

Key concepts and fundamentals

Water markets are based on the ‘cap and trade’ concept. The ‘cap’ is a limit on the total extraction of water from a defined resource (e.g. a groundwater aquifer), established by regulation. This is aimed at ensuring sustainable management of the resource by defining the volume of water that can be used for productive purposes, while ensuring that some water is reserved to sustain the aquifer or the environmental outcomes dependent on it.

Caps on water extraction are an important enabler for trade as they allow the scarcity value of water to be revealed. In Victoria, the cap on groundwater extraction within a given groundwater management unit (GMU) is set by the ‘permissible consumptive volume’ (PCV). In general, there will be little demand for trade where a cap is not in place, or has not been reached.

Access to take and use water from within the cap is enabled by ‘take and use licences’, which constitute a fixed term entitlement to take and use water from an aquifer. These are established under the Victorian Water Act 1989, and can be traded in part or in full, on a permanent or temporary basis, subject to the Act, Ministerial policies and trading rules in management plans.

Groundwater licences are sometimes subject to restrictions which prevent the full licensed volumes from being extracted. Restrictions limit the volume of water that can be taken at certain times or in certain years, or the rate at which that water can be taken. These restrictions are generally intended to protect the long-term sustainability of the groundwater resource and the rights of other water users drawing on that resource, including by reducing the negative impacts of changes in water quality.

Both permanent and temporary groundwater trade is possible in Victoria. Permanent transfers of a licence or part of a licence may involve trade to a different person and/or a different location. For permanent transfers to a different location, the seller’s licence is amended or cancelled and a new
licence issued (where appropriate), reflecting the volume of water transferred. All transfers are recorded in the Victorian Water Register.

**Administrative arrangements and policy settings**

**Management and spatial units**

Groundwater in Victoria is administered across multiple scales. Key spatial units relevant to groundwater management and trade include:

- **Groundwater Basins** – there are five basins used for planning and reporting on groundwater conditions.
- **Groundwater Catchments** – which are also used for planning and reporting on groundwater conditions. These areas represent regions of connected groundwater resources and are based on groundwater flow systems, as well as administration and surface water management boundaries. There are 20 groundwater catchments.
- **Groundwater management units** – these are discrete areas where specific groundwater management rules are defined, with two subcategories: groundwater management areas (GMAs) and Water Supply Protection Areas (WSPAs).
- **Unincorporated Areas** - an area of Victoria which contains substantial and often unquantified groundwater of varying yield and quality that has not been designated as either a GMA or a WSPA.
- **Groundwater trading zones** – zones that are defined in management plans.
- **Groundwater sustainable diversion limit resource units** – these are established under the Murray-Darling Basin Plan and define areas for reporting under the Plan.

Figure 1 in Section 3.2.1 shows Groundwater Basins and Trading Zones across Victoria.

**State-wide trade rules**

Trade rules are established to protect aquifers, the rights of licence holders, the environment, or to address specific issues such as waterlogging and salinity, and often reflect hydrologic connectivity (e.g. preventing trade when water cannot be extracted from a different zone).

Various trade rules are in place across Victoria. The rules can be grouped into the following categories:

- **no trade** allowed.
- **trade allowed** between users **within** the zone only
- **trade allowed** between users **within** the zone and **into** the zone only
- **trade allowed** between users **within** the zone and **out of** the zone only
- **trade allowed** between users **within** the zone and **into** and **out of** the zone.

Figures 2 and 3 in Section 3.2.2 shows trade zones and opportunities to trade between zones for permanent and temporary trade respectively.
Groundwater trade activity and trends

Changes in administrative areas and reporting conventions affects confidence in trade data collected prior to 2011-12. As such, this report only presents data for the five-year period from the 2011-12 to 2015-16 water seasons.

State-wide trade

Total annual permanent Victorian groundwater trade increased from 4,799 ML in 2011-12 to 10,290 ML in 2015-16. Over the same period, total annual temporary groundwater trade fluctuated significantly, peaking at 25,363 ML in 2015-16. Overall, there has been a substantial increase in trade (volume and number) for both permanent and temporary groundwater trade over the period considered.

Price data for groundwater trading is not robust, due in part to small numbers of trades and a high proportion of trades recorded with $0 prices. Only prices from 2013-14 onward can be reported (noting that confidence in reported prices is still low):

- 2013-14 – Permanent trade median price $972 / ML, temporary trade median price $66 / ML
- 2014-15 – Permanent trade median price $600 / ML, temporary trade median price $50 / ML
- 2015-16 – Permanent trade median price $550 / ML, temporary trade median price $56 / ML.

Basin scale trade

Groundwater trade has been most extensive in the Goulburn-Murray Basin, for both permanent and temporary trade. The Gippsland and Wimmera Mallee Basins are the next most intensive in most years. Most of the increase in trade over the five-year period is accounted for by permanent trading in

Note: Trades involving changes in land ownership are not included.

Figure ES1 Total volume of groundwater traded, and number of trades, 2011-12 to 2015-16

1 The median prices cited here are calculated with reference to non-$0 trades only.

![Figure ES2 Permanent groundwater trade by groundwater basin, 2011-12 to 2015-16](source: Aither, 2017, based on Victorian Water Register data. Note: Trades involving changes in land ownership are not included.)

![Figure ES3 Temporary groundwater trade by groundwater basin, 2011-12 to 2015-16](source: Aither, 2017, based on Victorian Water Register data. Note: Trades involving changes in land ownership are not included.)
The volume and number of trades is generally highly variable between GMUs within a single Basin and between Basins. Within the Goulburn-Murray Basin (the Basin with the most trade in most years), zones within the Lower Campaspe, Katunga, and Loddon Highlands and Mid-Loddon GMUs had the highest levels of trade over the five-year period.

Explaining observed trade results

Characteristics that support trade, and supply and demand factors

The wide variation in trade activity can be explained by:

- Water scarcity – there is generally more trade where there is limited or no capacity for additional licences to be granted, and less trade in GMUs with capacity for more entitlement to be issued under the current cap.
- Variable water availability – there has tended to be more trade in the latter part of the time period, and less at the beginning; climate and inflow conditions were generally wetter at the start of the period and moving towards drier conditions through the latter stages.
- The number and type of water users and participants – the Goulburn-Murray Basin has the greatest volume of water on issue, the greatest number of licensees, and a well-established irrigation industry with relatively diverse water uses.

Supply and demand side factors also explain the trends observed. Rainfall and other climatic variables are likely to have had a bearing on trade outcomes, as will surface water availability (given potential for substitution between sources). On the demand side, land use and crop types are also likely to have played a role. In some areas, conditions in both surface water availability and surface water markets can play a role in groundwater use and trade.

Management, administrative and other considerations

Policy, management and administrative practices also play a role in the extent of trade, although separating the extent to which these factors contribute to observed results was beyond the scope of this report. Important factors that will potentially facilitate, or hinder trade, include (NWC, 2011):

- **Prerequisites**: legal certainty, transparent market rules, effective governance, timely and accurate information, low transaction costs, adequate enforcement, and confidence in intermediaries.
- **Enabling mechanisms**: water rights definition and titling, market and trading rules, governance, market information, compliance and enforcement, and market administration and trade processing.²

Work recently undertaken by DELWP has identified certain issues with trade and management zones, trade rules, trade assessment and approvals, extraction matters, characteristics of entitlements, and information and education. Additionally, insights have been drawn from research into and engagement with licence holders, which points to a need to improve market and other information, transfer rules and processes, seasonal allocation rules, and confidence in resource allocation. These may need to be addressed to help facilitate groundwater trade, noting that these are not the most important factors in explaining observed trade results (see Section 5.3).

² Each of these factors contains several more detailed elements.
Considerations for groundwater policy and management

Drawing from the work undertaken previously by DELWP, as well as insights from the additional work undertaken by Aither for this report, there are several areas that are important to consider as part of improving or further developing groundwater markets in Victoria:

• Potential market size – there will be natural limits to the potential size of and activity in groundwater markets, as defined by hydrologic connectivity and similar issues. Hydrologic connectivity must be respected to protect existing rights, the environment, and the health and sustainability of aquifers.

• Transparency – water trading is facilitated by clear and consistent processes and rules, which can be readily understood by members of the public considering the option to trade. There is evidence that groundwater trade in Victoria may currently be burdened by undue complexity.

• Management and trading zones – there are several spatial scales for groundwater management in Victoria, which can be complex and confusing, especially as they relate to trading zones, which are not always aligned with other management areas. There may be benefits in rationalisation and improvements in alignment.

• Trade rules – there is evidence that improvements could be made to groundwater trading rules, including their clarity, transparency, consistency and application. While implementation in specific areas may differ slightly to reflect local conditions, consistency in principles and rationale is critical for efficient and effective markets. It is also important to ensure trade rules are not used to address other water management issues or licensing considerations (such as overallocation or drawdown), which would be contrary to National Water Initiative and Basin Plan commitments.

• Trade approvals and processing – there may be opportunities to further integrate groundwater trade into the Victorian Water Register where cost effective, and further codify trade approvals processes to reduce cost and improve approval timeframes.

• Education and information for market participants – increasing water users’ knowledge of how water markets work, how they can benefit water users, and how to participate in water trading can facilitate increased adoption of water trading as a management option. Educational and information resources are an important part of this effort.
1. Introduction

To date, the majority of water trade in Victoria, as in most states in Australia, has involved the trading of surface water. Nonetheless, groundwater trade is an increasingly important element in Victorian water trade. The physical characteristics of groundwater and administration of groundwater trade, and the development of groundwater markets, creates multiple challenges for government policy makers, rural water corporations (RWC), and water market participants. Though some of these challenges are similar to those in surface water markets, others are unique to groundwater trade. In spite of these challenges, the potential benefits of groundwater trade are significant and are likely to become more pronounced over time, as available groundwater resources are increasingly fully allocated and surface water availability changes.

This report seeks to highlight early trends in, and drivers of, groundwater trade in Victoria. It does this in part by drawing on work previously undertaken by DELWP, including two workshops held in 2016 and the reports prepared internally by or for DELWP. Further analysis and development of original material has been undertaken for this report, particularly in support of Section 2 and Section 5. Various reports and data sources were consulted and these are cited where appropriate.

This report is also intended to inform a separate project assessing the effectiveness of water markets in Victoria, the results of which will be reported on separately in early 2018.

This report is structured as follows:

• Section 2 introduces the fundamentals of water trade, both generally and with specific reference to Victorian groundwater trade. The section outlines the enablers of groundwater trade and introduces basic concepts in groundwater administration.

• Section 3 outlines the historical development, and administrative arrangements, for groundwater trade in Victoria.

• Section 4 presents data on groundwater trade activity and trends across Victoria, for permanent and temporary trade, including volume and price data, by groundwater basin and groundwater management unit.

• Section 5 explains some of the potential drivers behind the observed trends, including supply and demand side factors, as well as management and administrative arrangements.

• Section 6 provides an overview and discussion of several policy and management questions that are likely to be pertinent to the future of groundwater trade in Victoria.

• Section 7 draws together key issues from the analysis for consideration in future policy and management.
2. Fundamentals of groundwater trade

2.1. Features that support water trading

There are certain characteristics that are required for there to be demand for water trade. The following sub-sections (adapted from NWC, 2011) briefly describe some of the most significant of these. Without several of these characteristics, it is unlikely that water trade will be significant, even where legal and administrative arrangements for markets have been established.

- **Water scarcity**: Water markets are based on the ‘cap and trade’ concept. The ‘cap’ is a limit on the total extraction of water from a defined resource (e.g. a groundwater aquifer), established by regulation. This is aimed at ensuring sustainable management of the resource by defining the volume of water that can be used for productive purposes, and ensuring that some water is reserved for the environment (i.e. ‘outside the cap’). Caps on water extraction are an important enabler for trade as they allow the scarcity value of water to be revealed. In Victoria, the cap on water extraction within a given groundwater management unit (GMU) is generally referred to as ‘permissible consumptive volume’ (PCV). While most GMUs in Victoria are subject to PCVs, there remain areas where groundwater resources are not fully allocated and where new users may still obtain water by applying to the water corporation for a new licence rather than having to purchase one on the market. The Murray-Darling Basin Plan established volumetric groundwater Sustainable Diversion Limits. These are broadly similar in intention to PCVs.

- **Variable water availability**: Changes in the availability of water over time and space, contributes to demand for trade. In this regard, total water available across different sources is important, including rainfall, surface water and groundwater, because of the potential for substitution between sources. During or following dry years, restrictions may be placed on the abstraction of groundwater because aquifers do not recharge sufficiently and drawdown impacts may be felt. At these times, water allocations against surface water entitlements may also be constrained. This means there may not be enough water available for all users to meet their water needs, which drives trade between water users.

- **Connectivity between water systems**: Where water systems are connected, this can increase the potential number of market participants and allow users with different water demands to participate in trade. This will affect opportunities and potential demand, for trade. For groundwater systems, aquifers are discrete units that have limited connectivity with other units. They can be regional systems or in many other cases very localised systems with little connection with other systems. This physical limitation influences the development of groundwater markets and can limit the ability to trade across to other systems as there is no physical connection, nor is there a distribution system which connects them. This can limit the number of trading partners, including those with different demands (e.g. those growing different crops in another region or sub-region).

- **Number and type of water users and market participants (potential market size)**: Higher numbers of water market participants means there are more potential trading partners for trade. Greater variation in water demands (e.g. farmers growing different types of crops) is likely to lead to increased opportunities to trade, as the value of water to those users may differ, both within and between seasons.

- **Increasing water demand**: In addition to variation in demand between users, increasing water demand overall is also likely to support greater trade. New developments may have to secure

---

3 The impacts of reduced aquifer recharge may take many years to be realised, as recharge rates vary significantly between aquifers.
entitlements from existing entitlement holders, which can contribute to greater levels of trade and the movement of water resources to higher-value uses.

- **Pressure for structural change within industries**: Where there is change within individual industries, including in response to external drivers such as structural shifts in global commodity markets, there can be increased demand for trade as different entities enter or exit production, or modify their activities, with consequences for their demand for water.

In general, water scarcity and sufficient numbers of users (and, in some cases, the volume of water on issue) are likely to represent threshold requirements for an active water market to exist. Other characteristics will influence the extent of trade, but are unlikely to remove all incentives for trade if absent. The extent to which these features exist varies across different groundwater resources in Victoria, and therefore helps to explain why we may observe different trade activity.

### 2.2. Basic concepts in groundwater administration

This section introduces some key concepts in Victorian groundwater licensing and trading.4

#### 2.2.1. Take and use licence

In the context of groundwater, a take and use licence is a fixed term entitlement to take and use water from an aquifer. Take and use licences are established by section 51 of the *Water Act 1989* and can be traded in part or in full, on a permanent or temporary basis. Licence holders must seek and receive the approval of their water corporation prior to transferring their licence. Approval is subject to the constraints of the *Water Act*, ministerial policies and guidelines and trading rules contained in relevant management plans.

Licences are issued for between one and 15 years, and are subject to conditions relating to the exact location and depth from which groundwater can be extracted, the annual volume of water that can be pumped and the rate at which pumping can occur. When making a licence application, applicants may be required to undertake investigations commensurate with the volume applied for (DELWP, 2014).

#### 2.2.2. Restrictions on groundwater licences

In some GMUs, groundwater licences may be subject to restrictions on the volume of water that can be taken at certain times or in certain years, or the rate at which that water can be taken. Under some circumstances, licence holders may not be permitted to access the full licenced volume. These restrictions are generally intended to protect the long-term sustainability of the groundwater resource and the rights of other water users drawing on that resource, including by reducing the negative impacts of changes in water quality. The method to determine the need for a restriction and the restriction to apply are set out in management plans. Unless there is a statutory management plan, restrictions are implemented by declaration of a water shortage and a temporary qualification of rights under section 33AAA of the Act.

---

4 For definitions of these and other important terms in groundwater administration, refer to the glossary at the front of this report.
2.2.3. Permanent trade

The Water Act 1989 states that a groundwater licence may be ‘transferred to another person’ (s. 62(1)(1)) and that that transfer ‘may be either permanent or temporary’ (s. 62(1)(2)). In both cases, licence holders must apply to have the transfer approved. Permanent transfers of a licence or part of a licence may involve trade to a different person and/or a different location. For permanent transfers to a different location, the seller’s licence is cancelled and a new licence issued, reflecting the volume of water transferred. Where only part of a licence is transferred to a different location, the seller’s licence is amended or cancelled and a new licence issued reflecting the remaining (non-transferred) volume of water (DELWP, 2014, s. 26(1)).

2.2.4. Temporary trade

For temporary transfers of a licence or part of a licence to a different person and/or location, the volume that has been transferred is recorded in the Victorian Water Register (DELWP, 2014, s.26(2)). Generally, temporary trades must conclude at the end of a water season (i.e. June 30) and must be for a period of one water season only, or for the remainder of the current water season. Temporary trades may be permitted for a period of up to five years (DELWP, 2014, s. 26(5)). Any part of a licence that is the subject of a temporary transfer from the original licence holder to another person may not be approved for any further temporary transfer by this other person to take effect during the term of the original temporary transfer (DELWP, 2014, s. 26(6)).
3. Development and administration of groundwater trade

3.1. Historical development of groundwater trade in Victoria

This section provides a brief overview of the historical development of Victoria’s overall groundwater management framework, before positioning the development of groundwater trade within this framework.

3.1.1. Development of Victoria’s overall groundwater management framework

Victoria’s water resources are critical to the state’s economy, environment and communities. The water that feeds the state’s rivers, streams, lakes and aquifers has been managed in diverse ways by different groups of people for millennia. In the 21st Century, changing community expectations, climate change drivers and impacts, and shifting economic and demographic conditions combine to create new challenges and opportunities for the sustainable management of Victoria’s water.

Victorian groundwater resources have long been tapped for the watering of stock and crops, and for town and domestic water supply. In general, surface water resources were developed more intensively and more quickly than groundwater resources for the purposes of large-scale irrigation. Even today, many groundwater licence holders use only a fraction of their entitlement in some years.

As with surface water, exploitation of groundwater resources in the 1800s and early to mid-1900s was driven by an almost exclusive focus on economic development. Due perhaps to the relatively rapid pace of surface water development (and the immediately visible impacts of that development), surface water diversions were capped well before similar arrangements were put in place for groundwater resources. Licences to pump from unregulated streams during summer ceased to be generally available after the 1967-68 drought (DNRE, 2001). Groundwater licences were still being issued.

The Groundwater Act 1969 introduced several constraints on groundwater extraction and use that have been further developed and strengthened over the intervening decades (Clark and Myers, 1969). The declaration of conservation areas was permitted and restrictions were permitted to be imposed within control zones.

During the 1990s, Victoria began converting bulk surface water entitlements established under the Water Act 1958 to entitlements under the Water Act 1989, and established streamflow and groundwater management plans. This marked the introduction of groundwater caps and related restrictions regimes (Productivity Commission, 2003). Statutory management plans and local management plans are developed to manage risks to groundwater resources. Management plans aim to ensure that the resource is shared equally between users, that impacts on third parties are minimised, and that the environment and long-term sustainability of the resource is protected. Statutory management plans are a requirement for Water Supply Protection Areas (WSPAs) under the Water Act 1989. The plans are developed with the community, groundwater users and other stakeholders and define specific rules to meet the management objectives in the area. Local management plans are prepared in accordance with guidelines approved by the Minister, and are applied in GMUs other than WSPAs.
In 2012, Victoria developed a new framework for the management and reporting of groundwater resources. The framework comprises three levels for managing and reporting on groundwater:

- groundwater basins;
- groundwater catchments; and
- groundwater management units (that include groundwater management areas and water supply protection areas).

Groundwater basins and groundwater catchments are used for planning and reporting on groundwater conditions. These areas represent regions of connected groundwater resources and are based on groundwater flow systems, as well as administration and surface water management boundaries.

### 3.1.2. Development of groundwater trade

Prior to 1989, Victorian groundwater licences were generally issued with rural land title, and groundwater was often used for domestic and stock purposes, for irrigation, and as an alternative to surface water during dry years. Most large-scale irrigation was, and continues to be, dependent on surface water. Groundwater trading was not widespread though may have occurred informally, as happened in the case of some surface water entitlements prior to the formalisation of trading.

Following the introduction of the *Water Act 1989*, many previously existing pieces of water-related legislation were brought together to establish a framework for water management. The Act established processes for allowing entitlements to be issued, revoked, amended, converted to other entitlements, and transferred.

Today, the *Water Act 1989* provides the legislative basis for the planning and management of Victoria’s water resources. This legislation establishes a water licensing regime and sets out the conditions under which trading of surface water shares and allocations, and groundwater licences, can occur, and the way in which those trades should be approved and conducted.

As described above, section 51 of the Act establishes the basis for the issuing of licences to take and use groundwater. These licences establish the rights of irrigators and other groundwater users to take water from groundwater systems, and are issued by Water Corporations in accordance with the Act. Licensing responsibilities are delegated to the Rural Water Corporations (RWC).

The *Water Act 1989* also established the basis for the PCVs. PCVs are set by the Minister and facilitate trade by establishing the scarcity value of water within those systems. PCVs have been established in all Groundwater Management Areas (GMAs) and WSPAs. Critically, where groundwater in a given system is allocated up to its PCV limit, no new licences can be issued, and trade with an existing licence holder becomes the only means by which to acquire access to water. In a majority of GMUs, allocation of groundwater licences is at or near 100 per cent of the PCV.

The National Water Initiative in 2004 and the *Murray Darling Basin Plan 2012* have also influenced water reform. The former set out to achieve, among other objectives, the progressive removal of barriers to water trade, including through the minimisation of transaction costs. The latter established basin-wide trading rules for the Murray-Darling Basin with the objective of reducing restrictions on trade, improving transparency and access to information, and improving market confidence through a more effective water market.

Other important historical legislative and administrative changes that have affected the development of groundwater trade in Victoria include the introduction of carryover for some groundwater licences between 2012 and 2013. Carryover allows licence holders to take unused licenced volume in the
following season. It provides water users with greater flexibility to manage their own water availability between seasons. Carryover of between 15 and 30 per cent of licenced volume is presently permitted in the Lower Campaspe Valley WSPA, Mid Loddon GMA, Loddon Highlands WSPA, Murrayville GMA and West Wimmera GMA.

Victorian groundwater trade is recorded in the Victorian Water Register and reported annually in the State Water Accounts and the Water Trading Annual Reports.

### 3.2. Current administrative and policy settings

#### 3.2.1. Groundwater basins, groundwater management units, zones and other spatial units

Groundwater management in Victoria is administered across multiple scales. Groundwater basins and Groundwater Catchments are used for planning and reporting on groundwater conditions. These areas represent regions of connected groundwater resources and are based on groundwater flow systems, administration and surface water management boundaries. There are five basins:

- Goulburn Murray Basin;
- Wimmera Mallee Basin;
- Otway Torquay Basin;
- Gippsland Basin; and
- Central Basin.

There are 20 groundwater catchments.
Groundwater management units (GMUs) are discrete areas where specific groundwater management rules are defined. These are further categorised into two types:

- **Groundwater Management Areas (GMAs);**
- **Water Supply Protection Areas (WSPAs);** and

**Management zones** - are zones of intensive use where interference has or may occur due to high extractions are defined in management plans for some GMUs. Limits on entitlement within these zones may be specified in the plan including rules for trade within and between other management zones.

Collectively, GMUs and any associated management zones, have defaulted to trading zones. In total there are currently 174 trading zones in Victoria, constituted of 55 in the Goulburn Murray Basin, 38 in the Wimmera Mallee Basin, 26 in the Otway Torquay Basin, 30 in the Gippsland Basin, and 25 in the Central Basin. These zones are shown in Figure 2.
Figure 2  Groundwater trading zones in Victoria
3.2.2. State-wide trading rules

The rules that apply to Victoria’s 174 trading zones can be grouped into the following five categories, each of which may differ in its application within a single zone depending on whether it is permanent or temporary trade that is subject to the rule:

- **no trade** allowed
- **trade allowed** between users **within** the zone only
- **trade allowed** between users **within** the zone and **into** the zone only
- **trade allowed** between users **within** the zone and **out of** the zone only
- **trade allowed** between users **within** the zone and **into** and **out of** the zone.

The status of trading rules for permanent groundwater trade in Victoria (as at 2016) is shown for each trading zone in Figure 3. The status of trading rules for temporary groundwater trade in Victoria (as at 2016) is shown for each trading zone in Figure 4.
Figure 3  Overview of permanent groundwater trade options in Victoria, based on 2016 rules
Figure 4  Overview of temporary groundwater trade options in Victoria, based on 2016 rules
Each of these five categories of trading rule is designed to serve a different purpose. The broad kinds of purposes underlying different types of trading rule are introduced below. A brief description of the prevalence of each rule type is also provided.

**No trade allowed**

This rule prohibits all permanent and temporary trade. A rule in this category may be established to meet any of the objectives set out below for other types of trading restriction. There is one instance where both permanent and temporary groundwater trade are expressly prohibited. In the Shepparton Irrigation WSPA, groundwater management seeks to mitigate waterlogging and land salinity risk, and resource extraction is encouraged to manage high water tables. Trade is not necessary because licences can be obtained by applying to the licensing authority at any time. This rule may also apply where a water supply protection area is declared and trade is not permitted under statute until a management plan has been approved by the Minister.

**Trade allowed between users within the zone only**

This rule prohibits trade beyond the boundaries of a single trading zone. Trade is permitted between users within the zone. Rules in this category may be established to prevent trade beyond the boundaries of a shared groundwater resource or neighbouring resource that is not connected.

**Trade allowed between users within the zone and into the zone only**

This rule allows groundwater to be traded within the boundaries of a single trading zone. It also allows trade into a trading zone from other zones, but not out of that zone. A rule in this category may be established to encourage aquifer drawdown (e.g. to facilitate salinity control). The rule applies in some trading zones in the Gippsland Basin and the West Wimmera. In some cases, this rule applies for temporary trades only (i.e. permanent trades may only occur between users within the zone). In other cases, this rule applies for permanent trades only (i.e. temporary trades may occur within, into and out of the zone).

**Trade allowed between users within the zone and out of the zone only**

This rule allows groundwater to be traded within the boundaries of the zone. It also allows trade out of the zone into other zones, but not into the zone. Rules in this category may be established to manage the potential impacts of groundwater extraction on existing users, to protect surface water where there is no shared cap on connected resources, to prevent seawater intrusion of coastal groundwater, and/or to manage groundwater decline. In some cases, trade is not permitted as the PCV for the GMU is currently being calculated or revised. In 2016 there were eight zones where temporary and permanent groundwater trade into the zone was prohibited by rules that encourage trade out of a zone only. In one additional zone (i.e. Yarram WSPA Zone 2 (Central)), only permanent trade (i.e. not temporary trade) was restricted into the zone.

**Trade allowed between users within the zone and into and out of the zone**

This rule allows groundwater to be traded within the boundaries of the zone. Trade is also allowed into the zone from other zones, and out of the zone into other zones. In numerous groundwater markets across Victoria, trade is permitted within and between zones.

### 3.2.3. Trade between groundwater and surface water systems

At present, trade between groundwater and surface water systems is limited as most statutory and local management plans have not yet considered this trading option. The Upper Ovens WSPA presents a notable exception (see boxed text). *Water for Victoria* (DELWP, 2016, p. 135) states that
the government will continue to ‘invest in understanding where groundwater and surface water interactions have a significant impact to inform future combined management plans’.

### Integrated surface water and groundwater management in the Upper Ovens

The Upper Ovens WSPA covers the upper Ovens River upstream of the confluence with the Buffalo River near Myrtleford in North East Victoria. Within the Upper Ovens WSPA, the shallow groundwater system and the Ovens River are highly connected and are managed in an integrated manner. The Water Management Plan, approved in 2012, jointly manages both groundwater and surface water and is the first of its kind in Victoria. The Plan sets out the conditions under which transfer of licenced volumes between surface water and groundwater can occur.

### 3.3. Potential benefits of groundwater trade

Groundwater trading in Victoria can theoretically deliver a range of benefits for water users in a range of industries, with flow-on benefits to regional communities. Potential benefits include:

- The ability for water users to expand groundwater-dependent commercial operations where no new licenced volume is permitted to be allocated (see DELWP, 2015a).
- Provision of an additional source of income for willing sellers of groundwater licences where part or all of the licenced volume is unused for a period of time (see DELWP, 2015b, 2015c).
- Increased confidence in the reliability of water availability for those water users that place a comparatively high value on water as an input to production (see DELWP, 2015d).
- Enhanced resilience against the impacts of drought and water scarcity, especially where groundwater availability may be able to offset some or all the effects of reduced allocations against surface water entitlements (see DELWP, 2015e).
- Reduced environmental impacts from water use, where groundwater licences are traded to improve delivery of environmental water to sustain aquifers.
Case study: Olive growing in Smeaton

Glenn Billman’s olive grove sits within the Loddon Highlands WSPA. Since planting his olive trees in 1999, the only way Glenn has been able to access the water he needs is by buying temporary groundwater each year, due to the fact that groundwater licences have been fully allocated in that GMU.

When he commenced operations, Glenn installed a groundwater bore and was issued a licence to take and use groundwater for irrigation by Goulburn-Murray Water. While he could use the bore for domestic and stock purposes, the licenced volume was not adequate for commercial and irrigation purposes.

Each year, Glenn purchases 10 ML of groundwater on a temporary basis to irrigate. With no new groundwater licences being issued in the area, trading is necessary to sustain and grow the business. For more than ten years Glenn has purchased his temporary groundwater from the same seller. Each year they meet to negotiate a price.

Not only has trading provided Glenn with access to groundwater in an area where no new licence volume is being issued, it has allowed the sellers of that groundwater to maximise the value of their licence. In the absence of trading, the water Glenn purchases would likely go unused for consumptive purposes, generating no financial return for the original licence holder or for the local region.

Source: Adapted from DELWP, 2015a.
4. Groundwater trade activity and trends

4.1. Permanent and temporary trade

Changes in GMU names, trading zone boundaries and trading rules affect confidence in trade data collected prior to 2011-12. As such, this report only presents data collected over the five-year period from the 2011-12 to 2015-16 water seasons. While some trade activity may not be reflected in this dataset, it should still provide an effective baseline for the future analysis of groundwater trade in Victoria.

4.1.1. Volume

Total annual permanent Victorian groundwater trade increased from 4,799 ML in 2011-12 to 10,290 ML in 2015-16. Over the same period, total annual temporary groundwater trade fluctuated significantly, peaking at 25,363 ML in 2015-16. Overall, there has been a substantial increase in trade (volume and number) for both permanent and temporary trade over the period considered here (Figure 5 and Table 1).

![Graph showing total volume of groundwater traded and number of trades, 2011-12 to 2015-16](image)

Note: Trades involving changes in land ownership are not included.

**Figure 5** Total volume of groundwater traded, and number of trades, 2011-12 to 2015-16
### Table 1  Total volume of groundwater traded, and number of trades, 2011-12 to 2015-16

<table>
<thead>
<tr>
<th>Year</th>
<th>Temporary trade – volume (ML)</th>
<th>Temporary trade – number</th>
<th>Permanent trade – volume (ML)</th>
<th>Permanent trade – number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-12</td>
<td>7,524</td>
<td>97</td>
<td>4,799</td>
<td>52</td>
</tr>
<tr>
<td>2012-13</td>
<td>18,488</td>
<td>213</td>
<td>4,510</td>
<td>56</td>
</tr>
<tr>
<td>2013-14</td>
<td>14,513</td>
<td>159</td>
<td>4,173</td>
<td>57</td>
</tr>
<tr>
<td>2014-15</td>
<td>17,437</td>
<td>166</td>
<td>8,559</td>
<td>58</td>
</tr>
<tr>
<td>2015-16</td>
<td>25,363</td>
<td>262</td>
<td>10,290</td>
<td>90</td>
</tr>
</tbody>
</table>

Source: Victorian Water Register.
Note: Trades involving changes in land ownership are not included.

#### 4.1.2. Number of trades

As shown in Table 1, the numbers of permanent groundwater trades have increased in every year of the five-year period, with a significant increase from 2014-15 to 2015-16, following a more than doubling of permanent volume traded in the preceding year. Numbers of temporary groundwater trades have been more changeable across the five-year period, as have volumes for temporary trade. Numbers of temporary groundwater trades have tended to be between two and four times the number of permanent trades in each year, while volumes have been two to three times more than permanent trade.

#### 4.1.3. Prices

Price data for groundwater trading is not robust. This is due in part to small numbers of trades conducted and a high proportion of trades recorded as $0 trades.

Table 2 presents median prices for permanent and temporary groundwater trades for the period 2013-14 to 2015-16. All trades prior to 2013-14 were recorded as $0 trades.

### Table 2  Overview of price data for groundwater trades, 2013-14 to 2015-16

<table>
<thead>
<tr>
<th>Year</th>
<th>Median price – permanent trade ($/ML)</th>
<th>Median price – temporary trade ($/ML)</th>
<th>Percentage of all trades recorded at $0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>972</td>
<td>66</td>
<td>92%</td>
</tr>
<tr>
<td>2014-15</td>
<td>600</td>
<td>50</td>
<td>72%</td>
</tr>
<tr>
<td>2015-16</td>
<td>550</td>
<td>56</td>
<td>58%</td>
</tr>
</tbody>
</table>

Source: Victorian Water Register.
Note: Median prices are calculated with reference to non-$0 trades only.

The utility of this data is limited by the low numbers of data points in 2013-14 and 2014-15: only 11 temporary and six permanent non-$0 groundwater trades were recorded in 2013-14, and only 43 temporary and 20 permanent trades were recorded as non-$0 trades in 2014-15. The range of price figures is also relatively extreme: non-$0 permanent and temporary trades in 2013-14 ranged in price from $2/ML to $2,500/ML and from $0.1/ML to $100/ML respectively. In 2014-15, the ranges were $0.5/ML to $4,000/ML and $0.1/ML to $492/ML respectively. As such, this price data should be used with a degree of caution.
4.2. Groundwater trading by basin and groundwater management unit

The following sub-sections present groundwater trading activity at the basin scale, and then selectively at the GMU scale, reflecting trading activity in only those GMUs where the most trade has occurred. This approach has been taken due to the large number of GMUs, many of which have very low levels or no trade.

4.2.1. Overview of trade at the basin scale

In the last four years, the majority of Victoria’s permanent groundwater trade has occurred in the Goulburn Murray Basin, as shown in Figure 6 and Table 3. Over the five-year period, total permanent groundwater trade has increased from 4,799 ML to 10,290 ML. The majority of this increase is accounted for by the significant increase in permanent trading in the Goulburn Murray Basin in the 2014-15 and 2015-16 water seasons. In 2015-16, for example, trades in the Goulburn-Murray Basin accounted for 61 per cent (by volume) of all permanent groundwater trades in Victoria that year. By contrast, trades in the other four basins accounted for three per cent (Central), nine per cent (Wimmera Mallee), 12 per cent (Gippsland), and 14 per cent (Otway Torquay) of total permanent trade.

![Figure 6](image-url)  
**Figure 6** Permanent groundwater trade by groundwater basin, 2011-12 to 2015-16
Table 3  Permanent groundwater trade by groundwater basin, 2011-12 to 2015-16

<table>
<thead>
<tr>
<th>Groundwater basin</th>
<th>Volume traded (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goulburn Murray Basin</td>
<td>1753</td>
</tr>
<tr>
<td>Wimmera Mallee Basin</td>
<td>250</td>
</tr>
<tr>
<td>Gippsland Basin</td>
<td>2209</td>
</tr>
<tr>
<td>Otway Torquay Basin</td>
<td>141</td>
</tr>
<tr>
<td>Central Basin</td>
<td>446</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4799</strong></td>
</tr>
</tbody>
</table>

Source: Victorian Water Register.
Note: Trades involving changes in land ownership are not included.

As shown in Figure 7 and Table 4, temporary groundwater trade over the five-year period from 2011-12 has been similarly dominated by trade occurring in the Goulburn Murray Basin, especially in the 2015-16 water season. In 2015-16, trades in the Goulburn-Murray Basin accounted for 63 per cent (by volume) of all temporary groundwater trades in Victoria that year. By contrast, trades in the other four basins accounted for five per cent (Central), six per cent (Gippsland), 12 per cent (Otway Torquay) and 14 per cent (Wimmera Mallee) of total temporary trade by volume.

Source: Aither, 2017, based on Victorian Water Register data.
Note: Trades involving changes in land ownership are not included.

Figure 7  Temporary groundwater trade by groundwater basin, 2011-12 to 2015-16
Table 4  Temporary groundwater trade by groundwater basin, 2011-12 to 2015-16

<table>
<thead>
<tr>
<th>Groundwater basin</th>
<th>Volume traded (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goulburn Murray Basin</td>
<td>4752</td>
</tr>
<tr>
<td>Wimmera Mallee Basin</td>
<td>520</td>
</tr>
<tr>
<td>Gippsland Basin</td>
<td>585</td>
</tr>
<tr>
<td>Otway Torquay Basin</td>
<td>895</td>
</tr>
<tr>
<td>Central Basin</td>
<td>772</td>
</tr>
<tr>
<td>Total</td>
<td>7524</td>
</tr>
</tbody>
</table>

Source: Victorian Water Register.
Note: Trades involving changes in land ownership are not included.

4.2.2. Trade at the groundwater management unit scale

For each basin, permanent and temporary trading activity is shown over the five-year period commencing in 2011-12, for the four most significant GMUs in that basin. Significance is determined by summing the total volume of water traded in each GMU over the five-year period. Where fewer than four GMUs are included in a graph, this indicates that groundwater trades occurred in three or fewer GMUs within that basin across the period.

Goulburn Murray Basin

There are 16 GMUs in the Goulburn Murray Basin. In 2015-16, 90 per cent of permanent water trades by volume occurred in just two of these, the Lower Campaspe Valley WSPA and Mid-Loddon GMA. Volumes of water traded on the permanent market between 2011-12 and 2015-16 are shown for these two GMUs, and for the Loddon Highlands WSPA and Katunga WSPA, in Figure 8.

There are generally no clear discernible trends in the number of trades across years and WSPAs. In some years for some WSPAs there may be a relationship between volume and number of trades (e.g. volume and number of trades may be proportionate) – such as Lower Campaspe in 2011-12 and 2012-13. However, in others this is not evident (e.g. Mid-Loddon in 2014-15 and 2015-16).
Early trends in groundwater trade in Victoria

Source: Aither, 2017, based on Victorian Water Register data.

Note: Trades are attributed to a GMU where they are ‘within’ or ‘from’ that GMU. Trades involving changes in land ownership are not included.

**Figure 8  Permanent groundwater trade for significant GMUs in the Goulburn Murray Basin, 2011-12 to 2015-16**

On the temporary market, the Lower Campaspe Valley WSPA has seen the most significant trading activity in each of the past five years. Trading activity in the Katunga WSPA has also been increasing in recent years. The four most significant GMUs for temporary groundwater trade are the same as those for permanent trade. Volumes of water traded on the temporary market between 2011-12 and 2015-16 are shown for these four GMUs in Figure 9.

The average number of temporary trades per year in the Lower Campaspe Valley, Loddon Highlands and Katunga WSPAs, across the five-year period, was higher than that of any other GMU in the state. For several zones, trade numbers have been roughly proportionate to volume traded (number of trades increases with volume), although the relationship is not precise.
## Early trends in groundwater trade in Victoria

Source: Aither, 2017, based on Victorian Water Register data.

Note: Trades are attributed to a GMU where they are ‘within’ or ‘from’ that GMU. Trades involving changes in land ownership are not included.

**Figure 9** Temporary groundwater trade for significant GMUs in the Goulburn Murray Basin, 2011-12 to 2015-16

### Wimmera Mallee Basin

There are four GMUs in the Wimmera Mallee Basin. Over the five-year period commencing in 2011-12, permanent groundwater trade has only occurred in the West Wimmera GMA. Figure 10 shows that this GMU has seen a steady increase across the five years in the volume of water being permanently traded.

The number of permanent trades has also increased over the period, but the relationship between volume and number of trades is weak (e.g. 4 trades for 0.4 GL of water in 2013-14 and 4 trades for 1 GL of water in 2015-16).
Early trends in groundwater trade in Victoria

Source: Aither, 2017, based on Victorian Water Register data.

Note: Trades are attributed to a GMU where they are ‘within’ or ‘from’ that GMU. Trades involving changes in land ownership are not included.

Figure 10 Permanent groundwater trade for significant GMUs in the Wimmera Mallee Basin, 2011-12 to 2015-16

The temporary market in the Wimmera Mallee Basin has seen a similar growth in groundwater trading across the five years in the West Wimmera GMA, from 520 ML in 2011-12 to 3019 ML in 2015-16. As shown in Figure 11, this growth has been accompanied by limited activity in the Murrayville WSPA and Wimmera-Mallee UC.

For temporary markets, trade numbers have generally increased along with the volumes transferred. However, in some cases, large volumes have been transferred in a small number of trades, such as in the Wimmera-Mallee UC, where the entire 1,500 ML traded in 2014-15 was in a single transfer.
Gippsland Basin

There are 14 GMUs in the Gippsland Basin. As shown in Figure 12, permanent trade since 2011-12 has been characterised by low volumes with high volatility, due in part to infrequent single trades.

The spike in volume traded in the Yarram WSPA in 2014-15 is largely driven by one permanent transfer of a licence to abstract over 1,500 ML; this was one of five permanent trades recorded in that GMU in that year. In the Giffard GMA, the peak in 2011-12 consists of a single 900 ML trade.
Early trends in groundwater trade in Victoria

Source: Aither, 2017, based on Victorian Water Register data.
Note: Trades are attributed to a GMU where they are ‘within’ or ‘from’ that GMU. Trades involving changes in land ownership are not included.

Figure 12 Permanent groundwater trade for significant GMUs in the Gippsland Basin, 2011-12 to 2015-16

The temporary market in the Gippsland Basin is similarly volatile with low volumes from year to year, as shown in Figure 13. Denison GMA and Wa De Lock GMA replace Giffard GMA and Rosedale GMA as the third and fourth most active GMUs for trade, with total trading activity across the four GMUs increasing between 2011-12 and 2013-14 before declining significantly in 2014-15 and 2015-16.

The Yarram WSPA trading peak in 2013-14 is largely driven by one temporary transfer of a licence to abstract over 1,500 ML, presumably the same licence that was then permanently transferred in the following year (see above). There are no GMUs in the basin where more than five temporary trades were recorded per year, on average, over the five-year period.
Otway Torquay Basin

There are 18 GMUs in the Otway Torquay Basin. While volumes of water permanently traded are comparatively low, in those years where trade peaks occur (i.e. 2012-13 and 2015-16) permanent groundwater trade is dominated by the South West Limestone GMA (where nearly half of the total groundwater licences in the basin have been issued). Trade from this GMA accounted for 89 per cent and 97 per cent of total volume traded in this basin in 2012-13 and 2015-16 respectively.

Relationships between trade volume and numbers are weak or not existent for permanent trades in this area, and other than a relatively consistent number of trades in the Warrion WSPA there are no yearly trends evident.
Figure 14  Permanent groundwater trade for significant GMUs in the Otway Torquay Basin, 2011-12 to 2015-16

The Otway Torquay Basin temporary market is similarly dominated by trade from the South West Limestone GMA, as shown in Figure 15. Although no permanent trading was recorded in the SA Vic Designated Areas during the five-year period, that GMU saw the second-largest volume of temporary trading, followed by the Warrion and Bungaree WSPAs.

The total number of trades across the four GMUs peaked in 2015-16 at 44 temporary trades. In this Basin, there is a moderate relationship between volume and number of temporary trades, with some exceptions (e.g. Bungaree).
Early trends in groundwater trade in Victoria

Central Basin

There are 16 GMUs in the Central Basin. As shown in Figure 16, permanent trade activity since 2011-12 has been relatively minimal, with Koo Wee Rup WSPA consistently seeing higher total volumes of trade (at the GMU scale) than other GMUs.

On average, more than eight permanent trades were completed in Koo Wee Rup WSPA each year (the highest average for a GMU in Victoria), compared to approximately one trade per year on average for the other GMUs in this Basin. There are no yearly trends in trade numbers evident or clear relationships between volume and number of trades.
Early trends in groundwater trade in Victoria

Source: Aither, 2017, based on Victorian Water Register data

Note: Trades are attributed to a GMU where they are ‘within’ or ‘from’ that GMU. Trades involving changes in land ownership are not included.

Figure 16 Permanent groundwater trade for significant GMUs in the Central Basin, 2011-12 to 2015-16

Temporary groundwater trade in the Central Basin has only consistently taken place in the Koo Wee Rup and Wandin Yallock WSPAs, and in the Nepean GMA. In the Koo Wee Rup and Wandin Yallock WSPAs, volume traded has remained steady or increased in every year of the five-year period. Volumes traded are shown in Figure 17.

Similar to other Basins, there is a slight relationship between volume and number of trades for temporary trade, with generally more trades associated with higher volumes.
Having established a view of groundwater trading activity in individual basins, and in some significant GMUs, over the past five years, the next section of this report considers how we might be able to explain what we have observed. As part of this, the potential role that management and administrative factors might play in driving observed trading activity is considered.
5. Drivers of observed groundwater trade

5.1. Characteristics required to support trade

This section considers the characteristics and features required to support water trade (Section 2.1) in the context of observed trade results (Section 4). These features can help to explain what is observed in the results, including why we may observe relatively more or less trade across regions and time.

The features are also important for helping to clarify whether management or administrative issues may be impacting on trade. For example, in some areas there may be very little trade, but this may be because there are few water users and low volumes of water available for use (and trade) rather than because of less well developed or effective management arrangements (i.e. the fundamentals required to support demand for trade are not present).

5.1.1. Water scarcity

Scarcity in groundwater markets is partly reflected by whether the amount of water available for productive use is fully allocated, or not. This can be reflected by whether or not the PCV has been fully allocated to users. For example, in Victoria:

- there is generally no groundwater trade associated with units that have significant capacity for more entitlement to be issued under the current cap;
- trade occurs, but at very low levels, where there is still some (but less) capacity for more entitlement to be issued under the current cap; and
- the majority of trade occurs in units where there is limited capacity for additional licence allocation, such as where the PCV is, or is close to, fully allocated to users.

As has been observed by DELWP, the majority of trade tends to occur in units where groundwater trade is the only mechanism for an individual to access groundwater, and this corresponds largely with fully allocated units.

5.1.2. Variable water availability

In surface water markets, seasonal water availability is a major driver of trade (primarily, allocation trade). Increases and decreases in water available – these are generally reflected in seasonal allocations made to entitlements – influence the nature and extent of trade.

In groundwater, restrictions on use are somewhat analogous to allocations to entitlements in surface water. These restrictions reduce the amount of the licensed volume that can be extracted over a given period of time (usually expressed as a percentage of total licenced volume on the take and use licence). This has the effect of varying the amount of water available to users in different locations, at different times, which can influence demand for trade.

For example, if restrictions are very severe, producers may not have enough water to undertake viable production, and may sell what remaining water they have. Conversely, if the reduction is not sufficient to compel a total suspension of production, producers may seek to purchase smaller amounts of water to ensure they can remain at or close to full production. Figure 18 provides an example of restrictions on groundwater use in Victoria.
Case study: Dairy farming in the Hawkesdale GMA

Alanvale Dairy operates three dairies milking around 3200 cows in total and employing 35 staff. Other than stored silage the properties rely solely on groundwater for irrigation to grow feed during the dry months.

Only one of the three Alanvale Dairy farms came with a permanent groundwater licence. Due to a freeze on new licences in the area in the middle of the first decade of the 2000s, Alanvale Dairy’s only option became to buy groundwater from the market.

Alanvale Dairy now lease a block of land from which the owner temporarily transfers groundwater. Additional groundwater is purchased from others in the area as required and available. Having never bought permanent groundwater, other than that bought with the property, Alanvale Dairy now does not consider that there is any need to complete permanent trades.

Alanvale Dairy has arranged trades directly with groundwater licence holders, conducting up to three or four trades in a single water year. Several trades have run over multiple years.

The Local Management Plan for the South West Limestone aquifer specifically aims to encourage trading and provide more flexibility for current and prospective licence holders. This means Alanvale Dairy can seek trades from outside the Hawkesdale GMA, but still within the connected groundwater system. This has given the business the confidence to effectively abandon winter growth to move to a permanent pasture that requires watering each year. This change is built on Alanvale Dairy’s confidence that it can access sufficient groundwater resources through the market.

Source: Adapted from DELWP, 2015d.
Early trends in groundwater trade in Victoria


Figure 18 Restrictions on groundwater licences, June 2017

As is explored further in Section 5.2 below, there are additional factors that relate to variable water availability, including rainfall and surface water availability.

### 5.1.3. Connectivity between water systems

Connectivity between water systems can influence the size of a potential market. In surface water markets, allocation trade is possible across very large areas, including between states in the southern Murray-Darling Basin (i.e. between different surface water catchments, and their associated trading zones) owing to river systems and water infrastructure allowing the delivery of water. This can influence the number of potential market participants, the volumes of water available for trade, the nature of water demand, and other factors, which are all key determinants of the extent and nature of trade.

In groundwater, connectivity between management areas and trading zones can be more limited, owing to complexities in hydrogeological connectivity. In some cases, trading zones may be small with no potential for trade between them – in these cases, trade activity may be less significant because there are few opportunities to trade. However, in other cases, some degree of connectivity may exist, and may allow trade between zones – where this is possible, there may be relatively greater trade. These types of constraints (i.e. connectivity or lack thereof) are usually reflected in trade rules.
Figure 3 and Figure 4 (above) provide a visual representation of the extent to which trade is possible within groundwater management areas. In comparison to surface water, these show that groundwater markets are relatively smaller and more isolated than surface water markets. In general, surface water can be traded across much larger distances, and involve many more participants and varied types of irrigated agriculture.

5.1.4. Number and type of water users and participants (potential market size)

Potential market size is another important determinant of trade. Several indicators can point to actual or potential market size, including the amount of water on issue (available for use and trade), the number of separate and discrete (i.e. competing) water users, and the type of water users (including whether they have similar or diverse demands for water). At the basin scale, the relative amounts of groundwater on issue are as follows:

- Goulburn Murray – 245 GL
- Otway Torquay – 215 GL
- Gippsland – 215 GL
- Wimmera Mallee – 78 GL
- Central – 46 GL

Where there is more water available for use, there is often more production (and potentially more users, or larger individual users), and often more opportunities for trade. Trade volumes tend to reflect this; for example, groundwater trade is consistently greatest in the Goulburn Murray Basin and lowest in the Central Basin (see section 4.2.1).

The number of licences is also an indicator of potential market size, but is less useful because of the potential for the same water user (e.g. irrigator or business) to hold multiple licences, or, conversely, for areas with very small volumes of water on issue to be divided among many users (i.e. small volumes per licence) – the Central Basin is a good example of this, with a very high number of licences for the smallest volume of water on issue. However, Table 5 does show that the Goulburn Murray Basin has the largest number of licences, while also witnessing the most trading activity on a consistent basis.

Table 5 Number of groundwater licences by basin

<table>
<thead>
<tr>
<th>Basin</th>
<th>Number of licences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goulburn Murray</td>
<td>2895</td>
</tr>
<tr>
<td>Wimmera Mallee</td>
<td>258</td>
</tr>
<tr>
<td>Central</td>
<td>1629</td>
</tr>
<tr>
<td>Gippsland</td>
<td>1107</td>
</tr>
<tr>
<td>Otway Torquay</td>
<td>1659</td>
</tr>
</tbody>
</table>

Source: DELWP.
Note: Data current as at 2016.

The diversity of water users also influences the extent of trade because of the different demand profiles that different water users have. While analysis of the nature of water demand in the different groundwater areas was beyond the scope of this report, and the reports it synthesises, it may be that...
there is a greater diversity of crop types being grown in the basins with greater volumes of groundwater trade.

5.1.5. Increasing water demand

Where there is increasing demand for water, there will be more demand for trade. Increases can occur when there are new participants with additional water needs entering an area. In some areas of Victoria and southern New South Wales, there have been major new developments in certain horticultural industries and rice production in recent years, with net increases in total water demand as more land area has been dedicated to production. This increases demand for trade (and often increases water prices) as the water needs of this new production must be met.

In some areas, it is clear that demand for groundwater is increasing. This can be supported by sales of unallocated groundwater which have been undertaken by several Victorian RWCs. Victorian Government policy requires that any unallocated water be sold (rather than given away) and participation in auctions, including bids made, prices submitted, and water sold, suggest there is demand for more water resource. As areas approach full allocation, holding all other factors constant, it is likely that more trade will be observed.

**Case study: Boosting farm income by trading groundwater**

Trevor James’ Serpentine property is in the Mid-Loddon GMA in the Loddon River Catchment in northern Victoria. With more groundwater than he needed for irrigation, Trevor routinely sold groundwater – initially on a temporary basis then, later, permanently.

At Serpentine, Trevor farmed 640 hectares – irrigating 400 hectares and using the rest for dry land cropping. He found it more profitable to finish winter crops with irrigation than to grow summer crops, and used about a third of his groundwater most years. When he did occasionally grow a summer crop he would use only two thirds of the licensed volume. As a result, he always had excess water; as the associated annual fees increased, Trevor had to justify the cost of that water.

Then a series of dry years commenced. Other farmers were running short on water and looking to purchase more. At first, the focus was on temporary water trade because permanent trade was not available until a management plan was in place in the area. Trevor had one regular buyer each year who purchased about 500 megalitres and another two or three who would take between 50 and 200 megalitres.

In 2009, the permanent transfer of groundwater licence became possible when a local management plan was established. Trevor started undertaking a permanent trade to a vineyard he had previously been trading to on a temporary basis, as well as a suite of smaller permanent trades, including to a hothouse growing hydroponic tomatoes.

Trevor was able boost farm income through trading his unused groundwater. Over time he developed a regular customer base and found it satisfying to see the other operations develop through using the groundwater he had traded to them.

Source: Adapted from DELWP, 2015b.

5.1.6. Pressure for structural change within industries

As noted above, there have been some changes in water-using industries in Victoria in response to commodity market changes and other shifts. Developments that are significant for groundwater use patterns include the entry of new users like hot springs and mining companies, and the expanded
development of horticulture, market gardens, dairy and other enterprises. These changes have contributed to a range of water use strategies, such as sellers of surface water substituting with groundwater (and obtaining groundwater from the market), and new developments purchasing groundwater to meet their overall water needs.

5.2. Supply and demand side drivers of trade

Further to the characteristics required to support trade discussed above, there are supply side and demand side factors that may also influence trade results. These are briefly summarised below.

5.2.1. Supply

Supply factors already discussed above include the volume of water on issue, whether caps are in place and have been reached, and restrictions that may be in place that limit full utilisation of licenced volumes. Further supply side factors that influence trade in groundwater markets include:

- **Rainfall** – In-crop rainfall is a key determinant of water demand – low rainfall means greater reliance on licensed water, and vice versa. This is a strong driver of trade in surface water markets, and it is likely that changes in rainfall will also have impacts on use of groundwater and groundwater trade. While it is difficult to determine specific causality at the scale of analysis undertaken here, in some groundwater basins there has been greater groundwater trade in 2014-15 and 2015-16, which were years of lower than average rainfall in the southern Murray-Darling Basin.

- **Surface water availability** – When surface water allocations are comparatively low but there are no, or comparatively minimal, restrictions on groundwater use, significant increases in groundwater use and trading may be expected to occur as users compensate for reduced availability of surface water by relying more heavily on groundwater. Relative prices can also play a role here: when surface water allocations prices are high due to reduced water availability, it may be possible for some users (i.e. those with access to groundwater) to purchase temporary groundwater at competitive prices (whereas, in general, groundwater is more expensive to apply than surface water).

5.2.2. Demand

Major demand side drivers of groundwater trade include the nature and extent of irrigated production in the areas that have access to the relevant groundwater source (as is partly explored in relation to market size above). Level of demand, and changes in that level over time, are an important driver of surface water market activity, and may be for groundwater too, although potentially to a lesser extent if groundwater is a supplementary rather than primary water supply source, which is often the case. Two proxy indicators of changes in production are:

- **Land use** – What crop is being planted, and the area that crop covers, will determine how much water will be required. This requirement has to be met from rainfall, surface water or groundwater. When land use changes (i.e. area increases or decreases, or crop type changes), water demand changes, with potential consequences for market activity. As with supply side factors, the strength of this effect in groundwater markets will depend on the extent to which groundwater is a primary, as opposed to a substitute, source of supply. If for example, an area was totally reliant on groundwater (and fully allocated), and a water user changed production from a low to high water demand crop, holding all other factors constant, demand for trade would increase to meet the new crop’s water requirement.
• **Water use** – Water use by crop type (i.e. water applied) can similarly serve as an indicator for changes in demand, by reflecting what water has been applied to different crop types. This can reflect water obtained from different sources (surface or groundwater) and tends to be the inverse of in-crop rainfall.

### 5.3. Management and administrative factors

Another factor (or group of factors) that can help to explain trade results is the management and administrative arrangements that support trade. Such arrangements may have the potential to hinder or facilitate trade. An obvious example includes trade rules, which may either allow trade, or prevent it. These rules are based on a variety of rationales, but are principally designed to manage hydrological realities and minimise the potential for third party and environmental impacts.

However, there are many other factors that sit under the broad category of management and administrative factors. These can include prerequisites required for markets to operate efficiently, and enabling mechanisms that are needed to support those prerequisites (NWC, 2011):

- **Prerequisites**: legal certainty, transparent market rules, effective governance, timely and accurate information, low transaction costs, adequate enforcement, and confidence in intermediaries.
- **Enabling mechanisms**: water rights definition and titling, market and trading rules, governance, market information, compliance and enforcement, and market administration and trade processing\(^5\).

It is important to note that these factors are not:

- conditions or characteristics that lead to demand for trade (which are discussed in Section 2.2 and 5.1); or
- necessarily the most important factors in explaining observed trade results (supply and demand side factors such as those discussed in Section 5.2 above, and partly under Section 5.1, are also very important in explaining observed trade results).

The above prerequisites and enabling mechanisms will, however, influence the extent of trade (including, potentially, by preventing it) where underlying demand for trade is present (i.e. the characteristics listed in Section 2.1 exist).

It is unlikely that demand for trade will exist where the characteristics that lead to demand for trade (Section 2.2) are absent but comprehensive management arrangements are in place (i.e. the above prerequisites and enabling mechanisms are present, but, for example, there is no water scarcity, or there are few water users/participants). In short, having effective management arrangements in place is a helpful (and in some cases necessary) but not sufficient condition for trade.

However, where the underlying characteristics are present, and management arrangements are not well developed or effective, these factors may be constraining trade (sometimes substantially). Previous work undertaken by DELWP has identified the following management or administrative issues that may be impacting on groundwater trade in Victoria:

- trade zones and management zones, including how they are defined, and their relationship with other spatial management zones or units;

---

\(^5\) Each of these factors contains several more detailed elements.
• trade rules, including:
  - their legal status;
  - ambiguity and clarity, including unclear rules;
  - consistency with reform or national requirements;
  - unnecessary complexity;
  - the potential for state-wide rules or overarching frameworks to provide consistency, but also guidance for more specific localised rules;
  - undocumented rules;
  - variations in terminology;
  - units and zones with ambiguous boundaries;
  - accounting and reporting arrangements;
  - rules hierarchies; and
  - review processes
• statutory and local groundwater management plans and the time it takes to prepare or amend plans;
• trade assessment and approvals processes, including the extent to which these are codified or automated as opposed to being individually assessed, and the time taken to assess applications to trade;
• matters related to the point of extraction (e.g. bores and associated conditions or requirements);
• the characteristics of take and use licences (e.g. water rights);
• equity in access to trade opportunities; and
• information and education, particularly for actual and potential market participants.

Taken at face value, these issues are likely to be important to address in helping to achieve more effective and efficient water markets, and facilitate groundwater trade. However, specific priorities and actions must be guided by an assessment of where there is sufficient underlying demand for trade, and so where the largest gains from investing further effort in market development can be realised.

For example, ensuring instantaneous trade approvals in an isolated groundwater system with a very small amount of water on issue and very few water users is unlikely to be a higher priority than ensuring more fundamental issues are addressed in areas where there is greater demand for trade.

A note on trade results as indicators of barriers to trade

It is important to note that neither the number or volume of trades are useful explanatory variables for understanding ‘barriers to trade’, such as those that may exist in policy and operating arrangements set by government. Neither necessarily indicate the presence or absence of barriers to trade. While it will often be the case that there is reduced trade where barriers to trade exist, the reduced extent is not a sufficient condition to confirm the existence of, nor extent and nature of any barriers.

Relatively low, or high, volumes or numbers of trades generally reflect underlying characteristics required to support trade (as outlined in Section 5.1), and can further be explained by key supply and demand side drivers (Section 5.2). For example, low numbers of trades may be because there are few participants, poor connectivity, low volumes of water on issue, or no scarcity constraint –
these should not be considered or characterised as barriers to trade, but rather pre-conditions that lead to demand for trade and the potential for a market to exist.

The number of trades is a particularly poor indicator of barriers to trade as trade numbers only reflect the number of transactions that were required to buy or sell given volumes of water in the market. Because of mismatches between volumes being bought or sold (parcel sizes), buyers or sellers may need to undertake multiple transactions to acquire or dispose of given volumes, or split parcels if they wish to make purchases or sales. Traders can also undertake multiple trades in a season, so the number of trades is rarely equivalent to the number of market participants. Additionally, it is the volumes of water that matter to production and use decisions, not the number of trades (although the more transactions that are required, the greater the transaction costs will be, such that the number of trades can be used to analyse other more specific issues in more developed markets).

It is potentially the case that barriers to trade exist in groundwater markets. To more fully understand such barriers, it is necessary to assess market arrangements (including policy, institutional, administrative and operating arrangements) against various criteria required to ensure the efficient and effective operation of markets. Such an approach separates underlying characteristics that support demand for trade and other supply and demand factors from policy and operating arrangements or other areas within the control of government.

Such an assessment is being undertaken separately by DELWP: this will include an assessment of the current performance of groundwater markets against such criteria, and may identify barriers to trade in groundwater markets.

5.4. Insights from social research

Previous work has been undertaken by and commissioned by DELWP to examine social issues that may be affecting participation in or operation of groundwater markets (Gill, 2016). Some of that work was undertaken partly in response to underutilisation of available groundwater resources and the role trade might be able to play in increasing utilisation. Surveys, interviews and focus groups were undertaken with groundwater licence holders across Victoria.

Key social factors identified as potentially impacting groundwater trading behaviour include the personal circumstances of groundwater licence holders (e.g. life stage and property ownership history) and financial aspects such as high groundwater resource development costs and the potential to profit from trades. The results of the work appeared to suggest greater support for temporary trade than for permanent trade (among licence holders), given the perceived importance of retaining the value of water with the land property.

The work identified areas in which agencies or authorities could help to facilitate trade, including by providing better information (particularly on prices), helping to identify other market participants, and improving transfer rules or processes. Some respondents were also concerned about the impacts of trading on groundwater resources, indicating that further information on the sustainability of groundwater management may help to improve confidence among existing and potential future market participants.

The work broadly concluded that government could facilitate more groundwater trade by focusing on trade rules and boundaries, seasonal allocation rules, and provision of better information and resource surety. It also suggested further work be undertaken on administrative and resource management issues, and a better understanding of licence holder circumstances be developed.

Research showed that some licence holders have expressed a desire for the development of online trading tools. Consistent information on trading opportunities and administrative processes has
previously been highlighted as a potential facilitator of increased trade, and users have expressed a desire for information programs addressing these opportunities and processes to be developed.

In broad terms, some of the outcomes of this work may point to further drivers behind the nature and extent of trade observed in Section 4. It would appear that some issues may be impacting on confidence or ability to trade (e.g. information) or on market operation or efficiency (e.g. trade zones and rules), and that participant perceptions may have a role in observed trade results (e.g. prevalence of temporary trade).

The following section further discusses and responds to these and other policy considerations relevant to the future of groundwater trade in Victoria.
6. Considerations for the future

Research and analysis by DELWP and others, points to several policy and operational considerations that should be taken into account as groundwater trading in Victoria continues to mature and develop.

6.1. Transparency

Water trading is facilitated by clear trading processes and trading rules, which can be readily understood by members of the public considering the option to trade. In Victoria, groundwater trading is often relatively complex and this is complicated by incomplete documentation of trading rules and rules sitting in a large number of documents. Work undertaken to review groundwater trading rules across the state found numerous instances where statutory and local management plans neither explicitly allow nor explicitly preclude trade (or some forms of trade). In these circumstances, it is likely unclear to licence holders whether trade is permitted or not.

6.2. Access to markets

In Section 2, this report described several threshold conditions that must be met in order for trade to take place. One of these conditions is a sufficient population of licence holders. While, theoretically, two is a sufficient number of licence holders for trade to occur, in practice there is much greater potential for viable markets to exist in areas encompassing more water users with diverse demands for water. However, many groundwater market areas may be small with few users.

There may be potential opportunities to improve access to markets by improving administrative boundaries (e.g. to fully align trade related boundaries with groundwater resource boundaries), which may increase the number of potential counterparties and opportunities for trade. However, this would need to continue to reflect hydrological constraints (e.g. not attempt to allow trade between non-connected areas in an attempt to increase market size).

6.3. Unbundling

Take and use licences for groundwater resources are not unbundled in Victoria. For most major surface water resources, take and use licences were unbundled some time ago, with this approach having delivered a range of benefits and efficiencies for water trade and water management more broadly. It would be prudent to further consider the feasibility and desirability of pursuing unbundling for groundwater. In this respect, we note that the Victorian Government's recently released strategic plan for water in Victoria, Water for Victoria, has committed DELWP to investigating the merits of converting such licences in unregulated and groundwater systems into water shares and other related products.

6.4. Trade rules

Some statutory management plans and local management plans do not explicitly allow (or preclude) trade (or some forms of trade), meaning it is uncertain whether trade is permissible or not. In some cases, trade rules may explicitly refer to one form of trade but not another (e.g. explicit rules for
permanent trade, but not for temporary trade). In others, management approaches may be described in the text of a plan but not included as an explicit rule or prescription in the plan.

The legal status of rules contained in local management plans is also not clear, as compared to those contained in statutory management plans. Likewise, the status of ‘zone limits’ that are described in plans, but which have not been gazetted, is unclear.

Some trade rules are highly complex and may cause confusion. For example, in one GMU, trade into the GMU is explicitly allowed, but the plan states that there are four zones where it is not permissible to trade entitlement into, and so it is unclear which zones can receive a trade from outside the GMU. The precedence of one rule over another is not clearly established. In general, older plans are often more complex, in terms of zones and rules, and there may be opportunities to reduce complexity as plans are revised and updated.

For some challenges faced by RWCs in sustainably managing groundwater, trading rules may not be the most appropriate response. Density of bores and intensity of overall drawdown on the groundwater resource, for example, is a licensing consideration and should be managed as such, based on the properties of local hydrogeology. Issues best dealt with through improved cap management should not serve as a rationale for the imposition of trading rules. According to the National Water Initiative (COAG, 2004) and the Murray-Darling Basin Plan, trade restrictions should not be used to address overallocation. The Basin Plan states (s. 12.13), ‘A person may trade a water access right within a water resource free of any restriction based on the fact that a water resource is overallocated’.

The scope to simplify (or clarify) groundwater trade rules could be investigated. There may be opportunities to close existing gaps and address uncertainties via the development of new state-wide trade rules – adoption of a rules template to improve consistency between GMUs and across the jurisdictions of different RWCs may be a good place to start.

### 6.5. Management zones

Victorian groundwater policy and legislation designates multiple spatial scales for the management, and trading, of groundwater resources: basins, catchments, groundwater management units, and management zones. There can also be different planning or management instruments that apply within these spatial scales.

The boundaries of some of these spatial units conflict with one another, creating confusion and complexity, difficulties in developing clear management rules and arrangements, difficulties for accounting and reporting, and increasing the risk of disputes and other problems. At present, for example, some trading zones cross the boundaries of groundwater basins or catchments.

Ideally, boundaries to facilitate management of groundwater resources should be telescoped with each layer of finer-scaled units being nested within the boundaries of the relevant larger units. At the highest level, management should reflect the physical extent of the groundwater resource itself. Terminology in use could also be made consistent across the state through the adoption of a clear hierarchy of administrative management names.

Scale is important to markets (due to providing greater opportunity for trade) and hence it is important to ensure trade rules that are comprehensive – i.e. they should cover trade within and between areas within the larger management units.
6.6. **Trade approvals and processing**

Trade approvals and processing are administered by RWCs and recorded in the Victorian Water Register. Victorian Water Register enhancements to automate transactions could accelerate processing, improve monitoring, and review of the effectiveness of trade rules, processes and administrative standards.

6.7. **Education and information for market participants**

Increasing water users’ knowledge of how water markets work, how they can benefit water users, and how to participate in water trading can facilitate increased adoption of water trading as a management option. Educational and informational resources are an important part of this effort. Research commissioned by DELWP found that many licence holders expressed a desire for better information on water prices and other licence holders who are seeking to trade groundwater. That work also showed that some licence holders have expressed a desire for the development of online trading tools.
7. Conclusions

This report provides an overview of early trends in Victorian groundwater trade and some of the drivers of trade. It highlights several areas of groundwater policy and management where there are opportunities for improvements, including in the way groundwater trade is administered.

Groundwater trade in Victoria is still developing. Available data suggests there are variable levels of groundwater trade across the state and over time. In recent years, both permanent and temporary groundwater trading have increasingly been dominated by activity in the Goulburn Murray Basin, but groundwater trade has occurred in various areas across the state.

Variation in where and when trade occurs can largely be explained by the presence of the fundamental characteristics that drive demand for trade – water scarcity, variable water availability, connectivity between water systems, sufficient numbers and types of water users, increasing water demand, and pressure for structural change within industries. Key supply and demand factors also help to explain the variation.

However, there is also a range of policy, administrative and management issues at play, each of which may be impacting upon groundwater trade to some degree. This is to be expected given the relative immaturity of groundwater trading in Victoria. While some of these issues may be holding groundwater trade back, it is important to note they may not be the primary cause of the low extent of trade in many areas.

We do not yet know the precise extent to which management issues are hindering trade. However, in principle, a case can be made to address such issues, based on some important caveats, including there being underlying demand for trade. This report did not seek to analyse the nature and extent of barriers to trade formed by these types of issues, but this will be investigated and reported on in a separate project being undertaken by DELWP.
8. References


