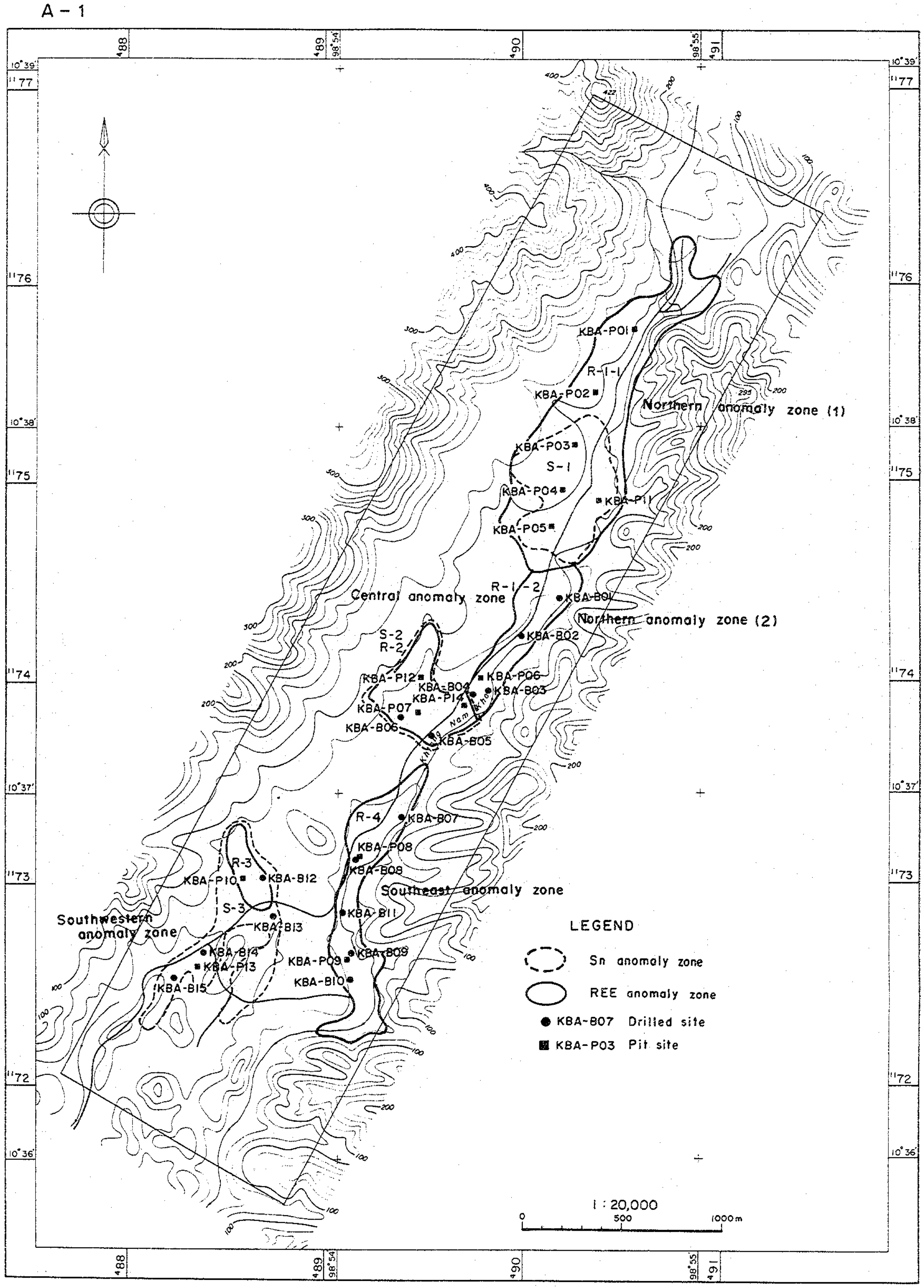


Fig. 35 Locality Map of Pit and Drilling Survey in Area A-1

The pit survey program has been initially performed for the potential zones of secondary ores in this year, afterwards the drilling program using the Banka drill method has been conducted in the selected promising zones along the Khlong Nam Khao.

The pits were principally planned to dig 1.5 x 1.5 meters in size and 4 meters in depth to reach basement rocks, but some pits were unable to reach basement rocks because of underground water or boulders exceeding 1 meter in size. Some pits are 3 meters in depth. The number of pits dug in the area is 14, and total depth is 44.5 meters.

The Banka drilling was planned to confirm ores at 15 sites around promising pits. All holes have reached to basement rocks. The total depth of the holes is 74.7 meters.

Sketching of all walls, 1:25 in scale, has been done after completion of the pits. Then, 50 centimeters long channel sampling has been performed due to their geological conditions, and collected samples have been panned to separate heavy minerals, which have been chemically assayed and made polished sections for microscopic observation.

Columnar sections, 1:50 in scale, have been made for all length of the drill holes by geological observation for each core tube section. Samples for every 1.5 meters section have been collected, and measured their volume and weight. These samples have been panned to separate heavy minerals, which have been chemically assayed.

5-1-2 Results of Pit and Drilling Survey

Following five zones were selected for further exploration activities based on the second phase survey results.

1. Northern Geochemical Anomaly Zone (1)
2. Northern Geochemical Anomaly Zone (2)
3. Central Geochemical Anomaly Zone
4. Southeastern Geochemical Anomaly Zone
5. Southwestern Geochemical Anomaly Zone

It was judged that these zones were of high potential for secondary ores.

(1) Northern Geochemical Anomaly Zone (1)

The Northern Geochemical Anomaly Zone (1) was underlain by talus deposits containing much amounts of fresh granite pebbles and cobbles, and colluvial or redepositional weathering residual sediments derived from granitic weathered soil. Potential for secondary ores in talus weathering residual sediments was evaluated for this zone in second phase survey. However, the pit survey results have revealed that no economical grade ore was in this zone. The assay results of this zone are as follows.

SnO_2	; 0.1 to 3.1 g/m^3
W_2O_3	; <0.6 g/m^3
Ta_2O_5	; <1.5 g/m^3
Nb_2O_5	; <5.4 g/m^3
TR_2O_3	; 4.0 to 56.0 g/m^3
ThO_2	; 1 to 6 g/m^3
Zr_2O_3	; 1 to 11 g/m^3
TiO_2	; 20 to 575 g/m^3

(2) Northern Geochemical Anomaly Zone (2)

The Northern Geochemical Anomaly Zone (2) is in an alluvial lowland along the Khlong Nam Khao, and underlain by a 1 to 2 meters thick sands mixed with silt layer, 1 meter thick white clay layer mixed with sand, and 2 to 3 meters thick sand and gravel layer, from the top to the bottom. Fig.36 shows this situation. The assay results have revealed that useful minerals were commonly concentrated in the lower sand and gravel layer, and laterally concentrated in the turning flow point in the down stream area of the Khlong Nam Khao. To the south of this zone, a hilly extension of weathering residual sediments comes out from the northwest side, making a pocket shape. It is said that the cut-off grade for tin is approximately 100 g/m^3, therefore economical ores in the zone are limited in a small area around KBA-B03 and KBA-P06. The cut-off grade for rare earths is not clearly known, because rare earths have been recovered as by- products of tin until now. Presumed that the cut-off grade for rare earths is as same as that of for tin, economical ores for rare earths are also limited in the same small area designated for tin, in the lower sand and gravel layer.

(3) Central Geochemical Anomaly Zone

It was evaluated that the potential for secondary ores in talus weathering residual sediments in the northwestern part and alluvial stream sediments was high in the southeastern part of the Central Geochemical Anomaly Zone. The area is underlain by talus deposits and redepositional weathering residual sediments in the northeastern zone. The grade for useful minerals is low as well as in the case of the

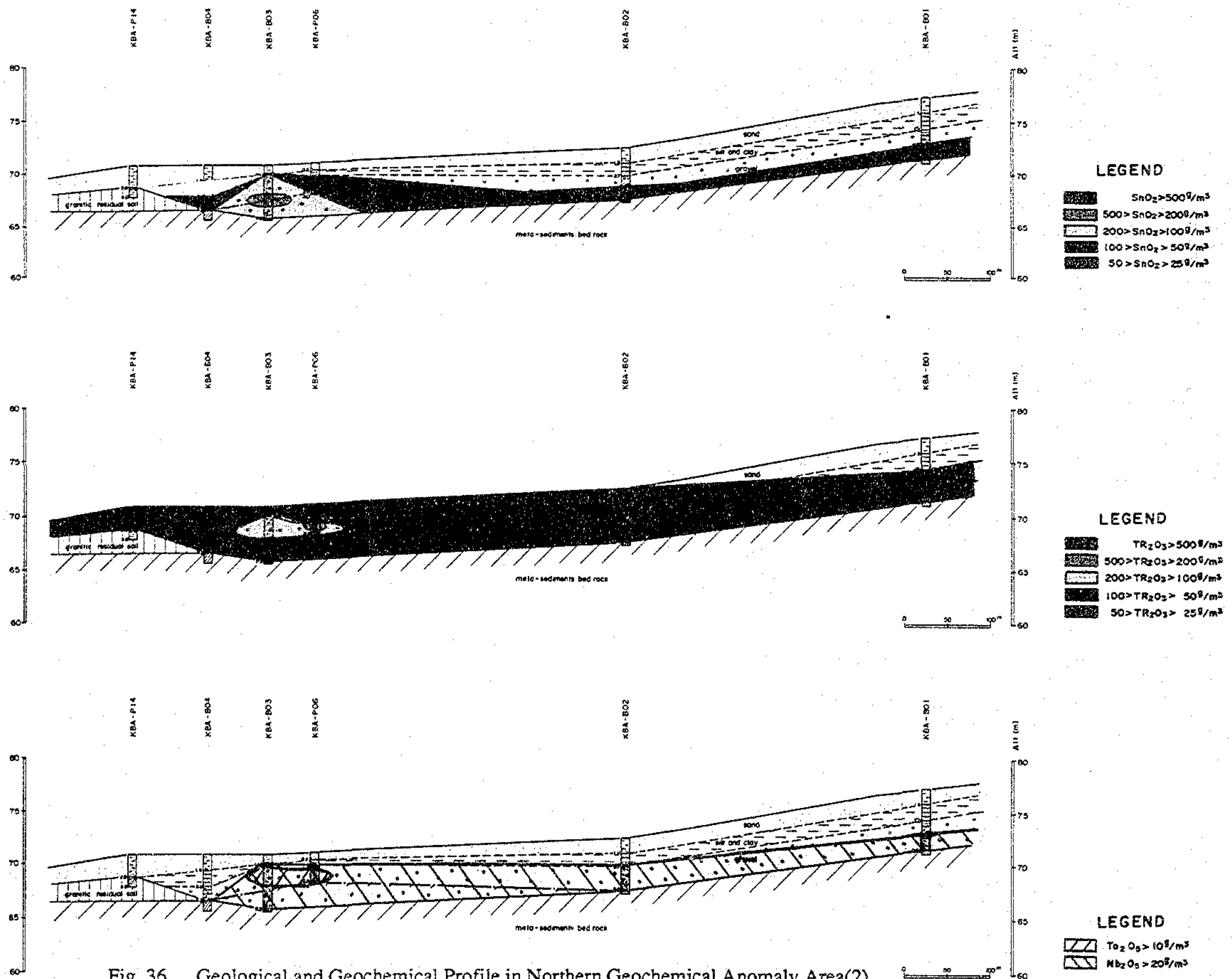


Fig. 36 Geological and Geochemical Profile in Northern Geochemical Anomaly Area(2)

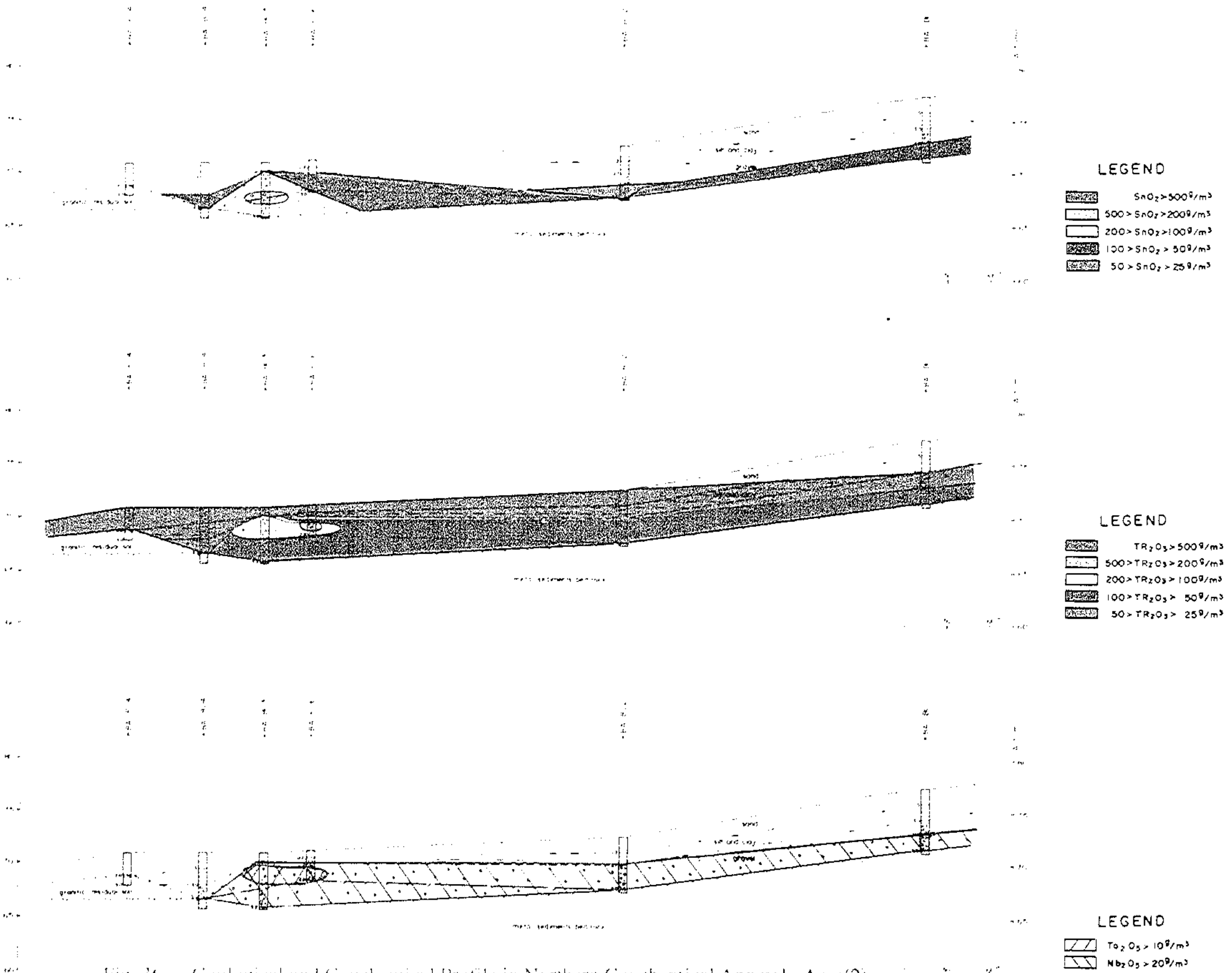


Fig. 36 Geological and Geochemical Profile in Northern Geochemical Anomaly Area(2)

Northern Geochemical Anomaly Zone (1), and the potential for ores is evaluated as low. The flat lowland in the southwestern zone around KBA-B05 is underlain by a sand mixed with silt layer in the upper, and sand and gravel layer in the lower. Tin is concentrated in the lower part of the sand and gravel layer. Figure 37 shows this situation. Rare earths are concentrated in the upper part of the sand and gravel layer. The sedimentary basin for ores is small in scale. However the tin grade is significantly high, SnO_2 1,700 g/m^3 in average in the small area around KBA-B05.

(4) Southeastern Geochemical Anomaly Zone

It was evaluated that the potential for secondary ores in sand and gravel layers was high in the Southeastern Geochemical Anomaly Zone, because the zone is situated in the area underlain by flat lowland stream sediments. As shown in Geological Profile (F), this zone is underlain by a 1.2 to 3.1 meters thick sandy silt surface layer and a 1 to 3 meters thick sand and gravel layer. The area highly concentrated by tin corresponds with the distribution of the sand and gravel layer in some degree. Tin concentration is, however, low in the upper part of the sand and gravel layer in the area around KBA-B08 and KBA-P08, and high in the overlaying sandy silt layer in the area around KBA-B10, in the down stream area. Rare earths are concentrated in the area around KBA-B11 in the central part of the zone, high in the lower part of the sand and gravel layer in the upper stream area, and in the overlaying silt layer in the down stream area, as well as behavior of tin. Figure 38 shows this situation.

The Northern (2), Central, and Southeastern Geochemical Anomaly Zones along the Khlong Nam Khao are characterized by high tantalum and niobium contents, Nb_2O_5 18 to 70 g/m^3 in the high concentration area of tin and rare earths. Behavior of tantalum and niobium are close to that of rare earths rather than that of tin. Behaviors of tritium, zirconium, and titanium have quite close correlation to that of rare earths.

(5) Southwestern Geochemical Anomaly Zone

It was evaluated that the potential for secondary ores in talus weathering residual sediments around the granite body and alluvial stream sediments along the river was high in the Southwestern Geochemical Anomaly Zone as well as in the Central Anomaly Zone. The pit and drilling survey results have revealed that high concentration areas were located only in the stream sediments area along the river. No high rare earths anomaly has been detected in the zone. The narrow sedimentary basins of the stream sediments,

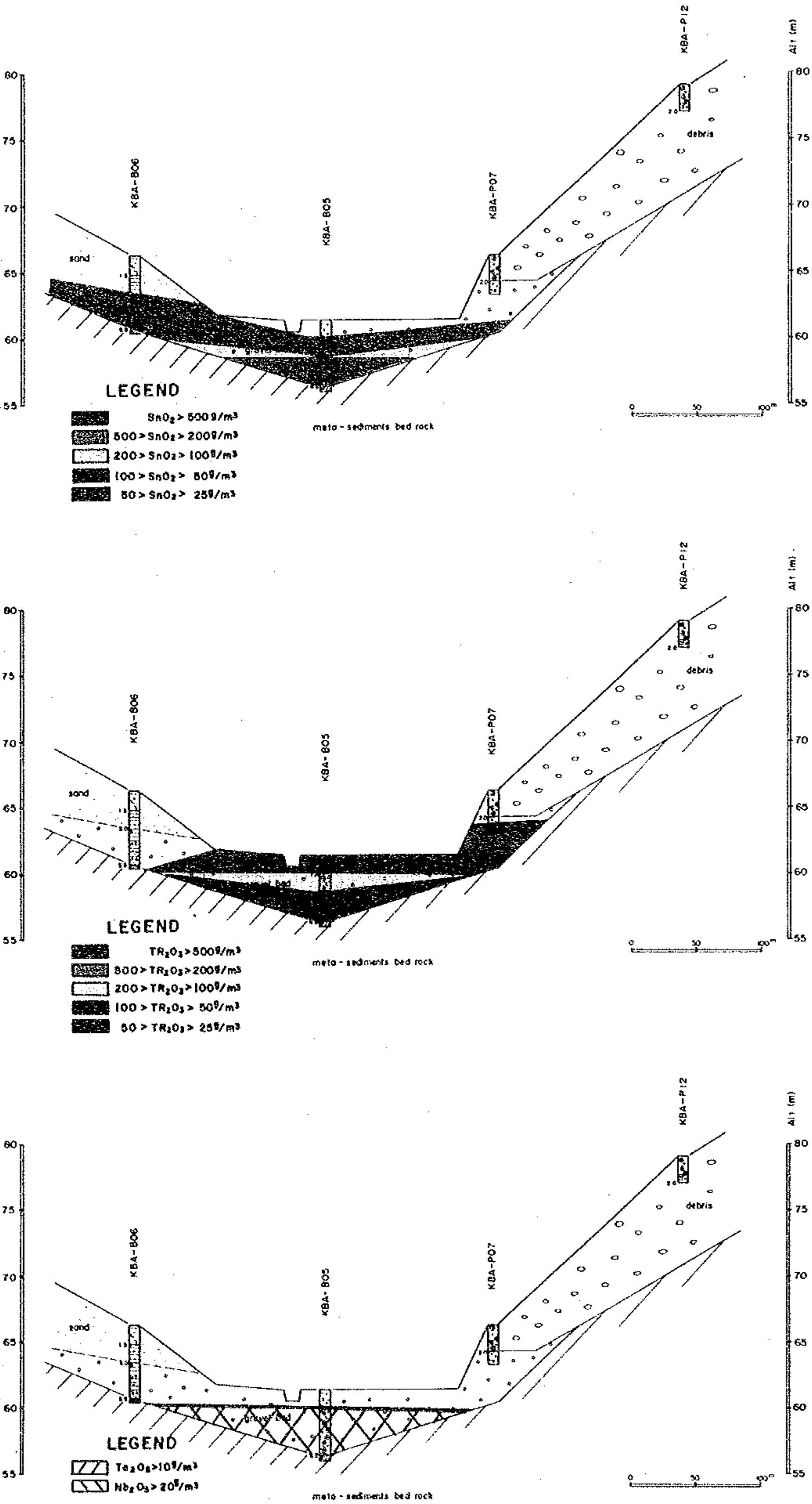


Fig. 37 Geological and Geochemical Profile in Central Geochemical Anomaly Area

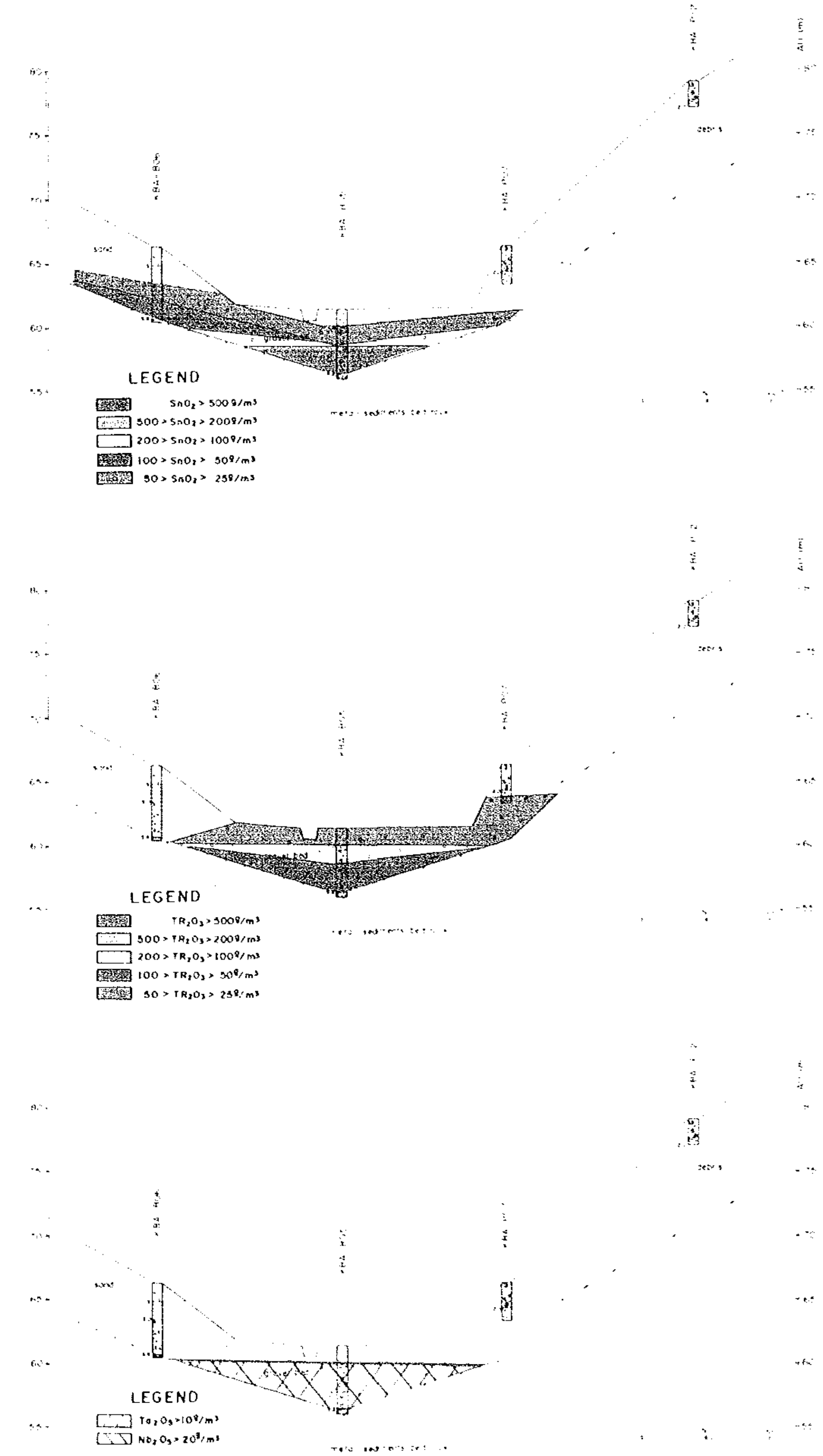


Fig. 37 Geological and Geochemical Profile in Central Geochemical Anomaly Area

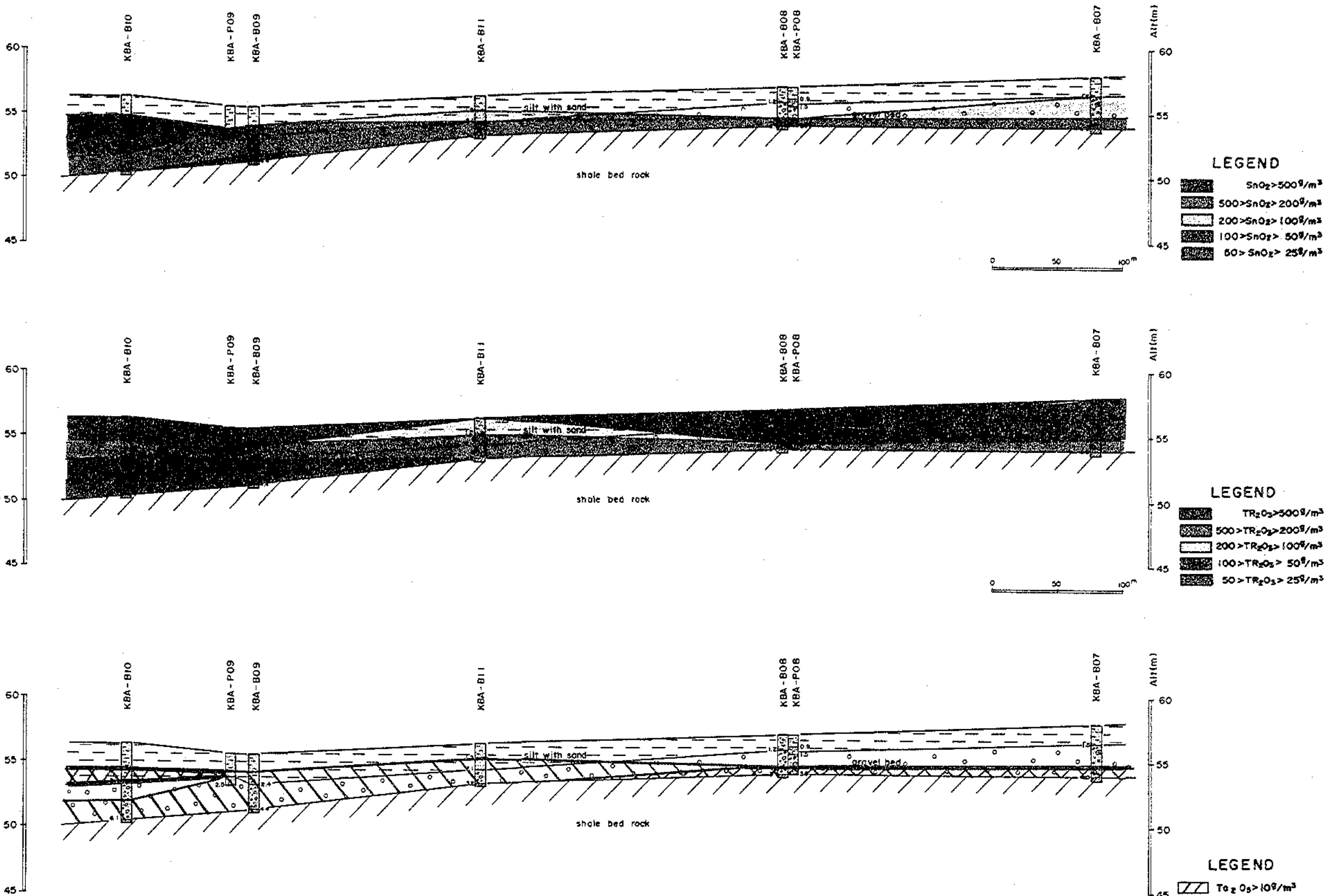


Fig. 38 Geological and Geochemical Profile in Southeastern Geochemical Anomaly Area

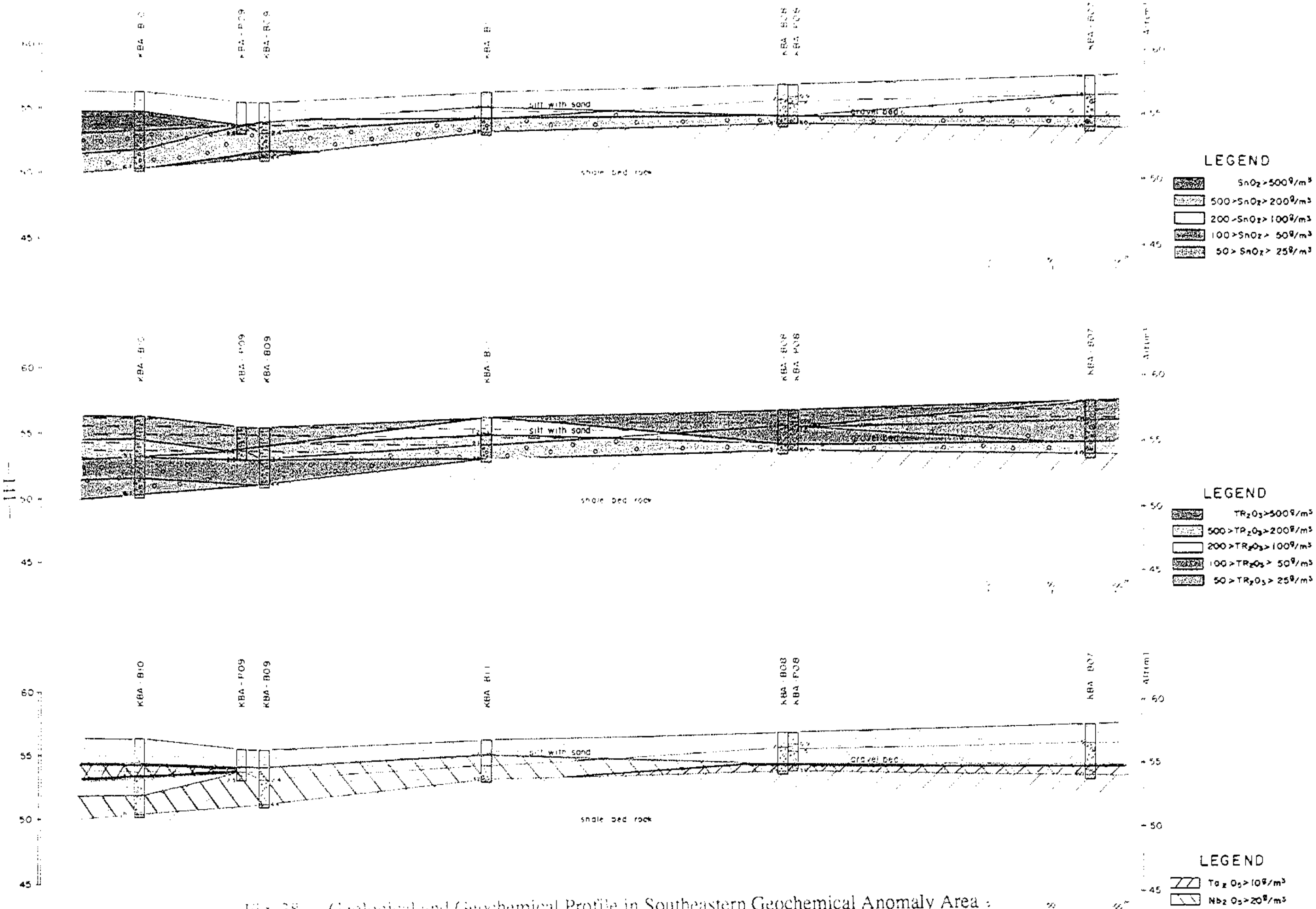


Fig. 38 Geological and Geochemical Profile in Southeastern Geochemical Anomaly Area

which contain secondary ores, are situated in two areas along the river. The eastern basin is underlain by a sandy silt layer in the upper part and a 4 to 6 meters thick clay layer in the lower part. The sand and gravel layer, only 1 meter thick, is seen in the lower part of KBA-B13. Tin is concentrated only in the sand and gravel layer, SnO_2 1,500 g/m^3 in grade, as shown in Figure 39.

The western basin is underlain by a 1 to 3 meters thick sands layer, a 0.7 to 3 meters thick silt mixed with sands layer, a 1.2 meters thick clay layer, and a 0.5 to 3 meters thick sand and gravel layer in the central to northern side, and a 1.5 meters thick sandy silt layer, a 2.5 meters thick sands layer, and a 0.5 meter thick sand and gravel layer in the southern side. No high concentration of rare earths, titanium, and zirconium is seen in the basin, however a high tin zone obliquely cut the bottom part of the layer, 2 to 3 meters in thickness, above the basement as shown in Figure 40. Concentration of tantalum and niobium in the basin is high together with tin.

5-3 Consideration

In A-1 area, relatively high grade tin deposits have been found in the river bed sediments which are distributed along Khlong Nam Khao and its tributaries at the southern part (Fig.41). The ore deposits are composed of five separated parts, and the total ore reserve is estimated to 780,000 m^3, 360 to 1,500 g/m^3 in tin. The secondary ore contains not only tin but also tantalum, niobium, rare earths, and titanium. It seems that the ore deposits are of economical, if the all elements are technically recoverable. The area is presently used for agriculture, therefore it is necessary to compare their economical preferability.

Table-5 Probable Ore Reserves in the A-1 Area

ZONE	North	Central	Southeast	Southwest-1	southwest-2
AREAS (m^2)	22,000	52,000	217,000	38,000	45,000
THICKNESS (m)	2.1	1.8	2.3	1.0	2.4
RESERVES (m^3)	46,200	93,600	499,000	38,000	108,000
AVERAGE ORE GRADE					
SnO_2 (g/m^3)	168.3	984.2	356.4	1,511.2	658.6
Ta_2O_5 (g/m^3)	7.9	11.2	11.3	20.7	9.0
Nb_2O_5 (g/m^3)	30.7	32.7	43.6	27.7	21.1
TR_2O_3 (g/m^3)	121.3	97.2	186.9	62.4	34.8
ThO_2 (g/m^3)	16.1	16.1	23.5	8.6	4.3
Zr_2O_3 (g/m^3)	19.2	15.3	33.1	17.4	15.1
TiO_2 (g/m^3)	1,038.6	589.4	1,448.1	385.1	197.9

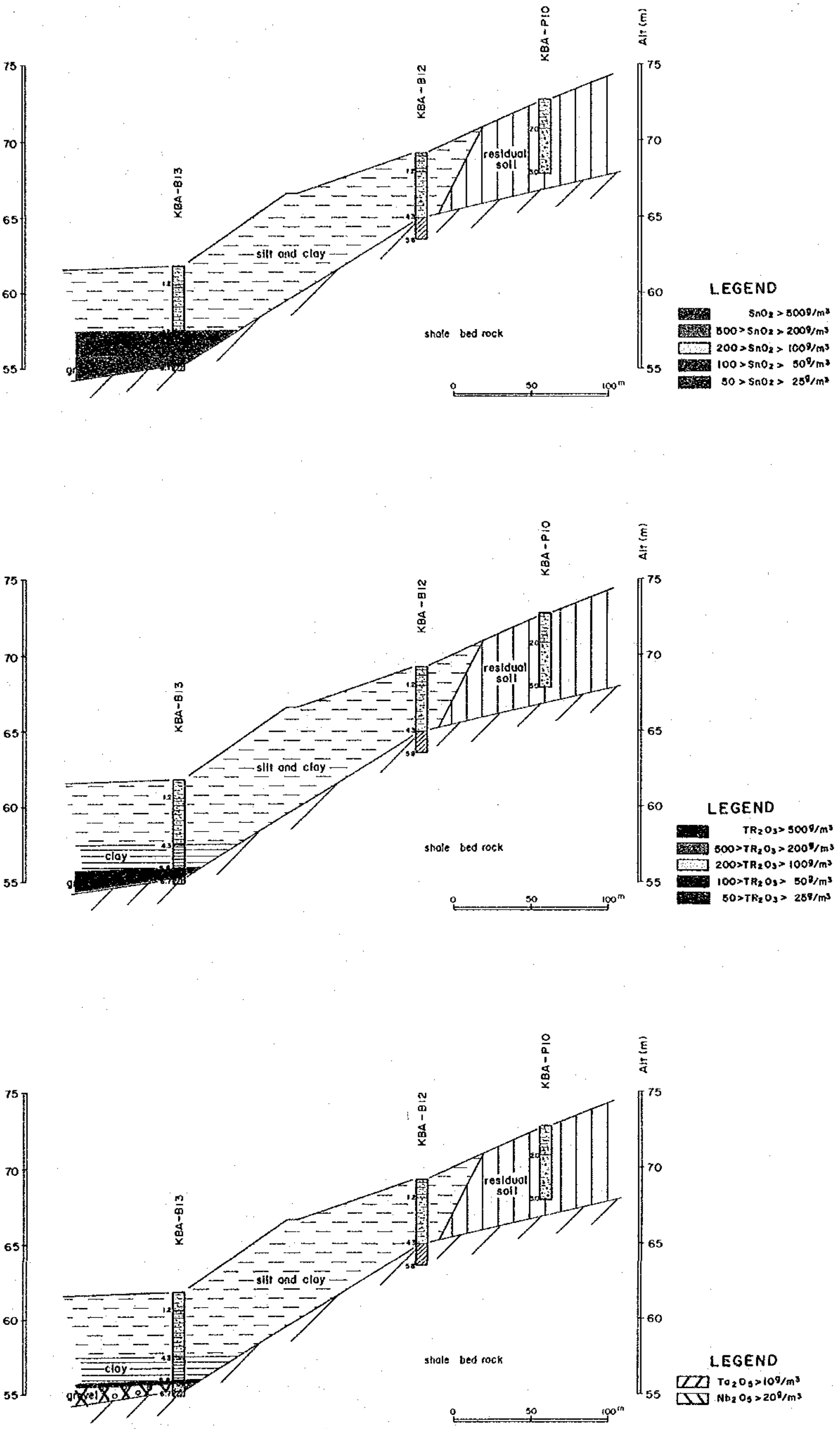
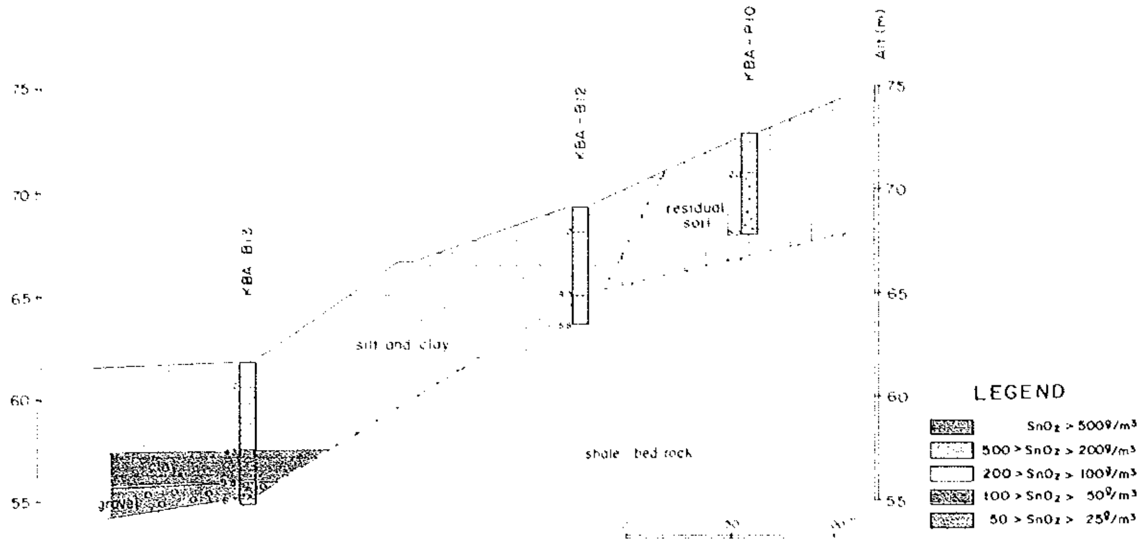
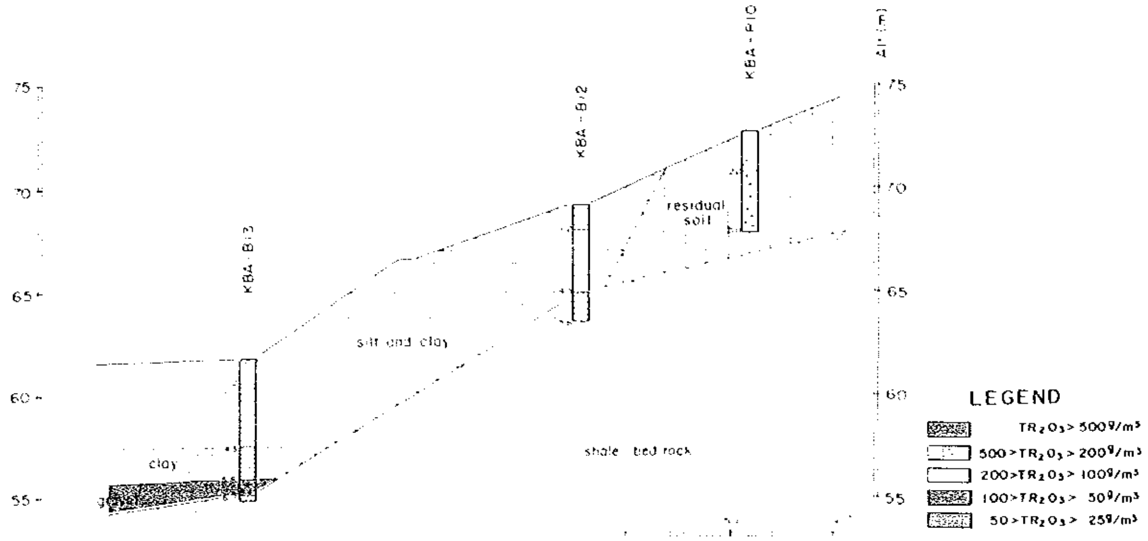


Fig. 39 Geological and Geochemical Profile in East Basin of Southwestern Geochemical Anomaly Area





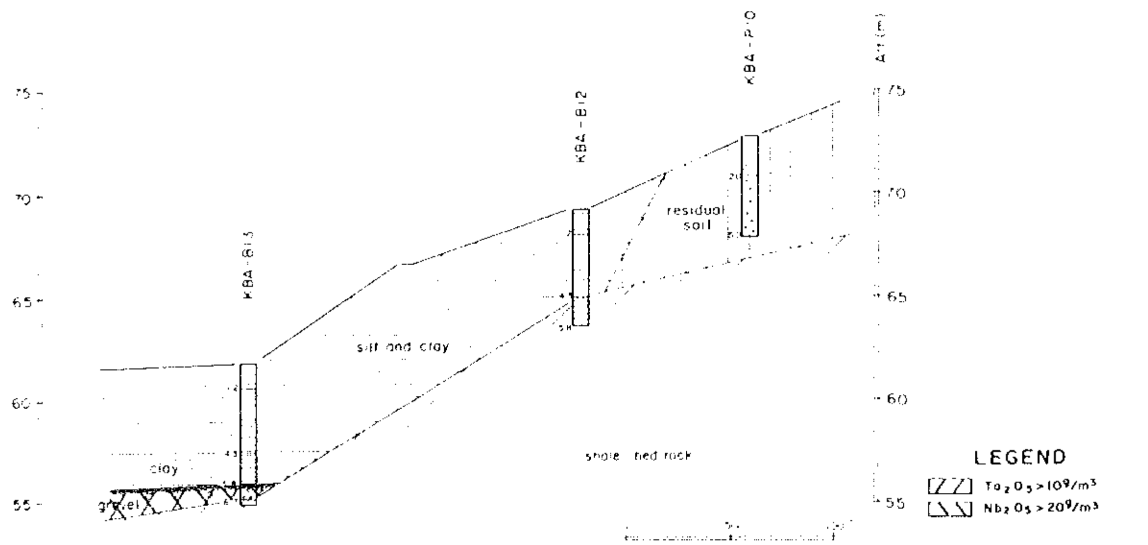


Fig. 39 Geological and Geochemical Profile in East Basin of Southwestern Geochemical Anomaly Area

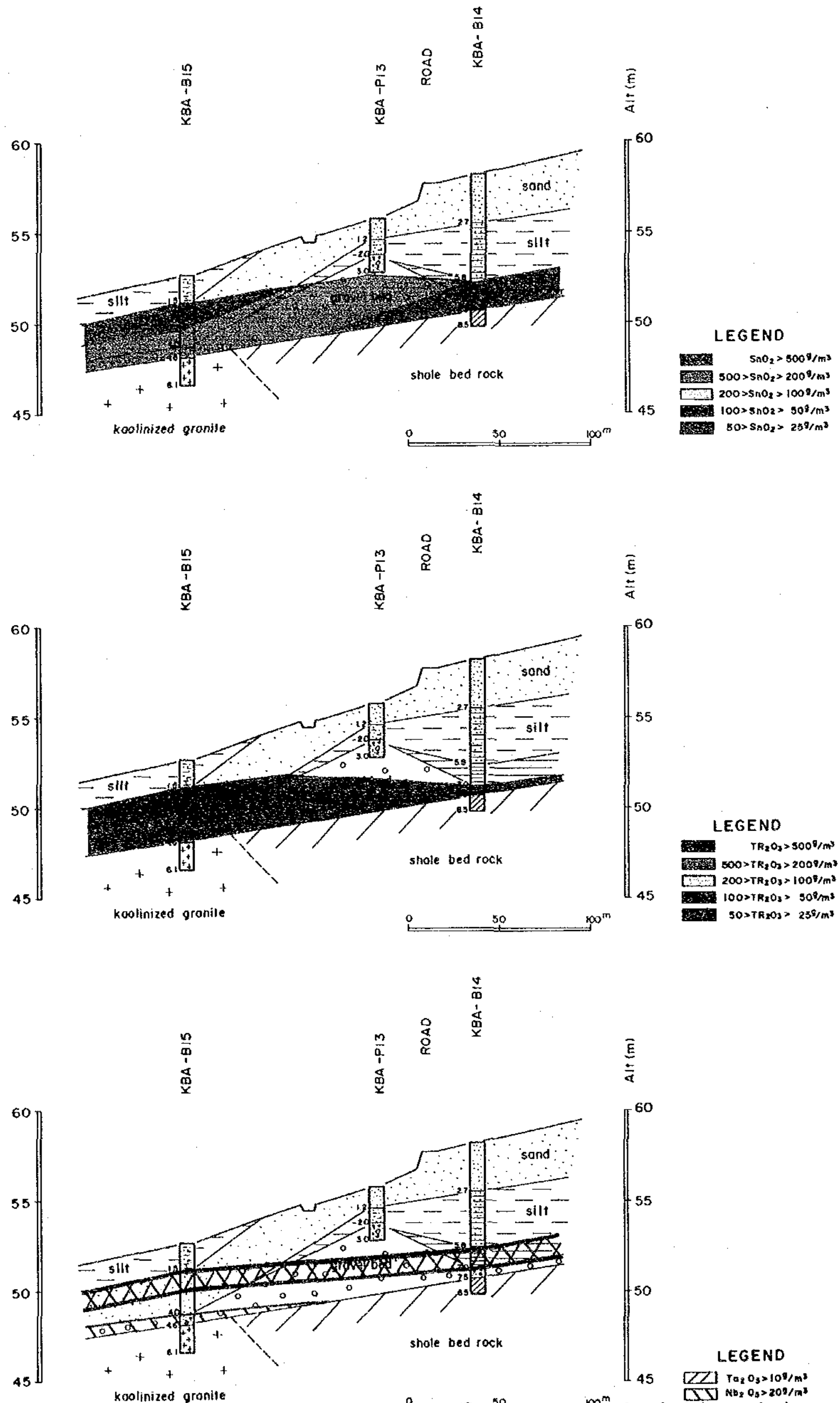


Fig. 40 Geological and Geochemical Profile in West Basin of Southwestern Geochemical Anomaly Area

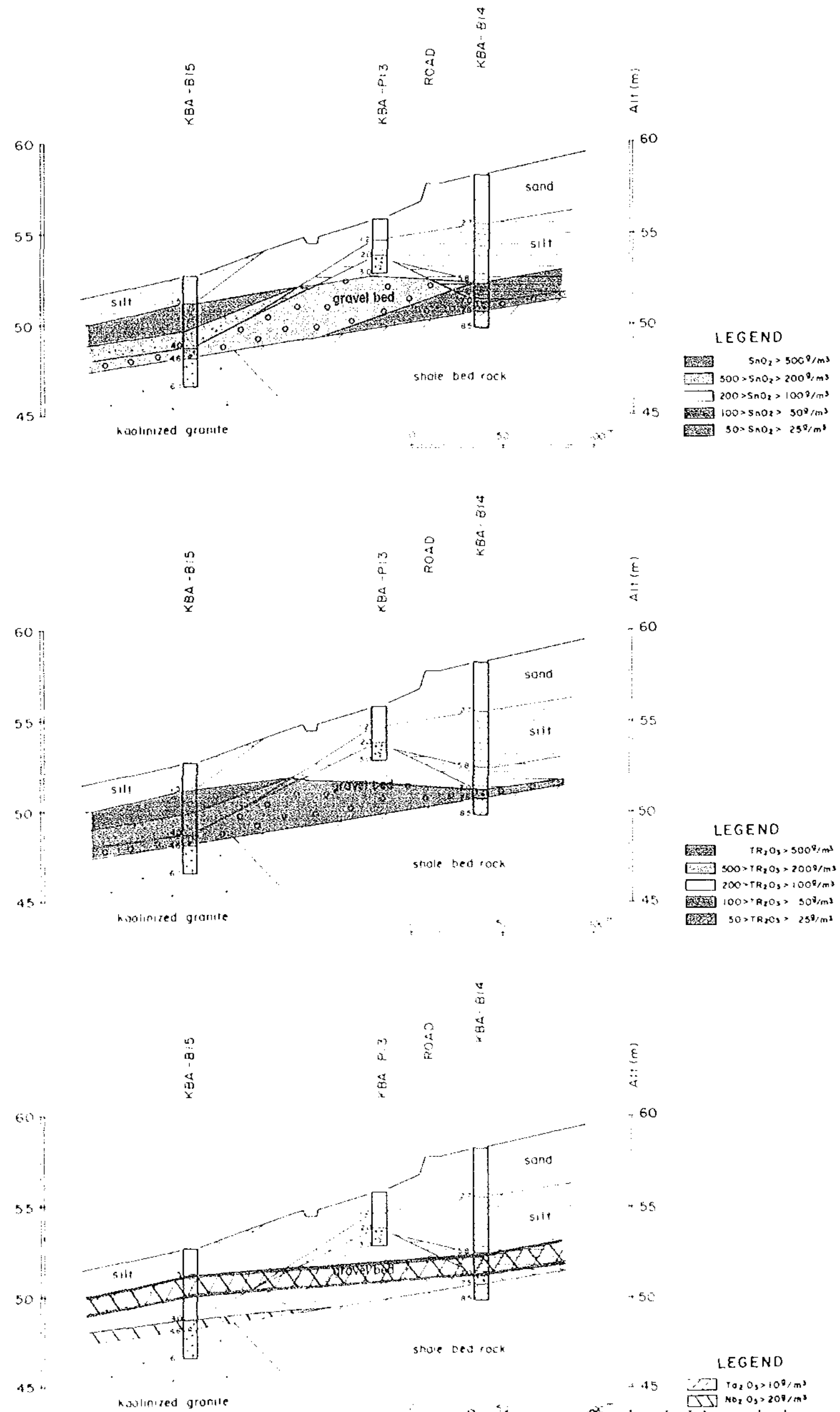


Fig. 40 Geological and Geochemical Profile in West Basin of Southwestern Geochemical Anomaly Area

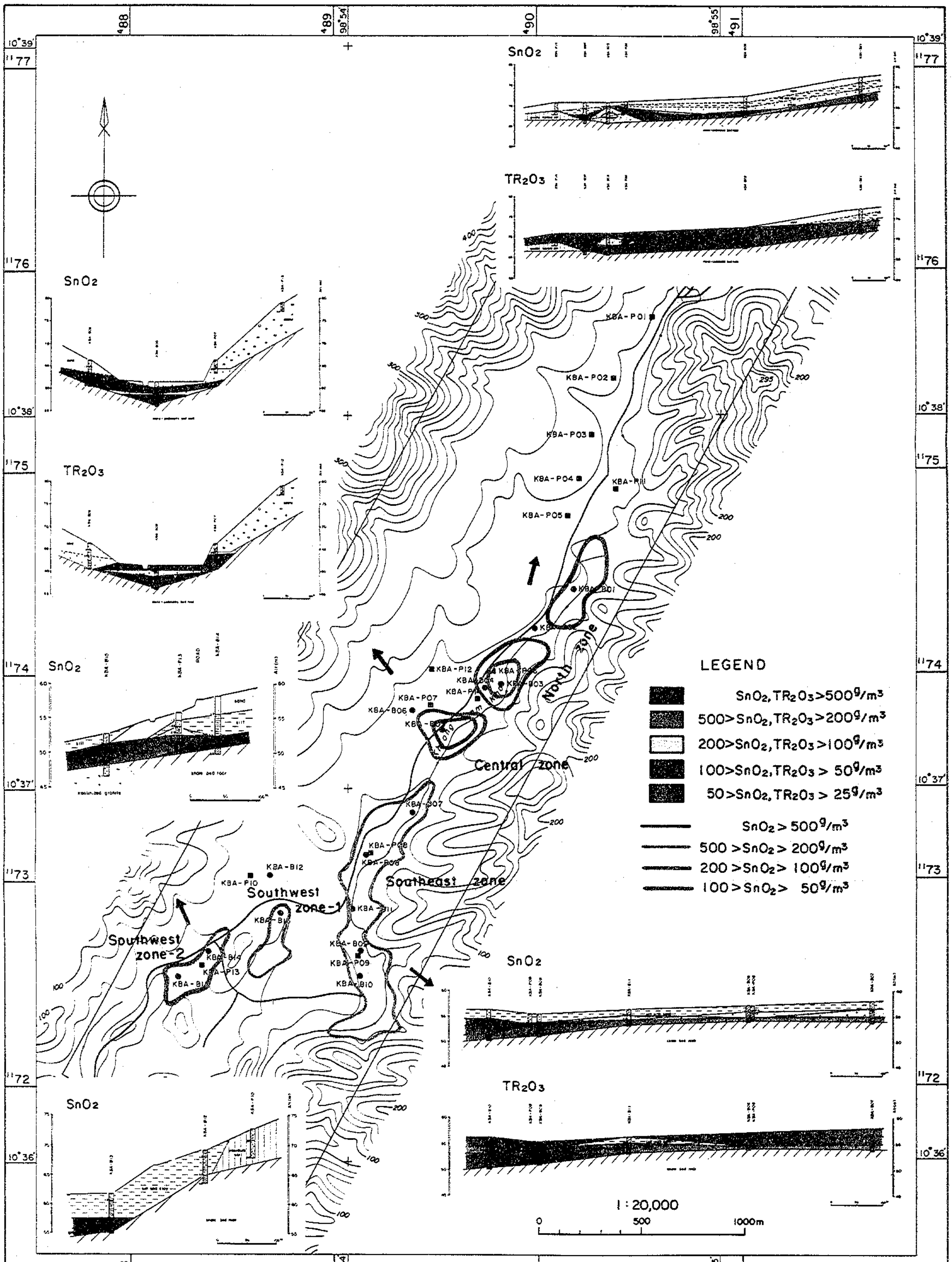


Fig. 41 Results of Pit and Drilling Survey in Area A-1

5-2 Area D-1, Drilling Survey

5-2-1 Selection of Location

The D-1 area is situated in the junction of the Khlong Kra Buri and Khlong La-Un, where is an alluvial swamp area covered by mangrove expanding about 2 kilometers width in between highway No.4 and the Mae Nam Kra Buri.

The second phase survey revealed that this area was in favorable geological environment and had high potential for secondary ores, even though no high soil geochemical anomaly was found.

The drilling survey has been conducted to confirm the shape of the sedimentary basin and to know its state of expected secondary ores in the bottom of the basin, using Banka Drill machine owned by DMR, Thailand.

Three survey lines tending northwest to southeast at the space of 144 meters, along the second phase survey base lines to cover the mangrove area. Two other lines perpendicular to the survey lines have been set at the off-shore area (Fig. 42). The sampling method is just same as that applied in the A-1 area. Total 16 drill holes have been completed in the area.

5-2-2 Results of Drilling Survey

No significant geochemical anomaly, except a small area of high rare earths content, has been found in the D-1 area in the second phase survey, because the area is extensively underlain by mangrove soil. However, high potential for secondary ores underneath mangrove soil was expected, because secondary ores are situated in the east side of the southern granite body and 10 kilometers south of the area.

The drilling survey results have revealed that the sediments in the basin increased its thickness in the boundary zone to the land area, and the base of the basin formed a flat plain at the depth of 10 to 14 meters. It seems that the topography is of abrasion or wave erosion platform by coastal erosion. This is much different from the underground structure presumed in the second phase survey, gently dipping toward the Mae Nam Kra Buri. The sand and gravel layer and sands layer overlaying the basement are 3.5 to 5.5 meters thick around KBD-03 and KBD-09. However no sand and gravel layer exists around KBD-08 and KBD-11. The sand and gravel layer is distributed in the steep cliff along the edge of the basin, accordingly it is presumed that the sediments deposited under the talus environment. The area around KBD-01 to KBD-07 and KBD-09 to KBD-10 was probably under the coarse grained fragment

D

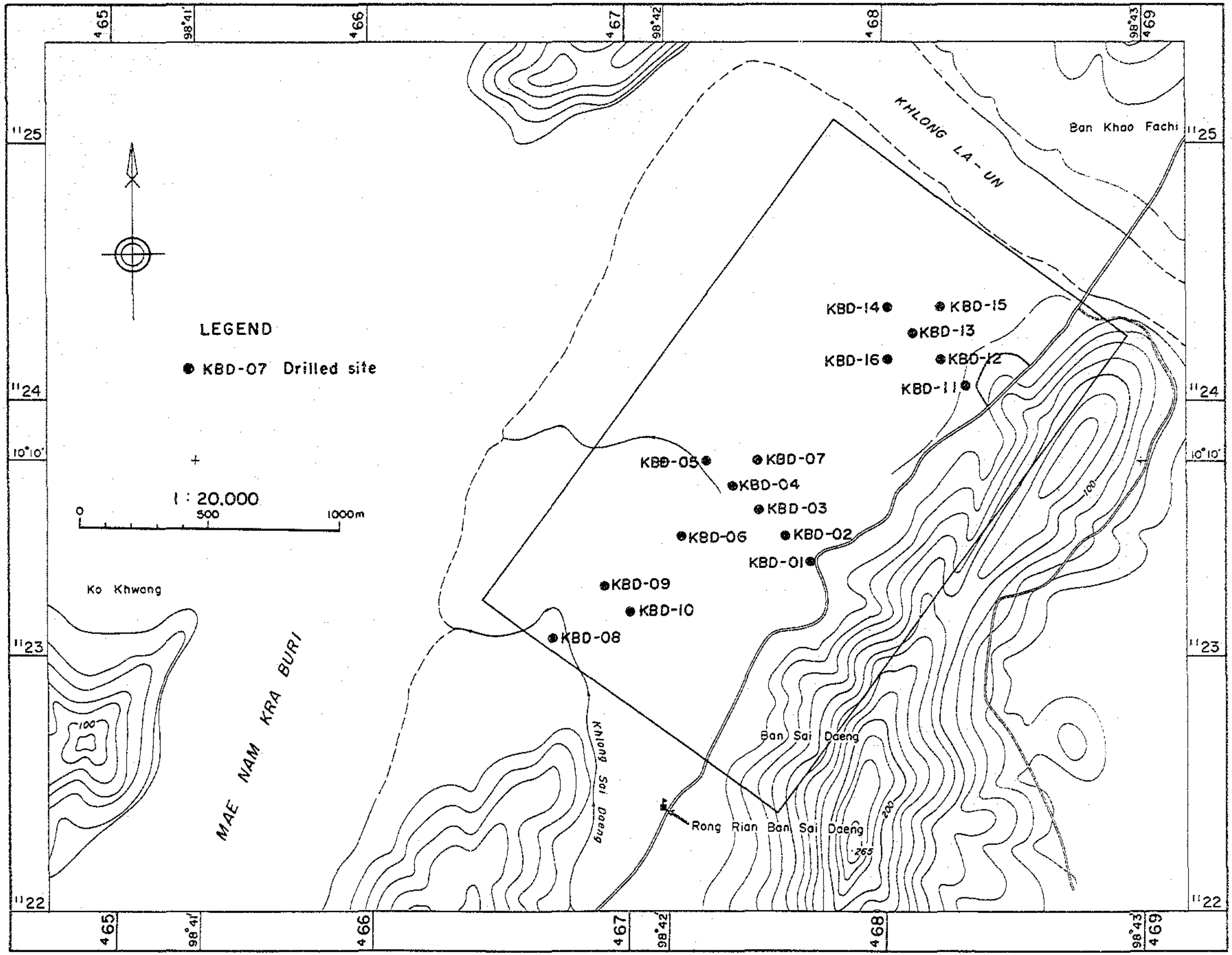


Fig. 42 Locality Map of Drilling Survey in Area D-1

sedimentation environment along an ancient river watershed judging from the surface topography. The sand and gravel layer and sands layer consist of felsic sands, granules, and pebbles containing granitic fragments, but fewer amounts of colored minerals (Fig.43).

The overlaying layer of the sand and gravel layer in the northeastern part and central to southeastern part of the D-1 area consist of gray to dark gray silt and clay containing much amounts of organic origin pyrite. It is presumed that the sediments deposited under the calm reductional environment. The silt and sands layers overlaying the sands layer in an area around KBD-03 and KBD-04 contain much amounts of oolitic siderite grains

This phase survey has revealed that the coarse grained sands layer distributed along the boundary between the basin and land area, which was revealed by the second phase survey, is limited on the surface. The sands layer has been probably transported by the present river system and deposited after the sedimentation of mangrove soil. In the second phase survey, the sand layer was designated as a geochemical anomaly zone, due to its high rare earths content reflecting its background geochemical character. The ore reserve, accordingly, was estimated based on an assumption that the sands layer extended underneath the mangrove soil. This assumption is, of cause, not correct, and the ore reserve estimated in the second year is worthless.

The assay results show that all elements are low in grade over the D-1 area, and it is judged that potential for ores is low. High content of rare earths and titanium is seen only in the lower parts of KBD-09 and KBD-10. This is in the sand and gravel layer deposited in the ancient river system along the Khlong Sai Deang (Fig. 44).

5-2-3 Consideration

It was difficult to predict the negative results for the sedimentary basin in the D-1 area before starting this phase survey. The major reason for that is the different prediction for the type of the basin and sediments. The fact that the sediments deposited on the abrasion platform, not on a gently dipping flat flour has been revealed by this phase survey. An interpretation for this is that the sediments probably were gently deposited accordance with sinking of the abrasion platform, and the sediments previously in existence, which probably contained useful minerals, were washed out when the platform was near the

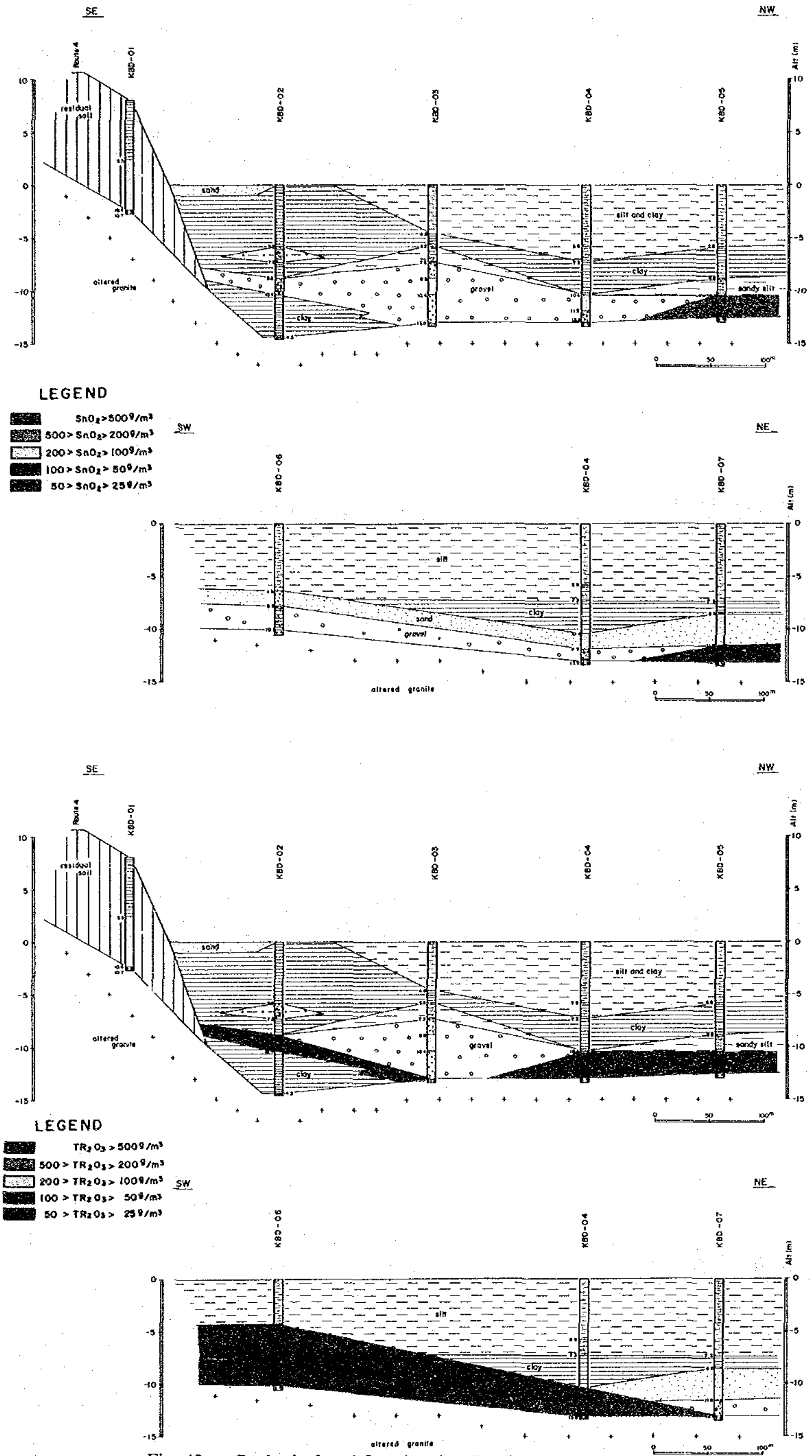


Fig. 43 Geological and Geochemical Profile in Area D-1

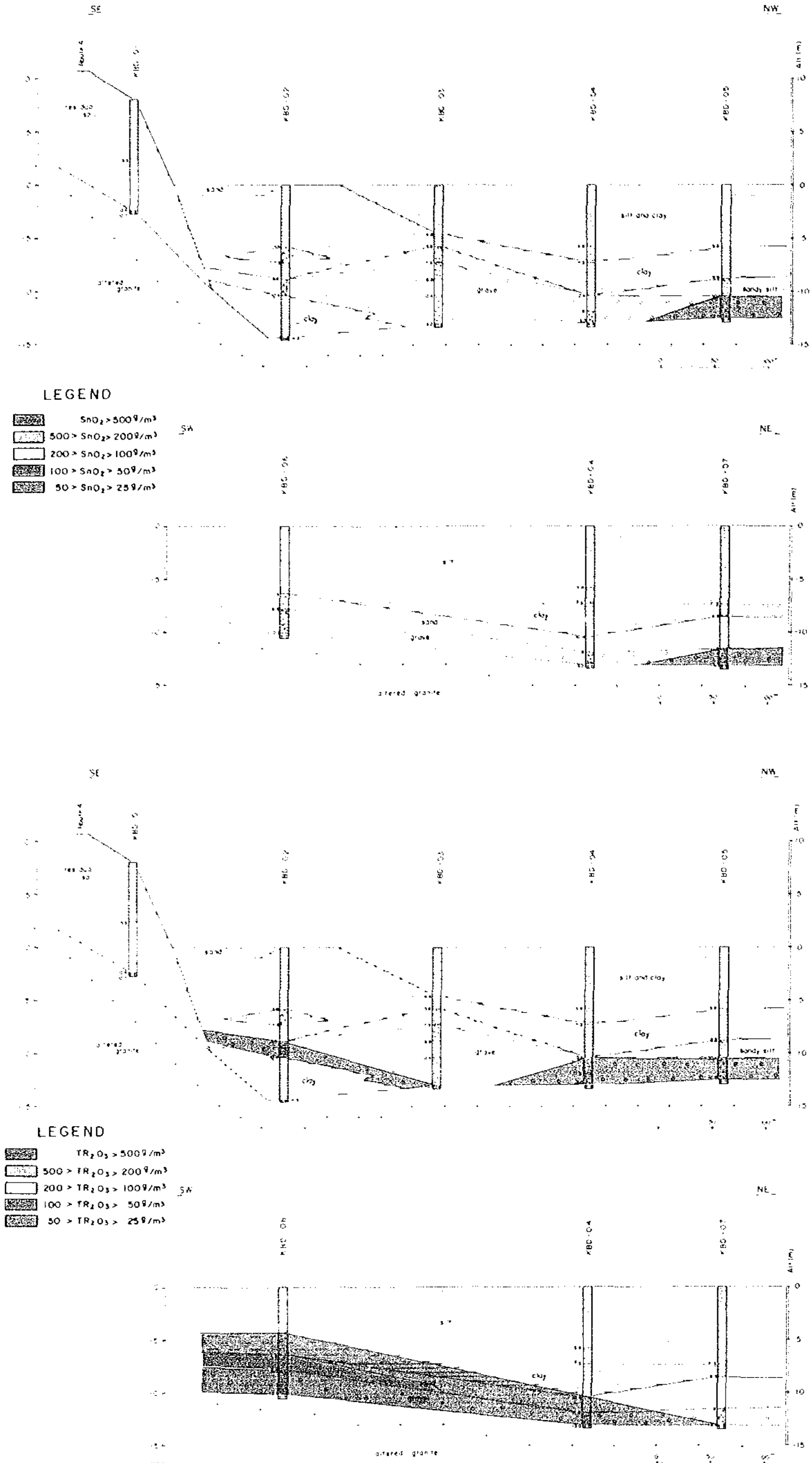


Fig. 43 Geological and Geochemical Profile in Area D-1

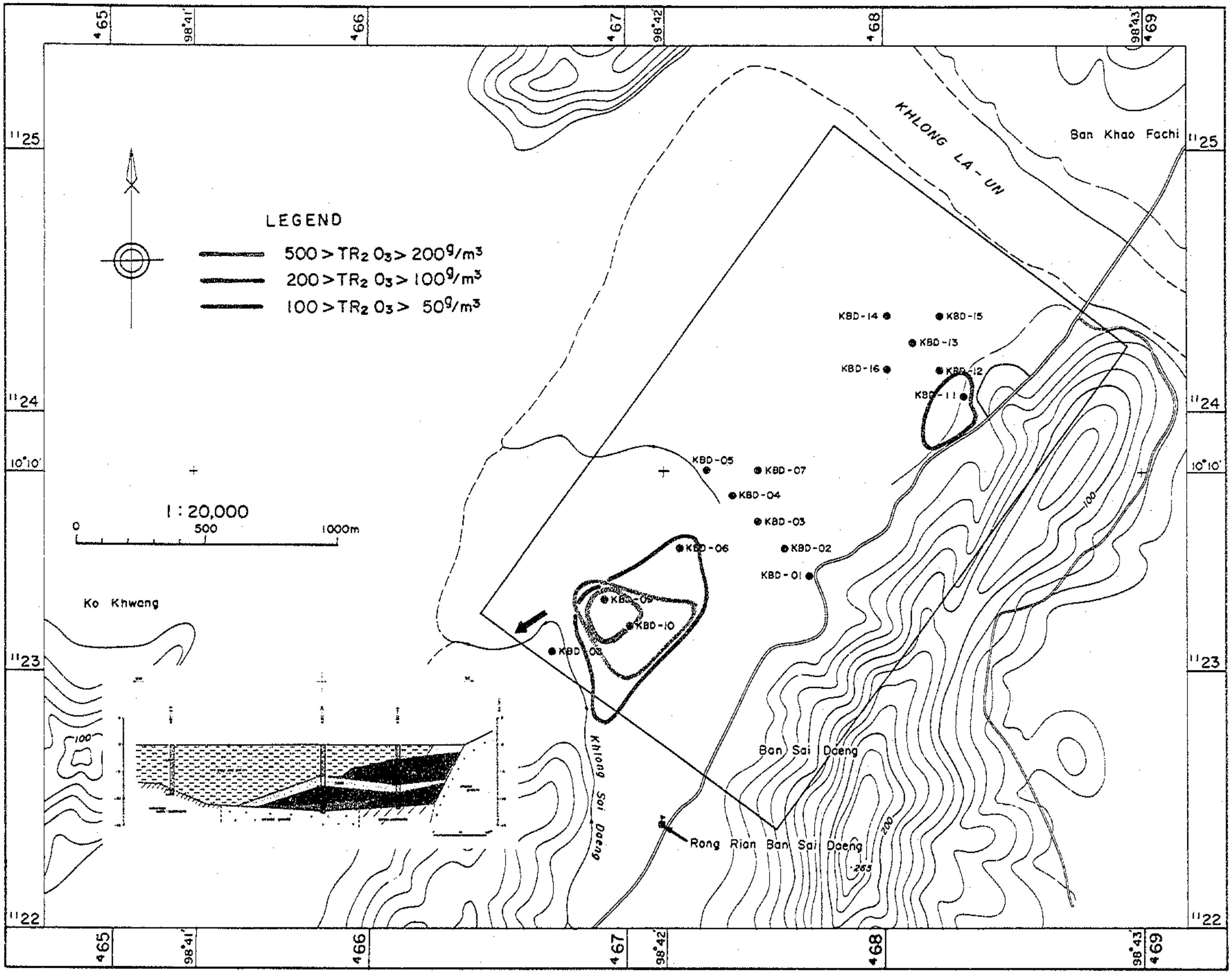


Fig. 44 Results of Drilling Survey in Area D-1

water front.

Another possibility is that the granite situated to the east of the D-1 area originally does not contain tin in any reason, as well as rare earths. However, the past two phase geochemical survey results reveal that the granite is petrologically just same as other granites in the surveyed area, and of high potential for tin. Only one different point is that the granite in the D-1 area has been undergone silicification and pyritization, as seen in the northern end of the body along the Khlong La-Un. Many amounts of oolitic siderite grains in the overlaying layer of the sand and gravel layer also indicate some possibility of strong hydrothermal activity in the area in some time. It is possible that the hydrothermal activity leached the granite, and took out useful minerals from the granite.

It is necessary to conduct further detailed researches to solve this problem.

Some parts concentrated by rare earth elements have been found in the D-1 area, however their reserves and grades are not enough for economical mining, in addition to that the ores are situated in an environmental conservation area.

Chapter 6 Consideration on the Mineralization in the Kra Buri Area

In the survey in the first year, the geochemical anomaly of rare earth elements in this survey area was recognized to exist in and around granite, and dead pits used for mining secondary tin deposits were found to be distributed closely to the granite body. These geochemical anomaly values are closely related to granite. These matters indicate that heavy minerals contained in granite, such as tin ore, monazite and xenotime have been brought and accumulated in alluviums such as talus sediments and river-bed sediments in the process of granite's weathering, cracking and breakage.

In the survey in the second year, geochemical exploration was made in the promising areas selected in the survey in the first year, where geochemical anomaly values concentrated on, for the purpose of investiging sedimentary basins to find secondary ore deposits as well as understanding the possibility that primary ore deposits in some places and adsorption rare earth deposits would exist.

The possibility that mineral deposits would exist was studied by giving consideration to the relationship between granite and mineral deposits in the survey area according to the results of the surveys in the first and second years.

In Area A-2 and Area D-1, there are soil samples, which were collected in the granite bodies. These soil samples show a high concentration of micro components in harmony with those contained in granite. The distribution of micro components differ based on granite facies. In Area A-2, the concentration of tin and tungsten in clayey granite, which is distributed on the northern side and on the southern side of the rock body, is high while the concentration of rare earth is low. In the case of solid granite facies containing crystals of potassium feldspar, this is the other way around. The concentration of elements in samples is almost equivalent to the values of micro components contained in granite as base rock. There are soil samples with a higher concentration, which were collected on slopes and low land along valleys. Therefore, minerals, which contain these elements, are imagined to be highly distributed in topographically-lower places.

In Area D-1, soil samples, which were collected in the granite distribution zone, show a high concentration of minerals in the same manner as Area A-2. There are also changes in lithofacies such as siliceous sinter and clayey granite in the granite body in the southern part of Area D-2. The concentration of micro components in samples on granite facies differs based on the facies. In the distribution zones of siliceous granite, tin and tungsten are added while rare earth elements are decreasing.

The concentration of tin and rare earth elements in clayey granite is lower than that in main facies, but the concentration of rare earth elements is higher than that of tin in contrast to Area A-2.

Fig. 45 shows the relationship between tin, minor component in granite, and rare earth elements. As shown in this figure, there is a negative correlation between both ones contained in granite. As shown in the relationship between the index of differentiation and micro components (Fig.46), tin focuses on being distributed in differentiated lithofacies while the concentration of rare earth is high in non-differentiated lithofacies. This means that tin and rare earth have stabilized in granite in the different stages of granite's differentiation. Rare earth becomes crystallized as rare earth minerals such as monazite and xenotime in the early stages of granite's differentiation while tin focuses on being distributed and stabilize as tin ore in more differentiated granite such as muscovite granite, tourmaline granite, greisen, pegmatite deposits and quarts deposits. In Area A-2, the concentration of minerals in soil samples in the distribution zone of clayey granite (original rock:muscovite granite) regarded as topgraphically-upper lithofacies is therefore high while the concentration of rare earth is high in main solid facies. As shown in geochemical exploration in Area A-1, a lot of tin is typically contained in river-bed sediments and talus consisting mainly of clay including debris of quarts deposits while rare earth elements exist together with river-bed sediments and talus sediments consisting of granite sand and debris. According to the results of the survey in the first year, only the geochemical anomaly of tin and tungsten is recognized in valley sand in the vicinity of the central granite body on its eastern side, where quarts deposits are developed in horfels sedimentary rock while the anomaly of tin is recognized to some extent in the river, where granite is exposed on the western side of the rock body and the geochemical anomaly of rare earth elements is more recognized to be stronger.

Fig. 47 shows the generation models of tin ore and rare earth minerals as well as secondary ore deposits in the Kra Buri area according to the above-mentioned matters. In granite, which has intruded into sedimentary rock, rare earth minerals stabilize in the main facies of the rock body early in the process of differentiation and stabilization, and a lot of tin and tungsten become concentrated in remained liquid

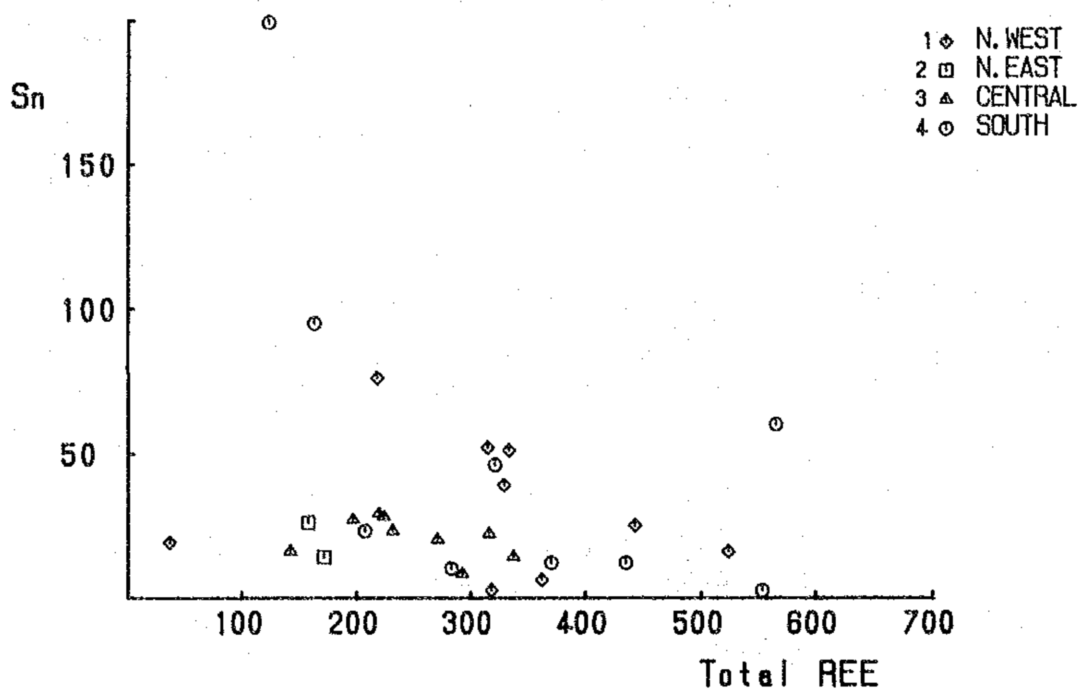


Fig. 45 Sn-Total REE Diagram of Granite

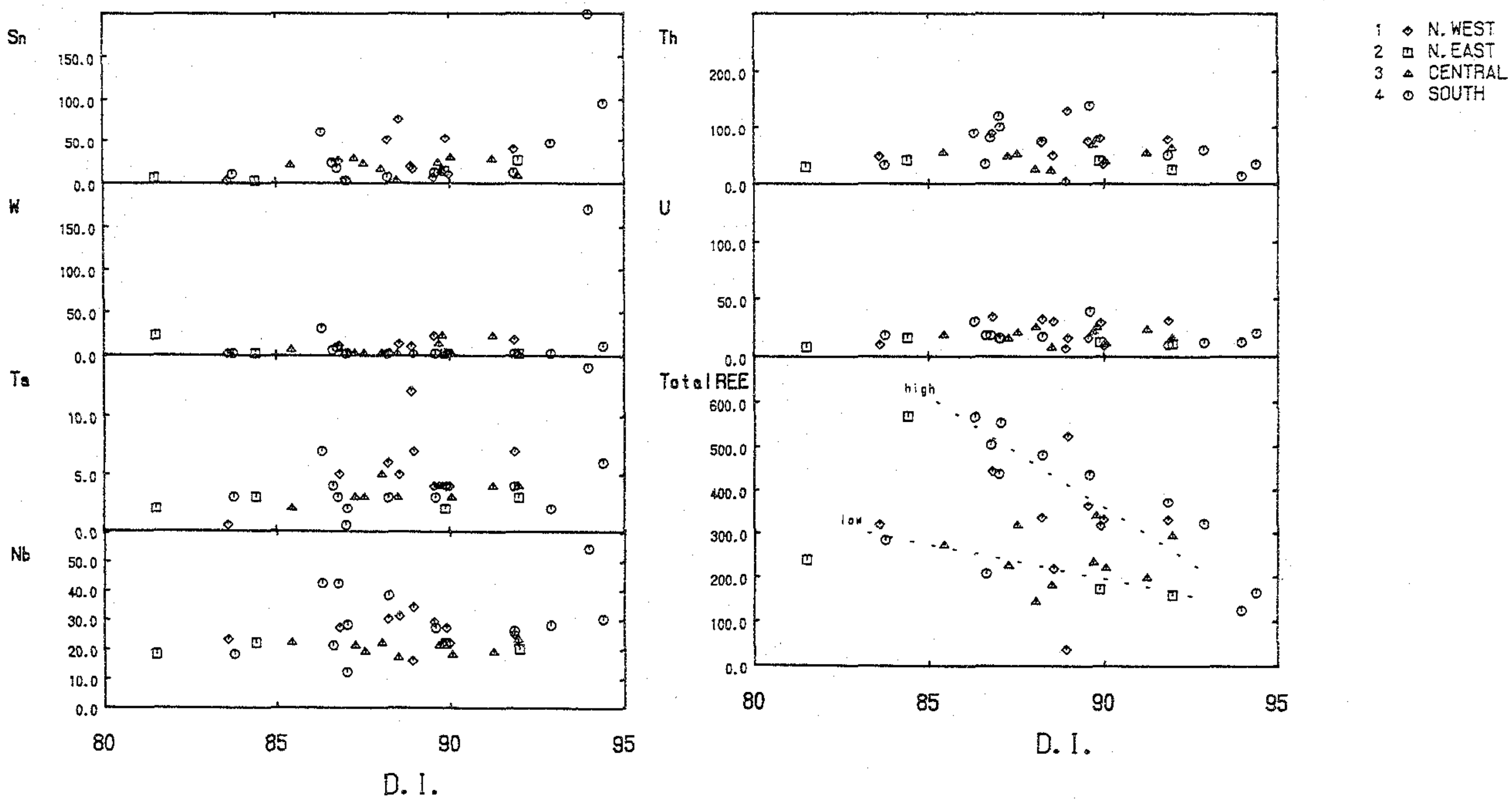


Fig. 46 Variation Diagrams of Minor Elements of Granite

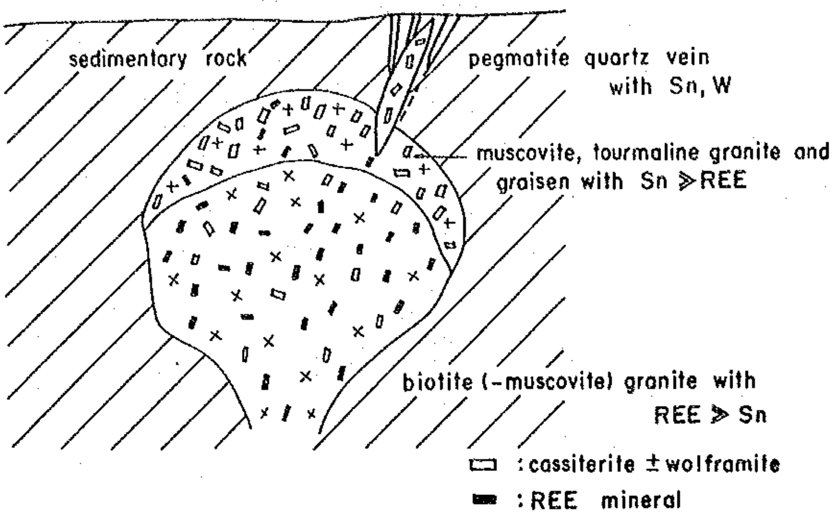
and crystallized and stabilized as tin ore and wolframite (or scheelite) in differentiated lithofacies (muscovite granite and tourmaline granite) in the upper part of the rock body, greisen as well as pegmatite deposits and quarts deposits, which derive from these matters and have intruded into the neighbor base rock. The geochemical anomaly of tin and tungsten coming from qarts deposits on the eastern side of the central rock body can be imagined to have been caused by qarts deposits, which were generated in the upper part of subsurface granite.

2) When the granite body rises and starts breaking off, pegmatite deposits and greisen existing in the upper part of the granite body and its differentiated facies first break off and tin ore and others, which are contained in these matters, then start accumulating in sedimentary basins lying around granite.

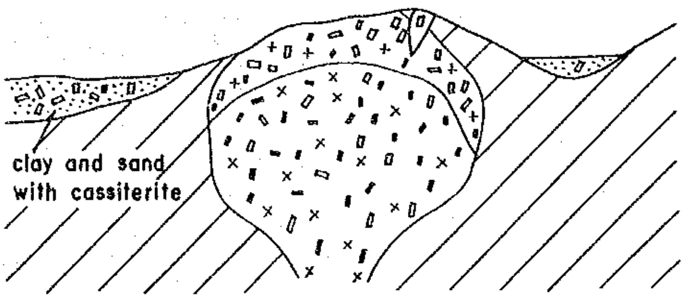
3) When the granite body further rises and breaks off, the main facies of the rock body are exposed and monazite and xenotime which are contained in the facies start accumulating in sedimentary basins. The sedimentary basin in the southern part of Area A-1 is applicable to the shifting process of 2) to 3) and the sedimentary basin in the northern part of the area is applicable to the sedimentary basins in 3). The results of drilling survey in third phase are also consistent with this idea.

It is obvious that that amount of minerals and their grades in the promising areas, which were calculated in the survey in the second year, largely differ based on the conditions and size of sedimentary basins, where secondary ore deposits have accumulated. As shown in Fig. 46, the content of tin and rare earth tends to be high in the northwestern granite body and the southern granite body, which are supply sources for A-1 and D-1, where a certain amount of minerals could be expected in the survey in the second year while the content of them tends to be relatively low in the northeastern guaranty body and the central granite body. According to geochemical exploration of valley sand in the survey in the first year, the anomaly of tin is strong and the anomaly of rare earth is not recognized on the eastern side of the southern rock body, the anomaly of tin is weak and the anomaly of rare earth is recognized to be strong on the northwestern side of the rock body, and the anomaly of both matters is recognized to be strong on the northwestern side of the rock body. In harmony with this matter, samples of granite, which were collected in the same areas, have much tin and less rare earth on the eastern side the rock body, samples have less tin and much rare earth on the northwestern side of the rock body, and samples have the average values between both of them on the southwestern side of the rock body. In the central rock body, which is

1) Intrusion and differentiation of granite



2) Erosion of upper level



3) Erosion of deeper level

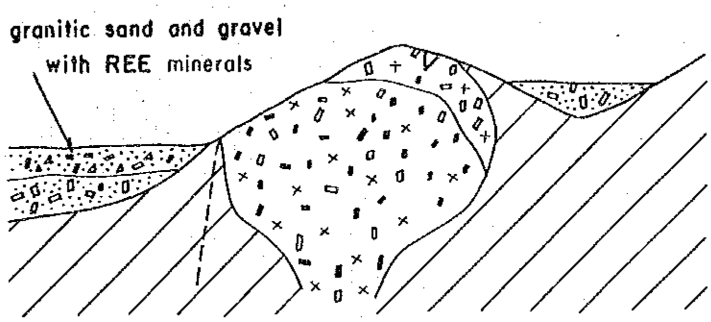


Fig. 47 Schematic Profile Relating Mineralization of Cassiterite and Rare Earth Elaments

divided into three rock bodies, the content of tin in the northern and middle rock bodies is lower than that in the southern one. In harmony with this matter, in Area B-3 next to the souther rock body, the grades of secondary ore deposits and the concentration of heavy minerals in samples are higher than those in Area B-1 and Area B-2.

As mentioned above, the existence of secondary ore deposits is largely dependent on the amount of micro components of granite as supply sources. As shown in Fig. 46, when the possibility that secondary tin deposits exist around granite is high, the content of tin is 25ppm or above. When the possibility that secondary rare earth mineral deposits exist is high, the content of rare earth is largely dependent on the degree of granite's differentiation, but can be estimated at about 300ppm or above.

PART III CONCLUSION AND RECOMMENDATION

Capter 1 Conclusion

In this Survey, regional geological survey and geochemical prospecting stream sediment, panned sample (heavy mineral) and soil samples were mede in the first phase, detailed geological survey and geochemical prospecting by soil sample, and geological survey by pit and drilling survey in the third phase. In this course, the scopes of the surveys were narrowed down to more promising area, and the following conclusion was formed.

(1) Through the lithostratigraphic classification of various rocks in the whole Survey Area, the stratigraphy has been established. Four Cretaceous granite masses was intruded into sedimentary rocks regulated by geological stracture.

The granites belong to the S-type, ilmenite series granite, and classified into the tin-granite based on their principal chemical components and tin contents.

(2) There are old secondary ore deposits of tin around four granite masses. Geochemical anomalies by all methods are distributed in Quaternary deposits around granite masses. Placer deposits of tin in alluvial basins and the possibility of primary deposits and adsorption-type rare earth deposits were expected.

(3) As the results of the surveys of the first phase and second phase, the two areas of A-1 and D-1 were picked out, and pit and drilling survey were carried out in these areas.

These survey have lead to the following conclusion.

Area A-1

(i) Potential for secondary ores in talus weathering residual deposits and stream sediments has been expected in the Area A-1. The survey results have revealed that potential for secondary ores in stream sediments was high in this area.

(ii) The areas evaluated as of high potential for secondary ores in talus weathering residual deposits based on the second phase survey results have been surveyed, and the assay results show that the grades of ores are one fifties to one thousands less than those in the second phase results. The differences between those are due to the different sample treatment methods. Actual mining grades would be close to this phase results.

(iii) Tin concentrated zones in secondary ores are in the lower parts, and rare earths concentrated zones tend to situate above the tin zones. It possibly shows that timing of supply for tin and rare earths in the sedimentary basin are different.

(iv) Content of rare earths is correlate to that of tritium, zirconium, titanium, niobium, and tantalum. The sedimentary basins along the Khlong Nam Khao contain much tantalum and niobium.

(v) Five potential zones for secondary ores are located in the A-1 area. The total probable ore reserves of the three zones along Khlong Nam Khao are 639,000 m^3, and the grades are as follows.

SnO_2	; 500 g/m^3
Ta_2O_5	; 10 g/m^3
Nb_2O_5	; 36 g/m^3
TR_2O_3	; 135 g/m^3
ThO_2	; 18 g/m^3
Zr_2O_3	; 23 g/m^3
TiO_2	; 1025 g/m^3

The total probable ore reserves of the two zones in the western side are 146,000 m^3, and the grades are as follows.

SnO_2	; 1000 g/m^3
Ta_2O_5	; 15 g/m^3
Nb_2O_5	; 24 g/m^3
TR_2O_3	; 50 g/m^3
ThO_2	; 6 g/m^3
Zr_2O_3	; 16 g/m^3
TiO_2	; 290 g/m^3

Area D-1

(i) The Area D-1 is dominantly underlain by mangrove soil, however preferable sedimentary basins for secondary ores were expected underneath the mangrove soil in the area. The survey results reveal that no significant sand and gravel layer exists in the area, and fewer amounts of useful minerals are contained in the sediments.

(ii) Major parts of the sediments, except some areas around ancient river systems, in the area have deposited under the quiet reductional environment, and contain little amounts of coarse heavy minerals.

(5) As the horizontal and vertical distribution of geochemical anomalies in sedimentary basin, it is revealed that the source of tin and rare earth minerals may be diffirent in granitic rocks.

Chapter 2 Recommendation for Future Works

The secondary ores confirmed in the A-1 area show significantly high contents of tin, accompanied by tantalum, niobium, rare earths, titanium, and zirconium. Even though the scale of the ore deposits is small, however, it is evaluated that the ores are of economical. The separation of drill holes was too large precisely to evaluate the ores. Therefore it is recommended that further detailed surveys are performed before the final decision for development. Furthermore, it should be reminded that the area is utilizing for agriculture, and economical compensation will be required for development of mining. Total economical tradeoff consideration is necessary.

Through the all programs, secondary ores containing not only tin but also rare earths have been the main target because of low tin market price. Speaking of tin, the old mining site in the watershed of the Khlong Kum, southern Kra Buri area, has the highest potential, and the upper stream area of the Khlong Lam Leang has high potential for primary ores. It is recommended further exploration activities to evaluate ore deposits in this area.

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