

A study area was defined which comprised the catchment of the Yarra upstream from and including Merri Creek, having an area of about 1,450 square miles, of which about half lies outside the metropolitan planning area.

Plan 8 shows this area, which includes portions of the municipalities of Bulla, Broadmeadows, Coburg, Brunswick, Collingwood, Fitzroy, Kew, Camberwell, Box Hill, Nunawading, Ringwood, Croydon, Sherbrooke and Upper Yarra, and the whole of the municipalities of Whittlesea, Preston, Northcote, Heidelberg, Diamond Valley, Eltham, Doncaster and Templestowe, Lillydale and Healesville.

(Additional major tributaries discharging into the Yarra include the Maribyrnong River, Moonee Ponds Creek and Gardiners Creek. However, investigations have indicated that the practical problems arising out of further urbanisation within the valleys of these watercourses are of lesser magnitude than for the study area and they are not referred to in this part of the report).

The present population within the study area approaches 700,000 persons, of which approximately two-thirds are located in the valleys of the northern tributaries of the Yarra, which are the Plenty River, and the Merri, Darebin and Diamond Creeks (Area 1) and one-third in the remaining part of the Yarra valley and its eastern tributaries (Area 2).

Within Area 1, settlement first occurred in the valleys nearest to the present Central Business District and progressively extended in a northerly direction.

Within Area 2, settlement first occurred generally in proximity to the major transport routes. These are remote from the Yarra except in inner portions of the area, consequently non-urban characteristics in many of the valleys adjoining the Yarra have been preserved to the present time. Usable land on either side of the flood plain has been progressively developed for urban purposes, leaving a strip of varying width extending from the Yarra Bend National Park, to Fitzsimons Lane within the city of Doncaster and Templestowe. Part of this area has already been included in existing or proposed public open space reservations in the metropolitan planning scheme as part of the Board's policy of progressively reserving land for public open space along the valley as development extended. However, the remainder is within the rural zone, and those parts which are above flood levels are subject to intense pressures for urban development.

The urban zones in the metropolitan planning scheme, and the various municipal planning schemes which have been approved by the Governor-in-Council could accommodate an additional population of some 250,000 persons through the study area, including at least 100,000 persons within Area 2, which is the general area, specially upstream from Warrandyte, to which the Government's statement more particularly applies.

Assuming that existing urban zoning provisions are not modified within this area, it is to be expected that population growth at least of this order will occur in the future.

The study area is of sufficient size to accommodate further major increases of population beyond the present urban zones, and the pressure for development will certainly be there. The very attributes of the valley which make it such an attractive area, themselves lead to these pressures.

However, an examination of the environmental and economic consequences has indicated that major constraints exist on such future development, particularly within Area 2. Apart from the desirability of conserving significant landscape and habitat within the valley, the following aspects relating to stormwater drainage and flood control, pollution control and sanitation of the river and water supply have influenced the Board's proposals.

#### *Stormwater Drainage—Flood Control*

There have been three well documented major floods in the Yarra River through Melbourne. These were the floods of 1863, 1891 and 1934, which resulted in approximately the same maximum river flows.

There are reports of other major floods prior to 1863, but these are not sufficiently documented.

It follows, therefore, that worse floods than the three recorded might be expected in the future. The Meteorological Bureau has estimated that an extreme flood likely in the Yarra at Warrandyte could be approximately 93,000 cusecs, which is several times the peak flow of the 1934 flood at this location.

The 1934 flood is used as a yardstick by the Board for defining certain acceptable limits, and has been used in this report for comparative purposes.

The Chandler Highway basin (from Fairfield to Templestowe) and the Yering basin (from Yering Gorge to Healesville) are



major natural flood mitigation features of the Yarra valley. It has been estimated that without these natural flood storage basins, the flood flows through Melbourne in 1934 would have been approximately doubled (i.e. approximately 80,000 cusecs compared with the recorded 40,000 cusecs at Johnston Street, Abbotsford).

It is important that the natural functions of these basin areas be retained.

A highly complex hydrological investigation, extending over several years, will be necessary to fully define the flooding consequences of further urbanisation in the valley and the possible flood mitigation works required. It therefore follows that any assessment made at this stage, although based on known hydrological factors and past experience, must necessarily be generalised, and of a provisional nature.

Urbanisation of a catchment increases the volume of rainfall runoff and also the peak discharge. This results from the reduction in rainfall losses due to the more impervious nature of the surface, and from the shorter period of time for the runoff to reach any given point. Also the incidence of severe flooding increases due to the greater variety of rainfall patterns in the catchment.

The percentage of areas urbanised or zoned for urbanisation within the catchment of the Yarra River and its tributaries, upstream from and including the Merri Creek, has already shown a marked increase since the major flood of 1934. Comparative figures are approximately 1.4% developed in 1934 as against approximately 9.9% urbanised or zoned for urbanisation in 1970. That the flooding potential has already increased is therefore obvious, and it can be accepted without reservation that further urbanisation on a major scale would radically increase the flooding potential in the Yarra valley unless remedial flood mitigation works were undertaken.

It is considered that concentration of development within the Yarra valley, upstream of the Diamond Creek, would give rise to a greater increase in flood potential than spreading such development further downstream into the catchments of the major tributaries of the river between, and including, the Merri and Diamond Creeks. This factor has been taken into account in the proposals contained within this report.

Nevertheless flood mitigation works will still be necessary and this aspect will need to be considered before permitting further urban development. On the basis of a very preliminary

assessment, and without the major hydrological investigation mentioned earlier it is considered that:

1. In Area 1, development of the urban corridors within the catchments of the major northern tributaries of the river, between and including the Merri and Diamond Creeks, will necessitate the construction of flood retarding storages on some or all of these tributaries. These storages will be required to offset the increased flood potential along these tributaries as well as along the Yarra River itself.

Apart from the Merri Creek, for which one site has already been reserved and is being acquired, no suitable storage sites appear to exist within the present metropolitan planning scheme area, and investigations are continuing in the extended planning area.

As all these tributaries, apart from Merri Creek, pass through the Chandler Highway basin, consideration may need to be given to the practicability of increasing the potential storage of this natural basin.

2. In Area 2 the flooding consequences of development within the urban corridors upstream of the Diamond Creek, may be offset by construction of flood retarding storages on the Stringy Bark Creek and its tributaries, or by a small increase in the potential flood storage of the Yering basin.

Alternatively, consideration might be given to the construction of further storage across the Yarra River at Yarra Brae, where the potential for storage of some 30,000 acre feet exists. If used solely for flood storage purposes, however, this would be of no value for maintenance of sanitary conditions in flows downstream, nor for water supply purposes.

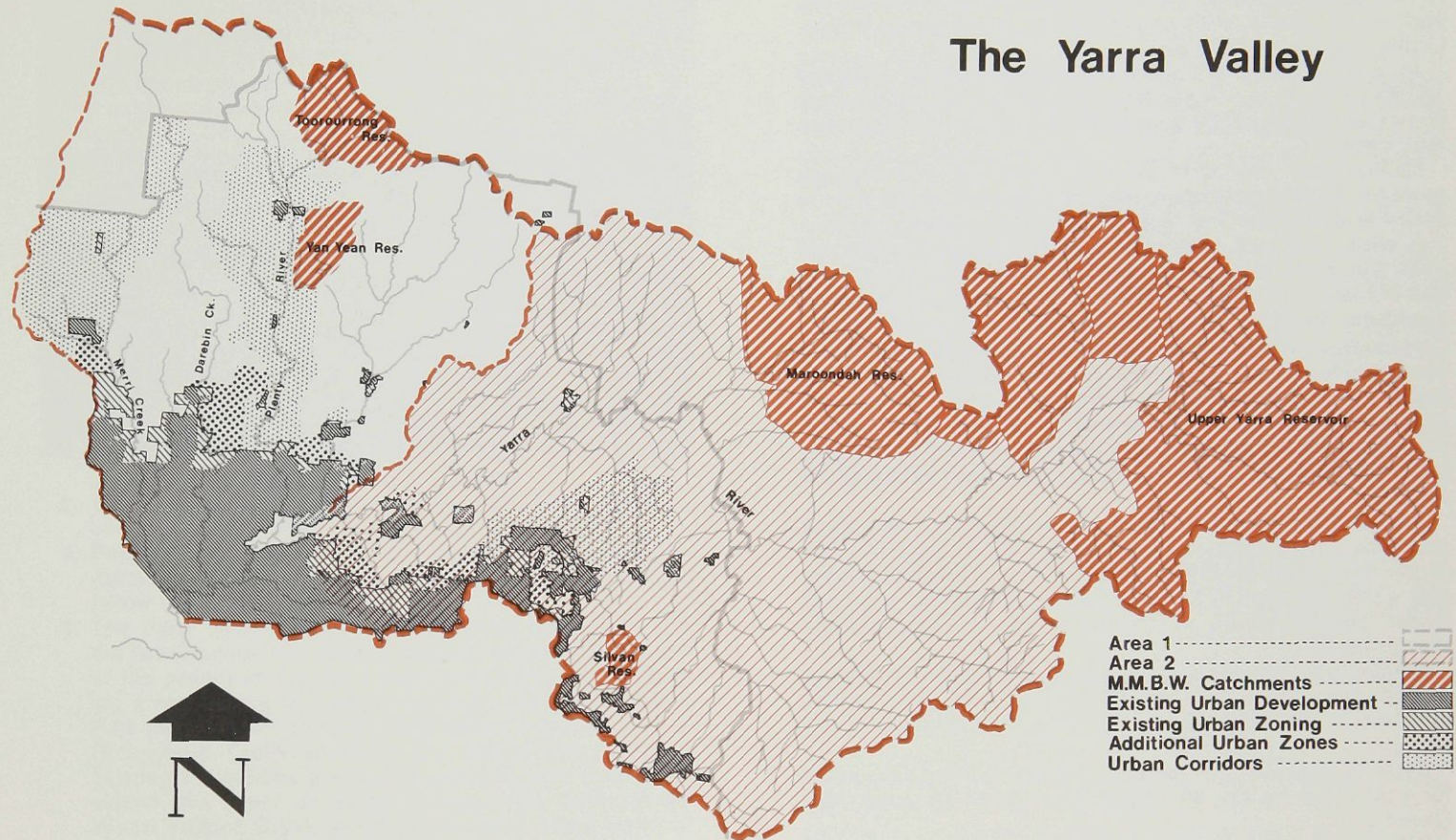
Whatever flood mitigation works are eventually found necessary, it is considered that costs of major magnitude will be involved. However it is considered that it would be unrealistic to put further constraint on development than proposed in this report, and that the distribution proposed within the catchment of the Yarra River and its tributaries will result in the least increase in flood potential, and will permit maximum deferment of the time in which major flood mitigation works will become necessary.

The provision of flood mitigation works at high cost must be recognised as essential if increases in population as predicted are to occur in the metropolitan region.



# PLAN 8

## The Yarra Valley



### 3 Regional Planning Policies

#### *Pollution Control and Sanitation*

Acceptable levels of pollution in a river depend on the uses to be made of the water from place to place along its course, and on acceptable levels of pollution in the receiving water—in this case Port Phillip Bay.

At present the waters of the State have not been classified for their beneficial use nor have standards been established. It is expected this will be done by the Environmental Protection Authority.

Management policies of planning, sanitation and drainage must be directed towards maximum protection of the river to preserve a valuable and highly regarded community asset.

A wide variety of pollutants from different sources could enter the storm drainage system and thence the Yarra River, and of these, the most important sources are from unsewered premises, drainage from livestock yards and eroded soil.

Yarra River water in the metropolitan area has suffered a marked deterioration since 1947. At this time there were about 60,000 persons in the whole metropolitan area not provided with sewerage facilities. At present there are about 130,000 persons alone in the Yarra valley not provided with sewerage—about 90,000 within the metropolitan region and about 40,000 beyond.

Analyses of samples taken above Dights Falls show ammonia concentrations ranging from 0.5 to 0.8 p.p.m. for 25 per cent of the samples. Research work in England shows that a concentration of 1.0 p.p.m. of ammonia will kill trout and lesser concentrations in the presence of other harmful chemicals.

Filamentous growths such as algae and the like, indicative of pollution, are to be seen. Clotting of flock-like material, presumed to be algae, is also clearly evident during summer periods.

Bacterial E-coli counts are high and beyond that acceptable for swimming by the standards established by authorities elsewhere.

Pollution of the river water at Warrandyte from some 40,000 persons upstream and from livestock is also strongly evident, but naturally, not as marked as at Dights Falls.

Briefly then, the water of the river in many parts has become unattractive for recreation purposes under present circumstances. It is clear that if the amenity offered by the river is to be retained, the number of properties not seweraged must be

