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Quaternary stratigraphy and prospects for placer tin in the Taiping–Lumut area, Perak

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INTRODUCTION

The Quarternary Geology Division of the Geological Survey of Malaysia since early 1977, has been carrying out systematic mapping of the unconsolidated sediments in the coastal areas of Taiping, Beruas and Lumut. The technique of mapping and other related details are given elsewhere (Suntharalingam, 1984). The main aim of the project is to map the sediments and indicate the areas of economic interest for further exploration. Figure 1 shows the area under discussion.

STRATIGRAPHY

Three stratigraphic units namely the continental Simpang Formation (equivalent to the Old Alluvium of Walker, 1955), Gula Formation, and the continental Beruas Formation (equivalent to the Young Alluvium of Walker, 1955) have been delineated in the area. They were based on the lithology, heavy mineral content and, to a lesser extent, on palaeoenvironment (Suntharalingam, 1982). Table 1 shows the correlation of these units with those of earlier workers, and Figure 2 shows the Quaternary geology map of the area.

Simpang Formation

The term Simpang Formation was introduced by Suntharalingam and Teoh (In manuscript) for a unit made of gravel, silt and clay overlying bedrock in the Taiping area. The formation is divided into two members i.e. the Lower Sand Member which consists of sand and gravel and the Upper Clay Member which is mainly clay.

The thickness of the formation varies from a few metres in the east to more than 50 m in the west. The common heavy minerals in the Lower Sand Member are ilmenite, tourmaline, pyrite and magnetite. Zircon, cassiterite and siderite are present in small amounts (1 to 5 percent) whereas monazite, xenotime, topaz, rutile, corundum and anatase occur in trace amounts. However, in the Upper Clay Member the heavy mineral content is poor.

The formation is believed to be Pleistocene in age and the deposits are continental and fluviatile in nature.

Gula Formation

The name Gula Formation was introduced by Suntharalingam and Teoh (in manuscript) for a unit comprising mainly of grey to greenish grey marine to estuarine

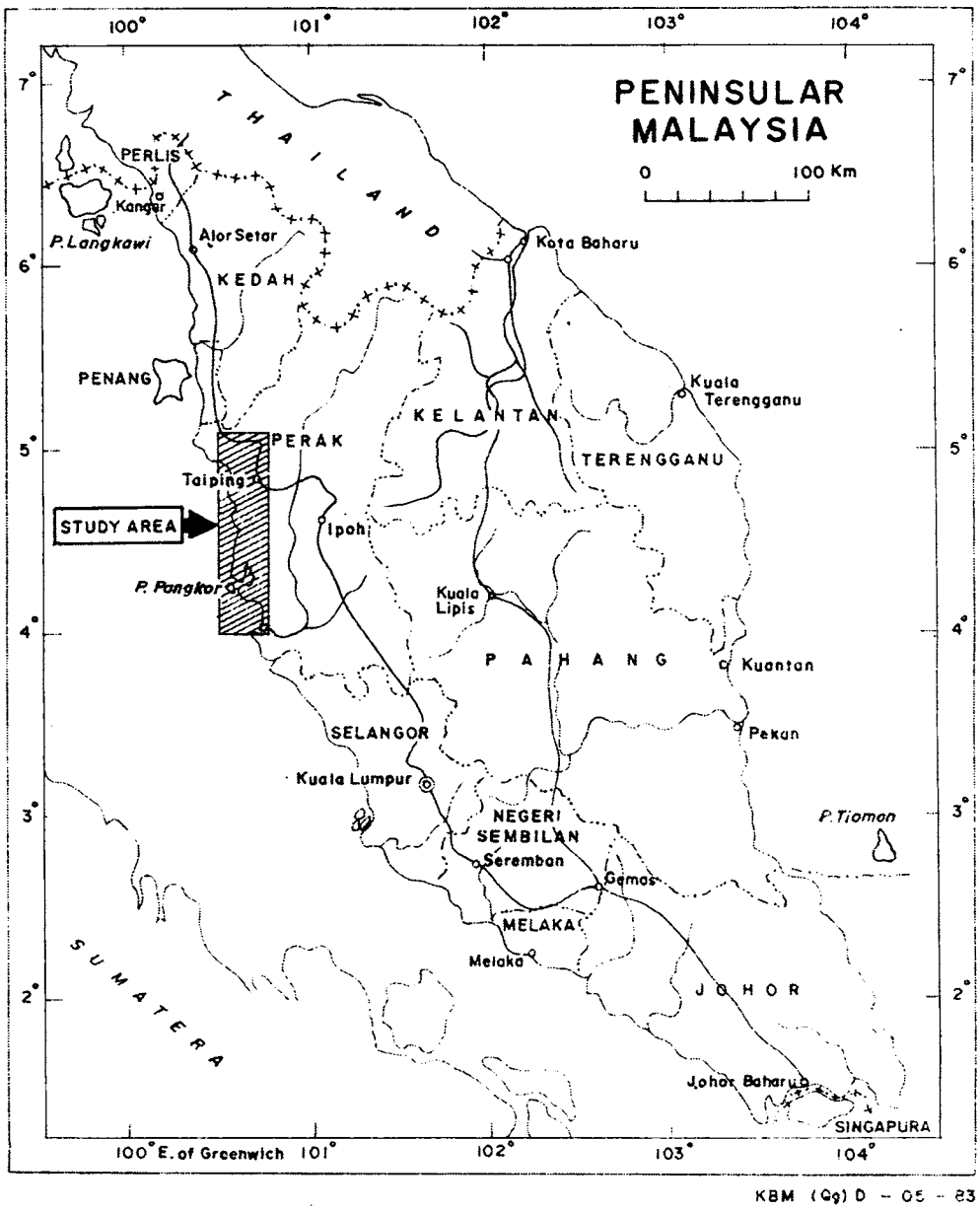
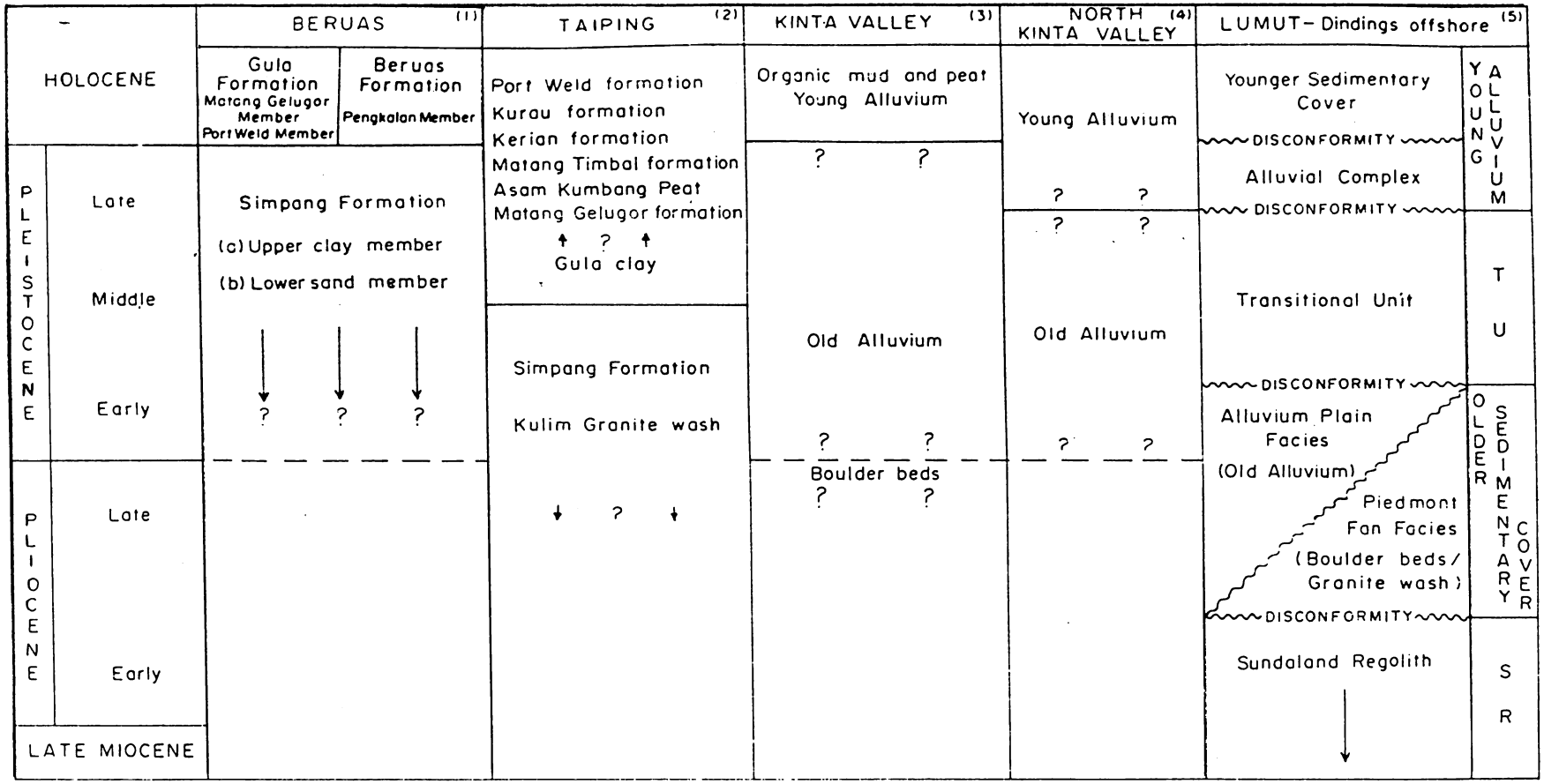


Fig. 1. Map showing the area of investigation.

TABLE 1

LATE CAINOZOIC CORRELATION CHART, PERAK



Source (1) T. Sunthoralingam. (2) T. Sunthoralingam and Teoh, L. H. (1980) (3) Walker, D (1955) (4) S.P Sivam (1969) (5) Batchelor B.C. (1979)

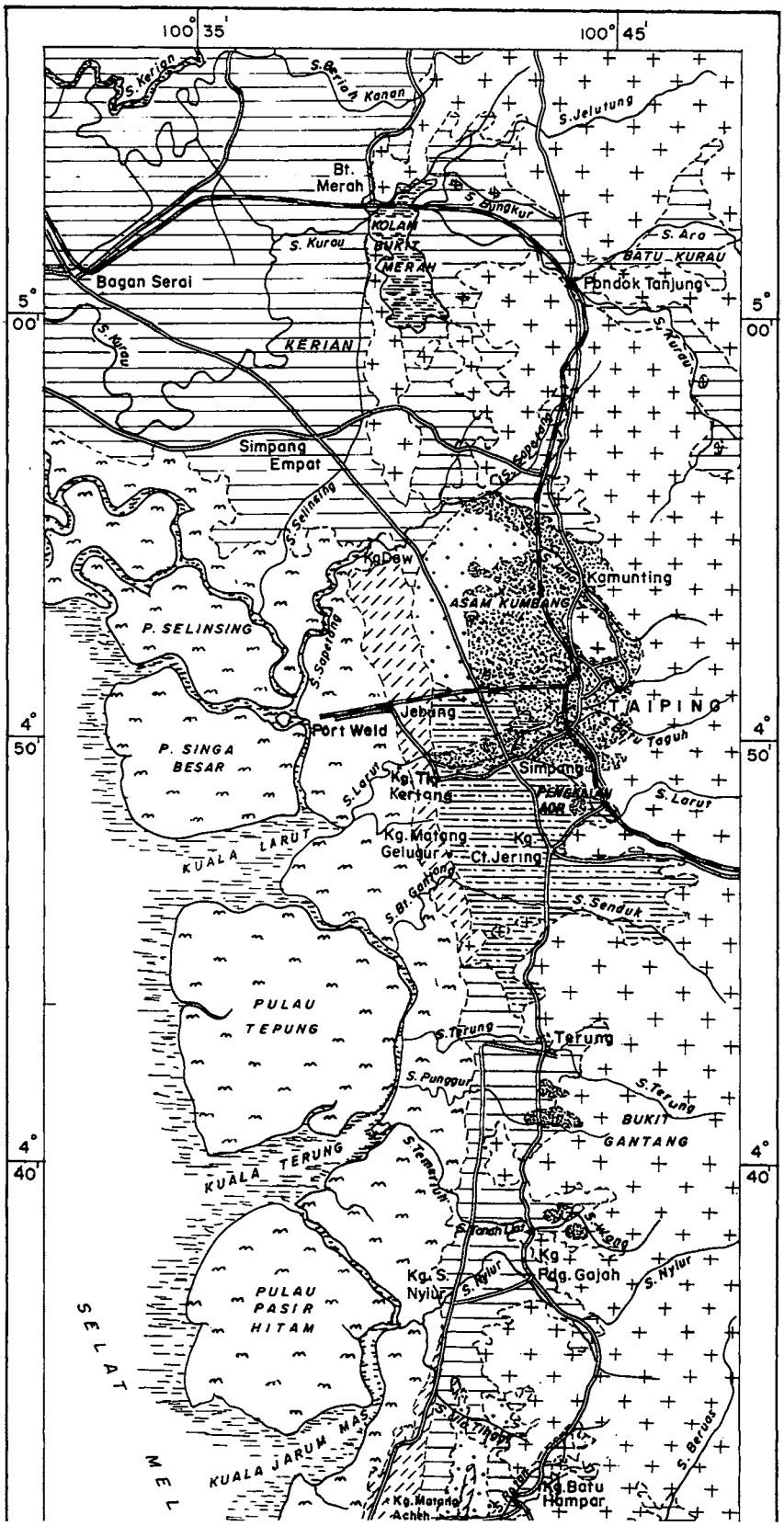


Fig. 2. Quaternary Geology map of the Dindings area.

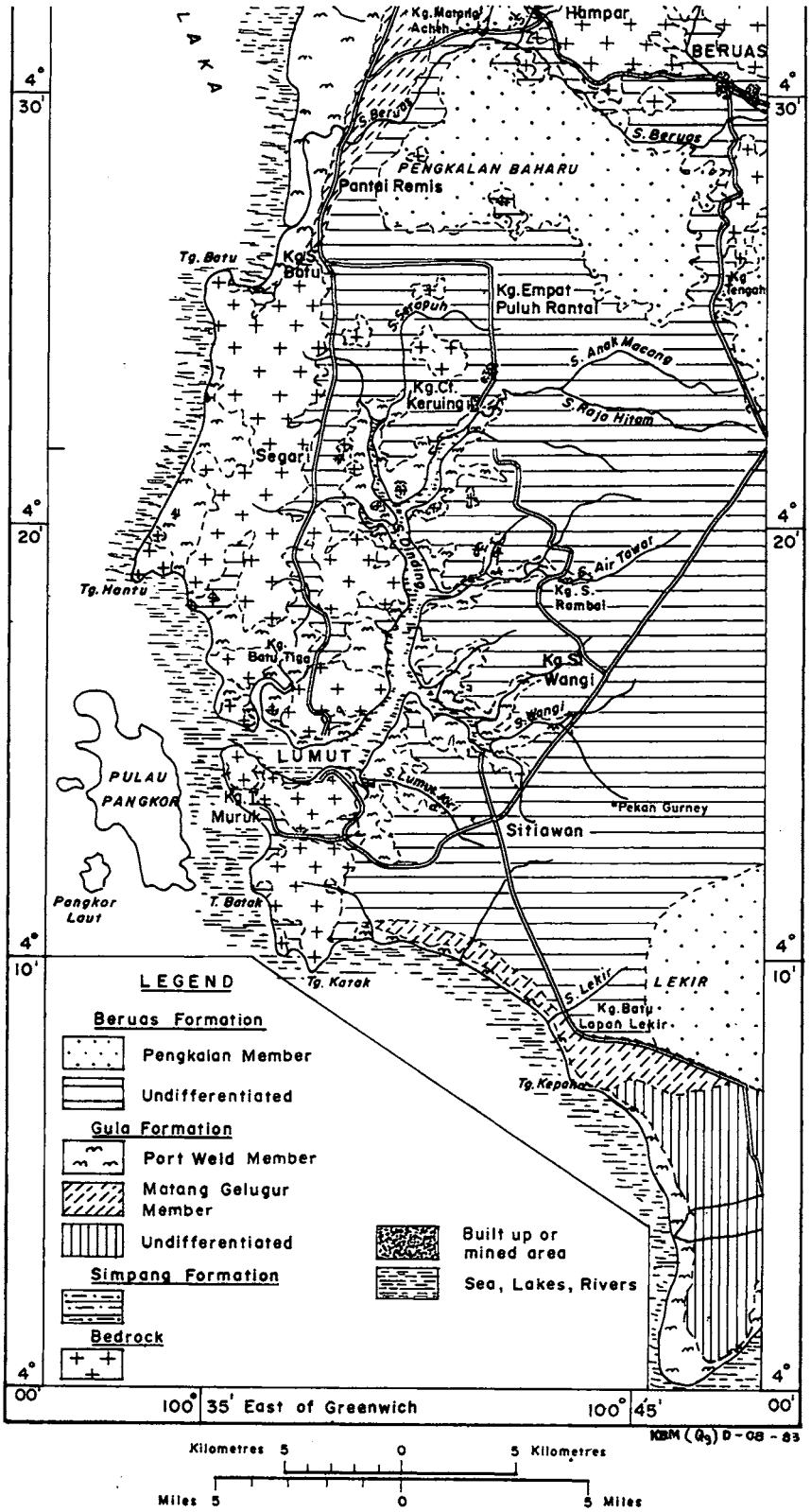


Fig. 2(cont'd.). Quaternary Geology map of the Dindings area.

clay and subordinate sand occurring in the Taiping area. The term Matang Gelugor Member was introduced for the subordinate sand forming the beach ridges in the coastal areas of Taiping. The term Port Weld Member was introduced for a unit made up of brown grey to green clay with abundant mangrove and riverine nipah vegetation occurring in the tidal areas.

The thickness of the formation varies from 1 metre to 20 m. The age is Holocene.

The heavy mineral content is poor in the undifferentiated clay of the formation and the Port Weld Member. However, the Matang Gelugor Member consists of ilmenite, hydroilmenite, pyrite, rutile, cassiterite, tourmaline, monazite, xenotime and garnet in minor to trace amounts.

Beruas Formation

Suntharalingam (in manuscript) proposed the term Beruas Formation for fluviatile-estuarine-lacustrine deposits made up of clay, sandy clay, sandy gravel, silt and peat occurring in the Beruas area. The term Pengkalan Member was introduced for the inland freshwater swamp deposit which is made up of clay, peat and silt.

The formation varies from a metre to less than 10 m in thickness. The heavy mineral content is low consisting of ilmenite, hydroilmenite, tourmaline and minor amounts of zircon, rutile, pyrite and iron minerals. Cassiterite is absent or present in trace amounts.

ECONOMIC GEOLOGY

Prospecting Results

Figure 3 shows the areas that have been prospected for tin by various mining companies and private individuals. The areas that have been intensely prospected are in Asam Kumbang, Kamunting, Taiping, Jebong, Pengkalan Aor, Simpang, Terong, Sungai Beruas, Bukit Gantang, Sungei Wang and Sungei Rotan. The prospecting results indicate that:

(a) The cassiterite is found in the sand and gravel layers and the best values occur immediately above bedrock,

(b) the areas with good results are those near the granitic hills

Results of the Investigation

The following observations and generalizations are drawn from the study of the Dindings area.

(a) In the Taiping area (map sheet 40) tin mining in the past has been confined mainly in the Simpang Formation to the area south of Sungei Sapetang and north of Sungei Larut. These rivers and their tributaries have played a part in the transportation and deposition of cassiterite.

Except for Sungei Beruas most of the rivers which drain the granitic rocks in the Beruas (Sheet 52) and Lumut (Sheet 63) areas are juvenile in nature. Residual or piedmont placers could be found at the base of the valley slopes and in early reaches of these rivers.

(b) From the location and distribution of tin mining activities in the Asam Kumbang, Larut and Matang, Pengkalan Aor, Simpang Terong, Sungei Wang and Sungei Rotan areas it can be deduced that tin has been derived from the mineralized areas to the east.

However, in the case of the Segari area the granitic rocks along the coast are mineralised and thus give rise to small deposits of tin.

(c) Placer tin is confined mainly to the base of the Lower sand member of the Simpang Formation where cassiterite occurs in economic quantities in the sand and gravelly sand layers above bedrock. Figure 4 shows the distribution of cassiterite in the various stratigraphic units.

Trace or minor amounts of tin have been recorded in the Upper clay member of the Simpang Formation and in the younger Beruas Formation.

(d) No tin or rarely trace amounts of tin were recorded in the undifferentiated clays of the Gula Formation. This indicates that the cassiterite found here is mainly fluviatile.

(e) Tin has been recorded in the Matang Gelugor Member. In some horizons the value of the ground is 0.01 katties per cubic yard (0.008 kgm per cu.m). The tin is derived from the stanniferous veins in the Segari granite and transported by longshore currents and deposited along the coast. As the beach ridges built up parallel to the coast the cassiterite was spread and diluted. It is possible that some fine cassiterite could have also found its way via Sungei Beruas or other rivers.

(f) The offshore deposits along the coast of Pantai Remis have been derived from stanniferous veins in the Segari granite. These deposits are generally coarse, angular, patchy and do not indicate transportation over large distances.

(g) Figure 5 shows the inland limit of marine sediments in the Taiping–Beruas area at the beginning of Quaternary and the amount of progradation that has resulted due to sea level changes and sediment accretion. It is unlikely that economically viable deep seated transported placers would be found west of this strand line as the drilling data give poor results. Further, this indicates the maximum distance of transport is less than 10 km from the source. The angular nature of the cassiterite and it being found together with the poorly sorted sediments of the Simpang Formation suggests limited transport.

(h) On the western side of the inland limit of marine sediments (figure 5) the cassiterite is generally finer than the 200 mesh fraction.

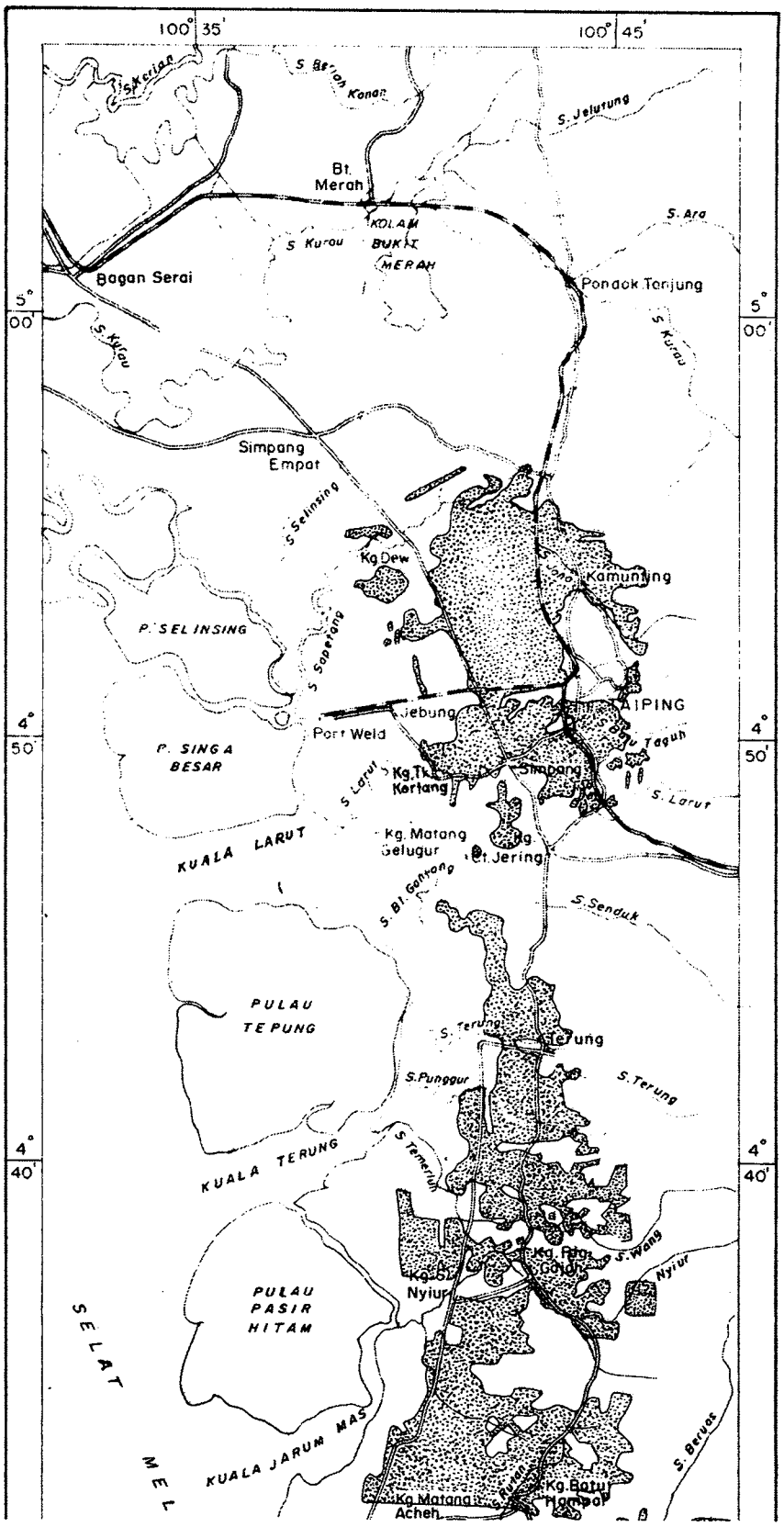


Fig. 3. MAP showing areas prospected for tin.

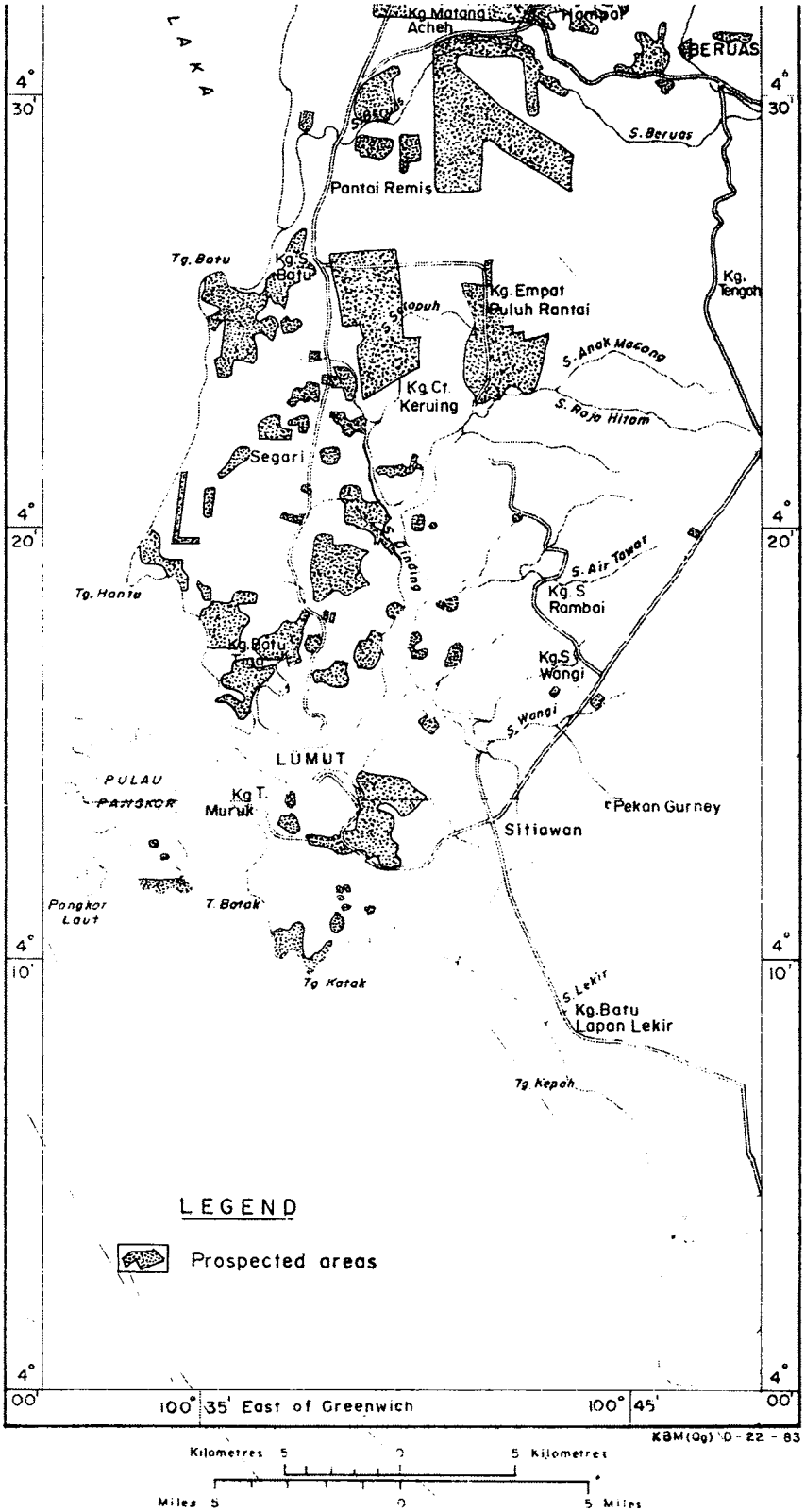


Fig. 3(cont'd.). MAP showing areas prospected for tin.

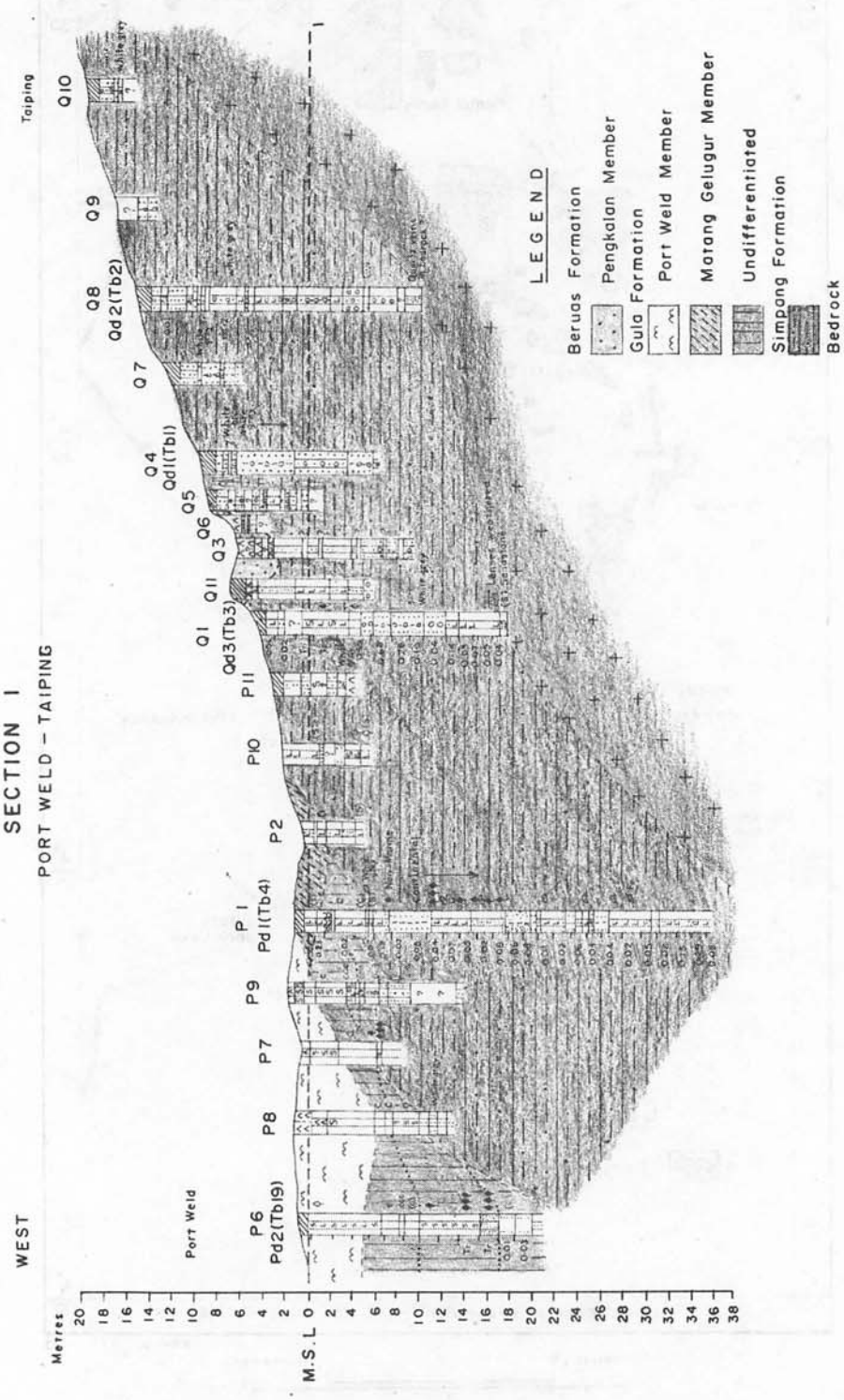


Fig. 4. Cross-sections showing distribution of cassiterite in the various units in the Taiping area.

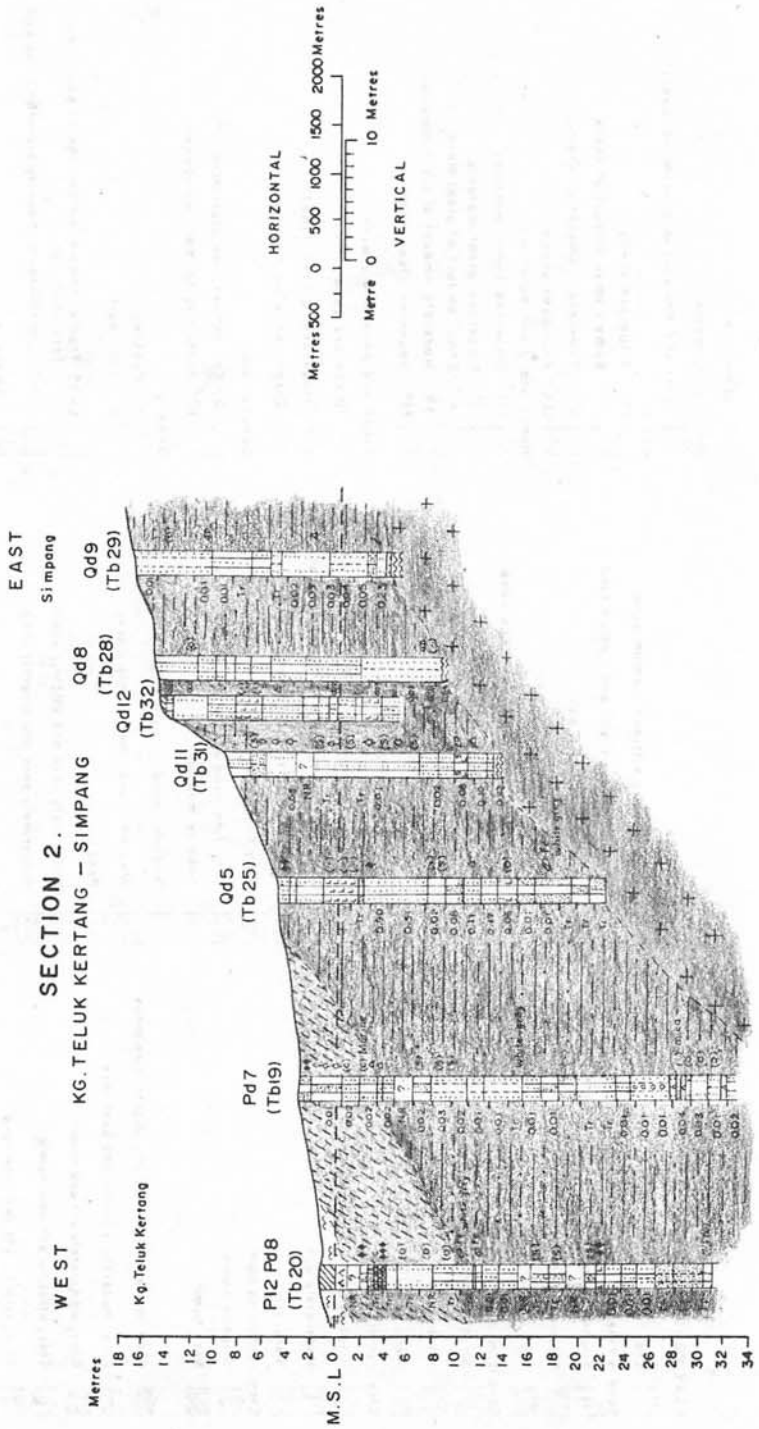


Fig. 4.(Cont'd.) Cross-sections showing distribution of cassiterite in the various units in the Taiping area.

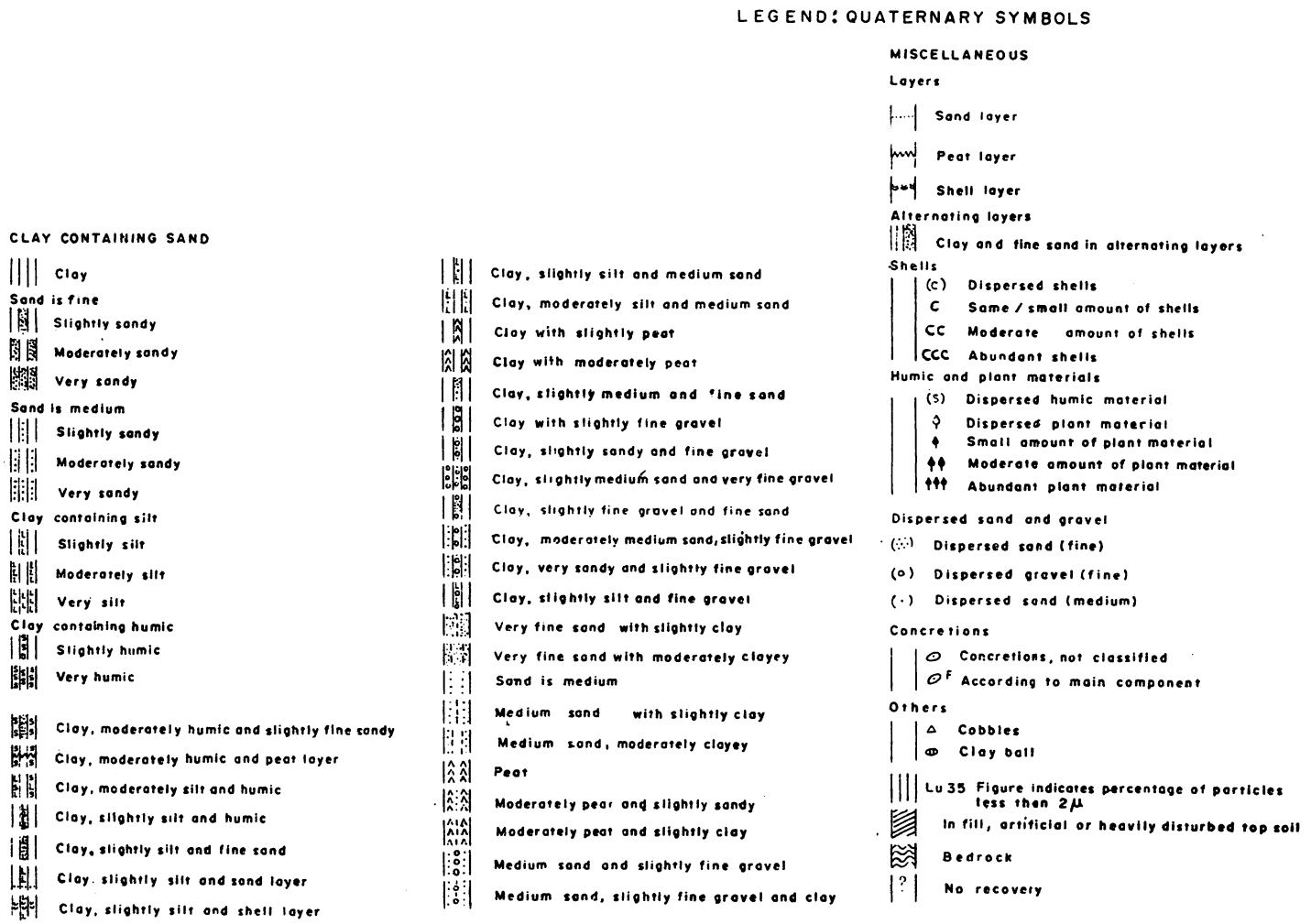


Fig. 4.(Cont'd.) Cross-sections showing distribution of cassiterite in the various units in the Taiping area.

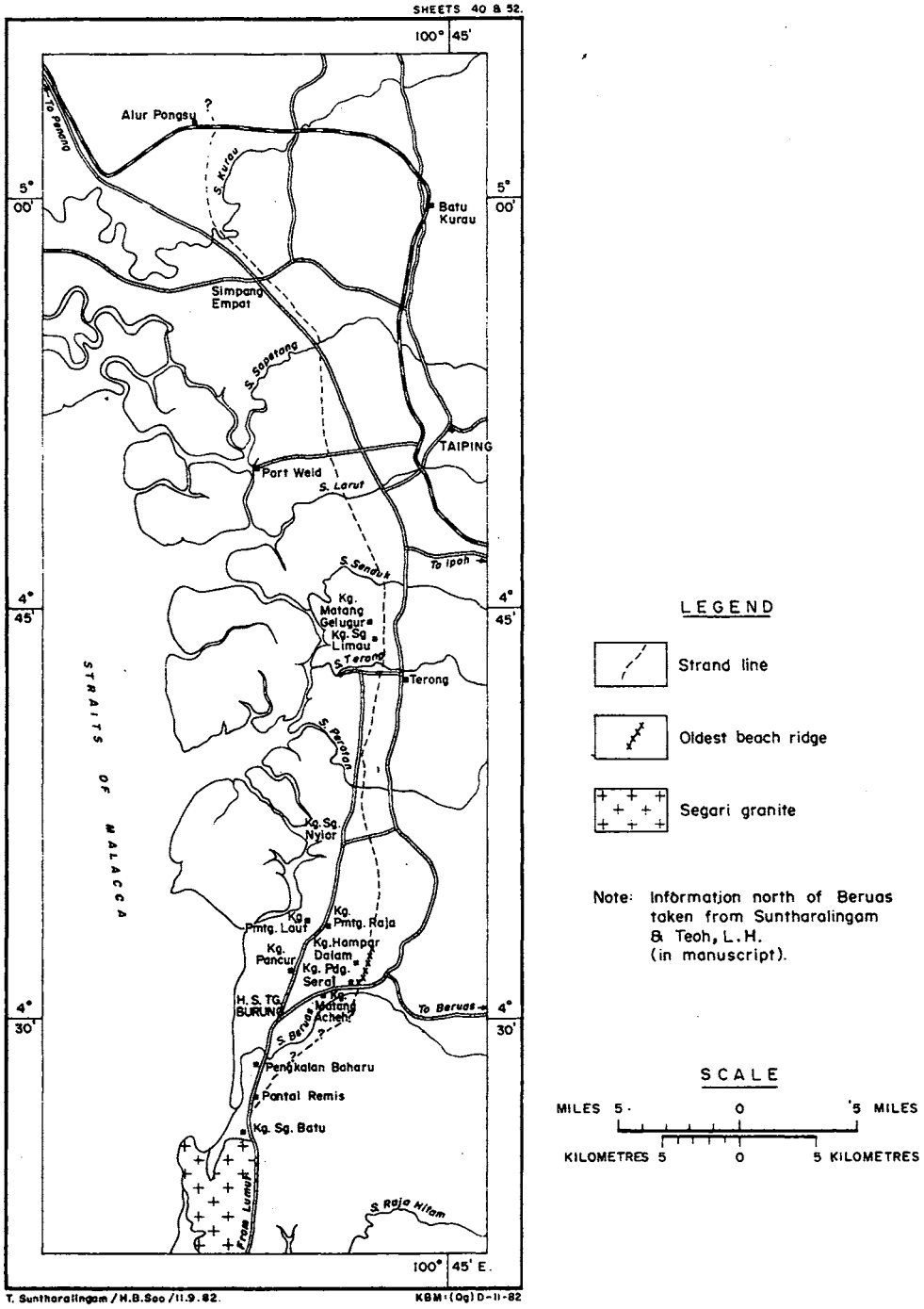


Fig. 5. Map of Taiping-Beruas area showing inland limit of marine Quaternary sediments.

(i) The Simpang Formation must have been formed from more than one period of deposition in the Pleistocene. Likewise, it appears that placer cassiterite resulted not from one period of deposition but from several pulses. This is shown by the higher concentration of placer tin in different stratigraphic horizons of the various boreholes.

(j) Figure 6 shows the thickness of unconsolidated sediments in the areas around Dindings. The old river valleys and courses of some major rivers deduced from aerial photographic studies by Koopmans (1964) have also been incorporated. The evidence from the thickness of sediments indicate that for example the Sungei Beruas previously flowed north of its present course.

PROSPECTS FOR PLACER TIN DEPOSITS

Taiping area

Figure 4 shows the cross-section of some of the scout banka holes drilled in the Taiping area (Sheet 40). The results show that in the environs of Asam Kumbang, Larut and Matang and Simpang certain horizons of Simpang Formation have values greater than 0.15 katties per cubic yard (0.119 kgm per cu.m) cassiterite. In the other areas the values are poor and insignificant.

There is very little possibility of finding shallow or deep seated placers north of Kampong Dew in the Bagan Serai–Kerian areas. In the Bagan Serai–Kerian area the Simpang Formation is overlain by an average of 20 metres of sediments of the Gula and Beruas Formations. The bedrock is greater than 40 metres in depth from the surface. Drilling results indicate that tin is generally found in the Simpang Formation with values ranging from 0.01 katties per cubic yard (0.008 kilogramme per cubic metre) to nil. The prospects of finding economically viable placer deposits in the Bagan Serai, Kerian and Batu Kurau areas appear rather slim.

The likelihood of finding new areas with shallow alluvial tin deposits (less than 30 m depth) in the Asam Kumbang to Simpang areas also appears slim because a large part of the area has been prospected and mined by private mining companies (Figure 3). The areas of interest are:

(a) The Ladang Kerian–Ladang Yam Seng area where Sungei Ayer Kuning and its tributaries drain into Sg. Sepetang (Figure 8),

(b) Ladang Jebong–Ladang Simpang,

(c) Ladang Matang Jambu–Ladang Lauderdale

The area west of Simpang–Kampong Dew Highway between Ladang Selinsing Selatan to Kampong Matang Gelugor should be prospected for deep seated tin placers. Drilling results, however, show that the best prospects lie between the area south of Kampong Matang Batu and north of Kampong Melawati.

Beruas

The thickness of sediments of the Gula and Beruas Formations overlying the

Simpang Formation varies from a few metres to about 15 metres. These overlying sediments generally have cassiterite values below 0.01 kattie per cubic yard (0.008 kg/cu. metre).

Figure 7 is a cross-section from Kampong Sungai Batu to Kampong Tengah in the east. This section indicates values of tin at various horizons ranging from 0.01 kattie per cubic yard to 0.13 k.p.cy (0.008 kg/cu m–0.103 kg/cu m). The cassiterite is generally derived from the Segari granite and further prospecting should be carried out to find if pockets or areas of economic concentration of tin occurs in the area east of the Segari granite.

Besides the areas (for example, Terong area) that are under mining concession the following should be further investigated (Figure 8).

(1) Kampong Punggor area where Sungei Punggor and its tributaries drain into the coast.

(2) Kampong Temerloh–Hutan Simpan Sungei Tinggi area especially between Sungei Nyior and Sungei Tanah Liat and nearer to the coast.

(3) The old river course of Sungei Beruas.

The offshore deposits off the coast of Pantai Remis are well known and has been prospected by a prominent local company.

Lumut

The best prospects for alluvial tin lies to the west and east of the granitic hills extending from Segari (Beruas area) southwards to Hutan Simpan Telok Muroh. The known offshore deposits around Lumut have been prospected by Pernas Mining.

Drilling results indicate only trace amounts of tin occur in the lowlying areas east of Sitiawan. However, it is recommended the former river course of Sungei Perak which flowed to east of the area should be investigated (Figure 8). In drillhole in the Ubiyu area, east of Pekan Gurney cassiterite values from 0.04 katties per cubic yard (0.032 kg per cu m) to 0.33 katties per cubic yard (0.261 kg per cu m) were recorded at different horizons from a depth of 38 m to 50 m (Abdullah Salleh, personal communication).

CONCLUSION

The studies carried out by the Geological Survey around the Dindings area shows that tin in economic concentrations is found only in the Simpang Formation. Cassiterite found in the lowland plains is derived from the Segari granite. It is fluviatile and has not been transported far from the source.

Several locations with interesting values for tin have been indicated and it is recommended that further drilling be carried out in these areas to ensure if they could be economically mined.

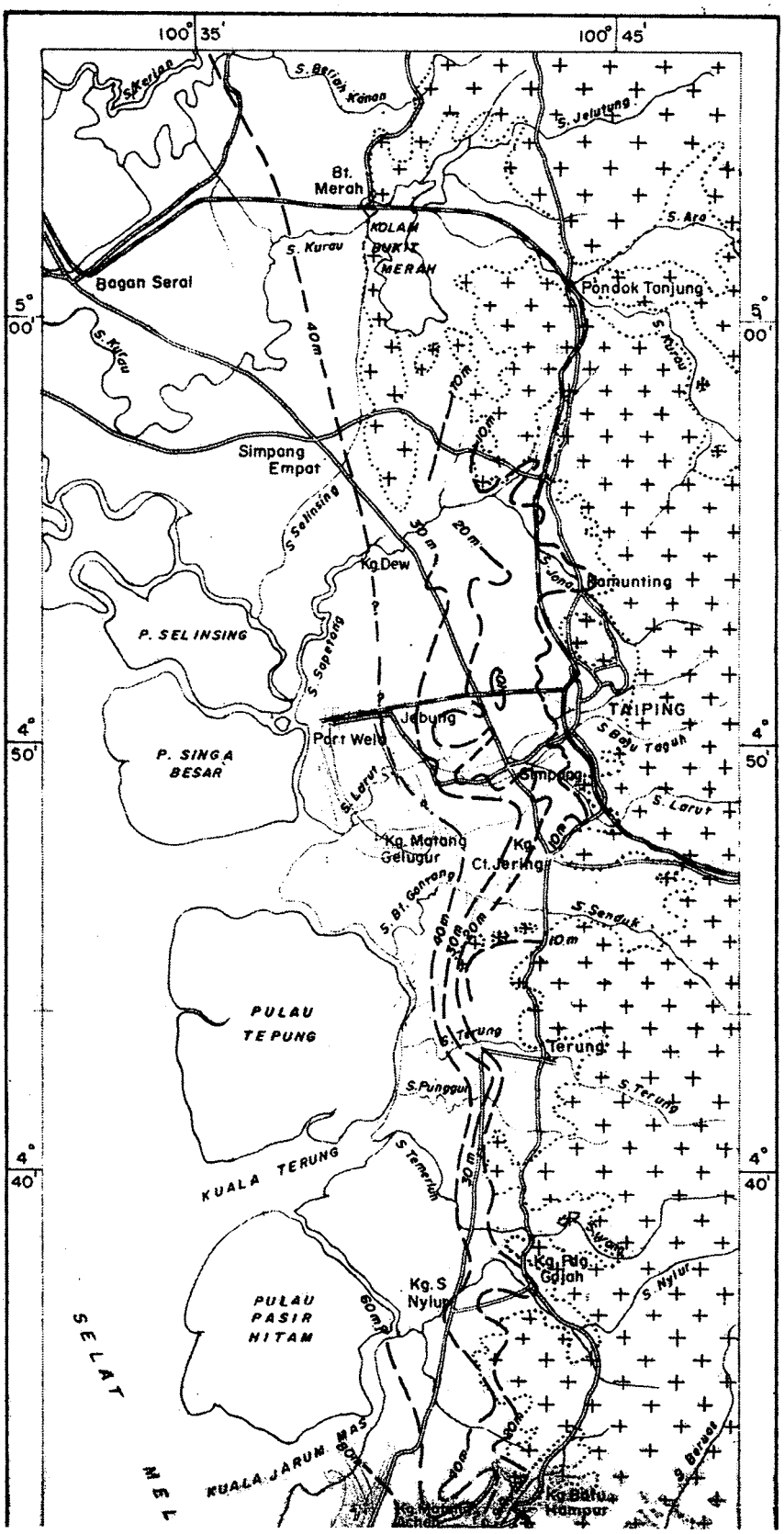


Fig. 6. Isopach map showing thickness of alluvium in the Dindings area.

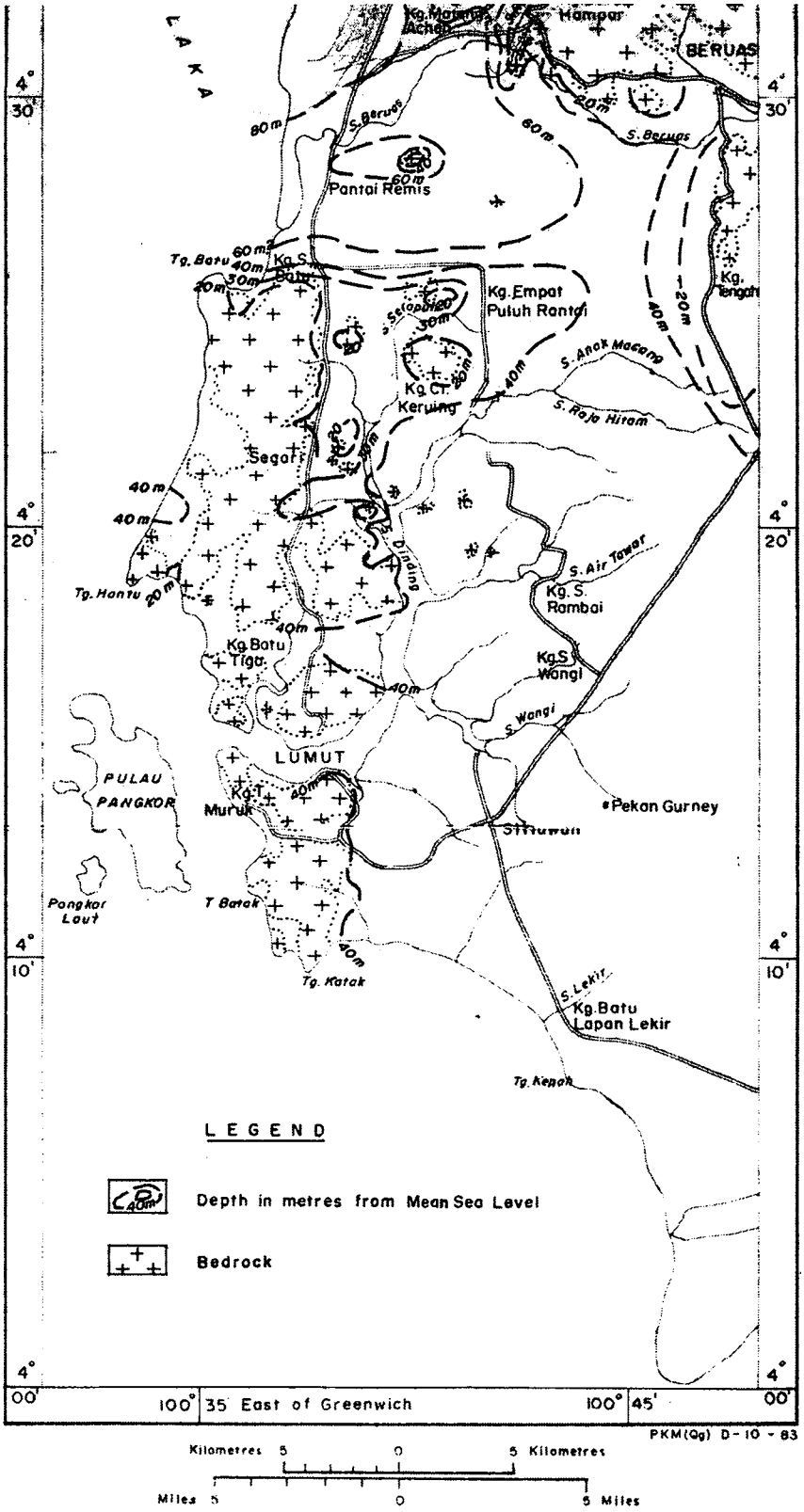


Fig. 6(cont'd.). Isopach map showing thickness of alluvium in the Dindings area.

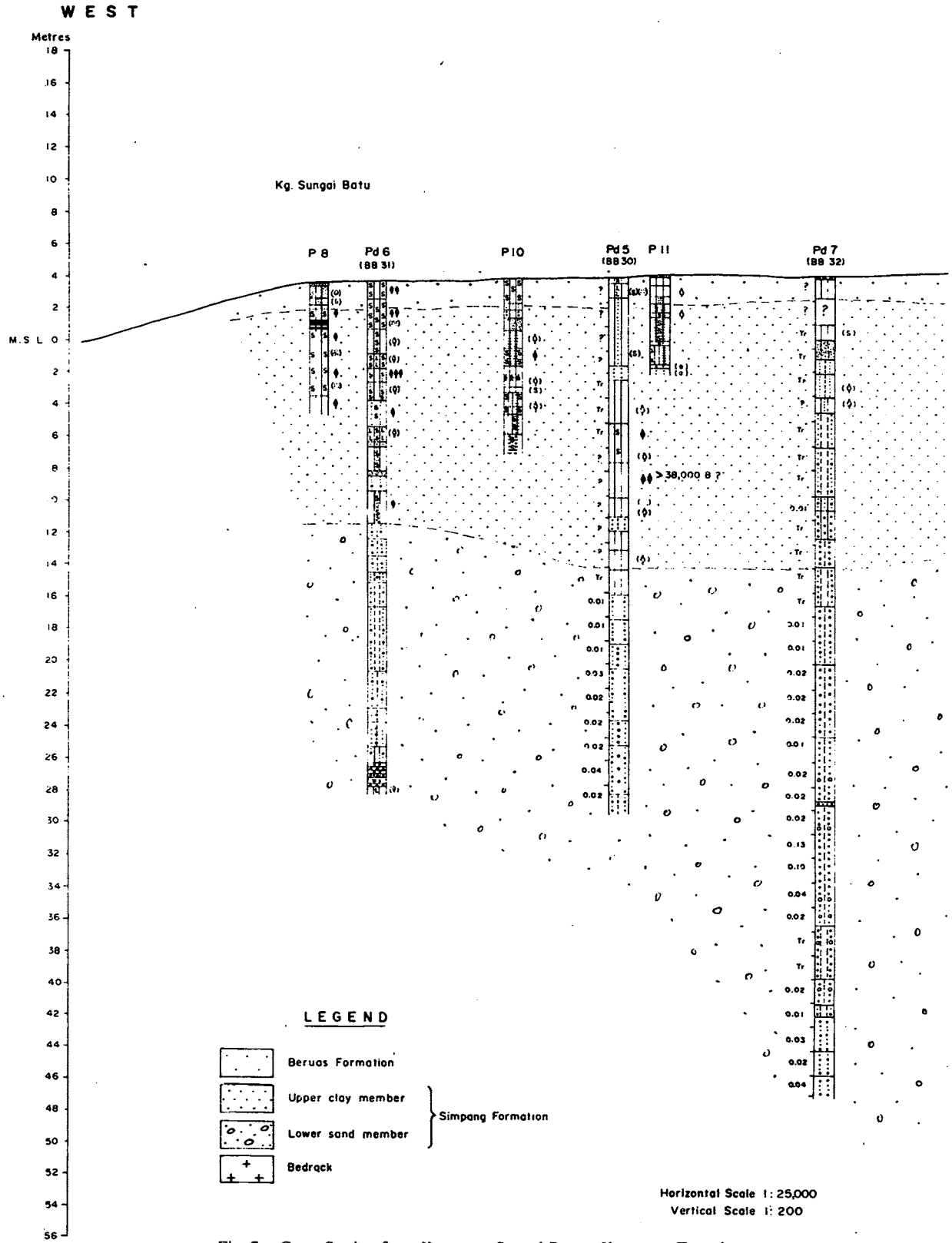


Fig. 7. Cross-Section from Kampung Sungai Batu—Kampung Tengah.

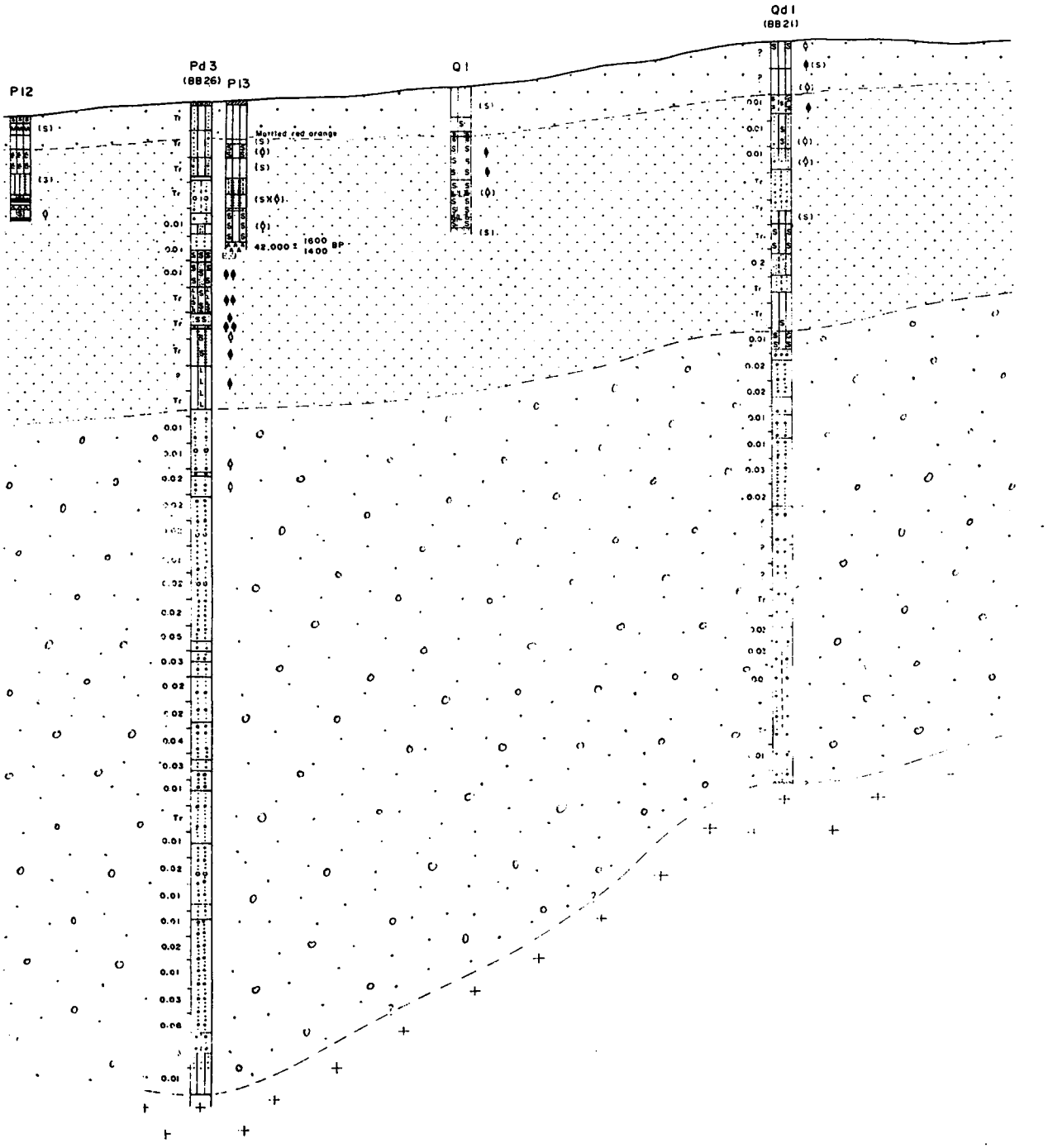


Fig. 7(cont'd.). Cross-Section from Kampung Sungai Batu—Kampung Tengah.

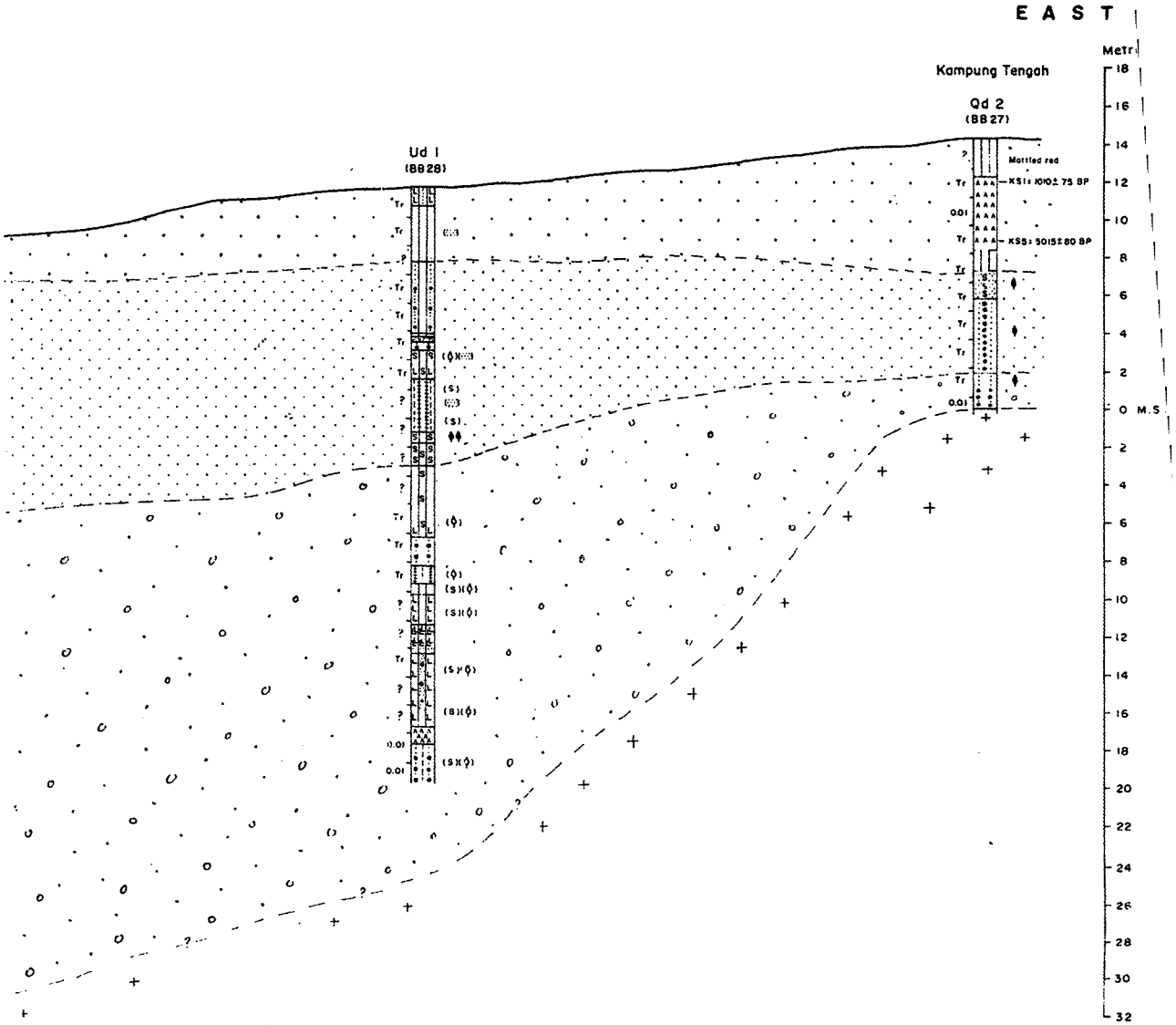


Fig. 7(cont'd.). Cross-Section from Kampung Sungai Batu—Kampung Tengah.

QUATERNARY GEOLOGICAL SYMBOLS

Fig. 7(cont'd.). Cross-Section from Kampung Sungai Batu—Kampung Tengah.

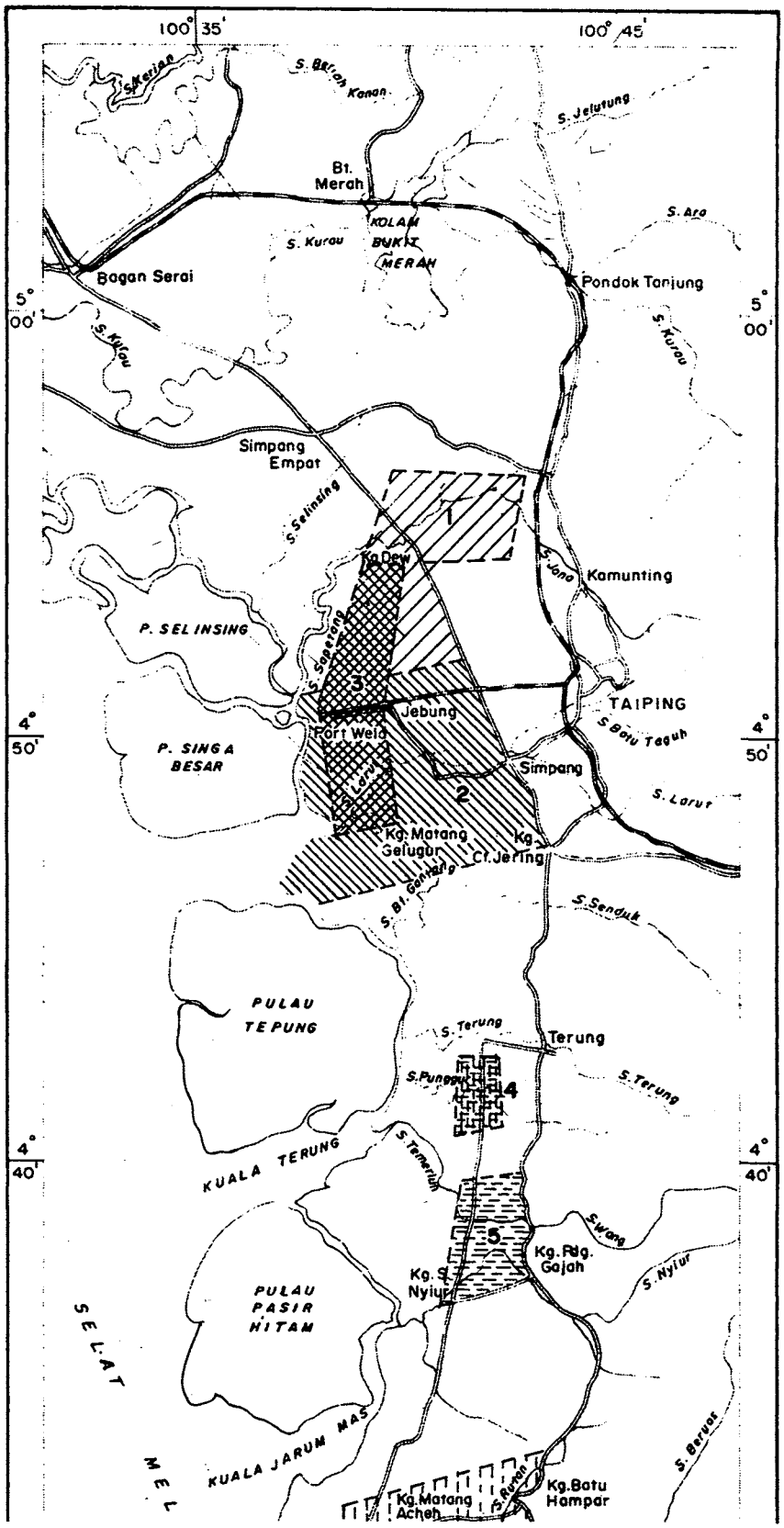


Fig. 8. Map showing prospects for placer tin around the Dindings area.

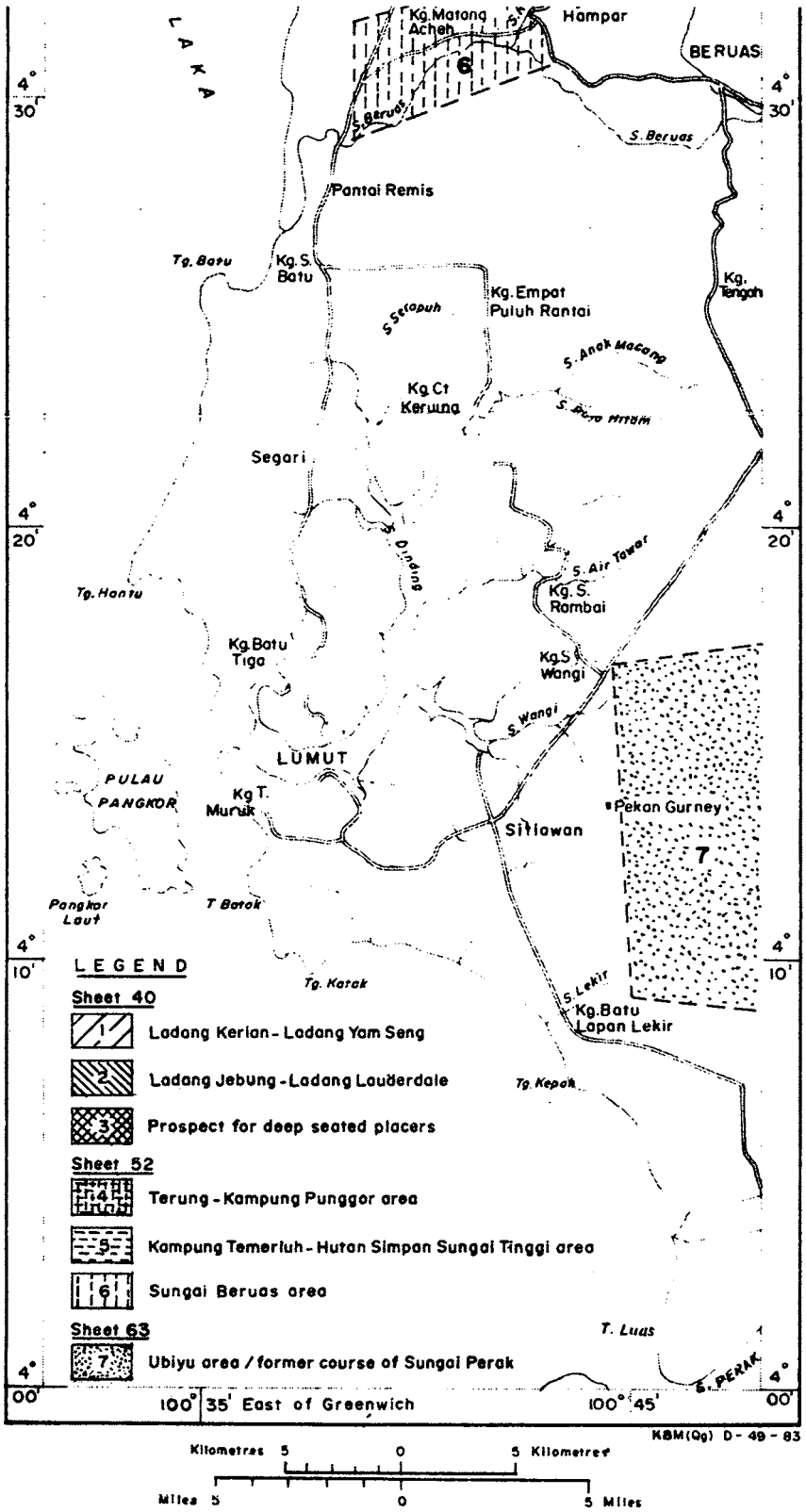


Fig. 8(cont'd.). Map showing prospects for placer tin around the Dindings area.

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