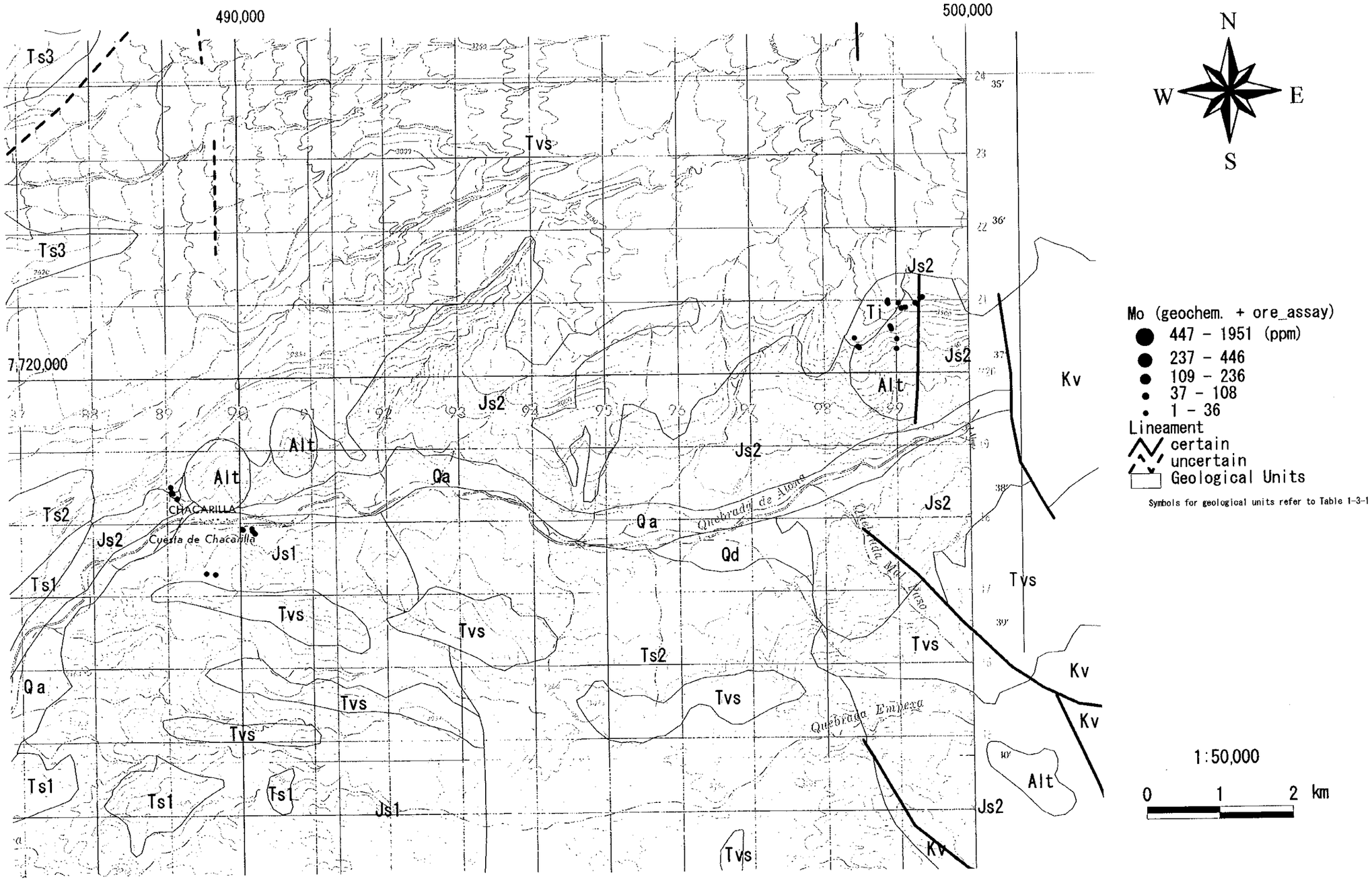


Fig. 2-1-30 (6) Geochemical Anomaly Map in the Chacarilla Area (Mo)

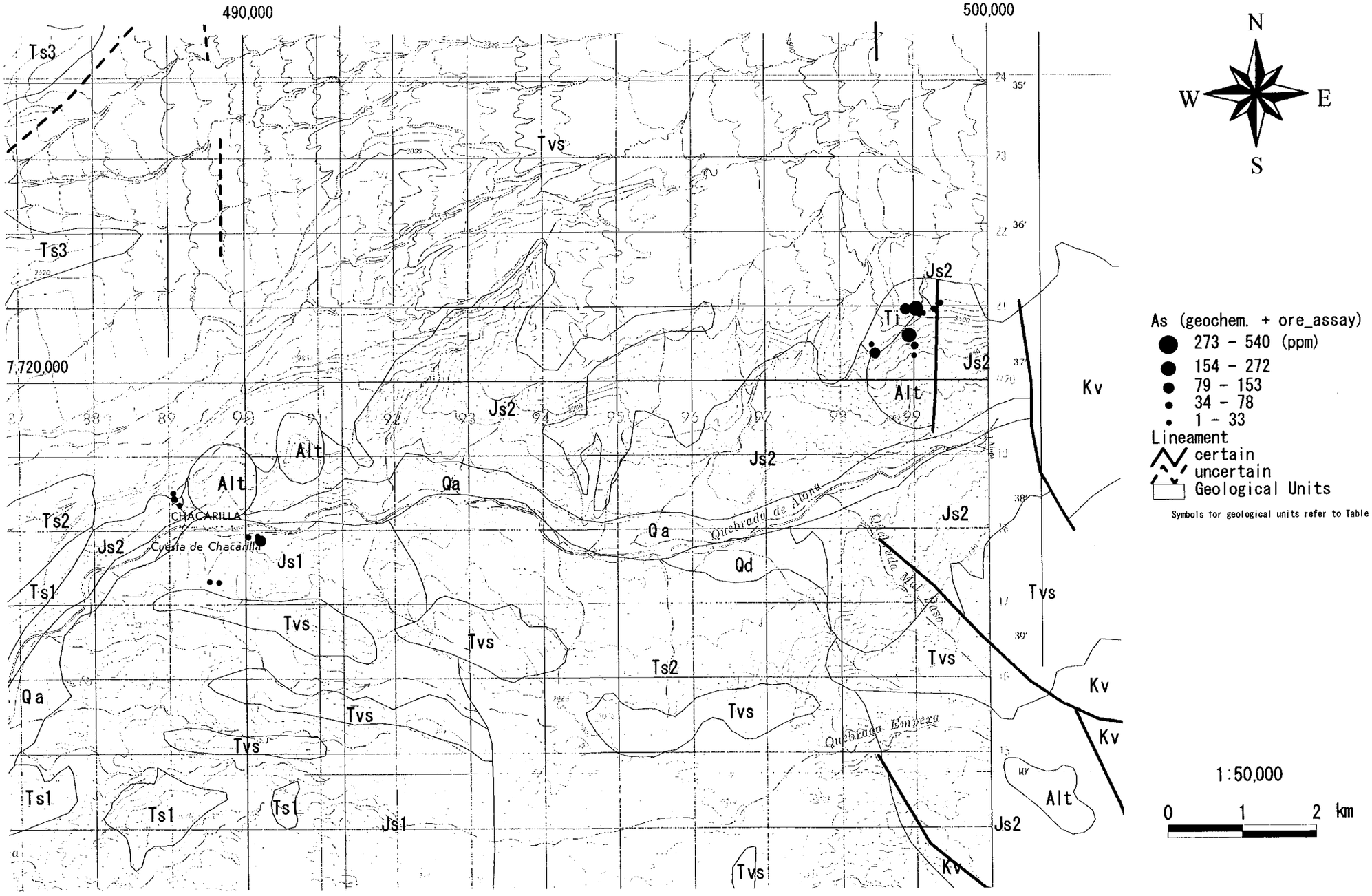


Fig. 2-1-30 (7) Geochemical Anomaly Map in the Chacarilla Area (As)

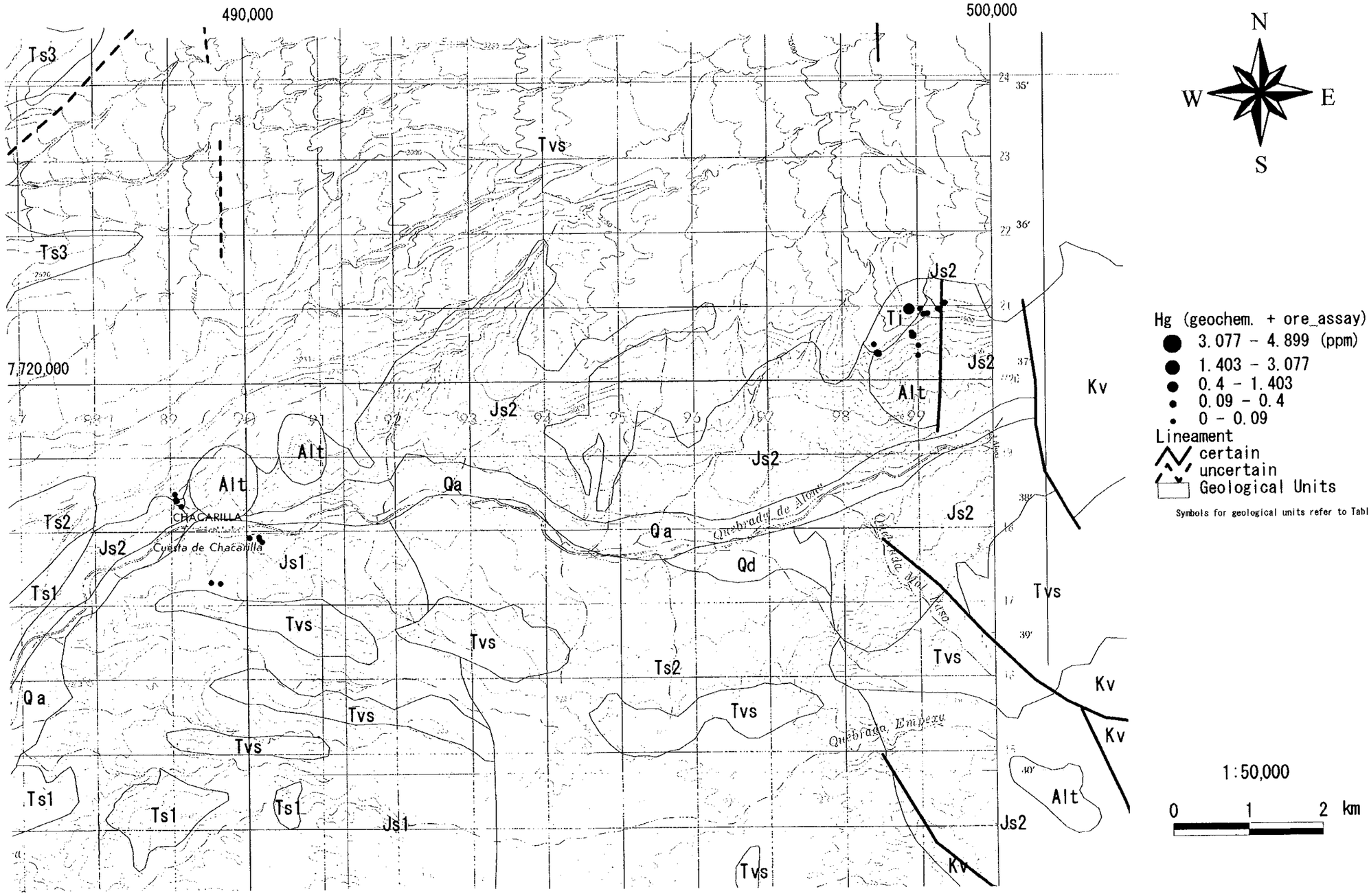


Fig. 2-1-30 (8) Geochemical Anomaly Map in the Chacarilla Area (Hg)

These intrusive rocks are diorite and granodiorite. Jurassic and Cretaceous Systems, and the intrusive bodies are overlain unconformably by Upper Tertiary System.

The Upper Tertiary System is composed of Miocene・Pliocene rhyolitic~basaltic lava・pyroclastics, ignimbrite, and intercalation of terrigenous sediments.

Quaternary System is composed of river deposits, lacustrine deposits, eolian deposits, colluvium, mudflow deposits, alluvium, and talus deposits.

Alteration zones were extracted on TM images at two localities in this area, one in the eastern part and the other in the western part.

The alteration zone in the eastern part is developed in the diorite intrusive bodies and in the Middle-Upper Jurassic deposits and consists mainly of silicification with sericitization in the periphery. In the diorite bodies, oxidized zones consisting of limonite is developed and also some pyrite remnants are found. In the Jurassic System in the vicinity, weak dissemination of malachite is observed. Quartz veins are less developed in this alteration zone.

The alteration in the western part is developed in the granodiorite porphyry bodies and the Jurassic System in the vicinity and it consists of sericitization and silicification. Pyrite dissemination is common in this alteration zone and weak chalcopyrite dissemination is found in the granodiorite porphyry. In the Middle and Upper Jurassic System in the southern part, NE-trending silicified veins are developed and boxwork oxidization suggesting pyrite origin is found in the vicinity.

Notable rock geochemical anomaly is high Zn-As anomaly in the eastern alteration zone.

1-1-6 West Queen Elizabeth district

For this district, sampling sites are shown in Figure 2-1-31, geological map in Figure 2-1-32, schematic geological column in Figure 2-1-33, location of mineral showings in Figure 2-1-34, distribution of alteration minerals in Figure 2-1-35, and rock geochemical anomaly distribution in Figure 2-1-36.

The geology of this district consists of Middle-Upper Jurassic, Lower Cretaceous, Upper Tertiary, Upper Tertiary-Quaternary, and Quaternary Systems.

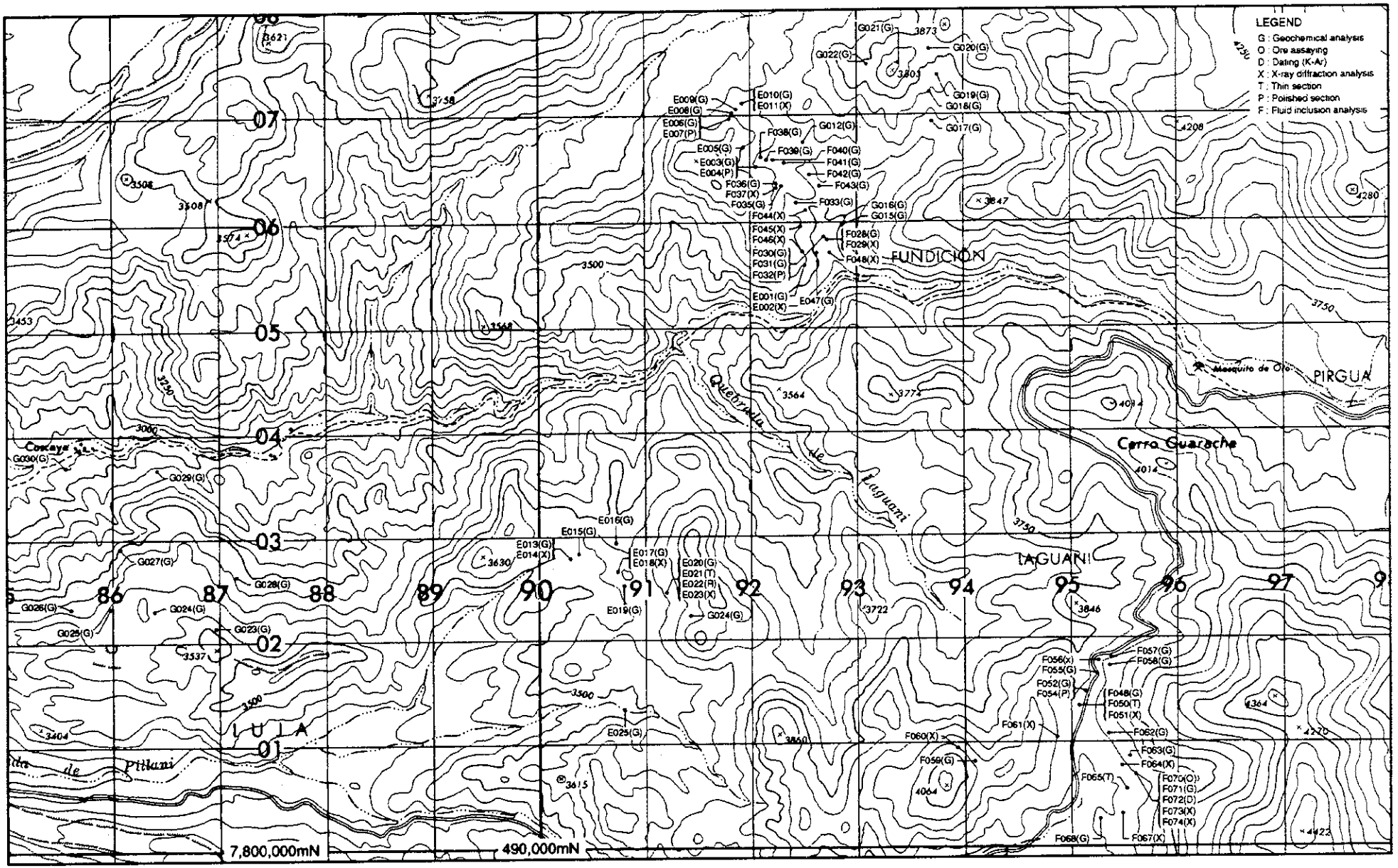


Fig.2-1-31 Sample Location Map of the West Queen Elizabeth Area

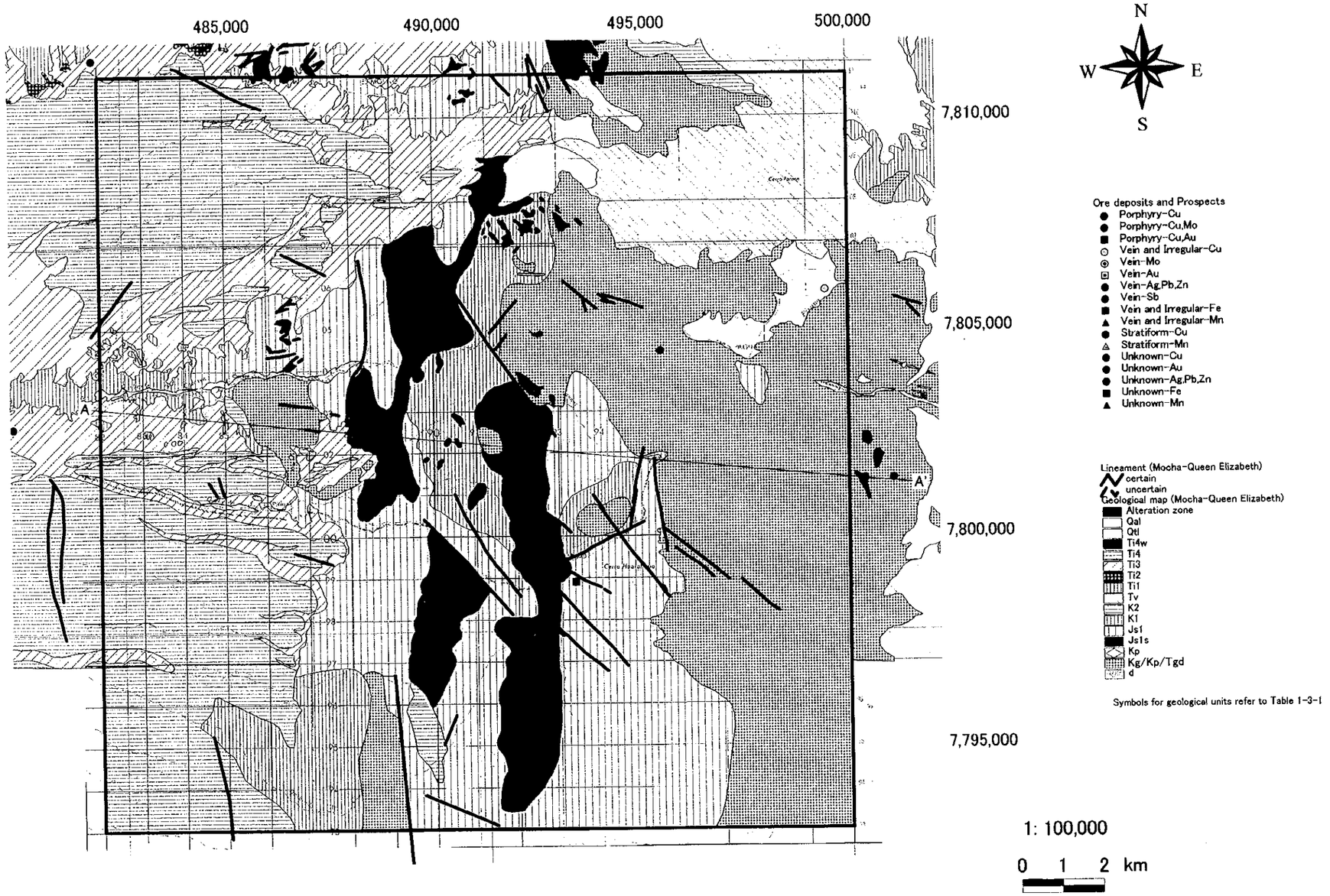


Fig. 2-1-32 Geological Map of the West Queen Elizabeth Area

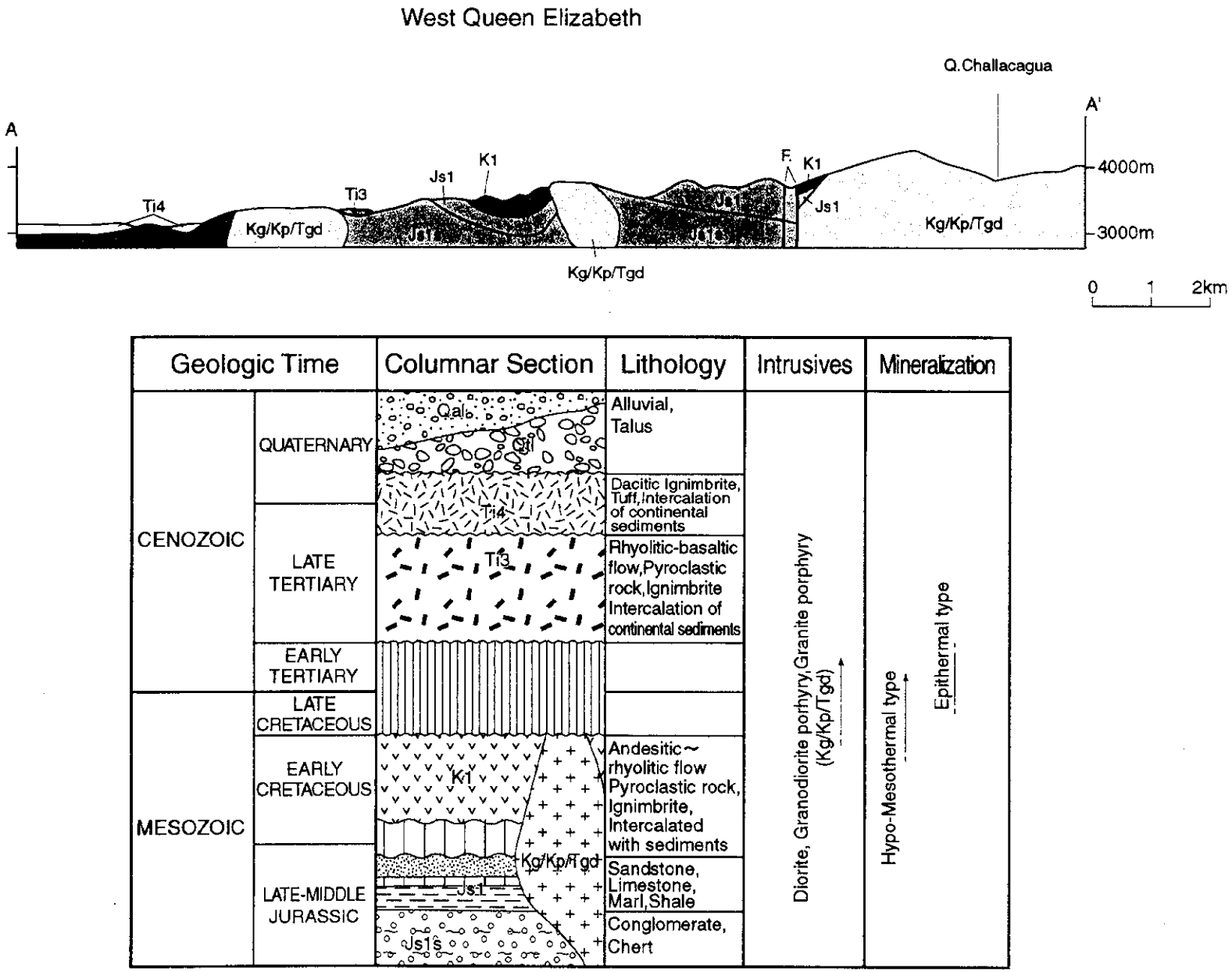


Fig.2-1-33 Schematic Stratigraphic Columns and Profiles of the West Queen Elizabeth Area

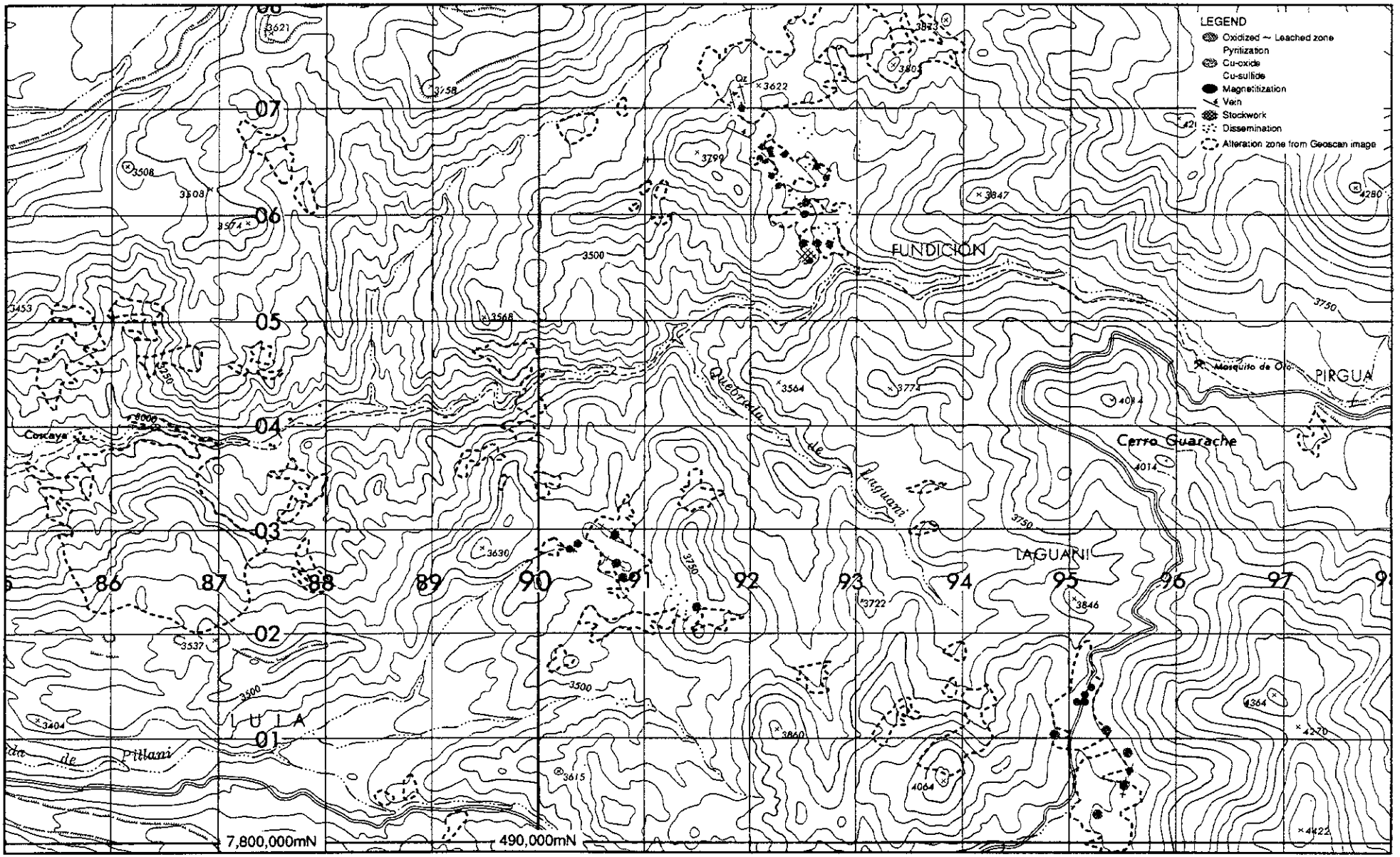


Fig.2-1-34 Mineralization Map of the West Queen Elizabeth Area

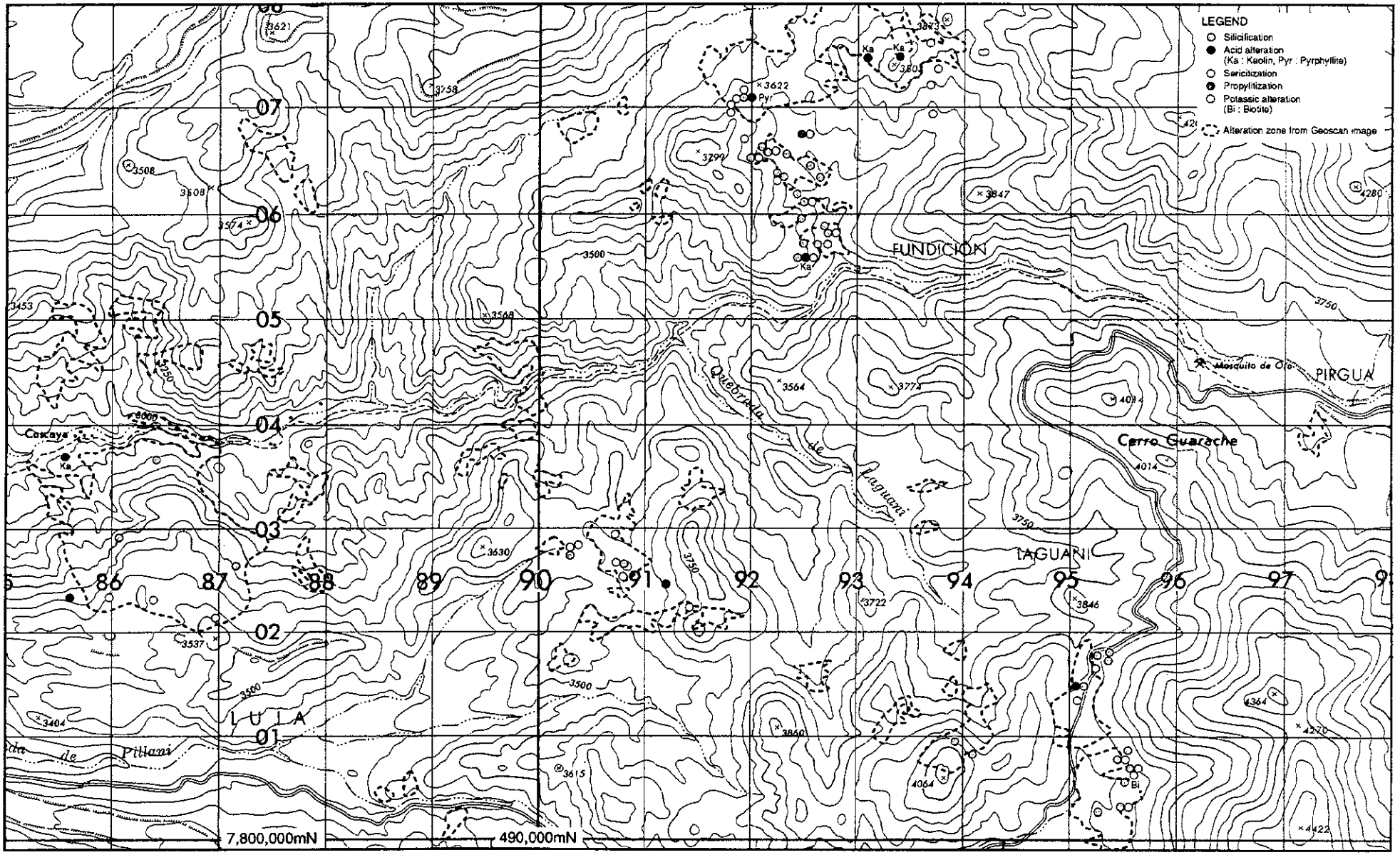


Fig.2-1-35 Distribution Map of Alteration Minerals at the West Queen Elizabeth Area

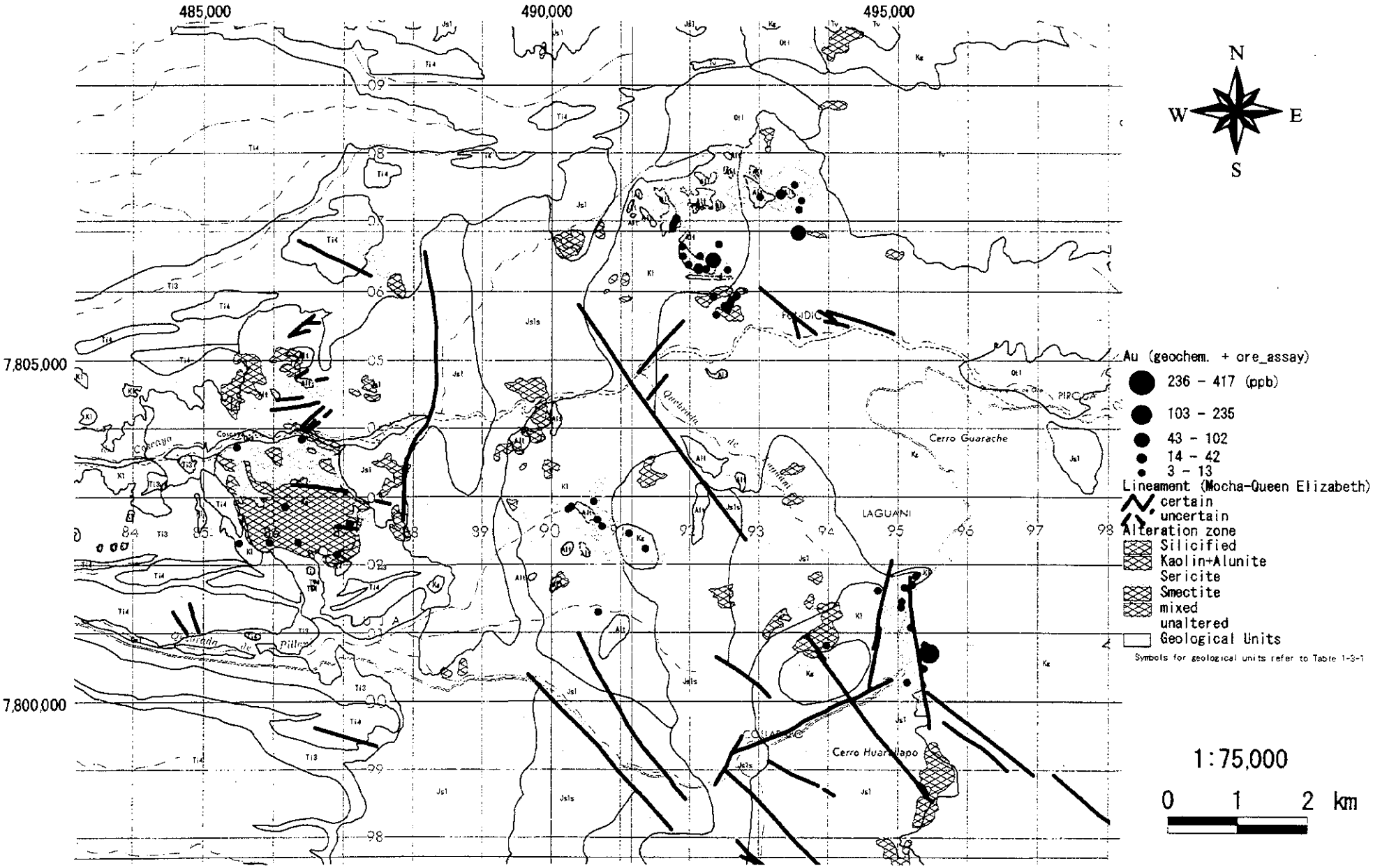


Fig. 2-1-36 (1) Geochemical Anomaly Map in the West Queen Elizabeth Area (Au)

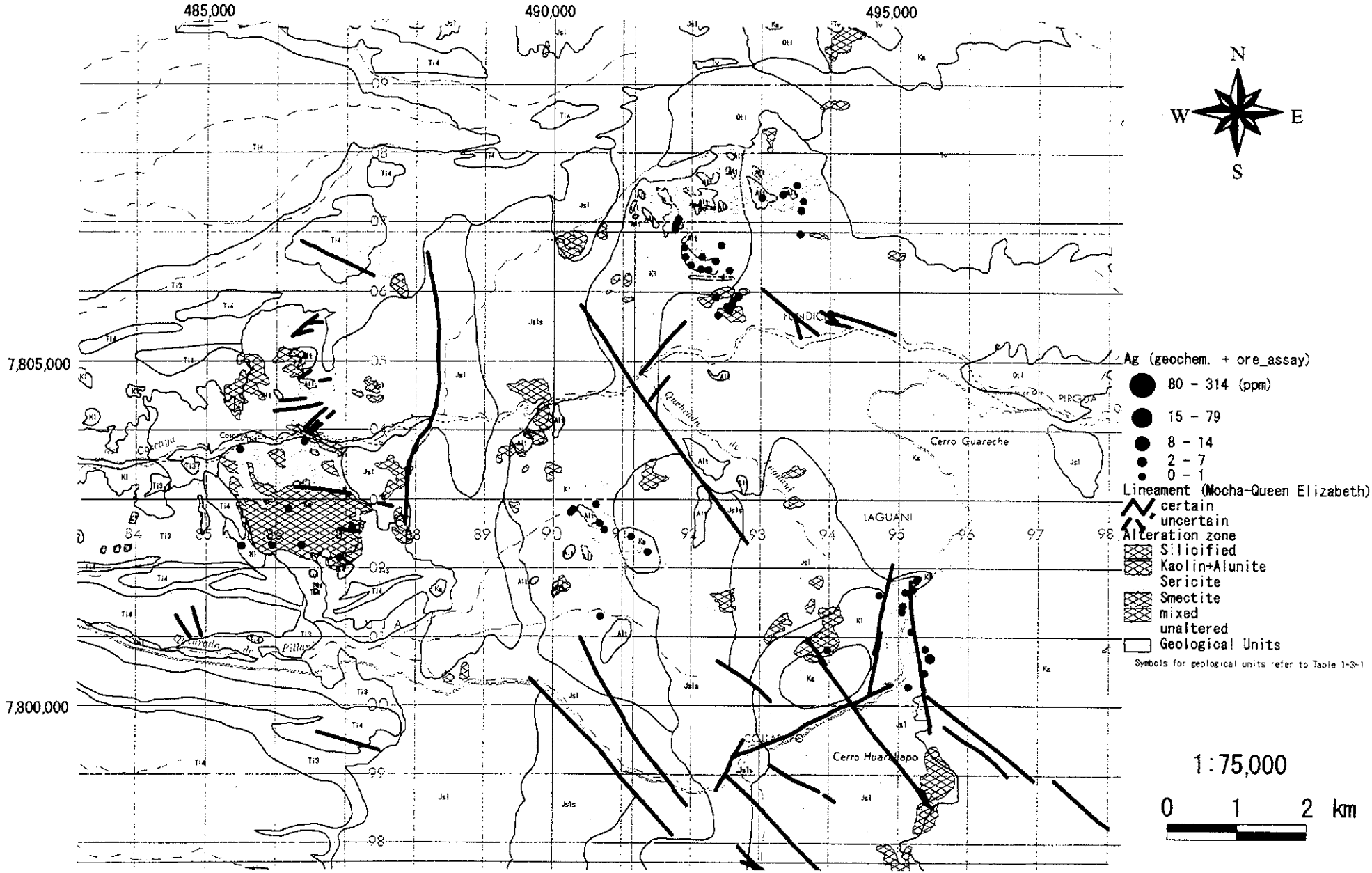


Fig. 2-1-36 (2) Geochemical Anomaly Map in the West Queen Elizabeth Area (Ag)

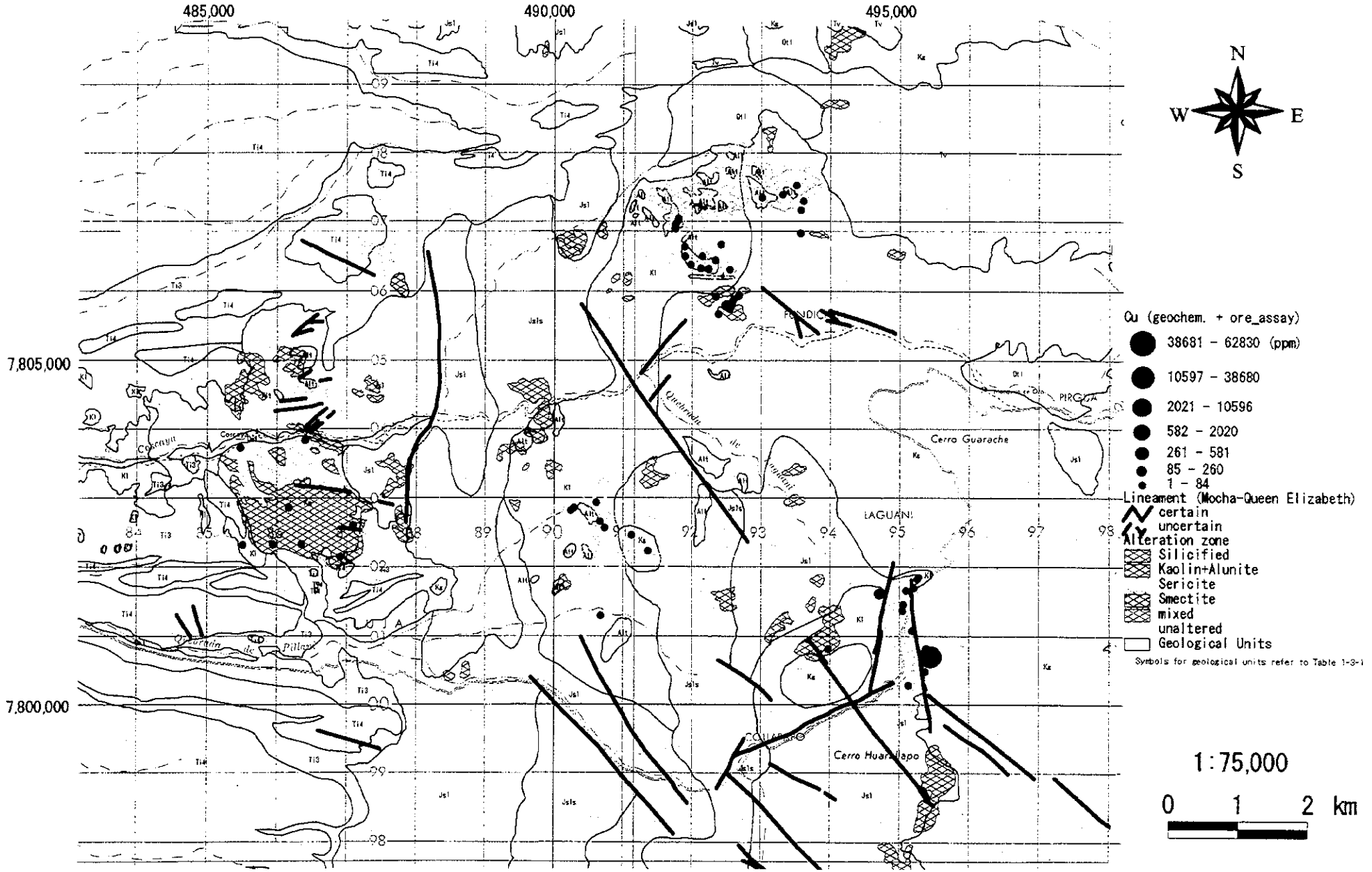


Fig. 2-1-36 (3) Geochemical Anomaly Map in the West Queen Elizabeth Area (Cu)

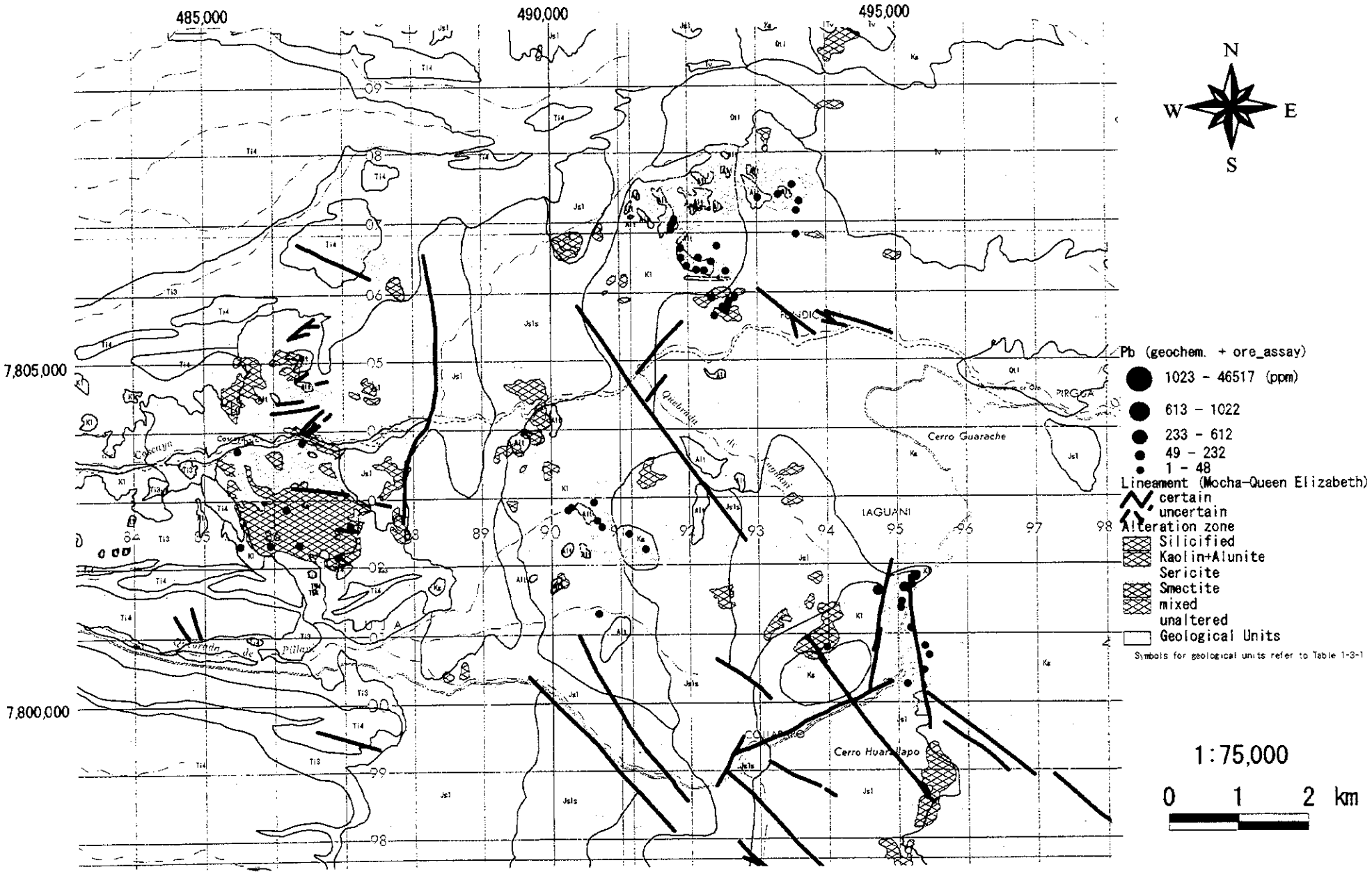


Fig. 2-1-36 (4) Geochemical Anomaly Map in the West Queen Elizabeth Area (Pb)

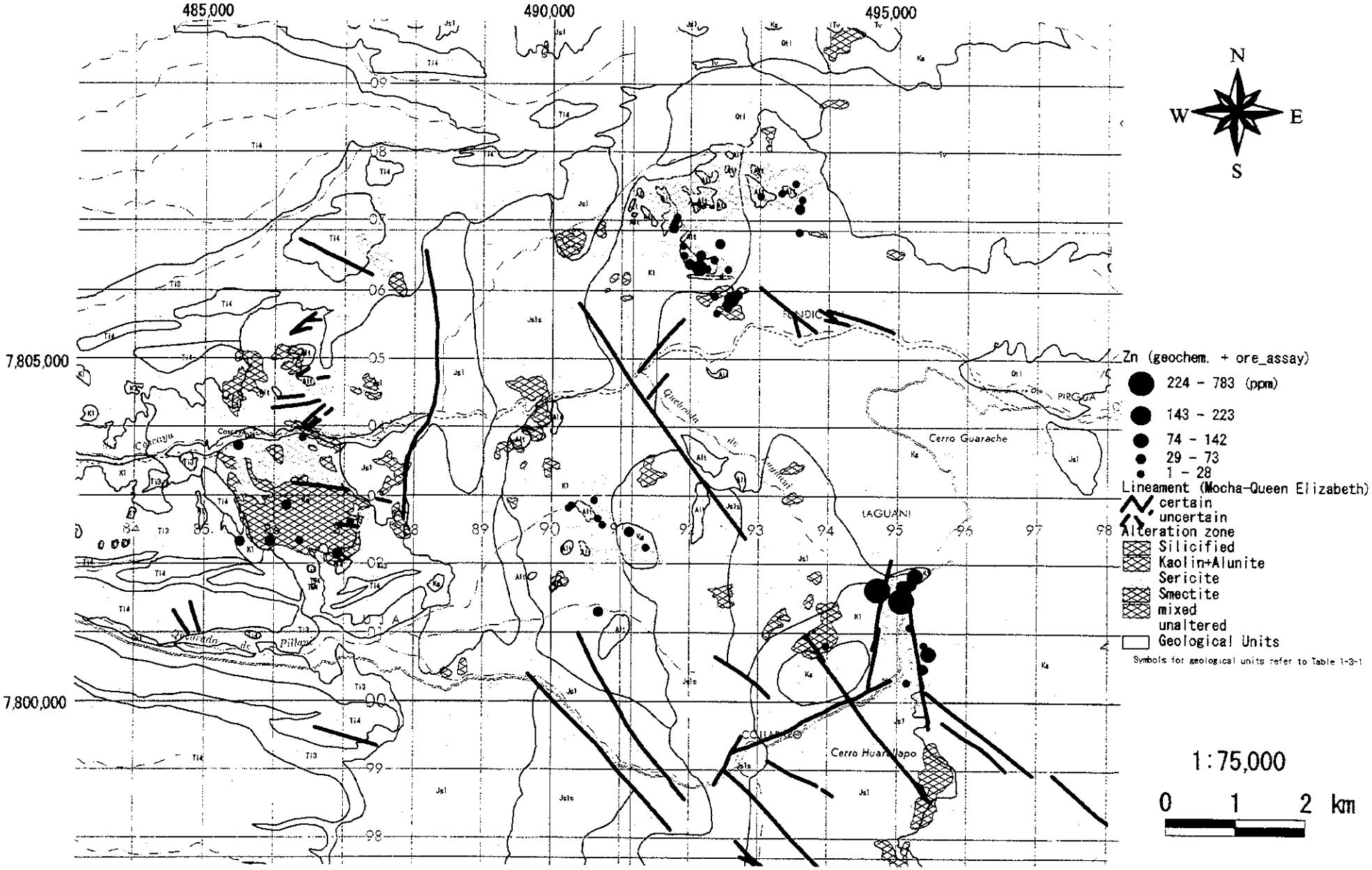


Fig. 2-1-36 (5) Geochemical Anomaly Map in the West Queen Elizabeth Area (Zn)

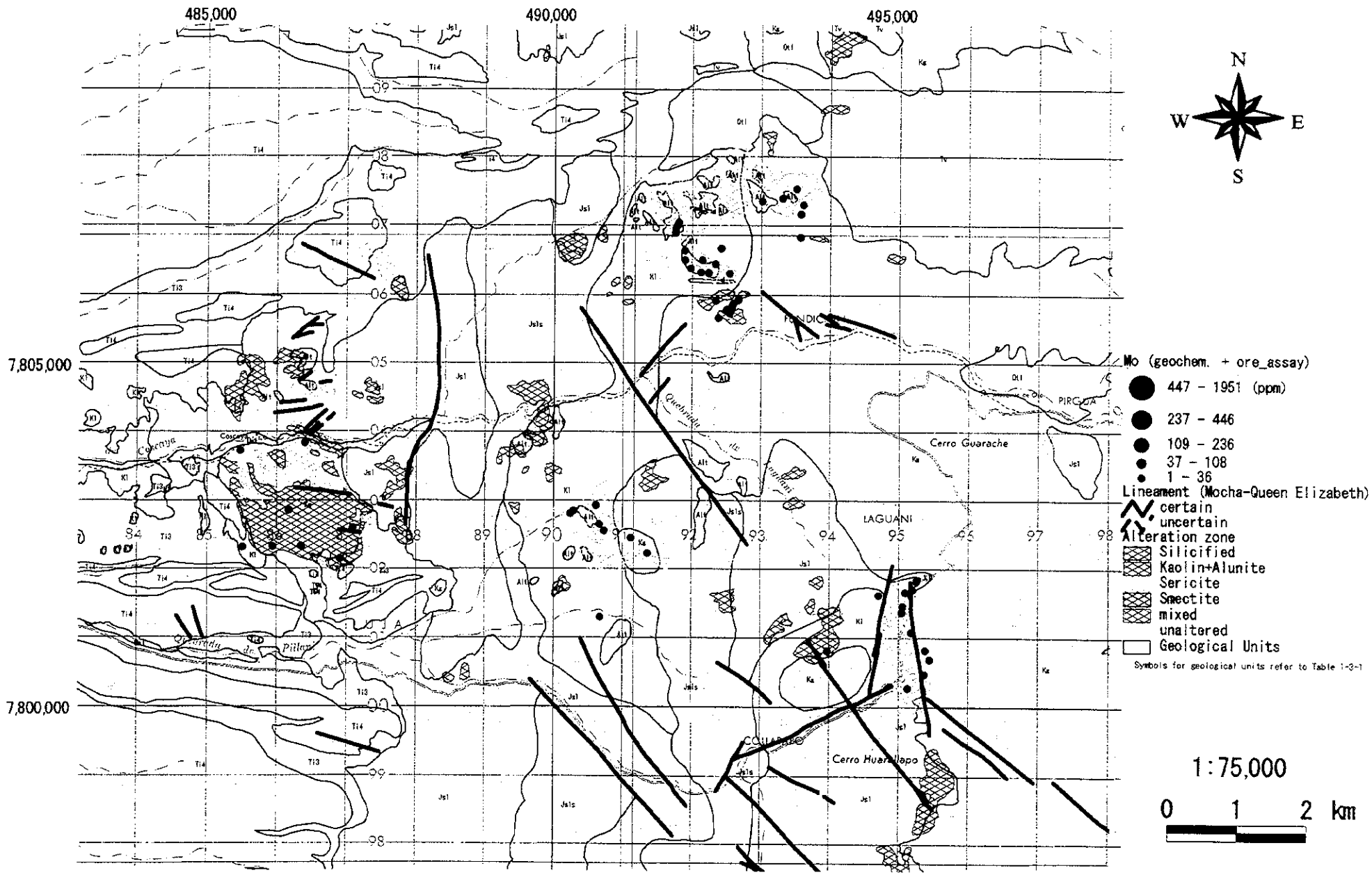


Fig. 2-1-36 (6) Geochemical Anomaly Map in the West Queen Elizabeth Area (Mo)

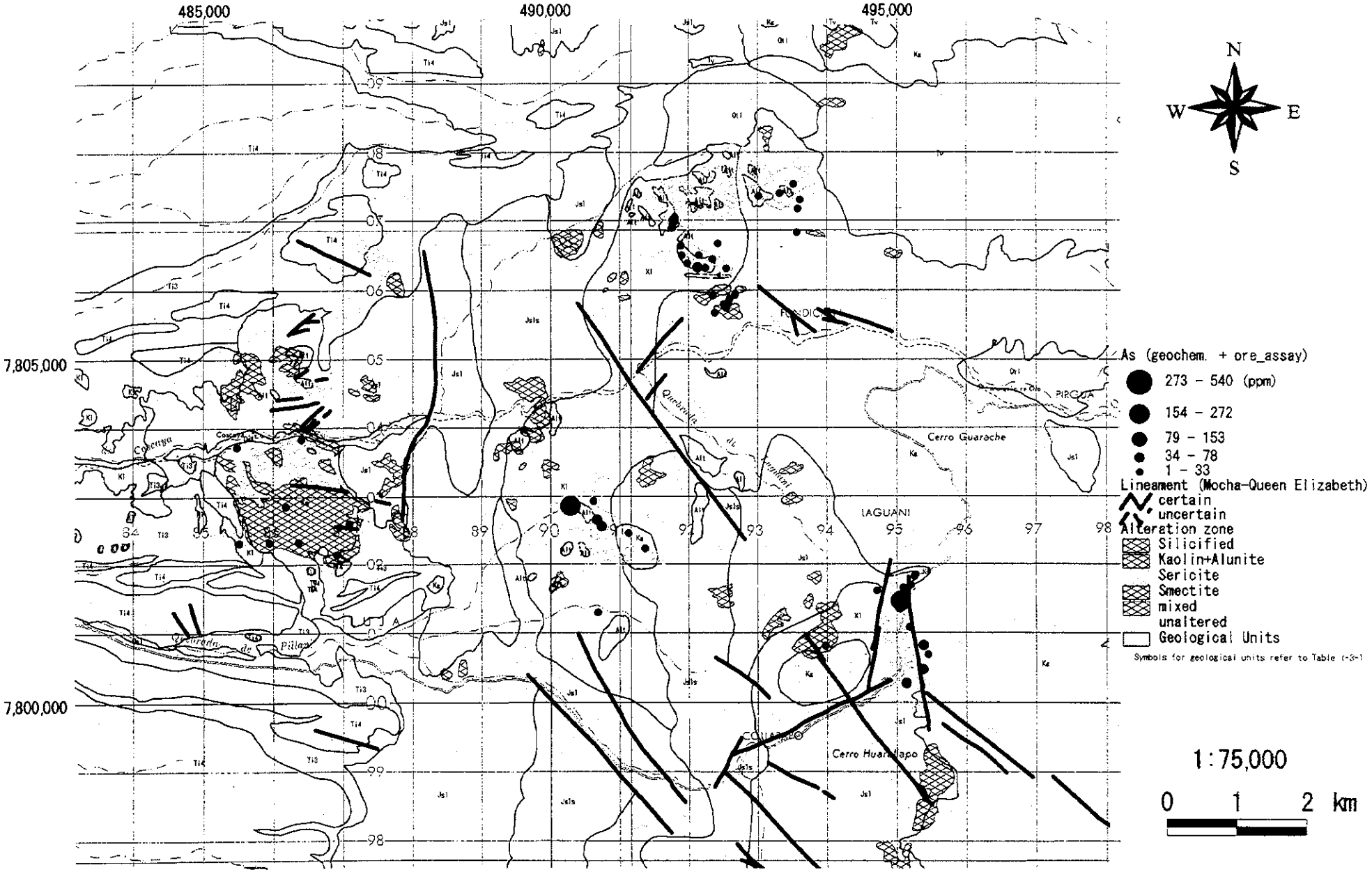


Fig. 2-1-36 (7) Geochemical Anomaly Map in the West Queen Elizabeth Area (As)

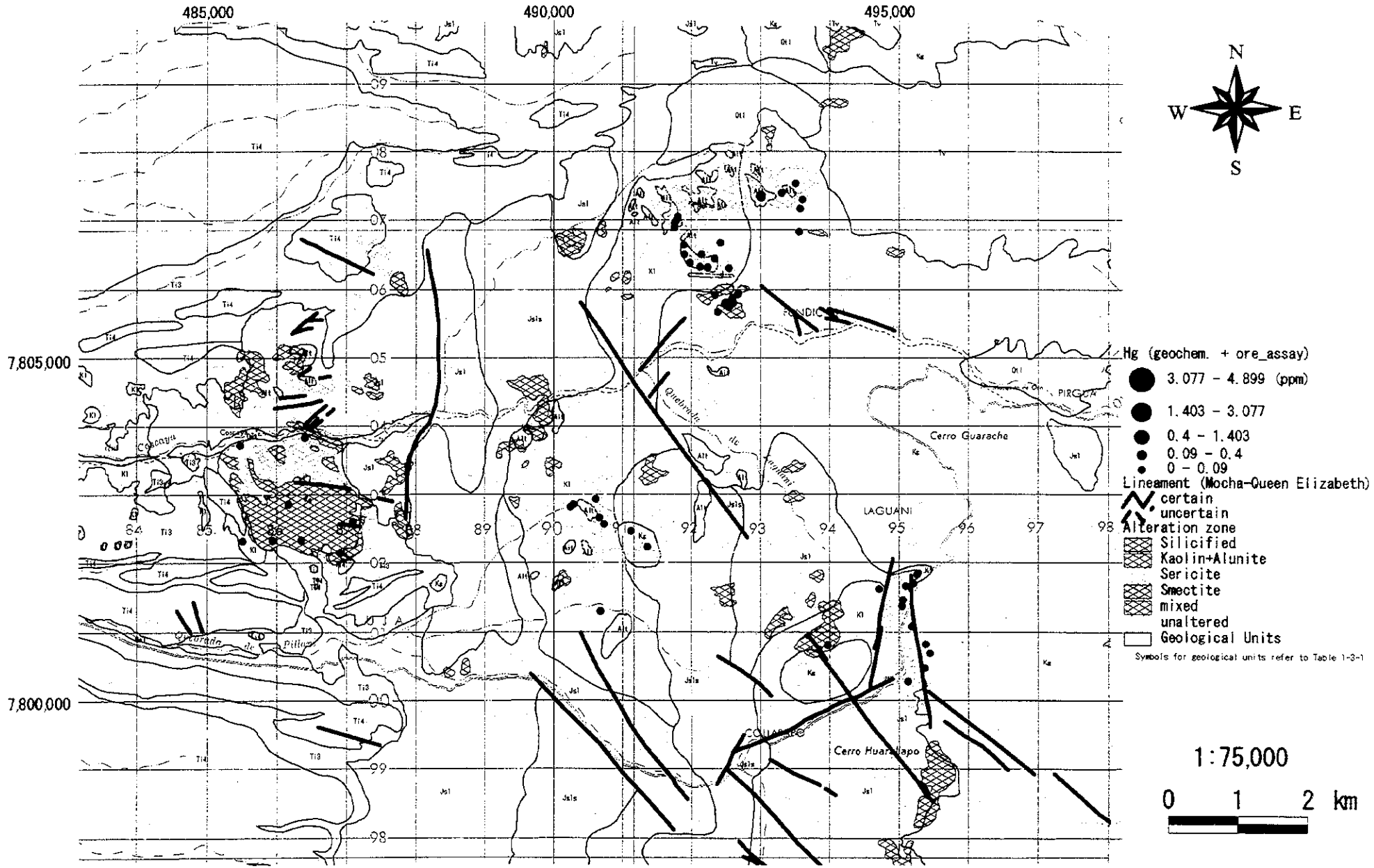


Fig. 2-1-36 (8) Geochemical Anomaly Map in the West Queen Elizabeth Area (Hg)

The Middle-Upper Jurassic System is composed of chert, conglomerate, shale, marl, limestone, and sandstone.

The Lower Cretaceous System is composed of andesitic~rhyolitic lava・pyroclastic rocks, ignimbrite, and intercalation of terrigenous sedimentary rocks.

The Middle-Upper Jurassic and Lower Cretaceous Systems are intruded by Cretaceous and Tertiary intrusive bodies. These intrusive rocks are diorite, granodiorite, and porphyry. The age of intrusion of these rocks have been indicated in the past geological maps as Cretaceous, but the age of parts of the intrusive rocks have been clarified to be middle Eocene because of the 41.3±1.0Ma obtained by K-Ar method of the primary biotite from granodiorite in the southeastern part of this area. Lower Cretaceous System and the intrusive bodies are overlain unconformably by Upper Tertiary System.

The Upper Tertiary-Quaternary System is composed of Pliocene-Pleistocene dacitic ignimbrite, tuff, and intercalation of terrigenous sediments.

Quaternary System is composed of alluvium, and talus deposits.

Alteration zones occur in four localities of this area, namely northern, central, southeastern, and western parts.

The northern alteration zone occurs in the Lower Cretaceous System and intrusive bodies (diorite, granite porphyry) and consists of silicification, sericitization, propylitization, and acidic alteration (kaolin, alunite, pyrophyllite). In this alteration zone, pyrite dissemination and limonitization are common, while quartz veins consisting partly of chalcedony are developed only locally. E-W trending andesite dikes occur in this zone.

The central alteration zone occurs in andesitic porphyry intruding Middle-Upper Jurassic System and in Lower Cretaceous System and consists of silicification, sericitization, propylitization, and kaolin. Pyrite dissemination and limonitization and hematitization are common in this zone. Development of quartz veins is not good, but NW-SE trending silicified zone is developed in this zone. This trend of the silicified zone coincides with the dominant direction of lineaments of this area.

The southeastern alteration zone occurs along the western side of the granodiorite body intruding into the Middle-Upper Jurassic System. A N-S extending lineament occurs along the western border of the intrusion and also a parallel lineament exist to the west. This alteration zone occurs between these two lineaments. This zone consists mainly of silicification and sericitization, and limonitization is also common. To the north of this zone, a 1m wide irregular magnetite vein occur for about 100m in the Jurassic System. Also to the south of this zone, quartz veinlets occur sporadically and green oxidized copper minerals, chalcopyrite, and pyrite are associated in parts of the veinlets, and biotite alteration is also observed.

The distribution of the western alteration zone coincides with that of the granite porphyry and the zone consists of silicification and sericitization, but ore minerals have not been found.

Notable rock geochemistry anomaly is high Au-Cu-Zn-As anomaly of the southeastern alteration zone, but its occurrence is local.

1-1-7 Tignamar district

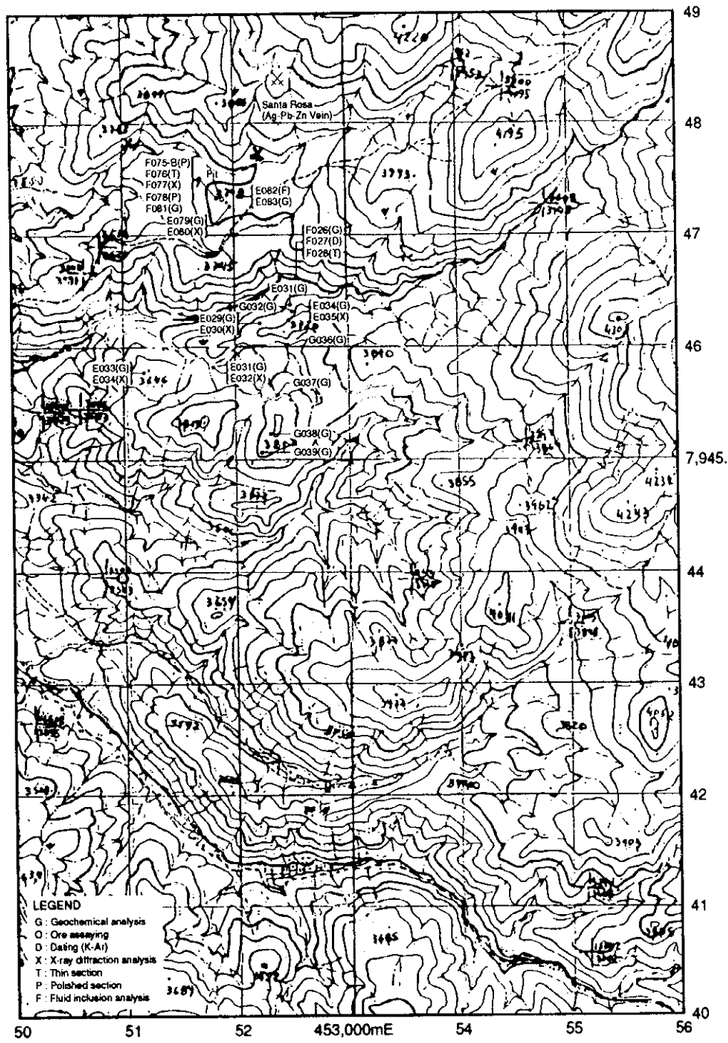
For this district, sampling sites are shown in Figure 2-1-37, geological map in Figure 2-1-38, schematic geological column in Figure 2-1-39, location of mineral showings in Figure 2-1-40, distribution of alteration minerals in Figure 2-1-41, and rock geochemical anomaly distribution in Figure 2-1-42.

The geology of this district consists of Paleozoic Erathem, Upper Cretaceous-Lower Tertiary System, Upper Tertiary System, and Upper Tertiary-Quaternary System.

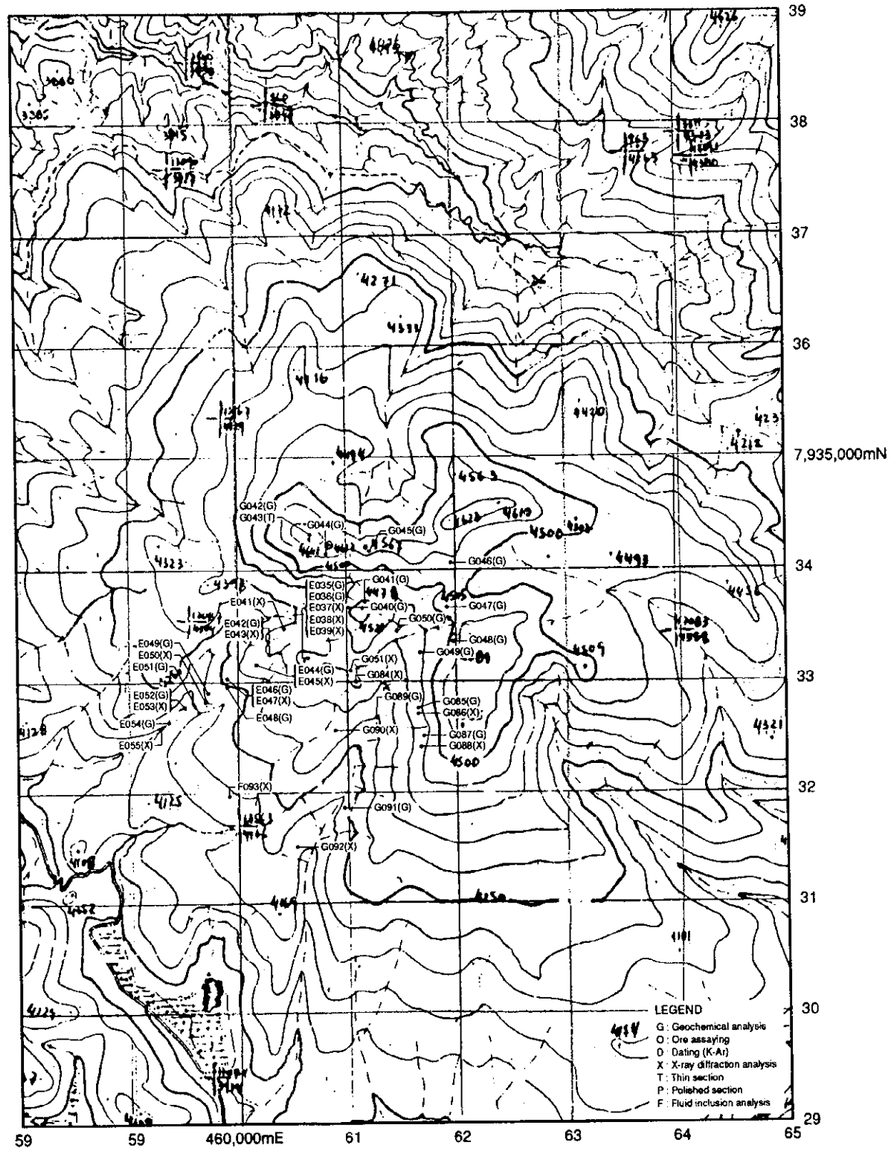
The Paleozoic Erathem is composed of metamorphic rocks of sedimentary and volcanic origin, and gneiss.

The Upper Cretaceous-Lower Tertiary System is composed of andesitic~rhyolithic lava・pyroclastic rocks and terrigenous deposits.

The Upper Cretaceous-Lower Tertiary System is intruded by Cretaceous to Tertiary igneous bodies. These intrusive rocks are granodiorite and porphyry. The Upper Cretaceous-Tertiary System and the intrusive bodies are overlain unconformably by Upper Tertiary System.

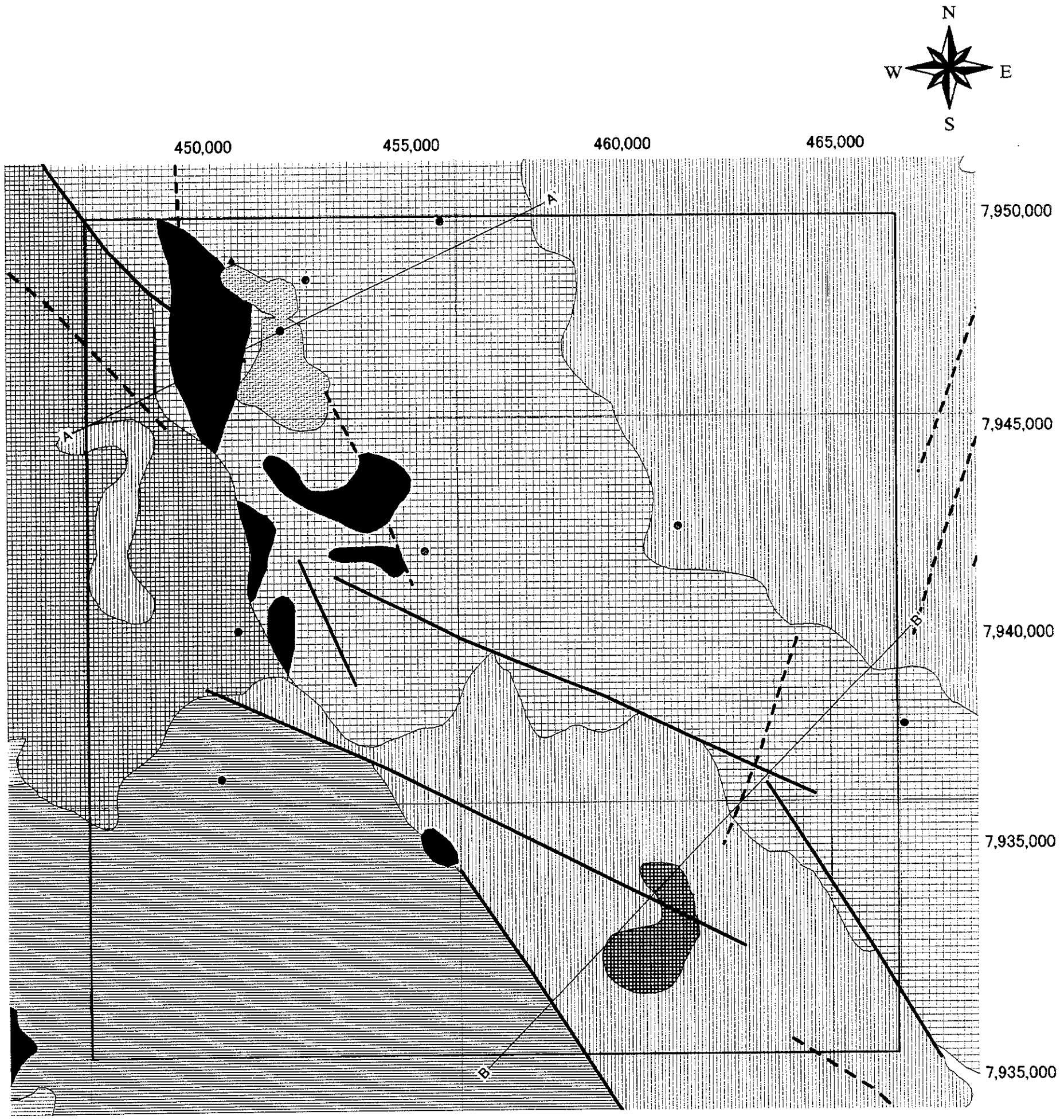


Northern Tignamer



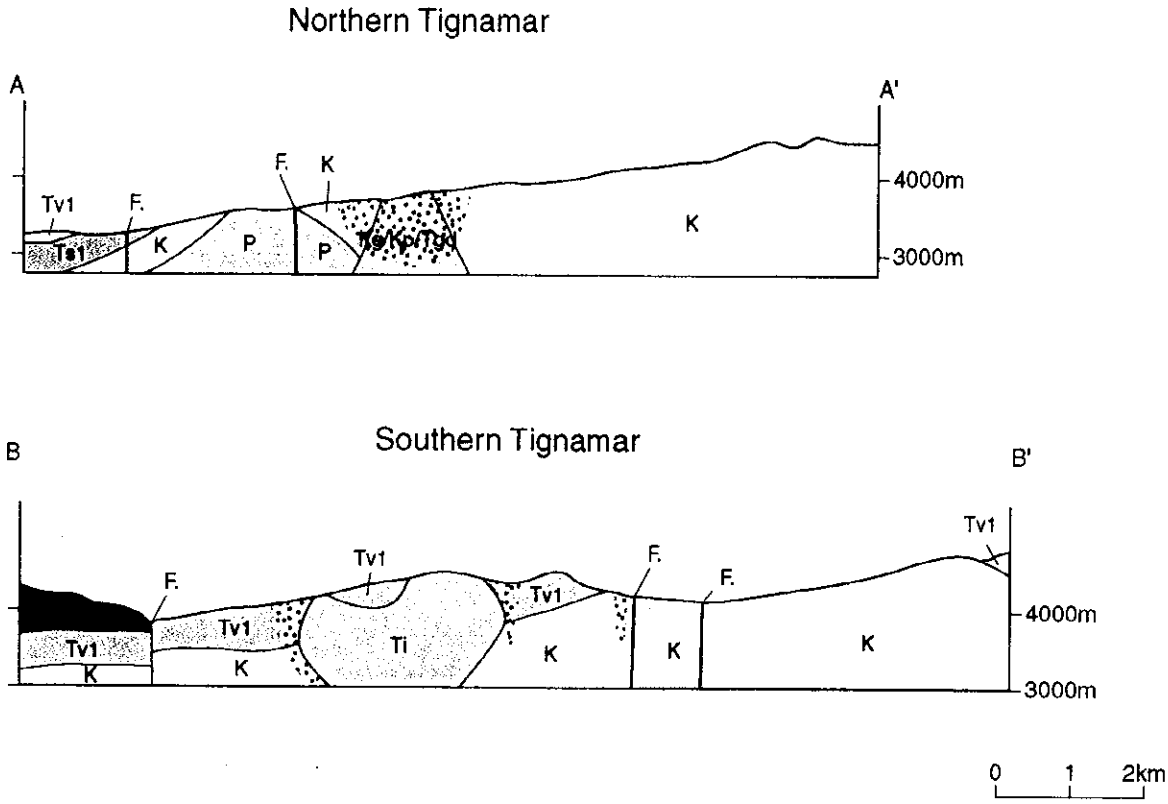
Southern Tignamer

Fig.2-1-37 Sample Location Map of the Tignamer Area



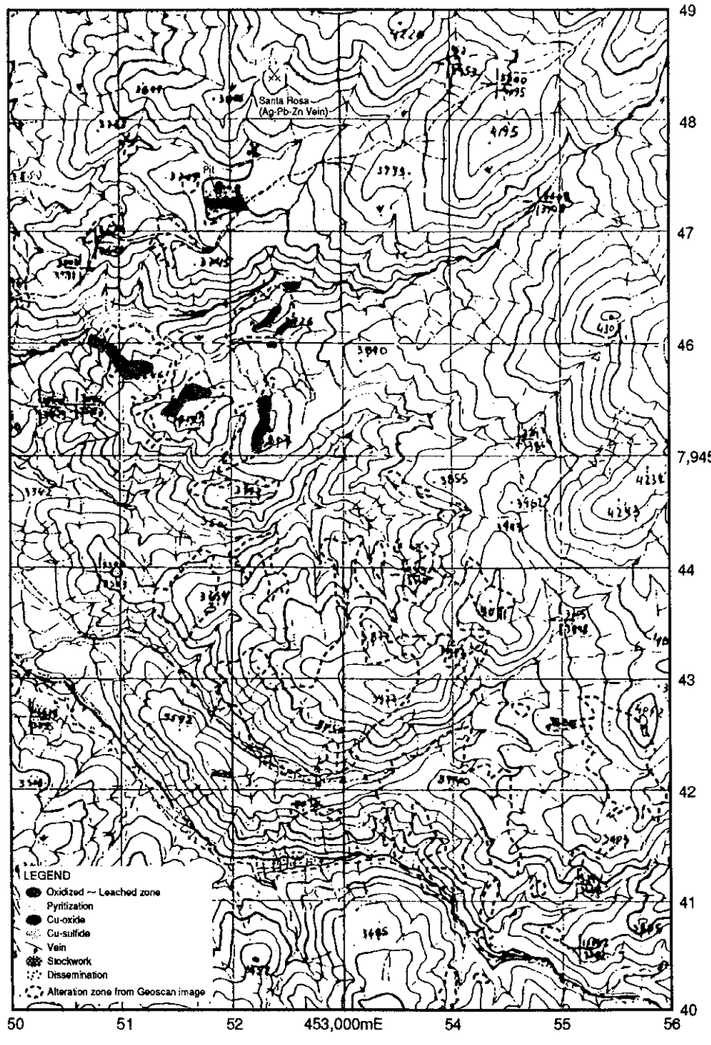
Symbols for geological units refer to Table 1-3-1

Fig. 2-1-38 Geological Map of the Tignamar Area

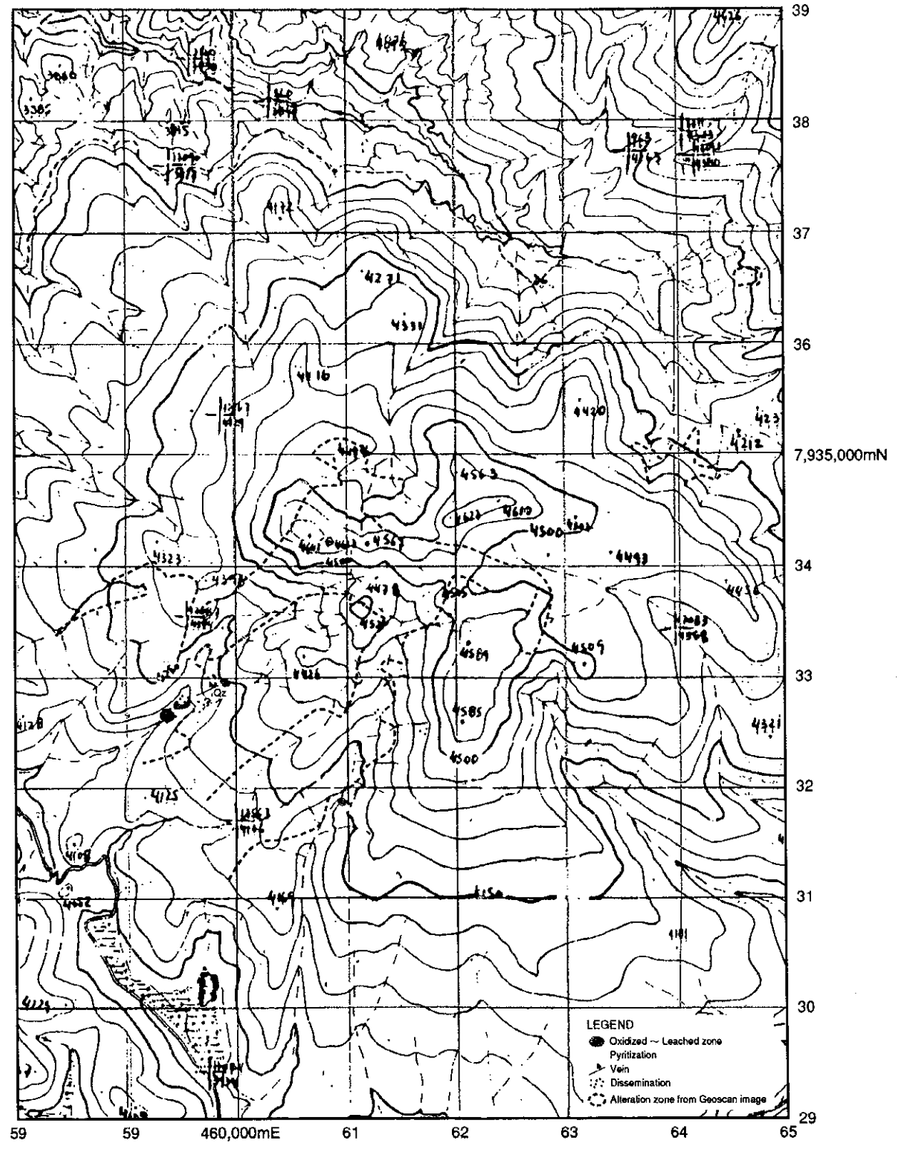


Geologic Time		Columnar Section	Lithology	Intrusives	Mineralization
CENOZOIC	QUATERNARY - LATE TERTIARY	Tv3, Tv1, Ti	Andesitic~ basaltic lava/ volcaniclastics	Granodiorite, Porphyry(Kg/Kp/Tgd) — Dacite, Porphyry(Ti)	Porphyry copper type — Epithermal type
	LATE TERTIARY	Ts1	Rhyolitic~ basaltic lava/ valcaniclastics, Intercalation of continental sediments		
	EARLY TERTIARY				
MESOZOIC	EARLY TERTIARY - LATE CRETACEOUS	K, Kg/Kp/Tgd	Andesitic~ rhyolitic lava/volcani-clastics Intercalation of continental sedimants		
PALEOZOIC			Gneiss, Metamorphosed sedimentary and volcanic rocks		

Fig.2-1-39 Schematic Stratigraphic Columns and Profiles of the Tignamar Area

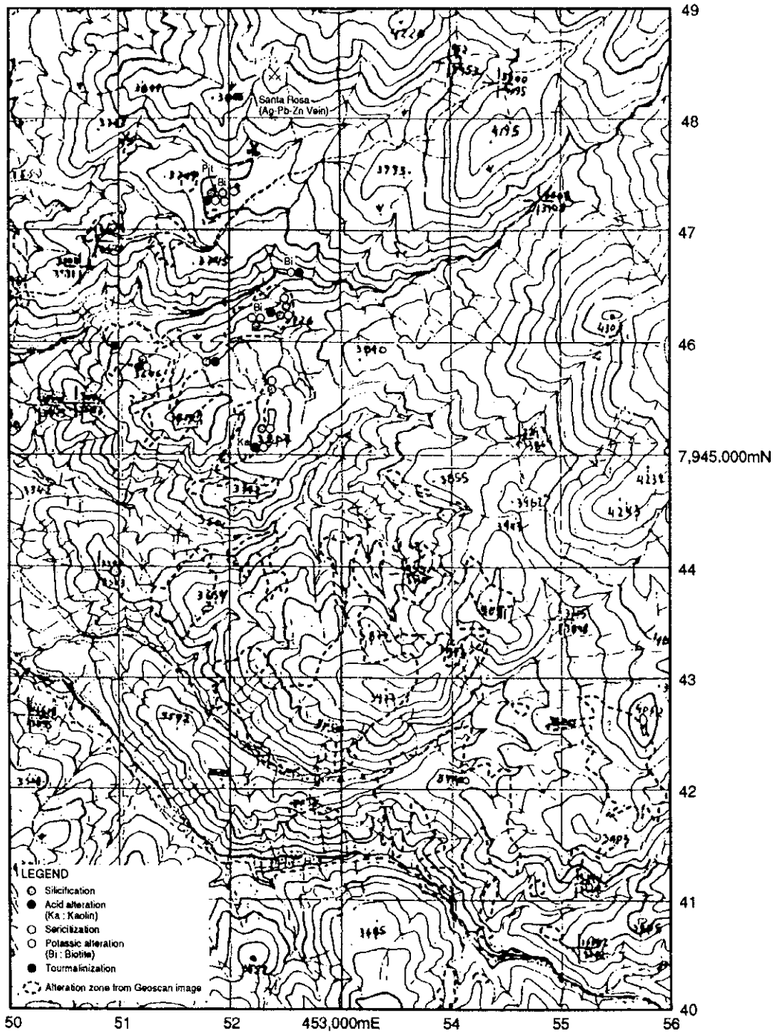


Northern Tignamer

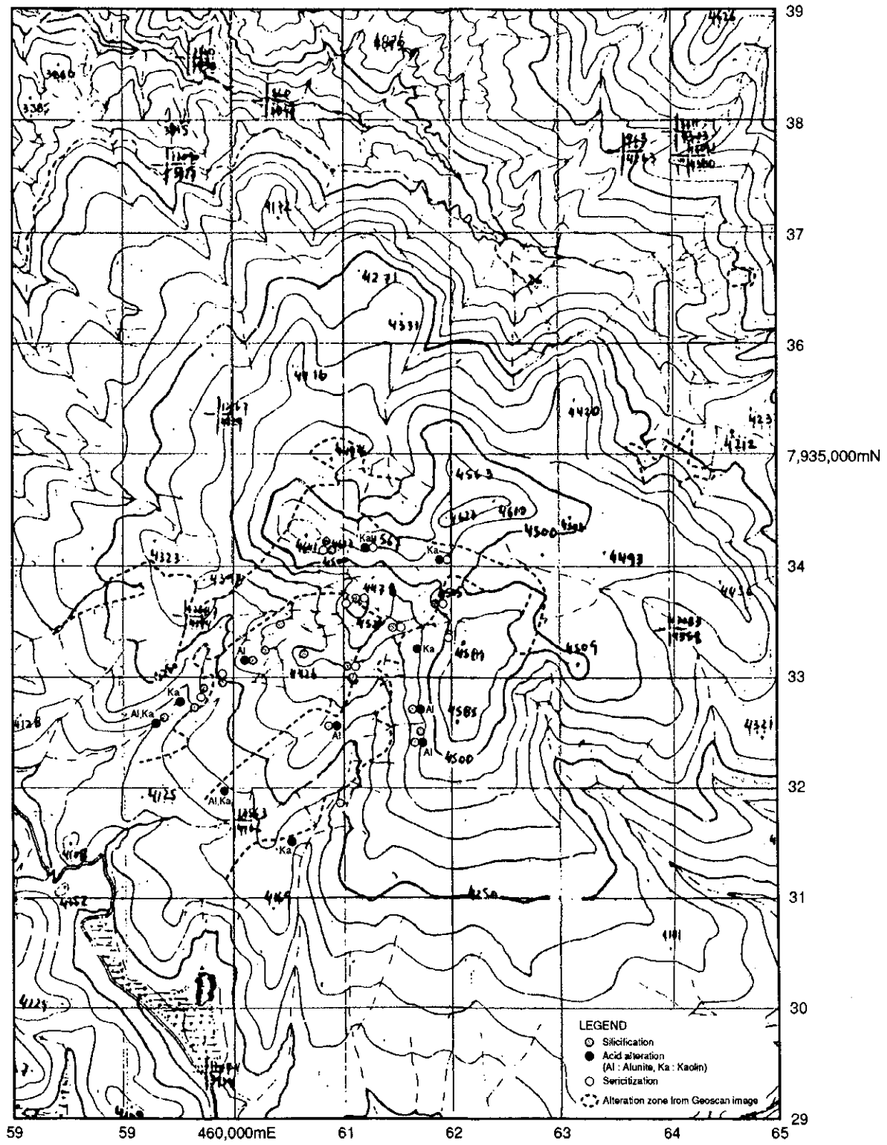


Southern Tignamer

Fig.2-1-40 Mineralization Map of the Tignamar Area



Northern Tignamer



Southern Tignamer

Fig.2-1-41 Distribution Map of Alteration Minerals at the Tignamar Area

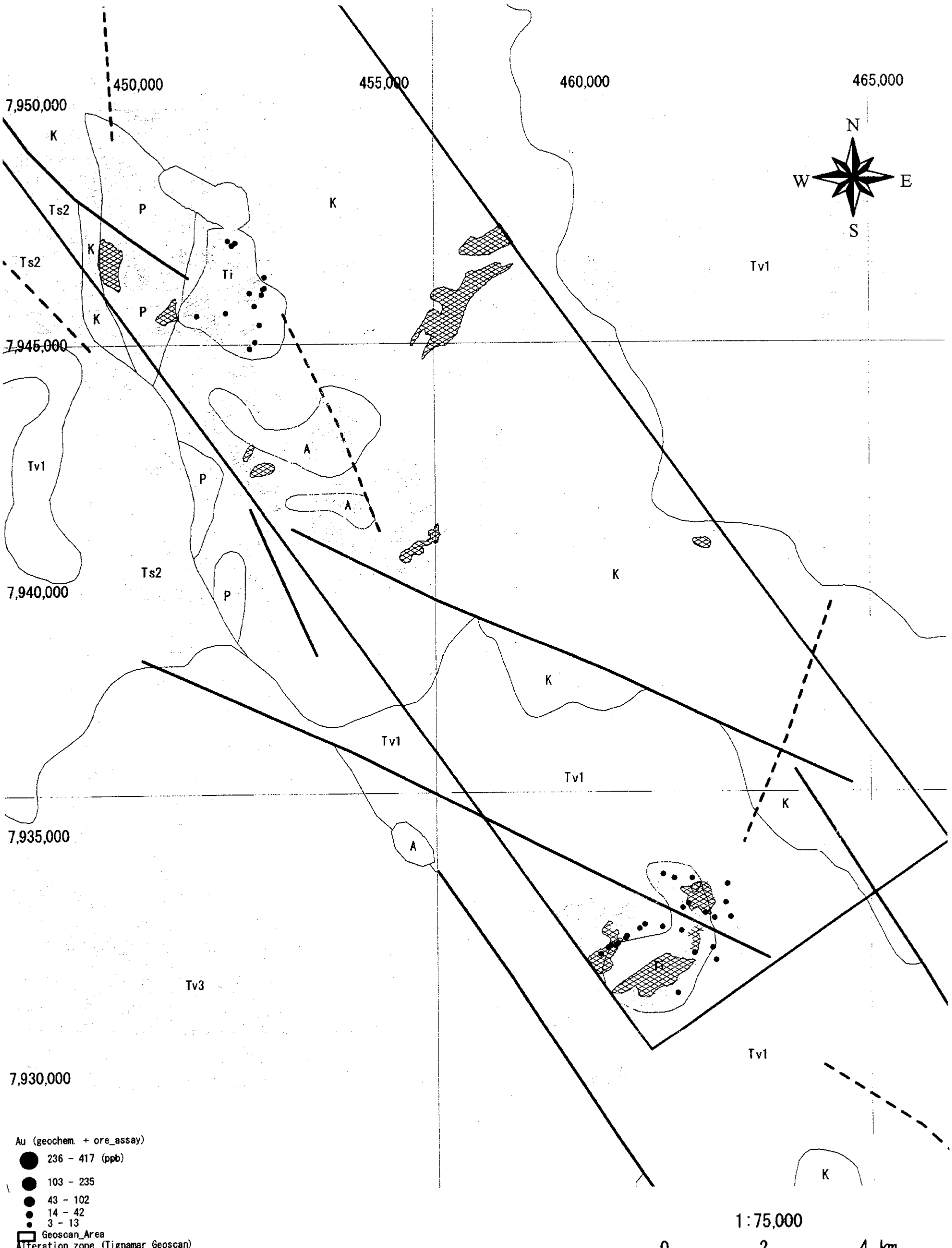


Fig. 2-1-42 (1) Geochemical Anomaly Map in the Tignamar Area (Au)

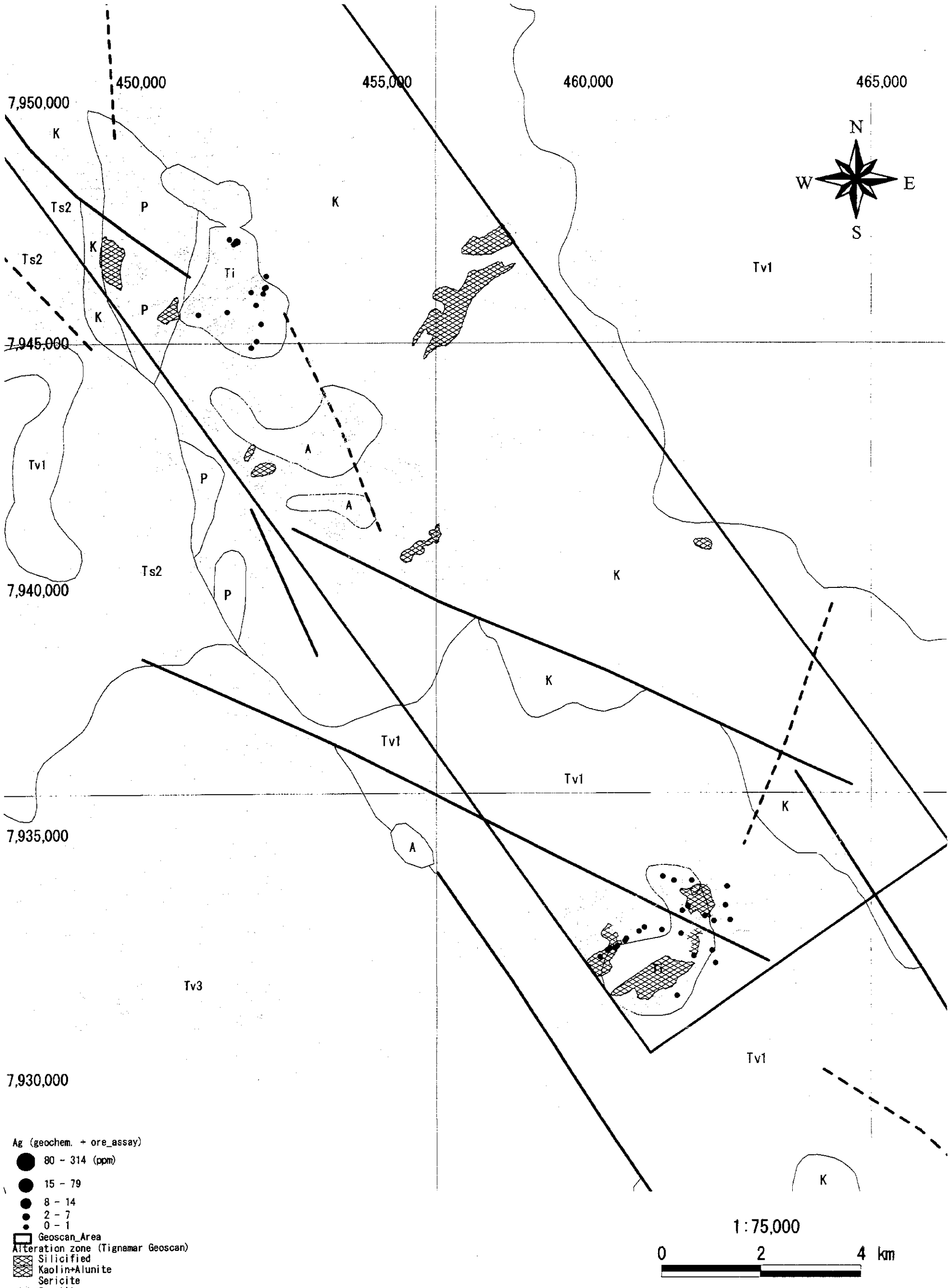


Fig. 2-1-42 (2) Geochemical Anomaly Map in the Tignamar Area (Ag)

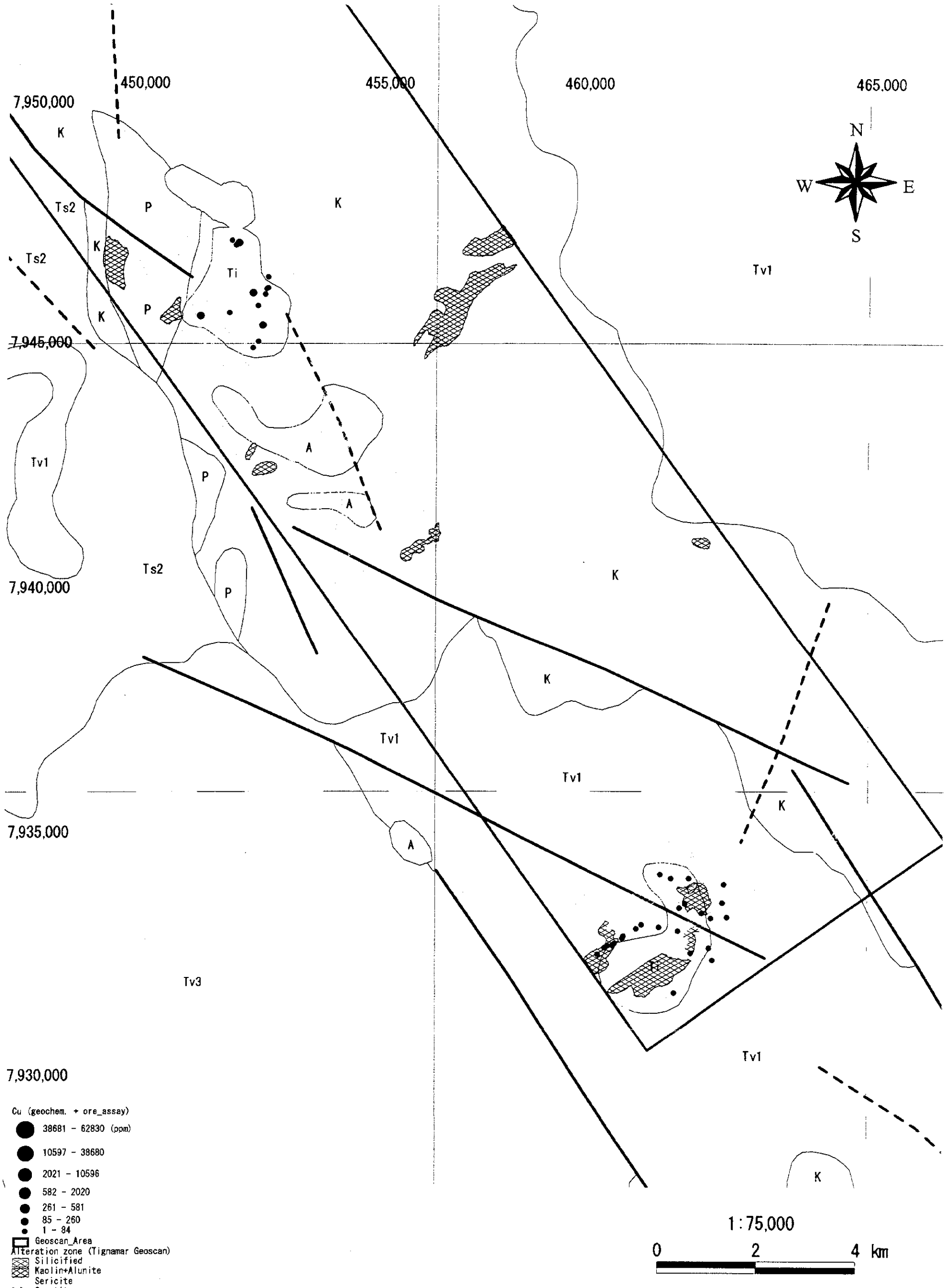


Fig. 2-1-42 (3) Geochemical Anomaly Map in the Tignamar Area (Cu)

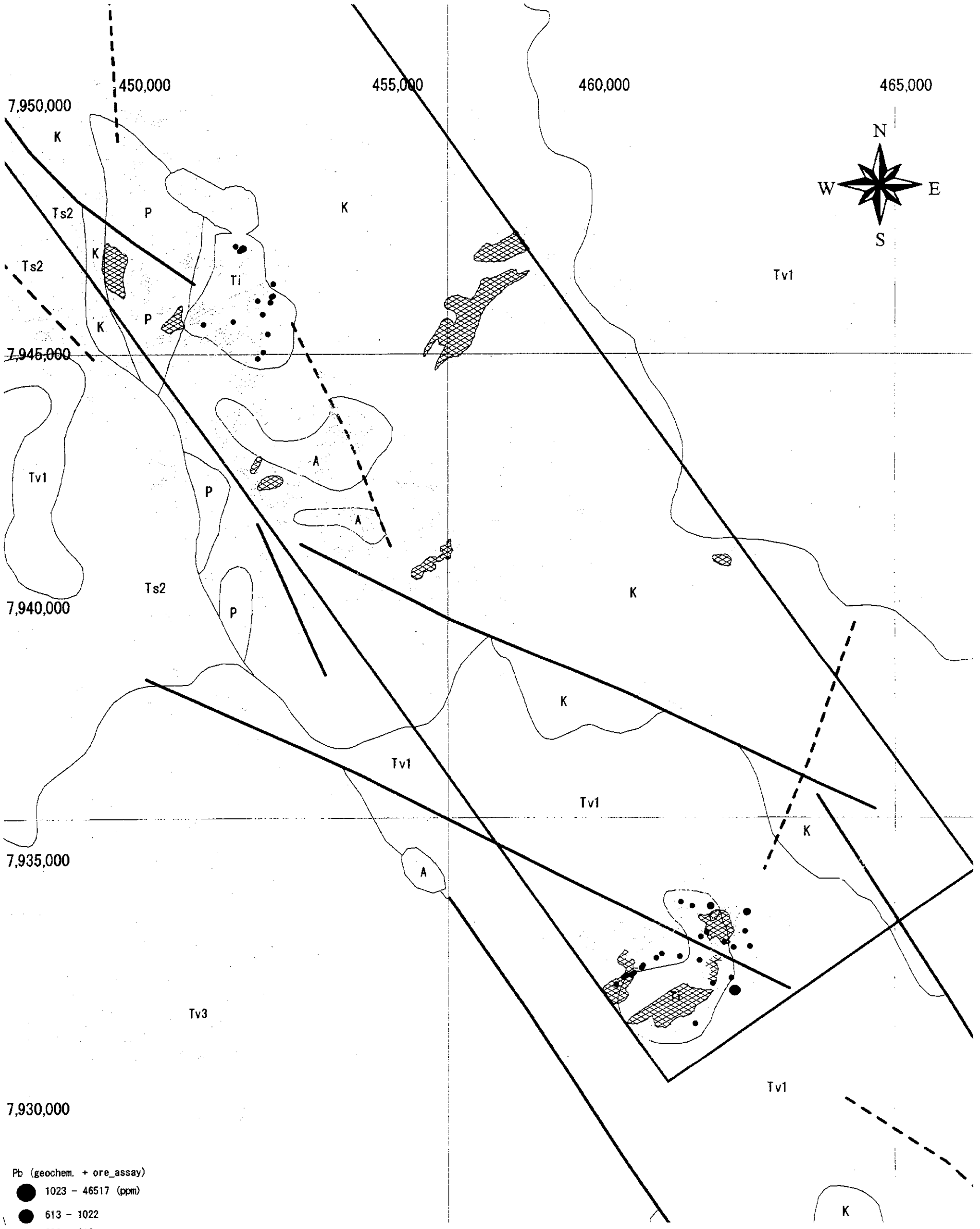


Fig. 2-1-42 (4) Geochemical Anomaly Map in the Tignamar Area (Pb)

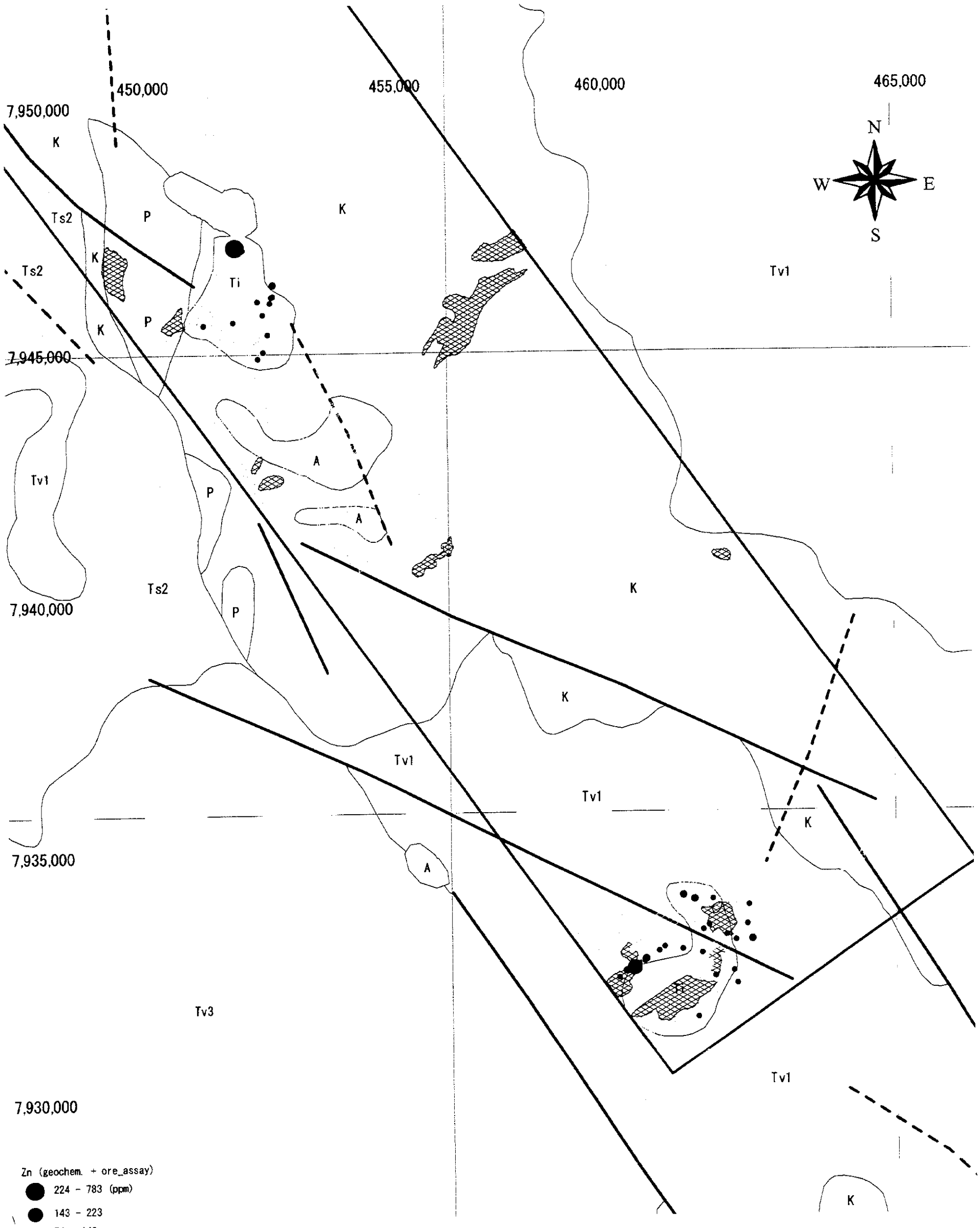


Fig. 2-1-42 (5) Geochemical Anomaly Map in the Tignamar Area (Zn)

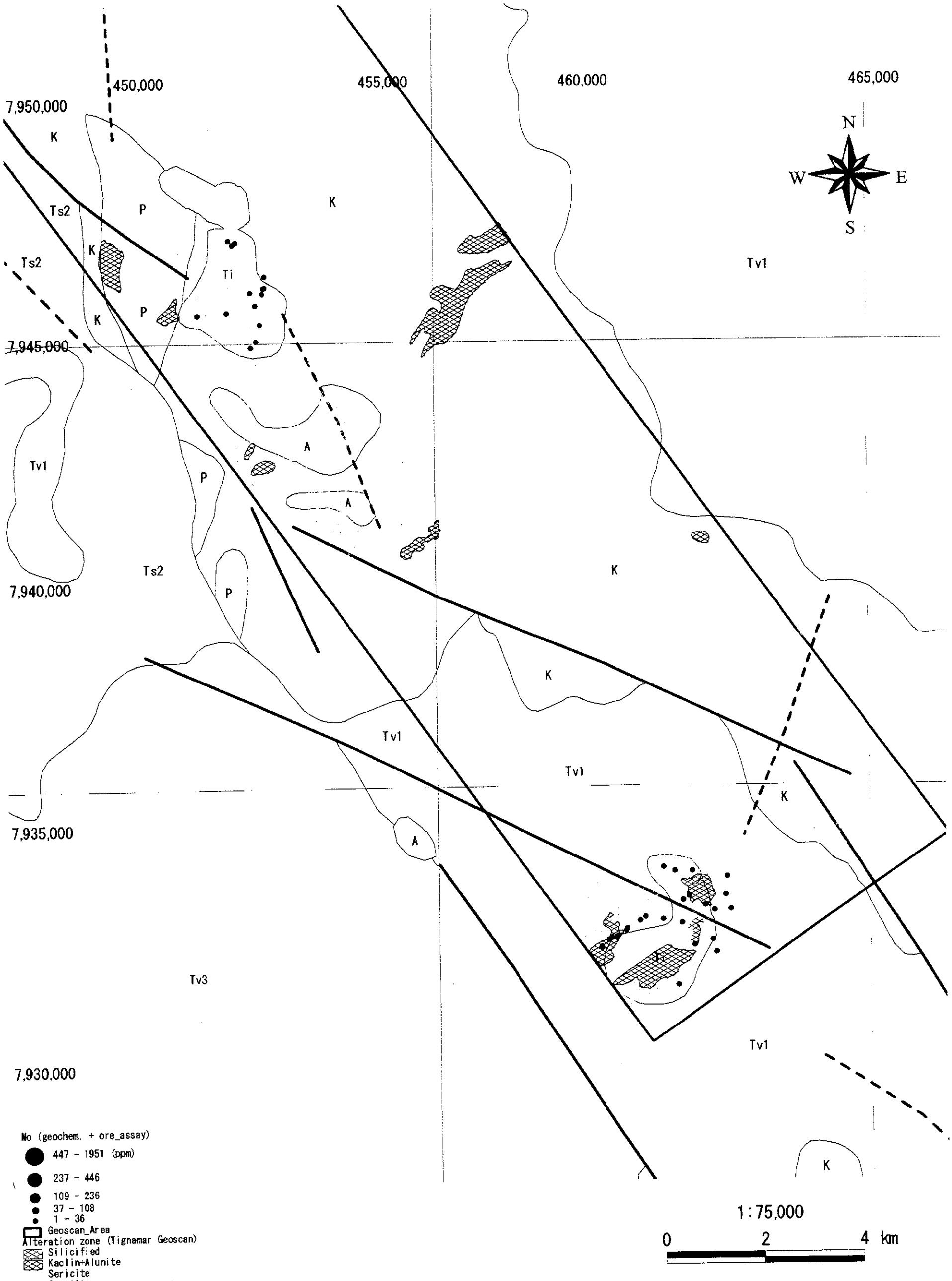


Fig. 2-1-42 (6) Geochemical Anomaly Map in the Tignamar Area (Mo)

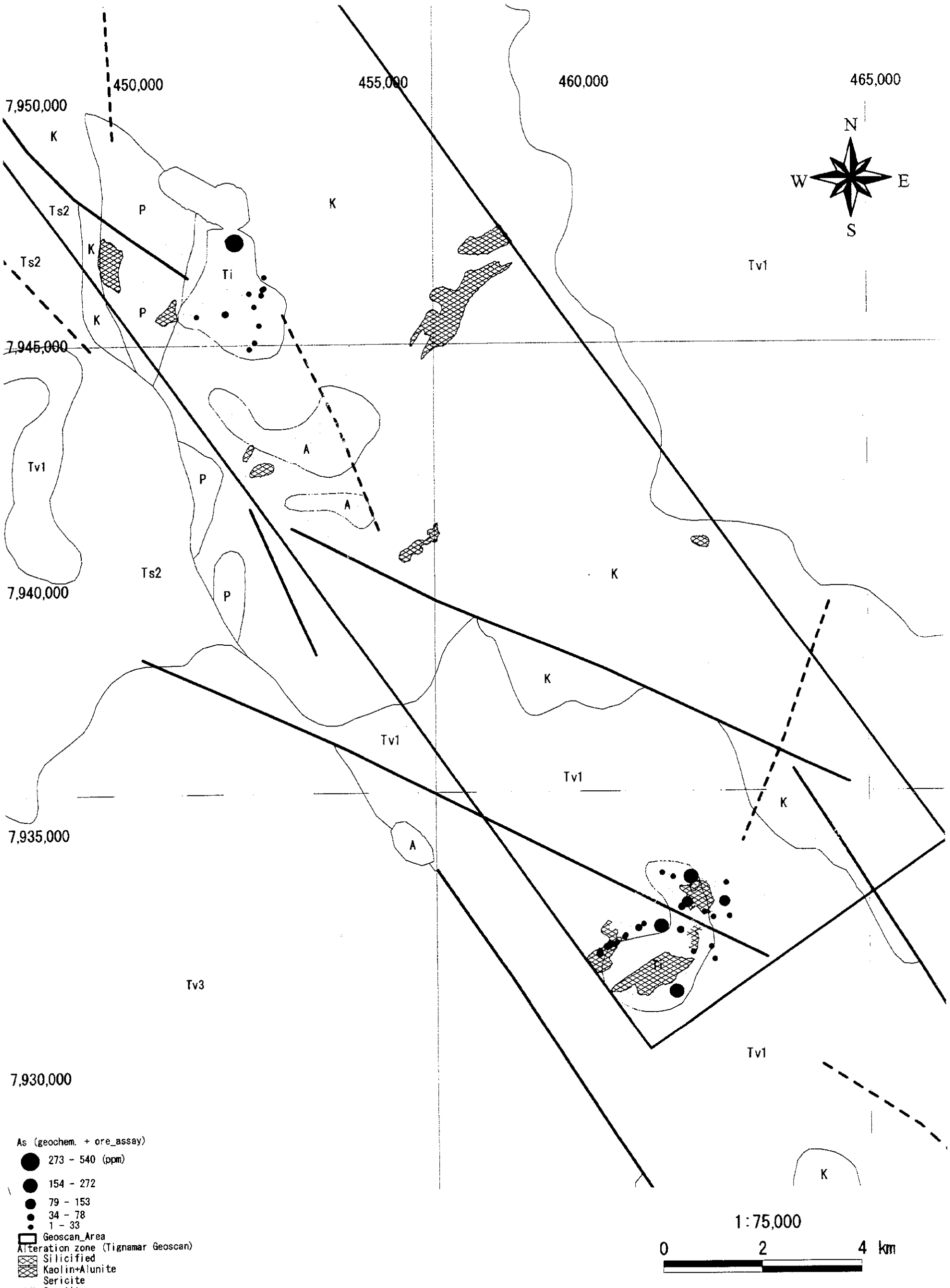


Fig. 2-1-42 (7) Geochemical Anomaly Map in the Tignamar Area (As)

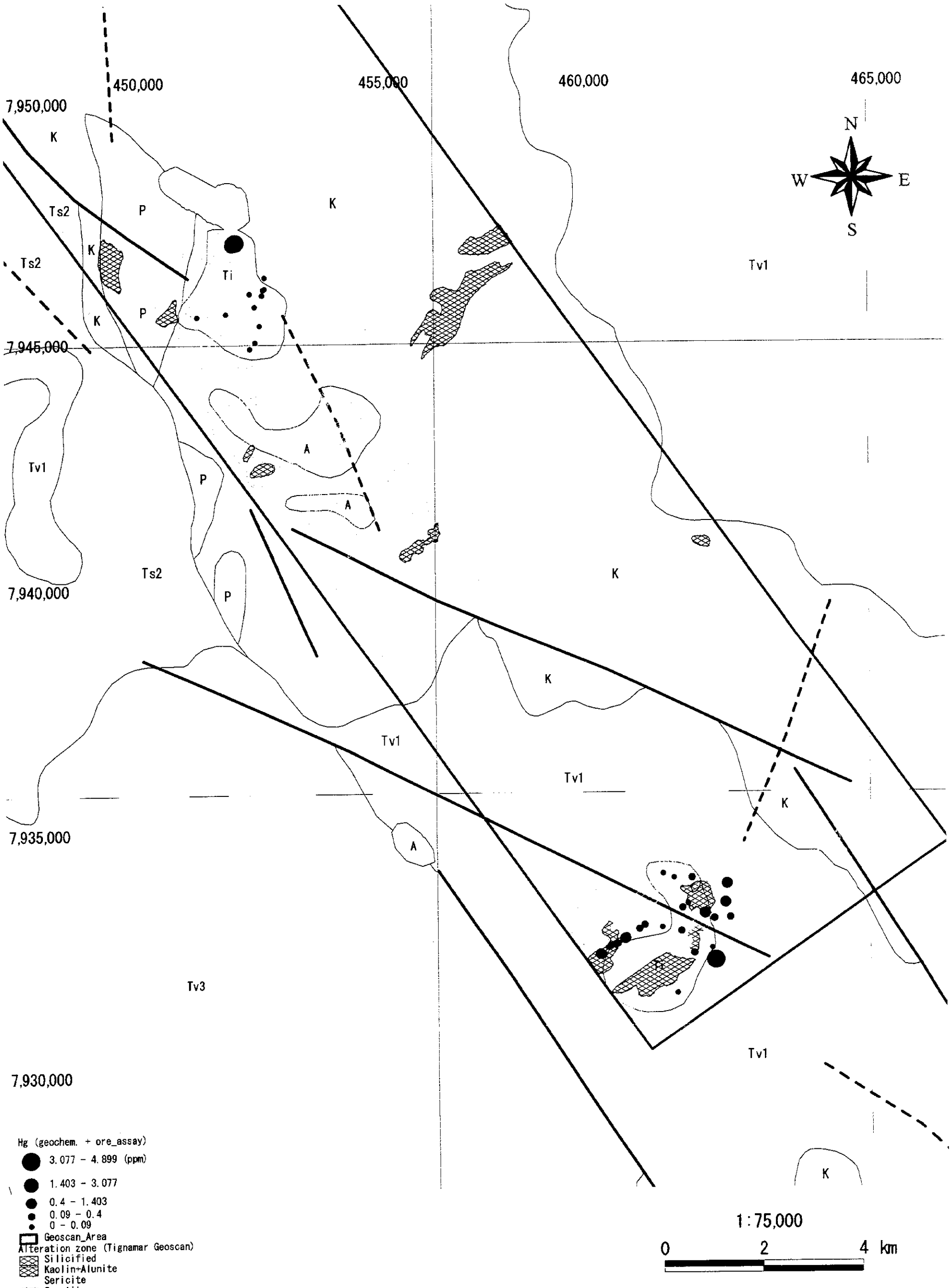


Fig. 2-1-42 (8) Geochemical Anomaly Map in the Tignamar Area (Hg)

The Upper Tertiary System is composed of Miocene-Pliocene rhyolitic~basaltic lava · pyroclastic rocks · ignimbrite and intercalated terrigenous deposits.

The Upper Tertiary-Quaternary System is composed of Pliocene-Pleistocene andesitic~basaltic lava · pyroclastic rocks, and they are intruded by Neogene-Quaternary igneous bodies. These intrusive rocks are dacite~porphyry.

In this area, alteration zone occurs at two localities, one in the northern part and the other in the south.

The northern alteration zones are large and aligned in the NW-SE direction in the granodiorite · porphyry bodies and in the nearby Upper Cretaceous-Lower Tertiary System. The present survey was carried out for the zones on the northern side. This alteration zones consist of silicification, biotitization, sericitization, propylitization and kaolinization. Drilling and shafting have been carried out in parts of these zones. It has been reported that 12m-thick porphyry copper secondary enrichment zone was confirmed by a 30m-deep shaft dug in order to check the orebody encountered by drilling. Green oxidized copper minerals, coarse-grained pyrite accompanied by chalcopyrite, chalcocite-pyrite dissemination, and white coarse crystalline quartz veinlet fragments were found in the dump of this shaft. The vicinity of the shaft is oxidized leached zone consisting of quartz, kaolin, limonite, and hematite with some remnants of tourmaline dissemination · veinlets and quartz veinlets. Fluid inclusions in the quartz veins are gas-liquid two-phase inclusions and their gas-liquid ratio differs by each inclusion indicating hydrothermal boiling. Average homogenization temperature is 290.7℃ and the salinity is 0.40 NaCl wt%, values indicating epithermal mineralization. It is inferred from the boxwork structure of the leached zone, that small amount of copper sulfide minerals and a large amount of pyrite were the primary ore minerals of this zone. Drilling has not been carried out for about 500m east of the shaft. Drilling has been done in many localities beyond 100m south of the shaft, but discovery of ores has not been reported. Propylite zone occurs beyond 500m north of the shaft, and vein-type Ag-Pb-Zn deposit (Santa Rosa mine, presently closed) occur 1.2km northwest of the shaft. The alteration zone to the south of the shaft consists mainly of silicification, sericitization, and tourmalinization with strong limonitization, but on the eastern side biotitization and dissemination of green oxidized copper minerals are observed in propylitized zone (Cretaceous).