

11 Campaspe Basin

11.1 Location of Water Resources

The Campaspe basin is located within the Murray-Darling Drainage Division. It includes the Campaspe River, the Coliban River and various smaller tributaries such as Axe Creek and Mount Pleasant Creek. The Campaspe River discharges to the River Murray at Echuca. A map of the river basin is shown in Figure 11-1.

Water supply protection areas (WSPAs) within the Campaspe basin include part of the Campaspe Deep Lead WSPA. Groundwater management areas (GMAs) within the Campaspe basin include part of the Ellesmere GMA.

11.2 Responsibilities for Management of Water Resources

Goulburn-Murray Water is the licensing authority responsible for managing groundwater pumping and private diversions from the river basin.

Coliban Water operates the Upper Coliban, Lauriston and Malmsbury Reservoirs in the upper reaches of the river basin, whilst Goulburn-Murray Water operates Lake Eppalock. Coliban Water is responsible for the majority of urban water supply in the Campaspe basin, with Western Water supplying Woodend at the southern end of the basin. Coliban Water supplies rural customers via the Coliban Main Channel.

The North-Central Catchment Management Authority is responsible for waterway management in the Campaspe basin.

11.3 Seasonal Overview

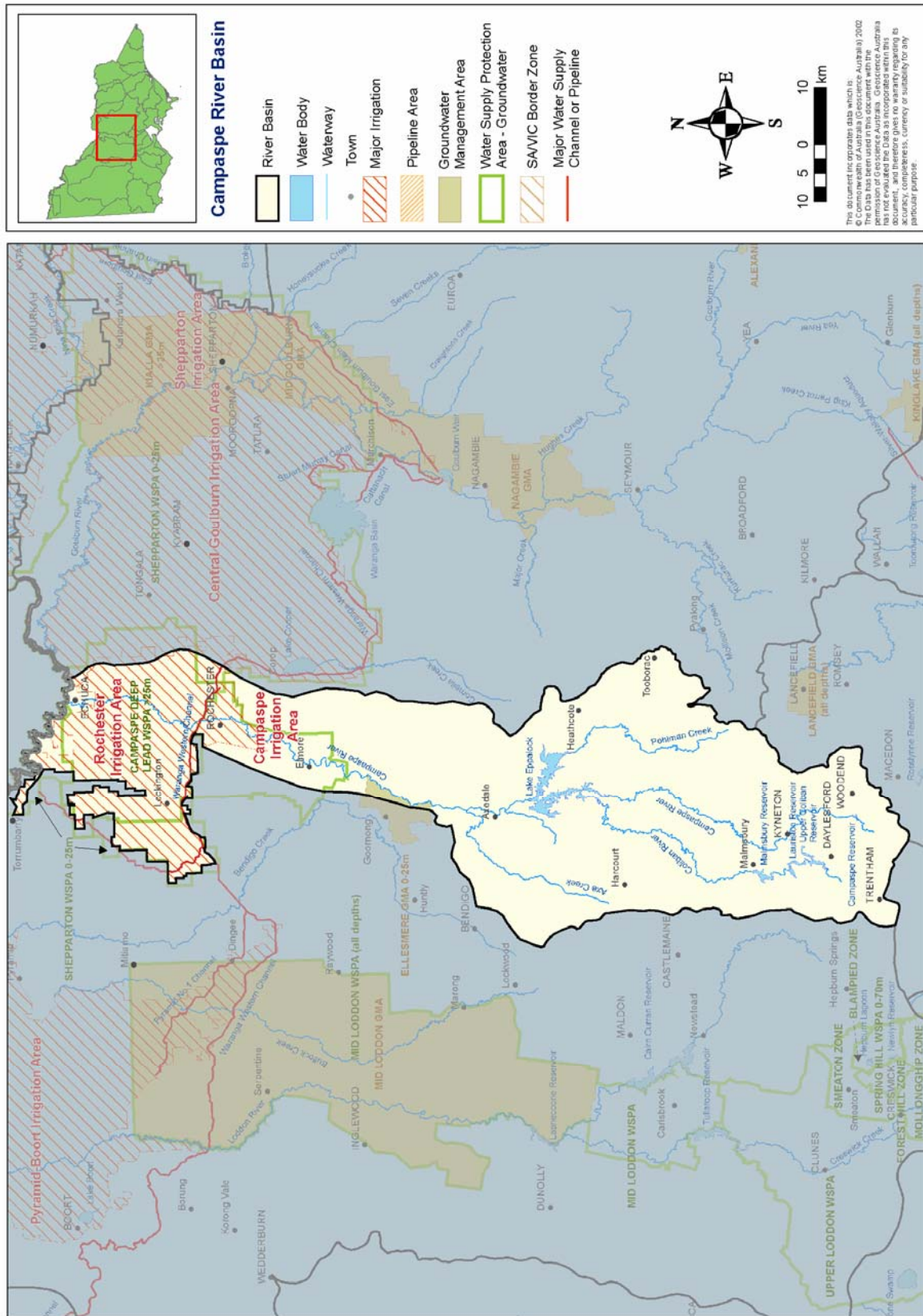
Rainfall conditions in the Campaspe basin in 2004/05 were approximately equal to the long-term average across the basin. Streamflows were, however, below average across much of the catchment, possibly due to the prolonged effects of previous dry years. Streamflows in 2004/05 in Axe Creek at Longlea (streamflow gauge number 406214) were 7% of the long-term average streamflow, whilst outflows from the Campaspe River at Rochester were 6% of the long-term average streamflow (but marginally higher than 2003/04 outflows).

The seasonal water allocation for the Campaspe Irrigation District was initially zero, and rose to 39% of water right by the end of February. This allocation was the lowest of the Northern Victorian irrigation areas during the season and was considerably lower than the previous year's February allocation (92%) and the long-term median February allocation (220%). The seasonal irrigation water allocation for Coliban Channel diverters in 2004/05 was initially 50% and rose to 65% of entitlement by the end of the February. This was much lower than the long-term median February allocation of 130% of entitlement.

Irrigation bans were imposed on licensed diverters on the Lower Campaspe River between the Waranga Western Channel and the River Murray from September 2004 until the end of the 2004/05 period. Irrigation bans were also in place from January 2005 to May 2005 along the Campaspe River and tributaries above Eppalock, including the Coliban River.

The severe urban restrictions in place at the start of the year eased slightly, but urban usage still remained restricted in this river basin throughout the year. Stage 4 (of four stages) for towns supplied from the Coliban system (including Bendigo) and Tooborac continued from June 2004. Restrictions were increased from Stage 2 to Stage 4 for towns supplied from the Campaspe system (Axedale and Goornong). All Stage 4 restrictions were eased to modified

Figure 11-1 Map of the Campaspe basin



Stage 4 restrictions in October 2004, then Stage 3 in November 2004. Stage 3 restrictions remained in place for the remainder of the 2004/05 period. Stage 1 restrictions (in place since late 2003) continued throughout 2004/05 for Trentham and Elmore, which are both supplied by groundwater.

Details of works undertaken to improve the basin's long-term water quality and river health during 2004/05 are available from the North Central Catchment Management Authority.

An assessment of the environmental health of rivers and streams in the Campaspe basin is available in the Index of Stream Condition (Department of Sustainability and Environment, 2005). (Go to: www.vicwaterdata.net).

11.4 Summary of the Total Water Resources in the Basin

The total volumes of water available and supplied from water resources in the Campaspe basin are shown in Table 11-1. The total surface water resource for the Campaspe basin includes 2,700 ML which was transferred into the Campaspe River from the Waranga Western Channel.

Table 11-1 Summary of total water resource and water use in the Campaspe basin, 2004/05

Water Source	Total Water Resource (ML)	Total Use (ML)
Surface Water	122,200	73,400
Groundwater ⁽¹⁾	Not available	Not available
Recycled Water	1,340	730

Note:

- (1) The total resource and use is not stated because not all GMAs or WSPAs in this basin have more than 90% of their surface area within the river basin boundary.

11.5 Water for the Environment

There was no formal environmental water reserve established in the Campaspe basin in 2004/05. However, the Murray-Darling Basin Cap, which is a limit imposed on the volume of water that can be diverted from rivers for consumptive use, applies in the Campaspe basin.

The environment's share of total flow at the Campaspe basin outlet was 9,900 ML, which is approximately 8% of total inflows (Table 11-2). This 9,900 ML represents all water flowing from the basin that was not taken out of waterways for consumptive uses.

When the environment's share of total flow in the Campaspe River passes out of the basin into the River Murray, it becomes a resource available to the Murray basin, along with other River Murray inflows. Once it has reached the River Murray, water from the Campaspe River is under the control of the Murray-Darling Basin Commission and may be used to meet the River Murray's environmental flow requirements and/or be diverted for consumptive use.

The ongoing drought continues to impact significantly on flows within all streams in the Campaspe basin. In the summer of 2004/05, 2700 ML of water was diverted from the Goulburn system through the Waranga Western Channel into the Campaspe River downstream of the Campaspe siphon. This transfer of water was undertaken to protect the environmental values of the river and improve water quality. Approximately 330 ML of the water released from the Goulburn was counted as an in-stream loss in the Campaspe River that did not reach the River Murray. This loss was accounted for as a consumptive use under the River Murray Flora and Fauna Bulk Entitlement.

11.6 Surface Water Resources

11.6.1 Water Balance

A surface water balance for the Campaspe basin is shown in Table 11-2. Note that only those on-stream storages greater than 1,000 ML capacity have been included in the water balance. In the Campaspe basin, on-stream storages greater than 1,000 ML capacity include the Upper Coliban, Lauriston and Malmsbury Reservoirs, as well as Lake Eppalock.

Table 11-2 Balance of surface water in the Campaspe basin

Water Account Component	2004/05 (ML)	2003/04 (ML)
Storage Volume		
Volume in storage at start of year ⁽¹⁾	30,300	36,900
Volume in storage at end of year ⁽¹⁾	41,600	32,900
Change in storage	11,300	-4,100
Inflows		
Catchment inflow ⁽²⁾	119,200	158,800
Return flow from irrigation ⁽³⁾	0	0
Waranga Western Channel to Campaspe River	2,700	1,400
Treated effluent discharged back to river	340	600
Sub-total	122,200	160,700
Usage		
Urban diversions	12,580	29,500
Coliban Channel rural diversions	13,600	
Campaspe Irrigation District diversions	13,500	23,900
Licensed private diversions from regulated streams ⁽⁴⁾	4,300	10,900
Licensed private diversions from unregulated streams	600	1,200
Small catchment dams	28,800	28,800
Campaspe River to Waranga Western Channel	0	1,300
Sub-total	73,400	95,500
Losses		
Net evaporation losses from major storages	11,400	12,300
Losses from small catchment dams	14,700	14,700
In-stream infiltration to groundwater, flows to floodplain and evaporation ⁽⁵⁾	1,500	34,000
Sub-total	27,600	61,100
Water Passed at Outlet of Basin		
Campaspe River outflow to River Murray	9,900	8,200
Environment's Share of Total Flow in the Campaspe Basin	9,900	8,200

Notes:

- (1) Campaspe Weir, which has a capacity of over 1,000 ML, was included in the total storage volume in 2003/04. Goulburn-Murray Water only maintains the volume in the weir pool to be able to supply irrigation channels by gravity and hence does not consider it to be a harvestable storage. For this reason, it has not been included in the 2004/05 water balance.
- (2) Inflows have been back-calculated from outflows plus diversions.
- (3) Assumed to be zero as Goulburn-Murray Water was unable to separate return flows by basin.
- (4) The volume of estimated diversions decreased from the previous year due to an improvement of the calculation method by Goulburn-Murray Water.
- (5) Losses estimated using loss functions from the Goulburn Simulation Model (REALM). The volume of estimated losses decreased from the previous year due to an improvement of the calculation method.

As shown in the balance, irrigation district diversions declined in 2004/05 compared to the previous season. This is due to the abnormally low allocations in 2004/05 (39%). In-stream losses are also considerably different, due to an improvement in the calculation method. In last year's water accounts, losses were back-calculated, whereas in the current year's water accounts, losses were extracted from the REALM model covering the river basin.

11.6.2 Small Catchment Dams

The capacity of small catchment dams in the Campaspe basin is estimated to be around 40,300 ML (Table 11-3). Usage in 2004/05 is estimated to be approximately equal to the average annual usage of 28,800 ML and, after allowing for losses, the total catchment run-off that is harvested as a result of the small catchment dams is estimated to be 43,500 ML.

Table 11-3 Small catchment dam information

Type of Small Catchment Dam	Capacity (ML)	Usage (ML)	Total Water Harvested (ML)
Stock and domestic	15,000	7,500	n/a
Irrigation	25,300	21,300	n/a
Total	40,300	28,800	43,500

Note:

(1) n/a: information not available

11.6.3 Water Entitlement Transfers

Transfers of water entitlements within the Campaspe basin are listed in Table 11-4. It can be seen from this table that there was a net import of water entitlement to the basin, with 62 ML being permanently traded out of the basin and 1,184 ML being temporarily traded into the basin.

Table 11-4 Water entitlement transfers in the Campaspe basin

Entitlement	Permanent Entitlement Transfer (ML)			Temporary Entitlement Transfer (ML)		
	Bought	Sold	Net Transfer To Entitlement	Bought	Sold	Net Transfer To Entitlement
<i>Coliban Water</i>						
Axedale, Goornong & Part Rochester ⁽¹⁾	0	0	0	50	0	50
Campaspe System	0	0	0	0	135	-135
<i>Goulburn-Murray Water</i>						
Campaspe District - Water right	0	478	-478	3,381	1,409	1,972
Campaspe District - Sales				0	0	0
Campaspe River - Water right	416	0	416	1,016	1,719	-703
Campaspe River - Sales				0	0	0
Total	416	478	-62	4,447	3,263	1,184

Notes:

(1) Coliban Water also purchased 918 ML of water right within the Campaspe Irrigation District in 2004/05, for use from 2005/06 onwards. This purchase will be accounted for under the Campaspe District water entitlement managed by Goulburn-Murray Water.

11.6.4 Volume Diverted

The volume of water diverted under each water authority's bulk water entitlement is shown in Table 11-5. Compliance with individual bulk entitlement volumes is deemed to occur in Table

11-5 if water use is not more than the maximum volume allowed to be diverted in 2004/05. Full details of compliance with bulk entitlements are expected to be provided in the resource manager's 2004/05 report for the Campaspe basin.

It is evident in the irrigation diversion figures in Table 11-5 that the Goulburn-Murray Water entitlement is under-utilised, with only 22% of the entitlement volume being diverted over the 10 year period of assessment. This is primarily due to a recent history of lower than average allocations over the extended drought period.

Licences on unregulated streams are not currently metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 11-5 Volume of water diverted under bulk entitlements in the Campaspe basin

Entitlement	Period of Bulk Entitlement (years)	Total Bulk Entitlement - 30 June 2005 (ML)	Net Temporary Transfer in 2004/05 (ML)	Maximum Allowable Diversion over Period (ML)	Total Volume Diverted over Period (ML)	Complied?	Volume Diverted in 2004/05 (ML)
<i>Coliban Water</i>							
Axedale, Goornong & Part Rochester ⁽²⁾	1	349	50	399	252	Yes	252
Coliban System	3	150,780	-135	150,645	88,427	Yes	25,721
<i>Western Water</i>							
Woodend	1	n/a	0	n/a	193	n/a	193
<i>Goulburn-Murray Water</i>							
Campaspe System	10	2,327,760	1,269	2,325,539	523,633	Yes	17,815
Total Annual Volume of Bulk Entitlements		283,385	1,184	384,740	82,284		43,981
<i>Licensed Diversions from Unregulated Streams</i>		1,559	0	1,559	600		600

Notes:

- (1) For multi-year entitlements, the maximum allowable diversion is estimated based on bulk entitlement volume as at 1 July 2004, plus allowances for permanent transfers of entitlement (annual volume multiplied by period of bulk entitlement) and temporary transfers that occurred in the 2004-05 period. The *actual* maximum allowable diversion will depend on when permanent transfers occurred over the applicable period, and the inclusion of temporary transfers that may have occurred in previous years.
- (2) Temporary transfer to bulk entitlement occurred to cover usage above allocation. Allocation in 2004/05 for Axedale and Goornong (215 ML entitlement volume, remainder to Part Rochester) was 50% to urban customers, or a total of 107.5 ML excluding temporary trade, whilst usage in 2004/05 was 117 ML.
- (3) n/a: bulk entitlement conversion order was not finalised at the beginning of 2004/05

11.6.5 Compliance with Passing Flow Obligations in Bulk Entitlements

The bulk entitlements in the Campaspe system have various passing flow requirements. Goulburn-Murray Water, as resource manager for the Campaspe basin, had not completed its compliance report at the time of publication of the water accounts.

No instances of non-compliance with passing flows were reported in 2004/05 by Coliban Water. Goulburn-Murray Water reported compliance failures with passing flow requirements following difficulty in determining minimum passing flow requirements under low flow conditions, due to measurement problems and inconsistency in travel time. Compliance failures also occurred due to errors in remotely accessed data.

11.6.6 Compliance with Streamflow Management Plans

No streamflow management plans are currently in operation in the Campaspe basin.

11.7 Groundwater Resources

A summary of the licensed entitlements and use for groundwater management units that overlap the Campaspe basin, excluding stock and domestic use, is presented in Table 11-6. An estimate of stock and domestic groundwater use is provided in Table 11-7.

In the Campaspe basin, groundwater is used as an urban water supply for the townships of Elmore and Trentham. The licensed entitlements and metered use for these groundwater supplies is provided in Table 11-6.

The Campaspe basin contains part of the Campaspe Deep Lead WSPA, the Shepparton WSPA and the Ellesmere GMA. The volumes described in Table 11-6 and Table 11-7 are totals for the management areas and include the area that falls outside the Campaspe basin. Groundwater entitlements and use for unincorporated areas have not been included in the 2004/05 water accounts.

Table 11-6 Compliance with licensed groundwater volumes, Campaspe basin 2004/05

Water Supply Protection Area/ Groundwater Management Area (1)	GMA/ WSPA Depth Limits (m) (2)	Allocation Limit (ML/year) (3)	Licensed Entitlement Allocated (ML/year) (4)	Metered Use (ML)	Estimated Use in Unmetered Bores (ML) (5)	Total Licensed Groundwater Use (ML)	Total Groundwater Resource (ML)
Ellesmere GMA (28%)	0-25	1,900	2,280	0	798	798	Not Available (6)
Campaspe Deep Lead WSPA (76%)	>25	46,039	46,039	25,270	443	25,713	Not Available (6)
Shepparton WSPA (12%)	0-25	203,619	203,619	64,820	15,000	79,820	Not Available (6)

Notes:

- (1) The percentage of the GMA/WSPA by surface area within the river basin is given in the parentheses.
- (2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.
- (3) The allocation limit represents either the sum of licensed entitlements for WSPAs or the permissible annual volume (PAV) for GMAs, and does not include groundwater resources from unincorporated areas within the basin.
- (4) Includes domestic and stock usage in those cases where this forms part of a licensed allocation.
- (5) For unmetered bores, usage is estimated using the average percentage of licensed entitlements that was used in metered areas across the State. In 2004/05 this was 36%.
- (6) No estimate of the total groundwater resource is provided when >10% of the GMA/WSPA is located outside the river basin.

Table 11-7 Number of stock and domestic bores and estimated use

Water Supply Protection Area/ Groundwater Management Area	No. of Stock and Domestic Bores (1)	Estimated Stock and Domestic Use (Assuming 2ML/bore) (ML)
Ellesmere GMA	16	32
Campaspe Deep Lead WSPA	188	376
Shepparton WSPA	415	830

Note:

- (1) There are a number of licensed groundwater allocations that also incorporate stock and domestic use. The estimated use for these bores is included in the licensed allocation in the previous table.

Table 11-8 Urban groundwater usage

Town Supplied	Licensed Allocation ML	Metered Use
Elmore	284	174
Trentham	48	16

11.8 Recycled Water

All sewage treatment plants in the Campaspe basin are operated by Coliban Water apart from Woodend, which is operated by Western Water. Around 54% of the volume of effluent passed through treatment plants in the basin was recycled for consumptive use (Table 11-9).

Table 11-9 Volume of recycled water

Treatment Plant	Volume Produced (ML)	Volume Reused (ML)	End Use Type for Effluent Reuse (ML)				Volume Discharged to the Environment (ML)	Other (ML) (3)
			Urban & Industrial	Agriculture	Beneficial Allocation (1)	Within Process (2)		
Elmore	40	0	0	0	0	0	0	40
Heathcote	119	94	0	94	0	0	0	25
Kyneton	646	328	0	328	0	0	318	0
Lockington	25	0	0	0	0	0	0	25
Rochester	299	113	0	113	0	0	0	186
Woodend	215	190	75	115	0	0	25	0
Total	1,344	725	75	650	0	0	343	276

Notes:

- (1) Volume used to deliver specific environmental flow benefits.
- (2) Water that is reused in sewage treatment processes, e.g. backflushing of filters.
- (3) Other refers to a change in on-site effluent storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.