

Chapter 1

Introduction

Location and Physiography

This report describes the onshore geology of the area covered by Sheet 9-NE-C/D (Chek Lap Kok). The description of the geology relates to the period before the commencement of major excavations for the new airport in late 1991. The area is part of that currently being developed for a new international airport for Hong Kong, to replace the current airport at Kai Tak in Kowloon Bay. The onshore area (Figure 1) comprises the island of Chek Lap Kok, which lies about 300 m north of the Lantau coast at Tung Chung Wan. Lantau is the largest island in the Territory and is situated to the west of Hong Kong Island.

Chek Lap Kok (Plate 1) is about 4 km long and 1.5 km wide at its widest point, extending northnortheast from Tung Chung Wan. The land area is approximately 2.8 sq km. The highest point on the island is Fu Tau Shan (Tigers Head Hill) rising to 121 m. South of Fu Tau Shan the land drops sharply to the sea at Fu Tei Wan (Tiger Bay), while to the north the land drops steadily to the coast at Cheung Sha Lan. The eastern side of the island is dominated by a ridge line of hills rising in places to over 100 m, and falling steeply to the coast along the eastern seaboard. The southern end of the island forms a small peninsula, rising to less than 80 mPD.

A finger-like peninsula extends northnortheast, creating a shallow bay, Sham Wan (Deep Bay), to the east. Sham Wan lies at the mouth of a large valley, with flat land and extensive agricultural development. Fu Tei Wan lies south of this valley, and forms a less extensive alluvial tract with some agricultural development.

In 1982, a test embankment for the proposed replacement airport was constructed offshore to the west of the island (cover plate). The embankment, about 6 ha in area, was built using material excavated from a borrow area to the north of Fu Tau Shan. Between the borrow and Fu Tau Shan is an area in which kaolin and sand were extracted commercially until a few years ago.



Plate 1 - Chek Lap Kok Island from the Southwest

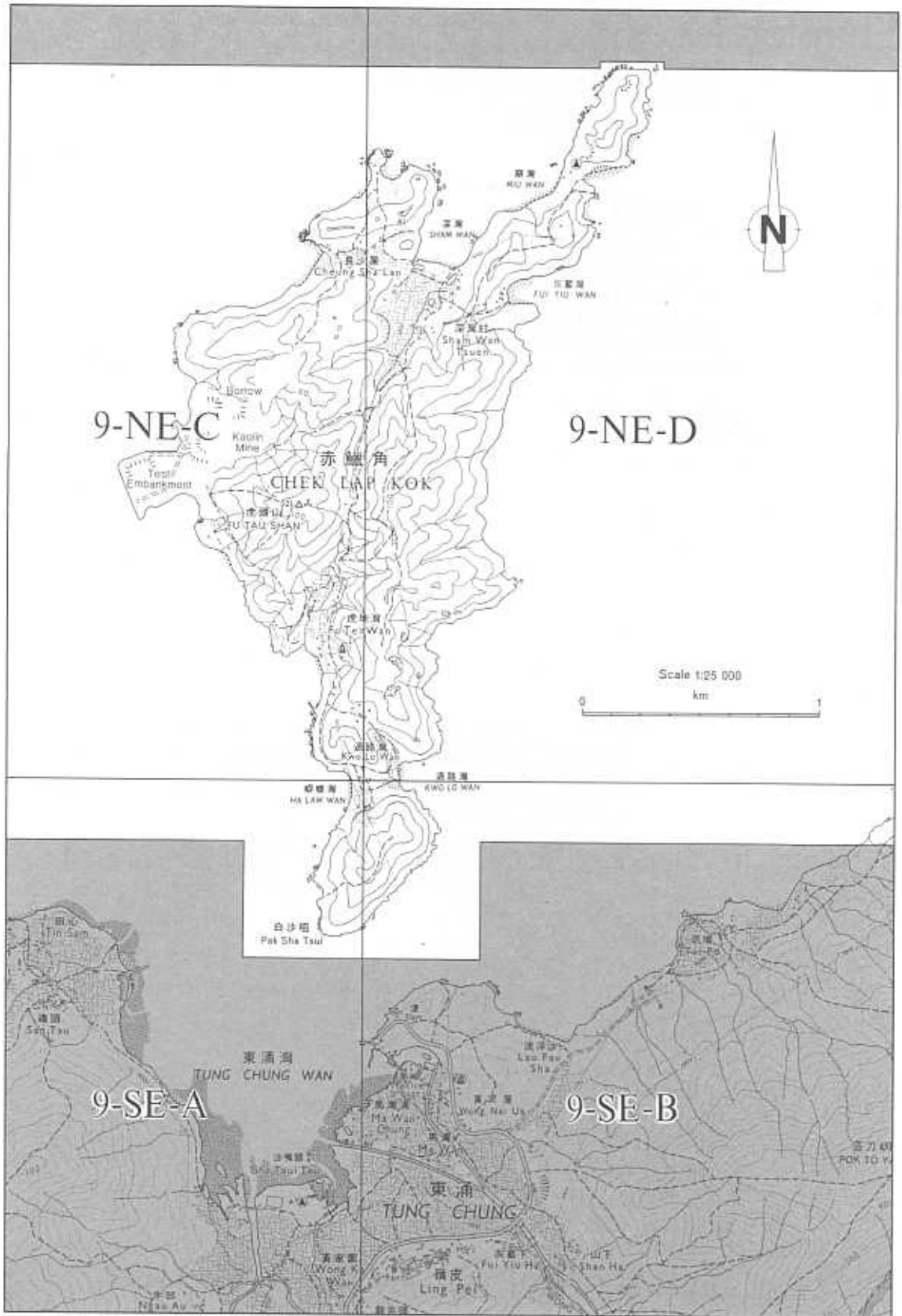


Figure 1 - Principal Topographic Features around Chek Lap Kok

The island is virtually depopulated, having supported a thriving agricultural and fishing community after the last war. There is an extensive network of footpaths over the hills, although they are seasonally overgrown. Many of the paths shown on existing survey plans are now impassable. Kaido ferries or other boats of shallow draft can make landfall at Cheung Sha Lan or near the old quarry east of Miu Wan. The jetty at the test embankment has deeper water but is in a poor state of repair. Small jetties south of Fu Tei Wan are only accessible at favourable tides.

Previous Work

The earliest geological survey of the Territory was undertaken between 1923 and 1927 by Brock, Uglow, Schofield and Williams under an agreement between the Colonial Office and the University of British Columbia. A map was published at 1:84 480 (3/4" = 1 mile) (Brock *et al*, 1936). Some of the findings relevant to this study of Chek Lap Kok were reported by Williams *et al* (1945), and a memoir based on this earlier work was produced by Davis (1952).

Williams *et al* (1945) recognised that Hong Kong is part of a complex granitic batholith. They subdivided their Hong Kong Granite type into three masses, the most westerly of which commences on the western side of Lan Tau (sic) island and the small island of Chu-lou-kok (sic). They assumed a Cretaceous age (Yen Shan No. 2 in China), and considered the occurrence in Kowloon to be typical.

Davis (1952) made specific mention of Chu Lu Kok (sic) in the same way, as part of the westernmost occurrence of Hong Kong Granite. Although he noted that the two largest buildings in Hong Kong, the Hong Kong and Shanghai Bank and the Bank of China Building, were both built of this granite type, he did not specify the source.

A systematic survey of the Territory by two geologists from the Institute of Geological Sciences, United Kingdom, was undertaken between 1967 and 1969. Two 1:50 000 scale geological maps and an accompanying report were subsequently published (Allen & Stephens, 1971), although they compiled the geology at 1:20 000 scale. These remained the definitive work on the geology of Hong Kong until publication of the results of the current remapping began in 1986.

For Lantau and nearby islands, Allen & Stephens (1971) is still the only published work available. They assigned the granite of Chek Lap Kok to the Cheung Chau Granite, partly because it was cut by dykes of feldspar porphyry (feldsparphyric rhyolite). They also noted that Chek Lap Kok is covered with large pieces of quartz from residual veins. Allen also mapped several quartz porphyry (quartzphyric rhyolite) dykes with a northeast trend in the southern half of Chek Lap Kok. In his field notes, Allen refers to these as D'Aguilar porphyry, after the area where they typically occur. He spent one day mapping the island in 1968, and noted many dykes cutting the medium-grained or fine- to medium-grained, variously porphyritic granite. Allen collected and sectioned two samples of granite from the island; Old Collection HK702 (1116 1683) and Old Collection HK704 (1222 2009). The only other note Allen & Stephens (1971) made on Chek Lap Kok was that a body of sea water was held in the remains of a lagoon behind the sand bar beach at Sham Wan.

An engineering geology map of North Lantau, including the island, was published by the Geotechnical Control Office (1988a). The solid geology is taken from Allen & Stephens (1971), with revised interpretations of superficial deposits and photolineaments.

The Present Survey

Geological field mapping of most of the island at a scale of 1:5 000 was undertaken in February and October-November 1989, and several more visits were made after the main survey. The main field traverses, including that of Allen, are shown in Figure 2. Most of the coastline was mapped in detail, with a few places being inaccessible, for example, north of the jetty at Cheung Sha Lan and part of the coast east of Fu Tei Wan. A single traverse inland covered the bulk of the central portion of the island. The borrow area and kaolin mine adjacent to the test embankment provide ample exposures of the deeply weathered granite, while the small quarries and stone workings around the northern coast provide the best exposures of fresh rock. Temporary exposures for a survey undertaken by the Hong Kong Archaeological Society provided additional information on the morphology and age of some superficial deposits, and on mineral extraction and use. Access for all the detailed field mapping was by fast launch from Kowloon, with additional short visits by helicopter.

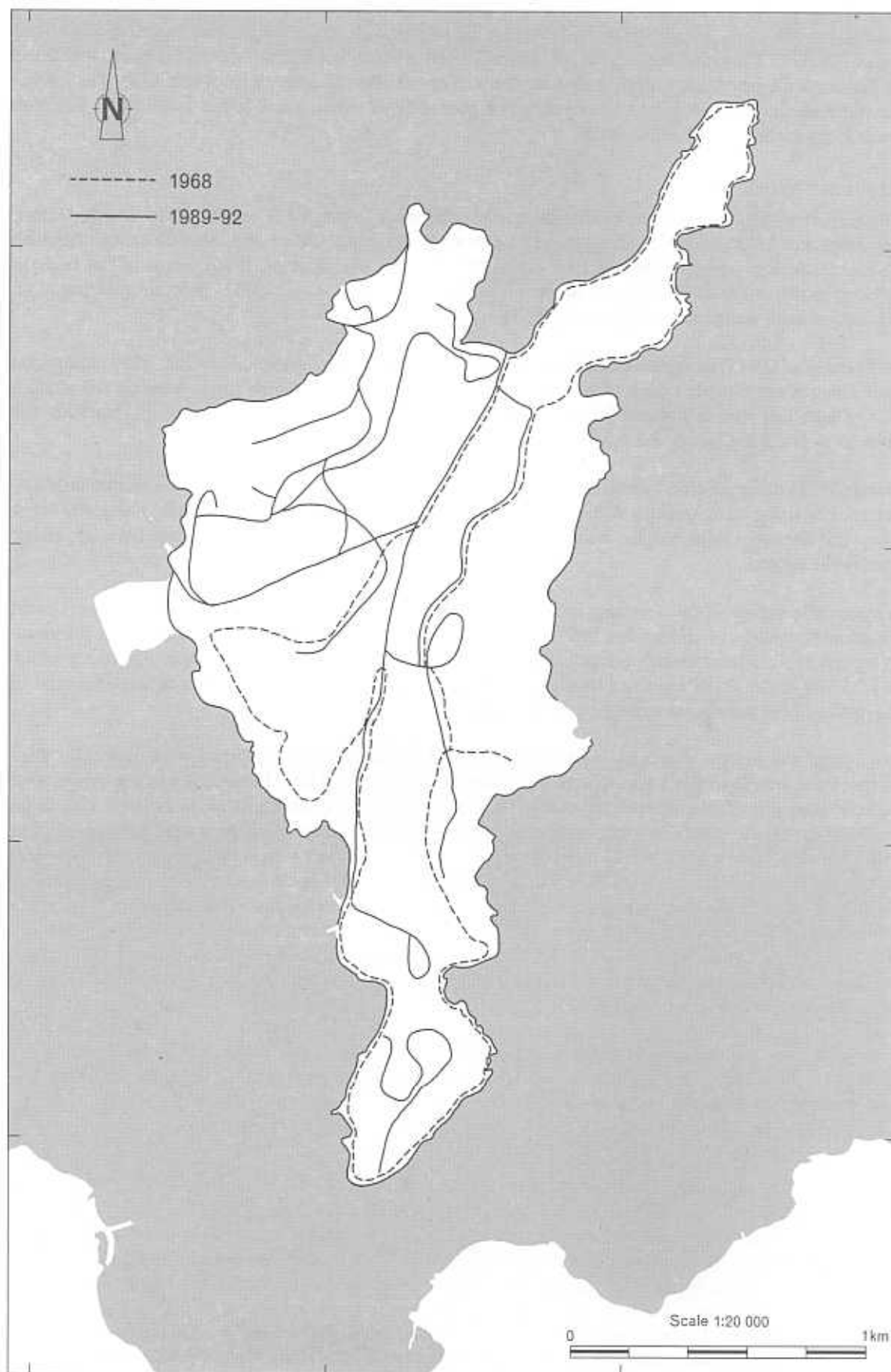


Figure 2 - Traverses Undertaken during 1968 and 1989-92 Field Surveys

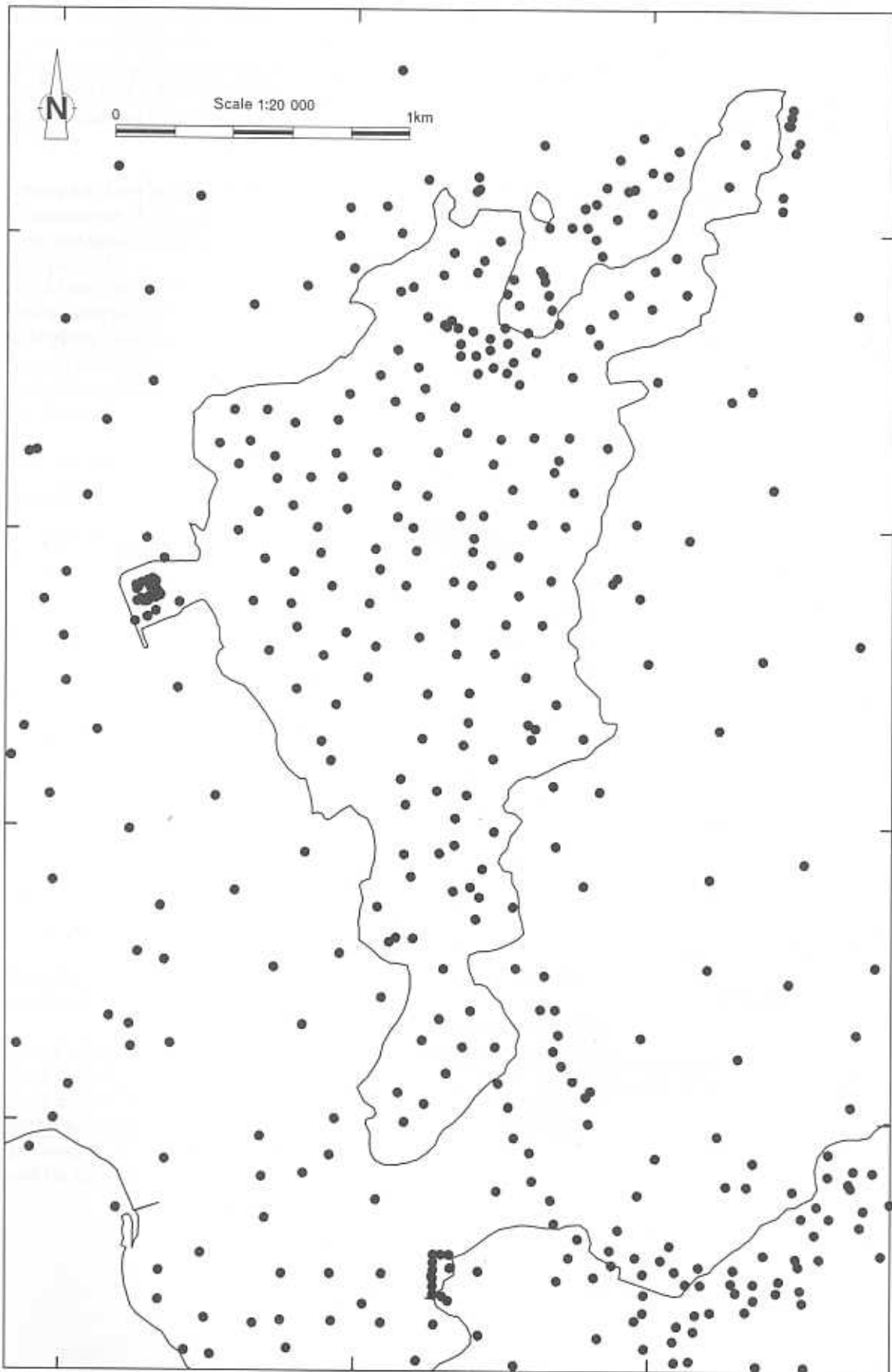


Figure 3 - Location of Boreholes Sunk in and around Chek Lap Kok up to October 1992

A total of 79 rock and soil samples were collected, and most of the rocks were thin sectioned. A desk study was completed on the 156 boreholes sunk on the island (Appendix 1, Figure 3). The logs were used in determining depth of weathering and rock type, in particular for distinguishing granite textures. A seismic refraction survey completed by Electronic & Geophysical Services Ltd in a small area east of the test embankment, supplemented by their interpretation of an earlier survey by Gammon, also provided useful information on the weathering profile.

A photogeological interpretation was completed using 1963 photographs, supplemented by 1964 photographs for the study of large-scale lineaments. A study of photographs between 1982 and 1990 was useful in understanding the formation of the borrow area and test embankment, and the history of kaolin mining.

The geological information gathered in the field, supplemented by studies of aerial photographs and boreholes, was compiled onto 1:5 000 Geological Map Sheet 9-NE-C/D. All records from the survey, including rock samples, thin sections, field notes, aerial photographs, field maps and analytical data, are held in the Hong Kong Geological Survey archives, Planning Division, Geotechnical Engineering Office.

Table 2 - Solid Rocks and Superficial Deposits of the Island

| SUPERFICIAL DEPOSITS | | |
|------------------------------|---------------------------------|---|
| Age | Classification | Principal Materials |
| QUATERNARY | Fill | Natural earth & waste |
| | Alluvium | Silt, sand & gravel |
| Holocene | Beach deposits | Sand |
| | Back beach deposits | Sand |
| | Intertidal deposits | Silt, sand & clay |
| Holocene & Pleistocene | Slope deposits | Sand, gravel, cobbles & boulders in silt matrix |
| MAJOR INTRUSIVE ROCKS | | |
| MESOZOIC | | |
| Upper Jurassic- | Fine-grained granite | |
| Lower Cretaceous | Fine- to medium-grained granite | |
| MINOR INTRUSIVE ROCKS | | |
| TERTIARY-MESOZOIC | Basalt | |
| | Lamprophyre | |
| MESOZOIC | | |
| | Quartzphyric rhyolite | |
| | Feldsparphyric rhyolite | |
| Upper Jurassic- | Aplite | |
| Lower Cretaceous | Pegmatite | |
| | Quartz vein | |