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WATER RESOURCES AND SEWERAGE

WATER RESOURCES AND THEIR CONTROL

Introduction

A Ministry of Water Resources and Water Supply was established under the *Water Resources Act* 1975 for the purpose of ensuring that the water resources of Victoria are utilised in the most efficient manner.

The *Water Resources Act* 1975 vested in the Minister of Water Supply the administration of the Water Act, the Melbourne and Metropolitan Board of Works Act (in respect of water, sewerage, and drainage functions), the Geelong Waterworks and Sewerage Act, the Latrobe Valley Act, the Mildura Irrigation and Water Trusts Act, the West Moorabool Water Board Act, the Dandenong Valley Authority Act, the Sewerage Districts Act, the Groundwater Act Part V, the River Improvement Act, and the Drainage of Land Act.

As part of the Ministry, there was a Water Resources Council, consisting of eleven members appointed by the Governor in Council and comprising the Director of Water Resources who was chairman; the three commissioners of the State Rivers and Water Supply Commission; the chairman, secretary, and engineer-in-chief of the Melbourne and Metropolitan Board of Works; a representative or nominee from each of the Waterworks Trust Associations of Victoria, the Victorian Irrigators Central Council, the Ministry for Conservation, and the Co-ordinator of Works from the Department of Management and Budget. The functions of the Council were to investigate and advise the Minister generally on matters pertaining to the water resources of Victoria or to water supply, drainage, or sewerage throughout Victoria, referred to it by the Minister.

During 1984 a major organisational change occurred in the water portfolio. Consequently on 30 June 1984, the State Rivers and Water Supply Commission and the Ministry of Water Resources and Water Supply were abolished, and from 1 July 1984 their functions were allocated to either the newly created Rural Water Commission or the Department of Water Resources. The guiding principle in this reorganisation has been to establish the Department of Water Resources as a lead agency for the sector and the Rural Water Commission as an organisation concerned mainly with the provision of services to irrigated agriculture.

Department of Water Resources

The Department of Water Resources commenced operations on 1 July 1984 as the central management agency for the water sector. Previously, the central management role was performed by two bodies – the Ministry of Water Resources and Water Supply, and the State Rivers and Water Supply Commission. This dual system was not effective either as a mechanism to provide advice to government on policy matters, or as a means of implementing policies and programmes. The Ministry and the Commission were abolished on 30 June 1984 and their functions allocated to either the new Department of Water Resources or the new Rural Water Commission.

The Department's objectives, as provided for in the *Water (Central Management Restructuring) Act* 1984, are:

'to provide advice to the Minister on all matters relevant to the activities or functions of the Department to ensure

(a) that the water resources of the State are managed in ways which are most beneficial to the people of Victoria;

(b) that water services are provided to local communities to the extent and to standards appropriate to the needs of those communities;
(c) that water services and associated management, economic and financial practices and policies are provided and administered efficiently, economically and in a manner fully accountable to the Government and the people of Victoria;
(d) that there is security in the water sector, a working environment which is safe and satisfying; and
(e) that the management of water resources and the provision of water services are undertaken in a socially and environmentally responsible manner and in consultation with the appropriate authorities'.

In 1984-85, critical areas of activity for the Department were to include:
(1) development of water allocation policies – the allocation of water in Victoria is an issue of increasing, not diminishing, conflict and public concern since unallocated water resources are diminishing, the cost of water resources development is increasing in real terms, and environmental considerations associated with water resource development and water allocations are a focus of growing public interest; and
(2) pricing and investment policies which are inextricably linked with water allocation decisions and therefore also require concurrent consideration.

Victoria has what has been characterised as a 'mature water economy'. The developmental phase is basically completed and the emphasis is on the management of existing water resources and infrastructure, rather than large-scale development of new sources. The Department was to establish a common State wide shared hydrographic data system and systematic instruments for the management of water resources.

The Department will generally not deal with local operational aspects of the water industry which will be the delegated responsibility of the Rural Water Commission, the Melbourne and Metropolitan Board of Works, the major regional water bodies, and local water and sewerage authorities.

It is expected that over the next three to five years there will be measurable improvements in the efficiency of the Victorian water industry, and that efficiency gains will be achieved in a way which is consistent with broad social and economic objectives of the government.

Further references: Water resources and their control, *Victorian Year Book* 1977, pp. 373-4; 1979, pp. 291-2; Water in the Victorian environment, 1982, pp. 1-19; Historical outline on water resources, 1984, pp. 274-80

MELBOURNE AND METROPOLITAN BOARD OF WORKS

Introduction

The Melbourne and Metropolitan Board of Works is the authority for providing water supply, sewerage, and main drainage services to the Melbourne metropolitan area and, since January 1984, virtually all of the Upper Yarra Valley area. The Board is also the authority for the management of Melbourne's major waterways and of the Metropolitan Parks. For more than thirty years the Board has been the planning authority for metropolitan Melbourne, but on 1 July 1985 this responsibility will transfer to the Ministry of Planning and Environment.

The formation of the Board followed the 1889 Royal Commission into Melbourne's sanitary conditions after continuous agitation by local municipalities for a sewerage system in the city. The Board was constituted by an Act of the Victorian Parliament in 1890 and began operations in July 1891. Its initial functions were to provide a sewerage system for Melbourne and the metropolitan area and to take over from the Public Works Department responsibility for the city's water supply. The Board's other responsibilities have been assumed progressively, and are now laid down in the *Melbourne and Metropolitan Board of Works Act* 1958 (as amended). Until 1 August 1978 the Board comprised a number of unpaid Commissioners appointed by municipal councils with a full time chairman, and (latterly) a deputy chairman. Following recommendations by a Board of Inquiry headed by Sir Roger Darvall, the composition of the Board was changed on 1 August 1978 to a full time appointed chairman, and six part-time members, four elected by area commissions comprising groupings of municipalities and two appointed by the Victorian Government. In 1982, as a result of a further review, the Board has consisted of a part-time chairman and six part-time members (as above), with a full-time general manager who is not a member of the Board.

Acts of the Victorian Parliament empower the Board to levy four rates annually: the water rate, metropolitan general rate (for sewerage services), metropolitan drainage and river improvement rate, and the metropolitan improvement or planning rate, all of which are based on net annual valuations of rateable properties but subject to specified minimum charges. The incoming revenue is used to operate and maintain the water, sewerage, and main drainage systems, to pay interest and redemption charges on loans raised for capital works, and to meet administrative expenses.

The proceeds of the metropolitan improvement rate meet annual expenditure for town planning, the Board's statutory contribution towards financing the Melbourne underground rail loop, payments of compensation for lands reserved under the Metropolitan Planning Scheme, and for metropolitan parks. The capital works of the Board are financed mainly from money which the Board is given approval to borrow after the annual meeting of the Australian Loan Council has considered the projected loan programmes of semi-governmental authorities throughout Australia.

Further references: Board of Inquiry into the Melbourne and Metropolitan Board of Works, 1977, *Victorian Year Book*, 1980, pp. 304-6; Urban water supply, 1984, pp. 280-7

Melbourne's water storages

Water to service the Board's needs is drawn mainly from mountain catchment areas to the north and east of the city. Water from the streams draining the catchment is harvested into on-stream storage reservoirs, comprising Yan Yean Reservoir (30,000 megalitres), Maroondah (22,000), O'Shannassy (4,000) and Upper Yarra (200,000). There are further major off-stream storage reservoirs (i.e. reservoirs without catchments of their own, which are filled by conduits) comprising Silvan (40,000), Greenvale (27,000), and Cardinia (287,000).

Further harvesting and storage capacity is provided by the 95,000 megalitre Winneke reservoir, pumping station and treatment plant, described in greater detail below.

Greenvale Reservoir is on Yuroke Creek, a branch of the Moonee Ponds Creek in the north of the city, and serves Melbourne's north-western and western suburbs to Werribee. Greenvale is supplied by pipeline from the Silvan Reservoir near Monbulk in the Dandenong Ranges, east of Melbourne. Silvan stores water from the O'Shannassy, Upper Yarra, and Thomson systems.

Cardinia is the biggest of the Board's storages with a capacity of 287,000 megalitres. It supplies Melbourne's south-eastern suburbs as far south as the boundary of Frankston and the State Rivers and Water Supply Commission Mornington Peninsula system and is fed from the Upper Yarra system via a pipeline from the southern end of the Silvan Reservoir. Supply to Silvan is supplemented by the new Yarra Valley Conduit from the Upper Yarra Reservoir which enables water diverted into the Upper Yarra from the Thomson River to be transferred to Cardinia Reservoir.

In mid-1973, the Victorian Government announced a dam building programme aimed at further increasing the storage capacity of Melbourne's water supply system. Included in this programme is the Thomson Reservoir as the main component of the third stage of the Board of Works' largest water supply project to date – the diversion of water from the Thomson River, about 170 kilometres east of Melbourne, into the Upper Yarra system. Construction work on the Thomson project started in 1969 and the first stage – allowing diversion of water from the Thomson through a 19.6 kilometre tunnel to Fehrings Creek, a tributary of the Yarra – was commissioned in September 1974. Water from the Thomson was diverted into the tunnel, then into the Yarra River via Fehrings Creek. From the Yarra, the flow entered the Upper Yarra Reservoir. Stage two of the project involved extending this tunnel at both its western and eastern ends. The western extension carried the tunnel to the Yarra River near the Reservoir, thereby superseding the outlet into Fehrings Creek. The eastern tunnel extension allows diversion of flow from the Thomson at a point known as Swingler, just below the confluence of the Thomson and Jordon Rivers, thus making use of a larger catchment area. Incorporating a concrete diversion dam at Swingler, stage two was completed early in the second half of 1977. The major component of the third stage of the Thomson Diversion Scheme is a large storage on the Thomson River, north of Erica, formed by the Thomson Dam. This dam is about 165 metres high and the earth and rockfill structure forms a reservoir inundating about 2,200 hectares. The dam impounds about 1.1 million megalitres and the reservoir extends for some 23 kilometres north of the wall.

Apart from the Thomson Dam, the works involved in the third and final stage of the Thomson scheme include an extension of the Thomson-Yarra diverson tunnel in a south-easterly direction for about 5.5 kilometres from Swingler to emerge within the Thomson Reservoir, and allow water to be transferred to the Upper Yarra system as required. Outlet works in the Thomson Dam release water for other uses downstream. The Thomson Reservoir stores water during wetter years when inflows are high and thus provides a water supply for Melbourne during drier years. This will enable the Board to operate its available storages much more efficiently than would be possible without a large back-up storage such as the Thomson. In addition, the dam provides regulation of the stored water to supplement the variable flows in the Thomson River for the irrigators and water users in the Thomson Valley. Building of the Thomson Dam was completed by mid-1983 and filling commenced on 19 July 1983.

The augmentation programme announced in 1973 also included the Winneke Reservoir Project (95,000 megalitres usable capacity) to develop the resources of the Yarra River at Yering Gorge and the nearby Maroondah aqueduct. Commissioned in November 1980, the Winneke scheme comprises an intake and pumping station on the Yarra River in Yering Gorge; a 'pressure tunnel' from the pumping station to the reservoir; a draw-off structure and tunnel from the reservoir to carry water to a pumping station below the main dam wall; a pipeline rising from this pumping station to a water treatment plant; a 'clearwater' storage basin adjacent to the treatment plant; and a pipeline from the storage basin through which treated water is transferred to the supply system.

The main dam is 85 metres high and 1,000 metres long, and impounds 95,000 megalitres of water. Comprehensive treatment of Winneke water is necessary because it is drawn from an inhabited catchment. The treatment plant is located close to the southern end of the main dam. It uses conventional water treatment methods in which chemicals are added to clarify water which is then filtered and chlorinated. As with the rest of Melbourne's water supply, water from Winneke is fluoridated in line with the requirements of the *Health (Fluoridation) Act* 1973.

A final decision to proceed with this project followed a comprehensive environmental study of the implications of the proposal, as a result of which significant changes were made to the original proposals to overcome environmental objections. Winneke Reservoir commenced operating in February 1981.

When the Thomson Reservoir is fully operational, the total storage capacity of Melbourne's water supply system will be 1,655,000 megalitres or approximately three times the expected annual demand.

In 1985 the Board completed the construction of the Western Transfer Main, which significantly improves the Board's capacity to transfer water from the eastern catchments to consumers in the west and north of the metropolitan area.

Water is conveyed to homes and industry in the Melbourne metropolitan area from various service reservoirs situated in convenient places so that an adequate pressure can be maintained in the mains. There are seventy-three service reservoirs and thirty-five sundry reservoirs and tanks with a combined capacity of 2,647 megalitres. Underground distribution and reticulation mains convey the water from the service reservoirs to its point of use.

As part of its water supply catchment management programme, the Board is carrying out extensive forest hydrology research at Coranderrk and North Maroondah, two eucalypt forest areas north and south of Healesville. The experiments are designed to determine a scientifically based, efficient catchment management policy related to water yield and quality. At Coranderrk, the effects of two different timber harvesting operations applied to mature eucalypt forests are being monitored, while at North Maroondah studies are being made to assess the effects of a regenerated eucalypt forest on water yield.

Following consideration of the results of this research up to 1979, the Victorian Government announced in 1981 that commercial logging of timber from the Board's catchments would continue to be not permitted.

In the interest of preserving water quality, public access to the Board of Works' forested catchment areas is not allowed, but there are picnic and passive recreational facilities below the dams at all the Board's storages except the O'Shannassy Reservoir. Public access is also available to four smaller reserves – Donnelly's Weir, Coranderrk Weir, Fernshaw, and the top of Black Spur. All the reserves are easily reached by car.

In 1984 the Board adopted World Health Organisation Guidelines for water quality for supplies from the Winneke Treatment Plant and future sources, and National Health and Medical Research Council Guidelines for the remainder of the system. This action means that the operation of the system is governed by objective criteria for water quality.

Total water consumption for 1982-83 was 356,124 megalitres, and rainfall over the catchment areas averaged 884mm. Total water consumption for 1983-84 was 372,957 megalitres, and rainfall over the catchment areas averaged 1,145mm, the long-term weighted average rainfall being 1,240mm.

At 30 June 1983, there were 947,573 properties or an estimated 2,489,000 persons in Melbourne supplied with reticulated water. This compares with 963,000 properties and 2,501,000 persons at 30 June 1984. The population figure for 1984 was revised on 1981 census results.

MELBOURNE AND METROPOLITAN BOARD OF WORKS, WATER SUPPLY SYSTEMS, STREAMFLOW YIELDS
(megalitres)

Year	Yan Yean	Maroondah	O'Shannassy	Upper Yarra	Thomson diversion	Total water yield
1978-79	25,400	89,700	123,600	227,900	75,900	542,500
1979-80	14,300	60,400	92,500	122,400	76,800	366,400
1980-81	10,900	82,800	114,400	183,800	112,400	504,300
1981-82	16,800	90,400	116,200	189,200	105,000	517,600
1982-83*(a)*	5,600	42,400	59,100	66,100	23,900	197,100
1983-84	15,100	84,400	120,000	186,500	112,200	518,200

(a) The year 1982-83 was a period of major drought.

NOTE. The yield shown for O'Shannassy includes the yield from Coranderrk, for the years 1978-79 to 1980-81 inclusive.

Further references: Thomson-Yarra Development Scheme, *Victorian Year Book* 1974, p. 253; Cardinia Reservoir, 1975, pp. 188-9; Lower Yarra Development Scheme, 1979, pp. 295-6

Cost of water supply system

The cost of capital works in respect of the water supply system under the control of the Board is shown in the following table for each of the years 1978-79 to 1983-84.

MELBOURNE AND METROPOLITAN BOARD OF WORKS, CAPITAL OUTLAY ON WATERWORKS
($'000)

Particulars	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Yan Yean system (including Greenvale)	30	27	17	12	40	24
Maroondah system (including Watson's Creek and Winneke)	55,435	49,177	31,104	11,923	2,132	1,046
O'Shannassy, Upper Yarra, and Thomson system (including Silvan and Cardinia)	19,297	22,672	36,555	61,078	71,983	62,138
Service reservoirs	4,904	3,935	5,916	10,070	9,823	3,630
Large mains and pumping stations	9,470	5,097	3,992	13,087	20,797	30,856
Reticulation	12,566	14,108	17,418	19,125	18,777	21,557
Afforestation	–	–	23	8	–	–
Investigations, future works	Cr.209	Cr.308	Cr.589	Cr.163	Cr.1,192	Cr.1,044
Total outlay	101,493	94,708	94,436	115,140	122,360	118,207

Consumption of water

During the year ended 30 June 1983, the maximum consumption of water in Melbourne and suburbs on any one day was 1,848 megalitres on 7 November 1982, and the minimum consumption was 614 megalitres on 16 May 1983.

The following table shows, for each of the years 1978-79 to 1983-84, the number of properties supplied with water and sewers, the quantity of water consumed, the daily average consumption, the daily average consumption per head of population served, etc.:

MELBOURNE AND METROPOLITAN BOARD OF WORKS, WATER CONSUMPTION AND SEWERAGE CONNECTIONS

Year	Improved properties supplied with water at 30 June	Total annual consumption of water	Consumption of water on any one day		Daily average of annual consumption of water	Daily consumption of water per head of population served	Improved properties for which sewers were provided at 30 June
			Maximum	Minimum			
	number	megalitres	megalitres	megalitres	megalitres	litres	number
1978-79	875,485	393,626	2,297	694	1,078	435	748,787
1979-80	899,341	446,801	2,657	714	1,221	489	768,647
1980-81	913,652	453,306	2,933	771	1,242	491	793,118
1981-82	930,573	451,416	2,838	786	1,237	486	820,075
1982-83	947,573	356,145	1,848	614	976	392	843,539
1983-84	963,000	372,957	1,985	628	1,019	407	865,392

Sewerage system

The present system consists of two distinct parts, the Western System draining to the Werribee Farm which provides land treatment, and the Eastern System draining to the South Eastern Purification Plant which is an activated sludge plant located at Carrum.

General description of the sewerage system

Melbourne's main sewerage system operates under what is known as the 'separate system' under which stormwater is excluded from the sewers. The system comprises:
(1) a vast network of reticulation sewers 100 mm, 150 mm, and 225 mm diameter, which collect the household and industrial drainage from all properties connected to the system;
(2) a system of branch and main sewers ranging in diameter from 300 mm to 2.7 metres which follow, generally, natural drainage routes such as rivers, creeks, and watercourses and which gravitate to a central point at Spotswood where they unite to form a 2.8 metre diameter trunk sewer running between Spotswood and Brooklyn;
(3) a pumping station of 1,137 megalitres per day capacity at Brooklyn where the sewage is raised about 52 metres and discharged into the head of the outfall sewer which proceeds 21 kilometres to Werribee; and
(4) the Board's Farm at Werribee where the wastewater is purified before final disposal into Port Phillip Bay.

For many years, the Werribee system handled almost all of Melbourne's sewage but with rapid development, particularly in the eastern and south-eastern suburbs, it became apparent that the Farm's capacity would be taxed.

As a result, the Board constructed the South-Eastern Sewerage System which was commissioned in 1975 and which is now treating approximately thirty per cent of Melbourne's sewage. It comprises:
(1) a trunk sewer, ranging from 4 metres to 2.6 metres in diameter, which extends thirty-two kilometres from Carrum to Kew;
(2) intercepting sewers to divert flow from existing sewers to the trunk sewer;
(3) a purification plant at Carrum; and
(4) a sixty kilometre long outfall which discharges the reconditioned water from the purification plant into Bass Strait near Cape Schanck.

In addition to the two major treatment plants, eleven regional and neighbourhood purification plants are in operation.

They serve local areas which cannot be connected with the main system and enable the provision of sewerage facilities ahead of the construction of main sewers.

It is anticipated that, with further development in the northern and western suburbs, the pollutant load at the Werribee Farm will increase and investigations into the amplification of the treatment processes are being undertaken.

Work has started on construction of a new trunk sewer from Brooklyn to Werribee, and a new north-west intercepting sewer is proposed for the future.

The Werribee Farm

The Board's farm covers an area of 10,800 hectares lying between Geelong Road and Port Phillip Bay and west of the Werribee River.

Three methods of purification are used depending on the season of the year and the rate of flow from the sewerage system: (1) *Land Filtration* for the period of high evaporation between September and April; (2) *Grass Filtration* for the period of low evaporation between May and August; and (3) *Lagooning* for peak daily flows and also wet weather flows. The purified effluents are discharged into Port Phillip Bay.

The standard of purity for effluent is that required by the EPA for discharge into Port Phillip Bay and examinations of effluents by chemical analysis ensure that this standard is maintained.

South-Eastern Purification Plant

Set on a 616 hectare site, the South-Eastern Purification Plant is one of the most sophisticated in the world.

It uses both mechanical and biological processes to purify the sewage. Separable and settleable solids are removed mechanically in the primary treatment, while remaining wastes are biologically oxidised in the secondary treatment.

The standard of purity for effluent is that required by the EPA. Computer controlled, the plant has a capacity of 290 megalitres a day, with scope for eventual expansion to a capacity of 1,800 megalitres a day if required. Reconditioned water from the plant is being used by several golf clubs to irrigate their courses, and experiments are being undertaken to determine other possible future uses of the water.

Sewerage service area extended

The Board's sewerage area has been greatly extended since 1983. On 1 July 1983, the Board assumed the responsibilities of the Upper Yarra Sewerage Authority; on 1 January 1984, those of all the Upper Yarra catchment except the Gembrook/Cockatoo/Emerald Waterworks Trust area; and on 1 March 1984, those of the Lilydale Sewerage Authority. The Board now has sewerage responsibility for the entire Upper Yarra Valley except for the Gembrook/Cockatoo/Emerald area.

The programme of sewer construction begun by the Lilydale Sewerage Authority has continued, and the Authority's programme to upgrade the Lilydale Regional Purification Plant Road has been completed

A new area office to service the Upper Yarra Valley was opened at Woori Yallock on 2 January 1984.

Western Trunk Sewer project

The new Western Trunk Sewer, from Brooklyn to Werribee, will replace the present Main Outfall Sewer. This sewer is now eighty-five years old and is the only means of conveying sewage from the metropolitan area to the Werribee sewerage treatment farm. It has deteriorated badly and is not adequate for flows in wet weather when rain water infiltrates the sewerage system. It has significant sections which are open channels and a source of odour.

The new sewer's main components are:

(1) A 15.3 kilometre deep tunnel 4.4 metres in diameter from Brooklyn Pumping Station to a new pumping station at Hoppers Crossing.

(2) Hoppers Crossing Pumping Station, working automatically under remote supervision from a central control centre, to lift sewage from the deep tunnel to the shallow conduit.

(3) A 7.2 kilometre shallow conduit 4.5 metres in diameter from the pumping station to Werribee Farm.

The whole project is estimated to cost $256m in 1984 values and will take nine years to complete. At this early stage, activity has been centred on the downstream part of the shallow conduit at Werribee and a start to tunnelling from shafts at the Hoppers Crossing pumping station site. Major items of equipment are being procured. These include the tunnel boring machine for tunnelling through rock, and pumps and electric motors for lifting sewage at the Hoppers Crossing pumping station.

The first length of the new sewer is planned to be in use by mid-1985. This will enable 1.5 kilometres of the Main Outfall Sewer to be abandoned.

In the long-term, a new North Western Sewer will extend the Western Trunk Sewer into the northern and north-western suburbs, providing relief to much of the overloaded system there and providing capacity for further development.

Sewerage backlog

The programme to overcome Melbourne's sewerage backlog continues. By 30 June 1984 it had reduced the original backlog of properties to be sewered to 17,500, from the peak of 160,000 in 1973.

However, when the Board's sewerage area was extended to include the Lilydale and Upper Yarra areas, the number of backlog properties rose by about 14,500. The total backlog at 30 June 1984 stood at 32,000.

Sewerage in new subdivisions

Activity in new subdivisions was at its highest for seven years in 1983-84 and about 8,000 allotments were provided with sewerage.

Trade waste

Specal emphasis continues on revising agreements with dischargers of trade wastes which have potential to harm maintenance personnel or the sewerage system, or which impose excessive treatment loads. Agreements with the tanning, chemical, and photographic processing industries are being reviewed.

Trade Waste Agreements current at 30 June 1984 were 3,524, down 28 on 1982-83. Trade Waste inspections in the year were 15,202, with 1,342 samples of discharges being taken for analysis.

The cost of sewerage works during each of the years 1978-79 to 1983-84 is shown in the following table:

MELBOURNE AND METROPOLITAN BOARD OF WORKS, CAPITAL OUTLAY ON THE SEWERAGE SYSTEM
($'000)

Particulars	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Farm purchase and preparation	1,235	1,793	2,032	1,233	2,194	3,898
Treatment works	4,164	2,675	4,611	2,805	5,004	5,028
Outfall sewer and rising mains	Cr.214	104	825	1,150	1,039	211
Pumping stations, buildings, and plant	1,491	865	855	1,799	4,485	2,771
Main and branch sewers	9,669	17,463	18,426	21,853	24,841	35,828
Reticulation sewers	46,621	45,128	54,586	58,994	49,809	50,729
Sanitary depots	Cr.15	1	Cr.34	–	–	–
Investigations	Cr.48	Cr.377	Cr.349	Cr.357	Cr.359	Cr.2,797
Total outlay	62,903	67,652	80,952	87,477	87,013	95,668

Disposal of nightsoil from unsewered premises

The responsibility for the collection, removal, and disposal of nightsoil from unsewered premises within the Melbourne metropolitan area was transferred from the individual municipal councils to the Melbourne and Metropolitan Board of Works by legislation in 1922. By agreement, each council pays to the Board a prescribed amount per annum to offset the cost of the service, etc. For the year 1983-84, working expenses were $392,462, costs of conveying and treatment $86,033, and investment $45,931, making a total of $524,326. Revenue was $287,480, giving a deficit of $236,946.

Drainage

The Board has been responsible for main stormwater drainage in the Melbourne metropolitan area since 1924. The current drainage area under the Board's control covers some 4,385 square kilometres. Besides being responsible for underground drains and the smaller creeks and watercourses, the Board also has responsibility over the metropolitan rivers within the drainage area. Local drainage responsibilities, namely those areas draining less than about 60 hectares, rest with the respective municipal councils.

The drainage functions of the Melbourne and Metropolitan Board of Works are aimed at the control of flooding, erosion, prevention of pollution and spread of disease, environment protection, and improved flood prediction and include construction of works, maintenance of works and natural channels, and policing of regulations. Total prevention of flooding is not feasible, so efforts are directed towards control and minimisation of the effects. Structural measures such as pipes and channels considerably improve the hydraulic efficiency of the waterway. However, such solutions are not always viable and alternative solutions, such as optimum land-use by retaining non-urbanised flood plains in uses which minimise interference with their flood carrying capacity, have been successfully used. Also, retarding basins have been successful, twenty-nine such basins being operated by the Board. A retarding basin is a reservoir, normally empty, having an outlet, always open, which is smaller than the inlet. During high flows the constriction holds back some of the flow and this only gradually escapes to the downstream system as the inflow subsides.

The Board is also involved in the control of building on land liable to flooding, acting under Regulation 44.5 of the Victorian Building Regulations.

The long-term programme of the Board to survey cross sections on all major watercourses within the metropolitan area progressed further with the completion of work on Kororoit Creek, Mullum Mullum Creek, and Edgars Creek.

The determination of the 1 per cent probability (once in 100 years) flood flows and flood levels for these, and other watercourses, is currently in hand.

The Board carries out necessary maintenance to ensure the required waterway area remains available. Such maintenance includes the removal of sediment, erosion prevention measures, clearing debris and rubbish, and de-snagging. In so doing, the appearance of the creeks and watercourses is preserved and dangerous areas eliminated.

At 30 June 1984, the total length of constructed drains under the Board's control was 548 kilometres, compared with 540 kilometres at 30 June 1983.

Further reference: Sewerage and Wastewater disposal, *Victorian Year Book*, 1984, pp. 296-9

Waterways management

With increased emphasis on recreational use of waterways and nearby lands, the Board has been heavily involved in providing information for various studies and reports on such matters. During 1983-84, these included the Lower Yarra and Maribyrnong River Concept Plans and the Upper Yarra River Management Strategy Report.

A more natural treatment of streams is to be stressed in future flood plain management and strategic planning of watercourses. Forward plans will be prepared for large drainage catchment for optimum use of retarding basins and for non-structural treatment of floodways. Development on lands liable to flooding will be controlled. In the current review of metropolitan open space policy, the Board is working towards the preparation of open space planning guidelines and a revised financial policy. A greater emphasis will be placed on the promotion and development of a linear open space network, particularly along urban waterways.

The Yarra River and its immediate environs is treated primarily as an open space system for nature conservation and recreation with provision, where appropriate, for primary production and forestry.

Consistent with these objectives, the Board is charged with the responsibility for preparing and implementing concept plans for the lower reaches of the Yarra River and similar plans for the lower Maribyrnong River. A concept plan for the Yarra River from Punt Road to Dights Falls went on public exhibition in 1985. The Board has recently completed the beautification of the Yarra River South Bank as the first stage of implementing the Lower Yarra concept plan approved in 1982.

Metropolitan parks

The primary objectives for the establishment and development of the parks system, outlined in 1975 and re-affirmed by the Board in 1983, are to:

(1) provide for people of all ages and abilities, a range of recreational and educational opportunities that are essentially of a regional nature and generally not provided elsewhere in the metropolitan area.

(2) protect and enhance existing environmental resources so as to enable the development of satisfying high quality natural and rural open space landscapes; and

(3) develop recreational and educational facilities appropriate to the type, scale, and quality of surrounding land-uses.

The Board continued to buy land for its metropolitan parks, adding fifteen hectares at a cost of $337,500, thus bringing the total area in Board ownership to 2,464 hectares, and the total cost of acquisition to 30 June 1984 to $39m.

Park management

Park management is a growing commitment as new areas are opened to the public and additional areas brought under Board ownership.

Apart from the developed picnic parks, management is orientated towards the identification, protection, and enhancement of natural resources through fencing, weed control, and pest eradication. The parks seek to provide a wide range of recreational and educational opportunities to the public, and public access is being provided to see commercial orchards, market gardens, farm animals, and crop production areas. Emphasis is increasingly on low cost development to facilitate public access to high quality landscapes.

Interpretation of the parks' natural resources is becoming increasingly important, particularly to provide opportunities close to Melbourne for rural education programmes. The Park Ranger service continues to develop both in expertise and experience and an in-service training programme is now in operation.

Maintenance of the parks has been critically reviewed and management prescriptions are being prepared to guide field staff in the sensitive management of the parks' natural resources. The need for comprehensive management plans has been recognised as a high priority.

Reservoir Parks with picnic facilities exist at the Maroondah, Upper Yarra, Silvan, Cardinia, Yan Yean, Toorourrong, Greenvale and Winneke Reservoirs, at Coranderrk Weir, Fernshaw, Donnelly's Weir, and the Top of Black Spur – the latter four all being in the vicinity of Healesville. The metropolitan parks are:

(1) Dandenong Valley, in the valley of the creek between Boronia Road and Wellington Road. This is being developed and will eventually comprise 1,330 hectares: sections totalling 200 hectares are now open to the public.

(2) Maribyrnong Valley, off the Calder Highway at Keilor, will eventually cover 460 hectares, including both MMBW and council-managed land. The Brimbank Park section of 106 hectares is now open.

(3) The Yarra Valley Park will eventually occupy 1,430 hectares along the river from Burke Road, Ivanhoe to Pound Bend, Warrandyte. Initial development has been centred on Banksia Park, off Templestowe Road, Bulleen and Westerfolds Park, off Porter Street, Templestowe.

(4) The Spring Park Golf Course (6 holes) at the corner of Springvale and Lower Dandenong Roads.

(5) Point Cook, off Aviation Road, adjoining the RAAF Base, will be of 933 hectares. The Board now manages 447 hectares, including a beach recreation use; and

(6) Werribee Park, including the historic Chirnside mansion and 131 hectares of formal garden and free range zoo operated by the Zoological Board.

Finance

Assessed value of property

The net annual value of property from 1978-79 to 1983-84 for the purpose of the Board's rating is shown in the following table:

MELBOURNE AND METROPOLITAN BOARD OF WORKS, ASSESSED VALUE OF PROPERTY RATED

($m)

Rate	Net annual value of property					
	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Water rate	1,677.9	1,719.5	1,752.3	2,614.2	2,672.5	2,742.4
Metropolitan general rate (for sewerage services)	1,374.5	1,435.7	1,478.3	2,241.7	2,296.8	2,410.7
Metropolitan drainage and river improvement rate	1,382.6	1,402.1	1,421.7	2,120.5	2,165.3	2,277.8
Metropolitan improvement rate	1,757.2	1,743.9	1,777.3	2,624.7	2,720.7	2,778.5

Finance for capital works

Capital works are financed mainly from money which the Board is given approval to borrow after the annual meeting of the Australian Loan Council has considered the projected loan programmes of semi-governmental authorities throughout Australia.

Board's borrowing powers and loan liability

The Board is empowered under section 187 of its Act to borrow up to $2,000m, exclusive of loans of $4.8m originally raised by the Victorian Government for the construction of waterworks for the supply of Melbourne and suburbs. In addition, the Board may, under section 200 of its Act, receive advances by way of loans from the Treasurer of Victoria, and the value of these loans is not included in the limit of $2,000m quoted in section 187. At 30 June 1984, the Board's total loan liability amounted to $2,036.4m, of which $1,723.4m had been incurred under section 187. All money borrowed is charged and secured upon the Board's revenues.

Revenue, expenditure, etc.

The following table shows the revenue, expenditure, surplus or deficit, and capital outlay of the Board in respect of its water supply, sewerage, and drainage functions during each of the years 1979-80 to 1983-84. The Board keeps a separate account of its financial activities as the Metropolitan Planning Authority.

MELBOURNE AND METROPOLITAN BOARD OF WORKS, REVENUE, EXPENDITURE, ETC.
($'000)

Particulars	1979-80	1980-81	1981-82	1982-83	1983-84
REVENUE					
Water supply –					
Water rates and charges (including revenue from water supplied by measure)	111,452	132,291	143,684	159,579	188,158
Sewerage –					
Sewerage rates	121,972	132,451	147,685	170,000	191,352
Trade waste charges	9,717	11,221	12,640	12,891	14,309
Sanitary and miscellaneous charges	4,127	4,760	5,790	6,748	24,679
Metropolitan farm –					
Grazing fees, rents, pastures, etc.	3	3	7	22	87
Balance, livestock account	2,374	1,343	1,296	1,765	1,713
Metropolitan drainage and rivers –					
Drainage and river improvement rate	18,499	20,040	24,141	28,079	31,464
Miscellaneous income	122	165	348	503	2,730
Total	268,266	302,274	335,591	379,587	454,492
EXPENDITURE					
Water supply –					
Management	15,199	18,212	23,850	25,614	28,851
Maintenance	23,784	30,448	38,280	58,363	67,414
Sewerage –					
Management	15,507	18,387	23,533	25,560	25,502
Maintenance	27,382	31,359	40,417	59,661	75,350
Metropolitan farm –					
Management	1,027	1,087	1,701	1,810	1,201
Maintenance	4,308	5,729	6,292	7,671	7,857
Metropolitan drainage and rivers –					
Management	3,510	3,906	5,308	5,885	6,266
Maintenance	5,306	6,596	8,955	11,052	12,203
Loan flotation expenses	2,430	2,693	*(a)*	*(a)*	*(b)*
Interest and finance expenses	118,818	118,747	141,651	169,641	174,845
Contributions to –					
Sinking fund	4,074	4,555	5,421	87	Cr.192
Loans redeemed reserve	8,378	8,698	10,220	3,032	2,594
Renewals fund	5,632	6,520	7,318	*(c)*	*(c)*
Depreciation	309	322	*(d)*	*(d)*	*(d)*
Superannuation fund	5,450	6,289	*(d)*	*(d)*	*(d)*
Provident fund	–	2,000	*(d)*	*(d)*	*(d)*
Municipalities for valuations, etc.	441	448	*(a)*	*(a)*	*(a)*
Rates equalisation reserve or general reserve	2,952	Cr.2,408	Cr.5,355	Cr.27,858	Cr.2,399
Appropriations for contingencies, accrued interest, etc.	–	5,000	–	–	–
Insurance fund	4,500	4,292	*(a)*	*(a)*	*(a)*
Capital works	18,400	28,200	28,000	10,247	–
Contribution to Consolidated Fund	–	–	–	27,680	55,000
Other	859	1,194	–	1,142	–
Total	268,266	302,274	335,591	379,587	454,492
Capital outlay at 30 June –					
Water supply	818,798	913,234	1,028,374	1,150,734	1,275,842
Sewerage	903,001	983,953	1,071,430	1,158,443	1,259,981
Drainage and river improvement works	101,339	114,153	131,736	144,071	155,365

(a) Included in management expenses.
(b) Included in finance expenses.
(c) Renewals Fund ceased 1982-83 onwards.
(d) Included in management, maintenance, and capital expenditure.

Town planning, metropolitan freeways, etc.

As a result of the passing of the *Metropolitan Bridges, Highways, and Foreshores Act* 1974 by the Victorian Parliament, the Board's road making powers, road assets, etc., and certain officers and other employees were transferred to the Country Roads Board, on 1 July 1974.

Also, under the same Act, the Board's responsibility for foreshores reverted to the Public Works Department.

In June 1984, the Victorian Government announced its plans for the Board to continue to manage Melbourne's hydraulic systems (water supply, sewerage, and waterways) and to be responsible for open spaces and the disposal of intractable wastes. Responsibility for the Melbourne Metropolitan Planning Scheme will transfer to the Ministry for Planning and Environment.

The following table summarises the revenue, expenditure, and capital outlay of the Board in connection with its functions as the Metropolitan Planning Authority during the period 1979-80 to 1983-84.

MELBOURNE AND METROPOLITAN BOARD OF WORKS: METROPOLITAN IMPROVEMENT FUND, REVENUE ACCOUNT, AND CAPITAL OUTLAY
($'000)

Particulars	1979-80	1980-81	1981-82	1982-83	1983-84
REVENUE					
Metropolitan improvement rate and sundry income	19,447	20,866	33,841	30,522	30,174
Sales of land	2,565	4,734	4,095	1,965	1,901
Total revenue	22,012	25,600	37,936	32,487	32,075
EXPENDITURE					
Management	6,453	7,532	10,011	11,413	13,240
Maintenance	1,027	1,580	3,589	5,351	5,620
Interest	51	51	52	52	51
Reserved land and acquisitions	2,415	4,535	2,242	3,934	1,464
Metropolitan parks land acquisitions	6,677	2,663	3,840	1,798	187
Construction works	1,847	1,869	4,932	9,426	3,651
Contribution to Melbourne Underground Rail Loop Authority	3,900	5,225	6,328	7,367	8,499
Transfer to rates equalisation fund	Cr.828	1,513	6,900	Cr.9,221	Cr.686
Contribution to Consolidated Fund	–	–	–	2,320	–
Other	470	632	42	47	49
Total expenditure	22,012	25,600	37,936	32,487	32,075
Capital outlay at 30 June	75,715	80,786	86,952	101,183	103,893

STATE RIVERS AND WATER SUPPLY COMMISSION

Operations

Following a Royal Commission on water supply, the Victorian Parliament passed the Irrigation Act of 1886 which vested the right to the use and control of all surface waters of Victoria in the Crown. This Act also provided for the establishment of irrigation trusts. Within a few years, large areas of Victoria were included in their districts. Inadequate water conservation, divided control of water resources, insufficient charges, and irregular revenue because water was used on a large scale only in dry years, caused most of the trusts to fail. Their failure made clear the need for a single authority to manage Victoria's water resources and resulted in the formation of the State Rivers and Water Supply Commission.

The State Rivers and Water Supply Commission was constituted under the Water Act passed by the Victorian Parliament in 1905. Under the provisions of the Act, the Commission was made responsible in general terms for the conservation, distribution, and management of Victoria's water resources outside the Melbourne metropolitan area.

In recent years the Commission's role broadened. The *Groundwater Act* 1969 gave the Commission additional responsibilities in regard to control of underground water. Amendments to the Local Government Act in 1973 extended the Commission's powers over sub-division of land. Prior to the amendment, the Commission's approval was only required for sub-divisions within irrigation districts. After amendment its approval was required for all sub-divisions outside the Melbourne metropolitan area. The *Drainage of Land Act* 1975 conferred on the Commission additional powers relating to the drainage of land and management of flood plains, outside the Melbourne and Metropolitan Board of Works and Dandenong Valley Authority areas.

The Commission comprised three commissioners appointed by the Governor in Council. At 30 June 1984, it employed a permanent workforce of 1,762 persons throughout Victoria. Maximum numbers of permanent staff engaged on programmes were: 246 on water resources; 81 on the

management of waterways and related lands; 831 on management of irrigation, drainage, and salinity control works; 354 on operation and management of urban water and waste-water systems; and 250 on management support. A casual labour force of 1,089 persons was also employed on construction, operation, and maintenance activities.

In addition to the administration of flood protection, drainage, and river improvement works throughout Victoria, more than 60 large storages, 320 subsidiary reservoirs, and 30,000 kilometres of channels and pipelines were operated by the Commission to supply water for irrigation, stock and domestic purposes, and reticulated town supplies. All these works were designed and constructed, and were operated and maintained by the Commission. Usage of irrigation water totalled 2,369,379 megalitres for 1983-84, compared with 2,722,142 megalitres for 1982-83.

The Commission's engineering functions were divided among the following five Branches, each under the control of a director:

(1) Engineering and Technical Services Branch was responsible for survey, design, and construction of major projects, maintenance and operation of major storages, and laboratory services;

(2) Rural Water Supplies Branch was responsible for design of works and operation and maintenance of irrigation, drainage, flood protection, river improvement districts, and flood plain management;

(3) Urban Water Services Branch was responsible for the construction, operation, and maintenance of urban water supply systems. In January 1984, the Commission's Local Authorities Division was transferred to the Ministry of Water Resources. Prior to this date the Urban Water Services Branch was also responsible for engineering and financial supervision of local water supply and sewerage authorities;

(4) Mechanical Branch was responsible for the design, construction, and maintenance of the Commission's mechanical and electrical engineering works as well as supervising the Commission's plant and vehicle fleets; and

(5) Planning and Development Branch was responsible for investigations of major proposals and salinity control works, and for developing corporate works programmes.

Support services to these Branches were supplied by the Finance, Stores, Personnel, Property and Legal Services, Valuations, and Secretarial Divisions of the Commission.

Outside the Melbourne metropolitan area the Commission services 111 towns with a reticulated water supply scheme. There are also twenty-seven river improvement trusts, and five drainage trusts outside the Melbourne metropolitan area.

Other services offered by the Commission include: irrigation and agricultural extension services, such as surveying, irrigation land layout, and surface and underground drainage layout; salinity control; licensing and control of private diversions from rivers and streams and from underground sources; and assessment, licensing, and policing of discharges to water outside the Melbourne metropolitan, La Trobe Valley, and Dandenong Valley areas. The Commission has also developed, patented, and arranged for the manufacture under licence of small control structures, both manual and automatic, for use in farm channels.

MAJOR WATER SUPPLY PROJECTS COMPLETED, VICTORIA, 1974 TO 1984

Project	Features
Rosslynne Reservoir (1974)	Earth and rockfill dam, storage 24,500 megalitres megalitres.
Millewa Domestic and Stock Scheme (1975)	Replacement of channels with pipelines, serving 227,000 hectares.
South Otway Pipeline (1975)	80 kilometre concrete-lined, mild steel pipes of 450mm diameter.
Tarago-Western Port Pipeline (1977)	90 kilometre contrete-lined, mild steel pipes of 1,050mm diameter.
Merrimu Stage 2 (Lerderderg River to Goodmans Creek) (1979)	Tunnel 4 kilometres long and Diversion Weir on Lerderderg River.
Dartmouth Dam (River Murray Commission) (1979)	Earth and rockfill dam, storage capacity 4,000,000 megalitres.
Cardinia-Frankston Pipeline (Stage 1) (1981)	11.73 kilometres concrete-lined, mild steel pipes 1,420mm diameter.
Mildura-Merbein Groundwater Interception Scheme (1981)	Construction of bores adjacent to Murray River, and pipeline to inland evaporation basin, to intercept saline groundwater entering Murray River.

MAJOR WATER SUPPLY PROJECTS COMPLETED, VICTORIA, 1974 to 1984 — *continued*

Project	Features
Nyah Pipeline Project (1982)	Replacement of channels with 44.74 kilometres of concrete pipeline serving an area of 1,566 hectares.
Sandhurst Reservoir (1983)	Earth and rockfill dam, storage 2,500 megalitres. megaiures.
Blue Rock Project (1984)	Earth and rockfill dam, storage 198,421 megalitres.

Source: State Rivers and Water Supply Commission.

Future programmes

Proposed expenditure on major works, urban water supply, provision of sewerage facilities, environmental protection, and water quality improvement under the Commission's three-year programme of capital works for the period 1984-85 to 1986-87 is $222m (at December 1984 prices). This involves an average annual expenditure of $74m subject to the availability of funds.

Major provisions in the programme include:

(1) the enlargement of Merrimu Reservoir and rehabilitation of Goulburn Weir. The total estimated cost of these programmes is $25.6m;

(2) Management of waterways and related lands, flood plain management, and control of flood protection districts. Total estimated cost of this programme is $11.9m;

(3) Provision of rural water supplies, including private diversions and drainage and salinity control measures. Total expenditure is estimated to be $27.2m; and

(4) Provision of urban water supply and wastewater services. Total expenditure is estimated to be $38.3m, excluding sewerage authorities and waterworks. Responsibility for these bodies was transferred to the Ministry of Water Resources on 1 January 1984, later known as the Department of Water Resources from 1 July 1984.

Irrigation

Most irrigation is carried out in districts directly controlled by the Commission, although there is an increasingly large proportion of 'private diverters', that is, irrigators who are authorised to take water from watercourses but whose holdings are not located inside an irrigation district. In the irrigation districts, water assigned to a given district is allocated to lands commanded by the channel system and suitable for irrigation on the basis of a water right. Irrigators pay a fixed sum for the volume of water allocated under water rights whether or not the water is actually used. Water rights are available in all but the driest years, and volumes in excess of water rights are usually available. The water right system ensures the irrigators of a minimum volume of water each year (except in severe drought years). Similarly, the Commission can rely on fairly constant revenue to meet the costs of district operations.

A feature of Victorian irrigation policy has been the development of closer settlement by intensive irrigation, that is, by allocating relatively large quantities of water per holding instead of limiting the allocation of water to a portion of each holding. This has meant that Victorian irrigation is predominantly devoted to dairying and horticulture, rather than to sheep raising.

In 1983-84, the area watered by private diversion from lakes, rivers, etc. was 72,717 hectares and the number of private diversions authorised for irrigation was 9,921. This compares with 84,912 hectares and 9,629 private diversions for 1982-83. The water delivered was used mainly to produce annual and perennial pastures and fodder, as well as potatoes, tobacco, hops, vegetables, vines, fruits, and cereals. About half the area privately watered is supplied from streams regulated by storages, the other half being from streams wholly dependent on rainfall. Many private storage dams are being built, frequently at substantial cost, to insure against low flows in the natural source.

The following table shows the areas irrigated in Victoria for the years 1978-79 to 1983-84:

AREA IRRIGATED, VICTORIA
(hectares)

Source of supply	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Goulburn-Campaspe-Loddon system	259,836	256,350	264,786	269,977	245,665	250,634
Murray River system	179,329	193,553	192,216	185,136	186,206	200,420
Other northern systems	6,541	6,975	7,549	7,593	4,990	6,030
Southern systems	34,800	37,725	36,815	37,090	33,491	36,733
Private diversions	71,101	74,045	75,753	76,375	84,912	72,717
Total	551,607	568,648	577,119	576,171	555,264	566,534

Further references: Irrigation, *Victorian Year Book* 1962, pp. 479-83; Wimmera-Mallee region water supply, 1963, pp. 499-501; Flood protection, river improvement, and drainage, 1963, pp. 501-2; Underground water, 1964, pp. 544-5; Water supply in Victoria, 1964, pp. 535-44; Goulburn-Murray Irrigation District, 1965, pp. 477-9; Spray irrigation in agriculture and dairying, 1965, p. 502; Private irrigation development, 1966, pp. 477-9; Water Research Foundation, 1966, pp. 479-80; River improvement, 1967, p. 298; Rivers and streams fund, 1967, p. 298; Dandenong Valley Authority, 1968, pp. 300-1; Water conservation, 1969, pp. 309-10; Water supply to Western Port, 1971, pp. 288-90; Lake William Hovell dam, 1972, pp. 294-5; River Murray Agreement and the River Murray Commission, 1972, pp. 296-301; Ten year plan, 1974, pp. 298-304; Millewa pipeline project, 1974, pp. 296-7; Snowy Mountains Hydro-Electric Scheme, 1974, pp. 298-304; Millewa Scheme, 1975, pp. 403-6; Tarago-Western Port pipeline, 1975, pp. 406-7; Storages, 1979, pp. 303-5; Water pollution control, 1981, p. 312; River improvement, regional drainage, and flood plain management, 1984, pp. 299-302

COUNTRY TOWN SUPPLIES

Introduction

During the gold rushes of the 1850s, large numbers of persons migrated to areas without adequate water supply either for domestic or mining purposes. The mining population was too unsettled to accept responsibility and no suitable supply authority existed. The Victorian Government, therefore, established the Victorian Water Supply Department which constructed reservoirs where needs were most pressing. The earliest reticulated supplies were to Bendigo in 1859, Ballarat in 1862, and Geelong in 1865. From 1872, government loans enabled municipal corporations to construct many waterworks of enduring value.

The first comprehensive legislation for the supply of water to country districts was the Water Conservation Act of 1881. This Act provided for the constitution of waterworks trusts to construct and manage supply works throughout Victoria. More detailed legislation to control supplies in urban areas was added in 1884.

By 1945, there were 258 cities and towns in Victoria with water supply systems, providing reticulated supplies to 51 per cent of Victoria's population outside the Melbourne metropolitan area. There are 449 cities and towns with reticulated water supplies. Supplies to 111 of these are managed by the Rural Water Commission – either as part of its major urban supply systems or as isolated towns in areas supplied for irrigation or domestic and stock purposes. The remaining 338 towns are supplied by local water authorities.

Sixty-six towns are supplied by the Commission's major urban supply systems on the Mornington Peninsula, and in the Otway and Coliban areas which were constructed primarily to supply towns (although a substantial volume of water for irrigation is supplied to the Bendigo-Castlemaine areas). A further fifty-seven towns are supplied from the irrigation network or from the Wimmera-Mallee channel. At 30 June 1984, a Committee was reviewing water and sewerage services in the Mornington Peninsula-Pakenham area, and considering options for the management structure of those services.

On 1 July 1983 responsibility for urban water supply for the Bellarine Peninsula was transferred from the Water Commission to the Geelong Waterworks and Sewerage Trust (now called the Geelong and District Water Board).

Local authorities

Prior to 1982 the administration of water and sewerage systems by separate authorities in country towns was unique to Victoria. Each authority enjoyed autonomy in most of its functions but, as the Victorian Government usually provided a high degree of financial assistance, it required that each trust submit proposals for new works to the Commission's scrutiny before approval and funds were forthcoming.

Since 1982 there has been substantial reorganisation of these authorities. The main thrust of this activity has been to reduce the excessive number of authorities and to upgrade the level of management within the authorities.

LANDS UNDER IRRIGATED CULTURE, EXTENT OF IRRIGATION AND AREAS WATERED, VICTORIA, 1982-83

Name of district area etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated (including lands adjoining a district)										
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vine-yards	Orchards	Market gardens	Fallow and mis-cellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
GOULBURN–CAMPASPE–LODDON SYSTEM														
Shepparton	81,955	75,678	182,323	39,987	5,416	288	146	161	10,400	18,441	163	3,743	513	716
Rodney	109,110	100,728	255,405	59,340	–	834	4,748	416	18,241	30,413	55	2,884	1,335	414
Tongala	93,769	69,869	149,517	34,768	1,379	127	913	114	10,113	21,348	1	130	353	290
Rochester	75,572	69,209	148,925	35,353	4,140	225	456	–	10,207	19,512	–	6	751	56
Dingee	4,379	3,815	10,051	2,017	131	–	8	3	474	1,401	–	–	–	–
Calivil	26,630	24,615	39,840	10,880	1,281	146	49	54	5,434	3,903	–	–	13	–
Tragowel Plains	88,906	76,299	122,613	44,287	5,438	180	633	1,476	30,034	5,884	–	–	11	631
Boort	47,182	40,539	53,938	14,995	3,242	710	769	–	7,526	1,750	–	–	450	548
Campaspe	8,508	8,095	19,491	3,368	417	266	54	–	267	2,120	–	–	244	–
East Loddon	–	–	–	251	4	12	56	–	145	34	–	–	–	–
West Loddon	–	–	–	419	38	46	–	–	149	36	–	–	–	150
Total	536,011	468,847	982,103	245,665	21,486	2,834	7,832	2,224	92,990	104,842	219	6,763	3,670	2,805
MURRAY RIVER SYSTEM Torrumbarry Weir														
Cohuna	52,311	49,277	135,833	40,578	1,147	579	62	358	19,246	19,139	–	1	21	25
Koondrook	38,069	32,435	73,514	23,386	2,116	277	198	85	15,316	4,950	–	84	2	358
Swan Hill	15,451	14,660	56,731	9,641	633	290	311	50	1,275	5,298	1,044	500	202	38
Third Lake	9,279	8,235	13,749	3,547	723	212	56	–	2,370	186	–	–	–	–
Mystic Park	8,673	7,735	11,845	4,141	1,020	19	–	91	2,660	296	21	10	24	–
Tresco	1,834	1,040	6,589	1,027	–	–	–	1	27	3	752	152	92	–
Fish Point	7,431	7,044	10,319	2,631	469	10	208	506	1,159	273	–	–	6	–
Kerang	34,246	29,668	62,139	22,203	2,429	229	535	886	13,637	3,959	–	2	2	524
Kerang North-West Lakes	–	–	–	665	196	58	48	–	214	3	80	43	23	–
Total	167,294	150,094	370,719	107,819	8,733	1,674	1,418	1,977	55,904	34,107	1,897	792	372	945

LANDS UNDER IRRIGATED CULTURE, EXTENT OF IRRIGATION AND AREAS WATERED, VICTORIA, 1982-83 – *continued*

Name of district area, etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated (including lands adjoining a district)										
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vine-yards	Orchards	Market gardens	Fallow and mis-cellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
MURRAY RIVER SYSTEM – *continued*														
Yarrawonga Weir														
Murray Valley (direct from river by pumping)	128,483	113,144	255,113	58,505	9,420	785	273	20	22,270	22,937	110	1,865	102	723
Nyah	1,566	1,328	9,387	1,148	8	6	46	47	23	157	644	82	108	27
Red Cliffs	5,500	5,160	43,800	4,875	–	12	–	68	–	7	4,502	183	23	80
Merbein	3,732	3,501	30,337	3,338	–	4	–	9	–	13	2,962	304	3	43
Robinvale	3,608	3,081	17,566	2,286	–	–	–	–	–	–	2,165	103	4	14
Carwarp-Yelta	–	–	–	251	175	22	–	34	–	20	–	–	–	–
Total	142,889	126,214	356,203	70,403	9,603	829	319	178	22,293	23,134	10,383	2,537	240	887
First Mildura Trust	15,863	7,984	73,005	7,984	–	–	–	–	–	214	6,134	284	–	1,352
Murray River system Total	326,046	284,292	799,927	186,206	18,336	2,503	1,737	2,155	78,197	57,455	18,414	3,613	612	3,184
OTHER NORTHERN SYSTEMS														
Coliban	–	–	–	2,039	7	27	4	75	374	1,091	13	394	44	10
Wimmera	–	2,988	–	2,951	59	10	–	–	28	2,796	–	34	20	4
Total	–	2,988	–	4,990	66	37	4	75	402	3,887	13	428	64	14
SOUTHERN SYSTEMS														
Bacchus Marsh	2,064	1,294	3,751	1,262	7	87	–	20	1	613	–	247	233	54
Werribee	3,760	3,510	9,678	3,215	6	67	–	–	2	999	–	28	2,081	32
Maffra-Sale	34,653	28,703	67,325	17,458	–	4	173	468	–	16,768	–	–	45	–
Central Gippsland	17,892	15,410	40,885	11,327	80	–	59	17	119	11,052	–	–	–	–
Mornington Peninsula	–	–	–	104	–	–	–	–	–	–	–	–	58	46
Bellarine Peninsula	–	–	–	125	–	–	–	–	–	–	–	–	105	20
Total	58,369	48,917	121,639	33,491	93	158	232	505	122	29,432	–	275	2,522	152
PRIVATE DIVERSIONS THROUGHOUT THE STATE														
Total	–	–	–	84,912	5,417	3,923	4,950	289	13,525	32,667	4,247	4,857	10,979	4,058
GRAND TOTAL 1982-83	920,426	805,044	1,903,669	555,264	45,398	9,455	14,755	5,248	185,236	228,283	22,893	15,936	17,847	10,213
GRAND TOTAL 1981-82	921,921	805,947	1,895,232	576,171	20,485	7,818	8,217	8,239	217,776	232,731	22,996	16,005	19,332	22,572

LANDS UNDER IRRIGATED CULTURE, EXTENT OF IRRIGATION AND AREAS WATERED, VICTORIA, 1983-84

Name of district area, etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated (including lands adjoining a district)										
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vine-yards	Orchards	Market gardens	Fallow and mis-cellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
GOULBURN-CAMPASPE-LODDON SYSTEM														
Shepparton	81,873	75,577	182,221	38,027	754	260	130	328	13,154	18,843	98	3,386	477	597
Rodney	109,046	100,656	255,546	57,871	1,127	872	577	744	20,149	29,652	53	2,959	1,352	386
Tongala	92,741	69,927	150,002	33,817	845	157	420	–	10,763	21,058	1	124	311	138
Rochester	76,047	69,378	148,691	38,953	1,696	311	–	–	14,800	20,288	–	20	736	1,102
Pyramid Hill	119,915	104,731	172,579	61,386	3,500	389	–	–	45,602	11,000	–	–	20	875
Boort	46,301	39,679	52,994	16,076	1,021	1,073	–	134	11,324	1,585	–	–	483	456
Campaspe	8,488	8,075	19,356	3,874	40	308	–	–	569	2,610	–	–	252	95
East Loddon	–	–	–	123	4	–	–	–	81	38	–	–	–	–
West Loddon	–	–	–	507	–	76	–	–	379	18	–	–	–	34
Total	534,411	468,023	981,389	250,634	8,987	3,446	1,127	1,206	116,821	105,092	152	6,489	3,631	3,683
MURRAY RIVER SYSTEM Torrumbarry Weir														
Cohuna	52,340	49,242	135,976	42,728	458	643	262	–	21,422	19,738	–	37	24	144
Koondrook	38,064	32,395	73,516	26,463	3,406	151	4	–	17,213	5,307	–	79	4	299
Swan Hill	15,415	14,630	56,598	9,697	466	346	206	–	1,252	5,606	991	458	188	184
Third Lake	9,276	8,233	13,749	3,178	411	247	80	–	2,235	184	–	1	–	20
Mystic Park	8,673	7,735	11,845	4,140	1,020	19	–	–	2,700	346	21	10	24	–
Tresco	1,835	1,092	6,601	1,104	33	6	–	–	16	1	784	168	96	–
Fish Point	7,431	7,043	10,319	2,883	583	13	496	–	1,512	277	–	–	2	–
Kerang	34,261	29,674	62,269	22,599	3,357	220	34	–	15,178	3,558	–	2	4	246
Kerang North-West Lakes	–	–	–	408	126	94	–	–	76	–	74	37	1	–
Total	167,295	150,044	370,873	113,200	9,860	1,739	1,082	–	61,604	35,017	1,870	792	343	893

LANDS UNDER IRRIGATED CULTURE, EXTENT OF IRRIGATION AND AREAS WATERED, VICTORIA, 1983-84 — *continued*

Name of district area, etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated (including lands adjoining a district)										
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vine-yards	Orchards	Market gardens	Fallow and mis-cellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
MURRAY RIVER SYSTEM – *continued*														
Yarrawonga Weir														
Murray Valley (direct from river by pumping)	128,372	113,221	255,676	67,462	1,207	998	652	–	35,841	23,892	110	1,808	204	2,750
Nyah	1,566	1,323	9,397	1,045	3	14	15	–	58	132	623	81	113	6
Red Cliffs	5,499	5,156	43,793	4,876	–	18	–	68	–	7	4,495	175	27	86
Merbein	3,733	3,500	30,327	3,313	–	3	–	13	–	6	2,906	311	3	71
Robinvale	3,613	3,085	17,565	2,365	–	–	–	–	–	–	2,169	101	2	93
Carwarp-Yelta	–	–	–	187	113	25	–	38	–	–	–	3	2	6
Total	142,783	126,285	356,758	79,248	1,323	1,058	667	119	35,899	24,037	10,303	2,479	351	3,012
First Mildura Trust	15,863	7,972	72,896	7,972	–	–	–	–	–	214	6,124	284	–	1,350
Murray River system Total	325,941	284,301	800,527	200,420	11,183	2,797	1,749	119	97,503	59,268	18,297	3,555	694	5,255
OTHER NORTHERN SYSTEMS														
Coliban	–	–	–	3,162	31	57	25	226	468	1,696	25	504	63	67
Wimmera	–	2,988	–	2,868	13	12	–	–	31	2,747	–	34	20	11
Total	–	2,988	–	6,030	44	69	25	226	499	4,443	25	538	83	78
SOUTHERN SYSTEMS														
Bacchus Marsh	2,069	1,297	3,762	1,193	2	132	–	–	–	584	–	256	218	1
Werribee	3,760	3,510	9,679	3,014	–	69	–	–	2	830	–	15	2,080	18
Maffra-Sale	34,637	28,727	67,413	19,528	–	17	2	–	223	19,256	–	–	30	–
Central Gippsland	17,892	15,407	41,013	12,894	166	11	94	–	825	11,797	–	–	–	1
Mornington Peninsula	–	–	–	104	–	–	–	–	–	–	–	–	58	46
Total	58,358	48,941	121,867	36,733	168	229	96	–	1,050	32,467	–	271	2,386	66
PRIVATE DIVERSIONS THROUGHOUT THE STATE														
Total	–	–	–	72,717	2,369	2,984	1,777	275	12,340	28,551	4,197	4,551	10,496	5,177
GRAND TOTAL 1983-84	918,710	804,253	1,903,783	566,534	22,751	9,525	4,774	1,826	228,213	229,821	22,671	15,404	17,290	14,259
GRAND TOTAL 1982-83	920,426	805,044	1,903,669	555,264	45,398	9,455	14,755	5,248	185,236	228,283	22,893	15,936	17,847	10,213

At 30 June 1984, of the 339 bodies which existed prior to 1982, 327 had been abolished and replaced by 147 successor bodies; the remaining 12 bodies were in the process of restructuring.

As part of the management improvements, major changes were being made to the system of financial accounting, to the reporting arrangements, and to the measurement of both financial and non-financial performance. This will make the authorities more accountable and performance orientated than was previously the case.

Present level of service

(1) *Water*. By 30 June 1984, 338 towns throughout rural Victoria – with an estimated total population of 937,288 people – had reticulated water supplies. The construction of new town supplies have commenced at Blackwood and Amphitheatre, with detailed plans being prepared for a supply to Oxley.

(2) Sewerage. By 30 June 1984, 141 towns outside the Melbourne metropolitan area had operating facilities serving an estimated total population of 1,078,560.

During 1983-84, construction began on new sewerage schemes at Halls Gap, Rutherglen, Wahgunyah, Woodend, and Kialla. Sewerage schemes have been approved for a further fifteen towns. Proposed schemes for sewering a further forty-five towns have been submitted for approval. There still remain twenty-four towns throughout the state with populations of 1,000 or more that do not have reticulated sewerage.

Further reference: Rural water supply, *Victorian Year Book*, 1984, pp. 287-96