# Urban Water Strategy

**2022**

URBAN WATER strategy

LOWER MURRAY WATER

VICTORIA State Government

## ACKNOWLEDGEMENT OF COUNTRY

'Lower Murray Water acknowledges the Traditional Owners of the land on which we work and reside. We recognise their continuing connection to land, waterways and community. We pay our respects to Elders past, present and future.

The Traditional Owner groups within Lower Murray Water's service region lie within the traditional lands of First Nations Peoples, from upstream at Koondrook moving downstream along the Murray River (Mil) through to the western edge of our region at the South Australian border.

They are the Barapa Barapa Peoples, Wamba Wemba Peoples, Wadi Wadi Peoples, Tatti Tatti Peoples, Latji Latji Peoples, Nyeri Nyeri Peoples, Ngintait Peoples and the Wergaia Peoples.

The First Nation Peoples' connection to land and water is the living cultural knowledge that is passed down from generation to generation. The stories that connected the ancestors to their culture still live through the First Nations Peoples of today.'

*- Acknowledgement of Country written by Stephanie Sloane.*

**Artwork by Bella Sloane**

# EXECUTIVE SUMMARY

Lower Murray Water's 2022 Urban Water Strategy (UWS) has been developed in accordance with the guidelines issued by the Minister for Water and addresses key actions identified in Water for Victoria, Victorian Government's strategic plan for management of our water resources. The guidelines state that the purpose of UWSs is to identify the best mix of measures to provide water services in our towns and cities now and into the future.

The following key activities were involved in development of this UWS:

1. Setting objectives and principles for the UWS development in accordance with the guidelines.
2. Customer and stakeholder engagement including early consultation with traditional owners.
3. Understanding the current water and wastewater systems including identifying relevant findings from recent experience and changes in regulations and industry practices.
4. Water supply and demand projections, taking into account relevant risks and uncertainties.
5. Determining appropriate level of service.
6. Systems performance and risk assessments.
7. Identification and evaluation of options.
8. Preparation of a drought preparedness plan.

The current water and wastewater systems' capacities, water entitlements, water consumption and climatic condition of the region were studied to better understand the existing conditions, which are important to undertake future projections and determination of appropriate options to ensure security of supply to LMW's current and future customers.

Level of Service is expressed in terms of supply reliability, which means how reliably LMW can supply water to our customers without restrictions. The current Level of Service was reviewed in consultation with our customers as a part of this UWS development. Based on the outcomes of the supply and demand analysis and consultation with our customers and stakeholders, 95% water supply reliability has been adopted as the agreed level of service. In order to ensure that an acceptable level of supply is maintained during drought periods, LMW will aim to provide at least 65% of the unrestricted demand as a minimum level of service.

The key factor that influences future water demand is population growth. To determine the appropriate growth rate for each town supplied by LMW, the following information was considered:

1. Number of property connections in each town.
2. Projection of residential land developments (>10 lots).
3. Population and household projections from Victoria in Future 2019.

Considering available information, growth rates based on the 3-year average of property connections was adopted, as this is considered the most reliable source of information. The water demand was projected using the historical water consumption data and the adopted growth rates for property connections.

Our water resources are highly dependent on climate. The potential impacts of climate were incorporated into the water supply projections using historical data and modelling (climate and hydrological modelling). The water supply projection was undertaken in accordance with the Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria, November 2020.

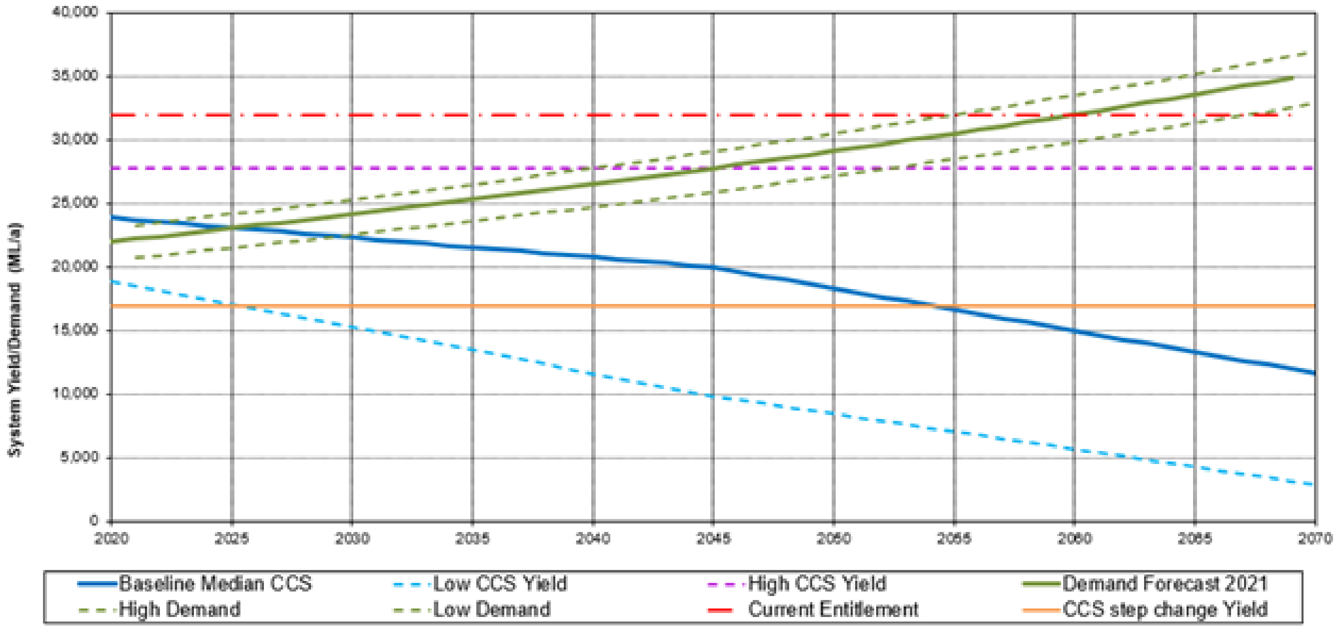
LMW sources 97% of its raw water from the Murray River with the remainder from Goulburn Murray Water (GMW) irrigation channel systems. Given that almost all the raw water is sourced from the Murray River System, the future raw water availability was assessed using the hydrological and climate modelling results for the Murray River System provided by the Department of Environment, Land, Water and Planning (DELWP). The results for raw water availability were provided in terms of percentage of allocation of high reliability water shares (HRWS) for the Murray River System for four climatic scenarios: high, medium, and low climate change impact, and post 1997 step climate change impact. Using DELWP modelling results for years 1997, 2045 and 2070 the prediction of water availability during the planning period (2021 – 2070) was calculated by interpolating the modelling results. Although the assessment was undertaken for all four climatic scenarios, medium climate impact scenario is used as a design parameter for determining options to ensure security of supply.

The yield of a water supply system is defined as the average annual volume that can be supplied at a specified reliability, subject to operating rules and typical demand patterns. For water resource planning purposes, both supply and demand are expressed as average volumes. Entitlements held by LMW defines the maximum annual volume of water which can be diverted from the relevant sources. Therefore, it is important to note that the entitlement volume is not always equivalent to the system yield.

The future yields were projected for the following scenarios:

1. High Yield – based on the low climate change scenario (CCS).
2. Baseline Yield – based on the medium CCS.
3. Low Yield – based on the high CCS.
4. Step Change Yield – based on post 1997 step CCS

The outcome of the supply and demand analysis is shown in the figure below. Note that yield curves presented in the figure were calculated based on the adopted annual reliability (level of service) of 95%.




As illustrated in the figure above, the uncertainty surrounding the climate change impacts is far greater than the range of demand projections. On the baseline yield projection, supply shortfalls are likely to occur from 2025, 2030 and 2023 for adopted demand, low demand, and high demand respectively.

In addition to the supply and demand analysis, a qualitative risk assessment was undertaken to identify risks to urban (potable) water supply and control measures. The assessment considered events that can cause risk of reducing or making existing sources of water unavailable and the risk of reducing potable water production. As per the assessment, the risks of low water allocation for the Murray River system and cyber-attack of infrastructure were identified as high risks. Most of the other risks were considered as moderate or low risks. The assessment also indicated that most of risks can be reduced to a low-risk rating with the existing controls and the additional mitigation measures identified. There are some risks can only be reduced to moderate-risk rating, however, the magnitude of those risks can be reduced with the mitigation measures identified as a part of the assessment.

The capacity of the existing water treatment plants (WTPs) for each of LMW's potable water supply system to meet projected demand was assessed. The assessment showed that all LMW WTPs have sufficient capacity to meet projected demand over the Water Plan 5 planning horizon except for Piangil and Murrabit. Given the size of the Piangil and Murrabit systems and Peak Day Demand occurs only for short period of time in summer season, water supply to these towns can be managed in the short term by carting water from the other water supply systems to top up storages as required. The long- term plan for Piangil and Murrabit is to supply from the Swan Hill and Koondrook WTPs respectively and decommissioning the existing WTPs.

The Swan Hill WTP is predicted to exceed the capacity in around 2032. Therefore, a new WTP with an initial capacity of 20ML will be constructed in around 2030. The long-term plan is to decommission the existing plant and upgrade the proposed new plant with sufficient capacity.

This UWS looked at overall water resources management, therefore an assessment of wastewater management was also undertaken as a part of the strategy. The wastewater inflows into LMW's Wastewater Treatment Plants (WWTPs) were projected based on the growth rates adopted for the water demand projections. For the purpose of the assessment annual average dry weather flow (ADWF) was considered, as it is consistent with the standard industry practice for assessing WWTPs' capacity. Given that the ADWF mainly consists of wastewater discharged from customers, climate does not have a significant influence on the ADWF. Therefore, the major uncertainty associated with the wastewater inflow projections is growth projection. To account for this uncertainty, high and low growth rates were considered in addition to the adopted growth rates.

The assessment indicates that the Mildura, Swan Hill, Nyah and Murrabit wastewater systems have sufficient treatment capacities to cater for the wastewater inflows up to the end of the 50 year planning period. The Lake Boga, Kerang and Koondrook systems are likely to reach capacity within the planning period. However, the earliest year when augmentation is required is likely to be more than 10 years from the current year. The current inflow exceeds the nominal capacity of the Robinvale WWTP. However, the operational experience and treated water quality monitoring data do not support this assessment. Therefore, further detailed investigation is required to determine the actual treatment capacity of the plant.

The strategy looked at all water supply options. An evaluation of options revealed that options such as ground water, storm water, rainwater harvesting, and recycled water are not feasible as standalone options to ensure water supply to our region. Given that there are no substantial alternatives to source raw water from the Murray River, the following three options were considered in this strategy to ensure the security of supply:

1. Buy water shares to increase the entitlement to maintain a buffer to ensure security of supply.
2. Buy temporary water allocation in "dry years" to supplement supply.
3. A combination of option 1 and option 2 – Purchase a volume of entitlement to match the projected water demand and buy temporary water allocation during low water allocation periods (i.e., dry years).

Option 1 is considered the preferred option due to the following reasons:

1. Buying temporary water allocation during dry years will be expensive and has reputational impacts associated with competing with "Irrigation customers" but remains a valid risk management tool during multiple years of drought.
2. Forecasting when to purchase temporary water allocation will be difficult due to climate uncertainty, which poses a risk of being unable to meet demand and needing to impose measures such as water restrictions in an unplanned manner.
3. Option 3 also has the same risks but to a lesser degree.
4. Most customers and stakeholders would like LMW to minimise the need to impose water restrictions, mainly to maintain green spaces especially mature trees, which contribute substantially to the amenity of our urban environments. The "green oasis" within an arid Mallee landscape.
5. Potential to generate revenue by trading excess allocation in the water market during high allocation periods.

Based on the supply and demand projections, the bulk water entitlement (30,971ML), the existing HRWSs (940ML of Murray and 550ML of Goulburn shares) and the anticipated purchase of additional water shares during the current Water Plan period (approximately 720ML), the estimated volume of additional water shares to be purchased during the WP5 period is in the order of 1,049ML.

Note that additional water shares required to be purchased after the WP5 period is not quantified at this stage due to uncertainties associated with the demand and supply projections. Given that the UWS will be updated every 5-years, LMW will continue to monitor the water supply and demand and utilise the information gathered to determine the volume of permanent water shares required to be purchased in the future.

The preferred option together with selected complementary actions form the strategy for balancing supply and demand of LMW's service region.

The complementary actions were identified in consideration with recent experience, risk assessment, and stakeholder feedback. The complementary actions aim to reduce the potable water demand, maximise use of the existing supplies and identify alternative sources to supplement potable water supply.

As a part of this UWS, LMW's drought response plan has been updated, which will guide LMW's responses in drought periods.

Overall, this UWS strategy provides a strategic plan to ensure security of supply, including practical options to manage water supply and demand now and into the future while supporting LMW to achieve its strategic goals.

# CONTENTS

# 1. INTRODUCTION

## 1.1. Purpose

Urban Water Strategies are prepared by Victorian Water Corporations every five years as a requirement of their Statement of Obligations. The 2022 Urban Water Strategy (UWS) details a range of actions which will be implemented over a long-term planning period to ensure urban water customers continue to receive a reliable water supply.

This 2022 UWS has been developed in accordance with the Guidelines for the development of urban water strategies, March 2021 (the guidelines) issued by the Minister for Water, and addresses key actions identified in Water for Victoria, Victorian Government's strategic plan for management of our water resources.

The guidelines state that the purpose of Urban Water Strategies is to identify the best mix of measures to provide water services in our towns and cities now and into the future.

Urban Water Strategies:

- Have a long-term outlook of 50 years;
- Consider the total water cycle, consistent with the principles of integrated urban water management;
- Support the development of resilient and liveable communities;
- Balance social, environmental and economic costs and benefits; and
- Take account of the consequences and uncertainty associated with population growth and climate change and climate variability.

The principles behind the development of an UWS are provided in Table 1.

**Table 1: Guiding principles for the development of UWS**

| Category | Principle |
|---|---|
| **System performance and diversity** | Specific, quantifiable and measurable criteria should be used to describe and monitor system performance in terms of levels of service |
| | Planning should recognise that water issues and opportunities are not uniform across the State. |
| **Integrated Planning** | Planning must be prepared for a range of possible futures – by making sure that systems could cope with a relevant continued dry sequence as well as the potential for a range of possible climate futures. |
| | Planning should be integrated and holistic across the complete urban water system. |
| **Taking Action** | A "no regrets" approach to taking action – by doing things that make the most sense under a range of planning scenarios - informed by detailed options assessment and adaptive management through regular monitoring and evaluation. |
| **Customer Involvement** | Customers must be involved in decisions about cost/risk trade-offs – by describing how each system would perform under a range of scenarios and what would be the cost of improving performance. |

Lower Murray Water (LMW) last developed an UWS in 2017. Since this time, LMW's water supply systems continued to recover from the severe drought conditions experienced during the Millennium Drought (1997-2009) and were on Permanent Water Saving Rules (PWSR), except for a short period in the financial year 2019/20. Stage 1 water restrictions were in effect from November 2019 to June 2020 due to low water allocations for the Murray River supply system.

This 2022 UWS refines the actions identified in the previous strategy.

## 1.2. Overview of Lower Murray Water

LMW is responsible for the provision of urban and rural water supplies to an area in the northwest of Victoria from Kerang to the South Australian border. Mildura is the largest city supplied in the region. Figure 1 below shows the service area of LMW.

**Figure 1: Lower Murray Water's Service Area**


On 1 July 2004, the Lower Murray Urban and Rural Water Authority was created under the provisions of the *Water Act 1989*, assuming the functions, powers and duties under the *Water Act 1989* of the Lower Murray Region Water Authority and the Sunraysia Rural Water Authority. On 19 August 2008, Lower Murray Water took over the functions, powers and duties of the First Mildura Irrigation Trust.

LMW provide several services across our region, but our core business is centred on providing:

- Urban water services to 14 townships with approximately 74,000 customers via 9 treatment plants.
- Wastewater collection, treatment and effluent re-use and disposal services to 11 towns with approximately 66,000 customers via 10 treatment plants.
- Raw water services to 2,666 irrigation and 2,240 stock and domestic customers in the four pumped irrigation districts of Mildura, Merbein, Red Cliffs and Robinvale, and to 297 Millewa waterworks district customers and 12 Yelta waterworks district customers.
- Management of the region's urban and rural bulk water entitlements of 403,390 ML.
- The collection and disposal of subsurface drainage water from the four pumped irrigation districts, and Nangiloc, Robinvale and Boundary Bend private diverters.
- Management of the private diversion licences of 1,313 water users along the Murray River in Victoria between Nyah and the South Australian border.

# OUR STRATEGY 2021-2025

## OUR PURPOSE

*To support our region to prosper by successfully delivering vital water services.*

## OUR VISION

*A healthy, sustainable water future underpinned by an LMW culture of performance excellence, built in partnership with our staff, customers and communities.*

## *Building a healthy and sustainable future through our strategic priorities*

### *Service Delivery*
Achieve high quality outcomes for our customers

### *Engagement*
Effective engagement with our stakeholders

### *Environment*
Better the environment in our region

LOWER MURRAY WATER

## *Building a dynamic culture of performance excellence through our strategic foundations*

### *People and Safety*
Enhance our people and safety and leverage innovation to be more efficient and effective

### *Infrastructure*
Ensure our assets and infrastructure meet current and future needs

### *Finance and Governance*
Secure our long-term financial success and upgrade our governance, systems and processes

## 1.3. Lower Murray Water's Strategic Goals

The figure (LMW Strategic Plan) on the previous page provides a high-level summary of LMW's strategic goals.

The availability of water is reducing due to factors such as climate change and changes in land use patterns. While the amount of water available from traditional sources is shrinking, water demand is increasing mainly due to population growth. It should be noted that major towns within LMW's region such as Mildura and Swan Hill are experiencing marked population growth. Therefore, diligent water resource planning is essential to ensure safe and sustainable water supply to our current and future urban water customers. The UWS is one of the key water resource planning tools, which directly and/or indirectly influences LMW achieving its strategic goals.

The key water resource management activities that have informed the development of this UWS and contribute towards LMW achieving the above strategic goals include:

1. Drought Preparedness Plan (DPP) details practical approaches for system operating during periods of water shortage. The purpose of a DPP is to detail management actions to meet critical human needs during an extreme dry period, or a water quality event of an intensity, magnitude and duration that is sufficient to render water acutely toxic or unusable for established local uses and values. The DPP is included as Attachment 1 of this UWS.
2. The Urban Water Restrictions By-Law No 2 (February 2012) provides the regulatory framework prescribing four stages of restrictions and prohibitions on the use of water that can be mandated by LMW when it is considered necessary to conserve water.
3. Permanent Water Savings Rules encourage efficient use of water on an on-going basis by maintaining a common-sense approach to water use.

Additionally, the actions contained in the Victorian Government's Water for Victoria have helped to inform the development of this strategy.

# 2. DEVELOPMENT OF THE STRATEGY

## 2.1. Urban Water Strategy Objectives

In developing the UWS, LMW aims to:

- Ensure safe, secure, reliable and affordable water and sewerage services that meet our region's long-term needs.
- Encourage the sustainable use of water resources – including rainwater, stormwater and recycled water and rainfall-independent supplies in ways that are efficient and fit-for-purpose, whilst ensuring that public and environmental health are protected.
- Enhance the liveability, productivity, prosperity and environment of our towns.
- Ensure that the water needs of environmental assets within the Mallee Region are transparently considered.
- Provides for a transparent and rigorous decision-making process, with clear roles and responsibilities and accountabilities, which can adapt to the changing environment.

To facilitate a more integrated short to longer term planning approach, the UWS has been developed in parallel to the update of the DPP. The UWS and the DPP provide key input into the development of LMW's Water Plan 5 (WP5). It is intended that the UWS will be reviewed every five years.

## 2.2. Urban Water Strategy Targets

A range of targets have been identified to guide the UWS development and meeting the identified strategic objectives. Some of these targets (such as supply and level of service targets) have been developed as part of the UWS development process, while others (such as the determination of acceptable tariffs) will be guided by LMW's WP5 process.

**Supply and Demand Targets**

The key target for the UWS is to balance projected water supply and demand over the 50-year planning period, but with a particular focus over the WP5 period (2023 – 2028).

**Level of Service Targets**

Level of service targets provide an indication for customers of the performance they can expect from their water supply, related to the tariffs they are being charged for the service.

**Cost and Revenue Targets**

As part of the development of the UWS, LMW will focus on cost-effective supply and demand options to balance the projected supply and demand over the 50-year planning period. Targets for cost, revenue, and tariffs will be developed by the LMW Board and Management through consultation with customers and the Essential Services Commission as a part of the WP5 development.

## 2.3. Level of Service

Level of Service is expressed in terms of supply reliability, which means how reliably LMW can supply water to the customers without restrictions. LMW's current Level of Service Standard is 96% annual supply reliability. In other words, water restrictions in no more than 2 years in 50 years.

The current Level of Service Standard was reviewed in consultation with our customers as a part of this UWS development. The UWS looked at various supply reliabilities (i.e., 90%, 95% and 96%) and their impact on the supply and demand balance and associated cost. The assessment showed that a high volume of entitlements and other sources of water will be required to provide high reliability. Consequently, cost to maintain high reliability will be high. As per the modelling of the Murray River system, reliability less than 90% will not have any impact on the supply. Therefore, the assessment was undertaken up to 90% reliability. Refer to Section 5 for more details.

The outcomes of the assessment together with cost implications were presented to customers at the focus group session. The 95% reliability has been adopted considering all the factors such as climate change, likely frequency of need for water restrictions, impacts on communities and cost.

Given the supply uncertainty due to climate change, a minimum level of service to be considered to ensure the basic needs of the community are met, particularly during prolonged drought periods. The implementation of water restrictions and voluntary demand reduction measures are the main actions to balance the supply and demand during drought periods. An assessment of various drought scenarios using the experience of the millennium drought period (stress analysis) showed that LMW will be able to supply at least 75% of the unrestricted demand. Note that the assessment was undertaken only for a 13-year period. Therefore, the outcomes of the assessment were considered with caution, particularly for medium to long term planning.

In consideration to the following factors, 35% reduction in unrestricted demand was considered as a minimum level of service. Basic needs of the community (i.e., water required for essential human needs).

- Socioeconomic needs (i.e., water required to maintain assets of community significance such as public open spaces and local businesses etc.).
- Restrictable demand (i.e., amount of water that can be saved by implementing water restrictions).
- Outcomes of the stress analysis.
- In other words, LMW will aim to provide at least 65% of the unrestricted demand to our community during periods of low water resources.

In other words, LMW will aim to provide at least 65% of the unrestricted demand to our community during periods of low water resources.

## 2.4. Key Activities in the Development of the Urban Water Strategy

LMW's 2022 UWS has been developed in consultation with our customers, key stakeholders, and the LMW Board. The UWS Project Team together with the Communications & Engagement Team has actively participated in consultation and engagement with key stakeholders and the community to help shape and influence LMW's UWS. A summary of the community and stakeholder engagement for the UWS can be found in Section 10 of this report.

As part of the ongoing commitment to engagement and consultation with customers and stakeholders, LMW will continue to engage with the community on several areas identified in the UWS and as a part of the Pricing Submission preparation.

Table 2 summarises the key activities of the UWS development.

**Table 2: Key Activities of the UWS Development**

| Core Requirements | Activities |
|---|---|
| **Objectives and Principles** | Setting objectives and principles for the UWS development in accordance with the guidelines. |
| **Stakeholder Engagement** | Development of an engagement plan. |
| | Engagement with our customers and stakeholders via online survey, virtual forums, and meetings. |
| **Managing risk and uncertainty** | The risks and uncertainties associated with water supply and demand were considered in the supply and demand projections based on the best available information. |
| | Undertaking a qualitative risk assessment to identify and implement control measures for risks to urban water supply. |
| | Preparation of a drought response plan. |
| **Incorporate Recent Experience** | Incorporating relevant findings from recent experience and changes in regulations and industry practices in the supply and demand analysis, options development and decision making. |
| **Understanding the current water system** | Providing an overview of the existing water supply and wastewater systems including historical water demand and sewage inflow data. |
| | Providing details of the water supply sources including bulk entitlements and water shares. |
| **Defining level of service** | Determining appropriate level of service standard in consultation with the customers and key stakeholders. |
| **Water Supply Projections** | Undertaking supply systems' yield projections. |
| **Water Demand Projections** | Undertaking water demand projections considering historical water consumption and population growth projections. |
| **System Performance Assessment** | Analysis of water supply and demand for different climate change scenarios. |
| | Analysis of wastewater systems' capacity. |
| **Identifying and evaluating options** | Identifying list of options to ensure safe and sustainable water supply to LMW's current and future customers. |
| | Identifying options to manage wastewater. |
| | Options assessment and selection of preferred strategy. |
| **Monitoring and Evaluation** | Review of the outcomes of the UWS will be undertaken in parallel with the preparation of the Annual Water Outlook. |
| **Drought Preparedness Plan (DPP)** | Development of a DPP to prepare and respond to water shortages resulting from drought and other extreme events. |

# 3. URBAN WATER AND WASTEWATER SYSTEMS

## 3.1. Climate of Supply Region

The LMW region is one of the driest regions in Victoria receiving average annual rainfall between 200 and 300 mm in comparison to the 400-600 mm of rainfall received per year in most other non-alpine regions of Victoria.  In addition, the region experiences about 1,800 mm of evaporation per year on average, compared to 1,400 mm or lower experienced in other regions.  The longer days and generally drier climate significantly influence water consumption and the community's dependence on reliable water sources. Historical average annual rainfall is shown in Figure 2, which illustrates the climatic conditions of the LMW region compared to other regions of Victoria.

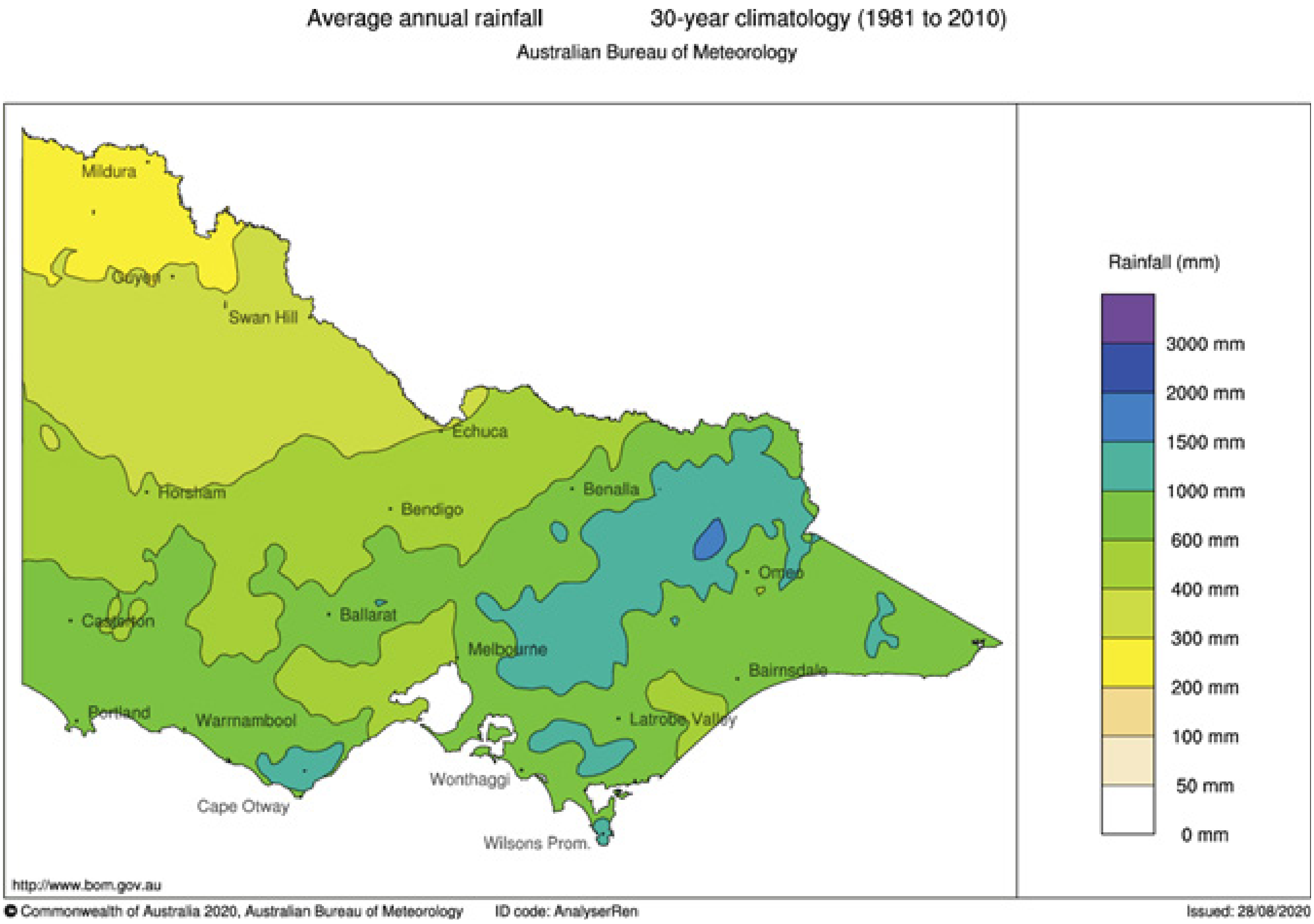



**Figure 2: Average Annual Rainfall Across Victoria**

Figure 3 (following page) shows the mean number of days of rainfall greater than or equal to 1 mm in Mildura, which accounts for around 65% of the population served by LMW. The long-term data (i.e., 1946 -2022) shows that highest number of days with rainfall greater than or equal to 1 mm is 5 days per month and number of days with rainfall greater than or equal to 1 mm per year is 43.5 days. As per the last 30 years data (i.e., 1991 – 2020), days with rainfall greater than or equal to 1 mm per year was reduced from 43.5 to 39.7 days, which is indicating a declining trend. The data shows that LMW region experiences dry conditions in most part of the year.

Figure 4 (following page) shows an annual time series of Victorian rainfall, demonstrating the high inter-annual variability in the State's rainfall. It should also be noted that the trend in annual rainfall totals (both State-wide and locally) is declining. Given that LMW is relying mainly on the Murray River system, which is fed by a large part of Victoria, decline in rainfall will have an impact on water supply. On the other hand, demand is likely to increase due to population growth and the dry climatic condition of the region. This indicates the challenge LMW is likely to face in managing supply and demand, particularly in the long-term.

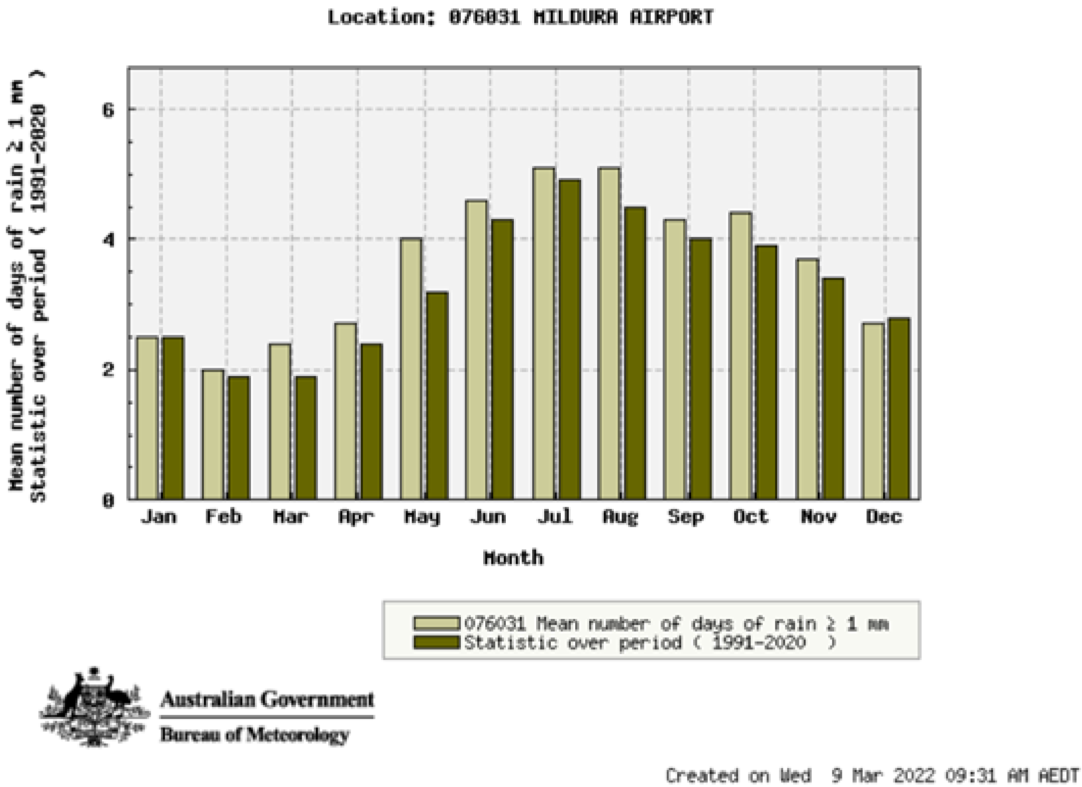



**Figure 3: Mean number of days of rain >= 1 mm in Mildura**

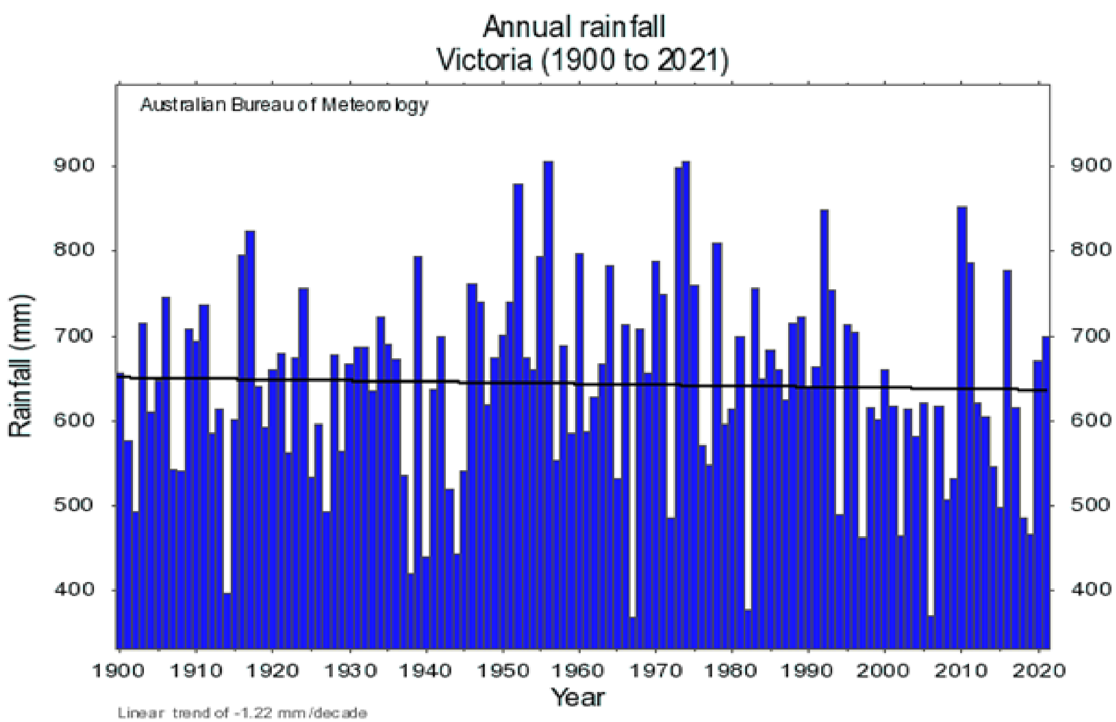



**Figure 4: Historical Annual Rainfall of Victoria**

## 3.2. Description of Water Supply Systems

LMW provides urban water supply service to 14 townships through 8 water supply systems. Table 3 provides a summary of the water supply systems.

**Table 3: Details of LMW's Water Supply Systems**

| System | Towns supplied | Supply Source | Current Level of Restrictions |
|---|---|---|---|
| **Mildura** | Mildura, Irymple and Merbein | Murray River | The permanent water savings rules (PWSR) are in place. |
| **Swan Hill** | Swan Hill, Nyah/Nyah West, Lake Boga and Woorinen | Murray River | |
| **Kerang** | Kerang | Loddon River & Murray River | |
| **Red Cliffs** | Red Cliffs | Murray River | |
| **Piangil** | Piangil | Murray River | |
| **Robinvale** | Robinvale | Murray River | |
| **Koondrook** | Koondrook | Murray River | |
| **Murrabit** | Murrabit | Murray River | |

Each of these systems is described below:

**Mildura**

Water is pumped from the River Murray at Mildura through two conventional water treatment plants (WTPs). The treated water is supplied to around 21,000 connections in the City of Mildura and surrounding rural-residential areas including the townships of Irymple, Merbein and Cardross. The Seventh Street WTP is designed for 85ML/d and the Mildura West WTP has a design capacity of 20ML/d.

The summer months' average daily consumption is normally below 70ML/d with occasional consumption above this. Treated water pumping stations at Seventh Street and Mildura West distribute water to two water towers with a combined storage capacity of 3.03ML. Additional booster pump stations and ground-level storages with a combined storage capacity of 37.6ML allow the system to maintain pressures to the outlying areas on higher demand days.

Merbein is supplied with treated water from the Mildura West WTP via the reticulation from the north-west end of Merbein via an approximately 7.14 km long, 450 mm diameter transfer pipeline. The pipeline transfers water directly to the Merbein reticulation, including the ground-level storage tank (7.5ML capacity). During high demand, booster pumps of 150L/s (13 ML/d) capacity can be operated to maintain optimum pressures and flows in the reticulation network.

**Red Cliffs**

The town of Red Cliffs (14 km south of Mildura) is an independent system and services around 1,700 connections. A raw water pumping station extracts water from the River Murray and supplies it to a Dissolved Air Flotation and Filtration (DAFF) WTP. The treated water is stored in a 6 ML ground-level storage tank (GLST). From the GLST the treated water is delivered to an elevated tank (Standpipe) near the town centre via two rising mains of 300 mm and 375 mm in diameter and supplied to the town. The plant design capacity is 11ML/d after an upgrade in 2018, and the average daily consumption during the summer months is usually below 9 ML/d.

**Robinvale**
At Robinvale, raw water is pumped from the River Murray via a 300 mm pipeline to a conventional WTP, which services around 1,000 connections. Treated water is pumped to a 0.9ML standpipe from a 3.6ML ground storage tank. The reticulation network is supplied from the standpipe. The maximum plant design capacity is 6ML/d, with an average peak daily consumption during the summer months of approximately 5.0ML/d.

**Kerang**
Kerang is situated at the southern end of the LMW region. Raw water is pumped either from the River Murray (at Koondrook) or the Goulburn Murray Water 14/2 Channel and treated in a conventional WTP, which services around 2,100 connections. Note that extracting water from the Loddon River is not feasible due to the poor water quality at present. However, LMW can extract water from the Loddon River in the event of an emergency with a temporary pipework arrangement.

The treated water is pumped via dual rising mains of 400 mm diameter to Nolan Street which supplies the reticulation network and a 0.68ML water tower and a 2.5 ML ground storage tank. During high demand, water can be supplied from the ground storage tank via a booster pump station to maintain optimum pressures and flows in the reticulation network. The maximum plant design capacity is 11ML/d and the average peak daily consumption reached 7.2ML/d during summer periods.

**Piangil**
At Piangil, raw water is pumped from the River Murray to a "Package" conventional WTP, which services around 100 connections. The plant has a capacity of 1.0ML/d. Treated water is then pumped to a 1.14ML ground storage tank, situated on a high ridge east of the town. The reticulation network is re-pressurised by a booster pump station from this storage tank.

**Koondrook**
Raw water is pumped from the Murray River to a conventional WTP with a capacity of 3ML/d, which services around 500 connections. Treated water is pumped to a 0.9ML standpipe from a 2ML ground storage tank. The Koondrook reticulation network is supplied from the standpipe.

**Murrabit**
The Murrabit system can pump raw water from the raw water storage basin, which is fed from the Goulburn-Murray Water channel or directly from the Murray River to a "Package" conventional WTP with 0.4ML/d capacity. The plant services around 50 connections. Treated water is pumped into a 50kL high-level storage tank from 2x 50kL ground storage tanks. The Murrabit reticulation network is supplied from the tower.

**Swan Hill**
The Rural City of Swan Hill is situated in the centre of LMW's southern region. Raw water is pumped from the River Murray at Swan Hill to a conventional WTP with a capacity of 30ML/d. The Swan Hill system also supplies Woorinen South, Nyah & Nyah West and Lake Boga, which together service around 7,000 connections. The average daily consumption is normally below 23ML/d for this system. Treated water pumps deliver treated water to a 2.27ML ground level storage and 0.68ML water tower at the city centre. Two GLSTs, each of 4.0ML capacity, and a 0.15ML water tower are situated west of the city. Note that a new 5 ML GLST at the existing Swan Hill West tanks site is being constructed and it will be operational from March 2022.

Woorinen South is supplied from the Swan Hill system via a 10 km long pipeline with 300 mm and 250 mm diameter sections with a 2.0ML ground level storage and associated pumps and chlorination facilities.
The townships of Nyah and Nyah West are supplied via a 27 km long, 250 mm diameter pipeline from the Swan Hill Water Treatment Plant. A 6 ML ground level storage tank, chlorination facility and re-lift pumps are situated at Nyah. Properties adjacent to this pipeline can access water for domestic or commercial supply.

Lake Boga is supplied via a 250 mm diameter pipeline from the Swan Hill WTP. A 0.9ML ground level storage, chlorination facilities, and a 0.1ML water tower and associated re-lift pumps have been installed to maintain pressure on days of high demand.

## 3.3. Sources of supply

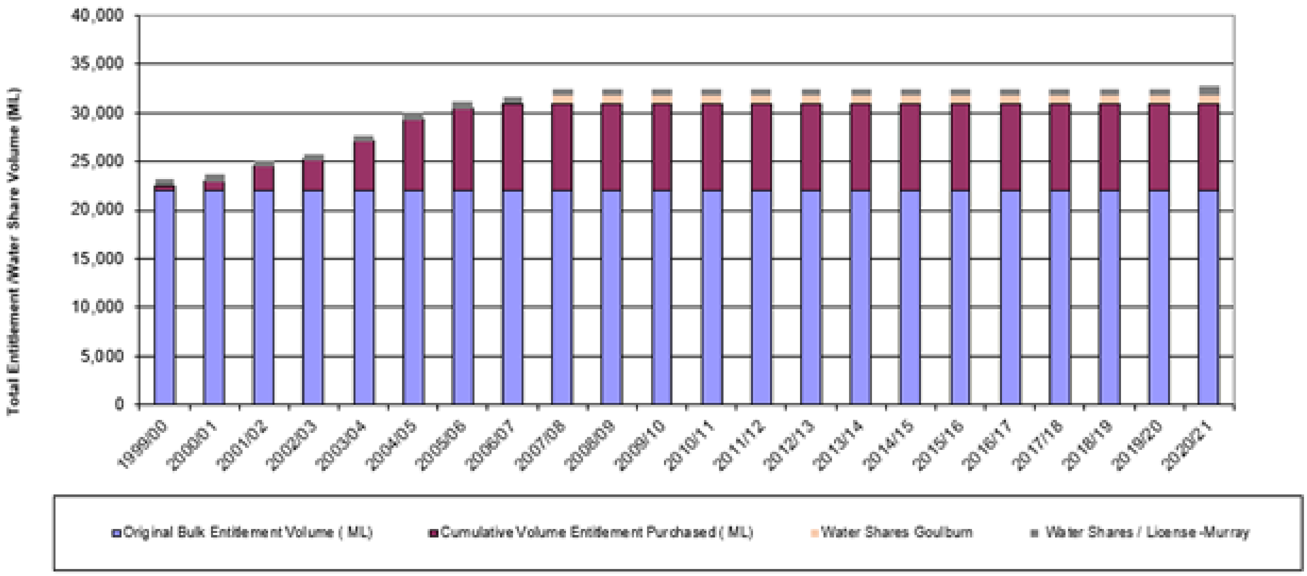
LMW sources about 97% of all raw water in the region from the River Murray, with about 3% (on average) being supplied from the Loddon River and Goulburn Murray Water (GMW) Channel System. All water is accessed via water entitlements.

A bulk water entitlement of 30,971ML is currently specified under the Bulk Entitlement (River Murray - Lower Murray Urban and Rural Water - Urban) Conversion Order 1999, of which 29,011ML has been nominated to be extracted from the River Murray and 1,960ML nominated to be diverted from the GMW supply channels. LMW supplements the bulk entitlement with purchases of additional water shares and allocation volumes and currently holds 1,490ML of high reliability water shares (940ML of Murray and 550ML of Goulburn shares) and 216ML of low reliability water shares (Goulburn). In total LMW currently holds 32,677ML of entitlements and water shares.

The original bulk entitlement which was established in 1999 provided a maximum annual diversion volume of 21,946ML. During the period 1999 to 2007, population growth and drier than average climatic conditions resulted in the annual demand exceeding the volume of original bulk entitlement. LMW therefore needed to secure supplies through the purchase of additional water shares, with a total volume of 9,025ML of water share purchased during this period. In 2010/11, the combined volume held by LMW (30,971ML) was consolidated into the bulk water entitlement.

A summary of entitlements and water shares held by LMW is shown in Figure 5.

**Figure 5: History of Water Entitlements and Shares held by LMW**




Moreover, the carryover rules that apply to LMW's urban water supply systems allow unused allocations at the end of the year to be taken in the following year/s. At the start of each year, the volume of allocation carried over and above entitlement volumes is quarantined in a spillable water account. This water is not available for use or trade until a declaration of low risk of spill is made. If a spill is determined to have occurred in the system, some or all this water is lost. Carryover is designed to provide added reliability and operational flexibility during dry periods for entitlement holders.

Offtake points and limits on the maximum daily diversion rates are specified in Schedule 4 of the Bulk Entitlement, a summary of which is provided in Table 4 (following page).

**Table 4: Maximum Daily Diversion Limits**

| System | Waterway/Channel | Off-take Point | Maximum Rate (ML/d) |
|---|---|---|---|
| Koondrook | River Murray | Koondrook Pump Station | 3.7 |
| Murrabit[1] | Channel No 2/11/4 | Metered Outlet No 4266A | 5.0 |
| Kerang | Loddon River – supply by GMW Channel 14/2<br>River Murray | Kerang Pump Station | 13.0 |
| | | Pump Outlet 2542 | 19.0 |
| | | Koondrook – Kerang pipeline | 3.7 |
| Swan Hill | River Murray | Swan Hill Pump Station | 29.0 |
| Woorinen | River Murray | Linked to Swan Hill | see above |
| Nyah West[2] | Channel No. 1/7/2 | Metered Outlet No. 8238 | 5 |
| Nyah[2] | River Murray | Nyah Pump Station | 2.5 |
| Piangil | River Murray | Piangil Pump Station | 1.0 |
| Robinvale | River Murray | Robinvale Pump Station | 6.0 |
| Red Cliffs | River Murray | Red Cliffs Pump Station | 9.5 |
| Mildura | River Murray | Mildura Pump Stations (for 7th St WTP and Mildura West WTP) | 122.0 |

1. Murrabit now has an offtake at the River Murray.
2. Nyah and Nyah West now take water from Swan Hill.

## 3.4. Description of Wastewater Systems

LMW provides wastewater collection, treatment and effluent re-use and disposal services to 11 towns via 10 wastewater treatment plants (WWTPs). LMW's wastewater systems predominately service domestic customers. Table 5 provides a summary of the wastewater supply systems.

**Table 5: Details of LMW's Wastewater Systems**

| System | Towns Serviced | Plant | Nominal Plant Capacity (ML/d) |
|---|---|---|---|
| Mildura | Mildura, Irymple and Red Cliffs | Mildura WWTP | 7 |
| | | Koorlong WWTP | 11.85 |
| Merbein[1] | Merbein | Merbein WWTP | 0.5 |
| Swan Hill | Swan Hill | Swan Hill WWTP | 4 |
| Robinvale | Robinvale | Robinvale WWTP | 0.63 |
| Lake Boga | Lake Boga | Lake Boga WWTP | 0.15 |
| Kerang | Kerang | Kerang WWTP | 1.9 |
| Nyah | Nyah and Nyah West | Nyah West WWTP | 0.25 |
| Koondrook | Koondrook | Koondrook WWTP | 0.3 |
| Murrabit | Murrabit | Murrabit WWTP | 0.025 |

1. Merbein WWTP will be decommissioned, and the wastewater flows from Merbein township will be sent to the Koorlong WWTP. The diversion of Merbein flows is expected to occur in 2022.

Each of these systems is described below:

**Mildura**

The Mildura sewerage system services around 19,600 properties including 6 major industrial customers, which consists of approximately 311 km of gravity sewers, 41 sewer pump stations and associated rising mains to transport flows to the respective WWTPs. Twenty-eight sewer pump stations transfer wastewater to the Koorlong WWTP, which includes wastewater from some of the Mildura wastewater catchments and Red Cliffs. The remaining sewer pump stations lift flows within the gravity system to the Mildura WWTP.

The Mildura WWTP is an extended aeration activated sludge plant based on an oxidation ditch system, which produces Class C quality treated water. The plant has nominal capacity of 7 ML/d; however, it is currently being operated at 4 ML/d due to operation issues and diversion of wastewater collected from some of the wastewater catchments to the Koorlong WWTP. The treated water is discharged into a billabong known as "the bong" for storage and reused on site by irrigating both pasture and tree plantations.

The Koorlong WWTP is based on the Sequencing Batch Reactor activated sludge process, which produces Class C quality treated water. The treated water is reused at a third-party reuse scheme within a nearby farm.

**Merbein**

The Merbein sewerage system services around 930 properties. The system consists of approximately 23.5 km of gravity sewers, 7 sewer pump stations and associated rising mains to transport flows to the Merbein WWTP, which is a lagoons-based treatment plant. The plant will be decommissioned in the near future and the flows from the Merbein wastewater catchment will be directed to the Koorlong WWTP. The main drivers for decommission the plant are odour complaints, residential growth and the location of the plant, which is within the flood plain.
The works are currently underway to decommission two existing sewer pump stations and construction of a new pump station and rising main to connect the Merbein system to the Koorlong WWTP. The works are expected to be completed in 2022.

**Swan Hill**

The Swan Hill sewerage system services around 5,465 properties. The system consists of approximately 85 km of gravity sewers, 28 sewer pump stations and associated rising mains to transport flows to the Swan Hill WWTP. Most of the sewer pump stations have been constructed as augmentations to service population growth within the township.

The Swan Hill WWTP is a lagoons-based system, which consists of a primary treatment lagoon with a mechanical aerator and three stabilization lagoons. The plant produces treated water equivalent to Class C reclaimed water quality, which is stored in a large pondage system and disposed via evaporation.

**Robinvale**

The Robinvale sewerage system services around 959 properties. The system consists of approximately 18 km of gravity sewers, 6 sewer pump stations and associated rising mains to transport flows to the Robinvale WWTP. The Robinvale Hill WWTP is a lagoons-based system, which consists of two facultative lagoons and two stabilization lagoons. The plant produces treated water equivalent to Class C reclaimed water quality, which is stored in a winter storage lagoon. The treated water is reused for irrigation at the adjacent farm.

**Lake Boga**

The Lake Boga sewerage system services around 366 properties. The system consists of approximately 11.5 km of gravity sewers, 5 sewer pump stations and associated rising mains to transport flows to the Lake Boga WWTP.

The Lake Boga WWTP is a lagoons-based system, which consists of two facultative lagoons and a stabilization lagoon. The plant produces treated water equivalent to Class C reclaimed water quality, which is stored in a storage lagoon and disposed via evaporation.

**Kerang**

The Kerang sewerage system services around 2,012 properties. The system consists of approximately 34 km of gravity sewers, 16 sewer pump stations and associated rising mains to transport flows to the Kerang WWTP.

The Kerang WWTP is a lagoons-based system, which consists of four treatment lagoons. The plant produces treated water equivalent to Class C reclaimed water quality, which is discharged into Fosters Swamp for evaporation.

**Nyah/Nyah West**

The Nyah/Nyah West sewerage system services around 413 properties. The system consists of approximately 12.5 km of gravity sewers, 4 sewer pump stations and associated rising mains to transport flows to the Nyah West WWTP.

The Nyah West WWTP is a lagoons-based system, which consists of two facultative lagoons and two stabilization lagoons. The plant produces treated water equivalent to Class C reclaimed water quality, which is stored in a storage lagoon and disposed via evaporation.

**Koondrook**

The Koondrook sewerage system services around 519 properties. The system consists of approximately 16 km of gravity sewers, 5 sewer pump stations and associated rising mains to transport flows to the Koondrook WWTP.

The Koondrook WWTP is a lagoons-based system, which consists of two facultative lagoons and a stabilization lagoon. The plant produces treated water equivalent to Class C reclaimed water quality, which is disposed via evaporation from the stabilization lagoon.

**Murrabit**

The Murrabit sewerage system services around 51 properties. The Murrabit sewerage system is a pressure sewer system; hence it does not have any sewer pump stations. The wastewater flows are transferred to the Murrabit WWTP via individual sewer pump units and approximately 3.5km of pressure sewer mains.

The Murrabit WWTP is a lagoons-based system, which consists of a facultative lagoon and a stabilization lagoon. The plant produces treated water equivalent to Class C reclaimed water quality, which is disposed via evaporation from the stabilization lagoon. Note that there is infrastructure to enable offsite reuse, however present flows have been too low to warrant operating the irrigation system.

## 3.5. Water Quality and River Health

LMW produces a high-quality drinking water at our water treatment plants. To verify and confirm that the quality of drinking water supplied to our customers meets all the relevant water quality standards and regulations, LMW has a comprehensive water quality monitoring program. During 2020/21 financial year, LMW met 100% compliance with the water quality standards specified in Schedule 2 of the Safe Drinking Water Regulations (SDWR) 2015. These are outlined in Table 6.

**Table 6: Water Quality Standards Specified in Schedule 2 of the SDWR 2015**

| Parameter | Sampling Frequency | Standards |
|---|---|---|
| Escherichia coli (E. coli) | One sample per week | No E. coli per 100 millilitres of drinking water, except for any false positive sample. |
| Total Trihalomethanes | One sample per month | Less than or equal to 0.25 mg/L |
| Turbidity | One sample per week | The 95th percentile of results for samples in any 12-month period must be ≤ to 5.0 NTU. |

In addition to the water quality parameters stipulated in Schedule 2 of the SDWR, LMW also monitor a range of other parameters, such as substances that may pose a risk to human health, to compare against the health-based guideline values of the 2011 Australian Drinking Water Guidelines (ADWG) and ensure the safety and quality of the drinking water. An assessment of results of these parameters tested during 2020/21 financial year against the ADWG health-based guideline values, found all results were compliant.

We actively participate in protecting and enhancing our rivers, streams, and floodplains through our own works and by supporting our partner agencies.

We work in collaboration with the Mallee Catchment Management Authority to assist in delivering environmental water entitlements, managed by the Victorian Environmental Water Holder (VEWH), to two local wetlands. During 2020/21, environmental water was delivered via LMW irrigation and drainage infrastructure to Lake Hawthorn (1,500ML) and Lake Koorlong (150ML). Lake Hawthorn provides important feeding habitat for more than 50 different species of migratory waterbirds. Delivery to Koorlong Lake supports the habitat for the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* listed (Endangered) Murray hardyhead fish.

We work closely with the Victorian Environment Protection Authority (EPA) to ensure deliver of wastewater to the Fosters Swamp (which is classified as Ramsar wetland), a habitat for macroinvertebrates. The macroinvertebrates provide a valuable food source for more than 48 species of waterbirds that visit the site. Bird species recorded at the site include ten migratory species that are internationally protected, these included the species listed in the *Flora and Fauna Guarantee Act 1988* (FFG-list). For example, Caspian Tern *(Hydroprogne caspia)* and Latham's Snipe *(Gallinago hardwickii).*

We are a participating organisation with the DELWP's WetMAP bird program, which aims to understand the relationship between waterbird numbers and wetland availability. We worked in collaboration with scientists to ensure the ongoing monitoring of waterbirds visiting the Swan Hill WWTP.

We work in partnership with the Mallee Catchment Management Authority to monitor 39 irrigation drainage sites in the region. The monitoring data includes flow and salinity and is used to manage salinity levels in the Murray River, ensuring the water is suitable for people, plants, and animals.

Works undertaken by LMW near waterbodies are always managed to ensure minimal vegetation removal is undertaken. We employ a range of methods including relocating projects, seeking advice on existing vegetation species, establishing tree protection zones, and using directional boring to bury pipes rather than cutting trenches.

Moreover, LMW partners with two local Catchment Management Authorities, these being the Mallee and the North Central to deliver works under their strategies that address waterway management, flood management and drainage.

It should also be noted that the entitlement framework and extraction limits managed by the Murray Darling Basin Authority (MDBA) also play an important part in ensuring the Murray River continues to have sufficient environmental flows to maintain biodiversity and river health.

# 4. WATER DEMAND PROJECTIONS

## 4.1. Supply System Summary

Table 7 provides details of property connections and approximate population as at end of the financial year 2020/21.

**Table 7: Summary of Population and Connections as at end of 2020/21**

| System | Towns Supplied | Population | Number of Connections | | |
|---|---|---|---|---|---|
| | | | Residential | Non-Residential | Total |
| Mildura | Mildura, Irymple and Merbein | 48,647 | 19,754 | 2142 | 21,896 |
| Swan Hill | Swan Hill, Nyah/ Nyah West, Lake Boga and Woorinen | 14,441 | 6,217 | 996 | 7,213 |
| Kerang | Kerang | 4,057 | 1,844 | 323 | 2,167 |
| Red Cliffs | Red Cliffs | 4,043 | 1,617 | 165 | 1,782 |
| Piangil | Piangil | 231 | 105 | 16 | 121 |
| Robinvale | Robinvale | 2,198 | 814 | 188 | 1002 |
| Koondrook | Koondrook | 993 | 473 | 59 | 532 |
| Murrabit | Murrabit | 101 | 44 | 12 | 56 |
| **Total** | | **74,711** | **30,868** | **3,901** | **34,769** |

## 4.2. Historical Water Use

Figure 6 below shows raw water consumption of LMW's water supply systems for last 20 years.

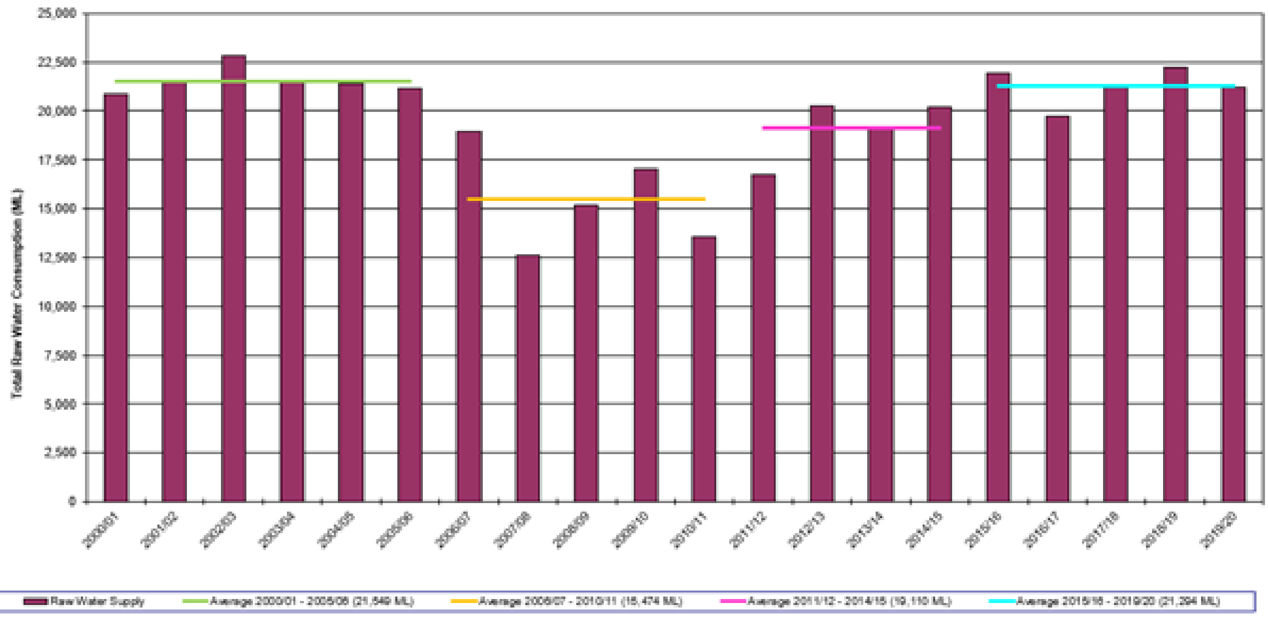



**Figure 6: Historical Raw Water Consumption**

As can be seen in Figure 6, average annual raw water consumption (21,549 ML) during the period between 2000/01 - 2005/06 was relatively high, which could be attributed to water availability being high and no water restrictions during this period.

During the period between 2006/07 to 2010/11, LMW's water supply systems were on various levels of water restrictions, which was due to supply shortage caused by the millennium drought. Hence the average annual raw water consumption (15,474 ML) was low during this period.

As the millennium drought ended in 2010/11, annual raw water consumption gradually increased across LMW's water supply systems. The average annual water raw water consumption for last five years (21,294 ML) is close to the consumption period prior to the drought. It should be noted that most of the LMW's water supply systems are serving a larger population than the pre millennium drought period. This indicates that the potable water consumption has reduced despite population growth in major towns over the period, which could be attributed to introduction of the Permanent Water Saving Rules (PWSRs) and water saving initiatives by both customers and LMW.

Water consumption across LMW's region generally occurs in proportion to population as is illustrated in Figure 7, with almost 95% of the total annual water consumption occurring in the four major centres of Mildura, Swan Hill, Red Cliffs and Kerang.

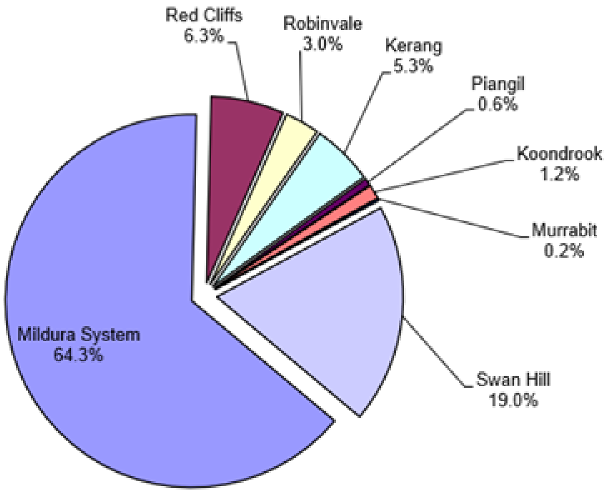



**Figure 7: Percentage of Water Consumption across the Water Supply Systems**

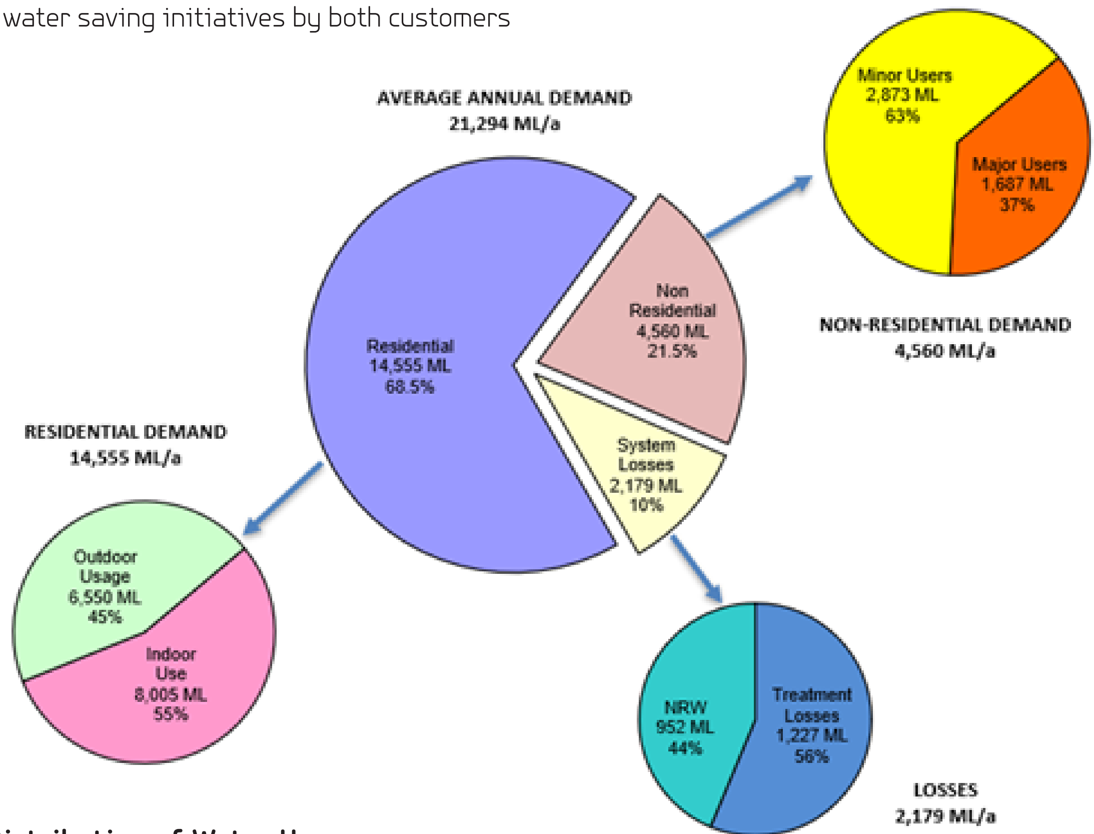



**Figure 8: Distribution of Water Usage**

As can be seen in Figure 8 (previous page), residential customers account for majority of the water consumption. It is difficult to determine how much water is used within homes and used outside on gardens etc. An analysis of quarterly water consumptions for recent years indicates that indoor use varies from about 54% to 58% of total residential consumption, with weighted average indoor use is about 55% of total residential usage.  Outdoor use therefore accounts for 45% of total residential usage.

Most of the water consumption by non-residential customers account for minor users such as shops, offices, warehouses and other commercial properties. Major users are wineries, food processing facilities and councils. The Councils use potable water for watering some public open spaces, sporting ovals, public buildings and gardens, although in recent years many public open spaces have been connected to raw or recycled water systems. An assessment of major customers, who uses potable water for watering public open spaces (i.e., parks, gardens, sporting ovals, cemeteries, school grounds and nature strips etc.) showed that water demand from these customers account for approximately 3% of the total potable water consumption (i.e., Metered water). It should be noted that majority of these sites are located in Mildura and Swan Hill.

Non-revenue water (NRW) and treatment plant loss account for a considerable portion of total water demand. An analysis of last five years of data indicates that losses account for approximately 10% of the total raw water consumption; of this approximately 44% and 56% account for NRW and treatment plant loss respectively.

## 4.3. Demand Projections

**Future Growth**

The key factor that influences future water demand is population growth in the LMW's service area. To determine appropriate growth rate for each town supplied by LMW, the following information were considered:

1. Number of property connections in each town.
2. Projection of residential land developments (>10 lots).
3. Population and household projections in Victoria in Future 2019.

The Victoria in Future 2019 (VIF) provides the projection of population and households for Local Government Areas (LGAs) up to 2056. The population data in the VIF is based on internal government mathematical models and expert knowledge, relying on trend analysis and assumptions about future change. Table 8 below shows the VIF population projections for LGAs; in which LMW operates.

**Table 8: VIF Population growth projections**

| | Population | | Change 2018 - 2036 | |
|---|---|---|---|---|
| | 2018 | 2036 | Number | Avg Rate |
| Gannawarra (S) | 10,550 | 9,930 | -620 | -0.3% |
| Mildura (RC) | 55,520 | 62,550 | 7,040 | 0.7% |
| Swan Hill (RC) | 20,760 | 20,520 | -240 | -0.1% |

Source: Table 3 of the Victoria in Future 2019, July 2019.

As can be seen in Table 8, population is expected to grow in the Mildura Rural City Council Area. Whereas population in the Swan Hill Rural City Council and Gannawarra Shire is expected to decline over the next 15 years.

An attempt was made to project future residential properties based on planned developments (i.e., developments > 10 lots). However, the growth rates based on planned developments found to be high and improbable. Moreover, information is only available for Mildura, Swan Hill and Kerang.

Additionally, a projection of future residential properties based on the historic water connection data was developed. A comparison of growth projections based on all three information sources are shown in Table 9 (following page).

**Table 9: Comparison of growth projections based on different sources of information**

| Region | % increase based on residential connections (LMW annual report data) | | | | Forecast future development based on planned developments > 10 lots (* 2021/22 financial year includes some development from 2020/21 FY) | | | VIF growth % | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 17/18 | 18/19 | 19/20 | *17-20 average* | 2021/22* FY | 2022/23 FY | 2020-2023 average | 2016-2021 | 2021-2026 | 2026-2056 |
| **Kerang** | 0.67% | 0.17% | 0.83% | **0.55%** | n/a | n/a | n/a | -0.08% | -0.28% | -0.26% |
| **Koondrook** | 1.13% | 2.02% | 1.98% | **1.71%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Lake Boga** | 1.18% | 1.63% | 0.46% | **1.09%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Mildura** | 1.31% | 1.31% | 0.93% | **1.19%** | 3.13% | 4.18% | **2.44%** | 0.94% | 1.01% | 0.85% |
| **Murrabit** | 0.00% | 2.33% | 0.00% | **0.78%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Mystic Park** | 0.00% | 0.00% | 0.00% | **0.00%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Nyah** | 0.33% | 0.99% | 0.33% | **0.55%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Nyah West** | 0.00% | 0.78% | 0.00% | **0.26%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Piangil** | 0.00% | 2.00% | 2.94% | **1.65%** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Red Cliffs** | 0.46% | 0.39% | 1.03% | **0.63%** | 2.42% | 5.59% | **2.80%** | 0.45% | 0.51% | 0.60% |
| **Robinvale** | 0.38% | 0.13% | 1.38% | **0.63%** | n/a | n/a | n/a | -0.30% | -0.50% | -0.13% |
| **Swan Hill** | 0.61% | 0.57% | 0.38% | **0.52%** | 1.91% | 1.46% | **1.12%** | 0.26% | 0.42% | 0.43% |
| **Woorinen Sth** | 0.00% | 0.65% | 0.00% | **0.22%** | n/a | n/a | n/a | n/a | n/a | n/a |

n/a – Information not available
Source: LMW's Water Strategy Report, 2021.

For the purpose of this UWS, growth rates based on 3-year average of water connections was adopted, as this is considered the most reliable source of information. Growth rates based on past 5 and 10 years of water connections data were also looked at in the assessment. However, they found to have a risk of overestimating the growth. Moreover, COVID pandemic will potentially have impacts on various aspects of our communities, including population growth, which is one of the considerations for selection recent data to determine growth rates for this UWS. This approach is consistent with the development of LMW's water and wastewater asset augmentation strategies.

It should also be noted that Council and VIF data includes growth in regional areas outside LMW's service region. Therefore, these can cause inconsistencies in planning for the water supply systems.

**Methodology**

For each system, per connection consumption was calculated based on average reported residential and non-residential connections and consumption data for the three-year period 2017/18 to 2019/20. The per connection consumption figures and the growth rates were then applied to project future potable water demand for the planning period (2020/21 – 2069/70). Reported leakage losses (non-revenue component of water produced by treatment plants) for each system were then added as a proportion of the potable water demand to determine the total potable water produced projections. Leakage losses were based on reported leakage losses for the same three-year period.

A small portion of raw water is used and/or lost during the water treatment process, which is known as treatment plant loss. The proportion of treatment plant loss for each system was calculated based on the reported raw water extraction, potable water production and leakage loss. The treatment plant loss for each system was added to determine the total loss and raw water demand projections for the planning period. The raw water demand is the summation of potable water demand, leakage and treatment plant loss.

Key assumptions used in the derivation of the raw water projections for each LMW's system are summarised in Table 10 (following page).

**Table 10: Key demand projection assumptions**

| System | Current average annual residential consumption (kL/connect.) | Annual residential connection growth rate (%) | Current average annual non-residential consumption (kL/connect.) | Annual non-residential connection growth rate (%) | Av. Ann. Leakage Losses (% total consump.) | Av. Ann. Treatment Plant Losses (% water produced) |
|---|---|---|---|---|---|---|
| Mildura | 528 | 1.2 | 1,260 | 1.0 | 2.5 | 5.6 |
| Red Cliffs[1] | 471 | 0.6 | 3,111 | 0.6 | 10.8 | 0.5 |
| Robinvale[2] | 509 | 0.6 | 910 | 0 | 11.2 | 1.3 |
| Kerang[2] | 419 | 0.6 | 634 | 0.6 | 9.0 | 11.5 |
| Piangil[1,2] | 472 | 1.6 | 4,184 | 0 | 6.6 | 10.8 |
| Koondrook[2] | 402 | 1.7 | 327 | 0.6 | 20.6 | 12.3 |
| Murrabit[1,2] | 496 | 0.8 | 1,000 | 0 | 4.0 | 10.3 |
| Swan Hill[3] | 449 | 0.5 | 1,004 | 0.2 | 3.9 | 4.7 |

1. Relatively high average consumption of non-residential customers in small towns are mainly influenced by major customers such as wineries, public open spaces etc.
2. As per the Victoria in Future 2019 document, long term population and household growth in LGAs of Gannawarra Shire and Swan Hill Rural City Council is likely to decline, therefore slightly lower residential growth rates were assumed for small towns within these LGAs beyond 2030.
3. Swan Hill system includes townships of Swan Hill, Nyah/Nyah West, Lake Boga and Woorinen.

The major uncertainties associated with demand projection are typically uncertainty due to growth projections and uncertainty due to inter-annual demand change from climate variability. For the LMW region, growth projections are generally stable or low, with historical water connections data providing a good indicator of future growth for most of the systems. However, the long-term growth estimates will have a certain degree of uncertainty.

The variation in historical raw water consumption demonstrates that climate variability does have a large influence on demand, with cooler, wetter years such as 2010/11 having lower demand and hotter, drier years such as 2018/19 having higher demand.

Another uncertainty associated with some of LMW's systems is use by major industries and other commercial customers. Particularly for small towns, where the major industry account for a significant portion of the water demand. Consultation with the relevant Councils revealed no significant new water using industries or industrial developments is expected in the region in the short term.

To represent uncertainty associated with the baseline demand projection, upper and lower bound demand projections were derived, illustrating the potential range in future demand. The upper and lower demand bounds largely represent the uncertainty associated with inter-annual consumption variability. The upper and lower bounds were determined based on the reported raw water consumption for the period between 2012 and 2020.

Based on the derivation method, Figure 9 below shows the combined raw water demand projection for the LMW systems for the 50-year planning period from 2021 to 2070.  The current average annual demand adopted for the UWS is 21,240 ML. The projections show that if residential water consumption per household remains at current levels, annual raw water demand could increase due to growth from 21,240 ML in 2020 to 23,465ML, 27,485 ML and 34,859 ML in 2028 (end of WP 5), 2045 (mid of planning period) and 2070 (end of planning period) respectively.

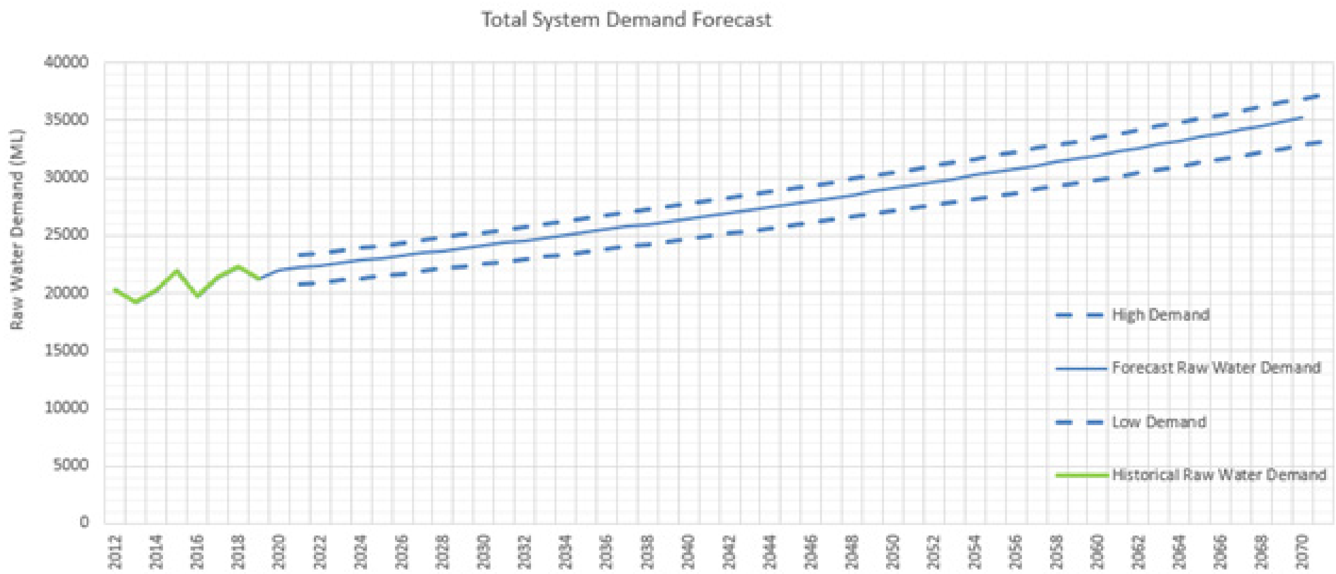



**Figure 9: LMW Water Supply Systems' Demand Projection**

# 5. WATER SUPPLY PROJECTIONS

## 5.1. Water Availability Assessment

Our water resources are highly dependent on climate. Therefore, it is important to consider potential impacts of climate change on water resources in the water resources management planning. Given that the UWS looks at the long-term (50 Years) water supply to our customers, the impacts of potential climate change impacts need to be considered in the projection of current and future water availability.

The potential impacts of climate were incorporated in the water supply projections using the historical data and modelling (climate and hydrological modelling). Though the scientific knowledge on climate change is maturing, there are uncertainties associated with the modelling and future greenhouse gas emissions in the future climate projections. Therefore, a number of scenarios were considered in the water supply projections to address the uncertainty.

LMW has used the Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria, November 2020 (the Climate Impact Assessment Guidelines) to undertake water supply projections. The Climate Impact Assessment Guidelines recommends the following scenarios to forecast water supply based on a post 1975 historic climate reference period.

The historic climate reference period is historic climate record over the period July 1975 to June of the most recent year of available data.

1. Low climate impact.
2. Medium climate impact.
3. High climate impact.

Additionally, a scenario using the post-1997 historic climate reference period data was undertaken to assess the water availability based on the assumption that the dry conditions experienced since 1997 represent a permanent step change in climate.

LMW sources 97% of its raw water from the Murray River with the remainder from GMW irrigation channel systems. Given that almost all the raw water is sourced from the Murray River System, the future raw water availability was assessed using the hydrological and climate modelling results for the Murray River System provided by the Department of Environment, Land, Water and Planning (DELWP). The results for raw water availability were provided in terms of percentage of allocation of high reliability water shares (HRWS) for the Murray River System for the above climatic scenarios. DELWP provided modelling results for years 1997, 2045 and 2070, therefore the prediction of water availability during the planning period (2021 – 2070) was calculated by interpolating the modelling results. Although the assessment was undertaken for all climatic scenarios, medium climate impact scenario is used as a design parameter for determining options to ensure security of supply.

## 5.2. Estimation of Current Yield

The yield of a water supply system is defined as the average annual volume that can be supplied at a specified reliability, subject to operating rules and typical demand patterns. For water resources planning purposes, both supply and demand are expressed as average volumes. Entitlements held by LMW define the maximum annual volume of water, that can be diverted from the relevant sources. Therefore, it is important to note that the entitlement volume is not always equivalent to the system yield.

For LMW systems, the yield is estimated to be the allocated volume in June based on the annual reliability and the current volume of entitlement held and represented as an average volume. Note that the modelling provides maximum allocations, whereas allocations during the year can vary. Hence the projected maximum allocations based on the model results were applied with a factor to represent yield as an average annual volume. The yield estimates based on medium climate impact scenario for the current year (2020) and end of planning period (2070) for various annual reliabilities are provided in Table 11.

**Table 11: Yield estimates**

| Annual Reliability | % Allocation | | Allocated Volume (ML) | | Yield (ML) | |
|---|---|---|---|---|---|---|
| | 2020 | 2070 | 2020 | 2070 | 2020 | 2070 |
| 99% (1 in 100 years) | 51% | 16% | 16,246 | 4,932 | 14,130 | 4,290 |
| 98% (1 in 50 years) | 85% | 25% | 27,060 | 7,914 | 23,530 | 6,880 |
| 96% (1 in 25 years) | 97% | 37% | 30,804 | 11,658 | 26,790 | 10,140 |
| 95% (1 in 20 years) | 100% | 42% | 31,911 | 13,402 | 27,750 | 11650 |
| 90% (1 in 10 years) | 100% | 91% | 31,911 | 28,902 | 27,750 | 25,130 |

## 5.3. Supply Projections

As described in Section 5.1, supply projections are undertaken for the following four scenarios:

1. High Yield – based on the low climate change scenario (CCS).
2. Baseline Yield – based on the medium CCS.
3. Low Yield – based on the high CCS.
4. Step Change Yield – based on post 1997 step CCS.

Figure 10 shows the supply projections for each scenario. Note that system yield is dependent on the annual reliability. The projections presented in Figure 9 are based on adopted annual reliability of 95%.

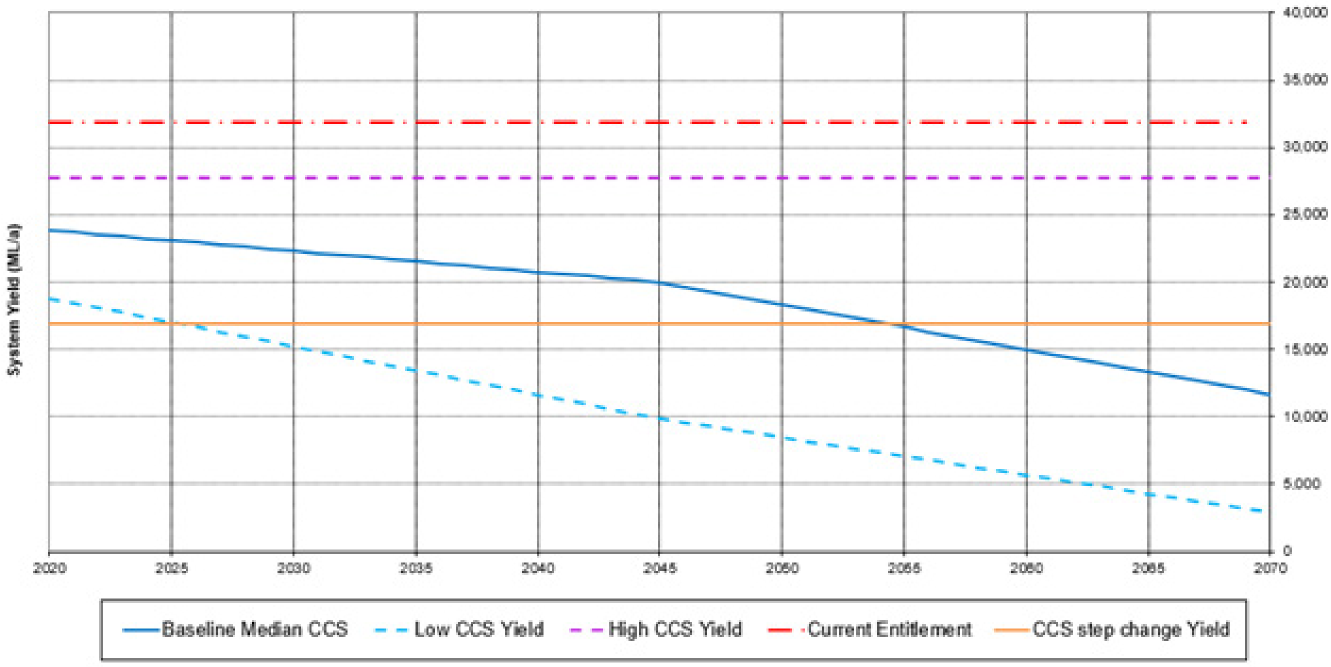



**Figure 10: LMW Water Supply System Yield Projection**

A summary of system estimated yields for each climatic scenario are provided in Table 12.

**Table 12: Projected system yields for planning period**

| Adopted Scenario | Estimated System Yield (ML/a) | | |
|---|---|---|---|
| | 2020 (current) | 2045 (Mid of planning period) | 2070 (End of planning period) |
| High Yield (low climate change scenario) | 27,750 | 27,750 | 27,750 |
| Baseline Yield (medium climate change scenario) | 23,865 | 19,980 | 11,650 |
| Low Yield (high climate change scenario) | 18,800 | 9,850 | 2,890 |
| Step change (Post 1997 step climate change scenario) | 16,930 | 16,930 | 16,930 |

# 6. CURRENT & FUTURE WATER SUPPLY & DEMAND

A supply-demand balance for the LMW region based on the water demand and supply projections is presented in Figure 11.

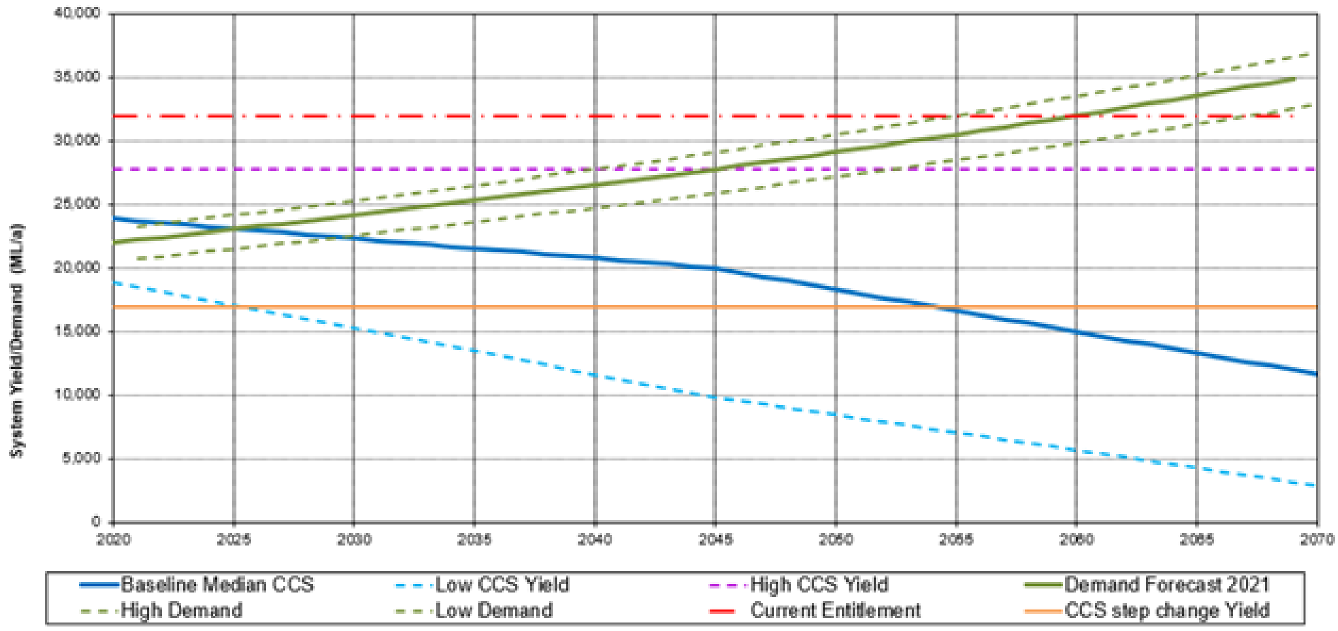



**Figure 11: Demand and Supply Projections**

Figure 11 indicates that the uncertainty surrounding the climate change impacts is far greater than the range of demand projections. Based on the baseline yield projection, supply shortfalls are likely to occur from 2025, 2030 and 2023 for adopted demand, low demand, and high demand respectively.

Based on the high yield projection, supply shortfalls are likely to occur from 2046, 2052 and 2040 for adopted demand, low demand, and high demand respectively. Whereas the projections for low and step climate change scenarios indicate that yields under these scenarios insufficient to cater for current demand.

The estimated water supply shortfalls based on baseline yield scenario are summarised in Table 13. It should be noted that the water supply projections are undertaken for the Murray River system as it accounts for approximately 97% of LMW's raw water supply.

Table 13 shows shortfall in supply to meet the demand at the agreed level of service (i.e., 95% reliability).

**Table 13: Supply and Demand Balance**

| Supply-Demand Balance | Shortfall (ML)[1] | | | |
|---|---|---|---|---|
| | 2021 | 2028 (End of WP5) | 2045 (Mid of planning period) | 2070 (End of planning period) |
| Maximum Shortfall | 440 | -2,200 | -9,093 | -25,224 |
| Baseline Shortfall | 1,712 | -844 | -7,505 | -23,209 |
| Minimum Shortfall | 2,984 | 513 | -5,916 | -21,194 |

Note: 1. Negative and positive values indicate supply shortfall and surplus respectively.
The water supply and demand projection calculations are provided in Attachment 2.

# 7. WASTEWATER SYSTEMS ASSESSMENT

## 7.1. Wastewater Flow Projections

The wastewater inflows into LMW's Wastewater Treatment Plants (WWTPs) are projected based on the growth rates adopted for the water demand projections. Given that LMW's wastewater systems predominately consists of domestic customers, residential growth rates are used for the wastewater inflow projections. Details of the growth rates adopted are provided in Section 4.3.

The wastewater inflows can vary depending on climate. The wastewater discharged from the properties connected to the system accounts for majority portion of the inflow to the WWTPs during the dry weather period, which is known as "dry weather flow". The inflow during the wet weather period will include wastewater discharged from the properties and the storm water infiltrated through the reticulation asset such as manholes and gravity sewers, which is known as "wet weather flow".

For the purpose of the assessment annual average dry weather flow (ADWF) is considered, which is consistent with standard industry practice for assessing WWTPs' capacity.

Given that the ADWF mainly consists of wastewater discharged from the customers, climate does not have a significant influence. Therefore, the major uncertainty associated with the wastewater inflow projection is growth. To account for this uncertainty, high and low growth rates were considered in addition to the adopted growth rates.

The low and high growth rates were based on the observed growth rates for residential connections in the last three years, where variation is within ± 0.3% of the adopted growth rate. When the observed growth rate is outside this range, the low and high growth rates were used as ± 0.3% of the adopted growth rate. This is to minimise over or under estimating growth.

The growth rates adopted for each system are provided in Table 14 (following page) and a summary of wastewater inflow projections is provided in Table 15 (following page).

**Table 14: Growth Rates Adopted for Wastewater Inflow Projections**

| Region | Growth Rates | | |
|---|---|---|---|
| | Low | Mean | High |
| Kerang | 0.30% | 0.60% | 0.83% |
| Koondrook | 1.40% | 1.70% | 2.00% |
| Lake Boga | 0.70% | 1.00% | 1.30% |
| Mildura | 0.90% | 1.20% | 1.31% |
| Murrabit | 0.50% | 0.80% | 1.10% |
| Nyah + Nyah West | 0.10% | 0.40% | 0.70% |
| Robinvale | 0.30% | 0.60% | 0.90% |
| Swan Hill | 0.38% | 0.50% | 0.61% |

**Table 15: Summary of wastewater inflow projections**

| Region | Wastewater Inflow (ML/d) | | | | Comment |
|---|---|---|---|---|---|
| | Current | 2070 Low | 2070 Mean | 2070 High | |
| Mildura | 10.16 | 15.90 | 18.44 | 19.47 | Includes wastewater from Mildura, Merbein, Irymple and Red Cliffs. The Merbein inflow is included as Merbein flows will be diverted to the Koorlong WWTP in 2022. |
| Robinvale | 0.69 | 0.80 | 0.93 | 1.08 | |
| Lake Boga | 0.12 | 0.16 | 0.19 | 0.22 | |
| Kerang | 1.52 | 1.76 | 2.05 | 2.29 | |
| Nyah | 0.19 | 0.19 | 0.23 | 0.26 | Includes Nyah and Nyah west |
| Koondrook | 0.23 | 0.46 | 0.53 | 0.62 | |
| Murrabit | 0.012 | 0.016 | 0.018 | 0.021 | |
| Swan Hill | 2.95 | 3.57 | 3.79 | 4.00 | |

## 7.2. Wastewater Treatment Plants' Capacity Assessment

The nominal capacities of LMW's WWTPs were compared against the projected inflows to determine the timing when augmentations are likely to be required.

The Mildura system consists of two WWTPs, they are Mildura and Koorlong WWTPs. Therefore, for the purpose of the assessment combined capacity was considered. The nominal capacity of the Mildura WWTP is 7 ML/d, however a derated capacity of 4 ML/d was considered in the assessment due to operational constraints, which is consistent with LMW's Wastewater Strategy, Dec 2021. Figure 12 shows the outcome of the assessment for the Mildura system.

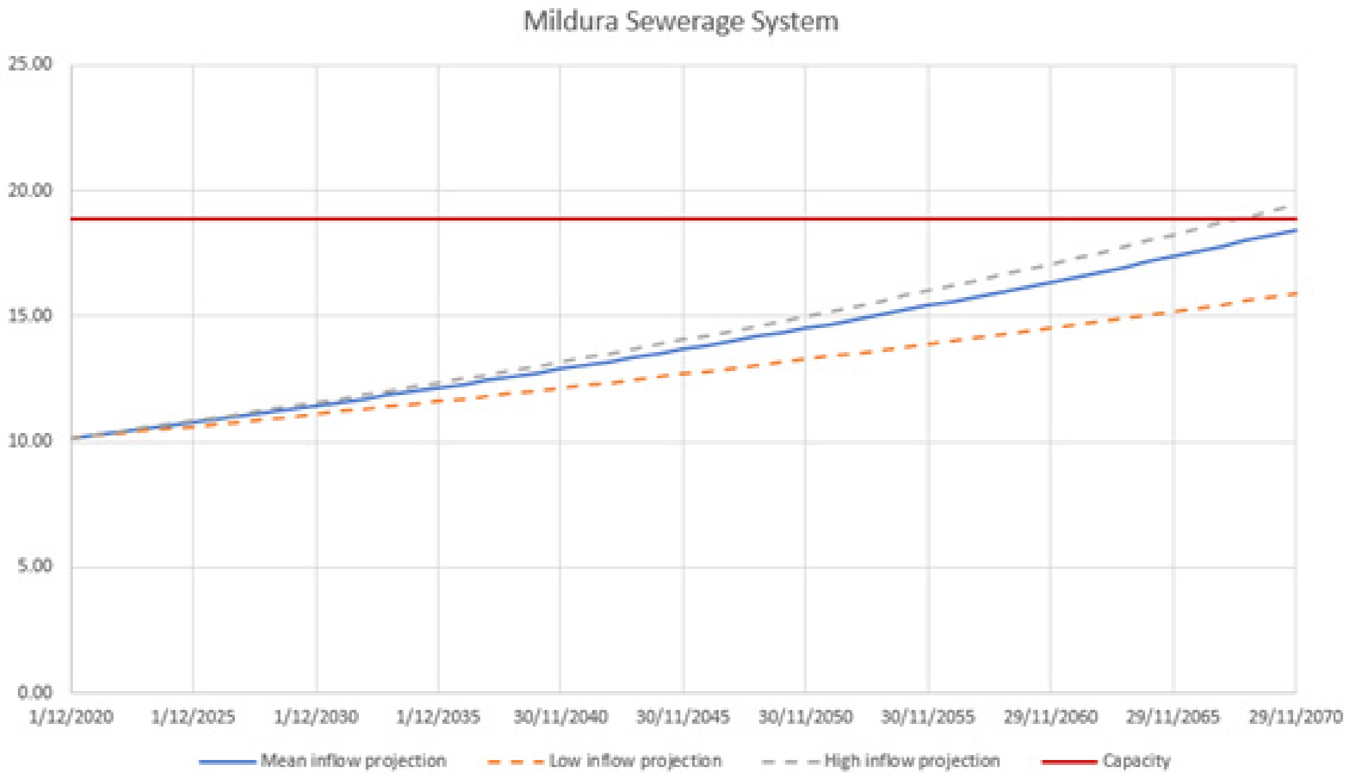



**Figure 12: Mildura Wastewater System**

The assessment indicates that the combined capacity of the Mildura and Koorlong WWTPs is sufficient to cater for the projected wastewater inflows up to the end of the planning period, except for high inflow projection. The earliest year the system would no longer meet the level of service is 2068. This indicate that the plants do not require augmentation until 2068 to cater for growth, however LMW's Wastewater Strategy, December 2021 identified some works are required to meet the operational and regulatory requirements. Details of these works are discussed in Section 9.4.

The details of the assessment of all the LMW's wastewater systems are provided in Attachment 2. The outcomes of the assessment are summarised in Table 16 (following page).

**Table 16: Summary of Wastewater System Assessment**

| System | Plant | Nominal Plant Capacity (ML/d) | Year when capacity will be reached | | |
|---|---|---|---|---|---|
| | | | Adopted | Earliest | Latest |
| Mildura | Mildura WWTP | 7 | Beyond 2070 | 2068 | Beyond 2070 |
| | Koorlong WWTP | 11.85 | | | |
| Merbein[1] | Merbein WWTP | 0.5 | n/a | n/a | n/a |
| Swan Hill | Swan Hill WWTP | 4 | Beyond 2070 | 2070 | Beyond 2070 |
| Robinvale | Robinvale WWTP | 0.63 | 2021 | 2021 | 2021 |
| Lake Boga | Lake Boga WWTP | 0.15 | 2045 | 2039 | 2056 |
| Kerang | Kerang WWTP | 1.9 | 2058 | 2047 | Beyond 2070 |
| Nyah | Nyah West WWTP | 0.25 | Beyond 2070 | 2061 | Beyond 2070 |
| Koondrook | Koondrook WWTP | 0.3 | 2036 | 2033 | 2038 |
| Murrabit | Murrabit WWTP | 0.025 | Beyond 2070 | Beyond 2070 | Beyond 2070 |

1. Merbein WWTP will be decommissioned, and the wastewater flows from Merbein township will be sent to Koorlong WWTP. The diversion of Merbein flows is expected to occur in 2022.

As can be seen in Table 16, Mildura, Swan Hill, Nyah and Murrabit systems have sufficient treatment capacities to cater for the wastewater inflows up to the end of the planning period. The Lake Boga, Kerang and Koondrook systems likely to reach capacity within the planning period. However, the earliest year when augmentation is likely to be required is more than 10 years from the current year.

The current inflow exceeds the nominal capacity of the Robinvale WWTP. However, the operational experience and treated water quality monitoring data do not support this assessment. Therefore, further detailed investigation is required to determine the actual treatment capacity of the plant.

# 8. ASSESSMENT OF SUPPLY RISKS

A qualitative risk assessment was undertaken to identify risks to urban water supply and control measures to manage those risks. The assessment considered the events that can cause risk of reducing or making existing sources of water unavailable and the risk of reducing urban (potable) water production.

The risk assessment was undertaken using the LMW's corporate risk assessment framework. The risk assessment takes into account of the existing controls (i.e., controls/facilities currently available) and additional controls that can be implemented as required to manage the risks.

The following risks were considered in the assessment.

1. Low water allocation for the Murray River system due to prolonging dry condition during the planning period.
2. Blue Green Algae (BGA) blooms in the raw water impacting the production of drinking water.
3. High concentration of emerging contaminants (e.g., microplastics, PFAS) in the raw water causing the raw water unsuitable.
4. Bushfire/ flooding or other events (e.g., black water) in the catchment causing deterioration of raw water quality, hence impacting the production of drinking water.
5. Flooding inundating the WTP sites.
6. Extended period of power outage causing plant shutdown due to extreme events such as storms, bushfire, flooding etc.
7. Major asset failure causing extended plant shutdown and/or supply interruptions.
8. Cyber-attack of infrastructure including SCADA and telemetry causing plant shutdown and/or supply interruptions.
9. A pandemic causing major shortage of critical staff and supplies.
10. Act of terrorism or intentional sabotage of water infrastructure causing plant shutdown and/or supply interruptions.

The above risks were assessed for each water supply system. As per the assessment, the risks of low water allocation for the Murray River system and cyber-attack of infrastructure were identified as high risks. Most of the other risks were considered as moderate or low risks.

The assessment also indicated that most of risks can be reduced to low-risk rating with the existing and the additional mitigation measures. There are some risks can only be reduced to moderate-risk rating, however, the magnitude of those risks can be reduced with the mitigation measures identified as a part of the assessment.

The following mitigation measures were considered to manage the risk of low water allocation:

- Maintaining Water Entitlements (WE) higher than the demand.
- Buy temporary water allocation shares in the water market where necessary.
- Community education programs to increase water use efficiency awareness.
- Investigation of alternative water supplies to supplement or offset potable water.
- Introduction of water restrictions as required.

The following mitigation measures were considered to manage the risk of cyber-attack:

- Back up communication service provider.
- Fire walls,
- Segregation of Information Technology (IT) and Operational Technology (OT) networks.
- Compliance with federal and state governments' regulations associated with cyber security.
- Raising staff awareness of cyber security.
- Implementation of the cyber security strategy.

The detailed risk assessment is provided in Attachment 3.

# 9. OPTIONS FOR SECURING THE REGION'S WATER SUPPLY

## 9.1. Options Identification and Evaluation

This Strategy has identified that the major uncertainty in LMW's supply system relates to the impacts on allocations resulting from climate change. The supply-demand balance highlights a wide range in future outcomes relating to supply. These outcomes significantly influence decisions to address the volume and timing of potential shortfalls.

As mentioned before, LMW is heavily reliant on the Murray River system. However, consideration was given for alternative sources of supplies in the options identification. Table 17 summarises assessment of alternative water supply options considered to offset potable water.

**Table 17: Evaluation of alternative supply source options**

| Option | Source Water Quality | Quantity of water | Energy/ Environment | Procurement, delivery and O&M risks | Cost | Overall Feasibility? (Yes/No) |
|---|---|---|---|---|---|---|
| **Ground Water**[1] | High salinity | Region is relatively dry, hence yield of groundwater aquifers can be limited. Moreover, yield likely to reduce during drought periods. | High energy requirement particularly for treatment as desalination will be required.<br><br>Generates highly saline wastewater. | Difficulties in securing ground water entitlements. | High capital and Operation & Maintenance (O&M) cost. | No |
| **Storm water**[1] | Highly polluted (pathogens and chemical pollutants) as storm water runoff from various areas. | Region is relatively dry and annual rainfall is low, therefore yield will be low. | High energy requirement particularly for treatment. | Potential for under or oversizing the asset due to variabilities associated with prediction of storm water volumes. | High capital and O&M cost. | No |
| **Rainwater Harvesting**[1] (I.e., rainwater tanks and package treatment unit at customers' properties) | Reasonably good quality but requires some degree of treatment for indoor use. | Region is relatively dry and annual rainfall is low, therefore, yield will be low. | Relatively low energy requirement. | High complexity in planning and delivery due to decentralised nature of the system.<br><br>Risk of failures due to potential O&M issues.[2] | Relatively low capital cost. However, there is a risk of increase in O&M cost due to potential failures. | No. Mainly, due to low yield and potential O&M issues. |

| Option | Source Water Quality | Quantity of water | Energy/ Environment | Procurement, delivery and O&M risks | Cost | Overall Feasibility? (Yes/No) |
|---|---|---|---|---|---|---|
| **Recycled Water**[3] | High concentration of pollutants (pathogens, chemical pollutants, and salinity) because source water is sewage. | Towns serviced by LMW are small and the largest town is Mildura with population approximately 48,650 and 2nd largest town is Swan Hill with population approximately 9,700. Therefore, volume of recycled water that can be produced or reused is very limited. | High energy requirement particularly for treatment to achieve high quality recycled water such as Class A, that can be supplied for several uses except for human consumption.<br><br>Production of lower quality recycled water such as Class C also requires relatively high energy. | High complexity in planning and delivery.<br><br>Risk of cross connection with potable water, particular for dual reticulation systems. | High capital and O&M cost.<br><br>Note that dual reticulation networks are required to supply recycled water (Class A) to residential customers. However, provision of dual pipe supply to the existing customers is impractical. | No.<br><br>Mainly, due to low yield and economic viability.<br><br>However, supply of recycled water equivalent to Class C or B quality can be considered for suitable end uses.[4,5] |

1. Refer to Section 3.1 for more information about climatic conditions of the region, which has a significant influence on the feasibility of these options.
2. For this option, rainwater tanks and package treatment units to be installed at each customer property. Customers are generally responsible for the O&M of the tanks and treatment units, which can lead to failures due to lack of skill, attention, and finance. Alternatively, water corporation could take the O&M responsibility, which can also have a number of risks such as getting access to the units, availability of spares, staff required to maintain several units and security of asset etc.
3. Victorian guideline for water recycling (EPA Publication No. 1910.2) March 2021, specifies three classes (A, B & C) of recycled water based on the water quality objectives, where A and C being the highest and lowest quality respectively.
4. Based on the projected wastewater inflows and potable water demand in 2045, maximum volume recycled water that can be produced from Mildura and Swan Hill wastewater systems are 27% and 28% of the potable water demand of Mildura and Swan Hill water supply systems respectively. However, it is not possible to reuse all recycled water that can be produced due to the following reasons: 1) High quality (Class A) recycled water is required to provide dual supply to residential customers. Note that it is impractical to provide dual supply for the existing customers, who account for majority of the demand, 2) production of Class A recycled water is not economically viable, 3) limited uses for lower quality (Class B or C) recycled water, and 4) most common reuse application is irrigation, and it is seasonal.
5. An assessment showed that potential demand for watering public open spaces in Mildura and Swan Hill is in the order of 3% of total potable water demand of these systems. Therefore, volume of potable water that can be offset by recycled water is insignificant. It should be noted that LMW is already supplying recycled water from the Koorlong WWTP to a 3rd party farm for irrigation, however their usage does not have an impact on the potable water demand. Therefore, reuse at the farm do not directly help to offset potable water demand, but it can be considered as an indirect benefit by reducing the raw water extraction from the Murray River.

As detailed in Table 17, none of these supply sources are feasible as standalone option to ensure water supply to our region. However, these options can be explored to supplement potable water. Particularly, maximising the use of recycled water for suitable reuse applications is considered in the strategy.

Given that there are no substantial alternatives to source raw water, the following three options were considered in this strategy:

1. Buy permanent water shares to increase the entitlement to maintain a buffer to ensure security of supply. Noting that volume of entitlement to be purchased will depend on adopted level of service.
2. Buy temporary water allocation shares in "dry years" to supplement supply.
3. A combination of option 1 and option 2 – Purchase volume of permanent entitlement to match the projected water demand and buy temporary water allocation shares during low water allocation periods (i.e., dry years).

Option 1 is considered the preferred option due to the following reasons:

- Buying temporary water allocation shares during dry years will be expensive and has reputational impacts associated with competing with "Irrigation customers" but remains a valid risk management tool during multiple years of drought.
- Forecasting when to purchase temporary water allocation shares will be difficult due to climate uncertainty, which poses a risk of unable to meet the demand and needing to impose measures such as water restrictions in an unplanned manner.
- Option 3 also have same risks but to a less degree.
- Most customers and stakeholders would like LMW to minimise the need to impose water restrictions, mainly to maintain green spaces, which contribute substantially to the amenity of our urban environments. The "green oasis" within an arid Mallee landscape.
- Potential to generate revenue by trading excess allocation in the water market during high allocation periods.

Note that the preferred option together with the selected complementary actions discussed in Section 9.2 form the preferred strategy for balancing supply and demand of LMW's service region.

As per the analysis, projected demand likely to exceed the supply in year 2025 (i.e., based on medium CCS). The analysis also showed that increasing water entitlements approximately equal to 50% of the projected demand in year 2025, will increase the supply to meet the demand beyond the WP 5 period (2023-2028). Moreover, maintaining water entitlements higher than the demand will enable to maintain a carryover volume, which could be utilised during the drought periods. The recent experience with low water allocations (2019/20) showed that having water entitlements with a buffer approximately 50% of the projected demand helped to ensure the supply to our region without needing to impose severe water restriction. Therefore, maintaining a buffer approximately 50% of the projected demand was used as a guide to estimate the additional water shares to be purchased during WP5.

Based on the supply and demand projections, the bulk water entitlement (30,971ML), the existing HRWSs (940ML of Murray and 550ML of Goulburn shares) and the anticipated purchase of additional water shares during the current Water Plan period (approximately 720 ML), the estimated volume of additional water shares to be purchased during the WP5 period is in the order of 1,049ML.

Note that additional water shares required to be purchased after the WP5 period was not quantified at this stage due to uncertainties associated with the demand and supply projections. Given that the UWS will be updated at every 5 years, LMW will continue to monitor the water supply and demand and utilise the information gathered to determine appropriate the volume of permanent water shares to be purchased in the future.

## 9.2. Complementary Management Actions

LMW will continue to invest in other complementary programs which offset the impacts of potential future supply shortfalls. These complementary works include:

- Reducing the demand for potable water.
- Alternative options to increase the supply of potable water.
- Either increase the supply of water, or reduce the demand for water, by alternative water sources.

For this UWS, the range of complementary options have been identified and assessed at a high level, building on assessments carried out for the 2016 UWS.

**Reducing Demand for Potable Water**

There are a range of potential actions that could be undertaken across each of LMW's supply systems that could reduce current and future consumption levels, summarised in Table 18.

**Table 18: Actions for Reducing Demand for Potable Water**

| Program | Actions |
|---|---|
| **Saving Water in the Home** | |
| Water efficiency education and awareness campaign | • Continue to participate in the Victorian Government's 'Target Your Water Use' program, which enables easy access to the information our customers need to make informed decisions about how they use water. Hence minimise water demand.<br>• Support and encourage schools in LMW region to participate in School Water Efficiency Program (SWEP).<br>• Renew advertising campaign regarding efficient water use.<br>• Promote water efficient appliances. |
| Efficient garden program | • Extend waterwise garden demonstration sites to other regions |
| **Saving Water in Commercial & Industrial Businesses** | |
| Sustainable Water Strategies/ Integrated Water Management | Assist Councils to implement sustainable water strategies by:<br>• Providing relevant data on water usage in the non-residential sector.<br>• Working with Councils on specific projects, particularly regarding reducing use of potable water on recreational and garden facilities (i.e., recycling / reuse options).<br>• Work with Councils to develop opportunities for integrated water management projects that are suitable for the dry Mallee climate. |
| Water efficiency and Consumption Reduction | • Work with top 20 major water users to improve water efficiency and reduce their water consumption. This will be undertaken by ongoing engagement with the identified customers. |
| Water efficiency education and awareness campaign | • Renew advertising campaign.<br>• Develop localised education initiatives & programs.<br>• Increased marketing via dedicated website, promotional material, community awards. |
| **Incentives and Rebates** | |
| Support for water efficient appliances | Continue to deliver programs for incentives and rebates for purchasing water efficient appliances. |
| **Policy and Regulation** | |
| Pricing | Review and revise pricing structure in line with government policy, noting that this will be undertaken as a part of pricing submission for WP5. |

**Improving the Use of Existing Supplies**

While LMW has made some substantial improvements in recent years to make more efficient use of existing supplies, a range of actions have been identified and assessed to further improve the use of existing supplies, summarised in Table 19.

**Table 19: Actions for Improving the Use of Existing Supplies**

| Program | Actions |
|---|---|
| **Savings in non-revenue water** | |
| Leakage detection program | • Undertake network leakage assessments.<br>• Improve metering program. |
| Water treatment plants loss reduction | • Undertake water audits at all water treatment plants to identify major losses.<br>• Implement controls or improvements to reduce the losses. |
| **Managing water security** | |
| Efficient use of carryover | • Continue monitoring and review program to assess impacts of carryover on system reliability. |

**Alternative Water Sources**

LMW will work with local governments and other public open space managers (e.g. Parks Victoria) to identify water sources to maintain priority open spaces such as sporting facilities, public gardens and street trees during drought to enhance community health, wellbeing and liveability. Identified open spaces and water sources will be incorporated into the DPP.

LMW will also work with other stakeholders such as farmers, commercial/industrial businesses, and property developers etc. to identify opportunities for use of fit for purpose alternative supplies. Any feasible opportunities identified through this process can be considered in the future pricing submissions.

A list of actions identified are summarised in Table 20. Figures 13 and 14 (following pages) illustrate the current utilisation of alternative water sources (i.e., alternative to potable water) such as recycled water, raw water and storm water in Mildura and Swan Hill respectively. The maps provide a valuable tool to assess future alternative water opportunities.

**Table 20: Alternative Water Sources**

| Program | Actions |
|---|---|
| **Recycling** | |
| Support uptake of recycled water by industry and Municipalities | Assess recycled water opportunities within Councils, golf courses and caravan parks etc.<br><br>Note that the existing Integrated Water Management (IWM) forums can be utilised to identify and implement potential opportunities for the use of recycled water in the LMW region. |
| Support uptake of recycled water for agriculture | Recycled water from the Koorlong WWTP is currently being reused for irrigation at a 3rd party farm. Assess additional opportunities for recycled water use by agriculture from the Koorlong WWTP. |
| **Stormwater** | |
| Roof water harvesting opportunities | Assess roof water harvesting opportunities in new developments |

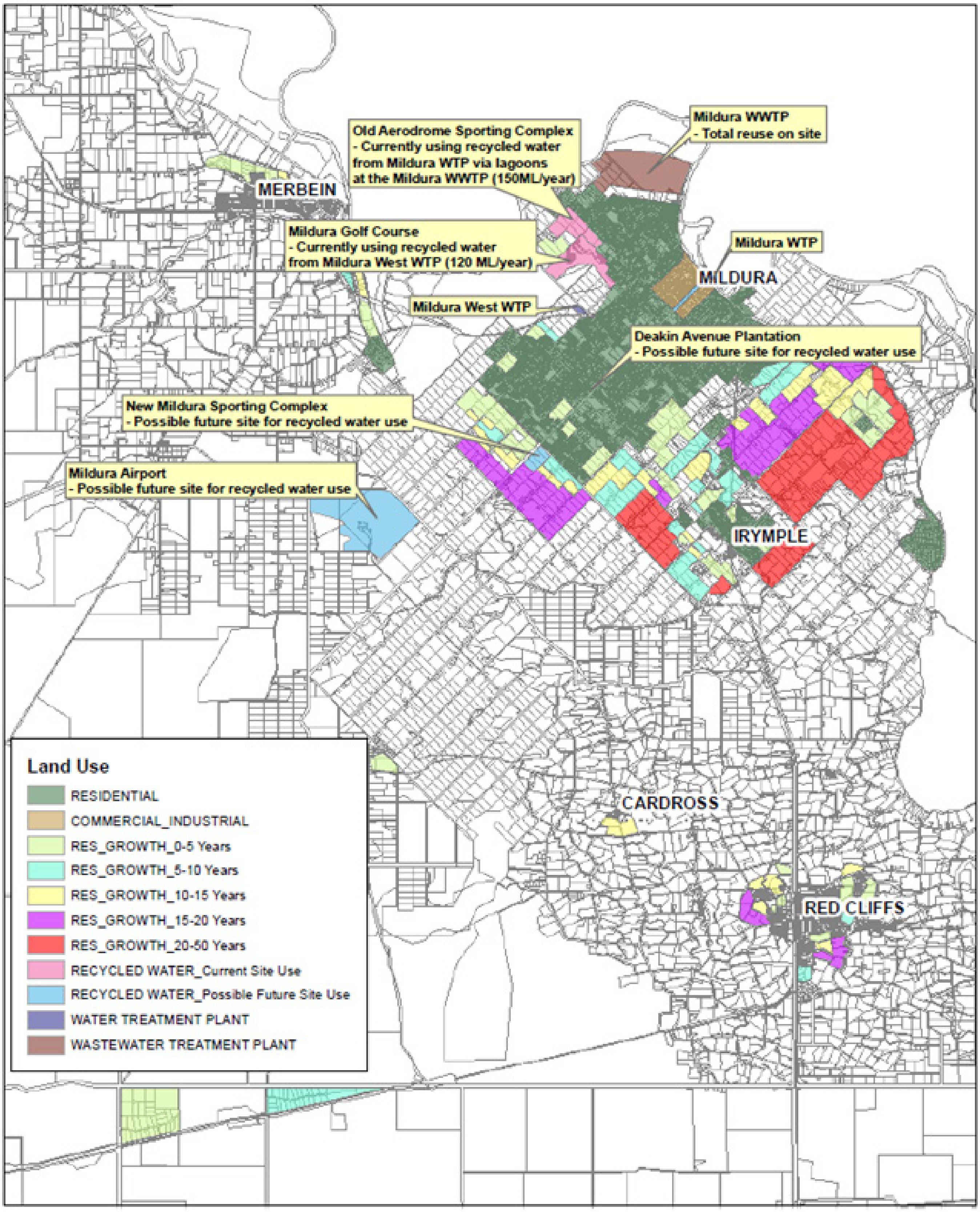



**Figure 13: Alternative Water Map for Mildura**

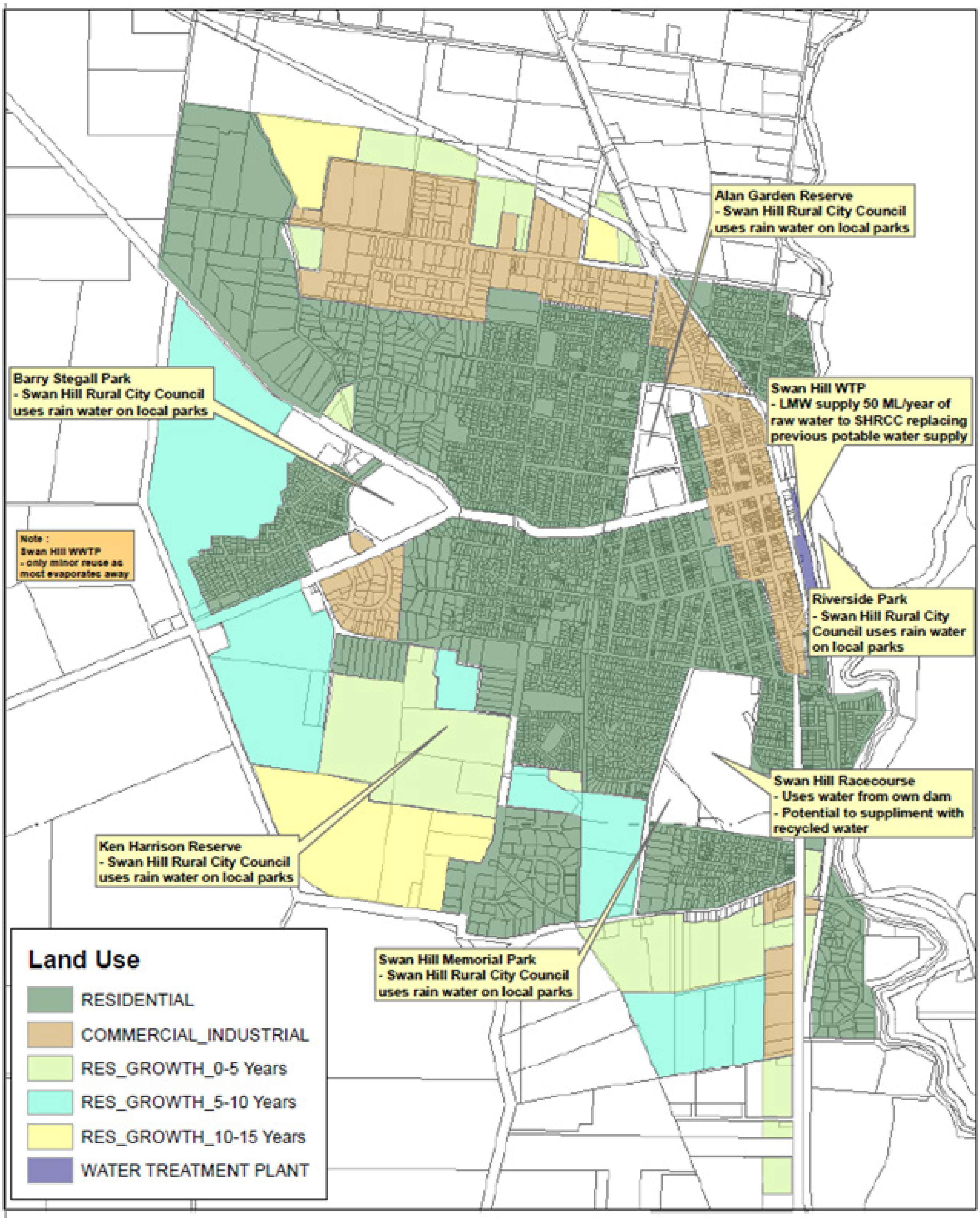



**Figure 14: Alternative Water Map for Swan Hill**

## 9.3. Options for Water Treatment & Supply Systems

The high-level options for production and distribution of safe drinking water to LMW's current and future customers and to comply with the regulatory requirements are outlined in this section. Note that LMW has recently completed a strategy to provide guidance on augmentation of water assets to cater for current and future customers.

An assessment of WTPs capacities against the projected peak day demands (PDDs), showed that all the WTPs except for Swan Hill, Murrabit and Piangil have sufficient capacity to cater for at least another 20 years. The current PDDs for Murrabit and Piangil systems are almost at the WTPs' nominal capacities. The Swan Hill system demand is predicted to reach the WTP capacity in around 2032.

**Mildura Water Supply System**

The Mildura water supply system consists of two WTPs with the combined capacity of 100ML/d, which would be sufficient to service up to around next 20 years. The long-term plan for Mildura is to augment the Mildura West WTP when required.

It was identified that the Mildura water distribution system requires additional treated water storage (TWS) to ensure security of supply in the next five years. Investigations are currently underway to develop a concept design for the new TWS.

**Swan Hill Water Supply System**

The capacity of the Swan Hill WTP is 30 ML/d, which is forecast to be exceeded in around 2032. Therefore, a new treatment plant with an initial capacity of 20ML will be constructed. The long-term plan is to decommission the existing plant and upgrade the proposed new plant with sufficient capacity.

A new 5 ML TWS tank is currently being constructed to ensure security of supply, which will be operational in 2022.

**Piangil and Murrabit Water Supply Systems**

The Piangil and Murrabit water supply systems consist of package conventional WTPs with 1.0 ML/d and 0.4ML/d capacities respectively. The assessment showed that capacities of these WTPs will exceed in the near future.

Piangil's water demand is mainly driven by a major non-residential customer, which accounts for approximately 50% of the demand. Therefore, short to medium term plan is to engage with the customer to install a storage tank at their property to eliminate their peak demand coinciding with the residential peak demand. Given the size of the system (i.e., no of connections) and PDD occurs only for short period of time in summer season, the Piangil water supply can be managed by carting water from the Swan Hill or other water supply systems to top up storages as required. The long-term plan is to connect Piangil to the Swan Hill system and decommission the Piangil WTP.

The assessment showed that the Murrabit WTP likely to exceed in around 2028. Given the size of the system and PDD occurs only for short period of time in summer season, water supply can be managed in the short term by carting water from the Koondrook or other water supply systems to top up storages as required. The long-term plan for Murrabit is to supply from the Koondrook WTP and to decommissioning the small package WTP.

## 9.4. Options for Wastewater Management

The high-level options to continue to provide wastewater services to LMW's current and future customers and to comply with the regulatory requirements are outlined in this section. Note that LMW has recently completed a strategy to provide guidance on augmentation of sewerage assets to cater for current and future customers. The compliance with the regulations including changes in the requirements such as introduction of General Environmental Duty (GED) under the *Environment Protection Amendment Act 2018* and opportunities to incorporate Integrated Water Management were also considered in the Strategy.

**Mildura Wastewater System**

The Mildura Wastewater System consists of two WWTPs. The Mildura WWTP plant is operated at lower capacity than its nominal capacity to minimise operation issues and most of wastewater is currently being treated at the Koorlong WWTP, which is relatively a new plant. The wastewater inflow from future growth will be treated at the Koorlong WWTP. Therefore, the following works are identified:

1. Duplicate the rising main from the Mildura reticulation network to the Koorlong WWTP to transfer additional flow due to growth.
2. Additional treated water storage and reuse area for the Koorlong WWTP to cater for additional flow and to meet regulatory requirements.
3. Continue to monitor the inflows and the performance of both WWTPs to determine additional works required in the medium to long term.

**Swan Hill Wastewater System**

As discussed in Section 7.2, the Swan Hill WWTP will have sufficient capacity to cater for growth approximately up to the end of the planning period. Therefore, no major works identified in relation to treatment. The available information related to growth indicates that most of the property development will occur in South-West part of the town known as "South-West Development Precinct (SWDP)". Therefore, some augmentations to the existing reticulation assets and new assets such as gravity sewers and pump stations need to be constructed to service the SWDP. Noting that most of the assets within the SWDP will be constructed by the developers in accordance with the LMW's specifications.

**Robinvale Wastewater System**

The assessment indicates that current inflow exceeds the nominal capacity of the Robinvale WWTP. However, the operational experience and treated water quality monitoring data do not support this assessment. Therefore, further detailed investigation will be completed as an immediate action to determine the actual treatment capacity of the plant. Any augmentations that may be required will be determined depending on the outcome of the investigation.

**Other Wastewater Systems**

The assessment indicates that all the other WWTPs (i.e., Lake Boga, Nyah/Nyah West, Kerang and Koondrook) do not require augmentation in terms of treatment capacity in the medium to long term. Therefore, no major works identified in relation to treatment. The available information related to growth indicates that most of the growth are occurring within the developed areas (i.e., infill growth) and the growth rates are not significant, therefore no major augmentation works are identified for the reticulation assets.

# 10. COMMUNITY AND STAKEHOLDER ENGAGEMENT

The 2022 UWS has been developed in consultation with our customers, key stakeholders, and the LMW Board. The UWS Project Team together with the Communications & Engagement Team has actively participated in consultation and engagement with key stakeholders and the community to help shape and influence LMW's UWS. The Consultation and Engagement Plan is included as Attachment 4 of the strategy document.

As part of the ongoing commitment to engagement and consultation with customers and stakeholders LMW will continue to engage with the community on several areas identified in the UWS and the Pricing Submission.

## 10.1. Stakeholder Identification and Engagement Methods

There are a range of internal and external stakeholders impacted by the UWS, with varying levels of influence and interest. Considering the potential level of interest and influence, the following stakeholders were consulted:

- Customers
- Traditional Owners and Organisations
- Local governments - Mildura Rural City Council (MRCC), Swan Hill Rural City Council (SHRCC) & Gannawarra Shire Council (GSC)
- Goulburn Murray Water (Bulk Water Supply Manager)
- LMW's Board and committees

The COVID 19 pandemic had a significant influence on the engagement methods that were deployed. Despite this we were able to undertake engagement activities via various forms including:

- Focus Groups consisting of various members of the community
- Surveys (online and postal)
- Social media
- Virtual meetings
- Face to face meetings

Initial engagement with our customers was completed via a survey. The survey was conducted via the following methods: 1) online surveys were emailed out to a random sample of LMW's customer database. LMW's website also displayed the link, and the survey was promoted via social media, and 2) mailouts of paper-based surveys were sent to customers, who may not have access to online services in the rural and remote parts of our service region. Fifty two paper-based surveys were returned. In total 542 participants completed the survey from across all towns in LMW's service region.

The focus group sessions were used to go through the aspects of the UWS in more detail including level of service (reliability), outcomes of the systems' performance assessment, options and complementary actions, with small groups of customers. The participants who expressed interest in attending focus group sessions in the initial survey were contacted to participate in the focus group sessions. Two virtual interactive sessions were organised, however the sessions were combined due to the number of participants. The focus group consisted of various cross sections of the urban water customer base and demography.

The First People of the Millewa-Mallee Aboriginal Corporation (FPMMAC) was consulted as a part of the engagement program. LMW will continue to attempt to engage with other interested Traditional Owner groups and individuals on specific themes and actions identified in the UWS and the Pricing Submission.

Virtual meetings were held with the relevant representatives from each council, who have areas of jurisdiction in LMW's service region. Councils were engaged as LMW's direct customers, who use potable water for some their assets of community significance such as public gardens, playing surfaces and public pools etc. and as well as the major stakeholder, who manage new developments to obtain information related to population growth and future development activities within their jurisdiction.

A virtual meeting was held with GMW to exchange information and understand the raw water storages and supply projections of the Murray River and Goulburn systems.

## 10.2. Summary of the Engagement Outcomes

### Customer Survey

Of 542 participants completed the survey, a large proportion of respondents were aged 65 plus with 41.98%, the next highest age group of respondents was the 55–64-year-olds with 21.83%. The lowest responding age group was those under 25 with 7 respondents in that age group.

With regards to level of service, 83.21% of respondents were happy with the current level of service (unplanned interruptions, taste, pressure, etc.) with the majority valuing that their water is delivered clean, no odour and their sewer systems remain reliable.

For the question 'What do they value most when it comes to your urban water supply?', 49.82% valued the water delivered is clean, has no smell and their sewer system is reliable as the most important. Followed by 30.81% who valued their water and sewer bills are affordable being most important.

With regards to question of willingness to pay more to ensure lower levels of water restrictions, 65.25% of respondents answered no. A closer statistic occurred for the question about their 'willingness to pay more to reduce/eliminate the impacts of events such as blackwater on water supply?', 49.34% responded yes and 50.66% responded no.

The above statistics to be looked in the context that the survey was undertaken at the early stage of the UWS development, and the respondents weren't provided with the details of water supply and demand projections, challenges in balancing supply and demand and options. Common comments made when respondents answered No to the willingness to pay more to increase the level of service were:

- Frustration with the pressure fluctuations and lack of water pressure from some respondents from small towns.
- Dissatisfaction with the taste and use of fluoride.
- High cost for current service fees.
- Wants to consider expanding sewerage service to Woorinen South and Piangil.

Common comments made relating to the question on "willingness to pay more on your water bill to reduce/eliminate the impact of events such as blackwater on your water supply" were:

- Questioning around why protection against blackwater should be at an additional cost and not something that customers are currently paying within the service delivery fee.
- Questioning around what black water is and the awareness about how to identify blackwater.
- Frequency of a blackwater event.
- Clean, safe, drinking water is a high priority.

### Focus Group Sessions

A virtual focus group session was held on 4 November 2021, with the participation of 11 customers. LMW presented information relating to the UWS and the risks associated with the water supply reliability. Facilitators discussed factors such as climate change and population growth in our region, resulting in additional risks associated with the future of our water supply.

There was a good understanding from the group regarding the challenges associated with balancing the supply and demand, concept of level of service, the options to maintain acceptable level of service and associated risks with the proposed options. LMW presented the three options discussed in Section 9.1 and the options of alternative water supply such as ground water, storm water and recycled water were also discussed.

Among the group there were diverse opinions on what reliability would be acceptable of our water supply. A small number of the group felt that climate change can have greater impact on water availability, hence willing to accept 90% reliability and acknowledged that under this case possibility of introducing some degree of restrictions is high. Overall, the consensus was the level of service valued was 95% reliability and were happy to take on some risk.

Key themes from the discussion forums can be summarised in the following topics:

- Continuous level of service and high quality of water.
- Customers were accepting of potential low impact of restrictions.
- Climate change -Considerations for the regional climate changes were discussed.
- Act environmentally friendly.
- Social responsibility for public gardens and green spaces.
- Continued investment in community education and intervention programs on water efficiency and climate change.
- Willingness to continue prudent levels of investment to reduce the need for imposition of severe water restrictions.

Subsequently, an urban water customers deliberative panel was formed as a part of the WP5 consultation.

The panel will meet twice however at the time of writing only the first round of meetings had been conducted. The feedback from the initial round of consultation does provide further evidence of customer support for measures both to reduce demand and to augment supply. Members of the panel were asked to prioritise amongst all the opportunities identified via a voting system.

The figure below shows that investing in recycling opportunities is strongly supported. Investing in additional entitlement is also strongly supported which reinforces the key messages received during the specific UWS consultation.

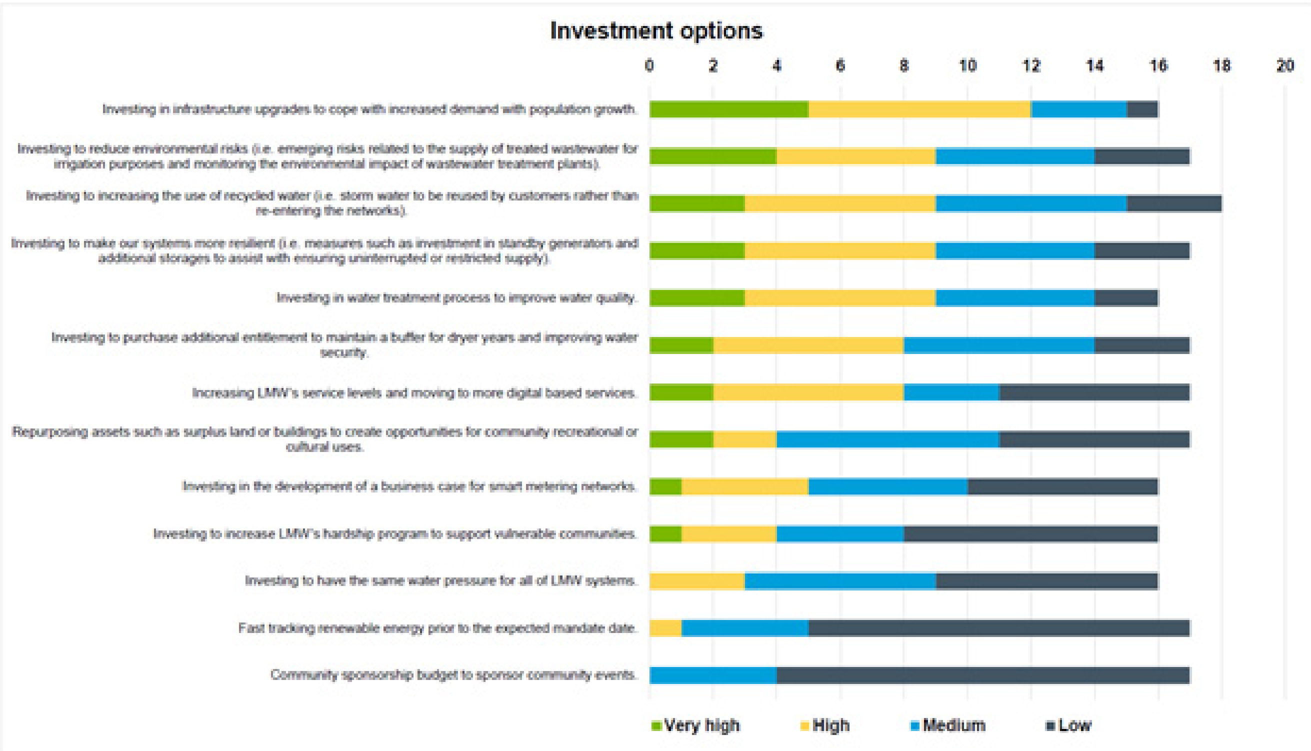



**Figure 15: Summary of WP5 Initial Consultation**

**Engagement with Traditional Owners**

As a part of the UWS development, a meeting was held on 7 July 2021 with the First People of the Millewa Mallee Aboriginal Corporation (FPMMAC) and LMW's representatives. This followed earlier contact between LMW and FPMMAC staff to explore interest and opportunities for involvement in preparation of the UWS. Although the UWS was the focus of the meeting, a wide range of topics were discussed.

Key discussion points were:

- Opportunities for Aboriginal communities to contribute their views, knowledge, and outcomes not only for this strategy, but also for other plans, projects etc.
- Recognition of the limited single source of water within FPMMAC's traditional lands and the need to maintain water quality within the broader Murray Darling Basin. The implementation of the Murray Darling Basin Plan and opportunities for FPMMAC to have access to water entitlements as part of allocation of water resource sharing within the Murray Darling Basin. While these discussions were outside of the scope of the UWS it helped to understand the priorities of FPMMAC and prompt discussions about how LMW and FPMMAC could explore commercial opportunities to provide economic benefit for local indigenous communities.
- There are opportunities for LMW to contribute to improve river health through either UWS or other projects. Noting that LMW is already involved in a number of river health improvement projects. Refer to Section 3.5.
- Future opportunities for engagement and collaborations.

LMW is actively exploring opportunities to procure services provided by FPMMAC.

For example, planting native vegetation in LMW sites (WWTPs' sites) to gain offsets for carbon emission as a part of the strategy to achieve LMW's carbon emission pledge. This may provide an opportunity to utilise plants from the native plant nursey that FPMMAC has established, provision of project management and monitoring/ maintenance services to establish and maintain these replanted areas.

Note that engagement with the Traditional Owners is ongoing as a part of the UWS and the Pricing Submission consultation processes.

**Engagement with other stakeholders**

Similar to the focus group session, virtual meetings were held with representatives from the councils and GMW. The information relating to the UWS and the risks associated with the water supply reliability including the risk factors such as climate change and population growth in our region, were presented to the participants.

Key discussion points with the councils were:

- Level of Service – General consensus was LMW to keep the water restriction as low as possible.
- Maintaining community assets such as public open spaces, gardens and ovals are important to improve liveability.
- MRCC mentioned that based on the millennium drought experience, severe water restrictions can cause significant damage to public green amenities. Particularly, trees may take long time to re-establish.
    - Council is looking at introducing drought tolerant plants for future public green amenities.
    - Use of raw water and other alternative water for irrigating public open spaces.
- SHRCC mentioned that green spaces (e.g., River Front, McCallum Street, the local ovals) would be considered as a high priority to maintain during any future drought periods.
- GSC mentioned that the council is exploring alternative water for irrigating public open spaces. Most of the public open spaces in Kerang and Koondrook are already on raw water supply. The council has also implemented a storm harvesting system at Riverside Park, Kerang. They will look at water efficiency and alternative water uses as a part of their climate adaption strategy, which is under preparation.
- Population growth and development areas were also discussed.
- SHRCC mentioned that Robinvale and Swan Hill are experiencing higher population growth rates compared to the other townships within Council. Victoria in Future (VIF) data does not provide the granularity for the future growth rates for these two towns.
- MRCC mentioned that population growth is less than the growth in new lots. LMW's approach to use the % increase in new connections to project growth and future demand is acceptable.

Key discussion points with GMW were:

- The impact of climate change is uncertain regarding water availability. However, an extended period of long dry period can be expected in the future.
- The security of urban water supply is unlikely to be impacted during a high climate change scenario/ ongoing extreme dry period. This is because the volume extracted from the river/ basin for the urban water is only 3%-4% of the total extraction. However, water restrictions may need to be imposed during prolonged drought periods.
- Macorna channel supply is one of the highest priorities for GMW to provide rural water to Kerang. Therefore 14/2 channel (a branch canal from the Macorna channel) would have a relatively reliable supply of water in the long term. Given that 14/2 is one of the sources of water for Kerang, the raw water supply for Kerang is relatively reliable.

# 11. RECOMMENDATIONS

Managing the impacts of reduced water allocations resulting from climate change is the main issue LMW is facing now and into the future. A range of initiatives has been implemented in recent years, such as purchase of permanent water shares to supplement the bulk water entitlement and carryover arrangements for unused allocations, which will assist to mitigate the impacts in the short term.
The preferred strategy for securing the region's water supply includes purchasing of additional permanent water shares from the water markets and a range of complementary actions aim to minimise the impacts of potential future shortfalls.

Purchasing of additional permanent water shares is a more cost-effective approach compared to large capital investments in new infrastructure. A planned approach in purchasing water shares provides flexibility in terms of the timing of decisions to purchase water. Whilst this option will minimise the need to implement water restrictions during dry periods, it presents an opportunity to generate revenue by trading excess allocation in the water market during high allocation periods.

It is also recommended to continue consultation with Councils, Traditional Owners and other stakeholders throughout the implementation of this UWS.

Actions to be implemented in response to drought periods are detailed in the DPP, which is provided in Attachment 1.

An action plan summarising the recommended actions to balance supply and demand over the 50-year period are provided in Table 21 (following page). This action plan will also inform some of the key works during the WP5 period (2023-2028).

**Table 21: Action Plan for Securing Water Supply**

| Action | Description | Timing |
|---|---|---|
| **Option to Increase Supply** | | |
| Buy permanent water shares to increase the entitlement to maintain a buffer to ensure security of supply. | In line with the feedback from the stakeholder engagement to keep the water restriction as low as possible.<br><br>Based on the supply and demand projections, the bulk water entitlement (30,971 ML), the existing HRWSs (940ML of Murray and 550ML of Goulburn shares) and the anticipated purchase of additional water shares during the current Water Plan period (approximately 720 ML), the estimated volume of additional water shares to be purchased during the WP5 period is in the order of 1,049ML.<br><br>Note that additional water shares required to be purchased after the WP5 period was not quantified at this stage due to uncertainties associated with the demand and supply projections. LMW will continue to monitor the water supply and demand and utilise the information gathered to determine appropriate the volume of permanent water shares to be purchased in the future. | 2023 - 2028 |
| **Reducing Demand for Potable Water** | | |
| Water efficiency education and awareness programs. | This action was strongly recommended by all the stakeholders.<br>Continue with the following actions:<br>1. Participating in Victorian Government's 'Target Your Water Use' program.<br>2. Support School Water Efficiency Program (SWEP).<br>3. Staff Training.<br><br>There is not enough data to estimate the demand reduction that can be achieved through these actions; however, it is anticipated that around 2 - 5% reduction in total demand can be achieved. | Ongoing |
| Community rebates and retrofit program. | LMW currently running a program to rebate for retrofitting water efficient appliances, particularly for those in hardship.<br><br>Since the millennium drought many customers have installed water efficient appliances in their homes and new properties are installed with water efficient appliances. Therefore, difficult to estimate the demand reduction that can be achieved through this action. | Ongoing |
| Water conservation programs. | Identification of major water use customers and work with them to minimise water use.<br><br>This is considered a short to medium term action as engagement with several customers and implementation of water consumption reduction measures will take a significant time.<br><br>Potable water demand of top 20 customers is approximately 7% of the total potable water demand. It is anticipated that 1- 2% reduction in demand can be achieved through this action. | 2023<br><br>Note that this action might continue for a few years. |

| Action | Description | Timing |
|---|---|---|
| **Improve use of existing supplies** | | |
| Improve metering and monitoring of the water supply systems. | This is to reduce the losses, hence reduce the volume water to be diverted from the river. This includes the following actions: | |
| | Audit of all the WTPs to identify areas for optimization to reduce plant losses. | 2024 |
| | Install flowmeters at strategic locations to monitor flows to better understand the water loss in the reticulation network. | 2023 - 2025 |
| | Review estimation of NRW by using billing data and metered data. | 2026 |
| Manage carryover to maximise system reliability during dry periods. | This will help to minimise the need to impose restrictions or need to purchase water shares during dry periods.<br><br>This action involves monitoring of water supply outlook and carryover volumes at least at annual frequency to make decisions on water trading such that appropriate volume of carryover is maintained. | On going |
| **Alternative Water Sources** | | |
| Work with the stakeholders to identify cost-effective opportunities for the utilisation of alternative water. | Aim to provide fit for purpose supplies to offset potable water. Based on the assessment of customers that are currently using potable water for watering to keep green amenities and potential new green amenities, around 1 - 2% of the potable water demand could be offset by provision of recycled water.<br><br>This action is considered a long-term action as it requires extensive engagement with the organisations who manage the facilities and the regulators and funding to install required infrastructure. | 2023<br><br>Implementation duration depends on the outcomes of engagement and funding availability. |

The recent experience and data confirm the effectiveness of the recommended actions (some of them are ongoing actions) in balancing water supply and demand. The following examples demonstrate their effectiveness.

1. LMW experienced low water allocations in 2019/20, which triggered the need for implementation of water restrictions. LMW was able to avoid the need for imposing severe restriction during this period mainly due to maintaining water entitlements with a buffer approximately equal to 50% of the demand, which helped to secure a reasonable volume of water even at lower allocations combined with "carryover" to utilise allocation in subsequent years.
2. The total water consumption and number of properties served in 2005/06 were 21,166 ML (unrestricted demand) and 29,190 respectively. Whereas total water consumption and number of properties served in 2020/21 were 22,040 ML and 34,769 respectively. If the water consumption per connection is same as the consumption as at 2005/06, then the total water consumption in 2020/21 should have been 25,208 ML. This shows that demand reduction of approximately 15% was achieved. This demand reduction could be attributed to introduction of the PWSRs and ongoing demand reduction activities such as water efficiency education and awareness programs, community rebate and retrofit program, and provision of fit for purpose alternative water to some public green amenities that previously used potable water (e.g., Mildura Aerodrome Sports complex is supplied with 150ML/year recycled water and SHRCC is supplied with 50ML/year raw water).

The likely mix of water supplies to service LMW's region in the future based on the recommended strategy is shown in Figure 15 (following page).

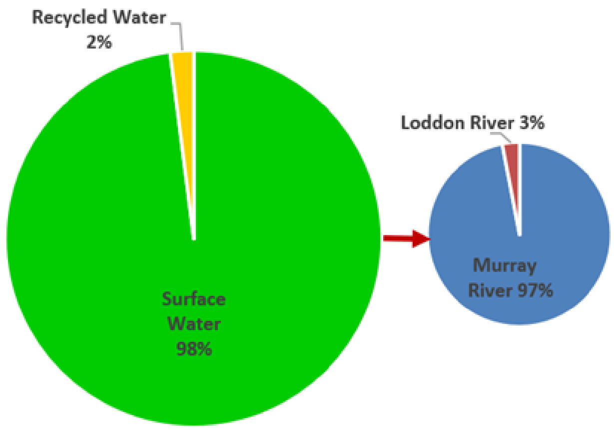



**Figure 15: Indicative Proportions of Future Water Supply Sources.**

**Water and Wastewater Systems Augmentation**
Table 22 below shows the recommended actions for augmenting the water and wastewater systems.

**Table 22: Action Plan for Water and Wastewater Systems Augmentation**

| System | Action Description | Timing |
|---|---|---|
| Water Supply Systems | | |
| Mildura | Construction of a new storage tank | 2026 - 2028 |
| Swan Hill | Detail design of a new WTP | 2025 - 2028 |
| Swan Hill | Construction of a new 20ML/d capacity WTP | 2029 - 2030 |
| Piangil | Engagement with the major non-residential customer, who contributes to the majority of demand (approx. 50%) to install a storage tank at their property. | 2023 - 2024 |
| Piangil | Connection to Swan Hill System and decommissioning of the WTP (long - term action). | To be determined. |
| Murrabit | Connection to Koondrook System and decommissioning of the WTP (long - term action). | To be determined. |
| **Wastewater systems** | | |
| Mildura | Duplicate the rising main from the Mildura reticulation network to the Koorlong WWTP. | 2024 - 2028 |
| Mildura | Additional treated water storage and reuse area for the Koorlong WWTP. | 2026 - 2028 |
| Swan Hill | Construction of a pump station and reticulation asset to service South-West Development Precinct (SWDP). | Timing will depend on the growth. |
| Robinvale | Investigation to determine the capacity of the Robinvale WWTP and determine if any augmentation is required. | 2023 |

**Monitoring and Reporting**
LMW will actively monitor the supply and demand balance as part of the implementation of this strategy. LMW has recently prepared an Annual Water Outlook, which will be updated on an annual basis and published for communicating supply reliability and level of service to our customers and the State Government. The Annual Water Outlook will enable the areas of greatest uncertainty to be tracked against the water supply and demand balance presented in the strategy, with actions being brought forward or deferred, as required.