13

WATER RESOURCES AND SEWERAGE

WATER RESOURCES AND THEIR CONTROL

Ministry of Water Resources and Water Supply

The 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 the State 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 is a Water Resources Council, consisting of eleven members appointed by the Governor in Council and comprising the Director of Water Resources who is 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 Association of Victoria, the Victorian Irrigators Central Council, and the Ministry for Conservation, and the Co-ordinator of Works from the Victorian Treasury. The functions of the Council are to investigate and advise the Minister generally on matters pertaining to the water resources of the State or to water supply, drainage, or sewerage throughout Victoria, referred to it by the Minister.

During 1979, the Council has been instrumental in initiating a number of significant studies, including:

(1) *Flood plain management.* Adoption by the Victorian Government of a Report describing the principles used in defining flood plains, together with guidelines for permissible works and structures within flood plains.

(2) *Re-use of waste water.* The Reclaimed Water Committee is continuing its studies and investigations into determining the feasibility of using reclaimed water for secondary purposes (agriculture, landscape watering, and industrial use). Included in the studies is a project to determine the viral content of raw sewage and treated effluents. The virological quality of waste water is likely to be a critical factor in the acceptance of the use of reclaimed water by the public.

(3) *Education campaign on water use.* The development of a campaign based on the theme "Use Water Wisely". The campaign aims to promote the efficient use of water, not only during the summer months but at all times throughout the year.

(4) *Investigations into household waste treatment.* A committee established by the Water Resources Council is examining alternative household waste treatment and disposal methods to determine their applicability as an alternative to full sewerage reticulation.

(5) *Economic aspects of the use of water resources in the Kerang region.* This major study, which utilised computer modelling to determine suitable programmes of water

supply and drainage in the Kerang region, highlighted the need for farmers to appraise on a regular basis alternative approaches to farming to ensure farm viability.

(6) *Research co-ordination.* There has always been a problem of co-ordinating research information. In an attempt to overcome this a committee has been established to ensure that all water related research is documented and made available to water resource managers.

Further reference: Water resources and their control, *Victorian Year Book* 1977, pp. 373-4; 1979, pp. 291-2

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. It is also Melbourne's metropolitan planning authority. The formation of a body such as the Board was urged by an 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 assume responsibility for the city's water supply, previously administered by the Public Works Department.

In the years since its inception, the Board, in addition to assuming responsibility for main drainage, has also been made responsible for maintenance and improvement of metropolitan rivers and watercourses, town planning, and metropolitan parks. With the exception of town planning, the Board's responsibilities are laid down in the *Melbourne and Metropolitan Board of Works Act* 1958 (as amended). Until 1 August 1978, the Board comprised 54 unpaid commissioners, a full-time elected chairman, and from 1975, a deputy chairman. Commissioners who were required to be members of a municipal council, could not hold their seats for more than three years without reappointment, while the maximum term for the chairman was four years before his appointment was reviewed. The deputy chairman's term was also for four years. Following recommendations by a Board of Inquiry, the composition of the Board was changed on 1 August 1978. It now comprises a full-time appointed chairman and six part-time members, four elected by area commissions comprising of groupings of municipalities and two appointed by the Victorian Government. Their appointments are for four-year terms.

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.

Board of Inquiry into the Melbourne and Metropolitan Board of Works, 1977

Terms of reference

By an Order in Council of 27 April 1977, Sir Charles Roger Darvall, C.B.E., of Melbourne and George Samuel of Perth, W.A. were appointed a Board of Inquiry, the terms of reference being:

(1) Whether the Board should continue to perform all or any and which of its functions.

(2) Whether the constitution of the Board under the *Melbourne and Metropolitan Board of Works Act* 1958 is inappropriate in any and what respects, having regard to the functions of the Board.

(3) Whether the Board should be reconstituted in any and what way and with any and what functions.
(4) Whether having regard to its powers, duties, and functions, any and, if so, what changes should be made to the administrative structure of the Board.
(5) Whether any and, if so, what changes are necessary or desirable in the manner in which the Board finances its functions having regard, in particular, to:

(a) the raising and repayment of loans and the setting aside of amounts for interest, redemption, and depreciation;
(b) the method of preparation of annual revenue estimates;
(c) the levying of rates based upon the net annual value of the property;
(d) the use of moneys to finance capital works provided by way of:
  (i) area contributions on new sub-divisions of land;
  (ii) the compulsory servicing of land in new sub-divisions;
  (iii) the national sewerage programme by the Commonwealth Government; and
  (iv) contribution to capital works from rate revenue.

Activities of the Inquiry

These involved:
(1) A study of the background and activities of a number of water and sewerage authorities situated in other countries and other States of Australia.
(2) The study of and visits to the varied and widespread activities of the Melbourne and Metropolitan Board of Works, discussions with its officers, and detailed examination of the substantial volume of historical, financial, and background data made available.
(3) Reference to the *Melbourne and Metropolitan Board of Works Act* 1958 (No. 6310) and the developing history of the Board over the years.
(4) The seeking of submissions based on the terms of reference from interested parties, study and evaluation of them, the carrying out of public hearings, and where sought, private discussions. In all, 158 submissions were received.

In broad outline the recommendations of the Board of Inquiry were:

Reference 1: Functions

That the Board of Works should continue as a statutory corporate structure and should also continue to perform all its current basic functions, including planning for the Melbourne and Metropolitan region.

Reference 2: Constitution

That in the opinion of the Inquiry, a Board of 54 commissioners (plus an executive chairman and executive deputy chairman) had become inappropriate to the current needs of the organisation and the community.

Reference 3 and Reference 4: Administrative structure

That the Board of 54 commissioners be replaced by a Board of six non-executive part-time commissioners, plus the State Government appointed executive chairman and (if then considered appropriate) a Government appointed executive deputy chairman. The non-executive commissioners to be suitably remunerated as occurs with other semi-government authorities. Three of the six to come from the municipal field and three selected by the Government as "possessing special business knowledge and experience".

Proposals were also made with the objective of assuring a close continuing relationship between the 52 metropolitan municipalities and the Board of Works — particularly in relation to the Board's town planning activities and responsibilities.

Reference 5 (a): Raising of capital funds and loan procedures

For reasons set out in the Report, the Inquiry did not recommend any change in the procedures presently adopted by the Board of Works for the raising and repayment of loans and the setting aside of amounts for interest, redemption, and depreciation.

Reference 5 (b): Annual revenue estimates

The Inquiry saw no lack of efficiency in the preparation of the annual revenue estimates of the Board of Works and saw no need for change from current procedures and controls.

Reference 5 (c): Levying of rates

The Inquiry recommended that the relative Act should be amended in regard to the levying of rates to enable the Board to use *either* the NAV (Net Annual Value) or the UCV (Unimproved Capital Value) basis or a combination of both.

Reference 5 (d): Special aids to the financing of capital works

Questions 5 (d) (i) and (ii) referred to the area contributions and compulsory servicing of land by developers and sub-dividers, this being a sensitive procedure; 5 (d) (iii) to the contributions by Commonwealth Government towards the backlog of the sewerage problem, and 5 (d) (iv) to the use of rate revenue for the financing of capital works.

In regard to these matters the Inquiry referred to the dilemma of the Melbourne and Metropolitan Board of Works (and indeed the Victorian Government itself) in meeting the needs and demands of the community within its rationed borrowing powers and bearing in mind the pressure to control rates within reasonable bounds. These constraints and needs had led to the special procedures referred to, and under the circumstances any recommendation as to their discontinuance was considered inappropriate.

Conclusion

The Report was completed and presented in mid-December 1977 and the Victorian Government's response was enacted on 30 May 1978 — the *Melbourne and Metropolitan Board of Works (Reconstruction) Act* 1978 (No. 9165).

Melbourne's water storages

Water to Melbourne and the metropolitan area is supplied from seven storage reservoirs drawing on the water resources of mountain catchment areas. Pipelines carry the water from on-stream storages distant from the city to off-stream storages located around the perimeter of the metropolitan area. Water is then conveyed to service reservoirs and elevated tanks throughout the suburbs for distribution to consumers.

When the Upper Yarra Dam was completed in 1957, the capacity of the storage reservoirs serving the supply system was increased to 296,000 megalitres, comprising Yan Yean Reservoir (30,000 megalitres), Maroondah (22,000), O'Shannassy (4,000), Silvan (40,000), and Upper Yarra (200,000). In the 22 years since Upper Yarra was commissioned, this storage capacity has more than doubled to 610,000 megalitres and work is under way on two new major reservoirs to add about another 1.2 million megalitres of water storage and give Melbourne, by the early 1980s, a supply system with a storage capacity equivalent to three times the expected annual demand.

The years since the completion of the Upper Yarra Dam have been the most significant in the history of Melbourne's water supply system. Major works undertaken since 1957—and particularly following the severe drought of 1967–68—include duplication of the transfer main between the Upper Yarra and Silvan Reservoirs; diversion of several Yarra tributaries into the supply system; construction of Greenvale and Cardinia Reservoirs; construction of the Yarra Valley Conduit to further increase transfer capacity between Upper Yarra and Silvan; construction of a transfer main between Silvan and Cardinia Reservoirs, as well as transfer mains from Cardinia to Dandenong, and from Dandenong to Notting Hill; and the Thomson Diversion Tunnel and Easton and Swingler Diversion Works to transfer water from the Thomson River to the Upper Yarra Reservoir. Major works currently in progress include the Sugarloaf Dam, with associated pumping station and water treatment works, and construction of the Thomson Dam.

The completion of the Greenvale (1971) and Cardinia Reservoirs (1973) added another 314,000 megalitres to the storage capacity of the metropolitan water supply system, bringing this capacity to its current level. Greenvale and Cardinia are off-stream storages in the sense that they are located on watercourses with little catchment of their own and hence are filled from external sources, i.e., the on-stream storages.

Greenvale Reservoir is on Yuroke Creek, a branch of the Moonee Ponds Creek to the north of the city, and serves Melbourne's north-western and western suburbs to Werribee. With a capacity of 27,000 megalitres, 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 by far 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 is fed from the Upper Yarra system via a pipeline from the southern end of Silvan Reservoir. Supply to Silvan is supplemented by the new Yarra Valley Conduit from the Upper Yarra Reservoir, which enables surplus water from the O'Shannassy and Upper Yarra catchments to be stored, and provides a marked degree of regulation of water from the diversion of the Thomson River, pending construction of the Thomson Dam.

Cardinia, with its large storage, supplies water to both the Dandenong and Notting Hill service reservoirs. The main dam embankment, with a base width of 303 metres, is generally rockfill with an impervious earth core. It has a maximum height of 86 metres, a crest length of 1,542 metres and contains about 3.7 million cubic metres of earth and rock. Cardinia started filling in 1973 and filled for the first time late in October 1977. The reservoir, which was designed by the Snowy Mountains Engineering Corporation, has a shoreline of about 56 kilometres and a surface area of more than 1,295 hectares.

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 channelled into the diversion 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 diversion 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 Jordan 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, to be formed by the Thomson Dam. When completed, this dam will be about 160 metres high and the earth and rockfill structure will form a reservoir inundating about 2,200 hectares. The dam will impound about 1.1 million megalitres and the proposed reservoir will extend for some 20 kilometres north of the wall.

A final decision to proceed with the Thomson Dam and its associated works was made by the Victorian Government early in 1976 after a study of the environmental implications during both the construction and operation of the dam. During the study, members of the public were able to make written submissions, either as individuals or collectively, on any aspect of the investigation, and these submissions were taken into account during preparation of the final report and recommendations. Apart from the Thomson Dam, the works involved in the third and final stage of the Thomson scheme entail an extension of the Thomson–Yarra diversion tunnel in a south-easterly direction for about 5.5 kilometres from Swingler to emerge within the proposed Thomson Reservoir, and allowing water to be transferred to the Upper Yarra system as required, as well as outlet works in the Thomson Dam for the release of water for other uses downstream. Excavation of the tunnel has been completed and construction of the dam embankment and associated works is proceeding. The Thomson Reservoir will store water during the wetter years when inflows are high and thus ensure an adequate water supply for Melbourne during the 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 will provide regulation of the stored water to supplement the variable flows in the Thomson River for the irrigators and water users in the Thomson Valley.

The augmentation programme announced in 1973 also included the Sugarloaf Reservoir (95,000 megalitres live capacity), which will store water pumped from the Yarra River at Yering Gorge and from the nearby Maroondah aqueduct. Basically, the Sugarloaf scheme comprises an intake and pumping station on the Yarra 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 covered "clearwater" storage basin adjacent to the treatment plant; and a pipeline from the storage basin through which treated water will be introduced to the supply system. Comprehensive treatment of Sugarloaf water will be necessary because it will contain agricultural and urban run-off. The treatment plant will be located close to the southern end of the main dam and will use conventional water treatment methods. Chemicals will be added to the water to encourage the settling of particles which cause turbidity and then the water will be filtered and chlorinated to kill any bacteria. The plant will produce a high quality potable water. Water from the Sugarloaf Reservoir will be introduced to the supply system via the Sugarloaf–Preston Pipeline which will run from the clearwater basin to a tunnel of the Maroondah aqueduct. Downstream of this point, the aqueduct is being converted to a 2.1 metre diameter pressure pipeline. As with the rest of Melbourne's water supply, water from Sugarloaf will be fluoridated in line with the requirements of the *Health (Fluoridation) Act* 1973. The reservoir, being an off-stream storage, is formed by a dam across the Sugarloaf Creek near Christmas Hills. The main dam will be 85 metres above stream bed level and will have a crest length of 1,000 metres. There will be two small saddle dams on the southern side of the reservoir. Sugarloaf will supply the northern and western suburbs, as well as Greenvale and Yan Yean storages, and thus reduce this component of demand on Silvan Reservoir.

Water reaches houses and industry in the Melbourne metropolitan area from the various service reservoirs situated in the highest convenient places so that a maximum pressure can be maintained, and peak demands can be met. There are 76 service reservoirs and tanks with a combined capacity of 2,136 megalitres. Underground mains and pipes 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 south and north 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 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.

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 at all the Board's storages, except the O'Shannassy Reservoir. Public access is also available to four smaller reserves—Donnellys Weir, Coranderrk Weir, Fernshaw, and the top of Black Spur. All the reserves are easily reached by car.

Total water consumption for 1977–78 was 402,600 megalitres, an increase of nearly 6 per cent over the previous year's consumption. Rainfall over the catchment area was about 20 per cent lower than average for this period; heavy rains in July were followed by very dry months. Notwithstanding the present decline in the rate of population growth, the planning of future water requirements for Melbourne has allowed for a continuous increase in water consumption due mainly to the continuing growth in households.

At 30 June 1978, there were 868,640 properties or an estimated 2,473,000 persons in Melbourne supplied with reticulated water. Average consumption for 1977–78 was 463,500 litres per property.

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: WATER SUPPLY SYSTEMS: STREAMFLOW YIELDS
(megalitres)

Year	Yan Yean	Maroondah	O'Shannassy	Upper Yarra	Thomson	Total water yield
1973–74	27,400	93,800	136,200	206,500	26,500	490,400
1974–75	31,900	108,500	170,300	351,000	25,300	687,000
1975–76	23,000	91,400	152,400	230,900	47,200	544,900
1976–77	21,600	104,400	120,400	219,500	80,000	545,900
1977–78	20,800	79,400	109,200	216,900	67,100	493,400

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 1973–74 to 1977–78:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON WATERWORKS
($'000)

Particulars	1973–74	1974–75	1975–76	1976–77	1977–78
Yan Yean system (including Greenvale)	246	320	82	45	42
Maroondah system	136	802	8,574	21,286	42,355
O'Shannassy, Upper Yarra, and Thomson system (including Silvan and Cardinia)	26,350	36,678	23,041	28,473	22,657
Service reservoirs	1,286	1,627	4,523	3,686	4,704
Large mains and pumping stations	6,134	3,690	14,086	18,488	19,330
Reticulation	4,533	5,963	8,766	9,590	17,712
Afforestation	2	22	6	21	20
Investigations, future works	1,994	1,917	*Cr.* 91	1	*Cr.*154
Total outlay	40,681	51,019	58,987	r 81,590	106,666

Consumption of water

During the year ended 30 June 1978, the maximum consumption of water in Melbourne and suburbs on any one day was 2,399 megalitres on 14 December 1977, and the minimum consumption was 705 megalitres on 27 March 1978.

The following table shows, for each of the years 1973–74 to 1977–78, 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.:

VICTORIA—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
1973–74	787,052	361,858	2,202	590	991	405.48	621,161
1974–75	809,372	355,625	2,274	620	974	393.66	640,165
1975–76	829,941	384,058	2,290	658	1,049	418.56	662,912
1976–77	850,834	381,489	2,273	638	1,045	423.59	689,336
1977–78	868,640	402,632	2,399	705	1,103	444.08	716,670

Sewerage system

The cost of sewerage works during each of the years 1973–74 to 1977–78, is shown in the following table:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON SEWERAGE SYSTEM
($'000)

Particulars	1973–74	1974–75	1975–76	1976–77	1977–78
Farm purchase and preparation	496	560	898	742	574
Treatment works	21,265	11,425	10,409	7,458	4,942
Outfall sewer and rising mains	2,975	1,430	393	354	89
Pumping stations, buildings, and plant	4,935	2,772	1,969	921	1,207
Main and branch sewers	24,201	43,301	45,249	33,575	14,368
Reticulation sewers	12,096	20,067	26,554	30,667	50,378
Sanitary depots	*Cr.* 48	—	—	3	61
Investigations	1,057	1,437	*Cr.*121	11	56
Total outlay	r 66,977	80,992	85,351	73,731	71,675

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 1977–78, working expenses were $304,772, costs of conveying and treatment $160,648, and investment $44,974, making a total of $510,394. Revenue was $609,255, giving a surplus of $98,861.

Drainage

Retarding basins

The Board of Works, acting as the drainage authority in the Melbourne metropolitan area, is responsible for providing flood protection works to serve in the most effective and economical manner. This has often been done by the construction of retarding basins. A retarding basin is a reservoir, normally empty, having an outlet always open, which is smaller than the inlet, so that during heavy storms part of the flow is held back and released gradually as the storm abates.

The first retarding basin constructed by the Board of Works is still in operation in Hawthorn, after more than 50 years' service. Twenty-one others have been constructed since. Two are presently under construction and planning for several further basins is proceeding. More basins will accompany the continuing growth of Melbourne.

Basins constructed to 1979 have flood storage capacities ranging from 4,900 to 1,960,000 cubic metres; the largest being the Jacana Retarding Basin on the Moonee Ponds Creek within the City of Broadmeadows. Although each basin had unique legal and economic problems associated with its development, all have similar hydrological reasons for their inception.

As the older catchments developed, no effective legislation was available to exclude development from the flood-prone areas adjacent to the creeks. This type of growth in some cases constricted the passage of larger flows and, during heavy storms, showed the retarding basin as the most effective and economical method of reducing peak flows to a flow which can be transmitted safely along the downstream drainage system. The alternative would have been the duplication or enlargement of the existing drainage systems.

In other areas, retarding basins are included in the original design of the drainage system. In these cases the basin not only retains peak flows but also reduces the size, and therefore the cost, of drainage works further downstream.

Some regions of Melbourne were originally swamp land and unfit for development. In such areas it is desirable to reduce flows and confine them to a narrower, controlled drainage system. This, in turn, drains the marshy areas and effectively opens up new lands for development. All this can and has been achieved most economically by the careful location of retarding basins.

A retarding basin may be formed in one of two ways. It can be excavated from a relatively flat area, or it can be formed by an embankment traversing a natural valley. The embankment may be specially constructed for the retarding basin or it can be used for a dual purpose by carrying a road across the valley.

The nature of a retarding basin lends itself easily to other uses. As many of the basins are empty and dry for the greater part of the time, some, with the co-operation of local councils, have been used for reserves and playing fields. Others have been designed to blend naturally with the surrounding flora to form parks, which to the untrained eye would not be recognised as flood protection structures.

The Lake Road Retarding Basin in the City of Nunawading is an example where a permanent lake has been incorporated in the design. The area surrounding the lake is preserved as a wildlife sanctuary by the Council. In addition, Cherry's Swamp and Truganina Swamp in Altona have been preserved to act as retarding basins, with the original character of the swamps being basically maintained so that these areas still provide a habitat for bird life, including several migratory species from the northern hemisphere.

Finance

Assessed value of property

The net annual value of property in 1976-77 and 1977-78 for the purpose of the Board's rating is shown in the following table:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: ASSESSED VALUE OF PROPERTY RATED
($m)

Rate	Net annual value of property	
	1976-77	1977-78
Water rate	804.7	1,641.5
Metropolitan general rate (for sewerage services)	663.3	1,321.6
Metropolitan drainage and river improvement rate	690.6	1,360.6
Metropolitan improvement rate	838.4	1,668.9

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 loan 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 1978, the Board's total loan liability amounted to $1,258.4m, of which $1,016.7m had been incurred under section 187. All moneys borrowed are 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 1973-74 to 1977-78. The Board keeps a separate account of its financial activities as the Metropolitan Planning Authority.

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

Particulars	1973-74	1974-75	1975-76	1976-77	1977-78
REVENUE					
Water supply—					
Water rates and charges (including revenue from water supplied by measure)	34,926	44,960	57,140	67,189	73,951
Sewerage—					
Sewerage rates	41,294	57,688	73,237	84,228	92,390
Trade waste charges	3,490	3,471	5,033	6,681	7,411
Sanitary charges	1,329	1,280	1,456	2,423	2,712
Metropolitan farm—					
Grazing fees, rents, pastures, etc.	3	3	4	3	2
Balance, livestock account	756	*Dr.* 263	*Dr.* 4	229	421
Metropolitan drainage and rivers—					
Drainage and river improvement rate	8,068	8,366	10,353	11,870	13,697
River water charges	12	16	11	12	16
Total	89,878	115,521	147,231	172,635	190,600
EXPENDITURE					
Water supply—					
Management	6,068	6,394	7,690	8,694	10,445
Maintenance	8,226	11,531	14,158	16,488	18,847
Water supply works	1,400	1,400	1,652	1,652	1,652

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: REVENUE, EXPENDITURE, ETC.—*continued*

($'000)

Particulars	1973–74	1974–75	1975–76	1976–77	1977–78
Sewerage—					
Management	5,811	9,232	9,617	10,755	13,144
Maintenance	6,616	11,364	15,320	19,599	22,102
Sewerage works	2,600	2,600	3,068	3,068	3,068
Metropolitan farm—					
Management	399	465	658	813	884
Maintenance	1,645	2,118	2,548	2,992	3,383
Metropolitan drainage and rivers—					
Management	1,298	1,053	1,588	1,735	2,165
Maintenance	2,097	2,734	3,421	4,162	4,691
Drainage works	1,000	1,000	1,180	1,180	1,180
Pensions and allowances	376	404	513	844	—
Loan flotation expenses	384	628	720	1,128	672
Interest (including exchange)	42,027	51,708	64,161	74,246	89,052
Contributions to—					
Sinking fund	2,023	2,210	2,408	2,727	3,172
Loans redeemed reserve	4,125	4,955	5,610	6,436	7,159
Renewals fund	1,109	1,151	1,466	1,796	2,449
Depreciation	264	320	1,015	1,019	372
Superannuation account	1,640	3,123	4,505	4,965	5,317
Municipalities for valuations, etc.	265	273	279	265	444
Rates equalisation reserve	505	858	3,674	4,371	202
Appropriations for contingencies, etc.	—	—	1,880	3,200	200
Other	—	—	100	500	—
Total	89,878	115,521	147,231	172,635	190,600
Capital outlay at 30 June—					
Water supply	324,338	375,356	434,343	515,931	622,597
Sewerage	460,694	541,686	627,037	700,769	772,445
Drainage and river improvement works	49,285	57,104	66,139	74,098	83,343

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 respect of its town planning functions, the Board now operates under the authority of the Minister for Planning.

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 1973–74 to 1977–78:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: METROPOLITAN IMPROVEMENT FUND: REVENUE ACCOUNT AND CAPITAL OUTLAY

($'000)

Particulars	1973–74	1974–75	1975–76	1976–77	1977–78
Revenue—					
Metropolitan improvement rate and sundry income	11,760	12,438	14,972	16,344	17,447
Recoup from Country Roads Board	—	1,026	—	—	—
Sales of land	—	2,042	5,225	1,644	4,781
Other	—	993	665	19	—
Total revenue	11,760	16,499	20,863	18,007	22,228

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: METROPOLITAN IMPROVEMENT FUND: REVENUE ACCOUNT AND CAPITAL OUTLAY—*continued*
($'000)

Particulars	1973–74	1974–75	1975–76	1976–77	1977–78
Expenditure—					
Management	2,144	2,936	4,249	4,576	4,864
Maintenance	1,110	42	38	305	453
Interest	70	73	77	120	210
Contributions to sinking fund	24	24	*Cr.* 24	—	—
Reserved land and acquisitions	6,056	8,615	4,759	5,557	2,409
Metropolitan parks land acquisitions	—	3,170	3,812	6,080	6,629
Special Road Projects acquisitions, etc.	—	553	553	—	—
Construction works	—	81	308	894	1,451
Road and foreshore works	114	—	—	—	—
Contribution to Melbourne Underground Rail Loop Authority	306	721	1,261	1,372	2,250
Transfer to rates equalisation fund	1,778	61	5,469	*Cr.*1,289	3,540
Other	158	222	361	392	422
Total expenditure	11,760	16,499	20,863	r 18,007	22,228
Capital outlay at 30 June *(a)*	145,472	*(b)*41,213	44,825	55,591	61,238

(a) Includes expenditure of $8,864,000 paid from the Roads (Special Projects) Fund in 1973–74. Also includes expenditure of $10,458,000 paid from the Commonwealth Aid Roads Fund in 1973–74.
(b) Henceforth excludes highways and bridge works, and foreshore works, responsibility for which has been transferred to other authorities.

STATE RIVERS AND WATER SUPPLY COMMISSION

Operations

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 for the conservation and distribution of Victoria's water resources and control of the waters from rivers and beds and banks of streams and the control of the other natural sources outside of the Melbourne metropolitan area.

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 the State's water resources and resulted in the formation of the State Rivers and Water Supply Commission.

In recent years the Commission's role has 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: its approval is now 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 comprises three commissioners appointed by the Governor of Victoria. It currently employs a permanent workforce of 1,790 persons throughout Victoria, and up to 1,300 casual employees according to the demand for labour on Commission works. About 450 personnel on the permanent staff are engaged in engineering, surveying, drafting, and other professional occupations, a further 490 are engaged in water distribution, district operations and maintenance, and another 510 are engaged in accounting and administrative functions. Of the casual labour force of 1,160 persons, 320 are engaged on construction projects and 840 on district maintenance.

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 are 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 are operated and maintained by the Commission. Delivery of irrigation water totalled 2,481,121 megalitres for 1978–79.

The Commission's engineering functions are divided between the following four Branches, each under the control of a chief engineer:

(1) Major Works Branch is responsible for investigation, survey, design, and construction of major projects, maintenance and operation of major storages, and planning and laboratory services;

(2) Rural Water Supplies Branch is responsible for operation and maintenance of irrigation, drainage, flood protection, and river improvement districts;

(3) Town Water Supplies Branch is responsible for the construction, operation, and maintenance of urban water supply systems, as well as engineering and financial supervision of local water supply and sewerage authorities; and

(4) Mechanical Services Branch is 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.

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

Outside the Melbourne metropolitan area there are now 472 towns served by a reticulated water supply scheme, of which 147 are managed by the Commission and the remaining 325 are managed by 207 local water authorities. There are also 135 sewerage authorities, 27 river improvement trusts, and 4 drainage trusts serving Victoria 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 resources; and assessment, licensing, and policing of discharges to water outside the Melbourne metropolitan area. 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 (terminal) channels.

Major water supply projects completed between 1970 and 1979 include:

Project	Features
Lake William Hovell	Earth and rockfill dam, storage 13,500 megalitres
Merrimu Tunnel Stage 2 (Lerderderg River to Goodmans Creek)	Tunnel 4 kilometres long, 2.7 metres diameter
Barr Creek Salinity	Salinity control on Murray River
Lake Hawthorn Salinity	Salinity control on Murray River
Lake Mokoan	Earth and rockfill off-river storage, capacity 365,000 megalitres
Rosslynne Reservoir	Earth and rockfill dam, storage 24,500 megalitres
South Otway Pipeline	55 kilometres concrete-lined mild-steel pipeline of 500 mm diameter
Tarago-Western Port Pipeline	65 kilometres concrete-lined steel pipeline of 1,100 mm diameter
Tarago Reservoir Enlargement	Construction of concrete wave wall on top of spillway — new capacity 37,500 megalitres
Millewa Domestic and Stock Scheme	Replacement of channels with pipelines — serves 227,000 hectares
Dartmouth Dam	Earth and rockfill dam storage — capacity 4,000,000 megalitres

Water pollution control

The Commission's Pollution Control Section was established in 1973 to exercise powers delegated to the Commission by the Environment Protection Authority to control water pollution in country areas, excluding the La Trobe and Yarra Valleys.

Pollution inspectors are based at Melbourne, Wodonga, Shepparton, Bendigo, Ballarat, Frankston, Geelong, and Warrnambool. The inspectors at Frankston, Shepparton, Geelong, and Bendigo work under the supervision of the local district engineer in close liaison with Pollution Control Section. The inspectors have been recruited from positions in health inspection, waste treatment, laboratory work, inspection and pollution control in other government departments, and technical teaching. On appointment, inspectors undergo intensive training for two to three months at Head Office before working in the field. Initial training is reinforced by bi-monthly training programmes that facilitate co-ordination of inspectorial activities throughout Victoria. Inspectors also participate in training programmes conducted by the Environment Protection Authority and the Ministry of Water Resources and Water Supply's Sewerage Operator Training Centre at Werribee.

Policy on some discharges, such as town drainage and sewerage overflows, are still under consideration. Septic tanks are now controlled by regulation, rather than licence, and consideration is being given to controlling discharges from garages and car washes. Dairy and piggery farmers now agree that their farm wastes can no longer be discharged into watercourses. Generally, effluent from these sources is being disposed of on land, even on small farms which are exempt from licence requirements, and this practice is being encouraged by the Commission.

Future programmes

Proposed expenditure on major works, urban water supply, sewerage, environmental protection, and water quality has been increased under the Commission's six-year programme of capital works for the period 1979–80 to 1984–85. The programme requires an allocation of $378m (at December 1978 prices) over the programme period, subject to the availability of funds.

Major provisions in the programme include:

(1) The commencement of six major water conservation dams, estimated to cost $90m for urban, industrial, and irrigation supply.

(2) Expenditure of $25m for the construction of large trunk pipelines to augment the Mornington Peninsula water supply system and to improve its operating capabilities.

(3) Expenditure of $18m on headworks improvements in the Bellarine Peninsula water supply system.

(4) Continuance of groundwater control programmes by extraction and disposal with partial re-use, in the Shepparton region, subject to the approval of the Parliamentary Public Works Committee inquiry into salinity in northern Victoria.

(5) Continuance of salinity control works in the Sunraysia and Kerang regions for the interception of saline groundwater flows to the Murray River, and disposal of saline drainage to evaporative disposal areas. Priority works for which Victorian Government approvals are available are expected to be completed by 1979–80. The total programme, which is estimated to cost $60m (at December 1977 prices), is subject to a Parliamentary Public Works Committee inquiry.

(6) Continuance of surface drainage programmes in the northern irrigation districts, including those programmes associated with groundwater extraction in the Shepparton region. These programmes are estimated to cost $2m to $3m per annum.

(7) A continuing programme, estimated to cost $500,000 per annum, for the roofing of storages within the Commission's major main urban water supply systems as a prerequisite to future long-term comprehensive water treatment programmes.

(8) Allocations for improvements to and for water treatment at urban centres, particularly those on the Murray River and in the Wimmera-Mallee areas. Water treatment plants will be completed at Red Cliffs and Robinvale within the programme period.

VICTORIA—LANDS UNDER IRRIGATED CULTURE: EXTENT OF IRRIGATION AND AREAS WATERED, 1978–79

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	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	82,557.2	76,138.8	181,882.0	34,403.8	256.0	343.4	250.8	286.5	12,538.9	15,246.3	172.8	3,613.4	372.9	1,322.8
Rodney	109,210.7	100,869.5	253,981.0	61,646.0	1,034.0	789.0	519.0	511.0	22,392.0	31,642.0	71.0	2,970.0	1,121.0	597.0
Tongala-Stanhope	31,151.3	28,599.7	104,931.0	25,735.0	540.0	105.0	60.0	260.0	6,630.0	17,480.0	—	200.0	85.0	375.0
Deakin	63,536.6	41,561.4	43,534.0	11,820.0	510.0	225.0	20.0	180.0	5,795.0	4,620.0	—	10.0	370.0	90.0
Rochester	75,643.4	67,896.9	148,224.0	37,500.0	1,209.0	215.0	8.0	68.0	13,848.0	20,570.0	—	17.0	490.0	1,075.0
Dingee	4,378.8	3,825.4	10,051.0	2,415.0	50.0	—	—	22.0	844.0	1,499.0	—	—	—	—
Calivil	26,669.4	24,666.7	39,899.0	11,803.0	112.0	385.0	69.0	138.0	6,906.0	4,004.0	—	—	3.0	186.0
Tragowel Plains	88,805.7	76,236.0	121,802.0	48,824.0	801.0	128.0	1,903.0	3,704.0	32,872.0	6,182.0	—	—	—	3,234.0
Boort	47,303.4	40,485.1	53,428.0	20,755.0	1,827.0	737.0	42.0	—	11,138.0	2,096.0	—	—	163.0	4,752.0
Campaspe	8,546.1	8,124.5	19,295.0	3,843.0	178.0	205.0	8.0	120.0	633.0	2,490.0	—	—	107.0	102.0
East Loddon	—	—	—	336.0	—	—	—	—	230.0	105.0	1.0	—	—	—
West Loddon	—	—	—	755.0	16.0	36.0	—	20.0	349.0	12.0	—	—	—	322.0
Total	537,802.6	468,404.0	977,027.0	259,835.8	6,533.0	3,168.4	2,879.8	5,309.5	114,175.9	105,946.3	244.8	6,810.4	2,711.9	12,055.8
MURRAY RIVER SYSTEM (Torrumbarry Weir)—														
Cohuna	51,449.3	48,181.9	134,449.0	43,642.0	305.0	575.0	527.0	1,246.0	20,614.0	20,175.0	—	1.0	101.0	98.0
Koondrook	38,149.5	32,544.7	72,781.0	24,872.0	2,727.0	67.0	46.0	168.0	15,484.0	4,966.0	—	172.0	21.0	1,221.0
Swan Hill	15,590.4	14,761.5	55,850.0	10,260.7	72.2	259.1	55.8	—	1,499.4	6,176.2	1,207.8	471.6	321.3	197.3
Third Lake	9,210.5	8,340.8	13,062.0	2,948.5	374.0	125.8	71.2	8.0	2,179.1	160.5	—	0.4	0.4	29.1
Mystic Park	8,676.7	7,738.8	11,477.0	3,307.1	—	88.1	128.0	103.2	1,822.5	556.5	19.1	17.7	8.0	564.0
Tresco	1,821.9	962.3	5,191.4	930.3	—	15.0	—	—	—	—	721.6	106.3	87.4	—
Fish Point	7,431.1	7,043.8	9,894.0	3,177.4	198.7	9.6	213.2	1,045.1	1,005.6	270.1	—	—	4.0	431.1
Kerang	34,371.4	29,738.3	62,023.0	19,379.3	1,798.4	97.5	48.0	325.4	12,920.8	3,317.5	—	—	—	871.7
Kerang North-West Lakes	—	—	—	583.8	160.0	32.1	20.0	—	221.1	10.0	77.8	29.8	0.8	32.2
Total	166,700.8	149,312.1	364,727.4	109,101.1	5,635.3	1,269.2	1,109.2	2,895.7	55,746.5	35,631.8	2,026.3	798.8	543.9	3,444.4
Murray Valley (Yarrawonga Weir)	129,378.2	113,853.0	253,844.0	50,354.0	1,544.0	512.0	312.0	—	21,025.0	21,344.0	95.0	1,623.0	337.0	3,562.0

VICTORIA—LANDS UNDER IRRIGATED CULTURE: EXTENT OF IRRIGATION AND AREAS WATERED, 1978-79—*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	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
Direct from river by pumping—														
Nyah	1,566.5	1,321.0	9,217.3	1,175.8	—	—	—	52.8	—	76.8	854.4	58.3	125.3	8.2
Red Cliffs	5,507.8	5,190.9	43,771.0	4,871.6	—	5.7	—	15.5	9.0	43.5	4,558.0	191.2	7.0	41.7
Merbein	3,731.8	3,502.3	30,247.0	3,432.2	20.0	—	—	20.3	2.6	20.6	3,008.7	316.7	6.0	37.3
Robinvale	3,608.3	3,076.3	17,528.9	2,150.0	—	—	—	—	—	—	2,044.0	106.0	—	—
Carwarp-Yelta	—	—	—	228.0	54.0	28.0	38.0	—	33.0	—	—	—	—	75.0
Total	14,414.4	13,090.5	100,764.2	11,857.6	74.0	33.7	38.0	88.6	44.6	140.9	10,465.1	672.2	138.3	162.2
First Mildura Trust	15,863.7	8,016.0	73,298.3	8,016.0	—	—	—	—	—	214.0	6,166.0	284.0	—	1,352.0
Murray River system Total	326,357.1	284,271.6	792,633.9	179,328.7	7,253.3	1,814.9	1,459.2	2,984.3	76,816.1	57,330.7	18,752.4	3,378.0	1,019.2	8,520.6
OTHER NORTHERN SYSTEMS—														
Coliban	—	—	—	4,068.4	14.0	91.5	—	230.7	636.4	2,427.4	19.7	490.5	106.5	51.7
Wimmera	—	3,048.0	—	2,473.0	—	4.0	—	—	16.0	2,408.0	—	29.0	16.0	—
Total	—	3,048.0	—	6,541.4	14.0	95.5	—	230.7	652.4	4,835.4	19.7	519.5	122.5	51.7
SOUTHERN SYSTEMS—														
Bacchus Marsh	2,373.9	1,320.5	3,803.2	1,208.0	8.0	34.0	—	—	—	677.0	—	208.0	228.0	53.0
Werribee	3,771.2	3,560.0	9,683.9	3,194.0	12.0	64.0	80.0	24.0	56.0	960.0	—	62.0	1,871.0	65.0
Maffra-Sale	34,687.7	28,358.6	64,999.0	18,355.0	22.0	39.0	26.0	96.0	—	18,128.0	—	—	44.0	—
Central Gippsland	17,896.2	15,306.5	38,912.0	11,814.0	50.0	—	—	—	—	11,764.0	—	—	—	—
Mornington Peninsula	—	—	—	103.8	—	—	—	—	—	—	—	—	57.9	45.9
Bellarine Peninsula	—	—	—	125.0	—	—	—	—	—	—	—	—	105.0	20.0
Total	58,729.0	48,545.6	117,398.1	34,799.8	92.0	137.0	106.0	120.0	56.0	31,529.0	—	270.0	2,305.9	183.9
PRIVATE DIVERSIONS THROUGHOUT THE STATE	—	—	—	71,101.0	2,216.0	4,033.0	1,363.0	788.0	13,505.0	26,646.0	3,992.0	3,932.0	9,829.0	4,797.0
GRAND TOTAL 1978-79	922,888.7	804,269.2	1,887,059.0	551,606.7	16,108.3	9,248.8	5,808.0	9,432.5	205,205.4	226,287.4	23,008.9	14,909.9	15,988.5	25,609.0
GRAND TOTAL 1977-78	921,064.5	803,595.4	1,883,259.7	575,346.6	22,775.0	11,829.2	5,215.2	14,246.1	206,009.0	235,270.8	23,027.6	14,943.2	16,020.4	26,010.0

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. The advantage of intensive irrigation is that much higher returns are available from a given quantity of water and, consequently, a much larger rural population is supported. Delivery of irrigation water totalled 2,481,121 megalitres for 1978–79.

In 1978–79, the area watered by private diversion from lakes, rivers, etc., was 551,607 hectares and the number of private diversions authorised was 11,381. 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 1973–74 to 1977–78.

VICTORIA—AREA IRRIGATED
(hectares)

Source of supply	1973–74	1974–75	1975–76	1976–77	1977–78
Goulburn–Loddon system	234,074	264,673	262,306	276,782	272,339
Murray River system	183,488	188,045	188,298	191,227	181,643
Other northern systems	7,316	7,341	7,475	7,454	7,035
Southern systems	34,988	35,345	35,566	35,012	36,341
Private diversions	85,176	90,439	84,556	78,339	77,988
Total	545,042	585,843	578,201	588,814	575,346

Further reference: Storages, *Victorian Year Book* 1979, pp. 303–5

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 Department of Victorian Water Supply 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 now 446 cities and towns with reticulated water supplies. Supplies to 148 of these are managed by the State Rivers and Water Supply 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 298 towns are supplied by local water authorities.

Eighty-seven towns are supplied by the Commission's major urban supply systems on the Mornington Peninsula, Bellarine Peninsula, Otways, 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 sixty towns are supplied from irrigation or waterworks districts in isolated areas of the State.

Local authorities

The administration of water and sewerage as separate authorities in country towns is unique to Victoria. Each authority enjoys autonomy in most of its functions but, as the Victorian Government usually provides a high degree of financial assistance, it requires that each trust submits its operations and proposals to the Commission's scrutiny before approval and funds are forthcoming. At June 1979, there were 207 local water authorities supplying 325 Victorian country towns. A further 18 town supply systems are under construction.

Organisation

There are two broad classes of local water authority:

(1) "Local governing bodies", which are municipal councils constituted as local governing bodies under the Water Act; and

(2) "waterworks trusts", the commissioners of which might comprise:

(i) councillors for the time being of the municipality concerned plus one Victorian Government nominee;

(ii) councillors of one or more municipal ridings plus up to three nominees; or

(iii) commissioners elected directly by the water ratepayers.

Local governing bodies (25) are usually limited to cities or boroughs as their water supply districts must be essentially urban in character. Although a local governing body may be composed entirely of councillors and use the council's name, it is a separate legal entity and its business and accounts must be kept apart from the administration of municipal affairs. Waterworks trusts usually comprise about six commissioners and have jurisdiction over a waterworks district, within which there may be one or more urban districts.

Several local water authorities operate under special Acts which are usually supplementary to the Water Act. These special authorities include the Mildura Urban Waterworks Trust, the Geelong Waterworks and Sewerage Trust, the Latrobe Valley Water and Sewerage Board supplying water in bulk to towns and industries in the La Trobe Valley and the West Moorabool Water Board which supplies water in bulk to the local authorities at Ballarat and Geelong. A number of small townships in Victoria are still supplied by local municipal councils under powers conferred by the Local Government Act. However, the provisions of that Act in relation to water supply are not sufficiently specific for the management of any substantial town water supply system. Although such supplies can receive consideration for a capital grant under the town water supplies assistance formula, the remainder of the costs must be found by the municipality concerned from its normal sources of loan funds.