

many are being filled with municipal waste, and this economical method of disposal will ultimately make these areas available for much-needed playing fields and, in some cases, for other purposes. The materials extracted from these deposits are all essential for the development of the city and, in general, the closer to the city they can be obtained the cheaper the cost to the community.

Map 7 shows the location, importance and estimated life of the principal groups of extractive industries within the metropolitan planning boundary of Melbourne. Because of the spread of urban development and of the restrictions imposed by the geological structure, future supplies of these materials must inevitably be obtained from the outer metropolitan area and beyond. It is certain that as the years pass, the stone will be obtained largely from the west, the clay and reef from the north-east and east, and the sand from the south and from districts beyond the metropolitan boundaries.

Sand

There are five broad types of sand required in Melbourne, each of which has its own peculiarities. Most of these requirements are amply provided for from the sand resources located on the coastal plain to the south-east of Melbourne.

It is estimated that the following quantities of sand are being used each year in the Melbourne metropolitan area:

Building Sand	240,000	cubic yards
Concrete Sand	300,000	„ „
Foundry Sand	30,000	„ „
Sand for Glass Manufacture	50,000	„ „
Sand for Silica-lime Bricks	50,000	„ „
Total	670,000	

The fine sand used for building purposes is now obtained from Clayton, Moorabbin, Springvale, Frankston and Port Melbourne within the planning area and from Cranbourne immediately adjoining the area to the south-east. From Clayton, Moorabbin and Springvale come about 100,000 cubic yards annually, from Cranbourne and Frankston about 120,000 cubic yards and from Port Melbourne about 20,000 cubic yards. The Port Melbourne sand is of inferior quality for building to that obtained from other areas and is in a location now strongly sought for industrial development. It is estimated that the Clayton-Springvale-Moorabbin area can supply building sand at the present rate for another 25 years and Port Melbourne for another 15 years. Cranbourne and Frankston have ample quantities of fine sand to supply the metropolitan area probably for hundreds of years.

The quantity of good concrete sand within the metropolitan area is limited because most of the deposits do not contain the gradation from coarse to fine grains most suitable for concrete work. Much of the sand used for concrete in the past came from a pit near Preston which has now been worked out. Some of the sand from the Moorabbin-Clayton-Springvale area is satisfactory for use in concrete with the addition of coarse-grained sand which has to be transported

from outside the area. Approximately 115,000 cubic yards of sand from this area are used annually for making concrete. The area around Clark's Road, Springvale, contains the best quality concrete sand in the metropolitan area and should be fully developed for this purpose in view of deficiencies in other nearby areas. Small quantities of good concrete sand are also being obtained around Kangaroo Grounds to the north, but the principal source of concrete sand today is, and in the future will be, from outside the area, mainly from Kooweerup to the south-east, Pyalong to the north-east, and the You Yang Range to the west.

Many of the high points near the city, especially to the south-east and east, are capped with a red sandy material known as marl, which is very suitable for foundry purposes, both for iron and steel castings. Most of these areas have been built on, but there is still a limited quantity of this material available in the Oakleigh-Dandenong areas and at Essendon and Hawthorn. In the Keilor area to the north-west there is a large quantity of sand suitable for foundry work, but it is covered by a thick layer of basalt. Most foundry sand is now coming from the Oakleigh area, which is expected to supply sand at its present rate for about 20 years. A large deposit exists near Dandenong, the extent of which has not been fully determined. The future supply of foundry sand is a matter causing some concern to industry, as many of the existing deposits are being worked out. It is desirable, therefore, to retain adequate areas in the Oakleigh-Dandenong area for this purpose. The use of foundry sand differs from that of other sands in that after use it is available for refilling quarry holes.

A deposit of the white sand suitable for glass manufacture is located at Carrum to the south-east, but because of the low-lying terrain it is capable of only limited exploitation. Future supplies of sand for glass manufacture will have to come from outside the planning area, principally from the Cranbourne area where suitable deposits are located.

A large quantity of sand suitable for making silica lime bricks is to be found near Frankston. This deposit is sufficient to meet Melbourne's needs of this material for many years.

Material for Brick Manufacture

The silurian mudstone or "reef" formation has the basic qualities necessary for making ordinary building brick. Approximately 600,000 cubic yards of this material is used annually to manufacture about 160,000,000 red bricks, and it is estimated that this figure could be increased to 800,000 cubic yards with the existing installations. The deposits of reef suitable for brick manufacture extend throughout parts of the northern, eastern and south-eastern suburbs, and quarries are being worked in the municipalities of Brunswick, Northcote, Preston, Doncaster and Templestowe, Box Hill Hawthorn, Malvern, Oakleigh and Mulgrave.

Much of the area in which this formation occurs has already been used for residential purposes. Therefore, when



A sand pit at Moorabbin



A reef quarry and brick kilns at Hawthorn



A clay pit at Campbellfield



A stone quarry at Sunshine