3. PHYSIOGRAPHY AND GEOLOGY

Aspects of the physiography and geomorphology of the study area have been described by several authors, and a brief synthesis that applies to the area has been given by Hills (1975) in his descriptions of the Port Phillip and Western Port Sunklands and of the Western Highlands. Other relevant information can be found in the collection of papers edited by McAndrew and Marsden (1973).

The geology of the area has been mapped by the Geological Survey of Victoria, Department of Minerals and Energy, and is covered by the Melbourne Map Sheet SJ5-55. **A** description of the area's geology can be found in the Geological Survey Bulletin No. 59 (1967). The ages of the rock formations span almost the entire geological history of the earth from the Cambrian to the Quaternary.

The rocks vary from granites, granodiorites, rhyodacites and basalts to sandstones, mudstones, shales, etc., and there are also unconsolidated gravels, sands, silts and clays. Consequently, the area possesses a great variety of parent materials from which different soils have developed. As the geology has been described more fully in the literature referred to, only a brief comment on the different rock types and ages will be given for each physiographic region described below.

Three major physiographic regions are recognised: Eastern Highlands, Western Highlands and Volcanic Plains.

1. EASTERN HIGHLANDS

The Eastern Highlands comprise at least two well defined physiographic units, the Kinglake Plateau and Nillumbik Terrain.

Kinglake Plateau

This plateau, with an elevation between 500 and 600 m, represents an early Tertiary land surface formed by extensive planation. The southern margins of the plateau are strongly dissected, and have evolved into country with long ridges and deep valleys (Humevale land system).

The plateau consists of laminated marine sandstones, mudstones and shales of Silurian age (Kinglake land system) and Devonian granodiorite with a surrounding metamorphic aureole (Mount Disappointment land system). The soils developed on these rocks are red or yellow gradational soils with fine structure.

Nillumbik Terrain

This surface is lower and younger than the Kinglake surface, being formed in the mid to late Tertiary. It occurs at an elevation of between 20 and 200 metres. Three land systems are recognised by variation in relief, from Doreen with little dissection to Mernda with moderate dissection and Arthurs Creek which is well dissected. Sunbury land system occurs further to the west on land which was possibly once part of the Nillumbik Terrain but which has been separated from the eastern section by Newer Volcanics.

The rocks of the Sunbury land system are Ordovician marine, thinly bedded shales and sandstones. The bedrock of the other land systems is the same as the Silurian bedrock within the Kinglake Plateau.

There is one very small capping of Pliocene-Pleistocene age basalt within the Nillumbik Terrain which has been separately mapped as the Kangaroo Ground land system.

2. WESTERN HIGHLANDS

The Western Highlands are of similar structure and evolution to the Eastern Highlands and there is evidence to suggest that some of the land surfaces are of corresponding age. However, the Western Highlands are generally at lower elevations than the Eastern Highlands and are separated from them by a gap at Kilmore.

The geology of the Western Highlands within the study area is variable, ranging from Cambrian marine sediments to Quaternary volcanics and sedimentary rocks.

Rocks of the Mt. William Group, representing the Lower and Middle Cambrian and consisting of cherts, black shales, ashes (with and without marine fossils), diabase and marine volcanics. stretch in a narrow north-south band from Mount William to near Monegeeta. Due to their resistance to erosion, these rocks now form one of the two highest elevations in the Western Highlands and have been mapped as the Mt.

William land system. The soils developed are mainly yellow-brown gradational and red duplex soils. The Upper Cambrian is represented by the Goldie Shales, which are black shales and mudstones without fossils. They occur in a parallel band immediately west of the Mt. William Group rocks.

Ordovician marine sediments consisting of thinly bedded shales and sandstones are widely distributed in the Western Highlands within the study area. Together with smaller areas of Devonian conglomerates (Kerrie Conglomerate), they give rise to a hilly landscape with predominantly mottled red duplex soils mapped as the Mt. Charlie, Rockford and Wombat land systems.

Laminated sandstones, mudstones and shales of Silurian age are situated in the middle of the area. Due to differences between these rocks in resistance to weathering, structure and stratification, the pattern of dissection and the landscape that has developed on these rocks is not the same throughout. Three land systems have been mapped - Darraweit Guim, Marnong and Springfield. Topography varies from undulating plains to low hills; the soils differ in depth and morphology, and there are differences in vegetation.

Devonian sedimentary rocks consist mainly of siltstones and sandstones, often interbedded, in the north-eastern part of the area. There is a small area of conglomerate (Kerrie Conglomerate) in the north-west near Mt. Macedon. The siltstones and sandstones are quite similar to those of Silurian age, and the previously listed Springfield land system extends onto these rocks as well.

The Devonian igneous rocks consist of the rhyodacite volcanics of Mr. Macedon and granodiorites and related rocks. The rhyodacites are comparatively resistant rocks compared with the sedimentary rocks in the study area and now form a mountainous landscape, the other highest elevation in the Western Highlands, which has been mapped as the Macedon land system. The granodiorites occur in two disjunct areas with different topography: low hills, mapped as the Greenvale land system, and mountainous terrain mapped as the Cobaw land system.

The Tertiary volcanic rocks, often referred to as Older Volcanics to distinguish them from the most recent Quaternary Basalts or Newer Volcanics, have minimal extent in the Western Highlands within the study area. The soils and landforms developed on them are similar to those on the Newer Volcanics and for this reason the Older and Newer Volcanics have been mapped together in the Romsey land system. However, the separate occurrence of Newer Volcanics at Pretty Sally have been mapped in the Pretty Sally land system.

3. VOLCANIC PLAINS

Volcanic activity was widespread during the Pliocene, and a large part of the study area is now covered by greater or lesser thicknesses of basalt. These Newer Volcanics consist of Olivine basalt with various alkaline derivatives.

The land surface which evolved on these lavas has an average coastward gradient of 0.5 to 0.8% and the soils which developed tend to have a high content of clay. There are local variations in climate, landscape evolution and soil formation which affect vegetation and land use potential. Eight land systems have therefore been recognised - Cottrell, Djerriwarrh, Footscray, Maribyrnong, Mickleham, Monegeeta, Rockbank and Wollert.

Quaternary sedimentary formations are unconsolidated and occupy only a small part of the area. The erupting basalt altered the existing drainage system and these Quaternary deposits are associated with the new drainage systems which developed. Only one land system has been mapped on Quaternary sediments, the Whittlesea land system, which takes the form of old, partly dissected alluvial terraces on sand, clay, silt and gravel.