

Goulburn Broken and North Central CMA Regional Irrigation Water Prospectus

Goulburn Broken CMA
April 2022

This prospectus provides information on the potential for irrigation in the Goulburn Broken and North central CMA Regions.

ACKNOWLEDGMENT OF COUNTRY

We acknowledge the Traditional Owners of the Country that we work on throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging and the Elders of other Aboriginal and Torres Strait Islander communities. Moreover, we express gratitude for the knowledge and insight that Traditional Owner and other Aboriginal and Torres Strait Islander people contribute to our shared work.

TO IRRIGATE LAND YOU NEED 4 ITEMS

- i. **Water** – all the available consumptive water is owned by someone and you can buy water from someone as entitlement or allocation. Water comes from a variety of sources and the volume available will depend on the water source.
- ii. **Water Use Licence (WUL) or a Take and Use Licence (TUL)** – this is attached to the specific site and it permits irrigation up to a limited volume under specific conditions. Sites without a licence or needing changed licence conditions are subject to Government approval under the Northern Victorian Irrigation Development Guidelines.
- iii. **Supply point with a right to connect** – this is either a Delivery Share within an Irrigation District supply system or a “Works Licence” for areas outside districts.
- iv. **Suitable soils** – this usually means finding well draining permeable soils, within established irrigation areas there is good soil data available to assist.

This document summarises the key issues and information to assist in obtaining the above four items, with most emphasis on the geographic location of water by subcatchment.

1 Overview of accessing water

HOW MUCH WATER IS NEEDED?

The **volume of water** needed depends upon area to be irrigated, climate (rainfall and evaporation) combined with the crop water requirements of the specific crop chosen. As a general rule of thumb the greatest water use is perennial pasture and the map below shows the average annual requirement across the State. Within the Goulburn Broken and North Central CMA areas perennial pasture requirements vary from 200 mm/y or 2 ML/ha at Marysville to over 1000 mm/y or 10 ML/ha at Swan Hill.

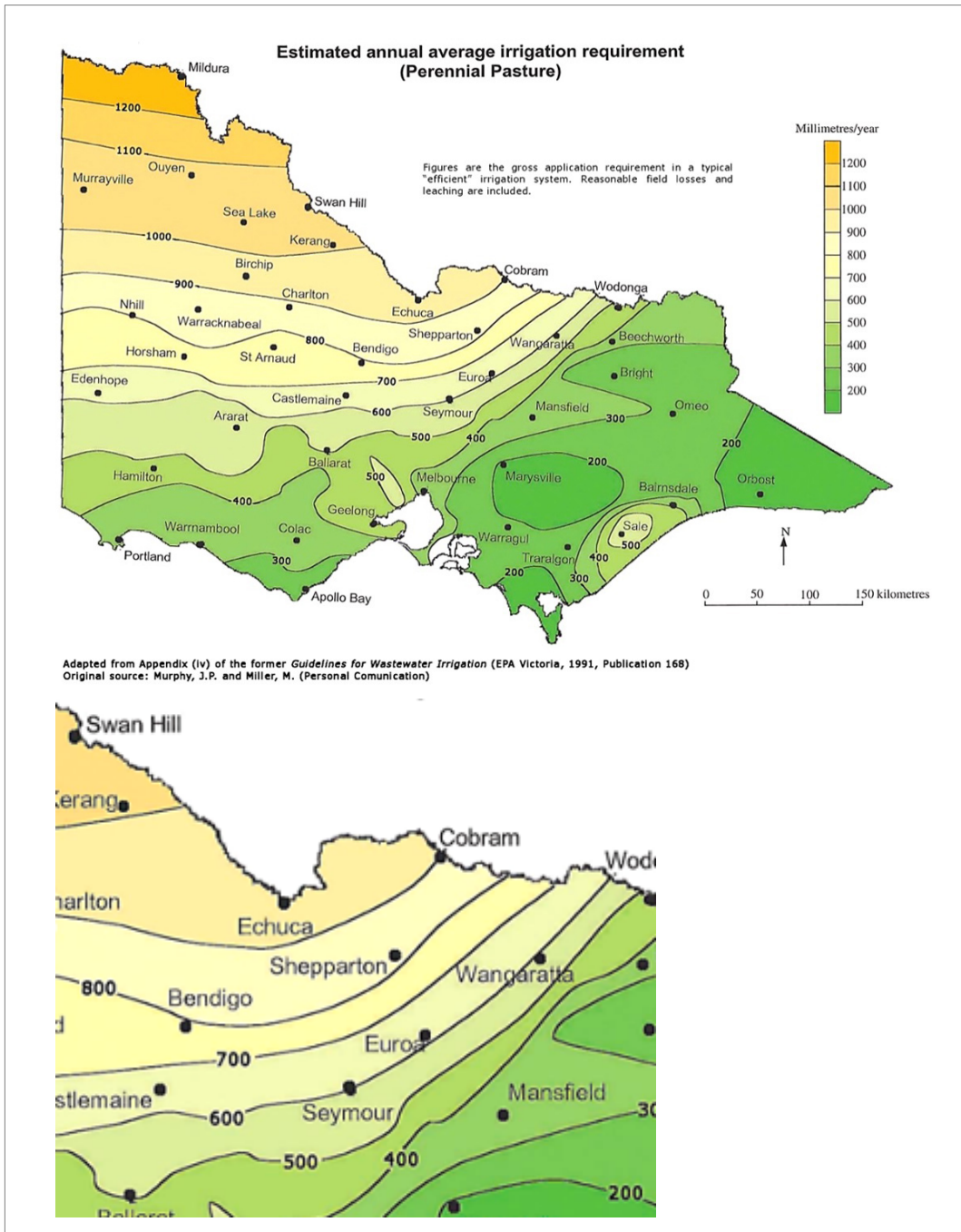


Figure 1-1: Perennial pasture average requirements – with study area

In any one year the requirement may vary by +/- 20% or more, especially in the upper catchment, where rainfall is a large component of usage. Other crops usually use less than perennial pasture with grape vines using around a quarter to half that shown for pasture.

Different sources of water have different reliabilities in that the volume available will vary from year to year. If you grow a perennial tree/vine crop then having water every year is essential whereas the area planted to annual crops can vary from year depending upon available water. The greater the reliability the greater cost of purchasing the water and so matching the crops with the appropriate reliability is critical.

Most of the water in the region available is of very high quality suitable for irrigation. However, groundwater and recycled water can have higher levels of salinity and other components. Different crops have different tolerances for water quality and so water quality needs to be checked. Information on the volumes of water available, it's reliability and quality for different locations for each of the possible water sources is provided in this document.

HOW MUCH INCOME CAN IRRIGATION WATER PRODUCE?

Understanding how much income can be generated by different activities is critical to what irrigation opportunities can be taken with different types of water in different locations. The following table gives an indication of the relative income for the northern parts of the two CMA Regions.

Table 1-1: Indicative gross income per ML across industries

CROP	PRICE	YIELD	ML/HA	INDICATIVE GROSS INCOME (+/- 50%)	
				\$/HA	\$/ML
Glasshouse crops	>\$2/Kg packed	>500 t/ha	10	>\$1 M	>\$100,000
Apples (Shepparton)	\$1.60/kg packed	45t/ha	6	\$72,000	\$12,000
Stonefruit	\$2,500/t	25t/ha	6 Shepparton	\$50,000	\$8,333 (Shepparton)
Canning Pears (Shepparton)	\$400/t	44t/ha	6	\$17,600	\$3,000
Citrus	\$700/t	35t/ha	12	\$24,500	\$2,040
Dried fruit	\$1,800/t	7.5t/ha	8	\$13,500	\$1,690
Wine grape -warm	\$500/t	25 t/ha	6	\$12,500	\$2,083
Cooler climate	\$1,500/t	5t/ha	3	\$7,500	\$2,500
Barn Dairy	0.40c/l	12,000l/cow 10 t DM/cow -70% home grown = 7 t DM grown/cow = 7/3= 2.3t/ML 12,000/2.3= 5,000 l/ML	7 ML/ha (maize at 21 t DM /ha) with bought in protein (3t /ML)	\$6,300 feed value /ha or \$300 feed/t Converts to \$14,000 milk/ha value \$667 milk/t	\$900 feed/ML converts to \$2000 milk/ML
Dairy	0.40c/l	7,000l/cow, 2.5cows/ha	6	\$7,000	\$1,100
Maize (grain)	\$400/t	15t/ha	7	\$6,000	\$830
Winter cropping	\$230/t	8t/ha	3 plus winter rain	\$1,800	\$300
Irrigated livestock	\$100/dse	20dse/ha	3 plus winter rain	\$2,000	\$330
Dryland cropping	\$230/t	4t/ha	NA	\$900	NA
Dryland grazing	\$100/dse	8dse/ha	NA	\$800	NA but high values for stock watering

The table is indicative only and is shown to illustrate relative industry differences; individual farms vary enormously from the above. Capital invested will reflect the risk and expectation for profit. For example, glasshouses, having a higher capital requirement, will need to yield more profit than all other irrigation.

Table 1-1 gives an indication of how much each ML generates at the farm gate. An industry's ability to buy water is strongly related to these values, but this is not the whole story because the water buyer also considers the impacts of not irrigating on future years profits. This accounts for the cost of replanting and lost production for several years that applies to fruit/nut trees and vines. In extreme droughts this can result in horticulturists paying higher prices than the value of their current crop.

Other irrigators may also pay more for water than the value of their current production, this can be to maintain future years production by retaining herd genetics or to continue long term contracts with their customers. Also, sometimes an irrigator will pay a higher price than the average gross income per ML, because the last ML is needed to realise the whole crop i.e. the marginal value created by the last ML is very high. However, in any industry it is not sustainable over the long term to pay more than the profit generated per ML. Typically this can vary between zero/or negative to 20% of gross income, but is variable.

Horticulture returns are significantly higher than other agricultural enterprises and will be most likely to afford water when supply is limited.

Note that in upper parts of the catchments the water used per ha is considerably less than shown above but the income per ha is similar and lower irrigation requirements can result in higher per ML of irrigation water used.

WHERE DOES IRRIGATION WATER COME FROM AND HOW MUCH?

The water comes from five different sources and within each source there are individual system characteristics:

- i. **Regulated waterways (Eildon/Hume/Eppalock/Loddon storages) – largest source of water with over 1,100GL/y of usage** This is generally very reliable and generally there is the ability to trade water across the area within some restrictions, and comprises:
 - a. **The channel/piped system** with the distribution of water to irrigation or rural district properties managed by GMW or Coliban Water – 1,100 GL/y usage
 - b. **Diverting water from the regulated river sections** of the Murray, Goulburn, Campaspe, Loddon and Bullarook - 70 GL/y usage.

Surface water from regulated waterways is water sourced from regulated flows that are released from a large upstream reservoir or weir. In these systems, large volumes of water can be harvested and stored to provide a more reliable supply of water. The allocation of water is managed through seasonal determinations and the Minister's carryover and trading rules. Examples of regulated systems with large storages include the Goulburn system which includes Lake Eildon as the large storage. For the Murray systems, it includes Dartmouth and Hume dams.

- ii. **Diverting water from the unregulated river/creek sections** of the Loddon, Campaspe, Goulburn, Avoca and Bullarook. This water is less reliable and reliability characteristics are very site specific and the ability to trade water between existing sites is very limited.

- iii. **Groundwater which is very site specific and variable in reliability, quality, and quantity. This includes:**
- a. 131 GL/y usage¹ in the Mid Loddon GMA and the Water Supply Protection areas of Loddon Highlands (GL). Lower Campaspe and Katunga. These have individual management plans to ensure reliability and have ability to trade within each individual area.
 - b. 12 GL/y usage in the other Groundwater Management Areas. This comprises nine different areas with limited management controls and limited trading ability (GL).
 - c. 93 GL/y usage in the Shepparton Irrigation Region Management Groundwater Management Area which has a large volume of “shallow: groundwater though much of it is a form of recycling excess irrigation applications and very site specific.
- iv. **Farm dams** – there are around 30,000 registered dam sites throughout the catchments, particularly in the upper parts where rainfall is higher totalling 12 GL/y of estimated usage. Trade is not usual with this form of water, but maybe possible for short distances downstream.
- v. **Recycled water** – there are over 20 wastewater treatment plants that produce recycled water for agricultural use. This total used by agriculture is approx. 11 GL/y, but the total volume of recycled water is higher. This water is only available by direct negotiation with the specific municipality or industry involved.

ENTITLEMENTS, LICENSES AND ALLOCATIONS

Water is made available to irrigators as an entitlement with an annual allocation which varies for each of the different water sources.

Each water source has an extraction limit (cap) that are regulated by rules to share and protect the resource for users and the environment. A cap on water extractions means that any expansion in irrigation on a property must buy an irrigation water entitlement from another user. This can be achieved by a water trade from a property that is reducing or ceasing irrigation.

The key features of the different entitlements and water allocation process in each system is as follows:

- **Surface water from regulated waterways** – The entitlements are either HRWS (High Reliability Water Shares) or LRWS (Low Reliability Water Shares) which receive an annual allocation based upon the water harvested and stored in the large storages such as Hume, Eppalock, Eildon and Campaspe and Loddon storages. There is the ability to carryover unused water from one season to the next.
- **Surface water from unregulated waterways** – Usage is licensed. These waterways do not have large dams or weirs controlling the streamflow. Water is taken directly from these systems by pumps or diverted to off-stream storages. The volume of water available is based purely on rainfall and run-off, not on storage. Therefore, water supplies are more susceptible to variation in streamflow, and less water is available in the drier months and in drought periods. These resources are managed through rosters and restrictions that are administered by Goulburn Murray Water, (GMW). Water cannot be carried over from season to the next.
- **Groundwater** from bores. Management of groundwater in Victoria uses administrative boundaries known as groundwater management basins. These basins are areas of connected groundwater resources and are based on groundwater flow systems with GMW managing allocations and licence arrangements. All of these systems have an entitlement but the allocation system varies as –
 - Water Supply Protection areas. These have annual allocations with the ability to carryover water between seasons

¹ Based on 2018/19 climate year usage

- Groundwater Management Areas. These do not have annual allocations but rather each site can access water up to the licenced volume if there is sufficient water able to be extracted.
- Shepparton Irrigation Region Management Groundwater Management Area. These also do not have annual allocations and often the entitlement volumes exceed the available water. Because the systems are generally shallow (<30m) the available water is very susceptible to wet and dry seasons. Much of this water is excess applied irrigation water (percolating down into the groundwater) so is susceptible to amount irrigation applied in the same locality.
- **Recycled water** – There are no entitlements as such with this water but rather there is a contract between the treatment agency or industry with the individual landholder.
- **Private small catchment dams registered for irrigation**, each existing dam has a site specific entitlement where the owner collects and stores surface rainfall runoff from land with their dam for later use. The actual volume available each year is dependent on the local situation.

WHERE CAN I TRADE WATER?

The trading of water is explained at <https://www.g-mwater.com.au/water-resources/water-trading> and the Victorian Water Register at <https://www.waterregister.vic.gov.au/>. Trading rules for a site vary with the water source as follows:

Regulated Water Systems – In declared regulated water systems trade can be (almost) anywhere within the same valley in the form of:

- Entitlement trade², which is sometimes called permanent trade, where the water share entitlement changes ownership
- Allocations trade, which is sometimes called temporary trade, which is equivalent to leasing water from another entitlement holder, usually for a limited number of seasons, typically one. Where the allocated water is transferred from the entitlement holder to another user via their allocation bank account (ABA).
- Intervalley trade of entitlements and allocations are subject to trading rules and is relatively limited
- Trade within irrigation districts is subject to the purchaser having sufficient Delivery Shares to enable delivery (refer later).

Unregulated Surface Water Systems – The trading of water is limited to:

- Licensed volume, where water can be used downstream of previous use – this can be a permanent or temporary trade.

Groundwater Systems – The trading of water varies between management areas and the rules are explained at <https://www.g-mwater.com.au/water-resources/ground-water/management>

- Water Supply Protection areas and mid Loddon GMA both entitlements and allocations can be trade within the area subject to local constraints
- Groundwater Management Areas. In practice there is little water of suitable quality available.
- Shepparton Irrigation Region Management Groundwater Management Area. Entitlements are not traded but rather there is opportunity for new entitlements to be issued subject to approvals and availability. In practice there is little water of suitable quality available.

Recycled Water – The trading of water is subject to the industry or town authority that produces the water.

Farm Dams – The trading of water is does not normally occur.

² Except for Regulated Coliban System where trade in licensed volume not entitlement

HOW DO I TRADE WATER?

Victorian water register

Victorian water entitlements are recorded in the Victorian Water Register, which provides an authoritative record of the entitlements and available allocation as carryover, seasonal allocation and trade. Useful information for water users about water entitlements, seasonal allocations, trade and transfers can be found on the Victorian Water Register website, waterregister.vic.gov.au.

The only water not included on the Water Register is recycled water.

Water Brokers

Water trading can be undertaken via a water broker or a private arrangement. Both must comply with water authority and Government regulations and forms. GMW also can assist, particularly in unregulated systems and Coliban Water maintain a register of buyers and sellers for their systems.

More information is available at <https://www.waterregister.vic.gov.au/water-trading>. And an approved list of brokers is provided by the Water Register at <https://www.waterregister.vic.gov.au/water-trading/broker-compliance>

HOW MUCH DOES WATER COST?

The cost of water entitlements and allocations varies between water sources and from year to year. The following gives some indication of the cost of water entitlements for the various systems based on current market prices. The following graphs indicate the entitlement prices for the Murray and Goulburn HRWS and LRWS trade.

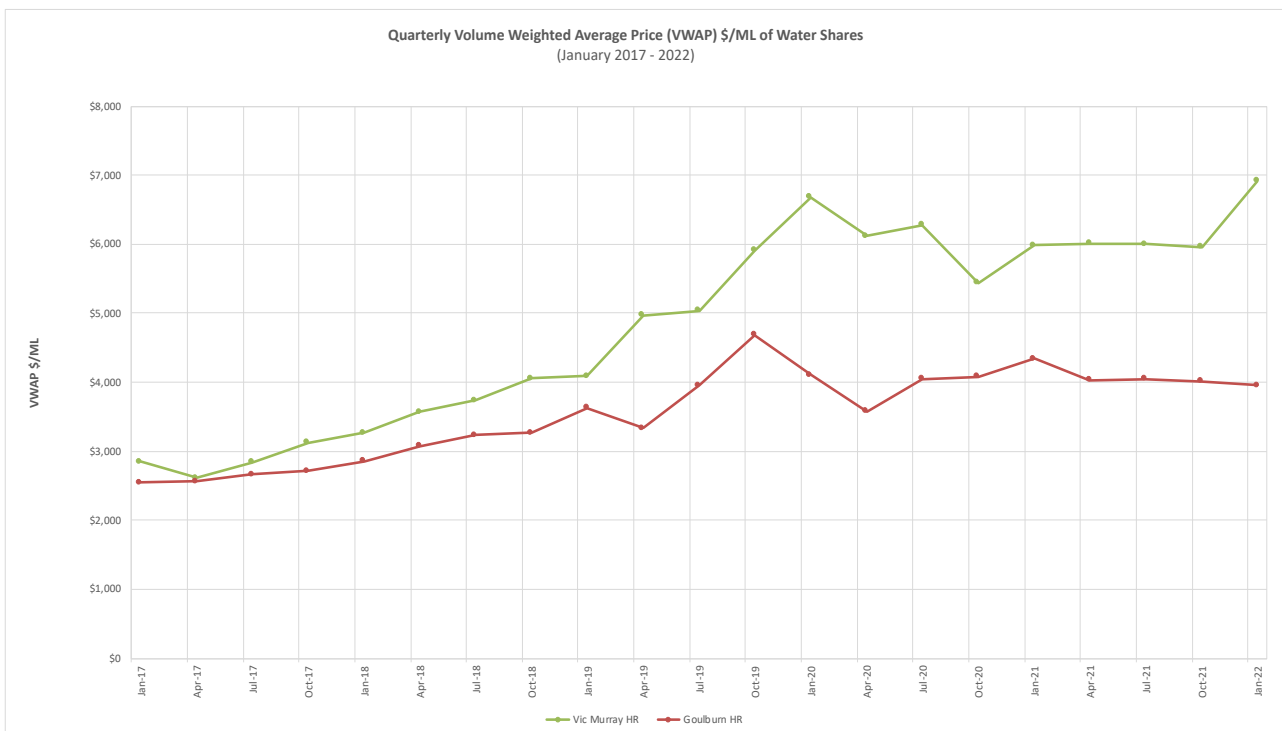


Figure 1-2: HRWS water trade prices

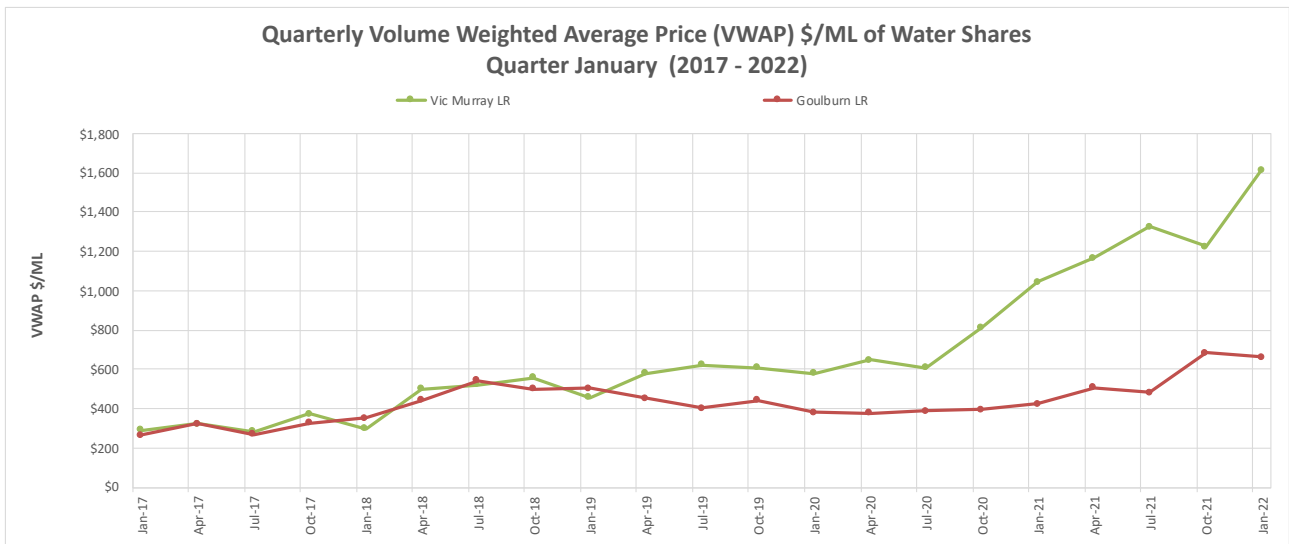


Figure 1-3: LRWS water trade prices

Allocations can trade only within the regulated surface system and the groundwater water supply zones. The following provides some indication of allocation historical prices for the Murray and Goulburn systems.

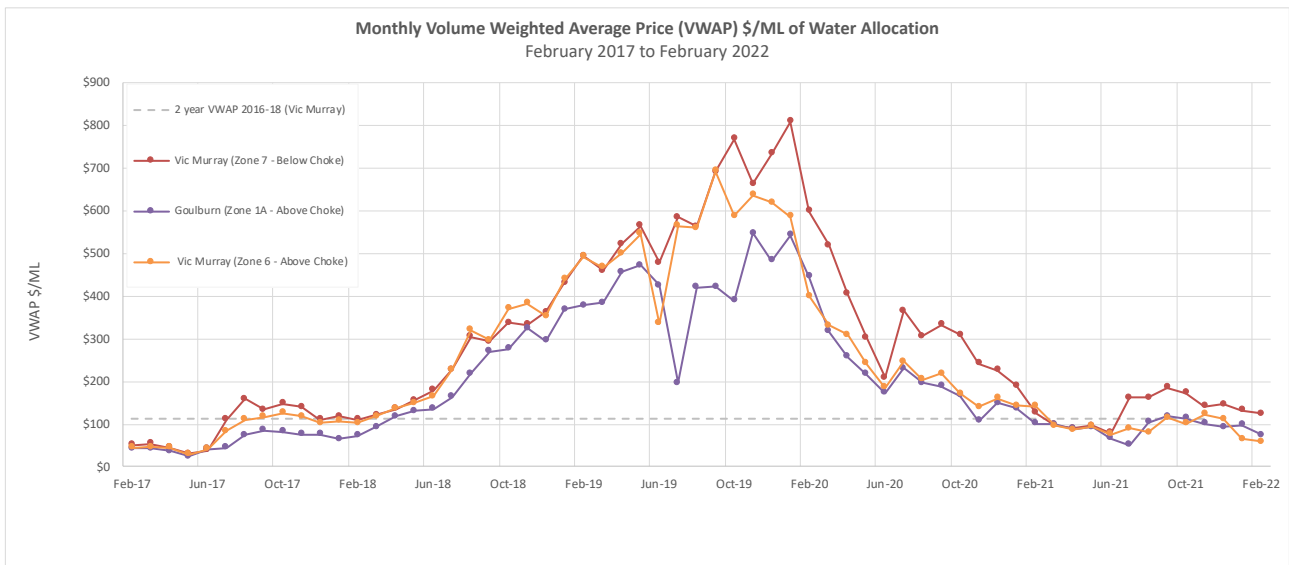


Figure 1-4: Monthly Volume Weighted Average Price (VWAP) \$/ML of Water Allocation

The Water Register also provides extensive up to date market information for different types of water entitlement and allocation.

CLIMATE CHANGE IMPACTS

Our climate has shown a warming and drying trend over recent decades, and this trend is expected to continue. In comparison to historical conditions we are already experiencing:

- Higher temperatures, particularly during the warmer months of the year.
- Reductions in rainfall in autumn and early winter, and in some locations, increases in rainfall during the warmer months.
- In some catchments, less streamflow is generated for the same amount of rain.

This prospectus uses recent years to estimate current water availability and drought water availability, but readers should bear in mind that climate change may further change availability.

2 Water Resources for Irrigation

2.1 SURFACE WATER

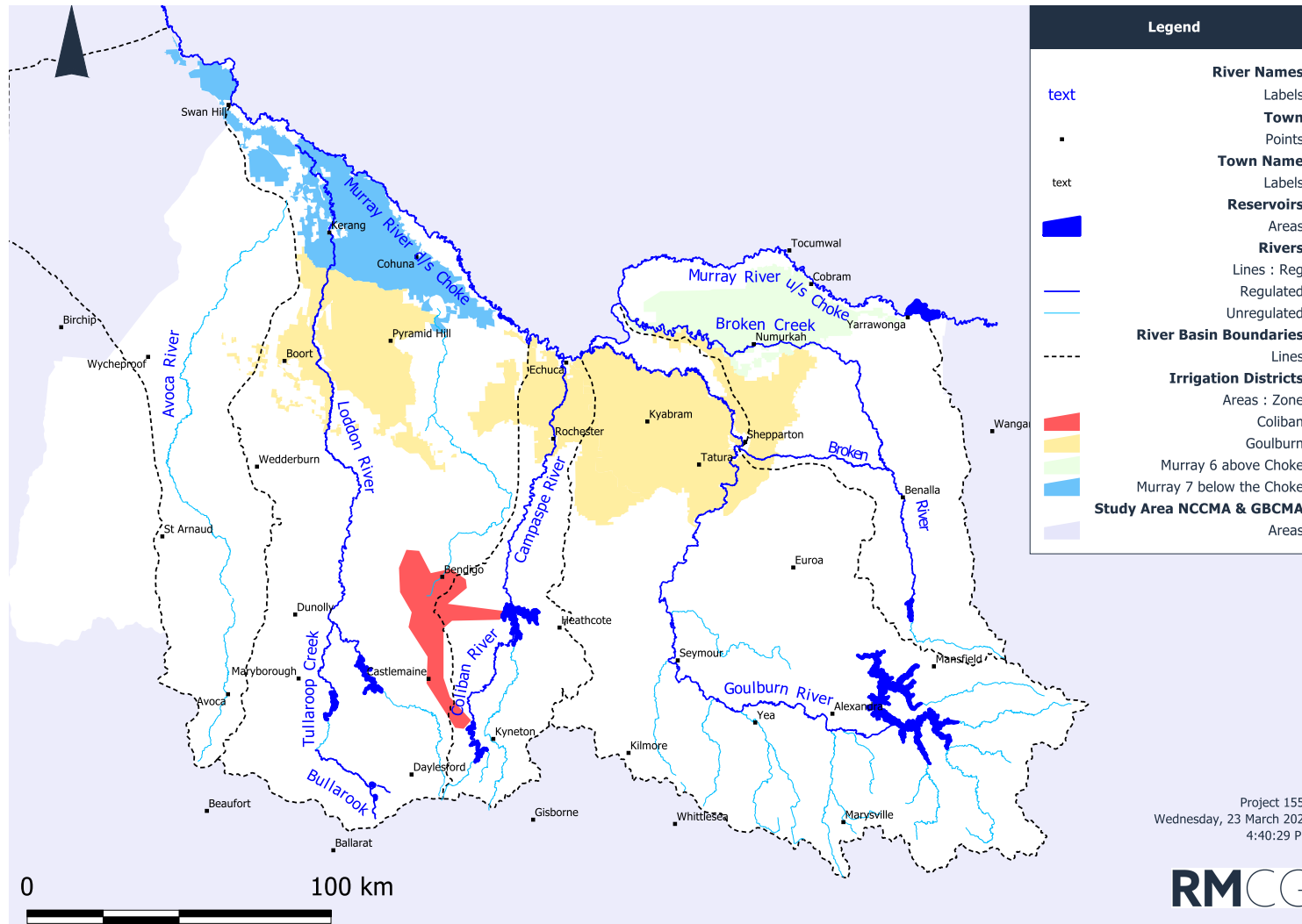


Table 2-1: Indicative water volumes, use and reliability by water supply system

	SUPPLY SYSTEM	# USERS ³	MAIN INDUSTRIES	HRWS ⁴ OR LICENSED VOLUME	LRWS	USAGE 2018/19 (TYPICAL YEAR)	USAGE 2019/20 (DRY YEAR)	HRWS ALLOCATI ON IN 2019/20	LOWEST ALLOCA TION YEAR IN LAST 20 YEARS	QUALITY
Regulated water										
GMID	Goulburn	9,000	dairy, hort, mixed	1,065,760 (690,000 ML held by irrigators)	472,522	674,000	341,000	80%	29%	<500 EC
	Murray 6 above Choke	1,800	dairy, hort, mixed	296,566 (197,000 ML held by irrigators)	125,565	171,000	75,000	66%	35%	<500 EC
	Murray 6B Lower Broken Creek	200	dairy, mixed	24,389	11,985	14,000	6,000	66%	35%	<500 EC
	Murray 7 below the Choke	3,000	dairy, hort, mixed	632,347 (299,000 ML held by irrigators)	169,925	233,000	104,000	66%	35%	<500 EC
Coliban system	Channel/pipeline supplies	1,382	d&s, hort, grazing	15,818	0	6,000	4,000	100%	30% (commercial) & 0% (non commercial)	<500 EC
Regulated Diverters	Goulburn	500	dairy, hort, mixed	47,908	14,335	19,000	13000	80%	29%	<500 EC
	Murray above Choke	300	dairy, hort, mixed	30,081	9,874	12,000	8,000	66%	35%	<500 EC
	Murray below the Choke	300	dairy, hort, mixed	19,790	7,551	8,000	5,000	66%	35%	<500 EC
	Broken	200	mixed	17,623	3,336	3,000	2000	2%	0%	<500 EC
	Loddon	200	Ann.I hort, mixed	21,391	8,079	12,000	9000	80%	0%	500-1000 EC
	Campaspe	200	mixed	23,465	19,175	11,000	4000	80%	0%	<500 EC
	Bullarook	20	Ann. hort, mixed	758	381	1,000	500	100%	0%	<500 EC
Total Regulated		17,102		2,195,896	842,728	1,164,000	571,500			

³ or licence holders

⁴ ML includes HRWS & LRWS water shares held by environment of the total entitlement. Also, "non water user" water shares have been assigned to GMID which will overestimate Murray zone 7 HRWS, as some will be in Lower Murray Water area. Estimates of HRWS held by irrigators in Region shown in brackets.

	SUPPLY SYSTEM	# USERS ³	MAIN INDUSTRIES	HRWS ⁴ OR LICENSED VOLUME	LRWS	USAGE 2018/19 (TYPICAL YEAR)	USAGE 2019/20 (DRY YEAR)	HRWS ALLOCATI ON IN 2019/20	LOWEST ALLOCA TION YEAR IN LAST 20 YEARS	QUALITY
Unregulated Water (Further detail is in Table 2-1)										
Streams	Loddon	202	non commercial, mixed	11,017		6000	5000	n/a	n/a	500-1000 EC
	Lower Loddon	102	mixed	8,354		6000	5000			
	Campaspe	118	non commercial, mixed	828		800	500	n/a	n/a	<500 EC
	Goulburn	773	non commercial, mixed	11,474		6000	5000	n/a	n/a	<500 EC
	Avoca	10	non commercial, mixed	2,289		90	50	n/a	n/a	>1000 EC
	Broken	145	non commercial, mixed	1,553		722	645	n/a	n/a	<500 EC
Total unregulated		1,350		35,515		19,612	16,195			
Registered Catchment dams (further detail is in Table 2-2)										
catchments usage for dams is after evaporation	Loddon	670	mixed	13,470		4000	4000	n/a	n/a	500-1000 EC
	Campaspe	341	mixed	6,058		2000	2000	n/a	n/a	<500 EC
	Goulburn	860	mixed	17,541		5000	5000	n/a	n/a	<500 EC
	Avoca	300	mixed	5,183		400	400	n/a	n/a	>1000 EC
	Broken	433	mixed	8,266		1000	1000	n/a	n/a	500-1000 EC
Total catchment dams		2,604		50,518		12,400	12,400			

Table 2-2: Unregulated streams by delivery system

DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME
120 BROKEN UNREGULATED			140 CAMPASPE UNREGULATED		
Baddaginnie Creek	13	249	Axe Creek - G-MW	10	115
Broken Catchment D/S Caseys		2	Back Creek Tributaries		-
Broken River (Upper)	8	56	Campaspe Catch (Epp to Weir)		1
Broken River Tributaries	6	170	Campaspe River Tributaries	3	85
Chinamans Creek - Broken		3	Campaspe River U/S Eppalock	21	103
Hollands Creek	45	409	Coliban R D/S Malmesbury Res	35	98
Lima Creek	23	368	Emu Creek	4	19
Lima East Creek	12	149	Falls Creek - Campaspe		2
Ryans Creek - Broken Unreg	29	97	Five Mile Creek	4	38
Samaria Creek		9	Mcivor Creek	12	140
Sams Creek	3	31	Meadow Valley Creek		25
Watchbox Creek		8	Mia Mia Creek		4
Wild Dog Creek - Broken		2	Myrtle Creek - Campaspe		24
			Sheepwash Creek - Campaspe		49
			Smokers Creek	9	29
			Stockyard Creek - Campaspe	3	61
			Wild Duck Creek	8	35

DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME
110 GOULBURN UNREGULATED								
Acheron River	112	1,764	Goulburn Catchment (Eildon-GW)		63	Reedy Creek (Dabyminga)	4	44
Allisons Creek	5	58	Goulburn R U/S Lake Eildon	45	141	Rubicon River	25	443
Back Creek - Goulburn		2	Goulburn Tribs (Eildon-G'Veir)	17	439	Running Creek - Goulburn		10
Bakers Creek	8	16	Goulburn Tribs U/S Eildon	5	16	Sailor Bills Creek		2
Big River		4	Health Creek	11	146	Sandy Creek - Goulburn	3	6
Boggy Creek (Delatite)		665	Home Creek	15	190	Scrubby Creek - Goulburn		2
Boundary Ck (Hughes Ck)	3	56	Home Station Creek		15	Snobs Creek	15	56
Brankeet Creek	20	77	Howqua River	24	221	Steavenson River	34	992
Bullock Yard Creek		107	Hughes Creek	24	1,438	Stirling Creek	7	188
Buttercup Creek		2	Jamieson River	68	171	Stockyard Creek - Goulburn		2
Chrystal Creek		25	Keppels Creek	6	353	Stony Creek (Narbethong)	9	24
Colonial (Spring) Creek	6	15	Kilmore Creek	6	225	Stony Creek (Ruffy)		2
Comptons Creek		2	Kurkuruc Creek	5	134	Sugarloaf Creek		4
Connelleys Creek	4	35	Little River	46	331	Sunday Creek - Goulburn Unreg	11	218
Crystal Creek - Goulburn	16	210	Little Steavenson River	3	43	Swamp Creek	4	20
Delatite River	76	678	Macks Creek	4	8	Taggerty River	5	271
Dip Creek		25	Majors Creek	7	14	Tallangalook Creek	13	26
Dom Dom Creek	3	5	Man-O-War Creek		13	Timbertop Creek	4	59
Doolam Creek	4	6	Merton Creek	9	87	Wildfellows Creek		2
Eglinton Creek	8	14	Mill Creek	3	221	Wilkes Creek	6	353
Elliotts Creek		205	Mollisons Creek	5	112			
Fishers Creek	12	111	Monkey Creek		2			
Fords Creek - Goulburn		76	Niagaroon Creek		83			
Gaffney's Creek		2	North Creek		2			
Glen Creek - Goulburn	5	10	Polettis Creek		2			
Godfreys Creek	13	109	Reedy Creek - Goulburn		2			

DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative)	VOLUME
150 LODDON UNREGULATED						151 LOWER LODDON UNREGULATED		
Adekate Creek	6	235	Loddon River U/S Cairn Curran	15	142	Bannacher Creek	6	282
Back Creek - Loddon	13	509	Loddon Tribs U/S Cairn Curran		2	Bendigo Creek	26	1,139
Barkers Creek	6	21	Mccallums Creek	8	194	Bullock Creek Lower	7	344
Bet Bet Creek - G-MW	8	309	Middletons Creek		32	Bullock Creek Upper	5	65
Bullarook Creek Tributaries	5	203	Mile Creek		17	Calivil Creek	11	1,308
Bullarook Creek U/S Newlyn Res	14	772	Mt Hope Creek	5	20	Grassy Flat Creek		89
Campbells Creek - Loddon	5	72	Muckleford Creek	5	69	Lake Boort		2
Captains Creek - Loddon	3	209	Myers Creek		28	Lake Meran	9	1,435
Caralulup Creek		168	Piccaninny Creek		570	Little Lake Meran		150
Coghills Creek	7	5,214	Pinchgut Creek	3	242	Loddon R (L'Weir to Kerang WP)	20	2,074
Creswick Creek	3	65	Rockylead Creek	4	140	Nine Mile Creek - Loddon		90
Deep Creek - Loddon		57	Sailors Creek	6	127	Penny Royal Creek		105
Forest Creek - Loddon		11	Slattry Creek		20	Seven Months Creek	4	360
Fryers Creek		2	Slaty Creek - Loddon	9	172	Twelve Mile Creek	3	311
Georgia's Creek		124	Stony Creek - Loddon		2	Wandella Creek	3	780
Green Gully Creek		10	Wallaby Creek - Loddon	5	74			
Jim Crow Creek	14	61	Wombat Creek - Loddon	9	149			
Joyces Creek	5	76	Wombat Creek Tributaries		2			
Kangaroo Creek - Loddon	5	132	Yandoit Creek		4			
Kennedy's Gully		4						
Kinypanial Creek		52						
Langdons Ck Upper	8	374						
Langdons Creek Lower		123						
Lawrence Creek		2						
Leitchs Creek		10						
Loddon Catch (Bridgew-L'Weir)		7						
Loddon R Tributaries (U/S CC)	3	189						

Table 2-3: Registered catchment dams by delivery system

DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME
NOT TRADABLE - BROKEN			Not tradable - Campaspe		
Baddaginnie Creek	11	199	Axe Creek - G-MW	46	1,012
Boosey Ck U/S 7/3 Inlet	21	315	Back Creek Tributaries	22	153
Broken Catchment (Niil-Caseys)	31	618	Campaspe Catch (Epp to Weir)	37	1,228
Broken Catchment D/S Caseys	33	871	Campaspe Catch (Weir to WWC)	6	48
Broken River (Upper)	11	678	Campaspe Catch (WWC-Murray)	9	123
Broken River Tributaries	26	357	Campaspe River Tributaries	21	279
Chinamans Creek - Broken		20	Campaspe River U/S Eppalock	45	645
Hollands Creek	13	614	Coliban R D/S Malmsbury Res		49
Lake Mokoan Catchment	22	291	Coliban R U/S Malmsbury Res	53	1,003
Lima Creek	9	98	Emu Creek	17	273
Lima East Creek		69	Five Mile Creek	5	110
Lower Broken Ck Catchment	232	3,831	Lauriston Reservoir	3	53
Pine Lodge Creek		42	Little Coliban River	22	376
Ryans Creek - Broken Unreg		25	Mcivor Creek	9	116
Samaria Creek		7	Mia Mia Creek		9
Sams Creek		21	Myrtle Creek - Campaspe	7	126
Upper Broken Creek Catchment	16	210	Native Gully Creek	3	64
			Sheepwash Creek - Campaspe	13	50
			Shepherd's Hut Creek		3
			Sweenies Creek	5	128
			Wild Duck Creek	15	210

DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME
NOT TRADABLE - GOULBURN								
Acheron River	20	233	Hirts Creek		2	Reedy Lake	2	43
Ault Beag Creek		3	Home Creek	7	109	Rocky Creek - Goulburn	3	150
Bakers Creek		7	Honeysuckle Creek	9	140	Rubicon River	3	359
Boggy Ck (Yea R)	3	291	Howqua River		2	Seven Creeks	46	835
Brankeet Creek	4	72	Hughes Creek	57	797	Steavenson River	3	23
Burnt Creek - Goulburn	5	51	Island Creek	4	51	Stony Creek (Seymour)		4
Castle Creek - Goulburn	11	231	Kalatha Creek	3	35	Stony Creek (Trib Honeysuckle)	8	214
Central Goulburn Irr. Area	2	134	Katys Creek		41	Strath Creek	8	22
Chyser Creek	2	37	Kilmore Creek	9	132	Sugarloaf Creek	8	83
Congupna Creek	5	72	King Parrot Creek	15	106	Sunday Creek - Goulburn Unreg	30	721
Connelleys Creek	5	185	Kurkuruc Creek	7	56	Swamp Creek		28
Creightons Creek	12	119	Limestone Creek - Goulburn	3	23	Waranga Reservoir Catchment		1
Crystal Creek - Goulburn	4	135	Little River	5	16	Wilkes Creek		77
Cummins Creek		5	Little Steavenson River		14	Yea River	49	610
Delatite River	15	310	Majors Creek	12	57	Reedy Lake	2	43
Dom Dom Creek		165	Merton Creek	9	170	Rocky Creek - Goulburn	3	150
Eglinton Creek		10	Mill Creek	3	108	Rubicon River	3	359
Faithfulls Creek	8	491	Mollisons Creek	12	293	Seven Creeks	46	835
Fishers Creek		16	Mountain Creek - Goulburn		25	Steavenson River	3	23
Fords Creek - Goulburn	14	209	Muddy Ck (or Pranjip Creek)	19	583	Stony Creek (Seymour)		4
Godfreys Creek	5	86	Murrindindi Creek	8	344	Stony Creek (Trib Honeysuckle)	8	214
Goulburn Catchment (Eildon-GW)	60	1,279	Nine Mile Ck (Trib Creightons)		2	Strath Creek	8	22
Goulburn Catchment D/S McCoys	202	5,753	Number Three Creek		1	Sugarloaf Creek	8	83
Goulburn Catchmnt (GW-Broken)	56	580	Pheasant Creek		47	Sunday Creek - Goulburn Unreg	30	721
Goulburn Tribs (Eildon-GWeir)	50	574	Reedy Creek - Goulburn		8	Swamp Creek		28
Goulburn Tribs U/S Eildon		1	Reedy Creek (Dabyminga)	4	71	Waranga Reservoir Catchment		1
Health Creek	4	12	Reedy Creek Tributaries		78	Wilkes Creek		77
						Yea River	49	610

DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME	DELIVERY SYSTEM	PROPERTIES (indicative) 5	VOLUME
NOT TRADABLE - LODDON					
Jim Crow Creek	6	357	Piccaninny Creek		24
Joyces Creek	10	177	Pinchgut Creek	4	197
Kangaroo Creek - Loddon	20	197	Rockylead Creek	6	321
Kangeraar Creek	7	153	Sailors Creek	7	53
Langdons Ck Upper	15	562	Sandy Creek - Loddon		5
Lawrence Creek		3	Seven Months Creek		90
Leitchs Creek	11	89	Slattery Creek	4	17
Loddon Catch (Bridgew-L'Veir)	24	725	Slaty Creek - Loddon	13	500
Loddon Catchment (CC to Laan)	29	337	Spring Creek Tributaries	11	138
Loddon Catchment (Laan-B'wtr)	15	435	Stony Creek - Loddon		12
Loddon R (L'Veir to Kerang WP)	14	403	Tourello Creek	3	29
Loddon R Tributaries (U/S CC)	10	118	Tullaroop Creek Catchment	12	149
Loddon River U/S Cairn Curran	7	86	Tullaroop Creek Tributaries		6
Loddon Tribs U/S Cairn Curran	4	59	Wallaby Creek - Loddon	5	79
Mccallums Creek	26	344	Wombat Creek - Loddon	5	65
Middletons Creek		10	Wombat Creek Tributaries	3	68
Mt Hope Creek		1			
Muckleford Creek	44	970			
Musk Creek		14			
Myers Creek		4			
Piccaninny Creek		24			

2.2 GROUNDWATER

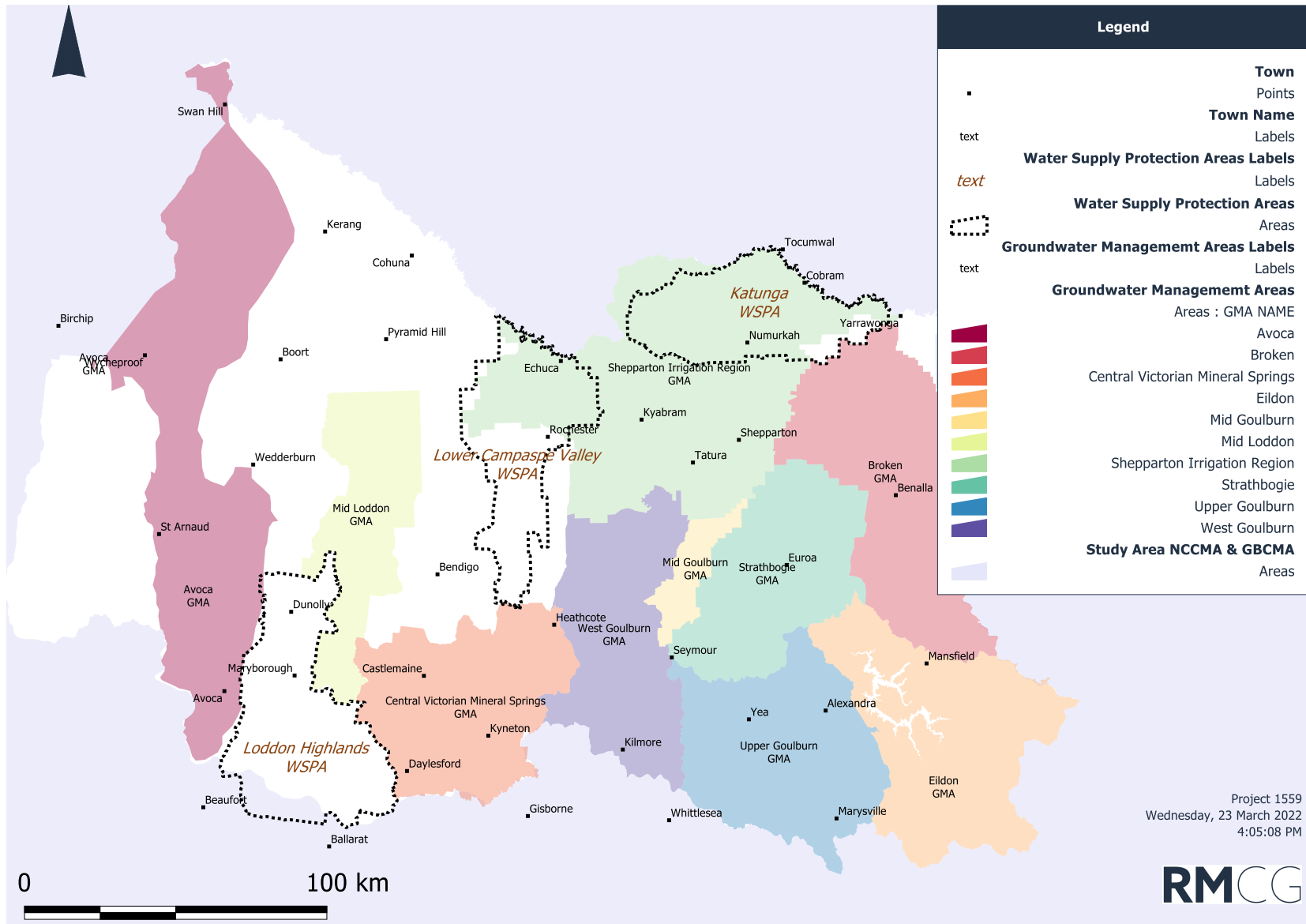
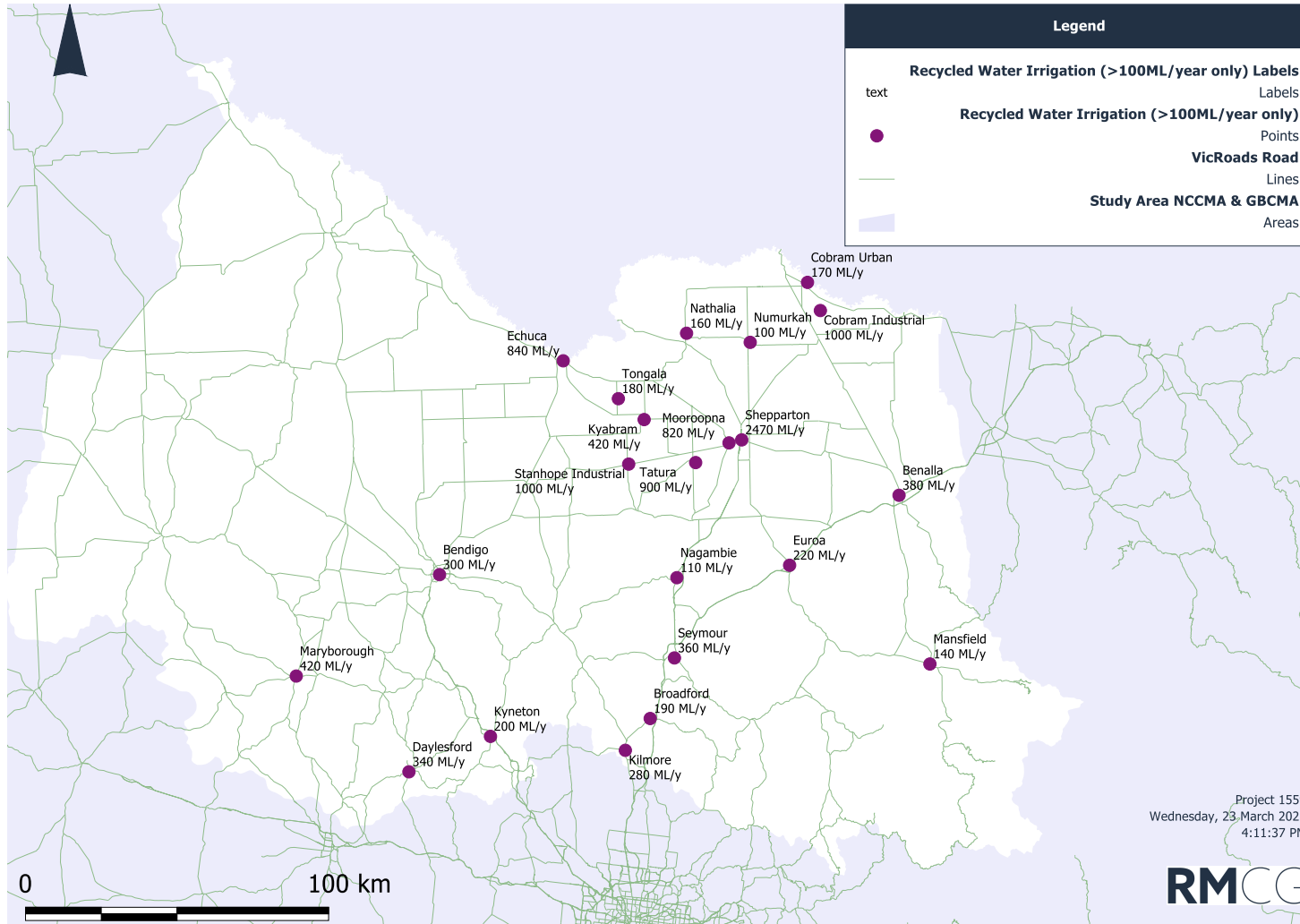


Table 2-4: Groundwater resources

GROUNDWATER SOURCE		#LICENCES	PCV OR LICENCED VOLUME IF NO PCV	USAGE 2018/19ML-TYPICAL CLIMATE YEAR	USAGE 2019/20 ML-DRY YEAR
Groundwater WSP areas	Katunga	268	60,577	41,104	37,837
	Loddon Highlands	181	20,697	9,097	6,071
	Lower Campaspe Valley	130	55,875	50,259	41,752
Groundwater management areas	Mid Loddon	102	34,037	30,310	20,147
	Broken	69	3,732	621	509
	Central Victorian Mineral Springs	142	6,024	1,090	1,154
	Eildon	26	1,496	216	216
	Mid Goulburn	65	12,470	4,766	4,029
	Strathbogie	59	1,660	529	558
	Upper Goulburn	116	8,568	935	968
	West Goulburn (8)	45	3,071	1,747	1,277
Avoca	50	2,915	1,751	1,602	
	Shepparton Irrigation Region	1054	184,937	93,828	106,719

Note groundwater quality for irrigation is high variable and is frequently >1,000 EC i.e. requires careful management, particularly on sensitive crops. Higher salinities tend to occur further west.

2.3 RECYCLED WATER



Note recycled water quality for irrigation is generally >1,000 EC i.e. requires careful management, particularly on sensitive crops. This agricultural usage includes agricultural use by urban authorities on their own farms, which may not be available to other users.

3 Regulatory framework

3.1 LEGISLATION

The *Water Act 1989* is the primary legislation guiding the management of Victoria's water resources. Under the Act, the Crown retains the overall right to the use, flow and control of all surface water and groundwater on behalf of all Victorians.

The Act establishes a water entitlement framework, and the government has established a water resource planning framework, to provide for the efficient and equitable sharing of Victoria's water resources.

The entitlement framework clearly specifies the legal rights and obligations of entitlement holders and the state in overseeing management of Victoria's water resources.

Victoria's water entitlement framework establishes the tools to ensure water can be managed to meet competing demands now and into the future. The framework establishes:

- Water entitlements
- Annual processes to allocate water to entitlements
- Ability to trade.

A feature of the framework is that it gives entitlement holders flexibility and certainty about how they manage their water, enabling them to make decisions and manage their own risks. This flexibility and certainty underpins investment decisions by irrigators, urban water authorities and industry. It allows water trade and new irrigation development to occur within strict rules and an overall cap on extractions that protect third parties and the environment.

All water supply systems have a cap or a limit placed on the total amount of water that can be taken from a system within a given timeframe, typically one year. Effectively, these caps limit the issue of entitlements in these systems so that water allocation and diversions do not:

- Impact on the resource and on access to the resource for other entitlement holders
- Impact on important environmental values
- Exceed the cap or limits on take from a resource.

3.2 GOVERNMENT AGENCIES

Irrigation water resources are managed by Goulburn Murray Water (GMW) within an overall Victorian policy framework overseen by the Department of Environment and Land, Water and Planning (DELWP) for the Water Minister. In this framework GMW manage:

- Reservoirs -the main water storages that regulate waterways
- Flows down regulated waterways to supply the Goulburn Murray Irrigation District (GMID)
- Flows down the channels and outlets within the GMID
- Flows to supply irrigators with their own pumps (these are known as diverters)
- Bulk supplies to many of the towns water authorities who then distribute and retail the water to town water users
- Rosters and bans on unregulated waterways
- Groundwater for irrigation
- Farm dams for irrigation.

GMW manage these water sources with a system of licencing, allocation policies, water trade rules and new irrigation development rules. While urban water authorities and the Environment Protection Authority (EPA) manage access and use of recycled water. In addition, the Goulburn Broken CMA and North Central CMA are responsible for waterway and catchment management.

Coliban Water's rural system near Bendigo is mostly for stock and domestic use, but does include some irrigation. It distributes water across their region via a network of open channel and pipeline systems. Water is sourced for this rural supply from their bulk entitlement to the Campaspe system.

In the Avon Richardson catchment (part of the North central CMA Region) Grampians Wimmera Mallee Water manage the rural water supply, but this is mostly for domestic and stock use and irrigation is negligible and has not been included in this prospectus.

3.3 ENTITLEMENTS AND LICENSING

3.3.1 REGULATED SURFACE WATER

In regulated surface water systems water shares are legally recognised perpetual entitlements to a secure share of the water available in a water system. Water shares have been issued only for large, regulated river systems. These are systems with dams or storages that harvest large volumes of water for regulated release to a large number of irrigation customers.

Water shares may be high-reliability (HRWS) or low-reliability (LRWS). The amount of water that may be taken under a water share in any year will depend on the allocation that is made in relation to water shares in that system and the amount of water in store. These allocations are made by the Northern Victorian Water Resource Manager and are usually made at regular intervals through the season (usually 1st and 15th of each month) at <https://nvrw.net.au>

Most of the regulated surface water systems in the region are “declared” in accordance with section 6A of the Water Act, with the Coliban rural system around Bendigo being the only significant exception. Coliban Water in Bendigo provides the management of this system.

The regulated systems in northern Victoria were declared on 1 July 2007. These included the Broken, Bullarook, Campaspe, Goulburn, Loddon and Murray systems that are downstream of GMW storages in the study area. In declared water systems, entitlements previously called water rights and take and use licences have been separated, or ‘unbundled’, into three separate elements. These are:

- A water share
- A delivery share in irrigation districts (or ‘extraction share’ in a works licence for a diverter)
- A water-use licence or a water-use registration.

A water share is the legally recognised, perpetual entitlement to a secure share of the water available from a declared water system. It gives the owner a right to a share of the water in the GMW dams. Water shares may be high-reliability or low-reliability. A water share is an entitlement to a share of the available water, which depends on seasonal inflows. Seasonal resource determinations specify the percentage of a water share that is available annually. Irrigators can also choose to carry forward unused water to the next year- this is called “carryover” and is subject to a number of rules. See GMW website at [link to carryover information](#).

A delivery share is an entitlement to have water delivered to land in an irrigation area, and it is subject to the available allocation. It gives access to a share of the available capacity in a channel or piped network that supplies water to a property. A delivery share is tied to the land and stays with the property if it is bought or sold. It also stays with the property if the water share is sold separately. For private diverters the equivalent to a delivery share is an extraction share, which is held on the works licence, which is required for the irrigator's pumping station on the river.

A water-use licence is a licence that authorises the use of water for the purposes of irrigation on the land specified in that licence: the use of water depends on available allocation. The licence sets out the conditions for use such as how much water you can use on your land in a single irrigation season, which is known as the Annual Use Limit (AUL).

Water-use licences are required for irrigation from the regulated Murray, Goulburn, Broken, Loddon, Campaspe, Bullarook, Werribee or Macalister systems. A water-use registration works in the same way, but it authorises use of water for purposes other than irrigation.

More information on entitlements is available from GMW. [click here to link to entitlement brochure](#)

3.3.2 IRRIGATION FROM UNREGULATED SURFACE WATER, IRRIGATION DAMS AND GROUNDWATER

In unregulated surface water systems, irrigation dams and groundwater - Take and use licences are issued under section 51 of the Water Act. They are fixed-term entitlements to take and use water from a waterway (in unregulated systems), catchment dam or groundwater.

The identification of land as a waterway is important because it has implications for landholders with respect to works and take and use licences and the referral of applications to catchment management authorities. If a waterway is not clearly a river, stream or lake, it can sometimes be difficult and contentious to identify whether land constitutes a waterway as defined in the Act. The guidelines to identify waterways are available at <https://www.waterregister.vic.gov.au/images/documents/WaterwayIdentificationGuidelines2022.pdf>

Each licence is subject to conditions specified on the licence. Licences are issued and managed in accordance with the 2014 Ministerial Policies for Managing Take and Use Licences. These policies set out matters and actions the Minister requires delegates (i.e. GMW) to consider or do.

3.3.3 NON IRRIGATION USE

For non-irrigation use Statutory rights are provided under sections 8 and 8A of the Act. These rights allow water to be taken without a licence under certain circumstances for specific uses, including:

- Domestic and stock: under section 8(1) and section 8(4)(c) of the Act, individuals can take water for domestic and stock purposes from surface water and groundwater from a small catchment dam or a bore. The water must be used for the specific purposes set out in the Act.
- Traditional Owners: under section 8A of the Act, any member of a Traditional Owner group who has a natural resource agreement under the Traditional Owner Settlement Act 2010 can take and use water from a waterway or bore for traditional purposes. Traditional purposes means providing for the personal, domestic or non-commercial communal needs of group members.

It should be noted that under the Act, a works licence is required to construct, alter, remove or decommission a domestic and stock bore greater than 3 m in depth. For small catchment dams, a take and use licence and/or a works licence is required to divert water from a waterway.

3.4 NEW IRRIGATION DEVELOPMENT

All irrigation developers must obtain a Water Use Licence⁵ (WUL) or a Take and Use Licence⁶ (T&UL) to enable water to be applied to land for the purpose of growing crops. It is important to note that approval for these licences need to be progressed in parallel with the approvals process for the associated Works through a Works Licence.

All developers of new irrigation developments (and significant re-developments) within the Goulburn Murray Water region of Northern Victoria must follow the Northern Victoria New Irrigation Development Guidelines 2020 (NVIDG). You are advised to contact an Irrigation Development Coordinator at Agriculture Victoria, before you proceed.

The Guidelines apply to previously unirrigated land for which there is no existing water-use licence or take and use licence, or **when a redevelopment would result in a change in the conditions of the existing WUL/T&UL.**

The Irrigation Development Coordinator (IDC) will explain the intent of the Guidelines, undertake a preliminary assessment of your proposed development. This will provide the developer with an understanding of the potential complexity of the assessment process, the information needed to be collected, and any issues which may impact on the time required to gain approvals and/or impact on the project cost structure.

The IDC will provide free impartial advice on a range of topics including explaining requirements and your responsibilities regarding native vegetation and cultural heritage considerations, planning controls for earthworks and off-site impacts (drainage and flood mitigation). The IDC will provide information and advice to ensure all irrigation design options are discussed and understood. The IDC can provide an information kit containing related fact sheets:

- Overview of the NVIDG process
- Irrigation and drainage plan
- Protecting Aboriginal cultural heritage
- Native vegetation protection
- Buffer standards for native vegetation protection
- Applying for a works licence
- Public land managers consent application
- Siting and design guidelines for works licences.

IDC contacts:

Echuca (west of the Goulburn River to Nyah)

- Kathy Long, Agriculture Victoria, PO Box 441, Echuca, Vic 3564, kathy.long@agriculture.vic.gov.au

Rutherglen (east of the Goulburn River and the North East)

- Dennis Watson, Agriculture Victoria, 124 Chiltern Valley Road, Rutherglen, Vic 3685, dennis.watson@agriculture.vic.gov.au

⁵ A Water Use Licence (WUL) applies to declared regulated waterways. Each licence has conditions set by the Minister for Water which are specified on the licence.

⁶ A Take and Use licence applies to either a fixed term or ongoing entitlement to take and use water from an undeclared waterway, catchment dam, spring, soak or aquifer. Each licence has conditions set by the Minister for Water which are specified on the licence.

4 Useful information

- Soils data— Agriculture Victoria provide soil survey information at [click here](#)
- Water shares in issue for each system [click here](#)
- Current and historical water allocations for surface water regulated systems [click here](#)
- Water trade opportunities between zones [click here](#)
- Tool to check current trading rules and limits [click here](#)
- Detailed trading rules for declared systems [click here](#)
- Map of trading zones [click here](#)
- Groundwater allocations [click here](#)
- Information on groundwater bores and quality [click here](#)

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