

Chapter 2

Outline of Geology

The district is situated in a structurally-complex zone at the intersection of three regional fault sets (Lai & Langford, 1995): an E-trending set of faults including the Tsing Yi Channel Fault, a NW-trending set including the Lamma Channel Fault, and a N-trending set.

The rocks are composed mostly of Mesozoic granites and volcanics (Table 2; Figure 5) which are intruded by an E-W oriented porphyritic rhyolite dyke swarm. Minor exposures of volcanoclastic sedimentary rocks are found in the northern part of the island. Representative whole-rock geochemical analyses of the main rock types are given in Table 3.

Welded lapilli-bearing coarse ash tuffs of the Yim Tin Tsai Formation (Tsuen Wan Volcanic Group) are stratigraphically the oldest rocks in the district. These rocks grade upward into welded lapilli- to block-bearing crystal tuff, tuff breccia and tuffite of the Shing Mun Formation. A locally thick (30 m), intercalated black siltstone unit exposed in the northern part of the island is defined here as the Tsing Yan Member of the Shing Mun Formation.

The volcanic rocks of the district are intruded by granite and granodiorite. The granodiorite is the oldest of the major intrusions and forms an irregular northeast-trending ridge-like mass in the northern part of the island. Granite forms a major plutonic body in the southern and eastern parts of the island and is mostly medium grained with a pronounced porphyritic texture close to the contact with volcanics. Coarse-grained granite has been encountered in offshore boreholes in the southeastern corner of the map sheet. Eastnortheast-trending porphyritic microgranite and feldsparphyric rhyolite dykes are the dominant minor intrusive rocks in the southern part of the map sheet. These are intruded by fine-grained granite and quartzphyric rhyolite dykes and sills in the central and northern parts of the district. Basalt dykes up to 5 m thick are generally the youngest intrusive rocks in the district. They intrude all lithologies except for some fine-grained granite dykes.

The geological structure of the district is complex owing to the intersection of regional fault sets. The dominant fault trend is to the northwest. These faults have been offset by a younger set of north-trending faults in the central region. Quartz veins are commonly associated with these faults and may be up to 5 m thick. There is no evidence for recent movement along any of the faults within the district.

Superficial sediments occur mostly around the coast and in the offshore area. Slope debris, comprising sandy silt with clasts up to boulder-size, on the upper slopes grades into alluvium on low-lying ground. The alluvium consists of silty sand and clayey silt and is frequently buried beneath disused paddy fields. Offshore (Figure 6), there is a veneer of Pleistocene alluvium underlying thicker marine sediments. The natural shoreline of Tsing Yi is dominantly rocky. Occasional beaches, comprising fine to medium shelly sand, are rapidly disappearing beneath continuing reclamation.

Intertidal sediments are known to occur beneath the extensive reclamation in the northeastern part of the island. There, intertidal muds comprising sandy clay with shell and coral fragments are found in the inner part of the estuary, becoming sandy in the more open areas. Offshore, marine mud, dominantly very soft clayey silt with shell fragments, is found in the southern part of the Rambler Channel, the western part of the Tsing Yi Channel and in small bays around the coast. Marine sand in the Rambler and Ma Wan channels is generally clayey, medium grained with shell fragments. Where strong currents exist in these channels, all superficial sediments have been scoured, and rock is exposed on the seabed.

Table 2 - Summary of the Onshore and Offshore Stratigraphy of the District

Stratigraphic Divisions		Lithostratigraphy and Genetic Classification		Principal Materials	Map Sym
Superficial Deposits					
QUATERNARY	Holocene	Fill Anthropogenic mud Intertidal mud Intertidal sand Intertidal sediments undivided Beach sand		Natural earth and waste Natural silt and effluent Mud Sand Mud and sand Sand	Qh ^f Qh ^m Qh ^{is} Qh ^r Qh ^{bs}
		Hang Hau Formation	Marine mud Marine sand	Soft mud; some sand Sand; some gravel and mud	Qh ^{mm} Qh ^{ms}
	Holocene and Pleistocene	Alluvium Slope debris		Silt, sand, gravel Sand, gravel, cobbles	Q ^a Q ^o
		Chek Lap Kok Formation	Alluvium, some estuarine and marine sediments	Clay, silt, sand and gravel	Qp ^t
Volcanic and Sedimentary Rocks					
MESOZOIC	Jurassic-Cretaceous	Tsuen Wan Volcanic Group	Shing Mun Formation Tsing Yan Member Yim Tin Tsai Formation	Lapilli coarse ash crystal tuff Black siltstone Coarse ash crystal tuff	JSM Jty JYT
Major Intrusive Rocks					
MESOZOIC	Jurassic-Cretaceous	Granite Granodiorite			gf, gm gdf
Minor Intrusive Rocks					
TERTIARY		Basalt and lamprophyre			b
MESOZOIC	Jurassic-Cretaceous	Feldsparphyric and quartzphyric rhyolite Porphyritic microgranite and fine-grained granite			rf g

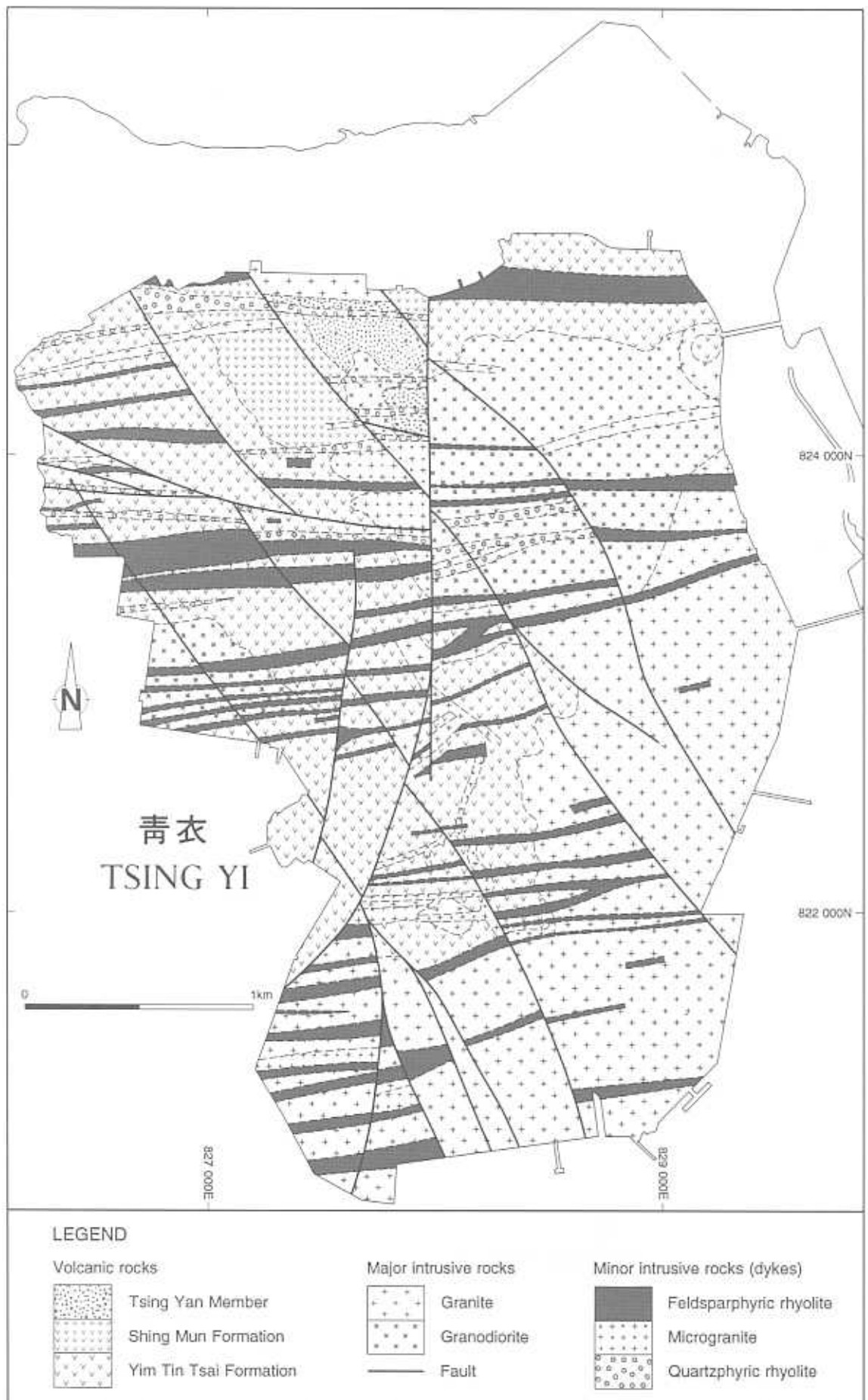


Figure 5 - Simplified Onshore Solid Geology of the District

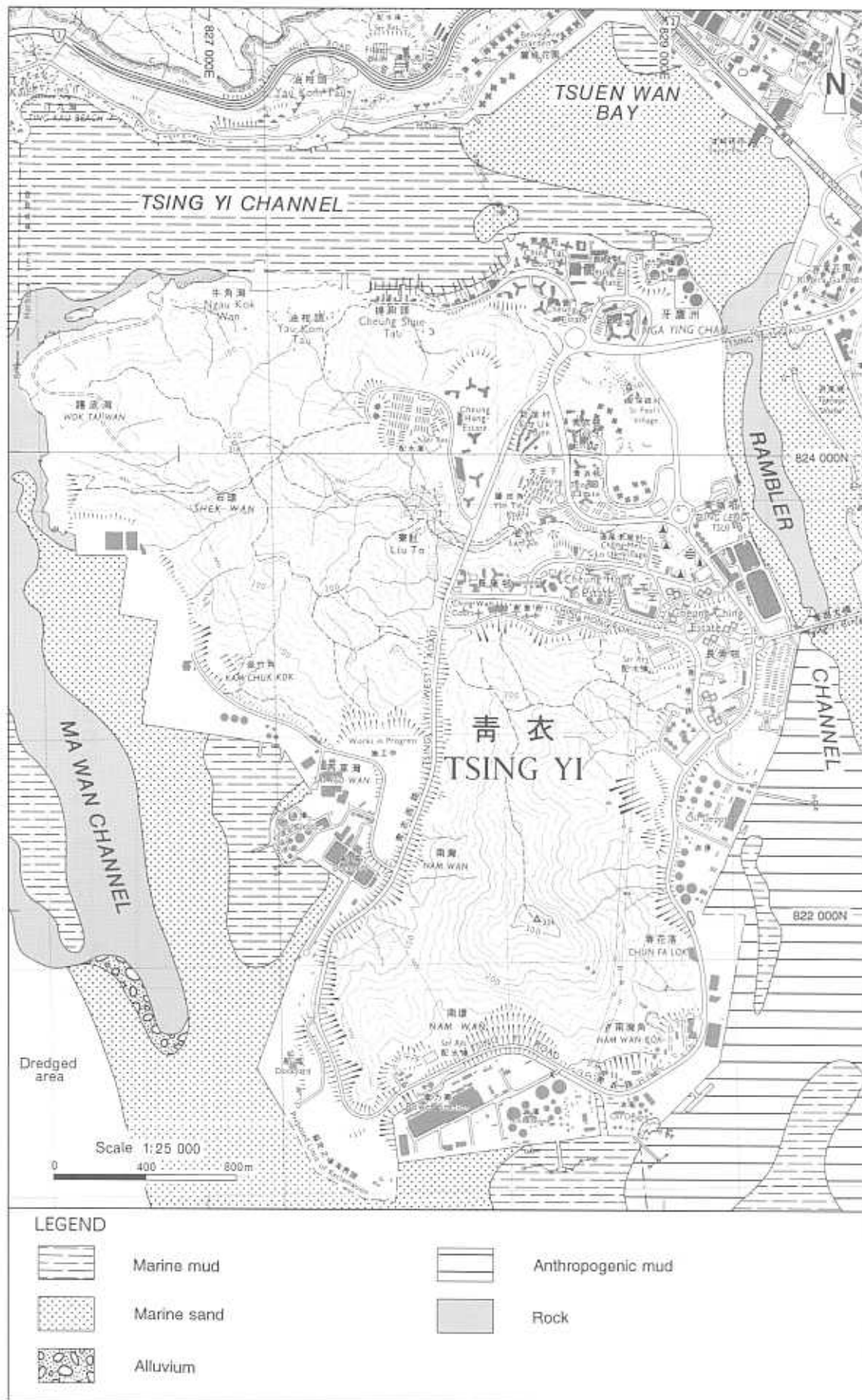


Figure 6 - Simplified Seabed Sediment Map of the District

Table 3 - Whole-rock Major- and Trace-element Geochemistry for Representative Rock Types on Tsing Yi. Major oxides in wt%, trace elements in ppm

Sample Grid Ref Rock Type	HK10862 27868 22823 Lapilli-ash crystal tuff	HK10867 26969 24070 Feldsparphyric rhyolite	HK10997 29213 23098 Porphyritic microgranite	HK11000 29012 23020 Medium-grained granite	HK11022 27670 22820 Lamprophyre	HK11031 26475 24365 Granodiorite
SiO ₂	70.11	76.84	76.98	76.81	50.45	65.07
TiO ₂	0.48	0.10	0.05	0.09	1.04	0.69
Al ₂ O ₃	13.78	12.08	12.43	12.23	13.30	15.05
Fe ₂ O ₃ *	3.74	1.46	1.03	1.38	9.53	5.17
MnO	0.08	0.03	0.05	0.04	0.12	0.10
MgO	1.02	0.08	0.02	0.07	8.44	1.33
CaO	2.35	0.79	0.61	0.67	9.05	3.65
Na ₂ O	2.61	2.75	3.22	2.71	1.36	4.15
K ₂ O	4.67	5.16	4.83	5.53	3.34	3.56
P ₂ O ₅	0.12	0.01	-	-	0.56	0.17
Total	98.96	99.30	99.22	99.53	97.19	98.94
LOI **	0.73	0.48	0.53	0.43	2.49	0.88
Mg#	35.07	9.79	3.70	9.13	63.69	33.75
Cr	15	24	15	9	363	10
Ni	12	11	19	9	104	9
Co	8	3	2	2	39	9
Cu	5	-	1	-	46	1
Pb	29	32	39	27	8	23
Zn	54	19	25	20	71	89
W	1	4	7	3	1	4
Mo	-	2	1	-	-	1
Rb	249	330	492	319	97	253
Ba	549	52	7	199	1125	557
Sr	235	35	10	39	656	190
Ga	18	16	20	17	17	18
Nb	12	22	64	23	6	13
Zr	154	126	97	111	130	191
Y	36	64	119	61	18	39
Th	27	46	49	35	4	23
U	6	7	10	7	2	5
La	45	36	8	33	29	41
Ce	75	77	33	84	72	55
F	1508	2779	4474	2518	1584	1873

* total iron as Fe₂O₃

** loss on ignition (LOI) at 1000°C

Mg# is 100Mg / Mg + Fe²⁺