REPORT ON GEOLOGICAL SURVEY OF CENTRAL SULAWESI, INDONESIA

Vol. IV

GEOLOGICAL SURVEY

GEOCHEMICAL SURVEY

NOV. 1972.

OVERSEAS TECHNICAL COOPERATION AGENCY
METALLIC MINERALS EXPLORATION AGENCY
GOVERNMENT OF JAPAN

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Preface

In response to a request by the Government of the Republic of Indonesia, the Government of Japan decided to investigate the potential of mineral resources in the Central Sulawesi, Indonesia, and entrusted the survey work to the Overseas Technical Cooperation Agency.

The Agency, considering the importance of the technical nature of the survey work, in turn sought the cooperation of the Metallic Minerals Exploration Agency of Japan (M. M. E. A. J.) to accomplish the task.

The survey work is expected to be carried out over a period of three years, beginning in 1970. M. M. E. A. J. organized a 19-man survey team headed by Mr. Hisashi Takahashi, Chief of the Overseas Department of the M. M. E. A. J. The team was sent to Indonesia from October 29 to December 29, 1971. During this period, the team, with the help of the Government of the Republic of Indonesia and its various agencies, was able to complete survey work on schedule for the current year.

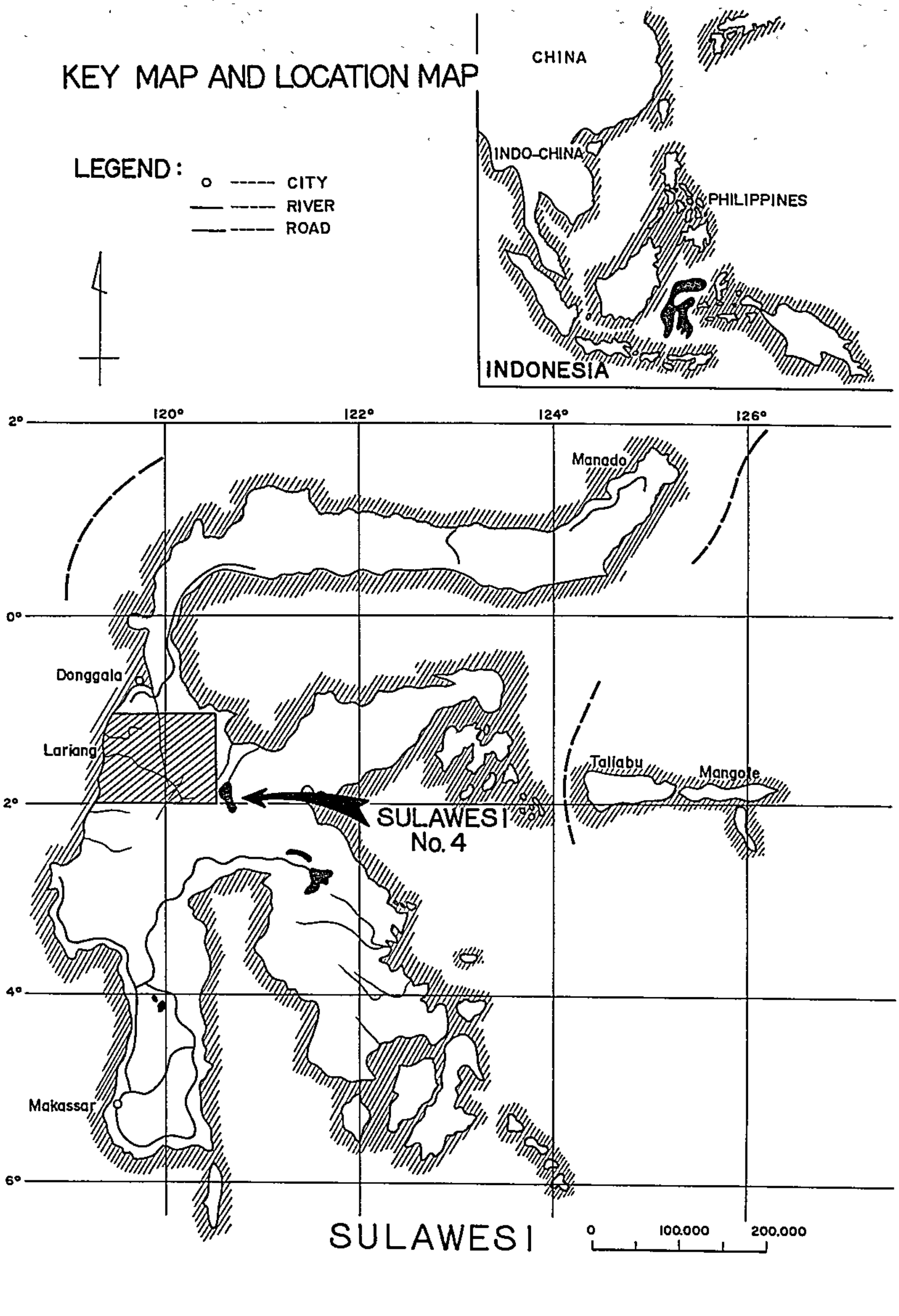
This report summarizes the results of the survey, and will form part of the final survey reports that will be prepared with regard to the results obtained in 1972.

I wish to take this opportunity to express my heartfelt gratitude to the officials of the Government of Indonesia for their wholehearted cooperation and support extended to the Japanese survey team.

November, 1972

Keiichi Tatsuke,
Director General,
Overseas Technical Cooperation
Agency

KEY MAP AND LOCATION MAP



SULAWESI

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Abstract

The purpose of the survey for the current year (fiscal year 1971, this is to be repeated in the following) in Central Sulawesi Province, is to investigate the promise in this area of the high potentiality of mineral resources uncovered by the results of the first year survey and to clarify the mode of ore occurrence. The field survey was carried out from November to December, 1971, and the surveyed area amounted to about 4,600 km^2 (Fig. 1).

The results of the current year survey do not contradict to any great extent those of the previous year survey. In this area, the basement rocks are gneiss, schist and phyllite, intruded by widely distributed granite (Figs. 2, 3). Some andesitic, dacitic and ultrabasic dikes of Late Tertiary to Early Quaternary period are observed. The sedimentation of the S. Tinauka formation, composed of sandstone, conglomerate and pyroclastics, occurred at least after a late stage of igneous activity mentioned above. The Palu Fault observed in the central part of the survey area, and distribution of basements and granites show N - S to NNW - SSE direction (Fig. 9).

Ore deposits in this area have close relation to granite intrusions as suggested in the report of the previous year survey. In the Bomba River and Rio districts, mineralized zones composed mainly of pyrite were sometimes found. These zones occur in the periphery of granitic bodies. Their mother rocks are gneiss and granite in the former district and slate in the latter (Fig. 10). The alterations including mineralized zones are generally very weak. The field observations of the above-mentioned mineralized zones are in good agreement with the results of geochemical survey, on the whole. Pyrite disseminated zones are often recognized

throughout the area, and the detected geochemical anormaly areas amounted to 17 (Figs. 13).

The detail elucidation of the mineralized zones at the Bomba River and at Rio, and geochemical anormaly areas is a future problem. In addition to the above-mentioned elucidation, complementary geological and geochemical surveys in the unsurveyed area are required. In view of difficulty of execution, effectivity and purpose of the present survey, the mineralized zones at the Bomba River and at Rio must be surveyed in the first place. For this purpose, in the third year survey, the mineralized zones should be investigated thoroughly to elucidate the ore scale and the mode of occurrence. For the method of survey, geological survey, geochemical survey, geophysical prospecting (E. M. method, I. P. method) and drilling are desired. It is also to be desired that the survey at S. Bomba mineralized zone be carried out prior to that at Rio mineralized zone.

I GEOLOGICAL SURVEY

1 Introduction

1-1 Purpose of Survey

The purpose of the survey for the current year in Central Sulawesi Province is to investigate the promise in this area of the high potentiality for mineral resources uncovered by the results of the first year survey and to make clear the mode of ore occurrence.

1-2 Period of Survey

The proper field work was done within 42 days from November 10 to December 21, 1971, but the actual stay of Japanese team in Indonesia was 62 days, i. e. from October 29 to December 29, 1971.

1-3 Composition of Survey Team

Management and negotiation party:

Hisashi Takahashi	Metallic Minerals Exploration Agency of Japan.
Yasushi Kanbe	Metallic Minerals Exploration Agency of Japan.
Hironao Suzuki	Overseas Technical Cooperation Agency.
Hardjono	Geological Survey of Indonesia
Toru Ohtagaki	Nikko Exploration & Development Co., Ltd.
Toshio Anzai	Nikko Exploration & Development Co., Ltd.

Field Survey party:

S. Sopu group

Takashi Ono	Nikko Exploration & Development Co., Ltd.
O. Butarbutar	Geological Survey of Indonesia

Mitsugi Nakamura	Nikko Exploration & Development Co. , Ltd.
Lindu group	
Koichi Shinoda	Nikko Exploration & Development Co. , Ltd.
Hanafi Harahap	Geological Survey of Indonesia.
Akitsura Shibuya	Nikko Exploration & Development Co. , Ltd.
Banggaiba group	
Hiroshi Fuchimoto	Nikko Exploration & Development Co. , Ltd.
U. Djumarna	Geological Survey of Indonesia.
Takeo Fukazawa	Nikko Exploration & Development Co. , Ltd.
S. Tinauka group	
Hiroshi Miyajima	Nikko Exploration & Development Co. , Ltd.
D. Sihotang	Geological Survey of Indonesia.
Eiji Hashimoto	Nikko Exploration & Development Co. , Ltd.
Rio group	
Hajime Takahashi	Nikko Exploration & Development Co. , Ltd.
Supardi	Geological Survey of Indonesia.
Atsuo Sasaki	Nikko Exploration & Development Co. , Ltd.
Hiroaki Miyazaki	Nikko Exploration & Development Co.., Ltd.
Gimpubia group	
Akio Shida	Nikko Exploration & Development Co. , Ltd.
Erdita Dipura	Geological Survey of Indonesia.
Shoji Uchiyama	Nikko Exploration & Development Co. , Ltd.
Supply and transportation group	
Nobuaki Kainuma	Nikko Exploration & Development Co. , Ltd.

E. Tjetje Geological Survey of Indonesia.

1-4 Method of Survey

Geological survey

Geochemical survey

1-5 Area of Survey (Fig. 1)

The northward limit:	the south latitude 1^{o}
The southward limit:	the south latitude $1^{o}30'$
The eastward limit:	the east longitude $119^{o}30'$
The westward limit:	the east longitude $120^{o}15'$
Area:	4,600 km^2

six sheets of topographic map (1/50,000, 15-minutes of latitude and longitude)

1-6 Route and Traverse

The followings are routes traversed by each group (along the Palu valley survey was conducted by all groups and other districts by each group):

1	S. Sopu group	Pandere vicinity (Bora - S. Sopu, S. Tongoa district - S. Menou - S. Wuno)	119 km
2	Lindu group	Kulawi vicinity, Salua vicinity (S. Torro - Tomado - S. Bomba - S. Webose - S. Saluki)	124 km
3	Banggaiba group	S. Sapo vicinity (Kulawi - Banggaiba - S. Leo - S. Bopana -	

		Towulu - Kulawi)	85 km
4	S. Tinauka group	The left bank of the Palu valley (Kulawi - Banggaiba - Tinauka - Bangga - S. Sore)	127 km
5	Rio group	The left bank of the Palu valley (Baluase - Rio - Tinauka - Ladundu - Tobi - Watsupo Sampu - Banemarawa - Baluase)	166 km
6	Gimpubia group	The left bank of the Palu valley (Binanga - Gimpubia - Watsupo Sampu - Ponbui - Bonemarawa - Gimpubia)	180 km

Total length of the survey route 801 km

1-7 Process of Survey

The survey area is situated in Central Sulawesi Province. The city of Palu lies about 30 km from the northern border of the investigated area, it is about one hour drive. Kulawi district can be reached by car about 5 to 6 hours from Palu during dry season. This area is 84 km wide from east to west and 55 km long from north to south, and mainly in mountain ranges, which consist principally of Mt. Nokila laki and Mt. Tangkulowi at altitudes above 2,500 m. We cannot find the flat terrain except in the narrowly distributed drainage area of the Palu River running northward through the center of this survey area, in the drainage area of the Sopu River which is a large branch of the Palu River, in the vicinity of the Lindu Lake and in the western coastal plain district. A thick forest favored by the tropical sun and rain covers all of the survey area. Most people live in the fertile Palu valley, while the mountainous areas are left to be terribly undeveloped. Consequently we were troubled because of few available routes for the survey over such a vast mountainous district, which made for hard work and many wasted days. The only accessible road is from Palu to Kulawi which run along the right side of the Palu valley. This road has branch leads to Baluase. A route on which ox-drawn carriages could travel was found only between Bora and Berdikari. Fortunately, however, we found many trodden down places all over the survey area which we made full use of in this roadless terrain. At the same time, boats or canoes were available on the Lindu Lake and the Lariang River. On the other hand, there is no accessible route may be found from the left side of the Palu valley down to the west coast except the bad horse tracks from Binangga to Ponbui via Gimpubia, from Baluase to Rio and following the downward stream of the Lariang river by canoe. Because of these inconveniences, the survey routes and area were sometimes limited. Such parts as the upper stream of the Sopu River and the environs of Mt. Nokila laki and Mt. Tangkulowi were too steep for us to approach. As there was no available track on the right bank of the Pakawa River, it was very difficult to supply materials and food, and we had to give up our survey there.

Followings are the note of our activities during our stay at the field.

November, 7 The main body of the survey team arrived at Palu. Immediately, we began a preliminary investigation for Kulawi and to collect route information.

November, 10 Various materials for the survey were airlifted from Djakarta, and then the actual field survey was started. First, we surveyed along the Palu valley in six groups, and at the same time planned in detail how to carry out surveying in the more remote areas.

November, 18-20 We all stopped surveying and returned to Palu for a big festival after the fast days, and prepared for distant area survey. Unfortunately, the helicopter was not likely to arrive on the scheduled date. Consequently each group arranged new program especially for transportation of supplies and equipments by using local labours. Discussions were held especially on how many poters will be needed included the amount of food supplies and materials for them and also on emergency liaison between each group. Also testing of the wireless apparatus was made before our start. As a result of our discussion, we concluded that we would not be able to exceed on one month in our survey by relying on manpower transportation, because of the small chances of getting food except for the part along the Palu valley, and because we could not expect much materials to be transported by human power under such severe natural conditions.

November, 21 Each group started for Kulawi, Bora, Binanga and Baluase, respetively, transporting materials and food with the aid of ox-drawn carriages, horses, boats and a great number of porters. The porters were 40 ~ 50 in number per group, and one of the groups used more than 20 horses.

In November, the rainy season set in. We had little rain in the low lands along the Palu valley, but in the mountainous district it rained every day. Fortunately, the rain always began to fall from the afternoon, so that each group could carry out the survey in the morning.

December, 7 The first helicopter arrived, and we were able to transport various materials without difficulty. However, owing to bad weather the helicopter was available only in the morning, and it was difficult for the pilot of the helicopter to find the survey team in the jungle. Besides, there were few available places to land except in the neighborhood of villages or dry river-beds. Consequently we failed extending helicopter transportation to the whole area.

In this survey, we organized six groups, each consisting of tow Japanese geologists and a member of the Geological Survey of Indonesia. These three members carried out geological survey and sampling for geochemical survey. Although we had to survey along rivers, for it was one of our purposes to sample alluvial deposits, we could not help taking routes to mountain ridges owing to limited tracks available along rivers or possible risk of flooding encountered in the rainy season. Rock specimens were sampled whenever a different kind of lithological character was found, but we got a small number of samples because of very large lithological units forming the area, which will be described later in this report. We selected principal samples at Palu and carried them back to Japan for laboratory analysis. Each sample was numbered consecutively and initialed showing what group or whom they belonged to. Initials used for each group were as follows:

S. Sopu group	- O, N
Lindu group	- S, B
Banggaiba group	- F, Z
S. Tinauka group	- M, H
Rio group	- K, Y
Gimpubia group	- D, U.

December, 21 The last party returned to the base camp in Palu and this actual field survey ended. The average survey distance of each group was about 4 km per day.

1-8 Bibliography

In this report, the same bibliographies and maps are used or referred to as in the report of the first year.

2 Geology

2-1 Stratigraphy (Figs. 2, 3, 4, 7, 8)

As regards geological stratigraphy, the results of current year's survey are basically identical to that of the previous year only with partial modifications. Through this survey, distribution of the stata and rocks is definitely shown, and the type locality and its nomenclature can be modified appropriately. Each formation will be described in comparison with the result of the previous survey.

2-1-1 G. Nokila laki Gneiss

The G. Nokila laki Gneiss which was named as "Sopu river gneiss group" in the previous report, crops out extensively from the right area of the Palu valley to the Lindu Lake and to Mt. Nokila laki and is widely observed as compared to the previous survey. The gneiss group contacts with granite, schist and the S. Tinauka Formation. The rock is intruded by the granite and is covered by the S. Tinauka Formation in uncomformity. At the right area of the Palu valley, the gneiss group is in contact with the Sidondo Schist but the stratigraphic relation between them is not clear. Its maximum thickness exceeds 1,500 m to 2,000 m. The gneiss group is observed as roof pendant-like, on the whole, and partially as xenolith. In view of lithological character, this group consists mainly of granitic gneiss and biotite gneiss which is considered to be derived from sedimentary rock, and partially of amphibolite or biotite schist. There is no field observation that other strata and rocks are covered by the gneiss and this gneiss has higher metamorphic grade than the other formations. The metamorphosed age can be considered at latest Pre-Miocene, judging from the fact that the metamorphosed gneiss is included in the granite as xenolith.

In this gneiss, intrusive rock which intrudes into other strata and rocks is sometimes observed. It is not suitable to classify this intrusive rock to the G. Nokila laki Gneiss. But, for convenience sake, this rock is classified to this formation. The intrusive rock is lithologically granitic, and dominate around the granitic bodies. It sometimes gradually transformed to granite. The rock, considered as an injection gneiss, intruded probably at the same time as the intrusion of the granite.

2-1-2 Towulu Schist

The rock, named as "Lariang river crystalline schist group" in the previous report develops in the right area of the mid-stream of the Lariang River. The distribution of the Towulu Schist in the present survey area is limited to the southwestern border of it. If further particulars of this rock is needed, refer to the survey report of last year. The metamorphic grade of this rock is higher than the other schist groups and it can be observed to be a gneissose part of it. So the rock is probably older than the other schist groups and differs in origin from the others. But the stratigraphic relations are not precisely understood, because the distribution of it quite differs from that of the others.

2-1-3 S. Rompo Schist

S. Rompo Schist distributes on a small scale in the southeastern part of the survey area. This schist is adjacent to the granite and gneiss groups and the pyroclastic rock of the S. Tinauka Formation. This rocks is intruded by the granite and covered by the S. Tinauka Formation. Relation to the gneiss group is not clear. They are characterized principally by amphibole schist. The metamorphic grade of this schist is generally low as schist and it has hardly lineation. This schist is rich in green coloured minerals rather than the Sidondo Schist, but sometimes biotite schist is found in it. The metamorphic grade of the rock of this schist is higher than that of the Sidondo Schist, but a large difference is not observed. This rock was classified into "Rompo river crystalline schist group" in the previous report. The thickness is estimated to be more than 1,000 m.

2-1-4 Sidondo Schist

The Sidondo Schist corresponds to the schist distributed with N - S trend on both sides of the Palu valley which was named as "Palu river crystalline schist & phyllite group" in the previous report. The distributed area differs little from the results in the previous survey. The rock is often included in granite as xenolith and mainly consists of biotite-quartz schist and partially includes slaty or phyllitic rocks, therefore its metamorphic grade is low as schist. The lineation is scarcely seen. The stratigraphic relation between this Sidondo Schist and the before-mentioned G. Nokila laki Gneiss is not comprehended yet. Slight Difference of metamorphic grade between the two is observed and the former seems to have a lower metamorphic grade than the latter. Judging from the evidence of thermal effects around the granite and xenoliths of this rock in the granite, it is inferred that sedimentation and metamorphism of the rock was formed at latest before granitic intrusion, but the precise geological age is not clear.

2-1-5 S. Pakawa Formation

The S. Pakawa Formation, observed widely from the left side of the Palu valley to the drainage of the Pakawa River in the west, consists of sedimentary rock with N - S trend. This formation is intruded by granite, and is covered by the S. Tinauka

Formation. In this formation, the phyllite member and the shale member is respectively correspond to the last year's "Palu river crystalline schist group" and the "Karangana river formation". According to the survey of the Rio district, phyllitic part are also found in slate. In the phyllitic rock, variations of metamorphic grade are observed so that some of them are often grouped into slate. The phyllite and the slate resemble closely in lithological character enough to be considered as of the same origin and highly-metamorphosed part of it altered into phyllite. There is neither stratigraphical difference between them nor lithological variation according the distance from the granite. The thickness including the slate and the phyllite, attains 6,000 ~ 8,000 m. In view of lithology and metamorphic grade, the geological time of this formation is probably Pre-Tertiary. But finding no fossil, its precise age can not be concluded.

2-1-6 S. Tinauka Formation

This formation which was formerly described as the "Doda formation" distributes widely around the Lindu lake and at the western part of the investigated area spread from the drainage of the Lariang River up to Rio. Although it widely distributed, but owing to the gentle dip, the thickness is estimated only about 50 ~ 200 m. But the thickness at the vicinity of the Tinauka River is more than 500 m. This formation is divided into two groups. One is composed of acidic pyroclastic rock which distributes principally in the side of the Palu valley. The other is normal sediment which distributes principally in the western coastal area. Both are the youngest unconsolidated sediment except the alluvium. The geological time probably ranges from Oligocene to Pleistocene. This formation covers all the other rocks in unconformity except alluvial deposit. Along the Palu valley this formation occurs as if it buried the topographical depression at the time of sedimentation. However, in the vicinity of Rio and the Tinauka River, the distribution area spreads into tops of the present high mountains and so does in the environs of the Lindu Lake. The above-mentioned phenomenon may be caused by the crustal upheaval after sedimentation.

2-1-7 Alluvium

Alluvial deposits is mainly distributed along the downstream of the Palu valley, in the environs of the Lindu Lake, along the midstream of the Sopu River and in the coastal plain formed by the mouth of the Lariang River and Pakawa River. Along the lower course of Palu valley and other rivers flowing down toward the west coast, some alluvial fans and alluvial sedimentary plains are observed. Along the Sopu River, small scale river terraces and talus sediments are observed. The great portion of the alluvial deposits in the vicinity of the Lindu Lake belong to lake deposit.

2-1-8 Intrusives

The distribution of granitic rocks spread over about half of the surveyed area. The locality is roughly divided into three, namely in the environs of Rio (Rio body), along over the left bank of the Palu River (G. Tangkulowi body) and in the province from the Sopu River to the Lindu Lake (Lindu body). Judging from the configuration and the scale which extends beyond the limits of the survey area, this granite is considered as a batholith.

This granite group petrographically consists of granite, granodiorite, adamellite, quartz-diorite, diorite and monzonite and sometimes contains porphyrite. The three bodies may be derived from a same batholith because characteristic difference is not observed among three bodies. They are all fresh and neither altered nor metamorphosed. The result of absolute age determination of the granitic rock of the last survey ranges from Late Neogene to Pleistocene. The rock with N - S general trend, intrudes gneiss, schist and the S. Pakawa Formation and covered by the S. Tinauka Formation and is intruded by the following intrusive rocks.

In addition to granitic rocks, many intrusive rocks are observed in dike shape. They are composed mainly of ultrabasic rock (peridotite etc.), andesite, dacite and rhyolite. The maximum width is about 10 m or so and the length is also small. Directions of individual intrusions are not constant but their ages are quite similar, namely after the intrusion of granite at Late Tertiary to Early Quaternary. So it seems probably to be the same age as that of the acidic pyroclastic rocks of S. Tinauka Formation.

2-1-9 Stratigraphical Relations

Following are the stratigraphical correlation of the above mentioned strata and rocks with the previous year's results.

Survey of 1971	Survey of 1970
Alluvium	Alluvium
S. Tinauka Formation	Doda formation
S. Pakawa Formation	Karangana river formation
Sidondo Schist	Palu river crystalline schist & phyllite group
S. Rompo Schist	Rompo river crystalline schist group

Towulu Schist	Laliang river crystalline schist group
G. Nokila laki Gneiss	Sopu river gneiss group

A description of igneous rocks is omitted in this report, because the results are not beyond the previous one.

2-1-10 Fossils (Table 1)

In this district, fossils can be observed only in siltstone and shale of S. Tinauka Formation. Shell fossils and microfossils (foraminifera) are confirmed according to the present determination which is the same as the previous results. There is nothing further added.

2-1-11 Pollen Analysis (Table 2)

The results of pollen analysis of sandstone, siltstone and shale in the S. Tinauka Formation are shown in Appendix. They are chiefly the results of the analysis of samples collected in Rio and the Tinauka River districts. They show that different paleo-circumstances are inferred even from a same district and same kinds of rocks.

2-2 Rock Descriptions (Table 3)

2-2-1 Gneiss Group

This group contains the main part of the Nolila laki Gneiss. Besides the Nokila laki Gneiss, it occurs as xenolith in granite and as injection gneiss. It is lithologically divided into two large groups namely granitic gneiss and biotite-amphibole gneiss. Granitic gneiss generally forms injection gneiss and distributes widely in the vicinity of granite. As mafic minerals, biotite is predominant and hornblende and pyroxene are also observed. Mineral Assemblages are similar to that of granite and diorite. Garnet, sillimanite and epidote are sometimes found, which are products due to thermal alteration by granites. This rock is so similar to granite in mineral composition and occurs so related to it that this rock sometimes cannot be distinguished from granite in the field survey. Actually, gradual transition zones in which the both vary with gradually each other are found in many cases.

Biotite-amphibole gneiss is widely distributed around G. Nokila laki and often found as xenolith included in granite. Compared with granitic gneiss, this rock is characterized generally by distinct gneissose structure, enrichment of mafic minerals and frequently amphibole, chlorite, epidote and etc. As some of rocks are observed to mediate between the both types and resemble closely the Towulu Schist, to draw a distinct boundary between them is difficult.

Amphibolite consists mainly of common hornblende, chlorite, plagioclase and magnetite. It occurs as a part of xenolith in granite. The occurrence of this rock is the same as that of the gneiss and its distribution is limited, so this rock is described here.

2-2-2 Schist Group

Among the three Schist groups of the Sidondo Schist, the S. Rompo Schist and the Towulu Schist, the Towulu Schist is not clearly understood, because detailed survey was not carried out in this year.

The rock of the Sidondo Schist and the S. Rompo Schist can be classified into two large groups from the view of lithology. One is biotite schist and biotite-quartz schist, which occupies the main part of the Sidondo Schist and is often included in the

Rompo Schist. This rock is hard and fine with well-developed schistose texture, looking black to dark gray coloured to the naked eye, and consists mainly of biotite and quartz, occasionally associated with sericite, chlorite, muscovite, calcite and carbonaceous material. The other is amphibole schist which is observed principally in the S. Rompo Schist, and partially in the Sidondo Schist. This is dark greenish gray to grayish black coloured and fine to medium grained hard rock. This rock is sometimes found even in the G. Nokila laki Gneiss. Such rock is mainly composed of common hornblende and feldspar and in some cases accompanied with biotite, pyroxene and chlorite.

Garnet, which is observed in the schist groups, particularly in the vicinity of boundaries with granite, is probably a product of thermal metamorphism due to the granite intrusion.

2-2-3 Hornfels

This rock occurs exclusively in the periphery of granite bodies, and is from several meters to less than twenty meters wide or so. It is well observed in the S. Pakawa Formation and also at the contact part of granite either with schist or with gneiss. This rock consists mainly of biotite hornfels. In appearance, it is a purplish green colour and compact. Garnet, sillimanite and muscovite are often observed in it.

2-2-4 Rock of the S. Pakawa Formation

The slate which is most commonly observed in this formation shows black colour and has a fine grained compact nature. It consists chiefly of quartz, chlorite and feldspar associated with sericite, carbonaceous material. It is sometimes calcareous.

Phyllite consists mainly of such principal rock forming minerals as contained in the before-mentioned slate and is observed to include biotite therein.

Sandstone and chert in this group are well observed in the vicinity of Watsupo Sampu, which is compact, medium grained and grayish green to blackish gray coloured and which consists mainly of quartz with chlorite, epidote, calcite and limonite. Andesitic tuff is also found in the vicinity of Watsupo Sampu.

2-2-5 Pyroclastic Rock of the S. Tinauka Formation

This rock is limited along the Palu valley and in the northern part of the Lindu Lake. It consists mainly of dacitic or rhyolitic tuff and, in part, of tuff breccia and lava. This rock is relatively soft and white and at times green coloured mineral (chlorite) is found. Fragments of tuff breccia are almost accidental which are composed of sandstone, slate and schist.

2-2-6 Normal sediment of the S. Tinauka Formation

The normal sediment occupies the greater part of the S. Tinauka Formation and is distributed thickly and widely especially from Rio to the Lariang River. This rock is relatively soft and unaltered on the whole, consisting of comglomerate, sandstone, siltstone and shale. Fragments of conglomerate are composed mainly of slate and granite. Its matrix is in many cases tuffaceous or sandy along the Palu valley and muddy in the western part. The diameters of fragments are generally large, attaining to 10 ~ 30 cm. Repetition of alternations of sandstone, shale and conglomerate is observed.

In the environs of Ladundu, an elevated coral reef develops attaining to a mountain top of an altitude of several hundred meters. Shale is sometimes interbedded in it. This elevated coral reef is considered as a member of the Tinauka Formation. The coral reef is very locally distributed so that we did not discover it when going toward the north across the Pakawa River or descending the Tinauka river to the south.

2-2-7 Alluvial Deposit

The description of this deposit is omitted, because there is no newly-found observation beyond the report of last year.

2-2-8 Granite Group

This group is classified into many rock facies from the viewpoint of composition and texture, namely, granite, granite porphyry, adamellite, granodiorite, granodiorite prophyry, diorite, diorite porphyry, quartz diorite (including tonalite), quartz diorite porphyry, monzonite, monzonite porphyry and prophyry. The description of each rock facies is shown in Table 3 of Appendix, which is summarized as follows.

In general character, there is less difference observed between the rock facies. The large part of the rock is fresh and only a small part of it is altered. As previously mentioned, the granite in this district can be classified into three bodies. It is one of the characteristics that we cannot recognize the lithologic difference among those three bodies. Namely in the previous survey, it was reported that Rio body, Lindu body and G. Tangkulowi body are characterized by hornblende granite, biotite granite and biotite-hornblende granite, respectively. The present survey, however, shows that biotite granite develops in all bodies. Relations between lithofacies and bodies turn out to be indistinct.

The occurrences of each rock facies are as follow. The granite consists of biotite granite, biotite-hornblende granite and hornblende granite, all of which are distributed in this area.

The granite porphyry also has the same distribution and mineral composition as the granite. It is characterized by large phenocrysts of feldspar (more than 10 cm).

Granodiorite is limitedly exposed only in a part of the Lindu body.

Diorite distributes extensively and comprises mainly hornblende diorite. It is sometimes accompanied by biotite.

Quartz diorite and tonalite, which are observed in the G. Tangkulowi body and in the western part of the Lindu body, consist chiefly of biotite and hornblende with porphyritic parts.

As for monzonite, adamellite and monzonite porphyry, principal mafic minerals of them are biotite and hornblende and they are comprized mainly in the Lindu body.

Mineral assemblages of the granite group are mainly plagioclase, orthoclase, quartz, biotite and hornblende, accompanied with titanite, magnetite, apatite and hematite. In many cases, they are also accompanied by iron sulphide, especially in the Lindu and the Rio body. Altered minerals such as kaolinite, chlorite, calcite, sericite, epidote and limonite are commonly recognized, though small amount.

The above-mentioned bodies always include a gneissose part which may be regarded as injection gneiss. Boundaries of granite and other rocks are already described in the paragraph of hornfels. In the Rio body, the preferred orientation of mafic minerals (ex. hornblende) is partially observed, which develops especially from Bonemarawa to Rio Pontroveti. This rock was tentatively called "banded granite" during the survey. This belongs to hornblende granite, and extensively distributes, so it cannot be considered the same as injection gneiss found in the other areas.

We have at present no evidence to conclude whether the preferred orientation is caused by metamorphism or shows flow structure of the granite intrusion.

2-2-9 Andesite

Andesite dikes are distributed widely over the area. They consist of many kinds of andesitic rocks such as hornblende andesite, biotite-pyroxene andesite and pyroxene andesite. They are small in scale and scarcely altered.

2-2-10 Dacite and Rhyolite

This rocks are not only found in dike form in small scale, but also exposed widely in the northern part of the Lindu Lake. The occurrence of the latter is not clarified in many points, as the present surveys were in sufficient in this respect. Principal mafic minerals of the former is characterized by hornblende and biotite. It is compact and not altered, having a hard appearence.

2-2-11 Ultrabasic Rock Group

This group is distributed in several areas as small dikes intersecting granite (Lindu body), and composed mainly of peridotite and sometimes of gabbro and hornblendite as well. Mineral assemblages are olivine and pyroxene, associated with chromite, serpentine and magnetite. Chemical weathering has not progressed to a great extent.

This rock is different from the ultrabasic rock in the western Sulawesi district in the mode of occurrence, scale and age. This rock is not expected to develop extensively.

2-3 Geological Structure (Fig. 9)

2-3-1 Structure of metamorphic rock and sedimentary rock

The metamorphic rocks in this survey area have a general trend of N - S or NW - SE direction, and the S. Pakawa Formation and the schist groups run parallel to it. The S. Pakawa Formation inclines to the east for the most part and to the west in some parts having a dip of $30^{o} \sim 60^{o}$, representing repeated fold. The Sidondo-and the S. Rompo Schist incline to the west in general.

On the other hand, the S. Tinauka Formation shows a fairly gentle dip angle, which suggests a different mode of sedimentation as compared to the above-mentioned rocks. This rock is in general distributed in a topographical depression, but is quite often observed even on the top of mountains with high altitude, which intimates the presence of recent structural movement (Quaternary). This structural movement should be considered not to be in folds, but to be uplifted, judging from the S. Tinauka Formation dipping gently and not being metamorphosed. This structural movement is supposed to have a close relation to Fossa Sarasina (or Palu Fault) in the central part of the survey area and also to the median tectonic line recognized in the eastern part of this area.

2-3-2 Relation of Igneous Rocks and Geological Structures

The distribution of granite which occupies a greater part of this area, has a N - S trend. The trend of intrusion of each granitic body and the zoning on the basis of mineralogical and lithological facies of granite cannot be made clear, based on our survey at this time. As for the other igneous rocks such as andesite, dacite, rhyolite and peridotite, the trends of distribution are various.

These intrusive rocks and xenolithes of slates included in granites are frequently observed along the Palu valley, implying that a strong structural movement occurred along the Palu valley.

2-3-3 Fault

A large fault which is named Fossa Sarasina (or Palu Fault) runs along the Palu valley. This fault could not be exposed anywhere, also strata on both sides of the fault differ much with each other, therefore it is difficult to estimate the transposition of the fault. However, considering the distribution of strata and the igneous activity along the both sides of this fault, there is no doubt that this fault holds an important position in geological structure of this area. This fault has a trend of NNW - SSE in accordance with the general geological structure of this area. Other small faults were found, but none of them are important in the scale or transposition.

As mentioned before, geological structure established by the previous survey remains almost unchanged by this survey. One of the reasons may be due to the lack of minute data available from the survey carried out, but basically the geology of this area is very simple because the geological structures are almost wholly controled by the younger movement.

2-3-4 Structural History

We will only enumerate the essential points of history in geological structure here, because the results of this survey do not differ so much as compared with the results of the previous one. The basement of the area is composed of the gneiss group and the schist group. Among these metamorphic rocks, the G. Nokila laki Gneiss and the Towulu Schist have a high grade of metamorphism. The S. Rompo Schist and the Sidondo Schist are regarded to be of about as old as each other. The S. Pakawa Formation is probably Late Mesozoic sediment from the viewpoints of consolidation and metamorphic grade, though this is not definitely concluded. The S. Pakawa Formation and the metamorphic rock groups such as schist groups of the Sidondo and the S. Rompo including the gneiss group may be possibly inferred to belong to the same period. Supposing the metamorphic grade becomes gradually higher to the east and on the other hand lower to the west (actually such a tendency is observed), there are no grounds for denying the assumption that these groups belong to the same horizon as they are alike lithologically and structurally.

Original structure of the Pre-Tertiary sediments was vanished by the Neogene granitic intrusion which started at Late Neogene and finished by Early Quaternary. The granitic batholith plays the leading role of making geological structures in this area. The trend of intrusive rocks, distribution of the Pre-Tertiary sediments and faults are uniformly the same, all showing N - S system, and the trend can be considered as the general one of the Palu zone in Sulawesi. This trend was probably fixed at the beginning of the intrusive activities of granite. Original features of the Palu Fault possibly started to form at the time of intrusion of granite, and its movement continued for a long time even after the intrusion of granite and has continued up to date. It is presumed that oscillatory movement in this area continued also after the deposition of the S. Tinauka Formation and played a part in this faulting movement. After the granite intrusion, various kinds of rocks intruded around the Palu Fault, and at the same time the sedimentation of the S. Tinauka Formation started, which probably continued to Pleistocene. The sedimentary environment is neritic or lacustrine. After the deposition of this formation, namely, as late as early Recent, a part of the S. Tinauka Formation was uplifted to high ground owing to large scaled oscillatory movement.

In conclusion, present geological structure was formed during a relatively short time from Miocene to Pleistocene, and at the same time the previous structure almost disappeared by this movement.

3 Ore Deposits

3-1 Alteration (Fig. 10, Tables 4, 5)

The alteration in the present survey area is generally weak. The kinds of alteration are limited to chloritization, kaolinitization, sericitization and carbonitization.

The alteration which occurred in this area probably was associated with the intrusion of granite. Hydrothermal alteration is hardly observed. Although many sulphide disseminated zones are recognized in the area, remarkably altered zone cannot be observed even in such disseminated zones. Microscopic observation suggests that the rock forming minerals around sulphide minerals are not altered. It is commonly found that sulphide minerals (pyrite etc.) are altered to hydroxides such as limonite. Sulphide disseminated zones were probably formed by mineralized activity with local pyritization due to hydrothermal processes as well.

3-2 Mineralized Zone (Fig. 10)

Some mineralized zones were found along the Sopu River at the time of the previous survey. The present survey has put emphasis on the investigation of the environs of granite, including this disseminated zone as well. The following are the results of present survey for mineralized zones.

3-2-1 S. Bomba Mineralized Zone

Mineralized zones recognized in the previous survey were very low in ore grade as far as we could observe. At that time a detailed survey on these zones was proposed as an important subject for the next survey. In this survey, a mineralized zone was newly discovered around the Bomba River and the Webose River in the east of the Lindu Lake, in addition, locally a small zone was found in the north of the Lindu Lake

(S. Watubose). The mother rock of the mineralized zones is the G. Nokila laki Gneiss and the rock type is biotite gneiss and biotite-amphibole gneiss. Granites intrude in this rock as stocks 10 ~ 50 m in diameter. Gneiss suffers thermal effects around the granite bodies being low in grade and small in scale. The mineralized zone occurs in gneiss around the granite principally in small veins or disseminated forms extending scores of meters in width. Disseminated zones are also observed in small granitic (partially monzonitic) stocks. Their metallic minerals consist mainly of pyrite, accompanied with a very small quantity of chalcopyrite and sphalerite as well, though they are invisible with the naked eye. The S content in the high grade ores is at maximum about 6%, but in ordinary ores about 1%, and Cu and Zn maximum contents 0.14% and 0.12%, respectively. Several disseminated zones are observed also along the Sopu River like the above-mentioned zones. They are scattered on a small scale and in addition, low in S grade.

Although the disseminated zone in the east of the Lindu Lake is probably not worth mining as it stands now, it is the most interesting one in this area in view of the following reasons.

1. The scale of the mineralized zone is large.
2. This mineralization is caused by intrusion of granite. Inferring from other examples, it is possible for the zone to develop as a favorable ore deposit.
3. There remains a possiblity of discovering higher grade parts of ore deposit in future. Because we can reveal only one part of the mineralized zone in this survey.

3-2-2 Rio Mineralized Zone

A large disseminated zone was found as a result of the present survey, which reaches Rio Pontroveti, Tobi, Ladundu and the Mantonge River. The rocks in this area consist mainly of slate of the S. Pakawa Formation and granite (Rio body), the latter being distributed extensively intruding slate of the S. Pakawa Formation. The Rio mineralized zone, of which mother rock is slate of the S. Pakawa Formation, is observed around granite. The slate suffers thermal effects around the granite in general. This zone is composed of sulphide minerals, in which limonitization of sulphide minerals is also often found. The mineralized zone was found to exist mainly in a succesion of boulders. Although the detailed survey was not carried out, the zone is observed to run about 10 km off and on from the Mantonge River to Rio Pontroveti with a N - S trend. A small scale mineralized zone occurs in the northern part of Ladundu, though sufficient data is not available. It is made up mainly of pyrite, of which crystals sometimes grow to 1 ~ 2 cm. In this zone other kinds of minerals cannot be seen with the naked eye. The S content grade is 1 % or so.

The Rio mineralized zone is considered inferior to the S. Bomba mineralized zone, because it is limited around the granite, not extending inside the granite body, and accompanied only with pyrite.

3-2-3 Mineralized Zone in Other Areas

Pyrite disseminated zones in general occur in this area, most of which are around granite bodies and probably have the same origin as mentioned above. These are composed only of pyrite as well, which is distributed in schist and slate as dissemination form. The content is very small in amount and is scattered as compared with the former two disseminated zones. The scale is unknown. These are not valuable ore deposits for mining, but extensively distributed and will serve as an important proof that granite generally accompanies mineralization.

3-3 Hot Spring

Several hot springs were recognized in the same way as at the time of the previous survey. Most of them are found along the Palu valley and a few observed along the tributaries of the Sopu River. Their distribution suggests that these springs were probably caused by fracturing of the Palu Fault.

II GEOCHEMICAL SURVEY

1 Sampling of Specimens

The geochemical survey was carried out in an area 4,600 km^2, which was selected on the basis of the results of the previous survey. The purpose was to point out the part having the greatest potentiality of metallic mineral resources by examining metallic content in stream sediments (sands) and soils. Total number of samples collected is 3,749, consisting of 2,990 numbers of stream sediment and 759 numbers of soil sample.

Methods of Sampling

Basically, sample is taken for every area of 0.8 km^2 and the traverse is properly selected in order to cover the area as complete as possible. Collections were executed along with the geological survey (Figs. 11, 12).

We carried out the field survey with the use of topographic maps on a scale of 1/50,000. The results of survey were summarized in a map on a scale of 1/150,000 reduced from the map of 1/50,000.

Specimens were collected in the lower course of tributaries at a short distance from the junction with the main stream on the selected route and also at every 500 m interval at the main stream. The samples were taken at a location where stream sediment at the river bottom is fine or at a sand bank where there is no possibility of soil mixing from either side of the banks. Stream sediments were scooped by hand and screened by the stainless screen on the site. If collecting samples was difficult owing to too much current, we subsituted the flood deposits for stream sediments.

In the districts that had no rivers on the survey route, we collected specimens in which humic soil was completely removed, of more than 500 g mainly using a hammer for geological survey. These specimens were screened under 80 mesh or smaller (or under 50 mesh when specimens smaller than 80 mesh were unavailable), and then treated to over 200 mesh at the site.

2 Choice of Indicator Elements

As the area has never been explored before, it is necessary in the first place to select indicator elements for geochemical survey. The first step was to carry out the analysis of multi-compositions and next to investigate the geochemical anomaly area indicated by the selected elements.

Stream sediment samples numbering 245 and soil samples of 147, so 388 in all, representing 10% of the total samples, were picked out in average proportion to the whole area and were examined by emission spectroscopic analysis. The number of elements analysed are 20 as follows:

Co, Zr, Ti, Zn, Na, Cu, Ag, V, Al, Ni, Fe, Ga, Si, Mg, Cr, Pb, Mn, P, B and Mo.

Following are the conditions of emission spectroscopic analysis.

A) Apparatus

(Spectroscope): SHIMAZU Quartz Spectrography (QL-170)

(Emission apparatus): Universal Emission Apparatus of NAKANO Electric Industry Co., Ltd.

(Measurement apparatus): SHIMAZU Spectroscopic Photo-Projection

B) Measurement conditions

width of slit: 12μ

height of slit: 2 mm

duration of emission: 70 sec

voltage: 200 voltages

current: 7 ~ 8 amperes

electrode: HITACHI R-grade Graphite Electrode 5 ϕ X 20 mm

anode: 3.5 X 2 mm formed

cathode: carbon electrode

dry-plate: FUJI Procesose

condition of developing: developer: FO-131

duration: 4 minutes

liquid temperature: 20°C

condition of fixation: fixer: FF-H4

duration: 5 minutes

liquid temperature: 20°C

measurement range: 2,300 ~ 4,400 Å

measurement method: indicated by classifying the intensity of spectral line into seven, 0, 1, 2, 3, 4, 5 and >5 with the naked eye.

C) Photographing

D. C. spark source arc method

According to this procedure, semiquantitative spectroscopic analysis was carried out for the 20 elements detected in the range from 2,300 to 4,400 Å.

The results of the examinations are shown in Appendix (Table 6-1).

According to these results, 20 elements can be divided into the following 4 points.

A) very little and undetectable

Ag, P, Mo

B) detectable but unvariable

Ti, Ga, B, Mn, V

C) generally included in rocks in large quantities

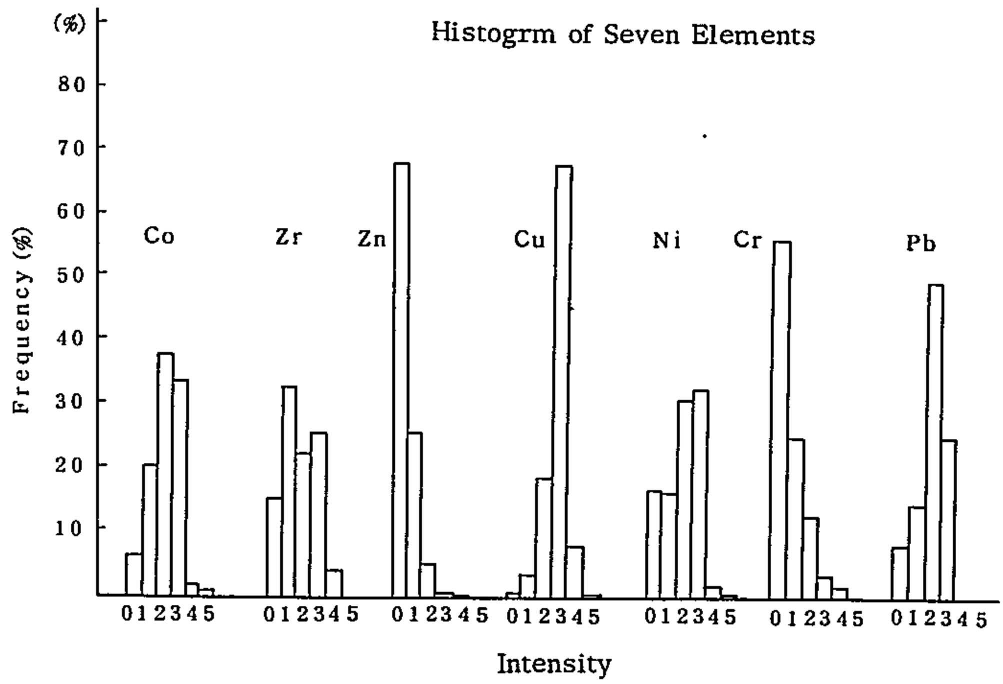
Na, Al, Fe, Si, Mg

D) content proper and considerably variable

Co, Zr, Zn, Cu, Ni, Cr, Pb

Elements grouped in A, B and C are not suitable for indicator elements and considered not to be worthy of analysis. Histogram is drawn only for D group as shown in this page, whereby we reviewed to point out the most suitable elements for indicator elements. Cu and Pb represent nearly normal distributions and are considered to be most suitable elements for the interpretation of geochemical survey results as convenient for statistical analysis in case the present samples are treated as belonging to a same population. The results of the present survey prove that any promising ore deposits expected in the area would contact metasomatic deposits around granite, porphyry copper deposits and vein type ore deposits, and from this point, Cu and Pb are most effective indicators for the choice of promising areas.

Though we have no conclusive factor to select another element, Zn is selected for tracer which is generally used for the geochemical prospecting.



3 Treatment of Indicator Elements

3-1 Analytical Technique

Quantitative analysis for all samples was made by the atomic absorption spectrography regards the selected elements as described before.

The conditions of the atomic absorption spectral analysis:

A) Apparatus

HITACHI 208 type Atomic Absorption Spectrophotometer

B) Sample treatment

1 g of sample was weighed and 10 cc of dilute aqua regia ($HCl : HNO_3 : H_2O = 3 : 2 : 3$) added. The mixture was warmed on a sand bath and evaporated until dry. After cooling the residue was moistened again with 5cc of dilute aqua regia and warmed until dissolved. Distilled water was added to the solution and diluted to 50 cc. After being filtered, Cu, Pb and Zn in the filtrate were measured by the atomic absorption spectrophotometer.

C) Measuring wave length

Cu	3247 Å
Pb	2833 Å
Zn	2138 Å

Analytical results are summarized in Appendix (Table 6-2).

3-2 Method of Analysis

The interpretation of analyzed value was executed for the following three groups,

(A) stream sediment : 50 ~ 100 mesh ("C" for short)

(B) stream sediment : – 100 mesh ("F" for short)

(C) soil : ("S" for short)

Flood plain deposit was treated as soil in general though the mode of displacements is different from stream sediment and soil.

The specimens were grouped according to the geology of the sampling location. The content of individual samples for geochemical survey was compared with that of typical rocks in the same geological group.

Background of the indicator elements varies according to geological condition, so, it is considered that the anomaly on the basis of mineralization also varies according to them. The above-mentioned method was adopted to determine the background and anomaly on the basis of the geological condition, and to investigate the correctness of background comparing with the content of indicator elements in rocks. On the basis of the geological map rocks are divided into 7 groups: Tertiary sedimentary rock, slate, phyllite, schist, gneiss, granite and the others.

Although there are various methods for the geochemical analysis, the following methods were adopted in here.

threshold value for stream sediment is equal to average plus double standard deviation, and

threshold value for soil is equal to three times standard deviation, which was introduced for the statistical reasons due to the scarcity of actual samples.

Definite method of stream sediment analysis is shown as follows. Standard deviation (σ) is obtained on the basis of the following equation.

$$\sigma = \sqrt{\frac{\Sigma f_i(x_i - \bar{x})^2}{N}} \qquad (1)$$

where

f_i : number of samples of individual rank

x_i : average content of individual rank

$\bar{x}$: average content of total samples

N : number of total samples

If we adopt only ($\bar{x} + 2\sigma$) as threshold value for stream sediment, the anomaly is isolated due to the scarcity of sampling frequency.

The analysis for stream sediment was therefore progressed under modified conditions as follows:

threshold value of the first class anomaly: $\bar{x} + 2\sigma$

threshold value of the second class anomaly: the value to 5% of the total from the maximum,

threshold value of the third class anomaly: the value to 10% of the total from the maximum.

Following are the analytical results for Cu of 50 ~ 100 mesh samples in the slate prevailing area.

Value ppm	Number of samples (f_i)	Accumulated frequency		$(x_i - \bar{x})$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$
		Number	%			
70 - 79	2	2	0.9	47.8	2,284.8	4,569.7
60 - 69	3	5	2.3	37.8	1,428.8	4,286.5
50 - 59	8	13	6.1	27.8	772.8	6,182.7
40 - 49	23	36	16.8	17.8	316.8	7,282.3
30 - 39	53	89	41.6	7.8	60.8	3,224.5
20 - 29	53	142	66.4	- 2.2	4.8	256.5
10 - 19	46	188	87.9	- 12.2	148.8	6,846.6
1 - 9	26	214	100.0	- 22.2	492.8	12,813.8

$\bar{x} = 27.2$ $\qquad \Sigma f_i (x_i - \bar{x})^2 = 45,467.8$

$$\sigma = \sqrt{\frac{\Sigma f_i (x_i - \bar{x})^2}{N}} = \sqrt{\frac{45,467.8}{214}} = 14.6$$

$\bar{x} + 2\sigma = 27.2 + 29.2 = 56.4$ ppm $\fallingdotseq 56$ppm

threshold value of the first class anomaly 56 ppm

threshold value of the second class anomaly 53 ppm

threshold value of the third class anomaly 46 ppm

Note: the second and the third class anomalies were obtained by proportional allotment procedure.

In the case of soil, we first calculated the average content ($\bar{x}$) and divided anomaly range into the following 3 classes.

threshold value of the first class anomaly $3\bar{x}$

threshold value of the second class anomaly $2.5\bar{x}$

threshold value of the third class anomaly $2\bar{x}$

Following are the threshold values on the basis of the above mentioned conditions.

Threshold value of soil samples

element	geological unit \ anomaly	first class	second class	third class
		ppm	ppm	ppm
Cu	1) S. Tinauka Formation	70	58	47
	2) slate of S. Pakawa Formation	99	83	66
	3) phyllite of S. Pakawa Formation	64	57	52
	4) Sidondo, S. Rompo & Towulu Schist	81	67	54
	5) G. Nokila laki Gneiss	51	42	34
	6) Granite	64	53	43
	7) others	62	60	56
Pb	1) S. Tinauka Formation	47	44	37
	2) slate of S. Pakawa Formation	43	37	31
	3) phyllite of S. Pakawa Formation	46	38	31
	4) Sidondo, S. Rompo & Towulu Schist	46	38	30
	5) G. Nokila laki Gneiss	46	39	31
	6) Granite	52	45	41
	7) others	49	45	39
Zn	1) S. Tinauka Formation	69	67	61
	2) slate of S. Pakawa Formation	162	135	108
	3) phyllite of S. Pakawa Formation	188	156	125
	4) Sidondo, S. Rompo & Towulu Schist	196	163	131
	5) G. Nokila laki Gneiss	150	125	100
	6) Granite	82	75	64
	7) others	93	87	79

Threshold value of stream sediment samples (- 100 mesh)

element	anomaly / geological unit	first class	second class	third class
		ppm	ppm	ppm
Cu	1) S. Tinauka Formation	67	51	39
	2) slate of S. Pakawa Formation	59	54	49
	3) phyllite of S. Pakawa Formation	61	—	53
	4) Sidondo, S. Rompo & Towulu Schist	45	42	39
	5) G. Nokila laki Gneiss	42	—	37
	6) Granite	49	39	30
	7) others	51	—	39
Pb	1) S. Tinauka Formation	26	—	21
	2) slate of S. Pakawa Formation	35	31	27
	3) phyllite of S. Pakawa Formation	34	29	27
	4) Sidondo, S. Rompo & Towulu Schist	35	33	28
	5) G. Nokila laki Gneiss	53	48	38
	6) Granite	60	55	35
	7) others	34	—	28
Zn	1) S. Tinauka Formation	72	—	65
	2) slate of S. Pakawa Formation	97	89	81
	3) phyllite of S. Pakawa Formation	107	99	97
	4) Sidondo, S. Rompo & Towulu Schist	95	89	85
	5) G. Nokila laki Gneiss	70	69	61
	6) Granite	68	66	58
	7) others	92	91	79

Threshold value of stream sediment samples (50 ~ 100 mesh)

element	anomaly / geological unit	first class	second class	third class
		ppm	ppm	ppm
Cu	1) S. Tinauka Formation	34	—	30
	2) slate of S. Pakawa Formation	56	53	46
	3) phyllite of S. Pakawa Formation	62	58	53
	4) Sidondo, S. Rompo & Towulu Schist	32	30	29
	5) G. Nokila laki Gneiss	23	—	19
	6) Granite	26	—	22
	7) others	43	39	34
Pb	1) S. Tinauka Formation	23	20	19
	2) slate of S. Pakawa Formation	27	25	20
	3) phyllite of S. Palawa Formation	31	30	27
	4) Sidondo, S. Rompo & Towulu Schist	26	—	22
	5) G. Nokila laki Gneiss	32	30	25
	6) Granite	37	—	27
	7) others	69	60	59
Zn	1) S. Tinauka Formation	71	—	66
	2) slate of S. Pakawa Formation	100	88	81
	3) phyllite of S. Pakawa Formation	103	98	96
	4) Sidondo, S. Rompo & Towulu Schist	96	88	85
	5) G. Nokila laki Geniss	72	67	60
	6) Granite	68	66	58
	7) others	92	90	78

In the case of stream sediment, among the values obtained in this way, some examples are revealed in which the threshold value of the first class anomaly is equal to the threshold value of the second class anomaly or the former is smaller than the latter. This is caused by the different statistical methods used, but this will not cause any problem in the analysis of geochemical surveys. In such case, we used $(\bar{x} + 2\sigma)$ for the threshold value of the first class anomaly and disregard the second class one.

The contents of Cu, Pb and Zn of each specimen of the representative rocks, stream sediments and soils of each geological unit are summarized in the table of 46 page.

The representative rocks show a decided difference in the values of identical elements of each geological unit. Namely, high values were shown by the S. Tinauka Formation, the slate of the S. Pakawa Formation (hereafter noted as "slate"), the phyllite of the S. Pakawa Formation (hereafter noted as "phyllite") and the Sidondo, S. Rompo and Towulu Schist (hereafter noted as "Schist"). The G. Nokila laki Gneiss (hereafter noted as "Gneiss") and Granite show low values. Making a study of the relative values of elements of the same geological unit, all show high concentrations of Zn, with the exception of Granite, followed by Cu and Pb in descending order. Granite alone shows high values of Zn, Pb and Cu in descending order.

Also, with regard to stream sediments and soils - with a few exceptions - trends are the same as those observed in the case of the aforementioned representative rocks. In other words, in regard to the elements of each geological unit, high values of Cu and Zn are shown by phyllite, Schist and slate, followed by the S. Tinauka Formation, Gneiss and Granite in descending order. In the case of Pb, notable differences are not observable with the exception of phyllite which shows a relatively high value. A study of the relative value of elements of the identical geological units shows the same trends as in the case of the representative rocks.

Consequently, we have come to the conclusion that the average contents of the stream sediments and soils gained by treatment during this time, show their backgrounds correctly.

Therefore, the before-mentioned threshold values calculated on the basis of the average content of the specimens, can be judged as suitable.

Comparative table between contents of indicator elements included in rocks and specimens

geological unit	sample name	Cu	Pb	Zn
		ppm	ppm	ppm
S. Tinauka Formation	rock (M-69)	41	16	92
	rock (M-79)	22	23	64
	stream sediment 50# ~ 100# (average)	18	11	44
	" - 100# (average)	24	12	47
	soil (average)	24	19	31
slate of S. Pakawa Formation	rock (D-357)	43	16	112
	rock (D-414)	35	19	124
	stream sediment 50# ~ 100# (average)	27	11	58
	" - 100# (average)	31	13	57
	soil (average)	33	16	54
phyllite of S. Pakawa Formation	rock (D-310)	55	21	106
	rock (D-321)	34	18	111
	stream sediment 50# ~ 100# (average)	37	17	87
	" - 100# (average)	34	18	80
	soil (average)	26	16	63
Sidondo, S. Rompo & Towulu Schist	rock (S-34)	50	30	100
	rock (S-35)	38	4	36
	stream sediment 50# ~ 100# (average)	19	11	54
	" - 100# (average)	25	14	63
	soil (average)	27	15	66
G. Nokila laki Gneiss	rock (S-7)	15	9	68
	rock (S-86)	3	7	45
	stream sediment 50# ~ 100# (average)	12	11	39
	" - 100# (average)	25	15	43
	soil (average)	17	16	50
Granite	rock (D-18)	5	24	32
	rock (Y-12)	5	11	34
	stream sediment 50# ~ 100# (average)	10	12	35
	" - 100# (average)	16	18	39
	soil (average)	22	21	32

4 Analysis of Anomaly Area

Anomaly for the specimens, divided into three groups (C, F, S) as described before, give the following conclusions (Figs. 13).

A) There is no case where different elements indicate different anomaly areas.

B) Distribution of the anomalies, in the case of F (stream sediment - 100 mesh) is found least scattered, always showing a common anomaly area and it can be considered a most adequate trace group for the analysis of extension of anomaly area.

C) The distribution of the anomalies, in the case of C (stream sediment 50 ~ 100 mesh), is found scattered, which is useful to emphasize the mode of anomaly area in virtue of its peculiarity.

D) As the anomalies, in the case of S (soil), is too limited in number, it is difficult to find anomaly area by itself. However, S has a complementary function to the distribution of the anomalies of F and C, because of the sampling points being different.

E) Anomaly areas are summarized as shown in the next table, according to an anomaly map prepared by plotting C, F and S therein.

List of Anomaly Areas

Anomaly area	Area	Cu						Pb						Zn						Note
		F		C		S		F		C		S		F		C		S		
	(km^2)	A*	B**	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
1 S. Sipano	5 × 10	69	◎	50	○	65	○	44	◎	24	○	148	○	106	◉	105	○	-	-	
2 S. Marino	7 × 20	89	◉	60	◉	146	◎	72	◎	37	◎	75	○	106	◉	107	◉	110	○	
3 Rio	8 × 10	167	◉	175	◉	56	○	80	◎	64	◎	137	○	106	◎	101	○	65	○	
4 G. Waukara	4 × 8	71	○	63	○	321	○	-	-	30	○	89	○	106	○	98	○	127	○	
5 Baluase	6 × 17	38	◎	28	◎	-	-	110	◉	138	○	47	◎	96	◎	80	◎	70	○	
6 Bangga	5 × 5	91	○	98	◎	-	-	60	○	33		-	-	69	○	69	◎	-	-	
7 Sidondo	6 × 15	***	-	46	○	-	-	153	◎	-	-	37	○	144	◎	90	◉	-	-	few S samples
8 Siroa	5 × 7	42	○	29	○	37	○	100	○	68	◎	90	○	109	○	105	○	103	○	
9 S. Manushi - S. Menou	7 × 10	30	○	32	○	****×	×	102	◉	75	◉	×	×	71	◉	58	○	×	×	no S sample
10 S. Sopu	4 × 8	82	○	61	○	×	×	-	-	-	-	×	×	82	○	61	○	×	×	no S sample
11 S. Matou	3 × 9	-	-	-	-	-	-	135	◎	96	○	48	○	-	-	-	-	-	-	no anomaly of Cu, Zn
12 Bomba	5 × 10	53	○	-	-	-	-	-	-	-	-	-	-	61	○	52	○	65	○	no anomaly of Pb
13 S. Lariang (1)	9 × 15	78	◉	60	◎	129	◎	159	○	26	◎	63	◉	82	○	93	◉	91	○	
14 S. Lariang (2)	5 × 7	-	-	-	-	-	-	30	◎	19	○	-	-	-	-	-	-	-	-	no anomaly of Cu, Zn
15 Matave	7 × 18	167	◉	31	○	66	○	-	-	67	◉	127	◉	-	-	61	○	76	◎	
16 S. Tumawu	4 × 7	59	○	25	○	-	-	-	-	46	◎	87	○	87	○	62	○	99	○	
17 Labua	7 × 10	57	○	43	○	99	○	40	○	58	○	48	○	49	○	58	○	48	○	

* A represents the maximum value of anomaly within each area.
** B represents the number of anomalies within each area (○ : 1 to 5, ◎ : 6 to 10, ◉ : over 11)
*** - represents no anomaly area.
**** × represents no sample.

Relations between anomaly areas and geology are discussed as follows:

(1) S. Sipano Anomaly Area

This area is almost definitely indicated by the three elements. Slate and phyllite dominate in the area and among them sericitization and thermal effects by granite intrusion are partially observed. The anomalies may be closely related to these alteration.

(2) S. Marino Anomaly Area

This area is indicated by the three elements and belongs to one of the most anomalous areas, though some discrepancies are slightly observed among anomaly areas of each indicator element. The rocks in the area consist mostly of slate, phyllite and granite. Weak sericitization and dissemination of pyrite are formed in rocks adjacent to granitic rocks. Anomalous accumulation of each element is observed at the country rocks in the vicinity of granite. This tendency is strongly indicated especially by Cu. The anomaly is probably caused by the mineralization related with granite.

(3) Rio Anomaly Area

This area is strongly anomalous in Cu and weakly anomalous in Pb and Zn. The rocks in the area are of slate, granite and phyllite. Thermal effects by granite intrusion and mineralization mainly of pyrite are recognized extensively over the area. Each element accumulates at the part where the pyrite dissemination occurs. This anomaly is probably due to the mineralization principally of Cu related with intrusion of granite.

(4) G. Waukara Anomaly Area

This area is not strongly anomalous but indicated by the three elements. The rocks in the area consist of phyllite and granite. Mineralization is not found at the surface. This anomaly occurs around granite and may indicate weak mineralization similar to (2) and (3).

(5) Baluase Anomaly Area

This area is indicated by the three elements. Cu and Zn are distributed in the same pattern but Pb biases slightly to the southeast. The rocks, in the Cu and Zn anomaly area, are mainly composed of granite, and those in the Pb anomaly area, granite and some Tertiary sediments. Pyrite dissemination is observed along the Palindo River and also weak concentration of Pb is found in stream sediment in the vicinity. Hot springs are often found in the Marima River, which is the southern extensions of the Pb anomaly area. This suggests that the enrichment of Pb is caused by solfataric alteration. Thus the source of Pb concentration in the Pb anomaly area can be expected from such an observation to a certain extent. However, it is not clear whether or not the Cu and Zn anomaly area which distributes from the central part to the north, has a relation to mineralization.

(6) Bangga Anomaly Area

This area is not extensive but indicated by the three elements. Cu and Zn show almost the same distribution but Pb is biased to upstream. The rocks in the area consist mainly of granite with slate in small scale remaining in the form of a roof-pendant in some places. Mineralized alteration can be found in the area. Cu, Pb and Zn are enriched in granitic rocks, but little observed in slate. The relation between the anomaly area and the mineralization is not clear.

(7) Sidondo Anomaly Area

The distribution of anomaly area varies for each element. Pb and Zn are found nearly in the same part and Cu is found only in a part of southern area of the former. The rocks in the area consist of schist intruded by granite, the whole area being considered to be almost around granite. Thermal effects around the granite is observed in the vicinity of Sidondo and pyrite dissemination partially in the Wuno River. Three elements are enriched in the environs of the above-mentioned thermal effected zone. Pb and Zn, especially Zn, concentrate in the vicinity of the stream drainage and in its downstream, where pyrite dissemination is observed. The anomaly is probably caused by the mineralization of Cu, Pb and Zn around granite.

(8) Siroa Anomaly Area

This area is indicated by the three elements and is small in scale. The rocks consist of schist, gneiss and granitic stocks which intrude into the former. Pyrite dissemination and chloritization occur in the granitic stocks and its environs. These are consistent with the mode of concentration of elements. Though some hot springs gush out in this area, the rocks around the springs are not always greatly altered. These phenomena suggest probably that the anomaly is due not to the solfataric alteration but to mineralization which has close relation to granite intrusion.

(9) S. Manushi - S. Menou Anomaly Area

This area is strongly anomalous in Pb and Zn and weakly in Cu. The rocks are composed principally of granite and in a small scale of roof pendant of schist. Pyrite dissemination occurs in a portion of the Menou River and, Pb and Zn enrichments are distributed around it. In the Manushi River, Zn and a little Cu are concentrated. Pb enrichment and alteration are not observed in the area. The anomaly observed in the Menou River is probably due to mineralization of Pb and Zn, but the relation of mineralization to this anomaly in the Manushi River is still a question.

(10) S. Sopu Anomaly Area

This area is weakly indicated by Cu and Zn. Pb content is not clearly indicated. The rocks in the area consist of granite and schist which is distributed as a roof pendant in a small scale. Mineralization and alteration are not so clealy indicated. The relation of this anomaly and mineralization is not clearly indicated.

(11) S. Matou Anomaly Area

This area is indicated only by Pb. Geochemical anomaly is not recognized in Cu and Zn. The rocks in this area are composed of granite and schist is observed in roof pendant structure.
As mineralization and alteration are not recognized in the area, the origin of anomaly is unknown.

(12) S. Bomba Anomaly Area

This area is indicated by Cu and Zn, but Pb anomaly is not observed. The rocks in the area consist of gneiss, granitic stocks which intrude into the former and Tertiary sediment. Pyrite dissemination is recognized in the gneiss and the granite which is the strongest mineralization found in the present survey. This anomaly is probably due to this mineralization.

(13) S. Lariang (1) Anomaly Area

This area is indicated by the three elements. The rocks in the area are composed of slate and Tertiary sediment. Mineralization is not found and it is not clear whether the anomaly suggests mineralization or not.

(14) S. Lariang (2) Anomaly Area

This area is indicated only by Pb. The anomalies of Cu and Zn are not found. The rocks in the area consist of Tertiary sediment. Mineralization and alteration are not recognized. The origin of anomaly is not clearly ascertained.

(15) Matave Anomaly Area

The anomaly indicated by the three elements shows a considerably high value. The rocks in the area consist of schist, gneiss both intruded by granite, and pyroclastic rocks of Tertiary. Mineralization is not found except in the environs of granitic stocks of the Torro River area. Cu concentration occurs weakly at the part of the said area which is of pyrite mineralization. In such a part, Cu anomaly possibly should have taken place associated with pyrite mineralization, in the other parts, however, relation of the geochemical anomaly to the mineralization cannot be accounted for.

(16) S. Tumawu Anomaly Area

This area is indicated by the three elements, principally by Pb and Zn. Cu accumulation is very low. The rocks in this area are made up of slate, forming a roof pendant in a small scale, and granite. Mineralization is not observed. The relation of the anomaly to mineralization is not clearly indicated.

(17) Labua Anomaly Area

This area is indicated by the three elements, especially by Cu and Pb. The rocks in the area are composed of schist and granite which intrudes into the former. The mineralization is not recognized so far in the present survey, owing to the poor distribution of outcrops as a whole. The source of anomaly is not clearly indicated.

As mentioned above, there are 17 anomaly areas observed in the present survey area. Cu and Zn distributions form nearly the same anomaly areas, on the other hand Pb has a tendency to show a slightly different area relative to the former.

5 Discussion and View for Future

5-1 Discussion on Geology

The result of geological survey of this area does not differ much from that gained through the survey of the last year. This actually depends on the insufficient amount and degree of the survey conducted in this year, but more fundamentally on the reason of large geological units and proverty of variation of lithofacies in this area. Accordingly, it is diffucult to establish the stratigraphy and define the tectonic zones only through a survey of this area. And it is nearly impossible to clarify the occurrence and ages of sedimentary and metamorphic rocks, because the distribution of these rocks are significantly confused by igneous activity of the young age. Even if the survey area is enlarged to the field of full Pasangkaju sheet (1:250,000) which was surveyed in the last year, nearly same results will be gained. Rock facies zoning of granite group appears to be absent.

Consequently, the geology of this area is not expected to be revised largely, even though the details of occurrence of each stratum and rock are clarified through future survey. In the survey of this time, even unsurveyed routes are mapped on the basis of boulders observed at the entrances of streams and the distribution of main rocks and strata are approximately exact.

5-2 Discussion on Mineralized Zones

Mineralization observed in this area is largely caused by intrusion of granite. As pointed out in the previous report, promising ore deposits can be expected to exist with high potentialities around the granite bodies, especially around small granite bodies. Considering also this reason, the area of the second year survey was chosen. Unexpectedly, the above-mentioned phenomenon was confirmed by the survey of this time.

The granite in this area is of the Neogene and probably related to the granite observed in Mindanao and Kalimantan. In this report, we pointed out the possible existence of porphyry copper type ore deposits also in the Sopu River mineralized zone which was found by the previous survey. However, it is uncertain whether the deposits, confirmed this time, promise porphyry copper ore deposits on a large scale. Due to the fact that mineralization in this area is always associated with granitic intrusion, it is very interesting to put phenomena for the next year program.

At the present moment, we are not able to evaluate the precence of other mineral resources in this area. Geological condition of this area suggests that there is very little possibility to develop petroleum or natural gas. Industrial minerals seem to be less valuable under the present field condition, except may be the building-stone which tremendously presents along the Palu valley.

5-3 Discussion on Results of Geochemical Survey

As has been stated before, the geochemical survey reveals 17 anomaly areas, among which the S. Bomba, Rio and S. Marino areas precisely coinside with the mineralization activity obseved by geological survey. The other anomaly areas are frequently recognized as related to pyrite dissemination. Among the above-mentioned three anomalies, the S. Bomba and Rio areas are affirmed mineralized zones revealed by the geological survey and the S. Marino is considered to be the north extension of Rio mineralized zone. Accordingly, the results of the geochemical and geological surveys are in good agreement on the whole. However, from the view point of quantitative analysis indicate that the grade of anomaly is not always correspond to the grade of mineralization, where the S. Bomba is one of the remarkable examples. This would depend basically on the lack of detailed survey and the difference of survey method, namely, field geological survey and geochemical survey. Mo and Ag occurances are also checked at the stage of qualitative analysis in geochemical survey, but the result is unfortunately negative.

Though we mainly stressed on stream sediment sampling, the worse field condition, such as steeply mountainous area and poor tracks along most of the rivers, the systematic geochemical sampling is not sufficiently progressed. In this kind of condition, a proper method for further geological investigation should be sought.

5-4 View for Future

About this area, three problems are awaiting solution in the future: (1) an additional geological and geochemical survey all over the area: (2) a detailed investigation on the confirmed mineralized zone, and (3) a detailed survey on the geochemical anomaly areas.

5-4-1 Additional Geological and Geochemical Survey

The survey of this year is utterly insufficient for mapping of the area on 1/50,000 scale. Additional survey on the whole area is required for completion of a geological map and detailed geochemical prospecting of this area. However, the additional survey on the whole area would not always bring about satisfactory results. First of all, additional survey would result in only partial revision of the geological map and any particular change in the general tendency is not foreseeable. Secondly, in the geochemical prospecting of this year, though at considerably different intervals, sampling from almost all water systems except on the north-western end of the survey area was done. Thirdly, it is doubtful whether additional survey of the whole area, even if it were to be tried, is feasible or not. All the possible roads and means of transportation have been utilized already. Consequently, future additional survey would require construction of new roads or use of a helicopter for supply of materials. Construction of new roads, however, is almost impossible because of the steep topography and rapid current of rivers. Use of a helicopter is limited because of scarcity of the available places to land. No place suitable to land is found, especially in the mountain range of the left side of the Palu valley, the upper reaches of the Sopu River, Mt. Nokila laki and the mountain range of the right side of the Pakawa River. Accordingly, for the additional geological survey, construction of many heliports is required, but this is quite expensive, because much time and manpower is required because of the dense jungles. Development of routes reaching the projected heliports and food supply for workers engaged in such work will give rise to serious problems. Consequently, for the additional geological investigation the cost of exploration will increase for additional labours which may reach up to 10 times than for the present survey, beside wasting time unnecessarily. The other unsolved problem is lacking local available labours and guides. In this area, there are only few people living around a big valley such as Palu and Pakawa. There may also some people settled up in the mountain, engaging in forestry or simple farming. These are the people who made a great contribution to this year survey. But they are small in number and there are several places where they refused to go, for example, Tangkulowi mountain region, Nokila laki mountain region and the upper reaches of the Sopu River. It is sure that the field work in this area needs the help of the local people. So that, it is more or less doubtful whatever the cost, personnel and days spent, it could make up for the geological blank of the survey area.

As has been mentioned before, the geological survey of this year on the 1/50,000 scale is not sufficient, but a future detailed survey which needs a great deal of time and cost could hardly be considered to bring about additional frutis worthy of such expenditure.

5-4-2 Detailed Investigation of Mineralized Zones

The S. Bomba, Rio (including S. Marino) mineralized zones confirmed through the survey of this year are not investigated completely yet to show the whole picture and need further detailed investigation. The purpose of the close examination is to clarify the scale of the mineralized zones (horizontal extent of the zones), density of the mineralization and the mineralized condition through the depth. This purpose would be accomplished by close geological survey, geochemical prospecting of the soil, geophysical prospecting (E. M., I. P. method) which are directly useful for exploration of sulfide ore deposits, and prospecting by drilling. As for the order of operation of these methods, it is recommended that the target should be chosen on the basis of the results of geochemical prospecting, geological survey and E. M. method. Then, judging from the data of the deeper levels gained by I. P. method, prospecting by drilling should be carried out.

Both the districts mentioned above should be closely examined, but if the says and cost are restricted, S. Bomba district must be investigated first, because the scale and density of the mineralized zone of this district are more excellent than those of the Rio district.

5-4-3 Detailed Investigation of Geochemical Anomaly Zone

The survey of this year demonstrated the 17 anomaly areas but some were not clarified as to the cause of the anomaly, lacking sufficient information on their extent and strength of anomaly. Accordingly, close geological investigation and more detailed geochemical prospecting (mainly on soil) in each anomaly area are required. But with the detailed investigation, it may be presumed that many problems will occur as well as in the case of the additional geological survey.

6 Conclusions

Mineralized zones, mainly composed of sulfide minerals, are recognized in both the S. Bomba and Rio districts through the geological and geochmical survey of this area. For the purpose of the survey to develop the mineral resources, the third year survey should carried out closely on these mineralized zones. Close geological, geochemical and geophysical surveys and prospecting by drilling seem to be most effective methods for exploration of the resources. As far as we concerned the S. Bomba mineralized zone is thought to be more promising prior to the Rio mineralized zone.

APPENDIX

Table 1. Foraminifera

Sample No.	:	M-107	
Location	:	Galopi	
Formation	:	S. Tinauka Formation	
Rock name	:	Siltstone	
Species & quantity	:	Nonion cf. grateloupi (d' Orbigny)	48
		Loxostomoides carinatum (Millet)	36
		Elphidium crispum (Linne)	11
		Buccella sp.	6
		Bolivina cf. striatella Cushman	5
		Siphouvigerina cf. ampullacea (Brady)	5
		Elphidium cf. decipiens (Costa)	5
		Pararotalia sp.	4
		Lenticulina spp.	3
		Rosalina bradji (Cushman)	3
		Cymbaloporetta bradji (Cushman)	3
		Fissurina spp.	2
		Cassidulina	1
		Ammonia cf. beccarii	1
		Cibicides pseudoungerianue (Cushman)	1
		Benthonic total	134
		Globigerina spp.	17

Explanation : This sample has much benthonic foraminifera compared to planktonic one, which shows that the environment where this sample deposited was shallow sea.
Nonion, Loxostomoides and Elphidium are abundant and Siphouvigerina which indicates somewhat deep sea is observed although small in quantity.
As a whole, this sample shows open sea character and inner or middle shelf.
About the age of this rock, decision is uncertain, but it will be presumed to be Pleistocene.

Table 2. Pollen Analysis

Analysis has been made on pollen and spore obtained from the following 7 pieces of samples.

K-1 (Siltstone containing small pieces of wood)

FZ-2 (Slate)

Y-12 (Siltstone)

Y-64 (Siltstone containing shell fossil)

Y-72 (Siltstone containing small pieces of wood)

Y-84 (Mudstone)

Y-100 (Siltstone containing small pieces of wood)

Constituents and distribution of frequency (%) of each sample are shown in Table 2-1.

It is inferred from the results of analysis that the samples, showing different constituents to each other without any to be indicative of sedimentation under the same circumstances, would have been sediments in the different pollen zone listed below respectively, considering the frequency and type of characteristic occurrence.

Table 2-2 Pollen Zone of Each Samples

Sample Nos.	Pollen Zone
K-1	Tricolporopollenis cingulum
FZ-2	Casuarina rumPhiana Kjellbergiodendron Limnogeiton
Y-12	Laevigatos Porites
Y-64	Brownlowia
Y-72	Kjellbergiodendron hylogeiton
Y-84	Sonneratia
Y-100	Monocolpites-Labiatae

Sedimentary environments are described below for each sample mentioned above.

K-1. Among trees of the mountainous regions of Sulawesi, several kinds of them are found akin to Tricolporopollenites cingulum and grow in the neighbourhood of an altitude of 600 meters ASL. On the other hand, judging from Rhizophorasp occurring at a high rate of frequency, they seem to have been sedimented in the lower regions, implying that the temperature at the time of sedimentation of K-1 was relatively colder than at the present time and the growing area of the forests and trees of the mountain regions extended down to lower parts of the mountain regions.

FZ-2. In that Casuarina rumphiana is a tree growing on a sandy sea coast or a sandy river bank near the coastline or inland and that Kjellberdendrom Limnogeiton grows in comparatively dry soil around lower damp areas, it is presumed that the sediments developed in lower damp areas surrounded by lower mountains which were in a relatively dried state.

Y-12. As it contains only Pteridophyta spore with almost no pollen and from the nature of the sediment, it is presumed to have been the secondary float carried down into a lagoon or onto lower land.

Y-64. Being a siltstone containing shell fossil, it was considered to be a kind of sediment usually formed in the shallow sea, but with high contents of pollen and spore. This kind is one of those forming a subtropical bush, and judging from the pollen of Rhizophorasp, Verbenaceae and Palm contained therein, judged to have been sedimented in an environment almost similar to the formation of the present mangroves.

Y-72. Combined with this tree growing on the low or medium height of mountains is Engelhardtiasp also growing in similar places, which is suggestive of the sediment formed in a lower inland area in an age dominated by colder climate than at the present time.

Y-84. This tree is one of those forming the present mangroves and grows in lower damp areas where deep lutaceous soil develops. Being without Rhizophrasp detected, however, it shows a different formation from that of the present mangroves. It is considered that the climatic conditions would not have been different from those in lower land areas of the present time and have been sedimented in a lagoon where water was not moving.

Y-100 From the occurrence of spore of Pteridophyta and pollen of Gramineac and Cyperaceac, it is considered to have been the sediment formed by the strong action of current water in the lower land areas.

Conclusion:

We have been able to accomplish frequency distribution of 68 kinds of pollen obtained from the 7 pieces of samples as stated above. There were a substantially large number of kinds provided for analysis, and pollen and spore of high rate of frequency were found in all samples. However, the only report on pollen analysis is for Brunei District of Borneo, and nothing has been reported so far with which the results of the present analysis could be reviewed in comparison. We would like, therefore, to discuss the subject of determining the geological ages after a comprehensive study is made on detailed data of surveys.

	Laevigatosporites mutidus	L. paruvus n. sp.	L. discordatus	Thelypteris sp.	Verrucatosporites uliens	V. histiopteriodes	V. margaensis	V. usmensis	Cyathea sp.	C. parunus n. sp.	Foreotriletes sp.	Crassoretitriletes sp.	Edvinatisporites sp.	Intrapunctatrilotes sp.	Leiotriletes wolffi	Osmundasporites sp.	Polypodiaceoisporites retirugatus	P. cyclocingularis	Stereisporites gradis	Verrucingulaxisporites granulatus	V. granus	Venucatotriletes sp.	Thelypteris sp.
K-1	19	3			1>	1>	1	1>	3	1>	1>	1>					2			1>	1>		1>
FZ-2	4	4	1>				1>		1	1>			1>	1>			1>	1>	1>			1>	
Y-12	81	1	6		3				5			1					3						
Y-64	13	1>			1>		1>		1>			1>		1>									1>
Y-72	7	2	1>		1>			1>	2								1>						1
Y-84	29	12	1>		3				3		1>			1>							1>		2
Y-100	29	10	10		3		1>		15		1>	1		1>	1>	1>	1>		2			.	1>

Table 2-1 Constituents of Samples and Distribution of Frequency (%)

	Corrusporis tuberculatus	Longapertites parous	L. vaneendenburgi	L. psilatus	L. retuculatus	Palmacpollis brevispinus	P. longaspinus	Piperaceac	Proxapertites cursus	Monocolpites ilexiifes	M. lilitus	Tricolpopollenis psilatus	T. reticulatus	Verbanaceae	Brownlowia	Quercus sp.	Ilex sp.	Ageratum conyzoides	Vernonia arborea	Euplorbiaceae	Retitricolporitea guianensis	Retibreitricolpovites trangulatus	Verrutricolpontes rotundi poris
K-1	1>	1>	1>									1	2					1>	1	1>	1>	1>	8
FZ-2	1>	5	2	2	3	2		4				2	1>	3							3	1>	11
Y-12																							
Y-64						4	2					7	2	2	7	2	1>				1>		31
Y-72		1>		2		1>	1>	1				1>	1>	1>			1>				1>		37
Y-84		1				1>	4	3	1	1>		10	1			1>					1>		2
Y-100		1>		1>		2	5	1>	1>	5	1>	2	1>	1>						1>			1>

	Tricolporopollenites cingulum	Rhizophora sp.	Gesneriaceae	Staphyleaeeae	Simarubaceae	Kjellbergiodendron limnegeiton	K. hylogeiton	Myrtaceoides reticulata	Passiflorapollis sulnwesiensis	Psiladiporites parous	P. magnus	Proteacidites dehaano	Casuarina runiphiana	C. striata	Engelhardtia sp.	Sonneratia sp.	Malpighiaceac	Labiatac	Gramineae	Cyperaceac	Buttinia andreevi	Thelypteris sp.	Total
K-1	16	19				12	5			1		1	1>		1>		1>						100
FZ-2	12	2	1>	1>	1>	14	6	1>	1>	1>		1>	7	1>	1>			1>	1>	1			100
Y-12																							100
Y-64	15	3	3			1>	1						1>		1	1>		1>					100
Y-72	18					2	17								4								100
Y-84	7						2				1>		1>			15							100
Y-100	1>						1>			1>	1>		1					2	1>	1>	1>	1>	100

Table 3. Microscopic Observation

(1) Gneiss Group - 1 (Granitic gneiss)

1.

Sample No.	Location	Formation	Rock name	Remarks.
S - 1	Mataue	G. Nokila laki Gneiss	Biotite gneiss	
S - 68	S. Omu	"	"	ref. Plate 1
S - 12	S. Salua	"	"	
S - 64	S. Webose	"	"	
S - 70	S. Omu	"	"	ref. Table 4
S - 80	S. Saluki	"	Diorite gneiss	
D - 22	S. Lefo	Granite	Granite gneiss	
S - 22	S. Sidaunta	"	Monzonite gneiss	
S - 75	S. Saluki	G. Nokila laki Gneiss	"	

2. Observation of hand specimen

Melanocratic coloured holocrystalline rock of medium to coarse grain.

Gneissic texture is observed.

3. Microscopic observation

Holocrystalline and consisting of anhedral quartz, orthoclase, biotite and small quantities of hornblende, but in Sample S22, hornblende is observed predominantly.

In most cases, orthoclase and plagioclase are altered into sericite and biotite into chlorite.

Apatite, sphene and tourmaline are also observed though in very small quantities.

(2) Gneiss Group - 2 (Amphibole gneiss)

1. Sample No.

Sample No.	Location	Formation	Rock name	Remarks.
S - 79	S. Saluki	G. Nokila laki Gneiss	Biotite amphihole gneiss	
S - 17	Laone	"	"	
S - 55	S. Bomba	"	Pyroxene-biotite gneiss	
S - 15	S. Salua	"	Pyroxene-hornblende gneiss	
B - 1	S. Webose	"	"	ref. Plate 2

2. Observation of hand specimen

Gray hard rock, holocrystalline in medium grain, showing schistose texture.

3. Microscopic observation

Principal rock forming minerals are quartz, plagioclase, hornblende, biotite and augite.

In most cases, quartz is found in anhedral form, and in other cases shows schistose and intersertal texture.

Plagioclase is in forms of albite, carlsbad and pericline twin.

Hornblende is mostly greenish and shows preferred orientation.

In addition to the abovementioned minerals, there are observed small quantities of apatite, magnetite and sphene accompanied occasionally with garnet, tourmaline and epidote.

(3) Amphibolite

1. Sample No.

Sample No.	Location	Formation	Rock name	Remarks
Y - 90	S. Saluki	Boulder in S. Tinauka F.	Amphibolite	ref. Plate 3

2. Observation of hand specimen

Light to dark green coloured and generally observed epidote.

It presents an appearance in parts of schistose texture.

3. Microscopic observation

Principal minerals are hornblende, plagioclase, epidote, magnetite and hematite, and in some cases actinolite is observed.

There also exists sphene in small quantities.

In some cases, hornblende is found to have been chloritized and plagioclase sericitized.

(4) Schist Group - 1 (Biotite quartz schist)

1.

Sample No.	Location	Formation	Rock name	Remarks:
O - 2	Pandere	Sidondo Schist	Biotite schist	ref. Plate 4
O - 6	S. Kuwanu	"	Sericite-biotite-quartz schist	
O - 11	S. Tandau	"	"	
O - 13	S. Tandau	"	Sericite-quartz schist	
S - 83	S. Saluki	"	Garnet-quartz schist	

2. Observation of hand specimen

Dark gray or black hard rock of fine grain, showing schistose texture.

3. Microscopic observation

Essential constituent minerals are quartz, biotite and plagioclase, but biotite is not observed in O - 13.

Besides the above, accessory constituents such as garnet, chlorite, muscovite, calcite or opaque mineral (mainly pyrite) are observed.

Part of garnet in the sample S-83 is replaced by chlorite or magnetite.

(5) Schist Group - 2 (Amphibole - schist)

1.

Sample No.	Location	Formation	Rock name	Remarks
O - 4	Pandere	Sidondo Schist	Amphibole schist	
O - 7	S. Kuwanu	"	Biotite-amphibole schist	
O - 8	"	"	"	ref.
S - 35	S. Torro	S. Rompo Schist	Amphibole schist	ref. Plate 5
S - 36	"	"	Pyroxene-amphibole schist	
S - 69	S. Saluki	G. Nokila laki Gneiss	Amphibole schist	
S - 78	"	Sidondo Schist	Pyroxene-amphibole schist	
M - 42	S-Maconifa	"	Biotite-amphibole schist	

2. Observation of hand specimen

Dark greenish gray or dark gray coloured hard rock of fine to medium grain.

3. Microscopic observation

Holocrystalline, schistose texture.

Essential constituent minerals are amphibole, plagioclase, clinopyroxene.

Amphibole is green to yellowish green colored.

Plagioclose in Sample S78 is subhedral and is observed to have albite and carlsbad twin.

In Samples O-7 and O-8, zonings are observed, where biotite is predominant and in others chlorite is predominant.

Accessory constituent minerals are magnetite, garnet, etc.

(6) Hornfels

1.

Sample No.	Location	Formation	Rock name	Remarks
S - 14	S. Salua	G. Nokilalaki Gneiss	Hornfels	ref. Plate 6
S - 42	S. Lariang	S. Rompo Schist	"	ref. Table 4
S - 33	S. Torro	"	Garnet-sillimanite-biotite hornfels	

2. Observation of hand specimen

Generally light purplish brown compact rock although presenting varied appearances of light green to purplish brown colour.

3. Microscopic observation

It consists mainly of quartz, biotite and small quantities of epidote, magnetite, garnet and carbonates.

Quartz is in anhedral form and occupies about 70% of the whole constituents.

(7) Sandstone

1. | Sample No. | Location | Formation | Rock name | Remarks |
|---|---|---|---|---|
| D - 180 | S. Siloto | S. Pakawa F. | Sandstone | ref. Plate 7 |

2. Observation of hand specimen

Gray fine grained rock.

3. Microscopic observation

Essential constituent minerals are grains of plagioclase, orthoclase and calcite and small quantities of sphene and magnetite are observed.

Chlorite and sericite are secondary constitutes.

Calcite veinlets are observed.

(8) Slate & Phyllite

1. Sample No.

Sample No.	Location	Formation	Rock name	Remarks
Y - 81	S. Lariang	S. Pakawa F.	Slate	ref. Plate 8
FZ - 5	S. Rumane	"	Slate	
K - 185	S. Rio	"	Biotite phyllite	

2. Observation of hand specimen

Gray to black compact rock of fine grain.

3. Microscopic observation

Essential constituent minerals are quartz, chlorite and feldspar.

Accessory constituents are sericite, plagioclase and carbonates.

Sample K - 185 consists mainly of biotite, carbonates and granular quartz.

(9) Granite Group - 1 (Granite)

1.

Sample No.	Location	Rock name	Remarks
O - 21	S. Tonga	Biotite granite	
O - 40	S. Wuno	"	
O - 16	S. Sopu	"	
O - 18	"	"	
O - 20	"	"	
O - 1	Pakuli	"	
S - 20	S. Sidaunfa	"	
S - 48	S. Tumau	"	ref. Plate 9
S - 71	S. Saluki	"	
D - 256	S. Meno	Hornblende-biotite granite	
D - 269	~	"	
D - 388	Banemarawa	"	
D - 401		"	
D - 231	West of	"	
D - 237	S. Pekawa	"	
D - 252		"	
O - 19	S. Sopu	Hornblende granite	
O - 35	S. Meno	"	
O - 36	"	"	
O - 39	S. Wuno	"	
Y - 11	S. Marima	"	
S - 4	Kabutia	Biotite-hornblende granite	
O - 27	S. Watubose	"	
O - 28	"	"	
D - 7	S. Palindo	"	
D - 10	"	"	

2. Observation of hand specimen

Hard leucocratic rock, holocrystalline and of medium to coarse grain.

In some part, light green to dark gray coloured mesocratic rocks are observed in fine to medium grain.

3. Microscopic observation

Essential constituent minerals are quartz, plagioclase, orthoclase, hornblende and biotite.

Plagioclase are from albite to and sine. In some cases, biotite and hornblende are replaced by chlorite.

Accessory constituents are small quantities of sphene, apatite, hematite, chlorite, epidote, sericite, etc.

(10) Granite Group - 2 (Granite - porphyry)

1. Sample No.

Sample No.	Location	Rock name	Remarks
D - 247	S. Pakawa	Granite porphyry	
D - 280	Watsupo Sampu	"	ref. Plate 10
O - 17	S. Popu	"	
O - 31	S. Meno	"	
O - 33	"	"	
O - 41	S. Wunou	"	
S - 18	S. Sidaunta	"	
S - 92	S. Saluki	Biotite-granite porphyry	

2. Observation of hand specimen

Leucocratic hard rock of medium to coarse grain, but some mesocratic rocks are also observed.

3. Microscopic observation.

It is observed to consist of orthoclase, plagioclase, biotite, hornblende and quartz.

Orthoclase is replaced by sericite and chlorite in samples of D-280 and S-92.

In samples of O-17, 31, 33 and 41 and D-247, plagioclase is also replaced by sericite and chlorite.

Biotite is also observed in part to have been replaced by chlorite, epidote and carbonates.

Groundmass is observed to consist mainly of orthoclase, plagioclase and quartz, and of small quantities of apatite, hematite, limonite, sphene and magnetite.

(11) Granite Group - 3 (Monzonite porphyry)

1.

Sample No.	Location	Rock name	Remarks
S - 39	East of Kedundu	Monzonite porphyry	ref. Plate 11
S - 41	"	"	

2. Observation of hand specimen

Holocrystalline rock of gray coloured medium grain.

White phenocryst of feldspar shows schistose structure to some extent.

3. Microscopic observation

Phenocryst consists of orthoclase, plagioclase, hornblende and apatite.

Orthoclase and plagiclase are subhedral and replaced in part by sericite and chlorite.

Groundmass consists of quartz, biotite and magnetite, and biotite shows schistose structure.

(12) Granite Group - 4 (Diorite porphyry)

1. Sample No., Location, Rock name, Remarks

Sample No.	Location	Rock name	Remarks
S - 52	S. Tumawu	Quartz-diotite porphyry	
S - 10	S. Salua	Biotite-tonalite porphyry	ref. Plate 12
S - 84	S. Saluki	Quartz-diorite porphyry	
FZ - 12	S. Lariang	Biotite-quartz porphyry	

2. Observation of hand specimen

Sample S-52 is grayish white to gray coloured holocrystalline medium grain, showing a kind of porphyritic texture consisting of big crystals of feldspar.

Sample S-84 shows schistose texture with white portion and grayish black portion arranged in banded form.

3. Microscopic observation

Constituents are quartz, orthoclase, plagioclase, hornblende, biotite, sphene and opaque minerals.

Plagioclase is euhedral and forms carlsbad twin. Biotite is replaced by chlorite.

(13) Granite Group - 5 (Quartz diorite)

1. Sample No.

Sample No.	Location	Rock name	Remarks
S - 67	S. Saluki	Biotite-quartz diorite	ref. Plate 13
FZ - 1	S. Lariang	Hornblende-biotite-quartz diorite	

2. Observation of hand specimen

Gray to dark gray holocrystalline rock of medium grain showing granitic texture.

3. Microscopic observation

Holocrystalline rock with essential constituent minerals consisting of quartz, plagioclase, biotite and hornblende.

Quartz occurs as euhedral crystals or as anhedral crystals showing intersertal texture. Plagioclase is subhedral, forming albite twin.

Part of hornblende exists as poikilitic texture in plagioclase.

As accessory constituents, magnetite, apatite and sphene are observed.

(14) Granite Group - 6 (Diorite)

1. Sample No.

Sample No.	Location	Rock name	Remarks
O - 22	S. Tongoa	Biotite diorite	
K - 129	S. Mohana	Hornblende-biotite diorite	
O - 23	S. Sopu	Hornblende diorite	ref. Plate 14
O - 15	S. Sopu	Hornblende diorite	

2. Observation of hand specimen

Mostly fine to medium grain and mesocratic to melanocratic, some of them are light green rocks.

3. Microscopic observation

Essential constituent minerals are quartz, plagioclase, orthoclase, hornblende, and biotite.

Plagioclase is either subhedral or anhedral. Biotite and hornblende are replaced by chlorite, and plagioclase is in some cases found to have been sericitized.

(15) Granite Group - 7 (Monzonite)

1. Sample No.

Sample No.	Location	Rock name	Remarks
S - 53	S. Bomba	Hornblende -biotite monzonite	
S - 87	S. Saluki	"	
S - 74	"	Hornblende monzonite	ref. Plate 15

2. Observation of hand specimen

Grayish to dark gray coloured holocrystalline rock.

Porphyritic texture of feldspar is observed remarkably in S-53, and that of hornblende remarkable in S-74.

In S-87, hornblende is observed to exist in a form of lath within porphyritic texture of feldspar.

3. Microscopic observation

Essential constituent minerals are orthoclase, plagioclase, biotite and hornblende, and anhedral quartz is also contained.

Orthoclase is either subhedral or anhedral and usually forms carlsbad twin.

Plagioclase is also subhedral or anhedral, forming albite and carlsbad twin.

Accessory constituent minerals are tourmaline, sphene, magnetite and apatite.

(16) Granite Group - 8 (Adamellite)

1. Sample No.

Sample No.	Location	Rock name	Remarks
O - 34	S. Menou	Adamellite	
O - 42	S. Wuno	"	
O - 37	S. Menou	Biotite-hornblende adamellite	ref. Plate 16

2. Observation of hand specimen

Gray to grayish black coloured medium grain rock.

3. Microscopic observation

Holocrystalline rock consisting of plagioclase, biotite, hornblende, quartz, chlorite, epidote calcite, pyroxene and opaque mineral, among which plagioclase is predominant.

(17) Peridotite

1. Sample No.

Sample No.	Location	Rock name	Remarks
S - 5	Kabutia	Peridotite	ref. Table 4
S - 9	S. Salua	"	ref. Plate 17
S - 81	S. Saluki	"	

2. Observation of hand specimen

Dark greenish gray coloured compact rocks and some are found to contain much of phenocryst of pyroxene.

3. Microscopic observation

Holocrystalline rock consisting mainly of olivine (max. 4 mm) and pyroxene.

Quantities of orthopyroxene and clinopyroxene vary for each sample.

As accessory constituent minerals, chromite, serpentine and magnetite are observed in small quantities.

Serpentine develops in network and magnetite is observed to dot in the networks of chromite or serpentine.

(18) Andesite

1. Sample No.

Sample No.	Location	Rock name	Remarks
D - 52A	Panisibadja	Hornblende andesite	
K - 120	S. Mandtere	"	ref. Plate 18
D - 49	Panisibadja	Pyroxene andesite	
S - 90	S. Saluki	Biotite andesite	

2. Observation of hand specimen

Generally gray to dark gray medium grain rocks.

Clear phenocrysts of feldspar, biotite, hornblende etc. are observed.

3. Microscopic observation

Phenocrysts consist of hornblende, biotite, pyroxene and plagioclase (andesine), and groundmass consists of quartz, plagioclase, biotite, hornblende, apatite and opaque mineral.

(19) Dacite & Rhyolite

1. Sample No.

Sample No.	Location	Rock name	Remarks
S - 91	Paku	Pyoxene-hornblende dacite	
S - 43	Matave	Hornblende-biotite dacite	
S - 30	Matave	Biotite dacite	
S-- 19	S. Sidaunta	Hornblende-biotite dacite	ref. Plate 19
FZ - 10	G. Tangkulouwi	Altered dacite	
O - 25	Nopu	Rhyolite	

2. Observation of hand specimen

Sample S-91 (Pyroxene - hornblende dacite) is purplish and brecciated. Phenocryst is unable to be observed with the naked eye.

Biotite dacite of S-43, S-30 and S-19 are pale purplish to gray coloured compact rocks and observed phenocryst of quartz.

Altered dacite of FZ-10 is greenish gray fine compact rock with phenocryst scarcely observed.

Rhyolite of O-25 is light green and observed to contain chlorite as alteration product.

3. Microscopic observation.

In S-91 and S-43 are observed phenocryst of feldspar, hornblende, euhedral clinopyroxene and quartz, and as for groundmass, glass, plagioclase, clinopyroxene and magnetite are observed.

In S-30 and S-19, plagioclase showing carlsbad twin or zonal texture, and biotite and hornblende partially altered into chlorite are mainly observed, and in addition, small quantities of magnetite, apatite and sphene are found.

As for groundmass, quartz and feldspar are observed showing spleritic texture.

In FZ-10, phenocryst of hornblende is predominant, which is altered into carbonate or sericite. As for groundmass, carbonate mineral, sericite, quartz and secondary biotite are observed, having lost their original texture due to strong alteration.

In O-25, phenocryst of plagioclase and orthoclase are mostly sericitized.

scale
0 0.3mm

PL. 1 Biotite gneiss (Sample No. S-68)

(cross)

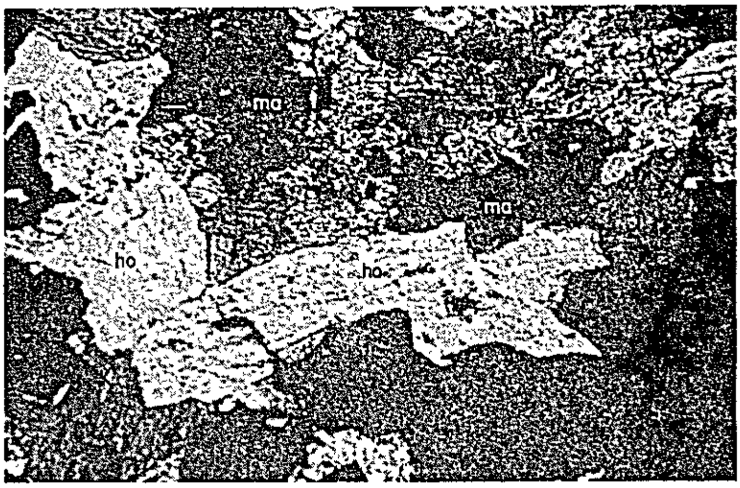
pl : plagioclase
ho : hornblende
or : orthoclase

scale
0 0.3mm

PL. 2 Pyroxene-hornblende-gneiss (Sample No. B-1)

(cross)

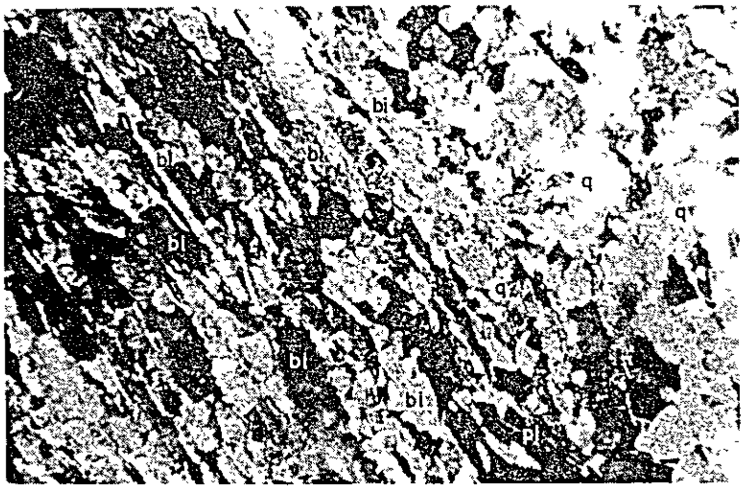
pl : plagioclase
bi : biotite
ho : hornblende
q : quartz



scale
0 0.3mm

PL. 3 Amphibolite (Sample No. Y-90)

(cross)
ho : hornblende ma : magnetite



scale
0 0.3mm

PL. 4 Biotite-schist (Sample No. O-2)

(cross)
bi : biotite q : quartz
pl : plagioclase

scale

0 0.3mm

PL. 5 Amphibole schist (Sample No. S-35)

(open)

ho : hornblende pl : plagioclase

q : quartz ma : magnetite

scale

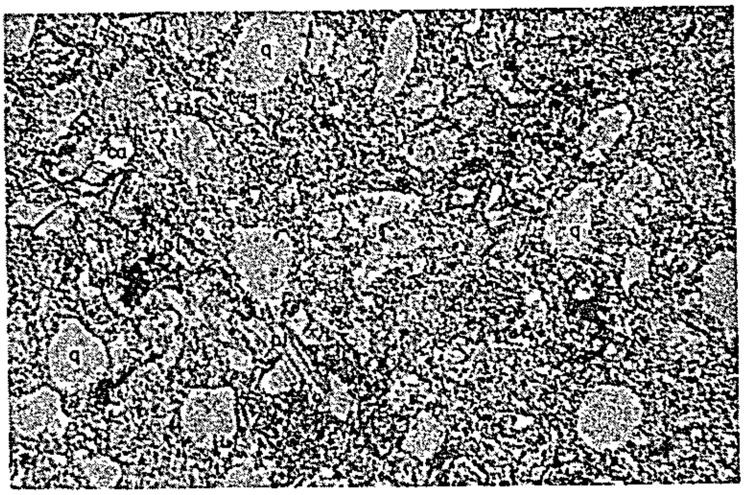
0 0.3mm

PL. 6 Hornfels (Sample No. S-14)

(open)

bi : biotite si : sillimanite

ho : hornblende



scale

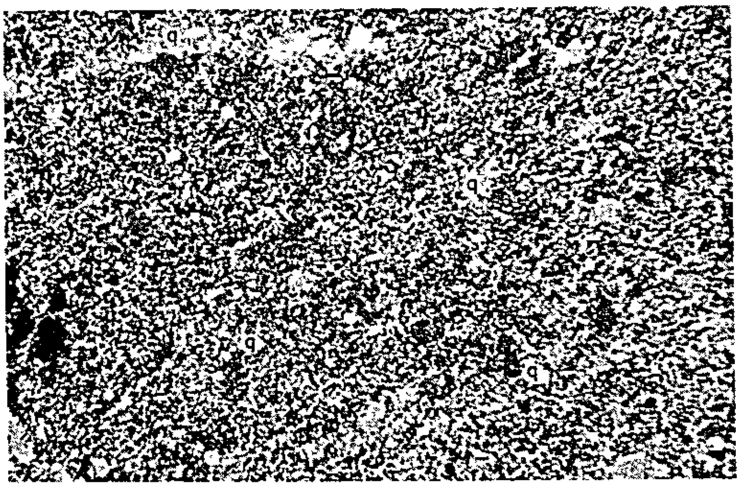
0 0.3mm

PL. 7 Sandstone (Sample No. D-180)

(cross)

q . quartz ca . calcarious mineral

pl . plagioclase



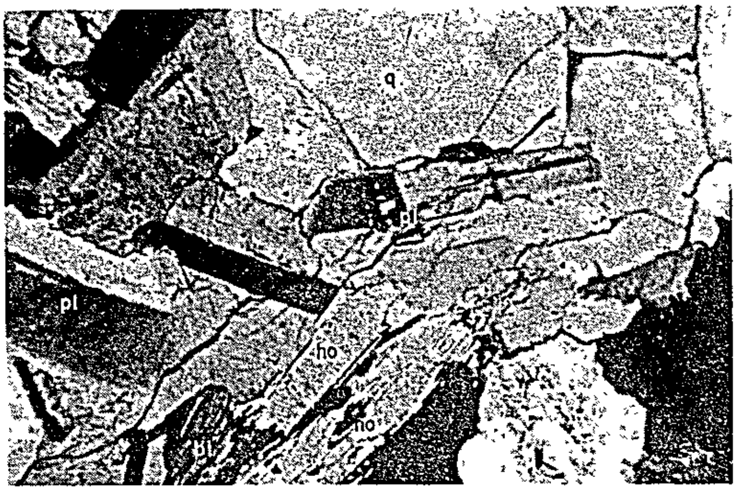
scale

0 0.3mm

PL. 8 Slate (Sample No. Y-81)

(cross)

q : quartz se : sericite



scale

0 0.3mm

PL. 9 Biotite granite (Sample No. S-48)

(cross)

q : quartz pl : plagioclase

ho : hornblende bi : biotite

scale

0 0.3mm

PL. 10 Granite porphyry (Sample No. D-280)

(cross)

q : quartz pl : plagioclase

scale

0 0.3mm

PL. 11 Monzonite-porphyry (Sample No. S-39)

(cross)

or : orthoclase bi : biotite

q : quartz pl : plagioclase

scale

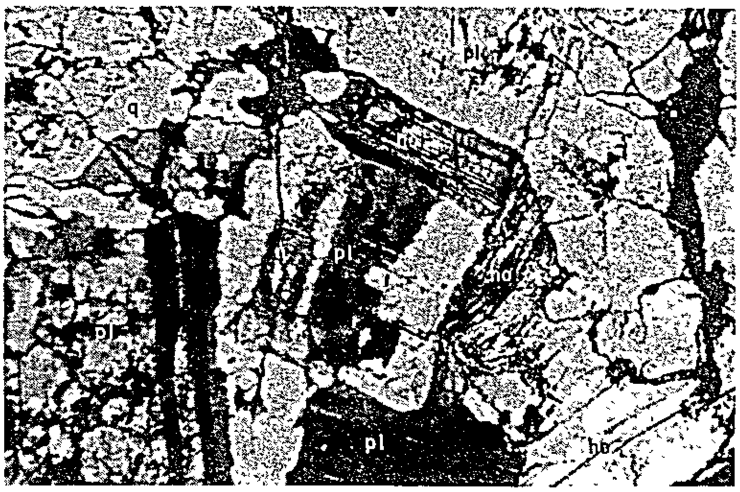
0 0.3mm

PL. 12 Biotite-tonalite-porphyry (Sample No. S-10)

(cross)

q : quartz ho : hornblende

pl : plagioclase



scale

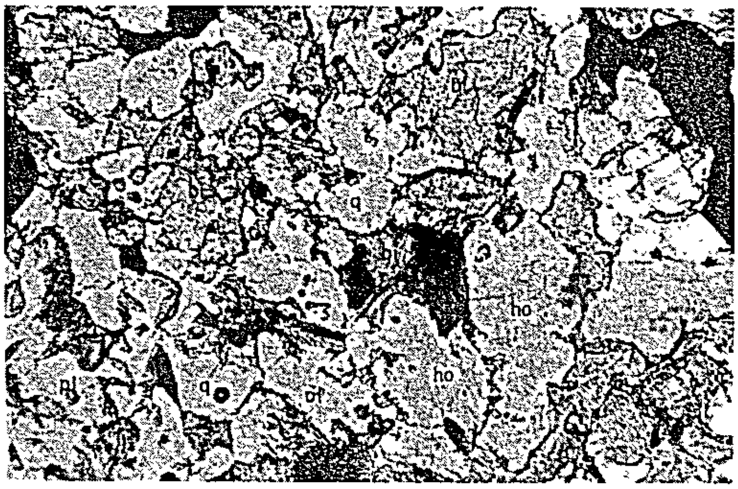
0 0.3mm

PL. 13 Biotite-quartz-porphyry (Sample No. S-67)

(cross)

q : quartz pl : plagioclase

ho : hornblende



scale

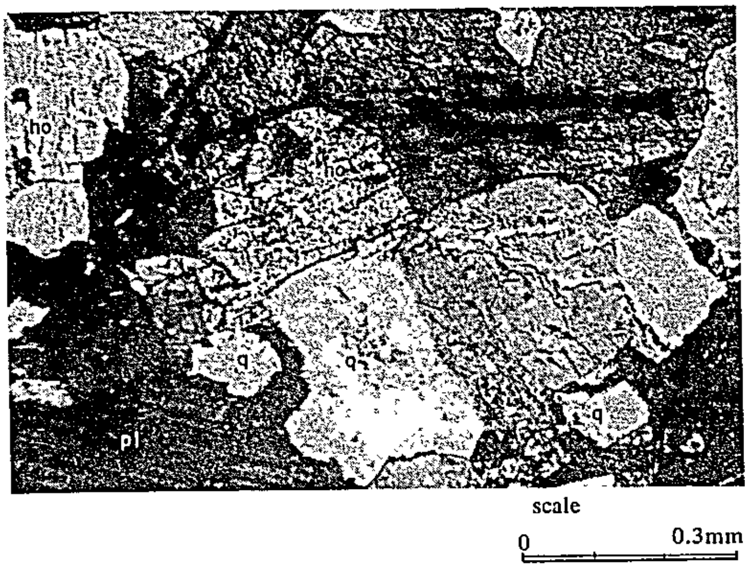
0 0.3mm

PL. 14 Hornblende-diorite (Sample No. O-23)

(open)

bi : biotite q : quartz

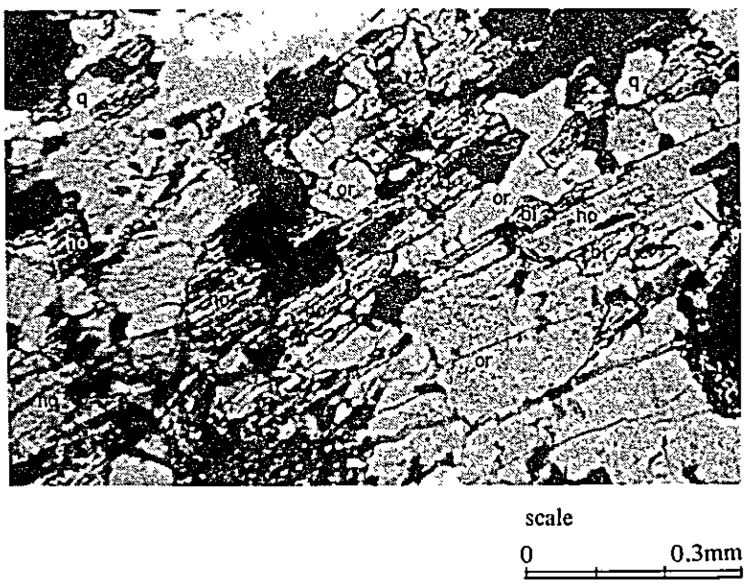
pl : plagioclase ho : hornblende



PL. 15 Hornblende-monzonite (Sample No. S-74)

(cross)

ho : hornblende q : quartz
pl : plagioclase



PL. 16 Biotite-hornblende-adamellite (Sample No. O-37)

(cross)

q : quartz or : orthoclase
ho : hornblende bi : biotite

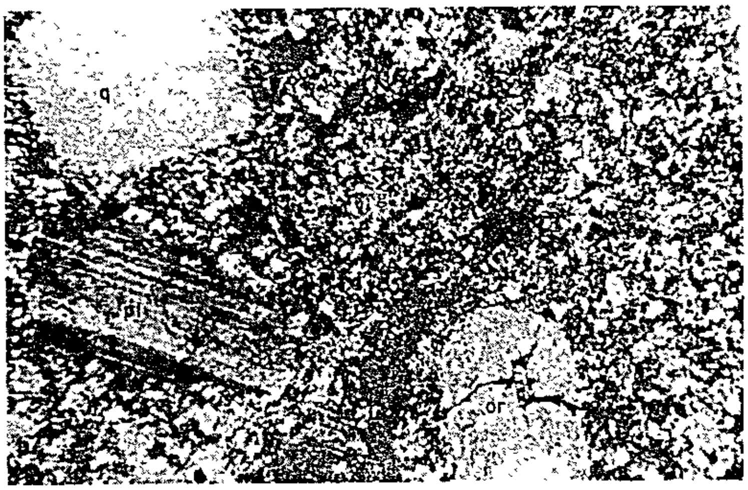
scale

0 0.3mm

PL. 17 Peridotite (Sample No. S-9)

(cross)

ol : olivine py : pyroxene



scale

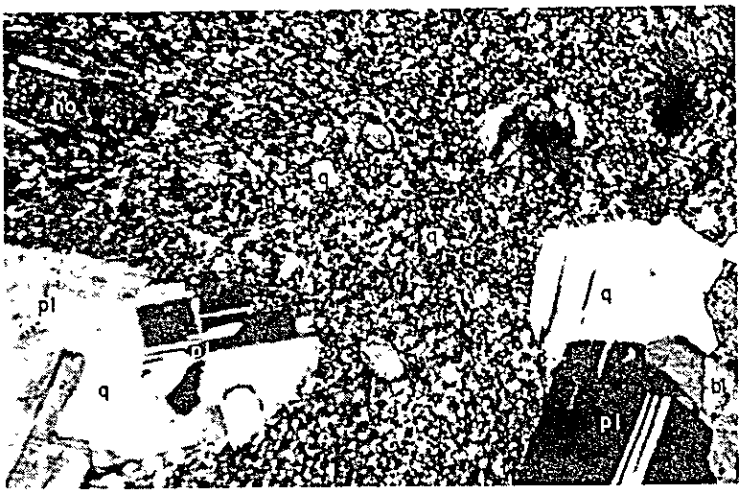
0 0.3mm

PL. 18 Andesite (Sample No. K-120)

(cross)

q : quartz pl : plagioclase

or : orthoclase g : groundmass



scale

0 0.3mm

PL. 19 Hornblende-biotite dacite (Sample No. S-19)

(cross)

ho ·	hornblende	q	quartz
pl .	plagioclase	bi	biotite

Table 4. Mineral Composition by X-ray Diffractive Analysis

Sample No	Location	Rock name	Clay mineral														Silica		Felds	Sulfate		Carb	Sulfide			Hom	Enst
			Kao	Pyrophy	Halloy	Vermi	Mont	Seri	1M	2M	Mus	Chl	Hyd	Mix	Talc	Anti	Qz	Cryst		Gyp	Anhy	Cal	Py	Gal	Sph		
S-5	Kulawi	Peridotite					+++								++	+										+	++
S-42	S. Kedundu	Hornfels										++					+++		+								
S-70	S Saluki	Biotie gneiss									+	+++							+++								

Remarks

Kao: Kaoline
Pyrophy. Pyrophyllite
Halloy: Halloysite
Vermi. Vermiculite
Mont. Montmorillonite
+++ abundant

Seri: Sericite
1M. 1M peak type of sericite
2M. 2M peak type of sericite
Mus Muscovite
++ common

Chl: Chlorite
Hyd: Hydromica
Mix: Mixed layer minerals
Anti: Antigorite
+ little

Qz. Quartz
Cryst: Crystobalite
Felds: Feldspar
Gyps: Gypsum

Anhy: Anhydrite
Carb: Carbonate
Cal. Calcite
Py: Pyrite

Gal: Galena
Sph: Sphalerite
Horn: Hornblende
Enst: Enstatite

Table 5. Chemical Assay

Sample No.	Location	Rock name	Copper contents percent	Molybdenum contents percent	Iron contents percent	Lead contents percent	Zinc contents percent	Sulfur contents percent
B-3	S. Webose	Biotite granite	< 0.01	< 0.01	6.59	0.10	0.12	0.75
B-4	S. Webose	Garnet gneiss	< 0.01	< 0.01	7.15	< 0.01	< 0.01	1.23
S-53	S. Bomba	Biotite hornblende monzonite	0.01	< 0.01	4.47	< 0.01	0.01	1.47
S-54	S. Bomba	Biotite hornblende monzonite	< 0.01	< 0.01	5.03	< 0.01	< 0.01	0.12
S-62	S. Webose	Biotite monzonitic gneiss	< 0.01	< 0.01	6.92	< 0.01	< 0.01	3.18
S-65	S. Webose	Biotite garnet gneiss	0.14	< 0.01	20.55	< 0.01	0.02	6.81

Table 6-1 Qualitative Emission Spectrochemical Analysis of Geochemical Samples

Remarks:

Photographical intensity

5:	very strong	4:	strong
3:	medium	2:	weak
1:	very weak	0:	none

(A) Stream sediments (– 100 mesh)

	Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
1	D - 89	3	1	4	1	>5	4	0	3	>5	3	>5	3	>5	>5	2	3	3	0	3	0
2	125	2	1	4	1	>5	3	0	2	>5	3	>5	2	>5	>5	1	2	3	0	3	0
3	166	3	1	4	1	>5	3	0	2	>5	3	>5	2	>5	>5	1	2	3	0	3	0
4	196	2	2	4	1	4	4	0	2	>5	3	>5	3	>5	3	1	2	3	0	3	0
5	226	2	3	4	1	5	3	0	3	>5	3	>5	3	>5	4	0	0	3	0	3	0
6	254	3	2	4	1	>5	4	0	4	>5	3	>5	3	>5	>5	3	2	3	1	3	0
7	288	2	4	4	1	5	3	0	3	>5	3	>5	3	>5	>5	2	1	3	0	3	0
8	317	2	3	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	3	0	3	0	3	0
9	339	2	2	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
10	380	2	1	3	0	>5	3	0	3	4	1	>5	3	>5	3	1	2	3	3	2	0
11	419	3	2	4	1	>5	3	0	3	>5	3	>5	3	>5	3	0	2	3	0	3	0
12	F - 19	0	2	3	0	>5	2	0	0	>5	0	>5	3	>5	>5	0	3	2	0	0	0
13	45	2	3	4	0	>5	3	0	1	>5	1	>5	3	>5	>5	0	1	3	1	0	0
14	67	1	3	3	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	3	3	0	0	0
15	95	3	2	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
16	119	2	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	3	0
17	143	2	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	0	0
18	167	2	2	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
19	218	2	3	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	2	3	3	0	1	0
20	241	3	1	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
21	265	3	2	4	1	5	4	0	3	>5	3	>5	3	>5	>5	2	2	3	0	3	0
22	291	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
23	317	4	1	4	1	5	3	0	3	>5	3	>5	3	>5	3	1	2	3	0	3	0
24	339	2	1	4	0	5	2	0	2	>5	2	>5	3	>5	>5	1	2	3	0	0	0
25	361	3	2	5	1	>5	4	0	2	>5	3	>5	3	>5	>5	0	2	3	0	3	0
26	390	2	4	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	3	0	3	0
27	409	3	2	4	0	>5	4	0	3	>5	3	>5	3	>5	>5	0	2	3	0	3	0
28	438	3	4	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0
29	462	1	3	4	0	>5	1	0	1	>5	0	>5	3	>5	>5	0	2	3	0	0	0
30	486	1	3	4	2	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	3	0	0	0
31	510	2	3	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	3	0	1	0
32	534	1	3	4	0	>5	3	0	2	>5	0	>5	3	>5	5	0	2	3	0	0	0
33	561	3	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	2	2	3	0	0	0
34	585	1	3	4	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	3	3	0	0	0
35	609	3	3	5	1	>5	3	0	2	>5	3	>5	3	>5	>5	2	3	3	1	0	0
36	O - 8	3	1	5	2	>5	4	0	3	>5	3	>5	3	>5	>5	2	2	3	0	0	0
37	19	3	2	5	2	>5	4	0	3	>5	3	>5	3	>5	5	2	2	3	1	0	0
38	30	3	2	4	2	>5	3	0	3	>5	2	>5	3	>5	5	0	2	3	3	0	0
39	43	2	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	1	0	0
40	55	3	4	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	0	0

Sample No.			Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
41	O -	67	2	2	4	0	>5	2	0	2	>5	1	>5	3	>5	3	0	3	3	1	0	0
42		79	2	3	4	0	>5	3	0	2	>5	2	>5	3	>5	3	0	3	3	0	0	0
43		91	2	3	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
44		103	2	4	4	0	>5	4	0	2	>5	2	>5	3	>5	>5	0	1	3	0	0	0
45		116	1	3	4	0	>5	2	0	1	>5	0	>5	2	>5	5	0	3	3	0	0	0
46		127	0	3	4	0	>5	0	0	1	>5	0	>5	2	>5	3	0	2	2	0	0	0
47		139	1	4	4	0	>5	3	0	2	>5	0	>5	3	>5	>5	0	3	3	2	0	0
48		151	3	2	4	0	>5	3	0	3	>5	3	>5	2	>5	>5	2	1	3	0	0	0
49		163	3	1	4	0	>5	3	0	3	>5	2	>5	3	>5	5	2	2	3	1	0	0
50		176	3	1	4	0	>5	3	0	2	>5	4	>5	2	>5	>5	4	2	3	2	0	0
51		187	3	0	3	0	>5	4	0	2	5	4	>5	3	>5	>5	4	2	2	2	0	0
52		199	2	1	3	1	>5	1	0	3	5	0	>5	2	>5	3	0	0	2	2	0	0
53		211	0	3	4	0	>5	2	0	1	>5	0	>5	2	>5	5	0	2	3	0	0	0
54		223	0	2	4	0	>5	2	0	1	>5	0	>5	2	>5	3	0	2	2	0	0	0
55		235	2	3	4	1	>5	1	0	3	>5	0	>5	3	>5	5	0	2	3	0	0	0
56		247	3	2	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	0	2	3	0	0	0
57		259	2	2	4	0	>5	4	0	2	>5	2	>5	3	>5	>5	1	2	3	0	0	0
58		271	1	3	4	0	>5	2	0	3	>5	0	>5	3	>5	3	0	1	3	0	0	0
59		283	1	3	4	0	>5	2	0	1	>5	1	>5	3	>5	>5	0	1	3	0	3	0
60		295	2	1	4	0	>5	3	0	1	>5	2	>5	3	>5	>5	0	2	3	0	0	0
61		307	1	2	4	0	>5	3	0	1	>5	1	>5	3	>5	>5	0	2	2	0	0	0
62		320	2	3	4	0	>5	3	0	3	>5	2	>5	3	>5	3	0	3	3	0	0	0
63	Z -	9	2	3	4	0	>5	2	0	1	>5	0	>5	3	>5	>5	0	2	2	0	0	0
64		54	3	2	4	0	>5	3	0	1	>5	2	>5	3	>5	>5	1	2	3	2	0	0
65		78	2	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0
66	Y -	3	2	3	4	0	>5	3	0	2	>5	2	>5	3	>5	3	1	2	3	0	0	0
67		19	2	1	3	0	>5	3	0	2	>5	1	>5	3	>5	3	0	2	3	0	0	0
68		36	3	1	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	1	1	3	0	3	0
69		52	3	2	4	0	>5	3	0	3	5	3	>5	3	>5	3	1	3	3	0	0	0
70		66	3	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	2	0
71		84	2	2	4	0	>5	3	0	2	>5	2	>5	3	>5	3	0	2	3	0	2	0
72		113	3	0	4	0	>5	4	0	2	>5	3	>5	2	>5	>5	1	1	3	0	3	0
73	S -	7	3	4	4	0	>5	3	0	2	>5	3	>5	2	>5	>5	1	1	3	0	0	0
74		26	2	4	4	1	>5	2	0	3	>5	1	>5	3	>5	3	0	3	3	0	0	0
75		41	1	3	4	0	>5	2	0	3	>5	0	>5	3	>5	3	0	1	3	0	0	0
76		50	1	3	4	0	>5	3	0	2	>5	2	>5	3	>5	5	0	3	3	0	0	0
77		74	1	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	3	0
78		97	2	4	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	3	0
79		109	3	4	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	3	0
80		121	2	0	4	0	>5	3	0	3	>5	2	>5	3	>5	5	1	2	3	0	2	0
81		133	0	1	3	0	>5	2	0	0	>5	0	>5	3	>5	5	0	3	3	0	0	0
82		145	1	0	4	0	>5	2	0	3	>5	2	>5	3	>5	3	0	3	3	0	0	0
83		157	3	2	4	1	>5	3	0	3	>5	2	>5	3	>5	>5	0	2	3	0	0	0
84		181	3	3	4	0	>5	3	0	3	>5	3	>5	3	>5	5	2	3	3	0	0	0
85		193	2	3	4	0	>5	2	0	3	>5	2	>5	3	>5	>5	1	1	3	0	0	0
86		205	2	3	4	0	>5	2	0	3	>5	2	>5	3	>5	>5	0	1	3	0	0	0
87		217	2	3	4	0	>5	3	0	3	>5	0	>5	3	>5	3	0	2	3	0	0	0
88	K -	12	2	4	4	0	4	3	0	1	>5	2	>5	3	>5	>5	3	0	3	0	3	0
89		23	4	1	4	1	>5	5	0	4	5	3	>5	3	>5	3	2	3	3	0	3	0
90		35	3	1	4	2	>5	5	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0

Sample No.			Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
91	K -	47	3	1	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	0	3	3	0	3	0
92		61	1	4	4	0	0	3	0	1	>5	1	>5	3	>5	>5	0	2	3	0	3	0
93		74	1	4	4	0	0	3	0	2	>5	2	>5	3	>5	3	3	0	3	0	2	0
94		85	2	0	4	1	0	3	0	3	>5	2	>5	3	>5	3	0	2	3	3	2	0
95		97	2	1	4	0	>5	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	1	0
96		108	2	1	4	1	>5	3	0	3	5	3	>5	3	>5	3	0	2	3	0	3	0
97		131	1	0	3	0	>5	3	0	3	5	1	>5	3	>5	3	0	2	2	3	1	0
98		145	1	0	3	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	2	3	3	0
99		160	2	2	3	0	>5	3	0	3	5	2	>5	3	>5	3	0	1	3	3	2	0
100		171	2	3	4	1	>5	3	0	3	5	3	>5	3	>5	3	4	0	3	0	2	0
101		188	3	1	4	0	>5	4	0	2	>5	3	>5	3	>5	>5	0	1	3	0	3	0
102	M -	12	0	1	3	0	>5	2	0	1	>5	0	>5	2	>5	3	1	2	3	0	0	0
103		25	3	3	3	1	>5	3	0	3	>5	3	>5	3	>5	3	1	1	3	3	2	0
104		37	2	1	4	0	>5	3	0	2	>5	3	>5	2	>5	>5	0	1	3	0	2	0
105		45	2	1	4	0	>5	3	0	2	>5	3	>5	2	>5	>5	0	1	3	0	2	0
106		63	2	1	4	0	>5	3	0	2	>5	3	>5	2	>5	3	0	1	3	0	3	0
107		76	1	3	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	1	0
108		88	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	3	0	1	3	1	3	0
109		99	1	1	4	0	>5	3	0	2	>5	1	>5	2	>5	3	0	2	3	0	0	0
110		114	2	2	4	0	>5	3	0	3	>5	3	>5	2	>5	>5	1	2	3	0	3	0
111		125	3	3	4	1	>5	3	0	3	>5	3	>5	3	>5	>5	3	1	3	0	3	0
112		137	0	3	3	0	>5	2	0	1	>5	0	>5	3	>5	4	0	2	3	0	1	0
113		156	3	1	3	0	>5	3	0	3	5	3	>5	3	>5	3	1	2	3	0	1	0
114		168	2	1	4	0	>5	3	0	3	5	2	>5	3	>5	>5	0	2	3	0	2	0
115		192	1	1	4	0	>5	3	0	2	>5	0	>5	3	>5	>5	0	0	3	0	0	0
116		209	2	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	1	0
117		223	2	2	4	0	>5	1	0	1	>5	0	>5	3	>5	>5	0	2	3	0	0	0
118	H -	3	2	0	4	0	>5	2	0	2	5	0	>5	3	>5	3	0	2	3	0	0	0
119		15	1	0	4	0	>5	2	0	2	>5	0	>5	3	>5	3	0	2	3	0	1	0
120		32	1	2	3	0	>5	2	0	2	4	0	>5	3	>5	3	0	2	3	0	0	0
121		46	2	0	3	0	>5	2	0	2	>5	0	>5	3	>5	3	0	2	3	0	0	0

(B) Stream sediments (50 ~ 100 mesh)

Sample No.			Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
1	D -	12	1	2	3	0	>5	3	0	1	>5	0	>5	3	>5	3	1	3	3	0	0	0
2		112	3	1	4	1	5	3	0	3	>5	3	>5	3	>5	>5	1	3	3	0	3	0
3		146	3	0	4	1	>5	3	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0
4		184	3	1	4	1	4	4	0	3	>5	3	>5	2	>5	3	0	2	3	0	3	0
5		210	3	2	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	3	3	3	0	3	0
6		238	3	3	4	3	>5	4	0	3	>5	3	>5	3	>5	4	1	2	3	0	3	0
7		271	3	2	4	1	>5	4	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0
8		296	1	2	4	0	5	3	0	2	>5	2	>5	3	>5	>5	1	1	3	0	3	0
9		329	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	3	0
10		369	1	3	4	1	3	3	0	2	>5	3	>5	1	>5	5	2	0	3	0	3	0
11		393	2	1	3	0	>5	3	0	3	4	3	>5	3	>5	3	1	2	3	1	2	0
12	F -	5	1	2	4	0	>5	2	0	1	>5	3	>5	3	>5	>5	3	2	3	0	0	0
13		31	0	3	3	0	>5	2	0	0	>5	0	>5	3	>5	>5	0	3	3	0	0	0
14		55	1	2	3	0	>5	2	0	2	>5	0	>5	3	>5	>5	0	3	3	0	0	0
15		83	3	3	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	3	2	3	0	0	0

Sample No.		Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
16	F - 107	2	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	2	0
17	131	2	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	1	0
18	155	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	2	0
19	179	3	2	4	1	>5	4	0	3	>5	3	>5	3	>5	>5	0	1	3	0	3	0
20	205	3	1	4	1	>5	4	0	3	>5	3	>5	3	>5	>5	0	3	3	0	3	0
21	232	3	4	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	2
22	253	1	1	4	1	3	3	0	3	>5	2	>5	3	>5	>5	1	0	3	0	3	0
23	279	3	1	4	2	5	4	0	3	>5	3	>5	3	>5	3	2	2	3	0	3	0
24	303	4	3	4	2	>5	3	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0
25	327	4	1	4	2	5	3	0	3	>5	3	>5	3	>6	>5	2	2	3	0	3	0
26	351	2	3	4	0	>5	3	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0
27	373	2	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	3	0	0	0
28	398	4	1	4	1	>5	4	0	3	>5	3	>5	3	>5	5	1	2	3	0	3	0
29	424	3	2	3	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
30	450	3	1	4	2	>5	3	0	3	>5	2	>5	3	>5	>5	0	2	3	0	0	0
31	474	2	1	4	1	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	0	0
32	498	1	1	3	0	>5	2	0	1	>5	0	>5	3	>5	3	0	3	3	0	0	0
33	522	2	1	4	0	>5	2	0	2	>5	0	>5	3	>5	5	0	2	3	0	0	0
34	551	2	2	4	0	5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	1	0
35	575	2	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	3	3	0	0	0
36	599	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	3	3	0	0	0
37	O - 3	3	1	5	1	>5	4	0	2	>5	3	>5	3	>5	>5	0	2	3	0	0	0
38	13	3	4	5	2	>5	4	0	2	>5	2	>5	3	>5	>5	0	3	3	0	2	0
39	25	3	2	4	2	>5	3	0	3	>5	2	>5	3	>5	5	2	2	3	0	0	0
40	37	3	3	4	0	>5	2	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0
41	49	3	2	4	0	>5	3	0	3	>5	2	>5	3	>5	5	0	2	3	0	0	0
42	61	2	0	4	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
43	73	3	3	4	3	>5	3	0	3	>5	3	>5	3	>5	3	2	3	3	1	3	0
44	85	2	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	2	1	3	0	0	0
45	98	1	2	4	0	>5	2	0	1	>5	1	>5	3	>5	5	0	3	3	0	0	0
46	110	1	1	4	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
47	121	0	3	4	0	>5	2	0	1	>5	0	>5	2	>5	5	0	2	3	0	0	0
48	133	0	1	4	0	>5	0	0	1	>5	0	>5	2	>5	5	0	2	2	0	0	0
49	145	2	0	4	0	>5	3	0	2	>5	2	>5	2	>5	>5	1	1	3	0	0	0
50	157	3	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	1	3	0	1	0
51	169	3	1	4	0	>5	3	0	3	>5	2	>5	2	>5	5	2	2	3	0	0	0
52	181	3	0	3	0	>5	4	0	2	5	4	>5	2	>5	>5	4	2	3	2	0	0
53	193	3	0	3	0	>5	4	0	2	5	4	>5	3	>5	5	4	2	3	2	0	0
54	205	2	3	4	1	>5	3	0	3	>5	0	>5	3	>5	3	0	3	3	0	0	0
55	217	2	1	4	0	>5	2	0	0	>5	0	>5	2	>5	>5	0	2	3	0	0	0
56	229	0	1	4	0	>5	2	0	1	>5	1	>5	3	>5	>5	0	2	2	0	0	0
57	241	2	2	4	1	>5	1	0	3	>5	0	>5	3	>5	5	0	1	3	0	0	0
58	253	2	2	4	0	>5	4	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0
59	265	0	3	4	0	>5	1	0	3	5	0	>5	3	>5	3	0	0	3	0	0	0
60	277	2	1	4	1	>5	2	0	3	3	0	>5	3	>5	3	0	0	3	2	0	0
61	289	1	1	4	0	>5	3	0	1	>5	1	>5	3	>5	>5	0	3	3	0	0	0
62	301	2	0	4	0	>5	3	0	1	>5	2	>5	3	>5	>5	0	2	3	0	1	0
63	313	2	2	4	0	>5	3	0	1	>5	2	>5	3	>5	>5	0	2	3	0	1	0
64	325	0	3	4	0	>5	3	0	1	>5	0	>5	3	>5	3	0	1	2	0	0	0
65	Z - 42	2	2	4	0	>5	2	0	1	>5	1	>5	3	>5	>5	1	2	3	0	0	0

	Sample No.		Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo	
66	Z -	66	0	2	4	0	>5	1	0	1	>5	2	>5	3	>5	>5	0	2	3	0	0	0	
67	B -	3	3	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0	
68	Y -	11	2	1	4	0	>5	3	0	1	>5	1	>5	3	>5	>5	1	3	3	0	0	0	
69		27	2	1	3	0	>5	3	0	2	>5	1	>5	3	>5	3	1	3	3	0	0	0	
70		44	3	1	4	1	>5	4	0	2	>5	3	>5	3	>5	>5	0	1	3	0	3	0	
71		60	2	0	4	0	>5	3	0	2	5	2	>5	3	>5	3	0	3	3	0	2	0	
72		75	1	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	0	3	0	2	0	
73		92	2	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	3	0	
74	S -	22	2	0	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	0	0	
75		33	5	0	3	0	>5	2	0	0	>5	5	>5	3	>5	>5	4	1	3	0	0	0	
76		45	1	1	4	0	>5	2	0	2	>5	2	>5	3	>5	>5	0	1	3	0	0	0	
77		57	2	0	4	0	>5	3	0	1	>5	3	>5	3	>5	5	1	3	3	0	0	0	
78		67	3	1	4	0	>5	4	0	2	>5	4	>5	3	>5	>5	3	3	3	0	0	0	
79		79	1	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0	
80		91	2	0	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	1	0	
81		103	2	0	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	3	0	
82		115	3	0	4	0	>5	3	0	3	>5	1	>5	3	>5	5	0	3	3	0	2	0	
83		127	0	0	4	0	>5	2	0	0	>5	0	>5	3	>5	5	0	3	3	0	0	0	
84		139	2	0	3	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	0	0	
85		151	1	1	4	0	>5	3	0	1	>5	1	>5	3	>5	>5	0	2	3	0	0	0	
86		163	1	1	4	0	>5	3	0	2	>5	0	>5	3	>5	>5	0	3	3	0	0	0	
87		175	2	1	4	0	>5	2	0	1	>5	2	>5	3	>5	>5	0	1	3	0	1	0	
88		187	0	1	4	0	>5	2	0	3	>5	1	>5	3	>5	>5	0	1	3	0	0	0	
89		199	1	1	4	0	>5	2	0	1	>5	1	>5	3	>5	>5	0	1	3	0	0	0	
90		211	2	2	4	0	>5	3	0	2	>5	3	>5	3	>5	3	1	2	3	0	0	0	
91		223	2	0	4	0	>5	2	0	1	>5	3	>5	3	>5	3	2	2	3	0	0	0	
92	K -	5	2	0	4	0	>5	3	0	3	5	2	>5	3	>5	3	1	3	3	0	2	0	
93		17	0	1	4	0	4	2	0	0	>5	0	>5	3	>5	3	0	2	3	0	3	0	
94		30	1	1	4	0	>5	3	0	3	>5	0	>5	3	>5	3	0	2	3	0	1	0	
95		40	3	1	4	1	>5	3	0	3	>5	3	>5	3	>5	>5	1	3	3	0	3	0	
96		54	2	1	4	0	0	3	0	1	>5	2	>5	3	>5	>5	0	3	3	0	3	0	
97		69	3	0	4	1	0	3	0	3	>5	3	>5	3	>5	>5	0	2	3	0	3	0	
98		79	2	0	4	0	0	3	0	2	>5	2	>5	3	>5	3	0	2	3	0	2	0	
99		91	3	1	4	1	2	3	0	3	>5	3	>5	3	>5	>5	1	0	3	0	3	0	
100		104	3	0	4	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	3	0	1	0	
101		117	0	1	4	0	>5	3	0	3	5	3	>5	3	>5	3	0	2	3	0	1	0	
102		137	2	0	3	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	2	0	3	0	
103		151	3	0	3	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	2	3	2	0	
104		164	3	0	3	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	3	0	2	0	
105		178	3	0	3	1	>5	3	0	3	5	2	>5	3	>5	3	0	3	3	0	2	0	
106	M -	5	2	0	4	0	>5	3	0	3	>5	1	>5	2	>5	3	0	2	3	0	0	0	0
107		17	0	0	3	0	>5	2	0	1	>5	0	>5	2	>5	3	0	2	3	0	0	0	0
108		31	0	0	3	0	>5	2	0	0	>5	0	>5	3	>5	3	0	2	3	0	0	0	0
109		55	0	0	3	0	>5	3	0	0	>5	0	>5	2	>5	3	0	1	3	0	0	0	0
110		69	1	3	4	0	>5	3	0	1	>5	2	>5	2	>5	>5	0	1	3	0	0	0	0
111		82	1	3	4	0	>5	2	0	0	>5	1	>5	2	>5	>5	0	1	3	0	0	0	0
112		93	1	3	4	0	>5	3	0	2	>5	1	>5	2	>5	>5	0	2	3	0	0	0	0
113		105	1	3	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0	0
114		120	2	2	4	0	>5	3	0	3	>5	3	>5	3	>5	>5	0	2	3	0	3	0	0
115		131	1	1	4	0	>5	2	0	2	>5	0	>5	3	>5	4	0	2	3	0	2	0	1

Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
116 M - 143	1	0	4	0	>5	3	0	1	5	0	>5	3	>5	3	0	2	3	0	1	0
117 162	2	2	4	0	>5	3	0	3	5	2	>5	3	>5	3	0	2	3	0	1	0
118 185	2	1	4	1	>5	3	0	2	>5	2	>5	3	>5	>5	0	0	3	0	3	0
119 200	2	2	4	0	>5	3	0	3	>5	0	>5	3	>5	>5	0	1	3	0	1	0
120 216	2	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	1	3	0	2	0
121 228	1	2	4	0	>5	1	0	0	5	0	>5	3	>5	3	0	2	3	0	0	0
122 H - 8	1	3	4	0	>5	2	0	2	>5	0	>5	3	>5	3	0	3	3	0	0	0
123 21	1	3	4	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
124 40	1	0	3	0	>5	1	0	1	>5	0	>5	3	>5	>5	0	2	3	0	0	0

(C) Soils

Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
1 Y - 20	2	1	3	0	>5	3	0	2	>5	2	>5	3	>5	3	2	3	3	0	0	0
2 45	0	1	5	0	3	0	0	3	>5	0	>5	2	>5	3	2	0	0	0	3	0
3 70	1	1	4	0	3	3	0	3	>5	2	>5	3	>5	5	2	1	2	0	3	0
4 83	1	0	4	0	2	3	1	3	>5	1	>5	2	>5	>5	0	1	3	0	0	0
5 S - 121	3	0	4	1	3	3	1	2	3	2	>5	2	>5	2	1	3	3	0	3	0
6 167	3	3	4	4	4	3	0	3	>5	3	>5	3	>5	>5	3	3	3	0	2	0
7 190	0	3	4	0	2	4	0	3	>5	2	>5	2	>5	3	2	0	0	0	3	0
8 195	0	2	4	0	0	1	1	3	>5	1	>5	1	>5	3	0	0	2	0	0	1
9 200	0	3	4	0	0	3	1	3	>5	1	>5	2	>5	3	1	0	3	0	2	0
10 205	0	3	4	0	1	3	0	3	>5	1	>5	2	>5	3	2	0	0	0	2	0
11 211	1	0	4	0	5	1	0	2	>5	1	>5	2	>5	>5	2	2	3	0	0	0
12 216	3	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	2	3	3	0	0	0
13 221	2	1	4	0	>5	2	0	2	>5	2	>5	3	>5	4	2	3	3	0	0	0
14 D - 9	2	0	4	0	>5	2	0	2	>5	2	>5	3	>5	4	2	3	3	0	0	0
15 54	3	3	4	0	>5	3	0	3	>5	3	>5	3	>5	>5	2	2	3	0	3	0
16 65	0	2	4	1	3	3	0	3	>5	2	>5	3	>5	5	3	0	1	0	2	0
17 72	1	2	4	1	3	3	0	3	>5	2	>5	3	>5	5	2	1	1	0	2	0
18 80	0	0	4	1	3	3	0	3	>5	1	>5	2	>5	4	2	0	1	0	2	0
19 94	3	2	4	1	4	3	0	3	>5	3	>5	3	>5	4	2	3	3	0	3	0
20 111	2	0	4	0	3	3	0	2	>5	2	>5	2	>5	>5	2	1	3	0	3	0
21 129	3	0	4	1	5	4	0	3	>5	3	>5	3	>5	>5	2	3	3	2	0	0
22 141	3	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	2	2	3	0	0	0
23 157	1	0	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	2	3	3	0	0	0
24 173	2	3	4	1	3	3	1	2	>5	3	>5	2	>5	>5	1	1	3	0	3	0
25 188	3	1	4	0	3	3	0	2	>5	3	>5	2	>5	>5	4	1	3	0	2	0
26 209	3	1	4	1	4	3	0	2	>5	3	>5	3	>5	>5	1	1	3	0	3	0
27 220	3	1	4	1	>5	3	0	3	5	3	>5	3	>5	>5	1	2	3	0	3	0
28 234	3	1	4	1	>5	3	1	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
29 249	1	2	4	1	>5	2	0	2	>5	2	>5	3	>5	3	0	0	2	0	3	0
30 264	3	0	4	1	5	3	1	2	3	3	>5	3	>5	>5	1	2	3	0	3	0
31 282	3	0	4	1	>5	3	0	2	>5	3	>5	3	>5	3	1	2	3	0	3	0
32 297	3	0	4	1	5	3	1	3	5	3	>5	3	>5	>5	1	2	3	0	3	0
33 307	3	2	4	1	>5	3	0	2	>5	3	>5	3	>5	3	1	2	3	0	3	0
34 326	3	0	4	0	5	3	1	2	3	3	>5	3	>5	>5	0	2	3	0	2	0
35 345	2	3	5	1	3	3	1	2	>5	2	>5	3	>5	>5	0	2	3	0	2	0

	Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
36	D - 356	2	2	4	1	5	3	1	2	>5	3	>5	3	>5	>5	1	2	2	0	3	0
37	366	2	3	4	2	5	3	1	3	>5	3	>5	3	>5	>5	1	1	2	0	3	0
38	376	3	3	4	2	5	3	2	3	>5	3	>5	3	>5	3	1	2	3	0	2	0
39	390	3	1	4	2	5	3	2	3	3	3	>5	3	>5	>5	1	3	2	0	3	0
40	405	3	2	4	2	5	3	1	3	>5	3	>5	3	>5	>5	1	3	2	0	2	0
41	416	2	3	4	1	5	3	2	3	>5	2	>5	3	>5	5	2	2	3	0	3	0
42	424	0	3	4	0	5	3	0	3	5	2	>5	3	>5	3	0	0	0	0	3	0
43	432	4	1	4	2	>5	4	1	3	3	3	>5	3	>5	3	0	3	3	0	3	0
44	Z - 4	2	0	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
45	36	1	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	2	0	0	0
46	45	3	3	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	1	2	3	0	0	0
47	55	3	0	4	1	>5	3	0	3	>5	1	>5	3	>5	>5	0	2	3	0	0	0
48	65	3	2	4	0	>5	3	2	2	>5	2	>5	3	>5	>5	1	2	3	0	0	0
49	75	3	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	0	0
50	82	1	1	4	0	3	2	0	1	>5	0	>5	3	>5	3	0	3	2	0	0	0
51																					
52	H - 13	1	2	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	0	0
53	F - 10	0	2	4	0	>5	2	0	1	>5	1	>5	2	>5	4	0	2	2	0	0	0
54	22	1	2	4	0	>5	2	0	2	>5	2	>5	3	>5	>5	0	2	2	0	0	0
55	38	3	2	5	0	>5	3	0	3	>5	3	>5	3	>5	>5	1	3	2	0	0	0
56	52	1	1	4	0	5	2	0	1	>5	1	>5	3	>5	>5	0	2	2	0	0	0
57	64	1	1	5	0	>5	2	0	1	>5	1	>5	3	>5	>5	0	3	2	0	0	0
58	76	0	3	4	0	>5	2	0	0	>5	0	>5	2	>5	3	0	2	2	0	0	0
59	84	3	0	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	1	3	3	0	0	0
60	94	3	1	4	1	>5	3	1	3	3	3	>5	3	>5	>5	1	2	3	0	3	0
61	104	3	1	4	1	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	2	0
62	114	3	3	4	0	5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	2	0
63	124	3	1	4	1	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	2	0
64	134	3	1	4	1	>5	3	0	2	5	3	>5	3	>5	3	0	3	3	0	3	0
65	144	1	3	4	0	>5	2	0	2	>5	0	>5	2	>5	>5	2	2	3	0	0	0
66	154	2	0	4	1	5	3	0	2	>5	2	>5	3	>5	>5	0	3	3	0	3	0
67	164	2	3	4	1	>5	3	0	2	>5	2	>5	2	>5	>5	1	1	3	0	3	0
68	174	2	1	4	1	3	3	0	2	>5	3	>5	3	>5	>5	0	1	3	0	3	0
69	F - 182	1	3	4	0	4	3	0	3	>5	1	>5	2	>5	3	1	1	3	0	2	0
70	194	3	3	4	1	4	3	0	3	>5	2	>5	2	>5	>5	1	1	3	0	3	0
71	204	3	3	4	1	4	3	0	3	>5	2	>5	2	>5	>5	1	1	3	0	3	0
72	213	3	1	4	2	4	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	3	0
73	223	2	3	4	1	4	3	0	3	>5	1	>5	2	>5	>5	1	1	3	0	2	0
74	233	1	3	4	0	4	3	0	2	>5	1	>5	1	>5	>5	1	0	3	0	2	0
75	244	3	1	4	1	2	3	0	3	>5	3	>5	3	>5	>5	1	2	3	0	3	0
76	252	0	3	4	1	5	3	0	3	>5	3	>5	3	>5	>5	2	0	0	0	3	0
77	262	3	3	4	1	>5	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	3	0
78	272	3	1	4	2	>5	3	0	3	>5	3	>5	3	>5	>5	0	1	3	0	2	0
79	282	2	3	4	0	>5	3	0	3	>5	1	>5	3	>5	>5	1	1	3	0	2	0
80	292	3	2	4	1	>5	3	0	3	>5	3	>5	3	>5	>5	0	2	3	0	3	0
81	302	3	1	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	3	0
82	312	3	3	4	0	>5	3	0	3	>5	3	>5	3	>5	>5	0	2	3	0	3	0
83	322	3	1	4	1	>5	3	0	3	>5	3	>5	3	>5	5	1	3	3	0	3	0
84	332	3	1	4	1	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	3	0
85	342	2	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	1	3	3	0	2	0

No.	Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pb	Mn	P	B	Mo
86	F - 354	3	1	4	1	>5	3	0	2	>5	3	>5	3	>5	>5	0	2	3	0	2	0
87	364	3	3	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	1	2	3	0	3	0
88	374	1	3	3	0	>5	2	0	1	>5	0	>5	3	>5	>5	0	2	3	0	0	0
89	383	1	1	3	0	>5	3	0	1	>5	1	>5	3	>5	>5	0	2	3	0	2	0
90	393	0	1	3	0	>5	2	0	0	>5	0	>5	3	>5	3	0	0	2	0	0	0
91	402	1	3	4	0	2	2	0	3	>5	2	>5	2	>5	5	1	0	3	0	2	0
92	41'	2	2	4	1	3	3	0	3	>5	3	>5	3	>5	5	1	0	2	0	3	0
93	421	2	3	3	1	>5	3	0	2	>5	3	>5	3	>5	>5	0	3	3	0	1	0
94	431	1	3	3	0	>5	2	0	2	>5	0	>5	2	>5	>5	0	1	3	0	0	0
95	441	3	1	3	0	>5	3	0	3	>5	1	>5	3	>5	>5	0	0	3	0	0	0
96																					
97	461	0	2	3	0	>5	1	0	1	>5	0	>5	2	>5	>5	0	0	3	0	0	0
98	471	1	3	4	1	5	3	0	2	>5	0	>5	2	>5	>5	0	2	3	0	0	0
99	481	2	1	3	0	>5	3	0	2	>5	2	>5	3	>5	>5	0	2	2	0	2	0
100	491	2	3	4	1	>5	3	0	3	>5	2	>5	3	>5	>5	0	2	3	0	0	0
101	501	2	1	3	0	>5	3	0	1	>5	1	>5	3	>5	5	0	3	3	0	0	0
102	511	0	3	5	0	3	1	0	3	>5	0	>5	3	>5	3	0	0	0	0	3	0
103	521	0	3	5	0	3	3	0	2	>5	2	>5	3	>5	5	2	0	3	0	3	0
104	531	2	3	3	0	>5	3	0	2	>5	1	>5	3	>5	5	0	3	3	0	1	0
105	541	3	3	4	1	>5	3	0	3	>5	3	>5	3	>5	>5	2	3	3	0	2	0
106	548	3	1	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	2	3	4	0	2	0
107	558	3	1	4	2	>5	3	0	2	>5	2	>5	3	>5	>5	0	1	4	0	2	0
108	568	0	1	3	0	>5	1	0	1	>5	0	>5	3	>5	5	0	2	4	0	0	0
109	578	1	1	3	0	>5	2	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
110	588	2	1	3	0	>5	3	0	2	>5	1	>5	3	>5	5	0	2	3	0	0	0
111	598	2	1	4	0	>5	3	0	1	>5	2	>5	3	>5	>5	0	2	3	0	0	0
112	608	2	2	3	0	>5	3	0	1	>5	3	>5	3	>5	>5	2	2	3	0	0	0
113	M - 13	2	1	4	0	>5	3	0	1	>5	3	>5	3	>5	>5	2	2	3	0	0	0
114	46	2	2	3	0	>5	2	0	2	>5	1	>5	3	>5	>5	2	2	3	0	0	0
115	80	2	2	4	1	4	3	0	2	>5	1	>5	3	>5	5	0	3	3	0	0	0
116	108	0	2	4	0	4	3	0	2	>5	0	>5	2	>5	5	0	2	3	0	0	0
117	151	1	1	4	0	>5	3	0	2	>5	2	>5	3	>5	5	0	2	3	0	0	0
118	176	0	3	4	0	5	2	0	1	>5	0	>5	2	>5	5	0	0	3	0	0	0
119	183	3	0	4	0	>5	3	0	2	>5	2	>5	3	>5	>5	1	2	3	0	1	0
120	S - 2	2	3	4	2	5	3	0	2	>5	2	>5	3	>5	>5	0	2	3	0	1	0
121	7	2	3	5	1	>5	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	0	0
122	13	1	2	4	1	>5	3	0	2	>5	0	>5	3	>5	3	0	3	3	0	0	0
123	18	0	2	3	0	>5	1	0	1	>5	0	>5	3	>5	>5	0	2	3	0	0	0
124	23	0	2	3	0	>5	2	0	1	>5	0	>5	3	>5	5	0	3	3	0	0	0
125	30	5	0	2	1	3	3	0	1	>5	5	>5	2	>5	>5	4	0	3	0	0	0
126	38	2	1	3	0	>5	3	0	3	>5	2	>5	3	>5	>5	0	1	3	0	0	0
127	46	2	1	3	0	>5	3	0	3	>5	2	>5	3	>5	>5	0	1	3	0	0	0
128																					
129	56	3	1	4	0	>5	3	0	2	>5	3	>5	3	>5	>5	2	2	3	0	0	0
130	63	2	2	3	0	>5	2	0	2	>5	3	>5	3	>5	5	2	3	3	0	0	0
131	68	3	1	3	0	>5	3	0	2	>5	4	>5	3	>5	5	3	3	3	0	0	0
132	73	2	2	4	1	>5	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	0	0
133	80	2	1	4	1	>5	3	0	3	>5	2	>5	3	>5	>5	1	2	3	0	0	0
134																					
135	93	2	2	4	0	>5	3	0	3	>5	2	>5	3	>5	>5	1	3	3	0	0	0

	Sample No.	Co	Zr	Ti	Zn	Na	Cu	Ag	V	Al	Ni	Fe	Ga	Si	Mg	Cr	Pt	Mn	P	B	Mo
136	S - 99	2	2	4	0	>5	3	0	3	>5	2	>5	3	>5	>5	0	2	3	0	1	0
137	106	3	2	4	2	3	3	0	3	>5	3	>5	3	>5	>5	0	2	3	0	1	0
138	119	2	1	4	0	>5	3	0	3	>5	1	>5	3	>5	>5	0	3	3	0	3	0
139	124	2	1	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	3	3	0	1	0
140	130	2	1	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	1	3	3	0	1	0
141	152	2	0	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
142	164	2	2	4	0	>5	3	0	2	>5	1	>5	3	>5	>5	0	2	3	0	0	0
143	174	2	2	4	0	>5	3	0	3	>5	2	>5	3	>5	>5	0	2	3	0	0	0
144	191	2	2	4	0	>5	3	0	3	>5	3	>5	3	>5	3	0	2	3	0	0	0
145	203	3	2	4	0	>5	4	0	3	>5	3	>5	2	>5	>5	3	3	3	0	0	0
146	209	2	2	4	0	>5	3	0	3	>5	3	>5	3	>5	3	1	2	3	0	0	0
147	220	2	1	3	0	>5	3	0	2	>5	3	>5	3	>5	>5	2	3	3	0	0	0

Table 6-2 Metal Content of Geochemical Samples

(unit: p.p.m)

* Samples of qualitative emission spectrochemical analysis

(A) Stream sediments (-100mesh)

No.	Sample No.	Cu	Pb	Zn	No.	Sample No.	Cu	Pb	Zn	No.	Sample No.	Cu	Pb	Zn
1	B - 1	37	3	61	51	D - 189	40	20	95	101	D - 311	10	2	60
2	2	19	1	43	52	190	41	19	95	102	313	43	15	80
3	3	22	2	46	53	192	34	21	99	103	317*	15	5	73
4	D - 2	15	25	38	54	194	32	9	78	104	318	46	24	74
5	4	12	31	44	55	196*	30	7	79	105	319	13	3	70
6	8	15	26	41	56	197	25	10	65	106	323	15	5	63
7	12	12	28	35	57	201	34	15	79	107	325	51	20	83
8	13	11	10	40	58	204	36	14	70	108	328	38	20	78
9	16	9	3	26	59	207	22	5	74	109	329	51	19	83
10	17	10	28	40	60	210	89	72	87	110	331	55	22	83
11	20	32	1	70	61	215	7	2	58	111	333	69	25	86
12	24	28	<1	64	62	216	48	18	85	112	334	66	20	93
13	26	14	<1	42	63	218	40	16	76	113	337	56	21	90
14	29	29	1	73	64	219	31	14	76	114	339*	34	8	99
15	31	30	<1	73	65	221	21	4	61	115	342	27	13	67
16	33	27	4	67	66	223	33	11	72	116	355	36	21	69
17	35	25	2	64	67	225	34	13	74	117	359	26	16	69
18	55	57	12	91	68	226*	17	8	70	118	361	21	10	62
19	89*	45	40	104	69	229	16	8	66	119	363	19	7	55
20	92	42	13	91	70	230	7	10	26	120	365	12	<1	45
21	97	49	15	98	71	233	23	13	63	121	367	3	<1	17
22	99	51	6	98	72	235	22	8	69	122	369	16	2	51
23	102	25	1	75	73	238	40	12	77	123	371	13	<1	42
24	105	48	16	96	74	241	17	5	66	124	373	17	1	51
25	112	36	34	90	75	242	15	7	56	125	377	26	4	30
26	115	29	5	89	76	245	28	8	67	126	378	22	4	37
27	119	44	10	98	77	248	40	14	80	127	380*	21	17	34
28	122	38	10	86	78	250	25	14	69	128	381	10	2	17
29	124	37	2	89	79	254*	36	19	81	129	383	23	1	54
30	125*	46	18	92	80	257	37	22	80	130	385	28	<1	66
31	126	35	1	97	81	260	55	21	85	131	389	30	5	36
32	128	44	26	100	82	263	41	25	73	132	392	32	9	47
33	130	36	16	86	83	266	37	26	66	133	393	36	5	38
34	137	30	18	94	84	271*	38	20	71	134	397	37	11	47
35	142	50	44	106	85	274	27	16	72	135	400	31	8	39
36	144	42	9	88	86	277	23	17	79	136	402	28	14	43
37	146	47	9	97	87	281	33	18	79	137	413	32	5	56
38	150	43	12	101	88	283	48	34	87	138	415	34	14	68
39	152	42	25	94	89	284	33	14	86	139	419*	42	30	92
40	156	41	19	92	90	285	33	27	86	140	431	44	19	75
41	158	34	13	97	91	288*	16	5	74	141	434	41	21	76
42	161	44	17	101	92	290	30	14	78	142	F - 1	18	20	39
43	166*	38	15	79	93	292	8	4	53	143	3	9	<1	24
44	168	43	11	94	94	293	48	15	85	144	5	16	4	36
45	170	22	1	87	95	296	10	5	58	145	7	7	<1	23
46	176	47	14	94	96	298	67	9	93	146	9	12	1	30
47	178	35	8	100	97	300	33	10	73	147	11	14	<1	46
48	182	21	1	96	98	302	29	10	71	148	13	15	7	41
49	184	34	5	97	99	306	40	10	78	149	15	10	<1	26
50	187	42	20	93	100	308	42	17	80	150	17	21	6	35

No.	Sample No.	Cu	Pb	Zn
151	F - 19*	10	5	35
152	21	6	<1	20
153	23	15	1	35
154	25	9	1	33
155	27	8	<1	23
156	29	10	<1	29
157	31	7	1	21
158	33	16	16	43
159	35	10	8	50
160	39	11	1	27
161	41	9	<1	22
162	43	15	<1	24
163	45*	18	3	33
164	47	16	1	31
165	49	23	<1	35
166	51	10	<1	23
167	53	20	1	34
168	55	10	1	20
169	57	7	<1	16
170	59	9	1	24
171	61	13	2	32
172	63	13	7	47
173	65	12	1	26
174	67*	11	7	37
175	69	9	2	30
176	71	19	4	39
177	73	13	7	42
178	78	15	1	34
179	80	13	1	28
180	83	12	4	29
181	85	16	2	28
182	87	13	2	33
183	89	26	9	55
184	91	48	4	77
185	93	50	23	78
186	95*	35	25	84
187	97	47	10	75
188	99	15	<1	41
189	101	19	<1	44
190	103	15	<1	42
191	105	11	<1	38
192	107	14	<1	45
193	109	19	<1	58
194	111	30	6	70
195	113	9	1	31
196	115	27	<1	58
197	117	8	1	29
198	119*	19	4	62
199	121	22	<1	58
200	123	15	1	42
201	125	19	16	48
202	127	28	1	57
203	129	17	10	44
204	131	18	15	43
205	133	28	15	58

No.	Sample No.	Cu	Pb	Zn
206	F - 135	23	16	50
207	137	15	15	41
208	139	16	16	41
209	141	18	6	41
210	143*	12	5	42
211	145	13	17	38
212	147	30	6	70
213	149	19	5	45
214	151	31	10	56
215	153	22	2	51
216	155	26	1	56
217	157	34	6	78
218	159	40	7	74
219	161	32	4	62
220	163	15	4	66
221	165	38	16	67
222	167*	21	<1	70
223	169	27	7	59
224	171	34	5	67
225	173	32	4	65
226	175	30	8	43
227	117	18	12	57
228	179	38	21	67
229	183	33	22	66
230	185	78	27	78
231	187	24	11	57
232	189	40	16	69
233	193	47	18	77
234	195	52	12	73
235	197	44	6	76
236	199	46	8	82
237	201	46	4	79
238	203	42	12	78
239	205	38	10	77
240	207	37	9	75
241	209	51	10	83
242	212	53	6	77
243	214	13	<1	51
244	216	46	<1	78
245	218*	11	10	44
246	220	14	12	49
247	222	48	15	78
248	224	27	2	63
249	226	25	7	64
250	228	50	15	80
251	230	49	10	78
252	232	47	17	78
253	234	50	14	80
254	235	66	25	79
255	236	43	15	79
256	238	42	17	84
257	241*	40	8	91
258	243	38	17	85
259	245	63	18	98
260	247	45	14	78

No.	Sample No.	Cu	Pb	Zn
261	F - 249	46	10	79
262	253	9	<1	42
263	255	53	18	79
264	257	35	9	72
265	259	38	25	82
266	261	41	25	80
267	263	49	28	82
268	265*	43	11	91
269	267	26	6	68
270	269	50	17	79
271	271	42	20	76
272	273	30	7	70
273	275	40	12	78
274	277	64	20	83
275	279	58	16	81
276	281	16	7	50
277	283	15	8	45
278	285	42	16	77
279	287	45	16	80
280	289	23	18	54
281	291*	34	4	79
282	293	34	16	75
283	295	25	16	55
284	297	43	21	80
285	299	46	18	79
286	301	50	16	78
287	303	43	22	69
288	305	42	17	69
289	307	24	9	52
290	309	35	12	70
291	311	35	12	68
292	313	31	15	64
293	315	41	17	76
294	317*	33	3	84
295	319	25	11	57
296	321	11	5	40
297	323	35	15	62
298	325	20	11	51
299	327	45	20	78
300	329	36	12	67
301	331	9	6	39
302	333	16	11	61
303	335	22	14	63
304	337	6	4	29
305	339*	8	<1	43
306	341	16	159	47
307	343	11	8	38
308	345	23	20	71
309	347	18	11	56
310	349	25	10	71
311	351	32	11	72
312	353	35	11	73
313	355	38	18	72
314	357	41	10	79
315	359	25	4	60

No.	Sample No.	Cu	Pb	Zn
316	F - 361*	26	3	77
317	363	36	6	72
318	365	23	5	61
319	367	21	10	58
320	369	17	8	52
321	371	6	4	37
322	373	9	5	31
323	375	37	12	79
324	378	37	10	77
325	380	31	10	74
326	382	10	3	42
327	384	21	7	54
328	386	26	6	63
329	388	37	11	77
330	390*	8	<1	40
331	392	12	16	46
332	394	7	1	38
333	396	31	5	68
334	398	35	12	75
335	400	34	6	75
336	403	33	16	75
337	405	36	3	72
338	407	37	6	73
339	409*	28	1	76
340	412	31	5	73
341	414	30	7	62
342	416	17	4	48
343	418	11	3	40
344	420	18	8	47
345	422	15	9	50
346	424	6	7	34
347	426	24	10	54
348	428	12	5	44
349	430	8	7	36
350	432	9	10	35
351	434	22	21	35
352	436	17	15	54
353	438*	14	<1	65
354	440	12	7	42
355	442	5	2	27
356	444	5	3	25
357	446	3	1	26
358	448	11	10	55
359	450	13	7	38
360	452	5	7	30
361	454	2	1	29
362	456	32	<1	41
363	458	5	1	27
364	460	2	4	28
365	462*	3	<1	36
366	464	11	4	32
367	466	8	6	36
368	468	11	7	37
369	470	15	6	58
370	472	8	6	46
371	F - 474	9	5	53
372	476	5	5	33
373	478	12	10	55
374	480	10	12	59
375	482	15	1	53
376	484	14	16	53
377	486*	39	49	117
378	488	10	8	62
379	490	27	22	105
380	492	34	35	151
381	494	13	2	72
382	496	15	1	52
383	498	5	<1	81
384	500	12	1	86
385	502	21	19	107
386	504	10	7	68
387	506	12	8	94
388	508	6	6	66
389	510*	26	<1	88
390	512	4	3	71
391	514	16	6	73
392	516	36	10	97
393	518	10	12	64
394	520	7	4	45
395	522	8	6	51
396	524	22	10	101
397	526	23	5	82
398	528	13	1	61
399	530	10	2	50
400	532	10	2	48
401	534*	12	<1	55
402	536	22	7	62
403	538	12	7	71
404	540	18	6	67
405	542	9	3	47
406	544	13	7	70
407	549	57	3	69
408	551	13	3	56
409	553	7	<1	48
410	555	12	2	58
411	557	7	<1	46
412	559	12	2	56
413	561*	10	<1	39
414	563	12	<1	52
415	565	9	<1	38
416	567	7	<1	42
417	569	10	<1	45
418	571	6	<1	30
419	573	10	<1	39
420	575	7	<1	34
421	577	3	<1	29
422	579	7	<1	31
423	581	13	<1	35
424	583	15	<1	42
425	585*	5	<1	25
426	F - 587	8	<1	32
427	589	14	1	59
428	591	13	<1	24
429	593	7	<1	27
430	595	14	<1	43
431	597	10	<1	40
432	599	10	<1	36
433	601	19	<1	38
434	603	10	1	36
435	605	10	<1	33
436	607	32	3	48
437	609*	11	<1	38
438	611	10	2	40
439	H - 1	10	23	33
440	2	13	14	30
441	3*	8	13	22
442	4	21	13	28
443	5	11	40	25
444	6	14	16	28
445	7	9	12	22
446	8	11	50	44
447	9	21	16	25
448	10	14	20	22
449	11	15	24	33
450	12	10	27	29
451	14	15	26	38
452	15*	9	18	24
453	16	8	39	44
454	17	15	17	43
455	18	17	23	30
456	19	13	20	32
457	20	11	28	27
458	21	12	33	30
459	23	7	24	27
460	24	10	21	35
461	30	8	18	32
462	31	16	28	49
463	32*	8	14	18
464	33	6	16	31
465	34	3	10	23
466	35	6	12	24
467	36	6	10	26
468	37	6	22	32
469	39	10	24	41
470	40	2	11	17
471	41	5	15	24
472	42	4	18	23
473	43	8	31	35
474	44	5	14	25
475	45	6	16	32
476	46*	8	13	16
477	48	6	18	30
478	49	6	19	27
479	50	7	37	38
480	51	7	13	22

No.	Sample No.	Cu	Pb	Zn	No.	Sample No.	Cu	Pb	Zn	No.	Sample No.	Cu	Pb	Zn
481	K - 2	68	<1	44	536	K - 59	26	8	61	591	K - 116	32	13	75
482	3	31	1	36	537	60	17	<1	40	592	117	37	12	52
483	4	35	12	43	538	61*	10	41	16	593	118	32	5	53
484	5	20	7	30	539	62	18	<1	22	594	122	32	12	52
485	6	19	14	34	540	63	20	<1	18	595	123	32	9	43
486	7	23	39	46	541	64	12	<1	12	596	124	24	6	28
487	8	20	28	43	542	65	13	<1	10	597	129	33	9	52
488	9	14	9	33	543	66	40	12	37	598	131*	36	19	52
489	10	21	9	35	544	67	38	19	74	599	132	58	29	73
490	11	35	46	44	545	68	36	20	77	600	133	29	24	37
491	12*	10	3	38	546	69	35	21	79	601	134	42	16	40
492	13	13	1	22	547	70	11	<1	27	602	135	23	15	37
493	14	16	11	33	548	71	13	<1	27	603	136	34	15	34
494	15	29	27	60	549	72	33	17	37	604	137	30	8	36
495	16	11	8	17	550	73	32	10	37	605	138	35	23	48
496	17	7	1	13	551	74*	10	<1	42	606	139	42	19	50
497	18	14	9	23	552	75	34	8	58	607	140	31	9	55
498	19	23	18	39	553	76	29	9	39	608	141	44	15	53
499	20	20	16	32	554	77	48	15	45	609	142	51	20	61
500	21	23	28	38	555	78	34	15	37	610	145*	30	9	38
501	22	37	47	47	556	79	32	2	45	611	146	47	14	61
502	23*	4	<1	10	557	80	41	11	46	612	147	28	2	57
503	24	222	5	83	558	81	34	6	30	613	148	37	7	58
504	25	225	4	86	559	82	40	11	43	614	149	24	3	51
505	26	220	9	74	560	83	31	5	36	615	150	29	11	42
506	27	69	1	24	561	84	33	15	46	616	151	35	20	33
507	28	38	12	25	562	85*	23	13	47	617	152	27	7	53
508	29	30	1	23	563	86	45	22	76	618	155	41	9	46
509	30	35	4	28	564	87	37	13	47	619	156	36	10	41
510	31	74	7	40	565	88	21	5	41	620	157	29	16	38
511	32	38	10	35	566	89	26	15	56	621	158	35	26	48
512	33	56	19	79	567	90	22	13	51	622	159	45	23	84
513	34	82	11	76	568	91	29	9	71	623	160*	33	11	41
514	35*	71	21	106	569	92	22	7	54	624	161	42	20	45
515	36	62	22	73	570	93	12	<1	23	625	162	29	7	33
516	37	27	4	29	571	94	33	16	60	626	163	21	18	37
517	38	18	8	23	572	95	36	19	72	627	164	31	17	39
518	39	34	20	56	573	96	46	28	77	628	165	40	34	66
519	40	31	11	56	574	97*	26	8	45	629	166	25	21	45
520	41	49	30	76	575	98	49	12	43	630	167	29	16	67
521	42	143	45	138	576	99	49	23	56	631	168	32	23	39
522	43	52	30	94	577	100	44	25	53	632	169	46	24	67
523	44	49	42	93	578	101	45	19	71	633	170	44	14	59
524	45	35	20	80	579	102	28	7	61	634	171*	39	8	51
525	46	36	25	82	580	103	76	20	63	635	172	16	<1	36
526	47*	59	80	80	581	104	58	16	48	636	173	26	2	42
527	48	43	8	70	582	105	44	26	76	637	174	18	<1	24
528	49	25	11	56	583	106	35	15	76	638	175	57	18	82
529	50	43	13	77	584	107	50	16	55	639	176	41	<1	51
530	52	50	72	73	585	108*	34	12	91	640	178	19	<1	30
531	53	44	14	91	586	109	53	23	88	641	180	39	1	65
532	54	22	9	44	587	110	34	20	74	642	182	33	1	67
533	55	31	10	81	588	112	36	22	82	643	183	48	40	73
534	57	42	11	104	589	114	36	22	83	644	186	33	27	81
535	58	27	12	68	590	115	33	25	76	645	187	39	3	62

No.	Sample No.	Cu	Pb	Zn
646	K - 188*	44	8	39
647	M - 1	19	52	54
648	2	17	13	44
649	3	18	8	46
650	4	16	23	52
651	5	20	19	51
652	6	20	24	48
653	7	5	24	26
654	8	16	47	39
655	9	13	44	39
656	10	7	25	48
657	11	7	36	51
658	12*	5	7	16
659	13	14	9	37
660	14	7	2	38
661	15	14	11	36
662	16	6	<1	31
663	17	19	29	47
664	18	7	12	37
665	19	5	1	24
666	20	16	11	28
667	21	17	6	41
668	22	10	6	39
669	24	6	23	36
670	25*	11	9	38
671	26	19	2	46
672	27	12	11	32
673	28	16	15	40
674	29	13	13	29
675	30	20	19	37
676	31	8	6	25
677	32	23	11	41
678	33	8	6	27
679	34	21	13	39
680	35	22	13	37
681	36	17	6	34
682	37*	26	5	36
683	38	25	6	44
684	39	24	7	48
685	40	20	6	42
686	41	23	7	47
687	43	21	6	47
688	45*	21	6	40
689	46	24	27	100
690	47	21	14	78
691	48	10	15	77
692	52	9	24	77
693	53	10	22	81
694	55	13	27	85
695	57	10	33	89
696	58	11	6	47
697	61	22	14	47
698	62	21	9	49
699	63*	38	17	61
700	64	37	17	68

No.	Sample No.	Cu	Pb	Zn
701	M - 65	18	10	45
702	66	24	15	55
703	67	22	21	48
704	68	18	13	43
705	69	17	9	42
706	70	17	19	42
707	71	39	18	68
708	72	17	7	46
709	73	19	18	42
710	74	22	19	49
711	75	17	14	41
712	76*	16	10	33
713	77	20	27	43
714	78	25	22	50
715	79	14	7	40
716	80	15	17	37
717	81	17	10	42
718	82	16	15	36
719	83	19	21	43
720	84	17	17	41
721	85	34	23	65
722	86	17	14	45
723	87	22	11	45
724	88*	42	14	62
725	89	17	19	39
726	90	15	11	32
727	91	17	13	38
728	92	18	26	45
729	93	23	22	51
730	94	20	20	46
731	95	12	14	36
732	96	18	16	42
733	97	18	14	45
734	98	18	14	44
735	99*	19	16	37
736	100	17	11	40
737	102	18	16	48
738	103	14	14	43
739	104	14	18	41
740	105	12	16	38
741	106	14	12	39
742	107	22	15	44
743	109	30	20	65
744	110	29	18	59
745	111	21	16	38
746	112	28	18	36
747	113	28	16	56
748	114*	23	15	49
749	115	17	11	59
750	116	33	20	64
751	117	24	14	55
752	118	31	15	62
753	119	26	14	57
754	120	30	14	58
755	121	28	14	54

No.	Sample No.	Cu	Pb	Zn
756	M - 122	18	11	48
757	123	33	19	60
758	124	27	14	56
759	125*	21	5	43
760	126	31	14	57
761	127	17	11	48
762	128	32	17	57
763	129	23	14	52
764	130	31	15	35
765	131	11	14	21
766	132	9	7	29
767	133	28	20	46
768	134	19	10	43
769	135	26	11	31
770	136	10	10	15
771	137*	6	10	8
772	138	18	14	13
773	139	15	10	12
774	141	31	14	14
775	142	15	18	20
776	143	42	27	27
777	144	46	38	25
778	145	167	26	37
779	146	33	46	22
780	147	7	11	19
781	148	19	87	31
782	155	35	27	48
783	156*	27	28	33
784	157	28	14	34
785	158	62	32	57
786	159	90	19	44
787	160	51	23	47
788	161	18	7	21
789	162	45	14	34
790	163	27	14	36
791	164	35	14	31
792	165	30	17	38
793	166	29	23	62
794	167	27	18	59
795	168*	17	22	38
796	169	16	27	43
797	171	21	12	40
798	173	26	12	60
799	174	13	7	32
800	175	13	6	28
801	185	39	22	73
802	186	16	19	46
803	188	63	32	79
804	189	32	25	59
805	190	28	24	46
806	191	33	17	55
807	192*	36	14	51
808	193	35	32	56
809	194	27	12	64
810	195	46	20	48

No.	Sample No.	Cu	Pb	Zn
811	M - 196	91	16	69
812	198	28	12	51
813	200	25	12	45
814	201	26	9	37
815	202	20	26	43
816	203	24	17	51
817	206	40	14	56
818	208	17	17	40
819	209*	15	24	31
820	210	37	11	50
821	211	19	13	39
822	212	30	15	49
823	213	12	14	30
824	214	11	38	27
825	216	15	12	38
826	217	5	13	32
827	218	5	13	29
828	219	6	13	28
829	220	12	14	38
830	221	9	37	34
831	222	12	50	39
832	223*	5	6	21
833	224	4	24	28
834	225	7	24	24
835	226	6	10	22
836	227	7	22	31
837	228	8	23	33
838	229	16	93	39
839	230	17	66	47
840	231	9	30	35
841	232	12	14	32
842	O - 1	30	10	70
843	2	29	4	45
844	3	23	2	52
845	4	15	5	57
846	5	21	5	66
847	6	25	12	77
848	7	23	5	81
849	8*	26	<1	63
850	9	26	<1	68
851	10	32	6	69
852	11	25	<1	63
853	12	28	<1	67
854	13	21	6	65
855	14	22	7	68
856	15	18	15	69
857	16	11	19	57
858	17	12	4	55
859	18	16	5	36
860	19*	14	<1	34
861	20	15	14	36
862	21	5	20	35
863	22	4	16	37
864	23	6	19	39
865	24	14	15	30
866	O - 25	21	14	40
867	26	25	13	35
868	27	16	13	43
869	28	14	11	37
870	29	16	5	36
871	30*	12	<1	50
872	31	15	14	36
873	32	5	20	35
874	33	4	16	37
875	34	6	19	39
876	35	14	15	30
877	36	21	14	40
878	37	25	13	35
879	38	16	13	43
880	39	14	11	37
881	40	16	16	36
882	41	6	5	40
883	42	12	1	39
884	43*	45	<1	67
885	44	16	6	46
886	45	7	11	31
887	46	5	11	28
888	47	17	19	52
889	48	7	14	24
890	49	15	13	45
891	50	19	11	48
892	51	20	14	42
893	52	7	14	28
894	53	102	16	82
895	54	18	10	36
896	55*	14	<1	33
897	56	25	12	42
898	57	17	10	30
899	58	21	15	30
900	59	26	12	35
901	60	14	20	37
902	61	11	10	30
903	62	11	9	34
904	63	17	15	46
905	64	22	15	37
906	65	13	16	41
907	66	17	22	59
908	67*	7	8	38
909	68	23	16	48
910	69	7	19	35
911	70	8	11	35
912	71	8	13	37
913	72	11	10	42
914	73	6	3	32
915	74	7	1	36
916	75	6	1	30
917	76	14	<1	46
918	77	5	<1	31
919	78	7	<1	32
920	79*	9	<1	38
921	O - 80	5	<1	37
922	81	9	<1	46
923	82	5	<1	42
924	83	2	<1	25
925	84	19	<1	50
926	85	14	<1	36
927	86	2	<1	19
928	87	6	<1	32
929	88	8	3	44
930	89	8	<1	31
931	90	9	2	43
932	91*	4	<1	37
933	92	4	<1	36
934	93	8	<1	42
935	94	6	<1	22
936	95	10	13	49
937	96	3	7	32
938	97	8	8	35
939	98	6	7	37
940	99	6	4	37
941	100	11	10	39
942	101	8	5	37
943	102	11	7	50
944	103*	24	<1	50
945	104	28	2	49
946	106	5	2	31
947	107	5	7	31
948	108	7	101	39
949	109	6	61	43
950	110	4	3	31
951	111	9	8	49
952	112	5	31	36
953	113	5	6	38
954	114	2	8	27
955	115	12	20	53
956	116*	5	30	38
957	117	8	64	52
958	118	5	9	29
959	119	8	54	48
960	120	7	25	42
961	121	3	9	37
962	122	3	8	27
963	123	5	29	42
964	124	6	97	31
965	125	1	5	18
966	126	2	4	21
967	127*	5	19	22
968	128	<1	<1	20
969	129	1	5	20
970	130	1	8	20
971	131	<1	6	17
972	132	6	83	36
973	133	1	20	23
974	134	1	6	23
975	135	1	16	20

No.	Sample No.	Cu	Pb	Zn
976	O - 136	5	61	34
977	137	3	27	24
978	138	<1	<1	25
979	139*	9	11	33
980	140	3	18	25
981	141	1	5	27
982	142	6	135	33
983	143	5	31	38
984	144	1	<1	17
985	145	7	<1	32
986	146	14	<1	39
987	147	18	10	48
988	148	5	<1	35
989	149	19	<1	40
990	150	19	<1	42
991	151*	18	10	42
992	152	19	<1	44
993	153	17	1	36
994	154	23	<1	53
995	155	13	<1	33
996	156	17	<1	43
997	157	25	<1	64
998	158	13	<1	32
999	159	17	<1	37
1000	160	14	<1	30
1001	161	12	<1	28
1002	162	12	<1	22
1003	163*	24	8	34
1004	164	24	<1	51
1005	165	10	<1	30
1006	166	9	<1	33
1007	167	11	<1	35
1008	168	16	32	44
1009	169	22	7	42
1010	170	13	16	45
1011	171	12	<1	20
1012	172	18	18	44
1013	173	12	4	32
1014	174	32	16	50
1015	175	9	1	34
1016	176*	22	7	37
1017	177	5	21	28
1018	178	13	21	35
1019	179	19	30	39
1020	180	16	19	39
1021	181	24	23	45
1022	182	15	10	35
1023	183	18	16	35
1024	184	15	26	39
1025	185	15	17	40
1026	186	19	<1	38
1027	187*	21	13	44
1028	188	17	<1	45
1029	189	10	<1	43
1030	190	14	<1	41

No.	Sample No.	Cu	Pb	Zn
1031	O - 191	19	15	48
1032	192	23	20	51
1033	193	16	10	44
1034	194	4	<1	30
1035	195	3	<1	27
1036	196	7	<1	21
1037	197	1	<1	15
1038	198	2	<1	28
1039	199*	18	4	40
1040	200	3	<1	32
1041	201	3	<1	34
1042	202	5	<1	41
1043	203	5	47	45
1044	204	3	24	46
1045	205	6	58	51
1046	206	4	32	44
1047	207	6	56	40
1048	208	6	43	43
1049	209	5	33	41
1050	210	4	19	44
1051	211*	24	35	39
1052	212	5	5	45
1053	213	8	38	50
1054	214	7	75	39
1055	215	20	13	63
1056	216	3	5	38
1057	217	5	32	45
1058	218	7	16	52
1059	219	5	14	44
1060	220	6	49	52
1061	221	7	25	44
1062	222	9	82	49
1063	223*	6	32	44
1064	224	6	19	50
1065	225	7	47	47
1066	226	7	63	57
1067	227	7	53	51
1068	228	4	32	44
1069	229	8	30	54
1070	230	7	86	50
1071	231	4	70	44
1072	232	6	34	47
1073	233	7	74	53
1074	234	9	102	60
1075	235*	4	7	20
1076	236	7	4	58
1077	237	8	1	46
1078	238	3	<1	40
1079	239	2	<1	26
1080	240	8	2	50
1081	241	5	<1	38
1082	242	10	3	55
1083	243	3	7	42
1084	244	8	<1	43
1085	245	4	6	43

No.	Sample No.	Cu	Pb	Zn
1086	O - 246	4	<1	42
1087	247*	17	7	45
1088	248	14	6	57
1089	249	16	7	67
1090	250	14	3	52
1091	251	22	1	70
1092	252	7	<1	38
1093	253	14	10	52
1094	254	18	6	71
1095	255	8	1	42
1096	256	7	5	37
1097	257	15	5	51
1098	258	10	<1	43
1099	259*	30	9	53
1100	260	21	3	53
1101	261	19	4	63
1102	262	18	2	56
1103	263	11	<1	42
1104	264	6	<1	29
1105	265	4	3	36
1106	266	17	<1	39
1107	267	2	4	27
1108	268	2	3	29
1109	269	1	<1	32
1110	270	1	<1	35
1111	271*	25	7	35
1112	272	1	1	36
1113	273	1	<1	32
1114	274	9	<1	34
1115	275	1	<1	22
1116	276	3	<1	32
1117	277	3	<1	36
1118	278	1	2	28
1119	279	3	2	40
1120	280	3	4	32
1121	281	3	<1	31
1122	282	11	1	36
1123	283*	10	8	38
1124	284	7	<1	32
1125	285	18	2	50
1126	286	13	<1	41
1127	287	11	4	38
1128	288	19	2	45
1129	289	25	21	50
1130	290	24	13	52
1131	291	17	4	46
1132	292	11	2	35
1133	293	11	3	40
1134	294	18	4	37
1135	295*	11	7	39
1136	296	11	4	47
1137	297	17	7	54
1138	298	13	21	45
1139	299	17	14	57
1140	300	10	7	45

No.	Sample No.	Cu	Pb	Zn
1141	O - 301	16	8	55
1142	302	17	6	56
1143	303	12	8	51
1144	304	7	4	41
1145	305	16	19	68
1146	306	11	6	48
1147	307*	8	19	35
1148	308	16	8	49
1149	309	23	38	65
1150	310	16	15	70
1151	311	18	32	61
1152	312	21	36	80
1153	313	13	16	47
1154	314	22	10	71
1155	315	51	153	143
1156	316	25	10	83
1157	317	14	6	49
1158	318	16	7	63
1159	319	18	9	64
1160	320*	21	52	79
1161	321	17	6	54
1162	322	9	5	53
1163	323	84	9	94
1164	324	13	3	33
1165	325	25	4	55
1166	326	8	2	37
1167	327	14	8	56
1168	328	11	9	50
1169	329	16	6	40
1170	330	6	3	43
1171	S - 1	24	40	49
1172	2	34	8	56
1173	3	19	67	48
1174	4	167	61	66
1175	5	28	11	59
1176	6	49	23	76
1177	7*	22	14	58
1178	8	33	9	59
1179	10	21	7	50
1180	12	28	91	58
1181	19	13	23	51
1182	20	13	15	36
1183	21	13	9	43
1184	22	11	18	33
1185	23	9	16	46
1186	24	12	9	41
1187	25	10	21	34
1188	26*	7	16	55
1189	27	7	105	88
1190	28	71	18	95
1191	29	7	5	37
1192	30	15	45	45
1193	31	23	12	39
1194	32	29	53	47
1195	33	36	11	43
1196	S - 34	15	50	43
1197	35	24	10	47
1198	36	17	75	39
1199	37	10	12	28
1200	38	18	8	32
1201	39	10	13	40
1202	40	19	36	34
1203	41*	4	<1	45
1204	42	13	25	31
	43	5	4	30
1206	44	14	22	35
1207	45	8	9	33
1208	46	10	20	31
1209	47	13	12	36
1210	48	23	51	48
1211	49	22	49	52
1212	50*	16	5	41
1213	51	27	43	43
1214	52	29	48	45
1215	53	17	39	35
1216	54	32	33	47
1217	55	19	20	34
1218	56	23	15	37
1219	57	17	16	28
1220	58	11	29	31
1221	59	24	16	37
1222	60	29	37	37
1223	61A	21	44	44
1224	62	5	36	21
1225	63	6	25	24
1226	64	97	88	>300
1227	65	33	22	65
1228	66	9	16	40
1229	67*	26	38	45
1230	68	19	24	40
1231	69	7	5	24
1232	70	10	8	25
1233	71	15	12	28
1234	72	28	25	58
1235	73	29	15	72
1236	74*	22	4	73
1237	75	28	17	71
1238	76	30	24	82
1239	77	25	27	78
1240	78	78	16	91
1241	79	24	24	67
1242	80	40	15	89
1243	81	39	16	85
1244	82A	25	26	71
1245	89	49	31	81
1246	90	28	22	63
1247	91	33	23	64
1248	93	29	21	74
1249	94	31	22	19
1250	95	39	21	72
1251	S - 96	27	22	56
1252	97*	27	21	80
1253	98	36	31	80
1254	99	32	18	69
1255	100	32	21	63
1256	101	34	25	87
1257	102	32	16	66
1258	103	41	17	67
1259	104	29	20	[illegible]
1260	105	31	18	[illegible]
1261	106	48	26	90
1262	107	60	55	98
1263	108	29	23	67
1264	109*	34	12	64
1265	110	29	21	56
1266	111	33	34	77
1267	112	28	15	55
1268	113	27	28	62
1269	114	19	31	65
1270	115	35	24	72
1271	116	24	9	29
1272	117	36	23	59
1273	118	20	16	50
1274	119	16	12	55
1275	120	15	22	39
1276	121*	18	15	54
1277	122	16	18	43
1278	123	26	22	63
1279	124	13	15	45
1280	125	23	31	55
1281	126	28	23	48
1282	127	10	9	34
1283	128	34	24	54
1284	129	18	35	72
1285	130	23	52	85
1286	131	59	10	56
1287	132	13	17	44
1288	133*	8	9	45
1289	134	8	14	44
1290	135	18	46	65
1291	136	22	15	43
1292	137	6	14	46
1293	138	10	22	36
1294	139	19	51	67
1295	140	17	21	41
1296	141	11	16	42
1297	142	18	17	48
1298	143	14	7	29
1299	144	25	62	87
1300	145*	6	7	32
1301	146	21	55	65
1302	147	18	2	50
1303	148	16	4	35
1304	149	21	4	48
1305	150	16	3	39

No.	Sample No.	Cu	Pb	Zn
1306	S - 151	18	8	39
1307	152	15	3	35
1308	153	16	10	36
1309	154	24	10	44
1310	155	14	2	30
1311	156	20	4	47
1312	157*	15	1	50
1313	158	13	2	38
1314	159	14	3	39
1315	160	13	7	38
1316	161	40	10	17
1317	162	25	16	61
1318	163	14	14	38
1319	165	16	11	41
1320	166	13	4	30
1321	167	15	5	45
1322	168	21	11	48
1323	169A	53	8	57
1324	170	14	6	44
1325	171	20	3	39
1326	172	16	1	35
1327	173	13	5	48
1328	174	19	11	61
1329	175	17	4	46
1330	176	15	5	35
1331	177	23	6	54
1332	178	17	7	45
1333	179	8	5	26
1334	180	13	8	39
1335	181*	12	1	46
1336	182	16	6	44
1337	183	18	13	35
1338	184	18	2	39
1339	185	19	9	30
1340	186	31	12	53
1341	187	42	7	53
1342	188	21	23	62
1343	189	16	6	35
1344	190	38	73	79
1345	191	9	6	33
1346	192	18	6	35
1347	193*	7	3	32
1348	194	30	83	69
1349	195	9	2	27
1350	196	27	51	92
1351	197	22	100	109
1352	198	10	2	29
1353	199	12	5	32
1354	200	15	3	32
1355	201	14	4	34
1356	202	28	7	44
1357	203	10	3	30
1358	204	9	1	27
1359	205*	7	<1	35
1360	206	5	<1	30

No.	Sample No.	Cu	Pb	Zn
1361	S - 207	11	1	30
1362	208	7	1	25
1363	209	10	4	30
1364	210	11	<1	30
1365	211	16	3	34
1366	212	7	7	34
1367	213	7	3	25
1368	214	13	6	39
1369	215	16	10	33
1370	216	16	2	47
1371	217*	5	5	37
1372	218	19	9	42
1373	219	6	<1	25
1374	220	6	<1	35
1375	221	17	11	41
1376	222	27	7	55
1377	223	19	14	46
1378	224	15	9	41
1379	225	20	44	58
1380	226	19	29	42
1381	Y - 1	20	34	42
1382	2	13	20	47
1383	3*	12	33	42
1384	4	13	13	30
1385	5	24	19	54
1386	6	19	110	33
1387	7	12	17	46
1388	10	15	22	50
1389	11	19	25	62
1390	12	35	31	67
1391	14	35	35	73
1392	15	34	42	65
1393	17	37	39	76
1394	18	9	26	39
1395	19*	10	19	29
1396	20	12	8	37
1397	22	38	47	81
1398	23	34	13	84
1399	24	30	11	73
1400	26	34	11	84
1401	27	19	8	43
1402	28	36	14	90
1403	31	14	10	46
1404	32	13	9	41
1405	33	11	14	49
1406	34	43	17	96
1407	36*	32	18	83
1408	37	58	16	97
1409	38	45	17	98
1410	39	45	14	94
1411	40	71	23	106
1412	43	34	8	96
1413	44	43	13	89
1414	48	12	4	37
1415	49	16	5	50

No.	Sample No.	Cu	Pb	Zn
1416	Y - 50	16	5	46
1417	51	12	2	29
1418	52*	13	17	60
1419	53	14	8	32
1420	54	18	16	47
1421	55	9	15	33
1422	56	20	13	29
1423	58	11	5	22
1424	59	27	15	36
1425	60	28	3	37
1426	61	29	7	34
1427	62	19	3	28
1428	63	20	3	30
1429	64	22	6	36
1430	65	34	12	61
1431	66*	27	14	60
1432	67	35	17	73
1433	68	15	2	21
1434	69	20	4	28
1435	71	38	9	63
1436	73	70	32	86
1437	74	51	15	70
1438	75	30	7	60
1439	76	58	5	56
1440	78	32	7	49
1441	79	8	<1	15
1442	80	27	5	48
1443	84*	23	14	50
1444	87	22	5	53
1445	89	18	7	38
1446	90	10	8	16
1447	91	7	<1	11
1448	92	24	13	43
1449	93	19	17	44
1450	94	31	15	61
1451	95	8	<1	23
1452	96	21	6	50
1453	98	28	6	61
1454	99*	19	7	71
1455	101	19	6	47
1456	102	7	1	22
1457	103	44	17	72
1458	104A	36	10	71
1459	105	55	16	77
1460	107	33	10	66
1461	109	23	5	34
1462	110	25	6	47
1463	111	29	2	53
1464	112	32	8	64
1465	113*	30	14	77
1466	114	34	8	66
1467	115	41	13	71
1468	Z - 1	13	4	37
1469	3	12	8	54
1470	5	15	7	38

No.	Sample No.	Cu	Pb	Zn
1471	Z - 7	7	<1	27
1472	9*	9	11	35
1473	31	7	<1	37
1474	33	4	<1	24
1475	35	6	<1	26
1476	37	4	<1	23
1477	40	4	<1	29
1478	42	5	<1	33
1479	44	4	<1	30
1480	46	8	1	52
1481	Z - 48	8	<1	38
1482	50	8	1	35
1483	52	10	1	45
1484	54*	10	15	37
1485	56	7	1	33
1486	58	11	1	29
1487	60	11	1	34
1488	62	15	<1	33
1489	64	10	1	35
1490	66	3	<1	17
1491	Z - 68	7	1	27
1492	70	25	16	52
1493	72	6	2	20
1494	74	13	3	35
1495	76	16	3	45
1496	78*	14	8	27

* Samples of qualitative emission spectrochemical analysis

(B) Stream sediments (50 ~ 100mesh)

No.	Sample No.	Cu	Pb	Zn
1	B - 1	11	3	32
2	2	9	3	27
3	3*	15	8	41
4	D - 2	11	19	34
5	4	7	21	36
6	8	10	20	37
7	12*	9	22	31
8	13	8	16	33
9	16	7	10	22
10	17	8	20	33
11	20	33	12	83
12	24	27	10	74
13	26	10	6	37
14	29	30	10	79
15	31	32	11	83
16	33	30	12	78
17	35	30	10	79
18	55	59	21	94
19	89	43	30	98
20	92	38	17	90
21	97	35	12	86
22	99	51	15	96
23	102	24	11	75
24	105	46	17	93
25	112*	29	21	87
26	115	30	14	88
27	119	42	18	92
28	122	40	18	88
29	124	35	18	85
30	125	50	16	98
31	126	26	12	83
32	128	30	15	87
33	130	35	15	88
34	137	30	16	93
35	142	44	38	99
36	144	39	15	88
37	146*	38	16	88
38	150	40	21	97
39	152	39	21	91
40	156	40	22	90
41	D - 158	33	15	92
42	161	42	22	97
43	166	40	14	93
44	168	41	20	95
45	170	24	12	96
46	176	37	17	87
47	178	35	20	106
48	182	20	12	86
49	184*	31	12	88
50	187	44	20	109
51	189	43	19	100
52	190	43	24	97
53	192	37	20	99
54	194	36	20	102
55	196	36	14	91
56	197	28	17	88
57	201	38	24	99
58	204	39	20	89
59	207	25	17	93
60	210*	58	37	91
61	215	22	8	78
62	216	49	20	111
63	218	43	20	91
64	219	33	17	91
65	221	27	14	80
66	223	45	18	93
67	225	39	19	95
68	226	24	14	86
69	229	20	10	78
70	230	9	8	23
71	233	28	17	74
72	235	23	14	76
73	238*	37	14	85
74	241	22	7	84
75	242	20	5	66
76	245	28	17	79
77	248	46	20	104
78	250	26	11	85
79	254	11	20	85
80	257	38	25	97
81	D - 260	55	24	104
82	263	37	20	83
83	266	39	20	80
84	271*	35	18	81
85	274	31	19	93
86	277	23	19	94
87	281	33	19	93
88	283	45	30	101
89	284	37	22	104
90	285	41	27	13
91	288	19	10	80
92	290	35	20	100
93	292	9	3	53
94	293	45	24	106
95	296*	11	1	46
96	298	59	17	104
97	300	34	15	89
98	302	30	17	85
99	306	44	18	98
100	308	50	25	105
101	311	10	8	73
102	313	42	19	95
103	317	15	9	85
104	318	46	25	94
105	319	9	3	78
106	323	15	8	74
107	325	51	18	94
108	328	38	15	93
109	329*	47	16	90
110	331	60	21	95
111	333	73	24	101
112	334	66	16	104
113	337	58	22	104
114	339*	36	12	105
115	342	27	11	84
116	355	40	20	81
117	359	24	10	74
118	361	20	7	74
119	363	19	8	64
120	365	8	4	39

No.	Sample No.	Cu	Pb	Zn
121	D - 367	9	4	31
122	369*	17	13	53
123	371	17	5	55
124	373	21	10	68
125	377	39	13	44
126	378	26	14	40
127	380	27	12	39
128	381	15	13	32
129	383	9	5	35
130	385	26	8	56
131	389	49	11	61
132	392	34	12	59
133	393*	34	15	44
134	397	42	8	64
135	400	33	12	50
136	402	30	18	51
137	413	38	15	78
138	415	34	20	86
139	419	37	20	95
140	431	47	25	98
141	434	41	24	95
142	F - 1	12	20	39
143	3	6	6	38
144	5*	14	13	40
145	7	6	6	28
146	9	9	4	43
147	11	11	4	62
148	13	15	13	48
149	15	8	6	39
150	17	16	13	42
151	19	7	8	41
152	21	6	5	37
153	23	13	4	45
154	25	9	10	51
155	27	10	6	40
156	29	7	1	31
157	31*	9	5	35
158	33	18	16	50
159	35	15	14	47
160	39	10	6	42
161	41	10	1	35
162	43	13	1	37
163	45	16	3	36
164	47	13	4	40
165	49	12	4	36
166	51	7	4	33
167	53	17	2	39
168	55*	9	6	26
169	57	6	1	21
170	59	4	3	27
171	61	6	2	27
172	63	7	8	48
173	65	11	4	43
174	67	4	5	40
175	69	7	5	42
176	F - 71	16	6	46
177	73	7	8	51
178	78	13	7	59
179	80	12	5	27
180	83*	13	6	34
181	85	10	5	27
182	87	12	5	36
183	89	26	13	68
184	91	44	16	93
185	93	49	15	94
186	95	35	19	87
187	97	49	18	94
188	99	14	2	53
189	101	19	10	55
190	103	18	9	56
191	105	12	9	54
192	107*	16	10	54
193	109	18	11	68
194	111	30	16	87
195	113	8	4	36
196	115	26	15	72
197	117	5	15	33
198	119	20	13	65
199	121	19	20	65
200	123	14	12	52
201	125	18	26	10
202	127	24	12	68
203	129	16	15	52
204	131*	12	1	45
205	133	26	14	71
206	135	20	15	58
207	137	11	19	47
208	139	13	20	49
209	141	12	16	46
210	143	12	21	48
211	145	9	16	43
212	147	24	12	78
213	149	18	16	60
214	151	28	14	66
215	153	20	11	62
216	155*	17	<1	57
217	157	29	15	81
218	159	36	16	90
219	161	29	14	76
220	163	15	8	81
221	165	42	19	92
222	167	26	11	78
223	169	24	13	69
224	171	34	14	86
225	173	30	13	79
226	175	22	13	50
227	177	19	12	78
228	179*	30	1	80
229	183	33	15	82
230	185	60	17	87
231	F - 187	27	12	68
232	189	45	20	92
233	193	47	21	98
234	195	50	13	80
235	197	46	13	90
236	199	44	15	93
237	201	45	14	92
238	203	39	12	86
239	205*	30	7	85
240	207	41	13	92
241	209	51	17	97
242	212	55	17	89
243	214	8	2	44
244	216	42	15	87
245	218	16	11	39
246	220	10	9	47
247	222	41	11	83
248	224	20	6	62
249	226	26	8	70
250	228	55	16	92
251	230	48	14	86
252	232*	42	13	94
253	234	54	18	90
254	235	59	22	86
255	236	45	14	90
256	238	38	15	89
257	241	47	15	91
258	243	38	17	95
259	245	64	14	101
260	247	44	13	87
261	249	47	14	91
262	253*	10	<1	51
263	255	48	14	86
264	257	36	9	86
265	259	38	13	92
266	261	41	16	88
267	263	45	13	86
268	265	52	15	93
269	267	25	6	80
270	269	52	17	93
271	271	36	11	85
272	273	29	8	83
273	275	39	13	80
274	277	63	17	91
275	279*	44	6	91
276	281	14	11	54
277	283	7	8	48
278	285	49	19	99
279	287	56	21	108
280	289	23	9	62
281	291	35	9	74
282	293	36	13	84
283	295	26	8	62
284	297	45	14	90
285	299	51	17	92

No.	Sample No.	Cu	Pb	Zn
286	F - 301	51	16	89
287	303*	33	6	78
288	305	45	13	83
289	307	29	9	66
290	309	38	16	82
291	311	42	13	83
292	313	35	13	78
293	315	43	11	90
294	317	43	14	91
295	319	31	12	72
296	321	13	5	51
297	323	37	14	73
298	325	10	7	46
299	327*	35	11	89
300	329	29	13	67
301	331	6	8	42
302	333	15	11	65
303	335	22	13	74
304	337	6	5	33
305	339	7	9	46
306	341	13	22	46
307	343	7	5	76
308	345	7	7	61
309	347	14	6	84
310	349	22	9	84
311	351*	23	1	78
312	353	31	11	82
313	355	32	11	87
314	357	37	15	76
315	359	28	13	78
316	361	28	12	84
317	363	33	16	71
318	365	25	11	62
319	367	20	7	62
320	369	16	7	54
321	371	7	5	41
322	373*	8	<1	41
323	375	35	11	87
324	378	36	11	86
325	380	31	11	86
326	382	14	6	54
327	384	24	8	66
328	386	25	10	72
329	388	35	12	89
330	390	8	5	45
331	392	11	17	44
332	394	9	4	38
333	396	21	11	77
334	398*	34	4	90
335	400	32	13	86
336	403	30	13	85
337	405	32	11	85
338	407	35	12	85
339	409	21	9	63
340	412	27	11	80

No.	Sample No.	Cu	Pb	Zn
341	F - 414	26	11	67
342	416	19	8	57
343	418	12	6	46
344	420	17	8	48
345	422	19	12	59
346	424*	9	<1	42
347	426	26	11	70
348	428	11	7	47
349	430	5	7	38
350	432	6	9	35
351	434	22	27	42
352	436	9	11	57
353	438	9	5	62
354	440	8	5	47
355	442	4	2	26
356	444	4	3	32
357	446	3	2	25
358	448	8	6	54
359	450*	13	<1	45
360	452	3	2	26
361	454	1	3	27
362	456	13	2	32
363	458	2	2	23
364	460	1	3	23
365	462	3	3	24
366	464	6	3	27
367	466	13	6	45
368	468	14	4	38
369	470	16	6	55
370	472	11	4	45
371	474*	9	<1	54
372	476	14	2	29
373	478	14	5	50
374	480	14	5	59
375	482	14	3	52
376	484	13	3	52
377	486	43	58	125
378	488	11	5	56
379	490	18	17	116
380	492	27	30	142
381	494	13	4	58
382	496	6	4	34
383	498	5	<1	64
384	500	8	5	56
385	502	14	9	91
386	504	11	7	55
387	506	13	11	97
388	508	6	6	43
389	510	26	9	97
390	512	12	5	53
391	514	15	9	68
392	516	24	10	99
393	518	9	6	52
394	520	6	3	28
395	522*	8	<1	46

No.	Sample No.	Cu	Pb	Zn
396	F - 524	19	8	91
397	526	17	5	61
398	528	12	4	45
399	530	12	4	46
400	532	12	4	45
401	534	12	5	53
402	536	22	6	56
403	538	10	6	50
404	540	16	6	56
405	542	10	4	41
406	544	15	8	63
407	549	27	4	41
408	551*	11	<1	49
409	553	9	4	48
410	555	11	5	53
411	557	9	6	48
412	559	10	6	51
413	561	8	4	39
414	563	13	4	56
415	565	10	4	40
416	567	10	4	48
417	569	12	3	43
418	571	10	3	39
419	573	12	3	35
420	575*	9	<1	42
421	577	5	2	25
422	579	10	2	29
423	581	14	2	32
424	583	8	4	36
425	585	7	4	27
426	587	10	4	38
427	589	9	3	39
428	591	8	2	29
429	593	8	2	28
430	595	8	3	30
431	597	8	2	34
432	599*	10	<1	46
433	601	14	4	44
434	603	14	6	53
435	605	8	4	41
436	607	17	5	42
437	609	8	3	35
438	611	12	7	55
439	H - 1	5	18	30
440	2	9	12	26
441	3	8	22	35
442	4	19	15	29
443	5	5	28	32
444	6	9	11	27
445	7	5	7	18
446	8*	7	34	36
447	9	15	9	24
448	10	9	15	18
449	11	6	17	28
450	12	7	17	31

No.	Sample No.	Cu	Pb	Zn
451	H - 14	10	21	38
452	15	7	19	30
453	16	2	32	43
454	17	4	24	42
455	18	3	13	25
456	19	5	12	28
456	20	5	17	28
458	21*	9	42	21
459	23	4	22	29
460	24	4	15	30
461	30	3	11	26
462	31	8	29	39
463	32	4	9	25
464	33	5	14	31
465	34	3	6	19
466	35	4	9	19
467	36	5	8	23
468	37	6	19	30
469	39	7	28	34
470	40*	5	16	10
471	41	4	10	23
472	42	2	15	19
473	43	7	39	34
474	44	4	11	22
475	45	5	13	28
476	46	4	9	22
477	48	3	14	27
478	49	4	18	23
479	50	6	32	33
480	51	4	9	19
481	K - 2	76	10	51
482	3	24	7	25
483	4	29	15	38
484	5*	17	10	30
485	6	19	13	29
486	7	18	28	40
487	8	18	15	32
488	9	10	14	24
489	10	13	8	22
490	11	28	38	31
491	12	11	12	37
492	13	6	9	14
493	14	11	12	24
494	15	28	23	50
495	16	5	4	10
496	17*	158	13	72
497	18	9	10	15
498	19	14	11	33
499	20	20	9	28
500	21	14	9	36
501	22	28	25	58
502	23	157	12	38
503	24	91	6	50
504	25	138	6	36
505	26	101	6	16

No.	Sample No.	Cu	Pb	Zn
506	K - 27	29	6	12
507	28	18	5	12
508	29	22	9	48
509	30*	19	6	28
510	31	23	5	23
511	32	23	6	32
512	33	32	13	65
513	34	35	11	61
514	35	52	16	93
515	36	23	6	14
516	37	8	3	14
517	38	14	2	19
518	39	6	4	18
519	40*	19	7	66
520	41	35	14	68
521	42	34	11	69
522	43	28	13	68
523	44	28	15	70
524	45	22	8	55
525	46	17	6	54
526	47	76	59	63
527	48	27	9	69
528	49	12	1	35
529	50	24	7	60
530	52	33	53	69
531	53	33	10	61
532	54*	11	7	36
533	55	20	9	60
534	57	23	8	73
535	58	19	9	57
536	59	8	13	33
537	60	6	3	26
538	61	4	1	7
539	62	5	<1	15
540	63	7	<1	11
541	64	3	1	7
542	65	5	<1	7
543	66	29	7	36
544	67	29	15	67
545	68	29	15	70
546	69*	27	18	91
547	70	4	1	22
548	71	7	1	27
549	72	35	7	42
550	73	32	8	42
551	74	10	2	42
552	75	33	8	62
553	76	28	8	43
554	77	54	10	47
555	78	36	8	44
556	79*	25	3	54
557	80	28	6	40
558	81	30	6	30
559	82	35	8	44
560	83	28	5	38

No.	Sample No.	Cu	Pb	Zn
561	K - 84	32	10	51
562	85	28	9	47
563	86	36	15	69
564	87	32	23	51
565	88	11	4	34
566	89	22	10	46
567	90	16	8	58
568	91*	29	15	99
569	92	20	10	56
570	93	11	6	36
571	94	33	18	62
572	95	31	15	67
573	96	41	19	67
574	97	26	6	44
575	98	45	22	50
576	99	38	19	52
577	100	43	29	60
578	101	33	16	65
579	102	16	7	53
580	103	60	18	59
581	104*	49	14	57
582	105	35	16	68
583	106	27	9	78
584	107	40	8	47
585	108	26	13	77
586	109	36	16	85
587	110	19	11	65
588	112	31	17	85
589	114	28	15	84
590	115	25	11	66
591	116	20	7	64
592	117*	35	14	62
593	118	20	6	45
594	122	29	9	53
595	123	33	11	47
596	124	31	8	42
597	129	35	15	63
598	131	34	12	50
599	132	45	18	70
600	133	26	13	42
601	134	28	10	35
602	135	18	8	32
603	136	25	9	32
604	137*	23	9	37
605	138	30	11	42
606	139	36	8	46
607	140	32	8	56
608	141	38	9	45
609	142	48	8	57
610	145	38	9	45
611	146	33	16	44
612	147	22	5	39
613	148	32	10	50
614	149	17	7	44
615	150	29	10	42

No.	Sample No.	Cu	Pb	Zn
616	K - 151*	33	5	35
617	152	26	10	56
618	155	44	8	44
619	156	47	9	47
620	157	32	7	33
621	158	33	10	40
622	159	36	13	63
623	160	35	7	36
624	161	33	8	36
625	162	25	4	28
626	163	16	7	25
627	164*	22	5	33
628	165	22	10	41
629	166	14	10	32
630	167	20	7	47
631	168	29	7	33
632	169	34	7	47
633	170	27	9	41
634	171	22	6	32
635	172	5	<1	28
636	173	19	5	35
637	174	12	2	18
638	175	32	10	55
639	176	32	6	41
640	178*	12	<1	26
641	180	27	7	48
642	182	23	9	50
643	183	35	18	54
644	186	23	9	54
645	187	22	5	45
646	188	41	8	44
647	M - 1	8	10	36
648	2	5	5	26
649	3	5	5	26
650	4	7	5	30
651	5*	8	6	25
652	6	9	7	33
653	7	1	4	24
654	8	8	6	30
655	9	<1	2	24
656	10	1	5	26
657	11	10	6	34
658	12	1	3	26
659	13	1	3	24
660	14	10	7	31
661	15	2	4	32
662	16	9	7	29
663	17*	5	16	30
664	18	4	11	43
665	19	8	7	25
666	20	13	7	27
667	21	4	3	38
668	22	4	8	36
669	24	4	7	34
670	25	10	4	34

No.	Sample No.	Cu	Pb	Zn
671	M - 26	16	5	44
672	27	6	5	28
673	28	11	3	36
674	29	5	5	27
675	30	14	6	29
676	31*	6	10	22
677	32	15	6	32
678	33	5	5	28
679	34	17	11	34
680	35	14	7	31
681	36	7	3	22
682	37	24	5	35
683	38	22	8	37
684	39	25	6	45
685	40	20	4	38
686	41	25	6	50
687	43	25	7	55
688	45	26	7	45
689	46	18	20	87
690	48	8	10	81
691	52	9	15	83
692	53	6	14	79
693	55*	12	19	70
694	57	7	19	90
695	58	6	5	42
696	61	16	7	42
697	62	19	7	47
698	63	36	14	67
699	64	36	11	65
700	65	15	7	43
701	66	21	10	54
702	67	16	10	41
703	68	11	9	34
704	69*	13	<1	29
705	70	14	8	39
706	71	31	12	65
707	72	13	6	41
708	73	13	10	35
709	74	12	12	36
710	75	13	10	36
711	76	15	10	38
712	77	14	13	41
713	78	19	14	46
714	79	7	5	29
715	80	10	10	33
716	81	9	7	33
717	82*	12	6	26
718	83	10	11	34
719	84	11	19	35
720	85	23	15	54
721	86	11	11	38
722	87	13	7	34
723	88	29	12	61
724	89	10	8	30
725	90	7	8	26

No.	Sample No.	Cu	Pb	Zn
726	M - 91	10	6	28
727	92	14	16	42
728	93*	14	14	31
729	94	12	12	37
730	95	8	7	29
731	96	13	8	35
732	97	14	9	37
733	98	14	10	36
734	99	14	8	36
735	100	12	9	34
736	102	10	6	36
737	103	7	6	27
738	104	10	9	33
739	105*	9	7	25
740	106	10	8	31
741	107	14	8	32
742	109	23	18	56
743	110	23	11	53
744	111	19	12	35
745	112	22	11	48
746	113	21	10	47
747	114	24	12	56
748	115	15	8	44
749	116	27	14	56
750	117	20	10	51
751	118	24	11	53
752	119	32	12	57
753	120*	22	16	47
754	121	23	10	49
755	122	12	6	36
756	123	27	14	52
757	124	24	11	51
758	125*	25	12	53
759	126	23	10	47
760	127	14	7	45
761	128	28	13	54
762	129	22	8	50
763	130	24	9	30
764	131*	8	4	13
765	132	6	7	24
766	133	21	18	38
767	134	15	7	40
768	135	16	8	22
769	136	7	5	12
770	137*	4	8	9
771	138	15	7	10
772	139	12	5	9
773	141	27	9	12
774	142	11	16	15
775	143*	35	23	19
776	144	175	29	40
777	145*	22	26	16
778	146	24	16	14
779	147	5	6	15
780	148	15	64	25

No.	Sample No.	Cu	Pb	Zn
781	M - 155	25	19	39
782	156	25	23	37
783	157	20	11	28
784	158	39	38	50
785	159	51	12	40
786	160	33	17	37
787	161	11	7	18
788	162*	29	4	21
789	163	21	7	30
790	164	25	9	32
791	165	22	11	31
792	166	17	16	42
793	167	14	12	42
794	168	11	24	40
795	169	10	23	35
796	171	12	11	33
797	173	18	8	48
798	174	6	3	20
799	175	7	3	19
800	185*	33	17	64
801	186	12	16	54
802	188	63	30	73
803	189	29	26	57
804	190	20	18	43
805	191	35	19	57
806	192	38	13	58
807	193	33	21	55
808	194	22	8	64
809	195	34	23	45
810	196	98	15	68
811	198	23	11	50
812	200*	18	6	29
813	201	23	6	37
814	202	15	21	43
815	203	21	14	48
816	206	35	8	50
817	208	13	12	38
818	209	10	24	40
819	210	30	5	45
820	211	14	9	37
821	212	24	9	45
822	213	9	9	30
823	214	7	24	27
824	216*	12	<1	26
825	217	3	12	34
826	218	3	7	28
827	219	4	10	31
828	220	8	9	36
829	221	6	31	32
830	222	9	33	38
831	223	3	13	35
832	224	2	12	34
833	225	6	11	29
834	226	2	4	22
835	227	5	18	31

No.	Sample No.	Cu	Pb	Zn
836	M - 228*	5	5	24
837	229	14	63	39
838	230	11	41	43
839	231	5	20	33
840	232	8	11	28
841	O - 1	28	13	60
842	2	29	6	60
843	3*	18	<1	49
844	4	14	6	48
845	5	18	9	55
846	6	18	11	54
847	7	16	7	60
848	8	20	4	50
849	9	34	20	85
850	10	39	23	86
851	11	46	22	86
852	12	29	17	71
853	13*	20	3	67
854	14	27	18	82
855	15	20	18	77
856	16	11	12	58
857	17	19	4	59
858	18	12	4	37
859	19	15	4	36
860	20	21	4	47
861	21	4	4	31
862	22	5	43	38
863	23	5	4	72
864	24	14	4	35
865	25*	17	<1	49
866	26	28	7	41
867	27	13	4	40
868	28	10	2	32
869	29	15	3	34
870	30	11	5	52
871	31	5	9	44
872	32	8	11	33
873	33	12	2	44
874	34	7	3	34
875	35	4	2	26
876	36	14	5	46
877	37*	6	<1	27
878	38	11	5	44
879	39	14	4	47
880	40	15	4	50
881	41	5	2	22
882	42	13	4	60
883	43	17	5	38
884	44	12	4	48
885	45	10	3	33
886	46	7	1	30
887	47	11	4	36
888	48	12	3	37
889	49	14	<1	40
890	50	16	4	38

No.	Sample No.	Cu	Pb	Zn
891	O - 51	15	3	38
892	52	6	3	29
893	53	10	2	26
894	54	11	2	28
895	55	10	4	28
896	56	9	4	29
897	57	13	2	27
898	58	15	3	31
899	59	17	6	39
900	60	12	9	33
901	61*	9	<1	26
902	62	10	5	34
903	63	13	10	44
904	64	22	7	36
905	65	8	6	38
906	66	18	15	61
907	67	4	13	40
908	68	21	4	50
909	69	8	12	34
910	70	5	4	29
911	71	6	8	37
912	72	10	7	47
913	73*	6	<1	37
914	74	6	7	37
915	75	7	6	32
916	76	12	5	44
917	77	6	4	37
918	78	6	2	28
919	79	5	4	32
920	80	3	5	29
921	81	9	12	49
922	82	5	11	43
923	83	3	6	28
924	84	21	8	49
925	85*	13	<1	38
926	86	6	8	34
927	87	2	1	16
928	88	6	5	37
929	89	8	7	36
930	90	8	11	42
931	91	5	7	32
932	92	2	10	25
933	93	7	10	38
934	94	2	2	14
935	95	7	8	44
936	96	3	7	28
937	97	9	8	41
938	98*	6	<1	33
939	99	5	7	33
940	100	7	9	31
941	101	6	11	37
942	102	8	10	43
943	103	8	10	44
944	104	21	6	43
945	106	5	17	28

No.	Sample No.	Cu	Pb	Zn
946	O - 107	4	8	31
947	108	3	4	21
948	109	7	43	31
949	110*	5	<1	27
950	111	5	46	32
951	112	7	10	37
952	113	5	15	30
953	114	1	3	14
954	115	9	9	38
955	116	<1	30	33
956	117	7	47	40
957	118	3	10	30
958	119	5	38	36
959	120	4	9	31
960	121*	5	8	36
961	122	1	10	22
962	123	3	17	29
963	124	5	45	26
964	125	<1	4	7
965	126	1	5	20
966	127	1	14	17
967	128	1	5	18
968	129	1	7	19
969	130	1	4	17
970	131	<1	6	14
971	132	5	51	32
972	133*	4	2	21
973	134	2	4	21
974	135	1	8	17
975	136	4	40	28
976	137	2	8	25
977	138	2	6	23
978	139	6	13	27
979	140	4	18	22
980	141	2	21	20
981	142	7	96	33
982	143	4	22	26
983	144	1	<1	11
984	145*	9	8	31
985	146	11	8	32
986	147	17	25	60
987	148	5	6	36
988	149	16	6	36
989	150	13	6	44
990	151	15	7	46
991	152	13	5	41
992	153	13	10	41
993	154	22	13	57
994	155	12	7	38
995	156	14	11	40
996	157*	33	14	73
997	158	11	5	28
998	159	16	4	42
999	160	14	3	31
1000	161	11	5	24

No.	Sample No.	Cu	Pb	Zn
1001	O - 162	14	3	23
1002	163	20	8	36
1003	164	21	5	49
1004	165	10	6	32
1005	166	10	6	31
1006	167	11	7	31
1007	168	15	22	44
1008	169*	28	6	41
1009	170	12	14	50
1010	171	13	4	25
1011	172	14	12	36
1012	173	20	6	30
1013	174	24	11	46
1014	175	8	5	37
1015	176	11	7	31
1016	177	5	2	29
1017	178	11	5	38
1018	179	14	17	38
1019	180	13	9	35
1020	181*	25	14	40
1021	182	11	8	38
1022	183	12	13	28
1023	184	11	16	33
1024	185	12	15	36
1025	186	13	6	35
1026	187	9	11	34
1027	188	10	15	41
1028	189	4	7	30
1029	190	13	28	37
1030	191	12	13	36
1031	192	17	16	40
1032	193*	23	8	37
1033	194	18	4	31
1034	195	<1	4	29
1035	196	1	2	18
1036	197	<1	1	8
1037	198	1	3	22
1038	199	1	4	30
1039	200	2	24	26
1040	201	2	5	24
1041	202	3	6	40
1042	203	2	34	37
1043	204	2	21	34
1044	205*	20	50	49
1045	206	1	14	29
1046	207	2	42	32
1047	208	3	24	34
1048	209	1	28	32
1049	210	1	13	32
1050	211	2	42	31
1051	212	1	7	34
1052	213	2	19	39
1053	214	4	75	36
1054	215	3	16	40
1055	216	1	7	28

No.	Sample No.	Cu	Pb	Zn
1056	O - 217*	6	23	42
1057	218	3	10	37
1058	219	4	9	35
1059	220	4	39	42
1060	221	3	18	32
1061	222	5	44	41
1062	223	2	22	40
1063	224	1	14	37
1064	225	2	23	39
1065	226	1	28	40
1066	227	3	40	39
1067	228	1	18	34
1068	229*	6	18	44
1069	230	2	50	38
1070	231	2	59	36
1071	232	3	25	36
1072	233	4	56	36
1073	234	6	69	50
1074	235	<1	5	15
1075	236	2	11	31
1076	237	1	3	30
1077	238	<1	2	27
1078	239	<1	2	19
1079	240	4	5	37
1080	241*	13	7	32
1081	242	5	4	41
1082	243	1	9	26
1083	244	7	5	42
1084	245	<1	3	30
1085	246	<1	4	29
1086	247	10	6	43
1087	248	11	5	46
1088	249	13	8	57
1089	250	12	7	49
1090	251	19	7	11
1091	252	3	4	35
1092	253*	17	12	50
1093	254	14	9	58
1094	255	5	3	31
1095	256	3	4	29
1096	257	12	6	43
1097	258	9	7	38
1098	259	16	7	50
1099	260	12	7	37
1100	261	15	8	48
1101	262	10	5	41
1102	263	6	4	35
1103	264	3	1	22
1104	265*	22	9	36
1105	266	3	2	22
1106	267	3	<1	21
1107	268	2	1	22
1108	269	2	<1	26
1109	270	2	3	23
1110	271	3	2	26

No.	Sample No.	Cu	Pb	Zn
1111	O - 272	3	3	27
1112	273	3	1	28
1113	274	10	3	32
1114	275	4	1	23
1115	276	4	<1	28
1116	277*	6	4	37
1117	278	3	<1	24
1118	279	4	<1	34
1119	280	4	<1	27
1120	281	4	3	27
1121	282	11	3	35
1122	283	8	3	32
1123	284	7	3	33
1124	285	15	7	42
1125	286	11	<1	37
1126	287	10	3	30
1127	288	20	5	40
1128	289*	18	20	38
1129	290	23	14	52
1130	291	16	6	38
1131	292	9	3	30
1132	293	9	4	32
1133	294	13	5	29
1134	295	13	6	39
1135	296	8	5	27
1136	297	10	6	38
1137	298	12	14	39
1138	299	14	9	44
1139	300	9	6	29
1140	301*	12	9	47
1141	302	15	6	44
1142	303	9	6	41
1143	304	7	5	34
1144	305	13	11	46
1145	306	10	7	39
1146	307	8	8	44
1147	308	14	9	40
1148	309	19	26	53
1149	310	14	12	62
1150	311	13	16	48
1151	312	14	20	57
1152	313*	12	16	48
1153	314	20	12	57
1154	315	27	12	13
1155	316	23	9	68
1156	317	11	6	39
1157	318	12	7	42
1158	319	9	7	34
1159	320	10	27	48
1160	321	11	5	36
1161	322	8	8	43
1162	323	4	4	31
1163	324	12	4	27
1164	325*	11	14	46
1165	326	3	3	22

No.	Sample No.	Cu	Pb	Zn
1166	O - 327	4	3	37
1167	328	13	1	32
1168	329	8	3	39
1169	330	11	4	42
1170	S - 1	7	16	26
1171	2	30	11	47
1172	3	10	29	29
1173	4	181	61	64
1174	5	20	11	48
1175	6	25	15	54
1176	7	22	13	48
1177	8	17	8	36
1178	10	16	8	39
1179	12	19	67	44
1180	19	4	10	24
1181	20	9	9	21
1182	21	7	4	28
1183	22*	8	15	33
1184	23	3	7	27
1185	24	5	5	23
1186	25	6	7	17
1187	26	2	6	28
1188	27	3	50	41
1189	28	11	7	44
1190	29	7	4	35
1191	30	10	34	32
1192	31	13	5	28
1193	32	10	33	28
1194	33*	5	<1	26
1195	34	9	31	37
1196	35	10	2	27
1197	36	6	27	28
1198	37	8	4	26
1199	38	11	<1	31
1200	39	4	4	35
1201	40	10	17	24
1202	41	6	4	49
1203	42	7	6	23
1204	43	4	4	36
1205	44	9	5	27
1206	45*	4	<1	40
1207	46	7	6	30
1208	47	7	4	23
1209	48	15	37	35
1210	49	18	38	47
1211	50	11	12	25
1212	51	12	23	27
1213	52	11	16	24
1214	53	8	14	22
1215	54	17	23	31
1216	55	9	13	26
1217	56*	13	13	32
1218	57	11	<1	33
1219	58	7	16	32
1220	59	15	4	37

No.	Sample No.	Cu	Pb	Zn
1221	S - 60	16	4	34
1222	61A	9	55	36
1223	62	2	9	14
1224	63	4	4	19
1225	64	15	62	16
1226	65	21	8	45
1227	66	4	8	25
1228	67*	18	12	44
1229	68	13	13	31
1230	69	5	3	19
1231	70	5	4	17
1232	71	12	5	22
1233	72	15	11	37
1234	73	16	8	48
1235	74	18	11	49
1236	75	18	7	52
1237	76	20	9	52
1238	77	17	12	50
1239	78	31	7	53
1240	79*	17	17	64
1241	80	23	7	55
1242	81	23	7	60
1243	82A	17	15	58
1244	89	29	36	58
1245	90	17	12	52
1246	91*	19	11	60
1247	93	18	11	54
1248	94	18	11	48
1249	95	25	17	57
1250	96	17	11	47
1251	97	21	22	61
1252	98	19	19	54
1253	99	25	20	61
1254	100	18	9	48
1255	101	18	15	59
1256	102	21	14	53
1257	103*	19	6	57
1258	104	18	12	49
1259	105	23	18	59
1260	106	29	22	65
1261	107	27	37	63
1262	108	17	15	50
1263	109	26	9	47
1264	110	19	8	42
1265	111	23	19	59
1266	112	14	7	38
1267	113	16	13	42
1268	114	12	39	63
1269	115*	16	9	58
1270	116	10	5	16
1271	117	17	16	45
1272	118	14	19	44
1273	119	13	14	46
1274	120	13	11	43
1275	121	14	12	41

No.	Sample No.	Cu	Pb	Zn
1276	S - 122	15	15	46
1277	123	13	9	40
1278	124	8	9	37
1279	125	18	19	46
1280	126	32	26	41
1281	127*	4	16	46
1282	128	25	18	45
1283	129	10	22	48
1284	130	22	31	51
1285	131	3	5	23
1286	132	8	10	37
1287	133	2	7	35
1288	134	4	7	30
1289	135	12	36	52
1290	136	3	11	30
1291	137	2	13	35
1292	138	5	18	39
1293	139*	12	42	62
1294	140	5	10	34
1295	141	5	11	38
1296	142	7	11	40
1297	143	6	8	29
1298	144	13	46	57
1299	145	4	8	30
1300	146	15	49	55
1301	147	7	4	37
1302	148	7	4	28
1303	149	10	5	37
1304	150	8	5	33
1305	151*	8	5	38
1306	152	7	5	37
1307	153	6	4	27
1308	154	16	9	44
1309	155	5	8	31
1310	156	7	6	32
1311	157	9	6	35
1312	158	8	4	30
1313	159	7	6	39
1314	160	5	5	32
1315	161	8	5	35
1316	162	9	10	42
1317	163*	5	4	37
1318	165	8	6	35
1319	166	5	5	30
1320	167	12	6	41
1321	168	16	7	46
1322	169A	2	3	20
1323	170	11	5	45
1324	171	15	5	41
1325	172	10	3	32
1326	173	10	5	37
1327	174	13	6	52
1328	175*	7	1	44
1329	176	9	2	27
1330	177	12	4	37

No.	Sample No.	Cu	Pb	Zn
1331	S - 178	12	4	40
1332	179	5	2	26
1333	180	11	4	38
1334	181	11	6	40
1335	182	12	6	43
1336	183	10	6	34
1337	184	7	4	37
1338	185	6	3	31
1339	186	23	11	54
1340	187*	9	4	54
1341	188	20	19	81
1342	189	6	5	38
1343	190	29	34	62
1344	191	7	4	40
1345	192	13	6	46
1346	193	5	4	35
1347	194	18	48	58
1348	195	5	4	34
1349	196	16	30	69
1350	197	14	68	105
1351	198	4	4	34
1352	199*	5	1	34
1353	200	8	2	27
1354	201	6	5	37
1355	202	22	9	37
1356	203	7	3	34
1357	204	4	2	25
1358	205	6	6	34
1359	206	4	3	38
1360	207	9	4	38
1361	208	4	4	32
1362	209	8	6	37
1363	210	6	5	40
1364	211*	8	5	45
1365	212	3	4	41
1366	213	4	3	36
1367	214	10	7	46
1368	215	10	12	41
1369	216	11	11	48
1370	217	4	7	38
1371	218	12	10	43
1372	219	4	3	31
1373	220	5	2	41
1374	221	13	9	39
1375	222	21	8	45
1376	223*	10	7	46
1377	224	9	6	42
1378	225	15	23	51
1379	226	13	14	41
1380	Y - 1	12	22	34
1381	2	9	17	38
1382	3	8	20	41
1383	4	8	12	26
1384	5	13	15	40
1385	6	10	138	26

No.	Sample No.	Cu	Pb	Zn
1386	Y - 7	7	12	31
1387	10	10	15	41
1388	11*	13	28	48
1389	12	20	15	51
1390	14	26	28	61
1391	15	12	19	52
1392	17	22	23	56
1393	18	6	18	33
1394	19	6	6	26
1395	20	8	6	36
1396	22	26	28	57
1397	23	27	10	77
1398	24	28	12	80
1399	26	26	13	71
1400	27*	14	24	41
1401	28	27	12	62
1402	31	6	7	29
1403	32	3	6	22
1404	33	4	3	32
1405	34	31	8	79
1406	36	33	12	80
1407	37	34	10	79
1408	38	37	15	90
1409	39	39	13	84
1410	40	63	21	98
1411	43	21	8	87
1412	44*	36	23	89
1413	48	5	12	18
1414	49	6	7	23
1415	50	7	7	27
1416	51	4	4	13
1417	52	11	10	46
1418	53	7	10	19
1419	54	8	15	33
1420	55	4	8	15
1421	56	9	12	15
1422	58	6	6	12
1423	59	23	18	29
1424	60*	19	11	34
1425	61	21	7	28
1426	62	16	5	24
1427	63	17	7	27
1428	64	20	7	30
1429	65	16	6	39
1430	66	23	7	44
1431	67	24	9	42
1432	68	24	15	57
1433	69	12	3	20
1434	71	41	13	68
1435	73	67	36	101
1436	74	45	17	67
1437	75*	22	11	64
1438	76	50	9	50
1439	78	25	7	42
1440	79	4	1	9

No.	Sample No.	Cu	Pb	Zn
1441	Y - 80	23	11	41
1442	84	7	2	11
1443	87	14	8	42
1444	89	10	10	28
1445	90	7	4	14
1446	91	3	2	5
1447	92*	12	10	34
1448	93	12	15	29
1449	94	20	17	49
1450	95	5	2	19
1451	96	20	10	49
1452	98	25	10	58
1453	101	3	4	15
1454	102	12	8	34
1455	103	36	12	65
1456	104A	34	15	80
1457	105	33	12	64
1458	107	25	10	58
1459	109	10	4	18
1460	110	10	4	18

No.	Sample No.	Cu	Pb	Zn
1461	Y - 111	19	9	41
1462	112	29	13	69
1463	113	37	16	68
1464	114	27	12	54
1465	115	34	14	63
1466	Z - 1	6	3	36
1467	3	21	7	50
1468	5	8	3	27
1469	7	8	3	33
1470	9	5	3	35
1471	31	6	6	40
1472	33	2	3	20
1473	35	4	<1	24
1474	37	2	<1	17
1475	40	3	3	28
1476	42*	7	12	35
1477	44	4	3	34
1478	46	6	5	43
1479	48	6	5	36
1480	50	4	3	27

No.	Sample No.	Cu	Pb	Zn
1481	Z - 52	6	3	40
1482	54	8	5	43
1483	56	6	3	33
1484	58	8	3	28
1485	60	9	4	39
1486	62	10	3	35
1487	64	9	5	39
1488	66*	5	10	17
1489	68	5	3	22
1490	70	20	15	43
1491	72	5	3	18
1492	74	9	3	27
1493	76	12	5	38
1494	78	11	3	32

* Samples of qualitative emission spectrochemical analysis

(C) Soils

No.	Sample No.	Cu	Pb	Zn
1	D - 3	9	17	25
2	9*	22	47	64
3	21	37	<1	53
4	42	41	19	70
5	45	33	11	66
6	47	60	26	78
7	54*	98	28	81
8	56	45	22	66
9	59	71	15	65
10	61	62	18	80
11	63	37	10	62
12	65*	16	7	25
13	66	35	3	31
14	67	37	9	24
15	69	10	4	16
16	70	16	13	53
17	72*	16	16	51
18	74	53	23	74
19	75	24	12	38
20	77	50	30	70
21	79	23	14	39
22	80*	15	13	36
23	81	40	12	71
24	83	33	11	52
25	88	32	36	75
26	90	36	42	75
27	94*	55	35	79
28	100	43	22	71
29	103	39	18	61
30	106	37	13	64

No.	Sample No.	Cu	Pb	Zn
31	D - 108	31	22	54
32	111*	28	20	66
33	114	24	42	60
34	117	41	16	69
35	118	42	17	69
36	120	31	17	64
37	129*	41	19	84
38	132	22	43	35
39	134	50	148	79
40	136	42	35	71
41	140	44	43	72
42	141*	49	26	78
43	149	44	23	59
44	151	48	26	78
45	153	47	29	74
46	155	42	16	68
47	157*	43	24	86
48	162	40	23	64
49	164	46	21	69
50	165	59	28	84
51	171	27	12	63
52	173*	16	6	70
53	175	23	6	54
54	181	40	16	64
55	183	39	26	75
56	186	39	12	75
57	188*	37	18	85
58	193	31	17	59
59	198	31	10	67
60	199	39	18	63

No.	Sample No.	Cu	Pb	Zn
61	D - 209*	33	21	83
62	212	42	15	73
63	213	27	4	53
64	214	35	18	56
65	217	41	15	68
66	220*	46	19	85
67	222	27	8	58
68	224	34	9	65
69	227	25	7	39
70	232	35	27	39
71	234*	28	14	70
72	236	26	13	60
73	239	37	11	70
74	243	43	15	75
75	246	37	12	66
76	249*	39	22	83
77	251	31	13	81
78	255	32	9	7
79	258	38	11	81
80	261	28	7	79
81	264*	47	24	97
82	267	36	8	77
83	272	43	16	89
84	275	18	<1	59
85	279	20	<1	36
86	282*	48	26	96
87	286	45	30	97
88	289	18	7	68
89	291	28	13	89
90	294	46	11	77

No.	Sample No.	Cu	Pb	Zn
91	D - 297*	14	5	68
92	299	46	7	81
93	301	27	1	69
94	303	22	1	68
95	305	55	9	91
96	307*	64	15	98
97	309	49	19	95
98	314	36	23	79
99	320	37	21	83
100	322	30	12	86
101	326*	38	15	78
102	335	18	5	24
103	338	34	20	56
104	340	36	9	68
105	343	17	<1	37
106	345*	31	20	73
107	346	9	13	34
108	351	18	8	17
109	352	37	27	72
110	354	14	11	23
111	356*	27	22	28
112	358	6	1	29
113	360	14	9	46
114	362	20	8	62
115	364	21	7	64
116	366*	16	9	46
117	368	18	8	63
118	370	20	9	63
119	372	19	7	62
120	374	20	10	58
121	376*	22	24	17
122	379	40	17	55
123	382	13	9	35
124	384	20	8	46
125	387	38	5	43
126	390*	57	15	71
127	395	44	39	58
128	396	37	14	61
129	399	43	1	65
130	404	17	32	46
131	405*	63	31	68
132	407	31	23	74
133	408	22	8	38
134	409	18	13	57
135	410	32	75	57
136	412	24	16	35
137	416*	39	17	44
138	417	21	16	50
139	421	16	9	33
140	423	11	8	19
141	424*	16	8	18
142	426	13	21	20
143	428	6	1	16
144	429	10	3	23
145	430	33	10	39

No.	Sample No.	Cu	Pb	Zn
146	D - 432*	65	39	104
147	435	42	24	89
148	436	29	15	39
149	437	13	28	44
150	F - 2	27	17	58
151	4	10	10	41
152	6	17	15	59
153	8	12	14	49
154	10*	13	10	51
155	12	13	10	50
156	16	14	11	53
157	18	17	17	53
158	20	13	13	60
159	22*	14	8	53
160	24	10	10	43
161	28	9	1	44
162	30	16	5	59
163	34	14	12	38
164	38*	35	32	96
165	42	17	10	59
166	46	32	11	56
167	48	12	5	47
168	50	22	12	64
169	52*	12	4	39
170	54	24	2	37
171	58	10	6	47
172	60	21	11	58
173	62	38	8	64
174	64*	7	5	38
175	66	16	7	42
176	68	11	11	46
177	72	16	3	42
178	75	14	13	35
179	76*	16	12	49
180	77	13	12	33
181	79	16	6	49
182	82	6	19	25
183	84*	47	17	80
184	86	13	<1	19
185	88	27	19	55
186	90	29	10	55
187	92	46	29	67
188	94*	70	26	94
189	96	43	37	59
190	98	41	5	64
191	100	24	11	47
192	102	38	18	58
193	104*	13	14	42
194	106	18	25	52
195	108	26	35	61
196	110	29	18	62
197	112	22	23	55
198	114*	13	7	42
199	116	30	24	60
200	118	17	24	44

No.	Sample No.	Cu	Pb	Zn
201	F - 120	16	9	33
202	122	20	26	47
203	124*	21	14	46
204	126	20	21	46
205	128	22	25	51
206	130	24	23	52
207	132	17	29	45
208	134*	35	19	55
209	136	18	19	45
210	138	20	42	51
211	140	19	36	41
212	142	24	50	52
213	144*	14	16	36
214	146	20	51	53
215	148	21	47	48
216	150	18	12	45
217	152	31	8	54
218	154*	20	3	44
219	156	24	8	55
220	158	32	11	64
221	160	30	6	65
222	162	38	21	71
223	164*	21	15	55
224	166	34	10	66
225	168	28	10	62
226	170	28	9	57
227	172	22	4	53
228	174*	26	11	52
229	176	24	13	48
230	178	31	14	63
231	180	38	21	63
232	181	15	6	38
233	182*	20	10	45
234	184	36	14	63
235	186	38	30	75
236	188	41	19	64
237	190	41	19	69
238	194*	28	21	54
239	196	97	33	83
240	198	39	17	72
241	200	36	15	70
242	202	129	63	87
243	204*	32	11	59
244	206	46	17	67
245	208	40	17	68
246	210	40	16	66
247	211	71	15	53
248	213*	84	32	91
249	215	26	16	58
250	217	57	23	73
251	219	40	36	63
252	221	21	5	39
253	223*	44	23	62
254	225	71	26	69
255	227	62	22	25

No.	Sample No.	Cu	Pb	Zn
256	F - 229	49	15	73
257	231	50	17	68
258	233*	39	12	62
259	237	34	19	64
260	239	32	31	80
261	240	18	6	22
262	242	48	33	50
263	244*	46	15	57
264	246	66	33	74
265	248	81	42	89
266	250	40	35	77
267	251	4	4	10
268	252*	24	2	28
269	254	12	11	20
270	256	59	27	69
271	258	45	24	71
272	260	52	37	80
273	262*	46	28	67
274	264	46	30	71
275	266	44	33	82
276	268	48	31	74
277	270	40	22	70
278	272*	35	12	64
279	274	30	21	70
280	276	54	33	79
281	278	58	25	74
282	280	43	24	74
283	282*	24	8	52
284	284	47	32	75
285	286	30	20	69
286	288	57	26	83
287	290	19	14	49
288	292*	39	19	63
289	294	30	19	69
290	296	57	31	79
291	298	40	25	73
292	300	40	15	72
293	302*	40	15	64
294	304	32	15	66
295	306	48	21	74
296	308	29	13	63
297	310	43	17	75
298	312*	28	8	55
299	314	36	18	68
300	316	40	17	63
301	318	48	23	72
302	320	33	9	62
303	322*	36	14	56
304	324	42	15	71
305	326	19	7	47
306	328	38	15	68
307	330	59	18	73
308	332*	41	14	64
309	334	28	18	69
310	336	27	14	63

No.	Sample No.	Cu	Pb	Zn
311	F - 338	14	10	49
312	340	11	14	45
313	342*	24	14	46
314	344	29	14	53
315	346	32	10	63
316	348	44	10	57
317	350	38	11	56
318	352	35	12	66
319	354*	39	9	68
320	356	41	13	69
321	358	78	20	71
322	360	38	19	39
323	362	53	147	72
324	364*	25	8	61
325	366	24	16	70
326	368	34	14	55
327	370	60	18	67
228	372	25	14	53
329	374*	15	<1	42
330	376	34	16	64
331	377	41	18	67
332	379	50	17	72
333	381	71	27	80
334	383*	41	6	50
335	385	33	10	61
336	387	31	6	59
337	389	47	13	72
338	391	23	6	57
339	393*	19	<1	39
340	395	21	6	51
341	397	53	19	73
342	399	39	14	70
343	401	78	23	80
344	402*	29	13	48
345	404	41	14	70
346	406	61	28	70
347	408	48	18	69
348	410	36	12	61
349	411*	28	2	39
350	413	70	31	79
351	415	34	13	62
352	417	26	9	56
353	419	25	13	48
354	421*	45	22	65
355	423	25	12	59
356	425	15	17	48
357	427	77	35	81
358	429	21	20	61
359	431*	15	3	50
360	433	28	12	55
361	435	31	18	56
362	437	18	8	51
363	439	29	8	75
364	441*	40	<1	34
365	443	65	14	82

No.	Sample No.	Cu	Pb	Zn
366	F - 445	9	6	47
367	447	60	4	57
368	449	27	3	61
369	453	19	6	52
370	455	26	6	55
371	457	28	1	49
372	459	9	4	53
373	461*	7	<1	25
374	463	17	7	44
375	465	7	10	49
376	467	43	16	76
377	469	44	11	72
378	471*	27	8	75
379	473	23	16	68
380	475	38	18	82
381	477	22	13	52
382	479	33	15	79
383	481*	16	2	39
384	483	30	13	76
385	485	35	34	85
386	489	22	30	79
387	491*	20	2	41
388	493	97	48	119
389	495	26	16	92
390	497	38	22	65
391	499	37	22	88
392	501*	20	17	84
393	503	41	20	106
394	505	24	16	69
395	507	4	16	51
396	509	19	29	75
397	511*	19	4	65
398	513	22	12	63
399	515	27	11	67
400	517	25	20	72
401	519	34	42	84
402	521*	15	8	42
403	523	22	12	60
404	525	45	31	99
405	527	13	12	68
406	529	24	6	48
407	531*	24	5	60
408	533	20	24	58
409	535	36	3	78
410	537	48	9	71
411	539	22	5	64
412	541*	30	6	57
413	543	17	16	70
414	545	20	3	67
415	546	18	7	47
416	547	36	42	85
417	548*	22	16	66
418	550	28	4	50
419	552	21	3	57
420	554	16	5	73

No.	Sample No.	Cu	Pb	Zn
421	F - 556	24	24	81
422	558*	14	3	47
423	560	26	9	57
424	562	18	5	61
425	564	18	7	72
426	566	30	8	54
427	568*	24	1	39
428	570	23	5	53
429	572	14	4	56
430	574	28	1	46
431	576	19	5	49
432	578*	16	5	42
433	580	28	7	54
434	582	29	7	40
435	584	40	7	63
436	586	38	18	82
437	588*	15	2	38
438	592	14	3	41
439	594	23	1	42
440	596	21	4	50
441	598*	18	3	32
442	600	25	7	50
443	602	16	4	40
444	604	16	3	38
445	606	16	3	43
446	608*	14	2	33
447	610	34	5	45
448	612	10	2	44
449	H - 6	28	30	49
450	13*	34	40	70
451	K - 16	45	30	59
452	95	144	37	110
453	121*	27	49	65
454	126	39	35	92
455	128	126	17	63
456	143	48	44	35
457	144	43	27	25
458	167*	41	10	89
459	177	55	47	51
460	179	15	28	19
461	181	33	14	21
462	189	5	7	6
463	190*	3	1	5
464	191	7	4	4
465	192	146	49	28
466	193	130	32	45
467	194	42	82	11
468	195*	40	1	11
469	196	8	28	17
470	197	94	22	71
471	198	39	18	60
472	199	35	15	50
473	200*	11	4	16
474	201	2	<1	2
475	202	8	7	7

No.	Sample No.	Cu	Pb	Zn
476	K - 203	106	30	78
477	204	1	<1	2
478	205*	4	3	8
479	206	6	<1	6
480	207	28	10	23
481	209	321	56	127
482	210	3	20	19
483	211*	56	35	44
484	212	8	89	36
485	213	21	23	28
486	214	8	63	44
487	215	6	43	49
488	216*	9	26	64
489	217	8	42	49
490	218	42	30	64
491	219	8	10	39
492	220	5	30	54
493	221*	12	29	40
494	222	7	25	34
495	223	13	22	39
496	225	22	21	42
497	M - 4	37	30	45
498	6	4	15	37
499	13*	7	5	30
500	24	8	73	56
501	30	16	11	62
502	31	27	8	47
503	39	67	23	99
504	46*	30	17	60
505	49	45	16	53
506	50	31	37	75
507	51	28	20	70
508	79	19	16	44
509	80*	27	27	48
510	87	12	11	41
511	103	15	16	39
512	104	23	19	50
513	107	29	13	47
514	108*	35	22	49
515	128	40	14	58
516	143	68	33	19
517	149	24	32	17
518	150	8	137	26
519	151*	12	25	15
520	153	32	49	18
521	158	38	40	24
522	172	39	25	26
523	175	11	7	27
524	176*	22	3	5
525	179	5	3	8
526	180	43	20	40
527	181	10	<1	13
528	182	4	3	10
529	183*	19	1	14
530	184	4	<1	6

No.	Sample No.	Cu	Pb	Zn
531	M - 193	40	9	62
532	223	31	22	50
533	S - 1	33	30	67
534	2*	25	41	35
535	3	13	30	45
536	4	18	22	51
537	5	27	56	76
538	6	32	21	69
539	7*	28	12	87
540	9	6	<1	20
541	10	23	11	55
542	11	5	1	28
543	12	73	127	118
544	13*	17	77	59
545	14	4	33	32
546	15	17	16	35
547	16	14	16	40
548	17	2	37	14
549	18*	3	13	44
550	19	9	27	40
551	20	19	36	51
552	21A	14	6	64
553	23*	7	29	57
554	24	7	12	35
555	26	4	6	42
556	27	4	56	53
557	28	12	11	55
558	30*	43	9	48
559	32	9	45	33
560	33	16	2	32
561	35	7	4	38
562	36	6	52	36
563	38*	15	<1	50
564	39	6	<1	48
565	41	16	43	49
566	43	7	24	33
567	45	15	28	46
568	46*	18	5	66
569	47	15	50	47
570	48	14	1	39
571	49	7	1	42
572	50	7	1	47
573	52	4	1	51
574	53	13	31	43
575	54	4	9	52
576	55	9	42	37
577	56*	45	28	62
578	57	6	15	35
579	59	22	4	73
580	61	30	9	31
581	62	14	28	31
582	63*	9	9	39
583	64	12	39	50
584	65	14	4	46
585	66	14	28	50

No.	Sample No.	Cu	Pb	Zn
586	S - 67	21	23	49
587	68*	15	6	46
588	69	25	16	51
589	70	10	1	26
590	71	13	3	32
591	72	14	4	42
592	73*	39	10	92
593	74	20	14	60
594	75	27	17	67
595	77	23	14	65
596	78	37	7	67
597	80*	33	2	84
598	81	31	9	71
599	89	66	12	58
600	90	54	18	61
601	91	23	15	61
602	93*	27	30	78
603	94	55	29	73
604	95	16	8	55
605	97	19	30	68
606	98	40	56	72
607	99*	35	34	84
608	100	18	24	62
609	102	20	21	62
610	103	18	19	60
611	105	66	21	55
612	106*	43	49	87
613	107	39	65	71
614	116	14	18	52
615	117	13	14	59
616	118	18	29	65
617	119*	25	50	85
618	120	21	49	72
619	121	16	20	57
620	122	10	15	50
621	123	15	46	63
622	124*	19	38	72
623	125	18	25	58
624	127	<1	21	51
625	128	11	74	53
626	129	19	87	79
627	130*	13	16	60
628	131	4	4	47
629	132	6	50	52
630	133	4	8	42
631	136	10	<1	46
632	137	2	17	49
633	147	4	<1	37
634	148	6	<1	36
635	149	9	6	43
636	151	4	5	36
637	152*	13	6	68
638	153	6	8	43
639	154	25	17	55
640	155	5	20	42

No.	Sample No.	Cu	Pb	Zn
641	S - 157	7	11	42
642	158	14	17	49
643	159	5	<1	39
644	160	4	<1	43
645	162	11	4	51
646	163	13	28	58
647	164A	16	<1	56
648	165	16	6	52
649	166	13	8	58
650	167	17	15	61
651	169	17	10	61
652	170	7	5	45
653	171	25	21	65
654	172	16	<1	50
655	173	24	7	70
656	174*	27	6	76
657	175	12	4	53
658	183	22	18	62
659	184	6	2	48
660	185	4	2	47
661	186	36	15	74
662	187	9	6	48
663	188	33	39	77
664	189	13	10	55
665	190	11	2	45
666	191*	17	9	61
667	192	23	5	52
668	194	29	60	76
669	195	8	<1	39
670	196	37	90	103
671	197	20	63	81
672	199	7	1	44
673	200	25	1	31
674	201	24	<1	29
675	202	39	12	63
676	203*	32	4	70
677	204	10	2	47
678	205	6	3	38
679	207	7	<1	45
680	208	9	2	42
681	209*	11	4	51
682	210	7	2	40
683	211	7	2	51
684	213	4	3	38
685	214	2	3	35
686	215	11	4	49
687	216	11	6	43
688	217	11	15	58
689	218	8	<1	39
690	219	42	6	55
691	220*	14	8	52
692	221	17	11	53
693	222	92	8	82
694	223	14	12	46
695	224	36	8	63

No.	Sample No.	Cu	Pb	Zn
696	S - 225	30	17	67
697	226	18	11	52
698	Y - 1	35	34	66
699	3	10	23	32
700	5	39	19	46
701	16	12	19	37
702	20*	22	15	57
703	21	23	11	31
704	25	12	20	31
705	29	13	33	49
706	30	12	55	55
707	45*	2	1	4
708	46	6	15	6
709	47	36	9	9
710	48	12	14	23
711	52	15	10	23
712	57	4	19	3
713	70*	38	14	49
714	71	56	14	65
715	74	48	17	64
716	76	40	9	47
717	82	26	29	64
718	83*	40	14	55
719	85	13	16	30
720	97	17	15	22
721	Z - 2	27	5	60
722	4*	29	4	46
723	6	15	8	45
724	8	9	10	45
725	32	26	4	86
726	34	19	2	60
727	36*	39	11	74
728	38	43	10	72
729	39	27	24	69
730	41	11	4	51
731	43*	24	14	96
732	45*	26	15	91
733	47	24	10	91
734	49	26	13	97
735	51	20	14	62
736	53	28	12	65
737	55*	37	15	56
738	57	25	16	81
739	59	23	14	78
740	61	66	5	79
741	63	25	4	66
742	65*	19	10	66
743	67	13	6	34
744	69	9	11	36
745	71	24	16	56
746	73	26	13	58
747	75*	17	7	50
748	77	36	15	59
749	79	33	9	51
750	80	48	17	71

No.	Sample No.	Cu	Pb	Zn
751	Z - 81	27	15	59
752	82*	8	7	36
753	83	19	15	41

No.	Sample No.	Cu	Pb	Zn
754	Z - 84	19	15	41
755	85	22	15	59
756	86	13	24	46

No.	Sample No.	Cu	Pb	Zn
757	Z - 88	27	4	51
758	90	22	7	65
759	92	18	8	42