

Chapter 7

Superficial Geology

Classification and Distribution

Superficial deposits are those sediments that have not generally been lithified to form rocks. This study refers only to the onshore area, so deals with superficial deposits to the coastline and into the littoral zone, as far down as low water mark. The marine deposits below this level are the subject of a separate study. All of the superficial deposits are thought to have formed during the Quaternary period, and relationships between deposits are shown schematically in Figure 10.

The superficial deposits of the island are formed by mass wasting, fluvial and beach processes. There is also one unusual occurrence of an intertidal deposit. In the absence of beach sand there is a line between rock and offshore deposits that can usually be seen on aerial photographs. A darker mottled phototone formed by irregular, marine vegetation covered rock has a sharp boundary with smooth bare mud of the Hang Hau Formation at about the edge of the littoral zone (low water mark).

The alluvium is thought to be of Holocene age, although it is probably derived at least in part from the reworking of older deposits. Alluvium is mapped in three places only; Sham Wan Tsuen, Fu Tei Wan and east of the test embankment.

The larger slope deposits are probably Pleistocene in age, although they may be younger. No erosional feature can be distinguished between any of the young alluvium and adjacent slope deposits, probably because of continuous movement of material from the slopes by soil creep and surface runoff. The slope deposits also occur as isolated patches. Both the alluvium and slope deposits are thought to be composed of sand, silt and gravel, with boulders as a conspicuous additional feature of the larger debris deposits. Only rarely are these deposits exposed.

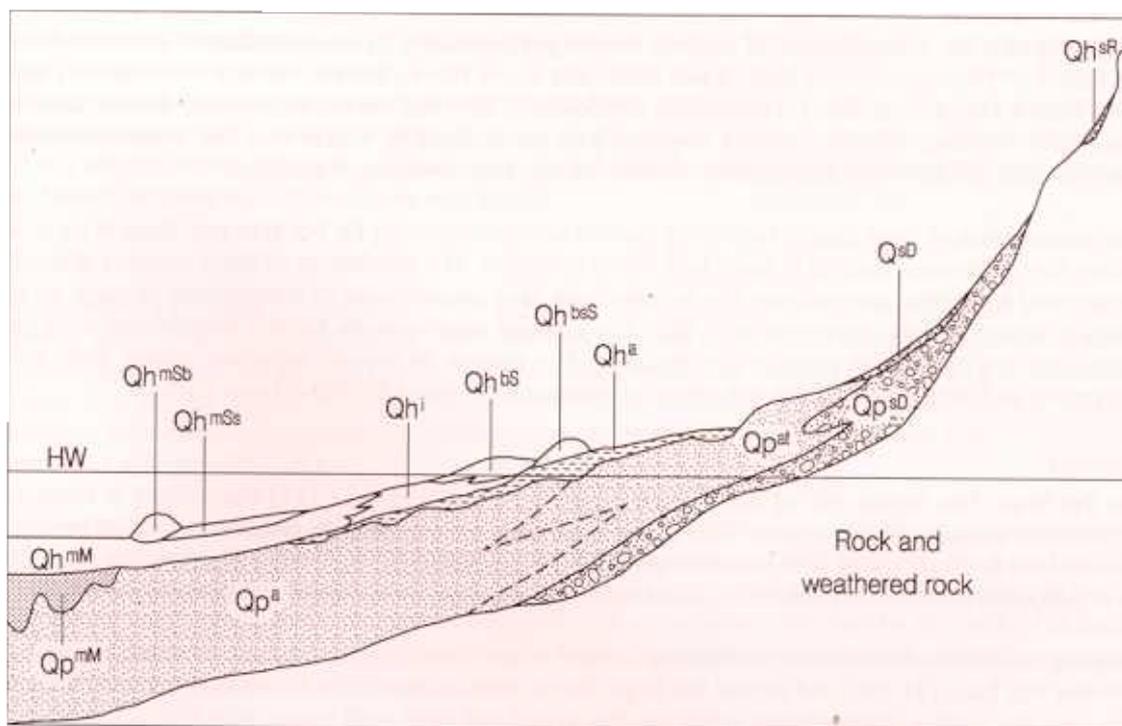


Figure 10 - Schematic Section Showing the Relationship between Superficial Deposits. Q = Quaternary; p = Pleistocene; h = Holocene; s = slope; a = alluvial; at = alluvial terrace; b = beach; bs = back shore (beach); i = intertidal; m = marine; ms = marine sheet; mb = marine bar; R = rock; D = debris; S = sand; M = mud; HW = high-water level

Beach deposits are dominantly composed of sand, extending inland from the low water mark. The largest deposits are found in relatively sheltered bays, although small isolated patches occur all round the rocky coastline. At Sham Wan Tsuen (115 195) it has been possible to differentiate a back beach as a separate feature rising 3 m above the adjacent alluvial tract.

The onshore area has been little affected by reclamation, the only fill material being that for the test embankment for the new airport.

Alluvium

Alluvium is found in three areas, but has not been seen in section and usually can only be described from ground investigation boreholes. Only one borehole, situated at Sham Wan Tsuen, intersects alluvium (L15/3427A, 11508 19528). This shows 7.5 m of light yellowish grey clayey sand with some fine gravel.

Details

Sham Wan Tsuen. Up to 8 metres of alluvial sand and gravel rest on weathered granite in an extensive alluvial tract at Sham Wan Tsuen. The tract widens out from the head of the valley, dropping from at least 7.5 mPD to 3.0 mPD. The alluvium fills the valley, producing a sharp base of slope feature against the surrounding granite hills. A small tongue of alluvium extends east from Cheung Sha Lan to join the main spread behind the current beach. The smoothness of the surface of the alluvium behind the beach is disrupted by the presence of a relict raised beach.

Fu Tei Wan. A small patch of alluvium lies below the slope deposits at Fu Tei Wan. The alluvium lies alongside a stream that flows into the northern end of the bay, and develops into a small mangrove swamp before giving way to the beach deposits.

Fu Tau Shan. Before development of the kaolin and quartz mine, situated east of the test embankment, there was a sizeable area of alluvium in the stream valley. This lay at 15 to 20 mPD to the north of a small stream, and was contiguous with adjacent small slope deposits; in part it was probably slope wash. However, this deposit is now largely obscured or destroyed by the mineral workings undertaken in the early 1980s.

Slope Deposits

Slope deposits are accumulations of material formed predominantly by mass movement of soil and rock on hillsides. They include rock falls, debris slides and debris flows (Varnes, 1978). Previously they have been referred to as colluvium in Hong Kong, although this term has not been rigorously defined and embraces the full range of slope deposits. Depending on the topography, source rock and distance travelled they comprise a mix of silt, sand, gravel, cobbles and boulders in varying proportions.

The largest areas of slope deposits are along the two valleys connecting Fu Tei Wan and Sham Wan. Elsewhere they form small patches in steep hollows on hillslopes. The distribution of slope deposits is largely determined by surface morphology. For the most part, they are restricted to thin mantles on some of the steeper slopes, feeding narrow valley infills. The material appears to be formed predominantly by soil creep and slopewash, and contains few boulders. The process of deposit formation grades from mass movement to fluvial action, and in one place the deposit grades into a hillside alluvial tract.

Details

Fu Tei Wan. The largest area of slope debris occurs at Fu Tei Wan (111 181) where there is extensive agricultural terracing in the deposit. This forms a relatively smooth, steeply inclined deposit of boulders and cobbles in silt. Sections were not seen, but one borehole (L27/3427A, 11069 18326) passes through 4 m of yellowish brown clayey sand with gravel before passing into the underlying weathered bedrock.

Cheung Sha Lan - Sham Wan. Artificially terraced slope deposits occur upslope of beach deposits at Cheung Sha Lan (111 197) and around the large alluvial tract at Sham Wan Tsuen (115 195). At Cheung Sha Lan, the surface of the deposit comprises fine gravel and sand, with quartz vein debris a prominent feature. At Sham Wan, the debris grades downslope into the alluvium with an imperceptible break of slope.



Plate 25 - Hong Kong Archaeological Society Excavation in Beach and Alluvial Deposits Ranging from 5 000 Years Old to Present Day at Sham Wan Tsuen (1157 1949)

Beach Deposits

Beach deposits comprise the unconsolidated sediment that extends from the low-tide mark to the uppermost limit of wave action. They are composed of coarse sand or a mixture of sand and cobbles. They form in all the sheltered bays, the largest deposits being at Sham Wan and Fu Tei Wan. The pale phototone of beach sand, sometimes speckled with boulders, is clearly seen on aerial photographs. This phototone can usually also be detected beneath shallow water. Back beach deposits are found behind the contemporary sand beach at Sham Wan Tsuen, rising to 5.5 mPD.

Details

Sham Wan. The beach sand at Sham Wan (116 197) fills much of this shallow bay, from a height of about 3 mPD down to low water mark. The sand forms a broad dune, with a stream incised into it, and is characterized in the tidal zone by sand bars. The material forming the beach is light brown and varies from coarse sand to fine gravel, with some mud. Pebble-sized fragments of rock litter the surface, and are probably derived from the recent stone cutting activities around the bay. In places, the broken rock dominates the foreshore (Plate 26).

Archaeological excavations in back beach deposits at Sham Wan revealed a layered sequence of coarse to medium sand interspersed with remains dated to the Tang Dynasty (c. 1 000 years old) and Late Neolithic (3 500-5 000 years old) (W Meacham, oral communication, 1993). This beach has been preserved behind the present beach because of a change in the depositional environment. This may be the result of changing land use patterns or because of a small drop in sea-level. The sand forming the beach probably formed by a combination of marine and aeolian processes.

An archaeological investigation at Sham Wan Tsuen (Plate 25) revealed coarse beach sand resting on bed-rock at about 3 mPD. The sand is over 5 000 years old (W Meacham, oral communication, 1991), and lies below 3 m of fine sand and soil ranging from Late Neolithic through the Tang Dynasty to the Ching Dynasty. Marine conditions prevailing at the time of formation of the oldest deposits gave way to fluvial and slope dominated deposition processes.

Fu Tei Wan. The beach at Fu Tei Wan (110 180) extends 100 m from the high water mark, and has been intersected by a shallow borehole (89/3955, 10992 17950). This shows sand with 3 to 16% mud and a trace of shell fragments extending for at least 3.8 m. The deposit is contiguous with marine sand deposits. The beach rises to 4 mPD, and is largely backed by partially eluviated slope deposits. The present form of the beach has largely been determined by extensive sand digging this century.

Cheung Sha Lan. The only other relatively large beach is at Cheung Sha Lan (110 197), and it is backed by slope deposits. Unlike the two larger beaches, it does not extend a long way to the low water mark. This beach is composed of light brown coarse sand with some shell fragments.

Intertidal Deposits

There is an unusual occurrence of intertidal deposits largely resulting from man's activity both at the kaolin mine and adjacent test embankment (105 187). The deposit consists of fine sand and silt, and is derived from washing of the weathered kaolinized granite to the east. Because of the impounding effect of the adjacent test embankment the silt and sand has accumulated in the artificial bay. However, the material has accumulated by natural processes and it is therefore considered to be a geological deposit and not fill.