3-2 Resistivity Section (Apparent resistivity section and resistivity section)

The zones of low resistivity delineated on the maps of apparent resistivity were examined on the resistivity sections. Locations of these sections are illustrated in Fig. IV-1. Some zones were examined with the sounding curves (annexed) and without the sections.

a. A zone of low apparent resistivity at the northeast of Sable Antelope. The low resistivity zones were found at the stations 125 (Fig. IV-14, 3-3'),125, 107, 71 and 89 (Fig. IV-18, 13-13'). The zones below 100 ohm-m were detected at the stations 125 and 89. These zones are supposed to be the indications of crushed zones which penetrate to the depths of massive limestone.

b. A zone of low apparent resistivity at the vicinity of Crystal Jacket. The zones of low resistivity were noted at the stations 112, 114, 117 (Fig. IV-14, 3-3'), 114 and 58 (Fig. IV-16, 7-7'). The anomaly at 117 indicates an crushed zone to the depths of massive limestone. A zone with a resistivity of 33 ohm-m was detected at the station 114, between 177 to 207 m in the depth. This anomaly forms, with an anomaly at the station 58, a zone of low resistivity which strikes in the northeast direction. On the extension of the trend, the Crystal Jacket and the Kakuyo are situated.

c. The zones of low apparent resistivity at the east and the west of Wonder Rocks. Low resistive zones were detected at the stations 34, 22, 16, 17 and 18 (Fig. IV-15, 4-4'). The zones range from 150 to 250 m in the depth and from 100 to 800 ohm-m in the resistivity.

d. The zones of low apparent resistivity at the south and the southeast of Wonder Rocks. The low resistive zones were located at the stations 42 and 32 (Fig. IV-15, 5-5'). A zone of below 100 ohm-m was detected in a shallow depth.

e. The zone of low apparent resistivity at the west of Colonel. The low resistive zones were noted at the stations 255 and 256 (Fig. IV-16, 6-6') in the area of stratified limestones. The rocks range from 800 to 900 ohm-m in resistivity and have a thickness over than 1,000 m.

f. The zone of low apparent resistivity trending toward northwest-westerly at the north of Blue Jacket. Referring to the sounding curves at the stations 183 and 184, the zone has an extent of more than 1,000 m deep with a resistivity ranging from 800 to 1,000 ohm-m and is located near the boundary between limestones and a series of metasandstones and shales.

g. The zone of low apparent resistivity trending northwesterly at 1 km west of Blue Jacket. The anomalous values were detected on the boundary between limestones and a series of metasandstones and shales at the stations 215 (Fig. IV-17, 10-10') and 242 (Fig. IV-18, 11-11'). Extremely low resistivity values are inferred to be of crushed zones in a series of metasandstones and shales, being 0.3 ohm-m at the depth of 126 to 242 m at the station 215, and being 0.2 ohm-m at the depth of 95 to 125 m at the station 242.

h. A north-northwesterly trending zone of low apparent resistivity at 2 km west of Blue Jacket. A zone of low resistivity at the station 199 (Fig. IV-17 9-9') is assumed to be a crushed zone to the depth in stratified limestones.

i. A north-northwesterly trending zone of low apparent resistivity at 2 km south-southeast of Crystal Jacket. Analyses on the stations 194 and 233 indicate the existence of a zone of 500 to 600 ohm-m from the surface to a depth of 100 to 150 m.

j. A zone of low apparent resistivity at 500 m south of True Blue. A zone of low resistivity was detected at the stations 260 and 262 (Fig. IV-16, 6-6'), ranging from 500 to 600 ohm-m in resistivity from the surface to a depth of 100 m.

k. A zone of low apparent resistivity at the northeast of Bob Zinc. Analyses at the station 72 and 73 indicate a zone from the surface to a depth of 100 to 200 m with the resistivity of 500 to 600 ohm-m. The anomalies of i,j and k are of the same kind and deemed to be correlative with limestones intercalated with a series of metasandstones and shales.

l. The zones of low apparent resistivity at the southern end and the southeastern end of the area A. The zones of low resistivity are distributed in a thick succession of metasandstones and shales. These are noted at the stations 177, 178 (Fig. IV-17, 8-8'), 206, 207 and 208 (Fig. IV-17, 9-9'), 244, 245, 246 and 247 (Fig. IV-18, 11-11'), 266, 267, 268, 269 and 270 (Fig. IV-16, 6-6').

Anomalies at 177 and 178 are of the resistivities of 7 to 11 ohm-m from the surface to a depth of 40 m. A fault is assumed to exist between these two stations. An anomaly at the station 206 indicates the crushed zones to the depths. At the stations 207 and 208, an anomalous zone of 5 to 20 ohm-m is delineated between the surface and the depths ranging from 80 m to 200 m. A fault is assumed to exist between the stations 207 and 208.

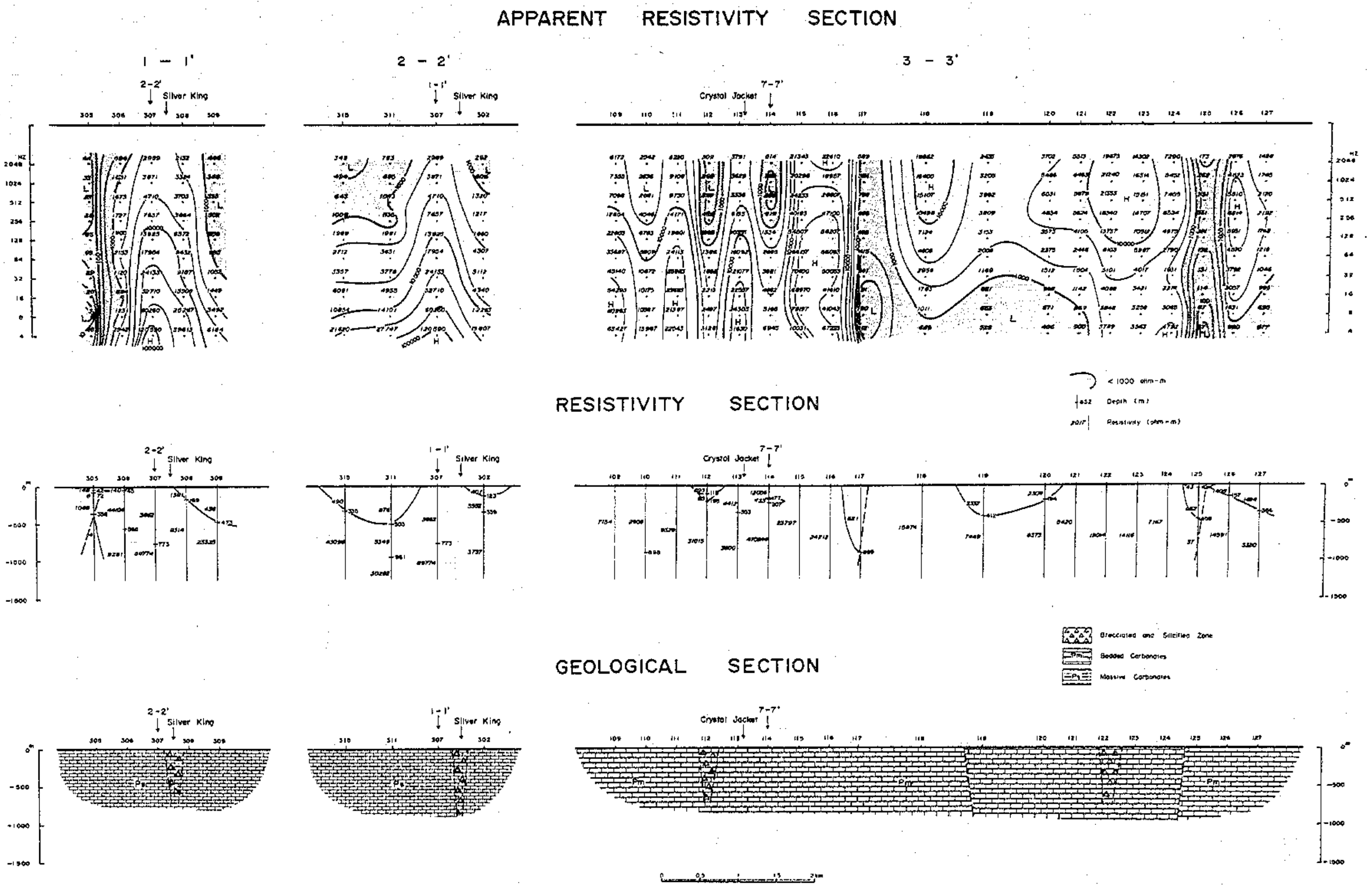


Fig. IV-14 Resistivity Section 1 ∿ 3

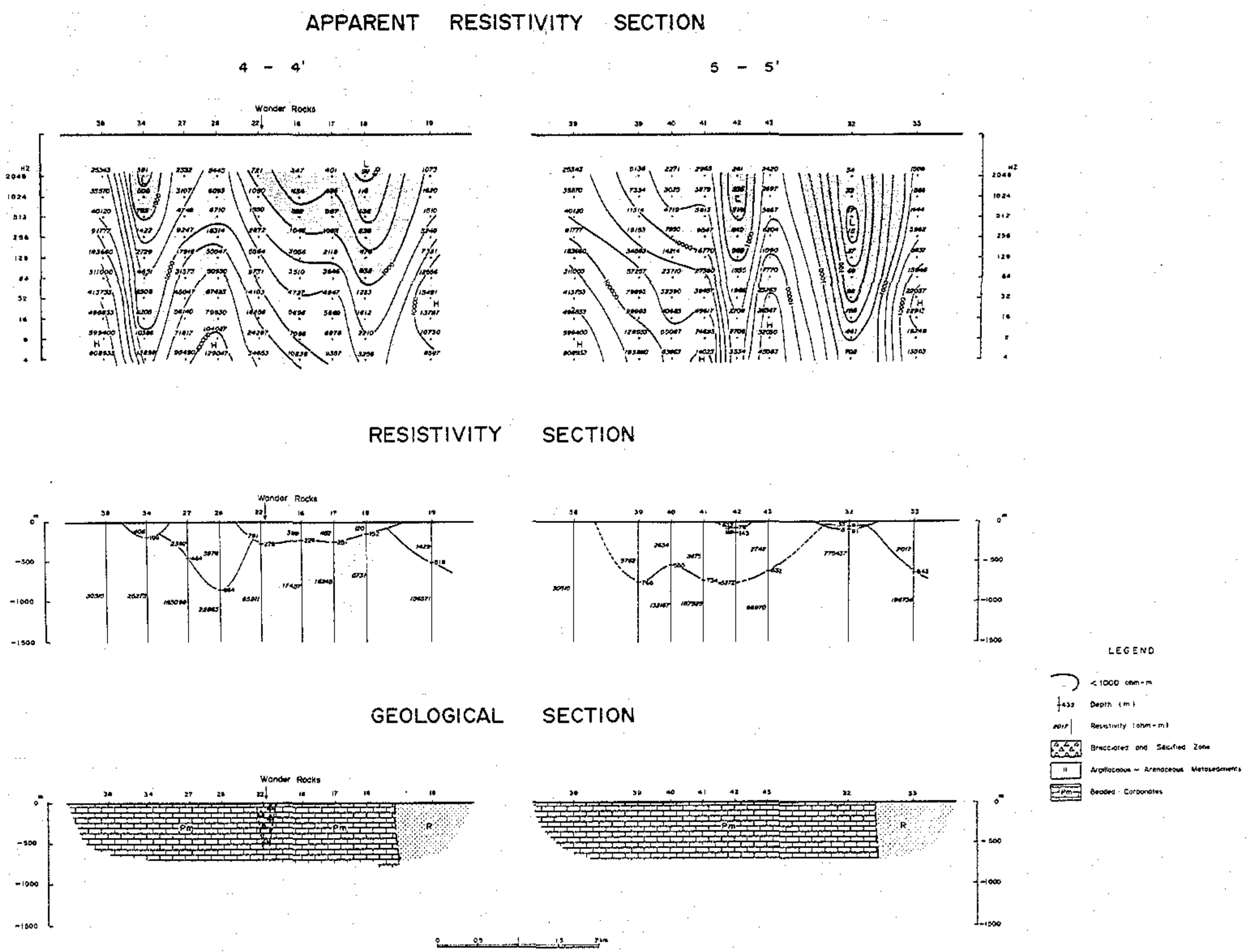


Fig. IV-15 Resistivity Section 4 ~ 5

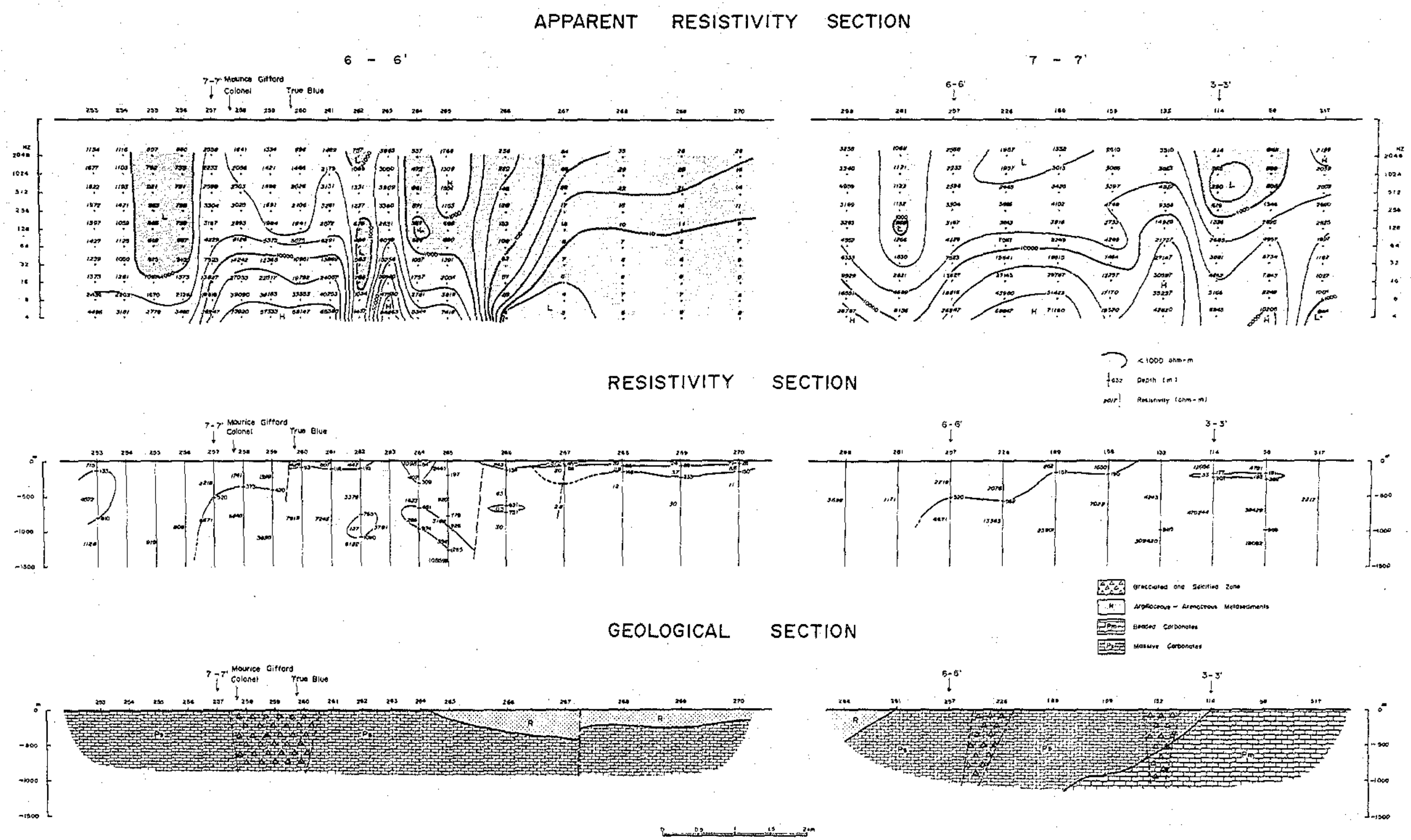


Fig. IV-16 Resistivity Section 6 ~ 7

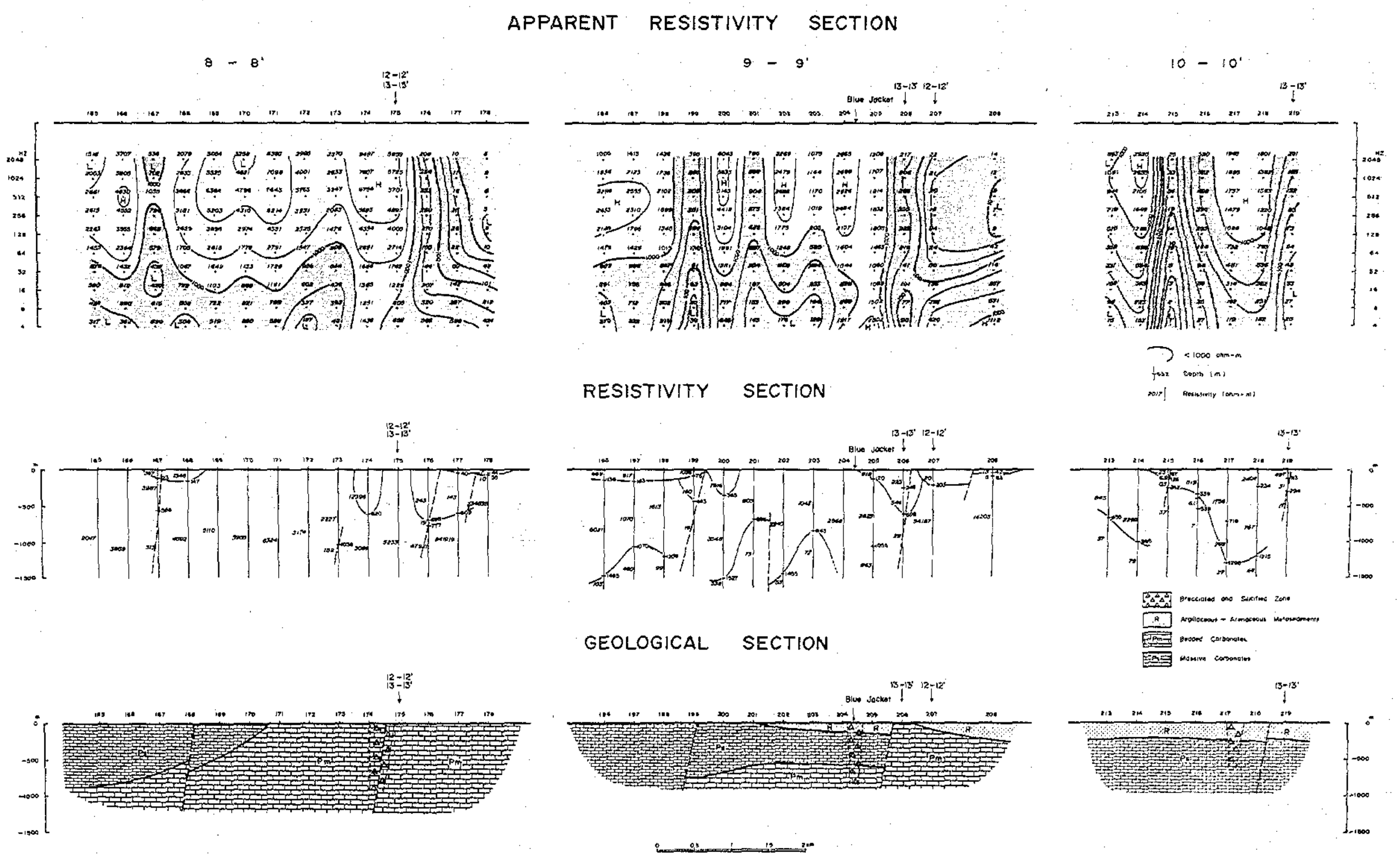


Fig. IV-17 Resistivity Section 8 ~ 10

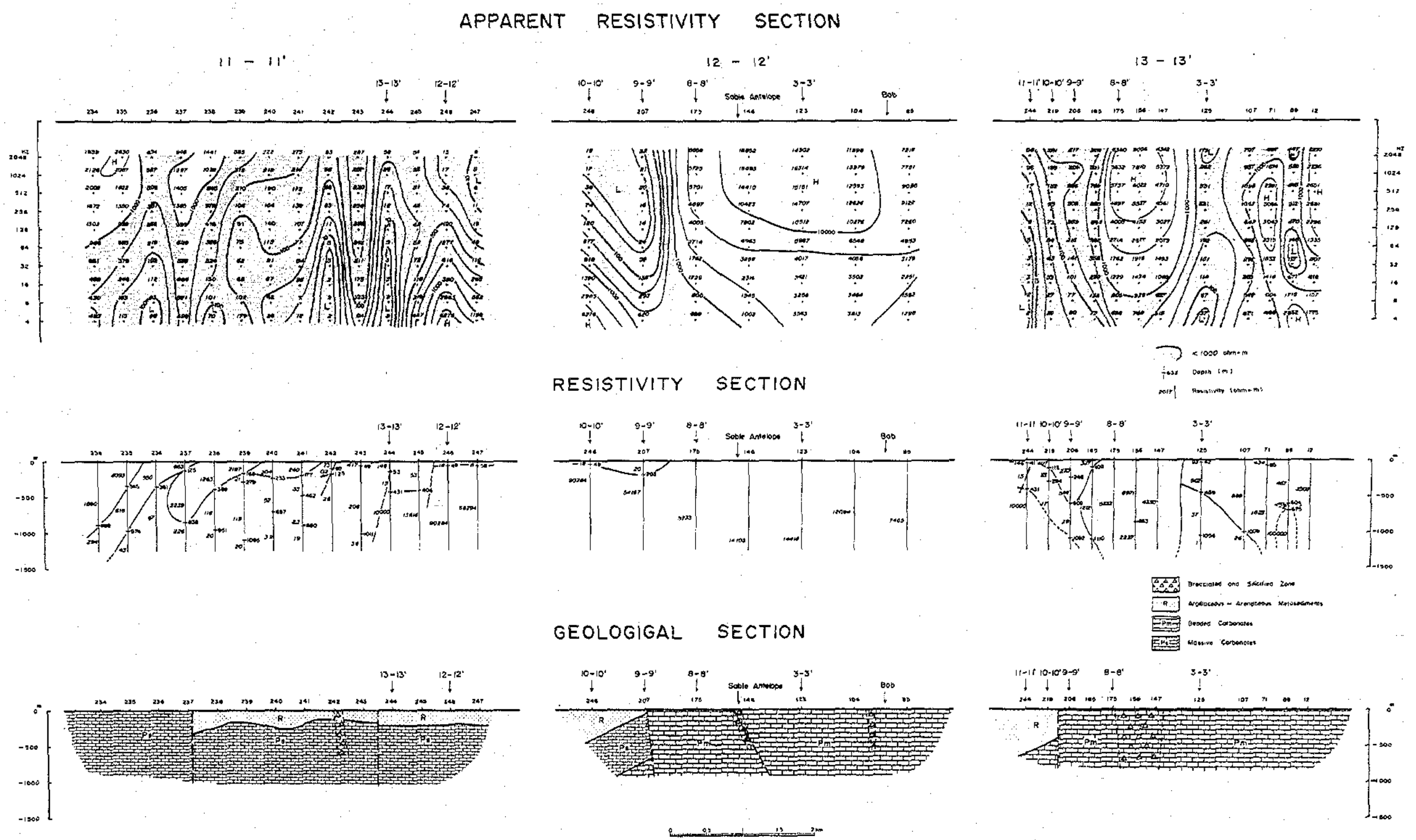


Fig. IV-18 Resistivity Section 11 ∿ 13

Anomalies at the station 219 (Fig. IV-17, 10-10') and 244 indicate an existence of crushed zones to the depths similarly to the station 206. These crushed zones are in succession with the zone at the northeast of Sable Antelope.

A zone of low resistivity ranging from 8 to 18 ohm-m exists from the surface to a depth of 50 m at the stations 246 and 247. A fault probably exists between the stations 245 and 246.

The zones of very low resistivity were detected in the depths from 70 to 200 m at the stations 267, 268, 269 and 270, being of 3 to 6 ohm-m. These zones are considered to be a succession of shales saturated with underground water.

m. A north-south trending zone of low apparent resistivity, at the west of the area B. A zone of low resistivity is observed at the station 305 (Fig. IV-14, 1-1') being of the 8 ohm-m in the depth from 42 to 72 m. The anomaly occurs in the area of stratified limestones.

The zones of low resistivity mentioned above are summarized in Table IV-6.

3-3 Resistivity Map

The resistivity maps are representation of the values of resistivity on the plans of 0, 100, 200, 300, and 400 m deep from the surface, obtained from analyses of the data at the observation stations.

(1) The map in the depth of 0 m has a similar pattern to the map of apparent resistivity at 2,048 Hz.

Table IV-6 List of Low Resistivity Zone

Type	Area	Station No.	Geology
Deep Fractured Zone	North east of Sable Antelope	71, 89, 107, 125	Massive Limestone
	East of Crystal Jacket	117	Massive Limestone
	Southwest of Blue Jacket	242	Metasandstone, Shale
	1 km West of Blue Jacket	215	Metasandstone, Shale
	2 km West of Blue Jacket	199	Bedded Limestone
	Southeastern part of A area	206, 219, 244	Metasandstone, Shale
Low Resistivity Zone (1000 ohm-m> >100 ohm-m)	East and West of Wonder Rocks	16, 17, 18, 22, 34	Massive Limestone
	Northeast of Crystal Jacket	58	Massive Limestone
	West of Colonel	255, 256 etc.	Bedded Limestone
	North of Blue Jacket	183, 184	Metasandstone, Shale
	2km South south east of Crystal Jacket	194, 233	Bedded Limestone
	South of True Blue	260, 262	Bedded Limestone
	Northeast of Bob	72, 73	Massive Limestone
Low Resistivity Zone (100 ohm-m> >100 ohm-m)	South and Southeast of Wonder Rocks	32, 42	Massive Limestone
	Northwest of Crystal Jacket	112	Massive Limestone
	Northeast of Crystal Jacket	114	Massive Limestone
	East of Crystal Jacket	117	Massive Limestone
	Northeast of Sable Antelope	89, 107, 125	Massive Limestone
	Southeastern Part of A area	177,207,208,245,246	Metasandstone, Shale
Low Resistivity Zone (<10 ohm-m)	1 km West of Blue Jacket	215	Metasandstone, Shale
	Southwest of Blue Jacket	244	Metasandstone, Shale
	Southeastern Part of A area	178, 208, 247	Metasandstone, Shale
	Southern Part of A area	266, 267, 268, 269, 270	Metasandstone, Shale
	Western Part of B area	305, 310, 315	Bedded Limestone

A zone of low resistivity less than 10 ohm-m, detected at the stations 310 and 314 in the area B, is considered to be of the near field effects.

(2) On the map of 100m deep, a northeasterly trending fault structure becomes distinct, although it was obscured on the map of apparent resistivity. The zones of the resistivities ranging 3 to 6 ohm-m are widely spread out in the southern part of the area A.

(3) On the map of 200m deep, the zone of low resistivity at the northeast of Crystal Jacket is apparent.

In this part the apparent resistivity maps, the resistivity sections (the apparent resistivity and resistivity sections) and the resistivity maps were provided to be analysed and to delineate the zones of low resistivity and also to clarify the geological structure such as faults and crushed zones.

The anomalous areas to be investigated in due course and the relationship of the geophysical anomalies with the occurrences of known mineralization are discussed in the following part.

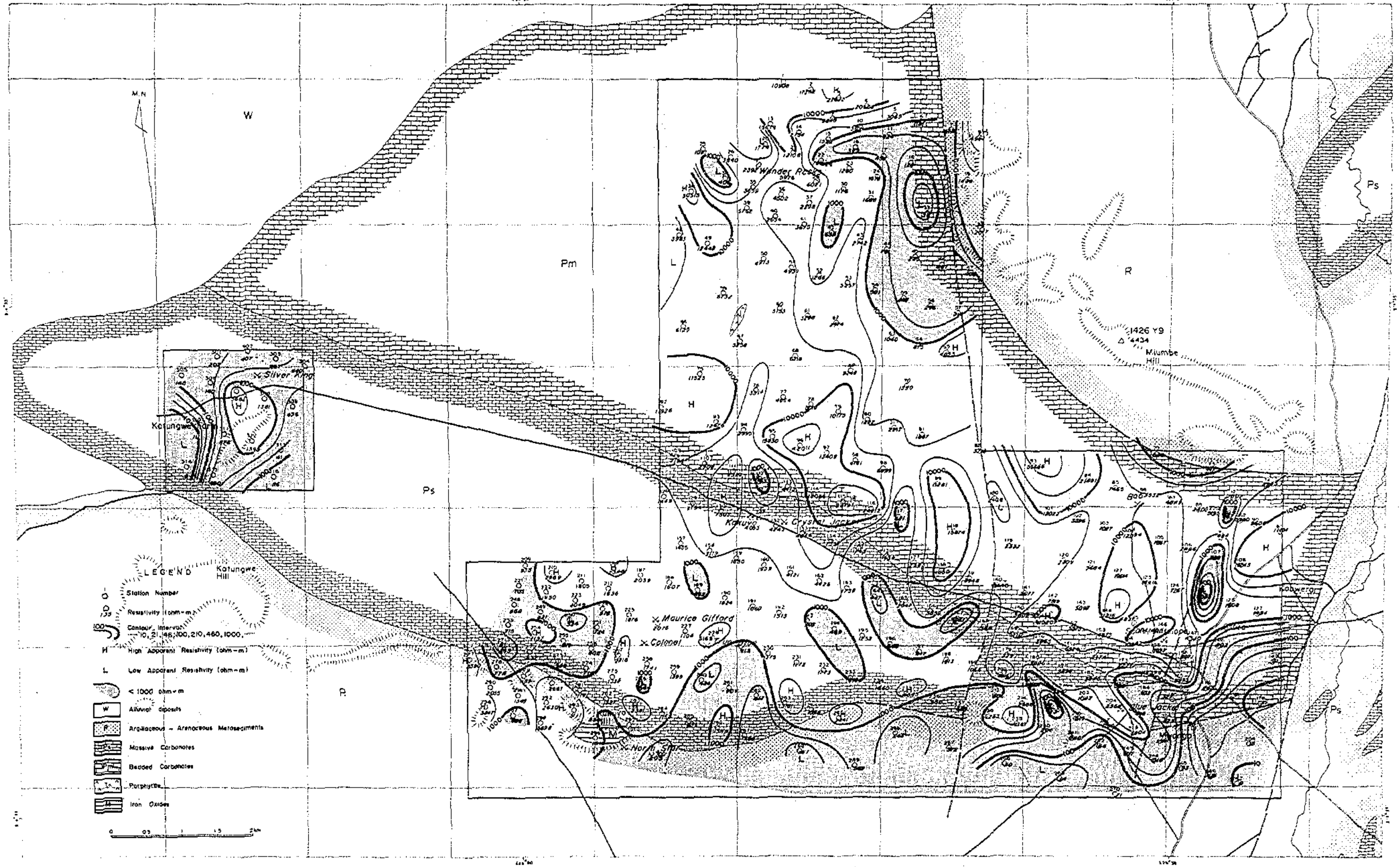


Fig. IV-19 Resistivity Map 0 m

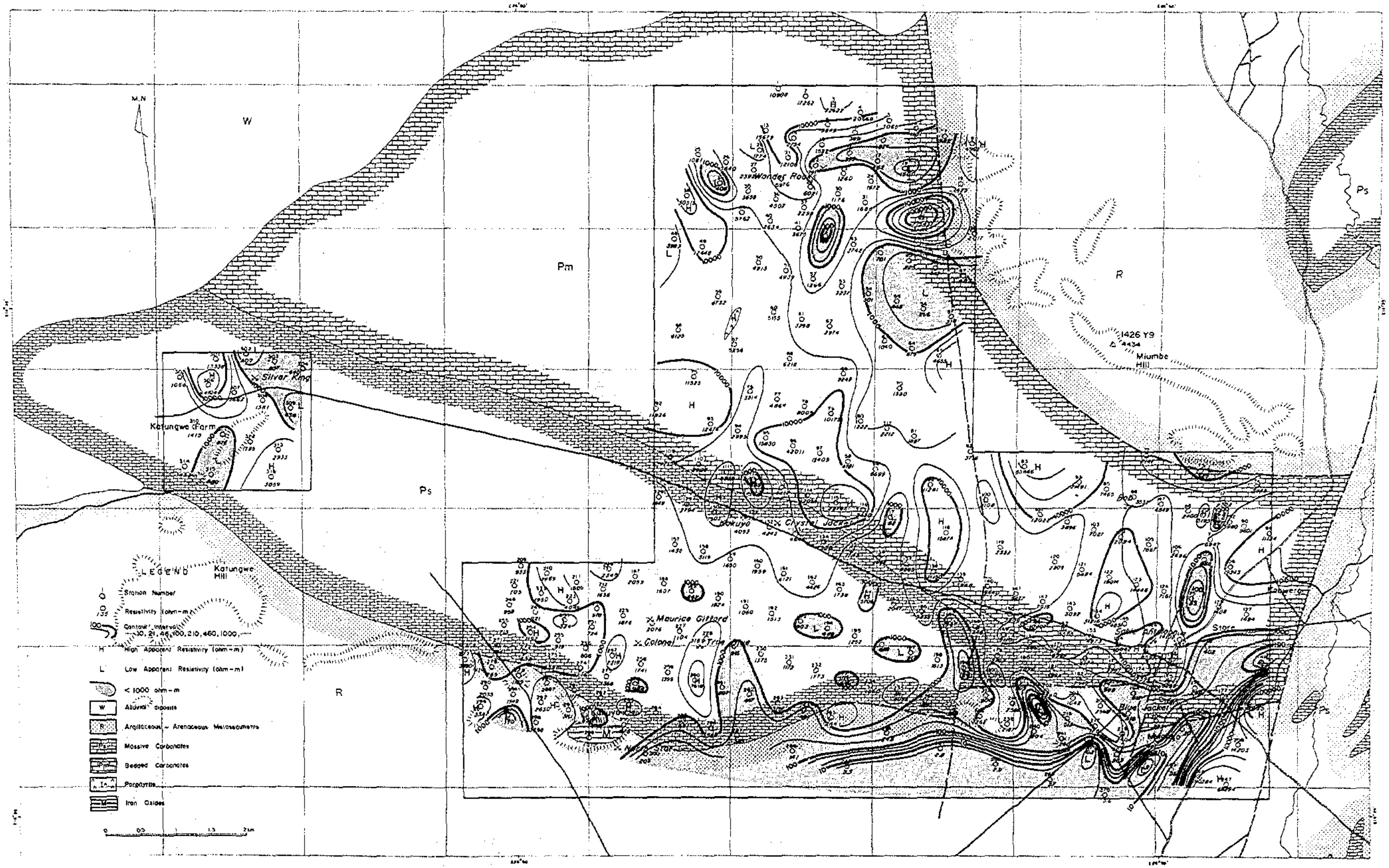


Fig. IV-20 Resistivity Map -100 m

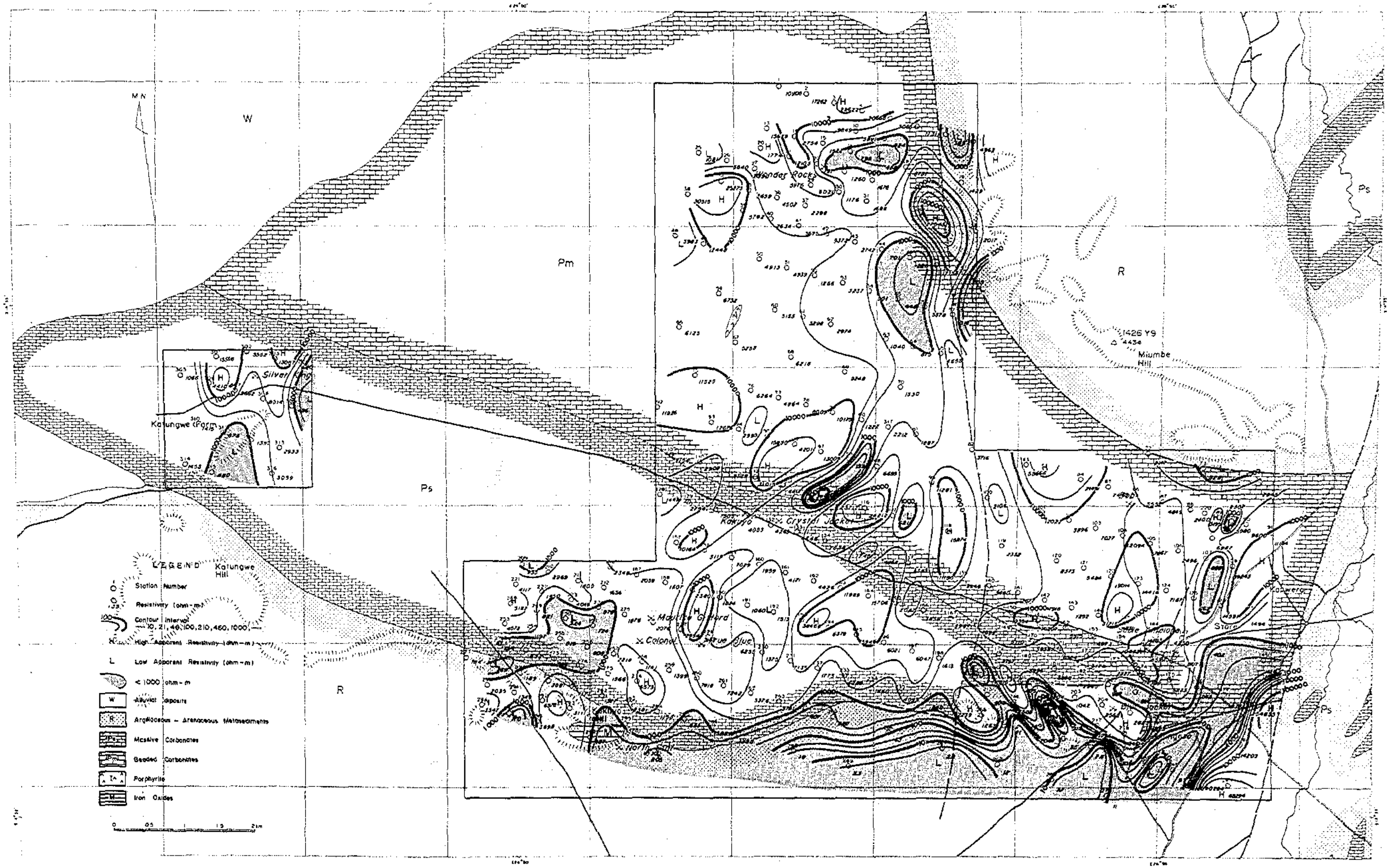


Fig. IV-21 Resistivity Map -200 m

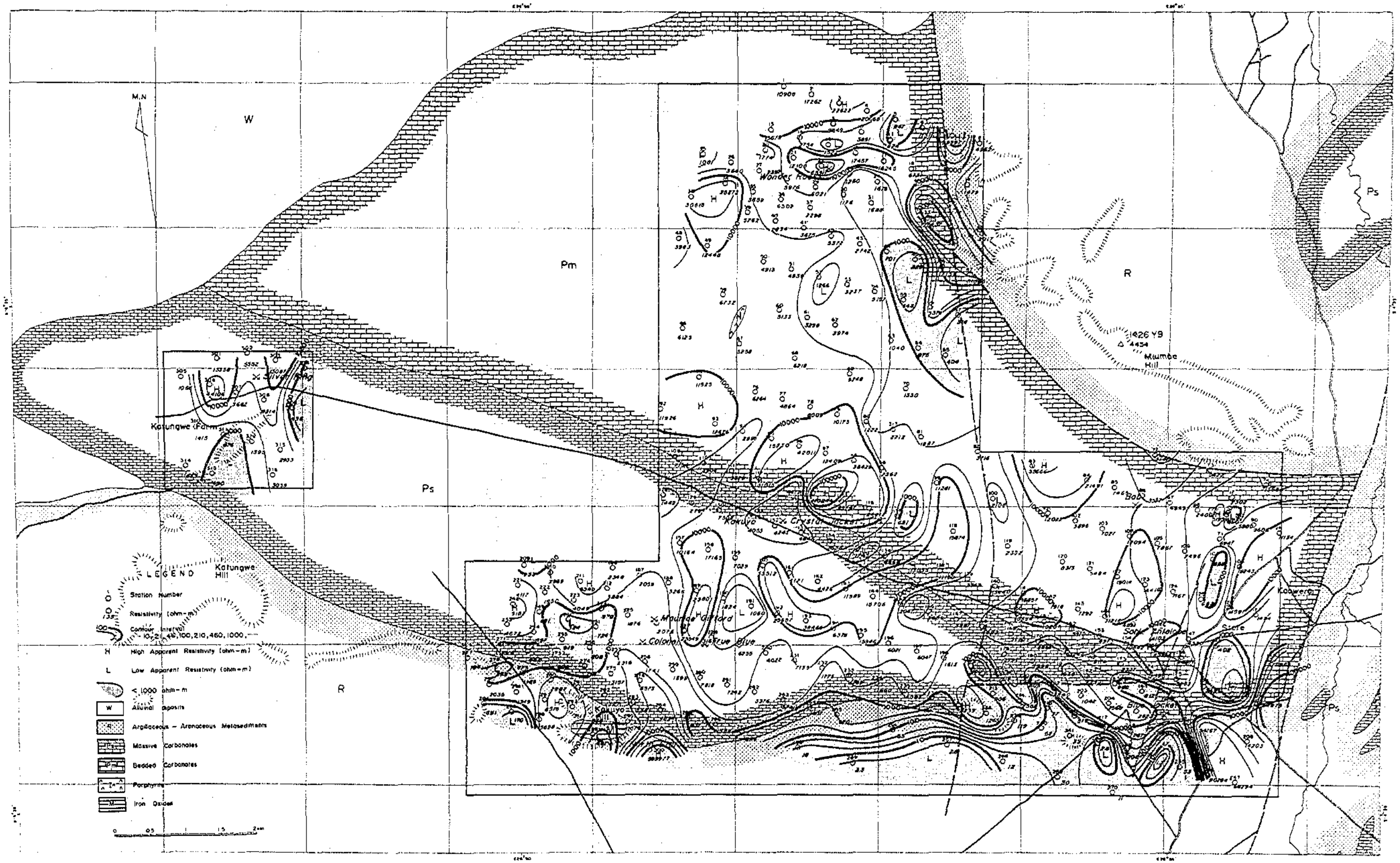


Fig. IV-22 Resistivity Map -300 m

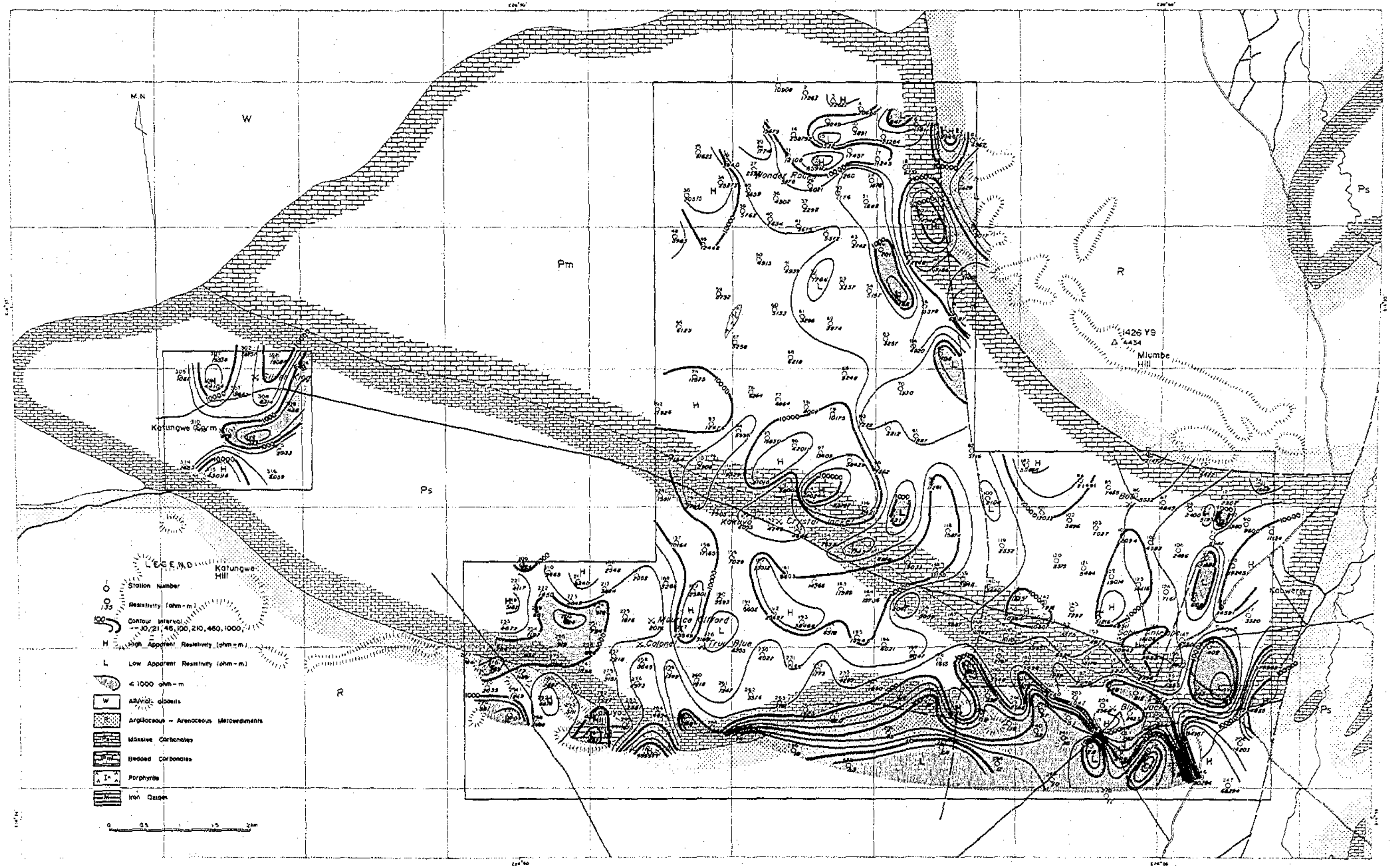


Fig. IV-23 Resistivity Map -400 m

PART V RESULTS OF THE SURVEY AND RECOMMENDATIONS

PART V RESULTS OF THE SURVEY AND RECOMMENDATIONS

Chapter 1 Results of the Survey

1-1 Geological Structure and Mineralized Zone

The mineralized zones in the surveyed area can be largely divided into those in brecciated fractured zones of carbonates in the northern part and those which occur along the weak lines such as fissures in the south.

The brecciated fractured zones are oval-shaped horizontally and pipe-shaped vertically. The oval is in the order of 10 m × 10 m to 300 m × 500 m. They are developed independently of each other and they are not arranged in any particular direction. Regionally, however, the mineralized zones from Sable Antelope to Silver King occur in a belt which is harmonious with the geologic structure N70° ~ 80°W. Wonder Rocks and Bob Zinc mineralized zones are not in this belt. The scale and intensity of mineralization are generally proportionate to those of the brecciated fractured zone and deeper mineralization is found when the outcrop occurs in lower stratigraphic horizon.

The position of the Wonder Rocks and Bob Zinc mineralized zones in relation to geologic structure is not quite clear, but the ores of the Bob Znc mineralized zone confirmed by drilling are elongated in N70° ~ 80°W direction, which is the general direction of the geologic structure. Also the brecciated fractured zone, Bob Zinc - Sable Antelope - Blue Jacket is arranged along the N-S system fault. It is considered that mineralization occurs at the intersections of the E-W and N-S system fissures.

Mineralization of Wonder Rock occurs at the contact of the two geochemical anomalous zones elongated in N70°E and

N20°W directions respectively. This is interpreted as the intersection of the fissures of E-W and N-S systems became the place of mineralization as in the case of Bob Zinc.

The E-W trending weak zone is the N70°W fissure in Kamiyobo and N20°E in Lou Lou. The direction at Sugar Loaf is inferred to be N20°E from the trend of the syenite tongue. The directions of these weak zones are all of local nature and cut the geologic beds obliquely. Their extension is in the order of several kilometers.

On the other hand, there are no mineralization along the major lineations which control the regional geologic structure. Thus it is inferred that the minor weak lineations of local scale became the conduit for the mineralizing fluid.

Regarding the country rocks, carbonates and intrusives generally constitute more favourable environment than metasediments for vein deposits because fissures are better developed and preserved in these rocks. Therefore, even when the fissures and mineralization in metasediments are weak, there are possibilities of ore shoots being formed in the underlying carbonates or near the boundary with the carbonates. Exposure, however, is extremely poor in this general area and thus it was not possible to confirm the above by surface geological survey. Particularly, in the Kamiyobo mineralized zone, strong Cu mineralization is observed in the fissures of shale but it is not possible to trace its extension. This fissure can be traced by aerial photographs in the unexposed plain areas and it is observed to continue into the carbonate areas.

We believe that the degree of the development of fracture system in various geologic units and the relationship between these units and mineralization could be clarified in the future by acquisition and analysis of geoscientic data including geochemical and geophysical prospection.

1-2 Geochemical Anomalies and Mineralization

Six geochemical anomalous zones were extracted in the southern part of this area. Of these six zones, the association with known mineralized zones are confirmed for two zones. Not all of the known mineralized zones are extracted as geochemical anomaly zones.

In the carbonates of the northern part, however, all of the known mineralized zones are extracted as geochemical anomalous zones. This difference is believed to be cause by the following factors.

Factor	Northern Carbonate Area	Southern Part (Present Survey)
Sampling Intervals	① Line 400m ② Points 100m	① Line 1 or 2km ② Points 500m
Mineralization	① Exposure good, intensely eroded ② Distribution of mineralization arranged in a zone	① Very few exposures. Ore shoots in underlying carbonates. Erosion expected to be small when mineralization in metasediments weak. ② Mineralization localized and separate.
Size of Anomalous zones	The dimension as large as several kilometers wide and several tens of kilometers long.	Small scale, discontinuous

The two anomalous zones where the relationship between the anomalies and the known mineralization can be observed are located in the vicinity of the Kamiyobo mineralized zone and it western extension. They are both (Pb)-Zn anomalies. On the other hand, strong Cu mineralization is observed at the Kamiyobo outcrop, but there is no evidence of Pb-Zn mineralization. Cu anomaly was not detected because the sampling traverse is at a distance from the outcrop and the Cu value was relatively high but not at the anomaly level. Anomalous values would probably be obtained if the sampling interval is shortened. There are no outcrops in the Pb-Zn anomaly points, but the values are extremely high and there are many anomalies, and the belt including the two zones extends 6 km. This is similar to the relation between Sable Antelope, where Cu mineralization was detected in the outcrop and was prospected in the early stages, and Bob Zinc mineralization zone nearby, which was noted for the Zn anomalies. It is expected that the conditions of this zone will be clarified by detailed geochemical survey.

An four points, mineralization was not found on the surface but geochemical anomalies were detected. The relationship between these anomalous zones and mineralization should be investigated after the results of the detailed geochemical work in the Kamiyobo mineralized zone and its western extension are obtained. The Pb-Zn anomalies of eastern Karenda which lies to the north of this zone are similar and is located in the same carbonate units. Thus comparative study probably would yield useful results.

The results of the detailed geochemical survey (lines 100m, points 50 m intervals) and percussion drilling at Wonder Rocks and Bob Zinc were reconsidered on the basis of the re-analysis of the geochemical data of the carbonate area in the north. The results of these studies show that very high Zn anomalies are detected over a wide area at Wonder Rocks mineralized zone and that the Zn values in a large amount of percussion drill soil samples are several percent (maximum 8.2%). Also from surface geological survey, it was interpreted that the centre of mineralization is already eroded out and that the deeper part of the mineralized zone constitute the outcrop.

At Bob Zinc, Zn anomalies higher than M+3σ and the percussion drill samples with Zn content exceeding 1% are both distributed very harmoniously in two zones (Fig. II- 4).

The drilling at the western anomalous zone of Bob Zinc has confirmed high-grade zinc ores. The shape, strike, dip of the orebody obtained from the above drilling agree extremely well with the shape of the anomalous zone and it indicates that the anomalies are formed by mineralization.

The eastern anomaly has not yet been explored. It is, however, very similar to that in the west, although the size is somewhat larger and the anomaly values are somewhat lower. Therefore, the erosion in this zone is considered to be less. It is very desirable to drill this zone. The results of this drilling will provide data for planning detailed geochemical survey for the Zn anomalous zone extending from Blue Jacket to North Star.

1-3 Geophysical Anomalies and Mineralized Zones

The values of the low resistivity zone (Table IV-6) generally fall within the following range.

In limestones...............30~100 ohm-m

In metasandstones, shales ..0.2~100 ohm-m

Generally, the resistivity of the massive sulfide deposits are considered to be less than 10 ohm-m and that of dissemination deposit less than 100 ohm-m. Therefore, zones with less than 100 ohm-m in limestone areas with high background values, and those with less than 1 ohm-m in metasandstone, shale areas with low background values were selected as resistivity anomaly zones (Table V-1). These zones are as follows.

Table V－1 The List of CSAMT Anomalies

Station No.	Section No.	Resistivity (ohm-m)	Depth (m)
32	5	35	0～61
		6	61～91
42	5	99	79～143
112	3	85	119～195
114	3, 7	33	177～207
125	3, 13	93	0～42
		37	＞459
178	8	1	44～55
215	10	0.3	126～242
242	11	0.2	95～125

Anomalies in deep zones, and those which are obviously caused by near field are excluded. Points 32, 42, 112, 114, 125 are in limestone and 178, 215, 242 are in metasandstone and shale. The characteristics of these anomalies are as follows.

a. Anomaly zone 32 is shallower than 100 m. It is seen from -100 m resistivity map (Fig. IV-20) that high resistivity zone rises below this anomaly zone. There is a N-S fault to the east.

b. Anomaly zone 42 apparently trends in N-S direction (0 m, -100 m Figs. IV019, IV-20).

c. The depth and resistivity value of anomaly zone 112 is similar to those of 42.

d. The trend of zone 114 is considered to be NE-SW (-200 m, Fig. IV-21).

e. Anomalous zone 125 is believed to occur deep in the fractured zone which continues under the NNE-SSW trend.

f. Point 178 is located along the E-W fault. -100 m resistivity map (Fig. IV-20) indicates that fault with NE-SW trend exists to the west of point 178.

g. Anomaly zones 215 and 242 are believed to be of very low value and occur in the fractured zone which continues into the deeper parts.

The apparent resistivity near the ore deposits is distributed over a wide area (Table IV-5). Also 0 m resistivity map (Fig. IV-19) shows that the values near the deposits other than North Star are higher than 1,000 ohm-m. The reasons for the above are considered to be the occurrence of the deposits in limestone, the small size of the deposits and silicification being the major type of alteration. Particularly high resistivity zone of over 10,000 ohm-m is observed to occur conspicuously near Bob Zinc, Sable Antelope and Crystal Jacket. Also, the following is observed regarding the relationship between the anomaly zone (Table V-1) and the ore deposits.

Sable Antelope and Blue Jacket are located in a belt which includes anomalous points 125 and 242. This NE-SW direction is the same as that of the fault which is inferred to exist in the southeastern margin of Zone A (Fig. IV-20, -100 m resistivity map). North Star, True Blue, Crystal Jacket, points 114, 58 (The resistivity of point 58 is higher than 100 ohm-m and thus is not included in Table IV-6.) occur on a line trending approximately NE-SW. This NE-SW trend agrees with that of the weak magnetic lineament of aeromagnetic map (survey conducted in 1967) and is considered to reflect the geologic structure controlling the ore genesis.

From the above considerations of geophysical anomalies, we arrived at the conclusion that the following areas (Fig. V-1) should be further surveyed.

(1) Eastern and southeastern part of Area A (include points 125, 215, 242, Sable Antelope, Blue Jacket and Bob Zinc).

(2) Central part of Area A (include points 58, 112, 114, Crystal Jacket and Kakuyo).

(3) Northern part of Area A (include points 32, 42 and Wonder Rocks).

Further application of detailed CSAMT, IP and SIP methods is recommended.

1-4 Synthesis

The promising areas and anomalous zones reported above are listed in Table V-1. They are numerous and extend over a very wide area. Therefore, for the evaluation of these anomalies, the best method would be to conduct exploration in a way for anomalous zones that the results would provide information and data relevant for the evaluation of other anomalies. The following is our thinking along these lines.

According to geological survey, the ore-deposits of this area are dissemination and veins accompanied partly by massive parts. The known deposits, however, are all mineralized out and we could not enter the old adits and therefore there are still some unclear parts regarding the mode of occurrence of the deposits.

In order to consider and evaluate the geochemical and geophysical anomalies, it is necessary to construct a model of the ore deposit. For this purpose, drilling should be conducted at the most promising locality and clarify the state of mineralization. The only locality where this can

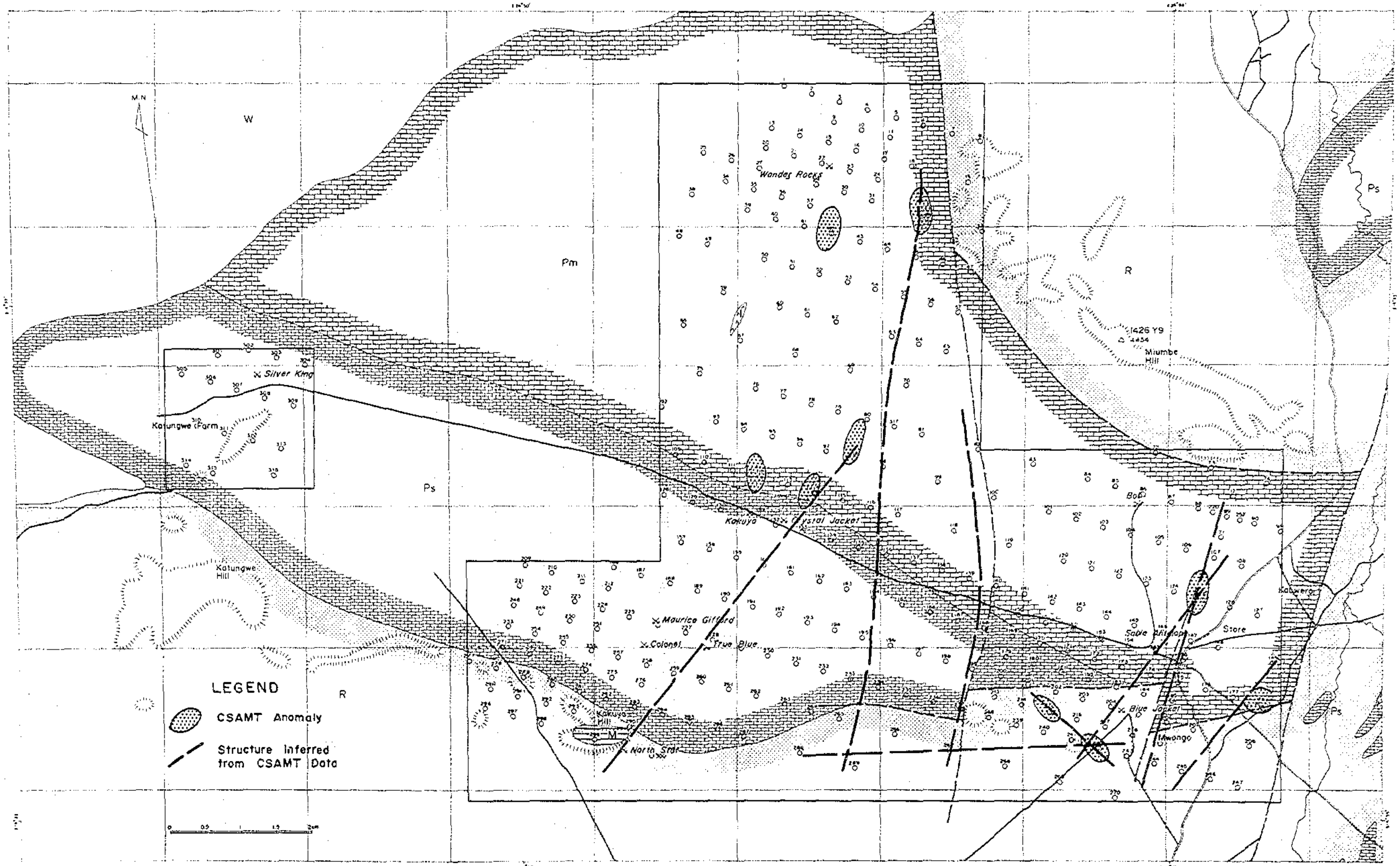


Fig. V-1 CSAMT Interpretation Map

be done with certainly is the Bob Zinc mineralized zone where ores have already been confirmed by drilling but the form of the deposit is not yet clarified.

Next if we lay emphasis on lead and zinc deposits, considering the mining situation of Zambia which have the famed Copper Belt, the most promising locality for occurrence of lead and zinc deposits although not yet drilled, is inferred from other data to be situated to the east of the known ore body at Bob Zinc. Also the clarification of these two anomalous zones will provide data for deciding the future prospecting for other geochemical anomalies in the zone extending from Sable Antelope - Blue Jacket to Silver King. Thus one of the high priority work would be drilling at Bob Zinc for clarifying the shape of the ore body and the Zn anomaly which was newly discovered.

The geochemical and geophysical survey conducted during the present work is of reconnaissance nature. Therefore, we believe that the relationship between the anomalies and mineralization will be clarified by detailed survey of the promising anomalies. Also the results of these work would enable the study of the relationship between the anomalies and mineralization for localities where evidences of mineralization cannot be observed on the surface.

The most promising geochemical anomalous zone is the Pb-Zn anomalies near the Kamiyobo mineralized zone and its western extension where the anomalies coincide with the known mineralized zone.

The most promising geophysical anomalous zones are the east-southeastern part of Area A which include Bob Zinc, Sable Antelope, Blue Jacket. Here the anomalies are densely concentrated and ore deposits and mineralization are developed. IP and SIP are the appropriate methods for the investigation of these areas.

Chapter 2 Recommendations

2-1 Conclusion

There are many ore deposits and mineralized zones in the surveyed area. Some of these have been mined out in the past, but many have not been explored in detail. The potential of this area is high regarding the occurrence of ore deposits.

The ore deposits in this area are network, dissemination and veins accompanied partly by massive ore. The mineralization is observed in the brecciated fractured zones in carbonates in the northern part and along weak lineations such as fissures in the southern part. There are geochemical and drilling data conducted by MINDECO/NORANDA for the northern carbonate area.

The promising zones shown in Table V-2 were extracted, by studying the results of the present work together with the reanalysed old data. The following three zones were selected as the most promising after careful study of the extracted zones above.

(1) The ore body confirmed by drilling at Bob Zinc and the newly discovered Zn anomaly to the east.

(2) Weak lineation along Bob Zinc - Sable Antelope - Blue Jacket.

(3) The vicinity of Kamiyobo - Pb-Zn geochemical anomaly zone to the west.

Regarding the newly found Zn anomaly of (1), the percussion drilling soil samples with over 1% Zn are distributed very harmoniously within the M+3σ zone of the detailed geochemical survey. The distribution of these anomalies and the ore body confirmed by MINDECO/NORANDA drilling have very similar shape.

Table V-2 The List of the Interesting and/or Anomarous Zones in Karenda Area

Zone	Recognized Survey Methods			
	Geological Survey	Geochemical Survey	Geophysical Survey	Reanalysis of old data
Bob Zinc New Zn Anomaly	○		○	◎ Detailed Geochemical Data and Drill Data
Kamiyobo ∿ Kamiyobo West Pb - Zn Anomalous Zone	◎	◎		
Bob Zinc ∿ Sable Antelope ∿ Blue Jacket Fracture Zone	◎		◎	◎ Geochemical Data
Sable Antelope Blue Jacket ∿ Silver King Mineralized Zone	○		○	◎ Geochemical Data
Blue Jacket ∿ North Star Zn Anomalous Zone	○		○	◎ Geochemical Data
Crystal Jacket ∿ Kakuyo Low Resistivity Zone	○		◎	◎ Geochemical Data
Wonder Rocks Low Resistivity Zone	×		○	× Drill Data
Karenda East Pb-Zn Anomalous Zone		○		
Kitumba Hills South Pb-Zn Anomalous Zone		○		
Chikwanba Hill North Pb-Zn Anomalous Zone		○		
Kitumba Hills North Ag-Cu Anomalous Zone		○		

◎ very interesting

○ interesting

× not interesting

It is considered that the possibility of occurrence of new ore deposits is high in this locality.

The above ore body found by drilling was thought to have platy form extending in the strike direction and cut by a fault in the east. The present work, however, showed that the body extends downward in pipe form. Thus it is highly desirable to determine the shape of this body by drilling.

Aside from the known deposits and mineralized zones along the weak lineation mentioned in (2), a new brecciated fractured zone was found to the east of Bob Zinc. Also many anomalies were found by geophysical prospecting. Re-analysis of geochemical data showed that the geochemical anomaly zones which occur approximately harmoniously with the geological structure from Silver King to Sable Antelope - Blue Jacket, change their direction along this weak lineation.

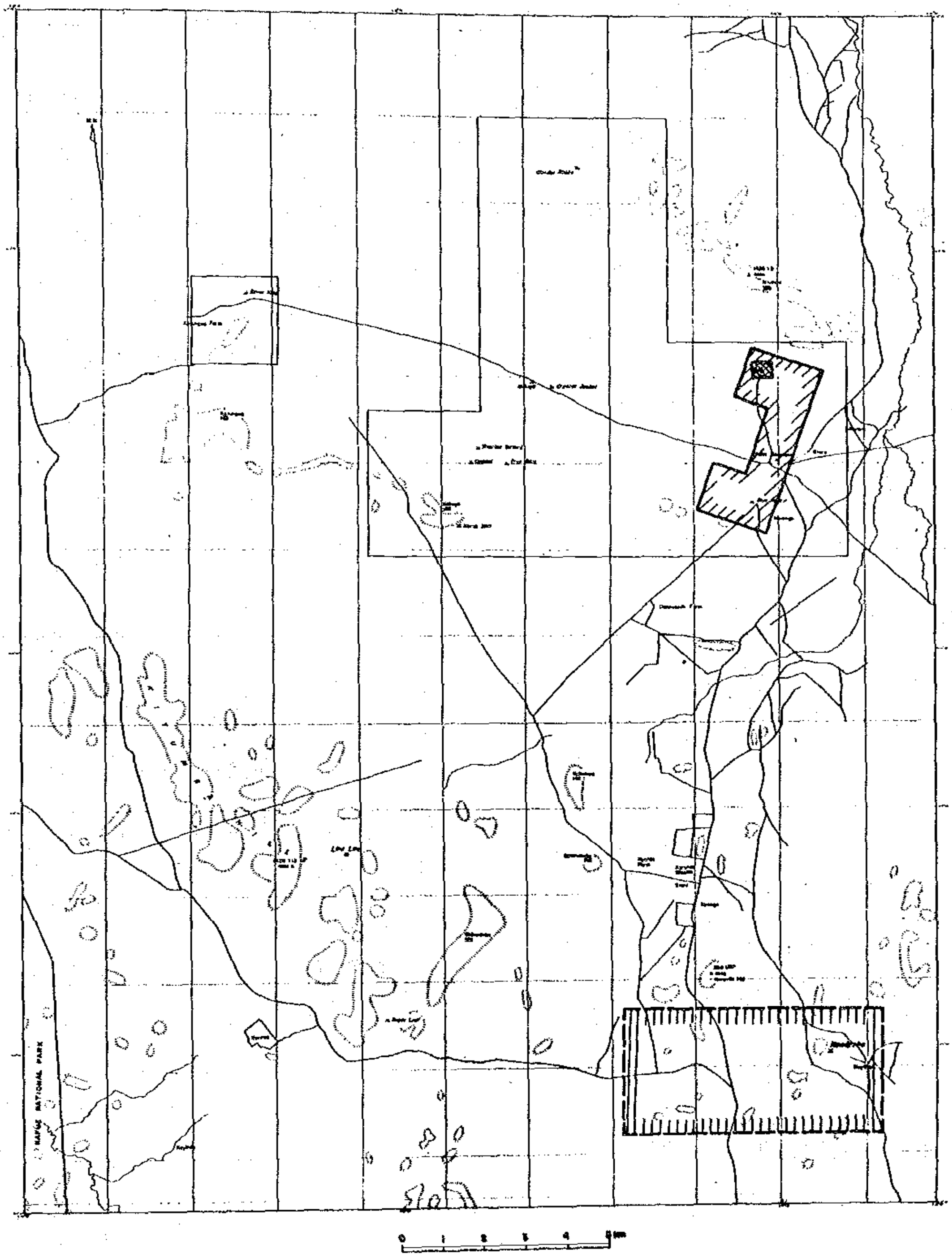
The Pb-Zn anomaly zone mentioned in (3), is of high anomaly values, the number of anomalies is large and the size extends over 6 km. The outcrop at Kamiyobo consists of cupriferous iron oxide vein of 4 m in width and the mineralization is very strong. Here Cu mineralization is observed in the outcrop while Pb-Zn anomalies are obtained nearby. Similar example is the Cu deposit of Sable Antelope and Bob Zinc mineralized zone found by geochemical prospecting.

2-2 Recommendation for the Second Phase

We recommend that the following prospecting work be conducted for the most promising zones (Fig. V-2).

(1) Bob Zinc Mineralized Zone

i) Drilling at the newly found Zn anomaly zone.



LEGEND

Recommeded Areas For

- Drilling Exploration
- Geophysical Survey
- Geochemical Survey

Fig. V – 2 Recommendation Map

ii) Drilling for investigating the shape of the ore body confirmed by drilling.

(2) Bob Zinc - Sable Antelope - Blue Jacket Weak Zone

i) Geophysical prospecting, SIP or IP method.

(3) Vicinity of Kamiyobo - Westward Extention, Pb-Zn Anomaly Zone

i) Geochemical prospecting.

Bibiliography

[On Geology and Geochemistry]

Cikin, M. & Drysdall (1971) : The Geology of the Country, North - West of Mumbwa (The Big Concession). (Geological Survey, Mining Department, Ministry of Mines.)

Cikin, M. (1972) : Report on the Exploration of the Sable Antelope, Blue Jacket, Lou Lou and Sugar Loaf Prospects in Big Concession. (UN Mineral Exploration Project)

Davis, C. J. (1973) : Statistics and Data Analysis in Geology.

Gersteling, R.W. (1959) : Report on the Geology of the Silver King Mine.

Kortman, C.R. (1971) : The Geology of the Zambia Broken Hill Mine "Kabwe".

Lepeltier, C. (1969) : A Simplified Statistical Treatment of Geochemical Data by Graphical Representation. (Economic Geology Vol. 64, p.538 ∿ 550)

Murangari, D.E.H. (1978) : Miumbe PL 146 Final Report (Mindeco Ltd., Mindex Dept.)

Pluhar, E.& Punukollu, S.N.(1984) : Detailed Geological Map of the Sable Antelope and Proposal for Copper-Silver and Zinc-Silver Exploration in the "Carbonate Formation North of the Katungwe and Kakuyo Hills, Mumbwa-North, Mumbwa-District.

Reeve, W.H. (1963) : The Geology and Mineral Resources of Northern Rhodesia. (Geological Survey, Ministry of Labour & Mines)

Searle, D.L (1973) : The petrogy, Mineralogy, Mode of Occurrence and Exploration Results of Lou Lou and Sugar Loaf Prospects, Big Concession Area.

[On Geophysics]

Cagniar, L. (1953) : Basic Theory of the Magneto-Telluric Method of Geophysical Prospecting. (Geophysics, Vol. 37, p.605 ∿ 635)

Goldstein, M. A. & Strangway, D.W. (1975) : Audio Frequentry Magneto Tellurics with a Grounded Electric Dipole Source. (Geophysics, Vol. 43, p. 669 ∿ 683)

Hanaoka, H. (1982) : On Magneto Tellurics. (BUTSURI TANKO <Geophysical Exploration>, Vol. 35, p. 262 ∿ 276)

M. M. A. J. (1980, 81, 82) : Report on Research of Mineral Resources Development Technology. (Deep Electrical Sounding Method)

Murakami, Y. (1983) : Fundamentals of Magnetotellurics. (BUTSURI TANKO, Vol. 36, p. 382 ∿ 391)

Strangway, D.W. (1984) : Audio Frequency Magnetotelluric (AMT) Sounding. (Developments in Geophysical Exploration Method - 5, p. 107 ∿ 159)

Yokokawa, K. (1984) : Summary of CSAMT. (BUTSURI TANKO, Vol. 37, p.279 ∿ 286)

Zonge Engineering & Research Organization INC. (1982) : Interpretation Guide for CSAMT Data.

Abbreviations

Ore minerals

At : atacamite
Bo : bornite
Bro : brochantite
Cc : chalcocite
Cov : covelline
Cp : chalcopyrite
Go : goethite
He : hematite
Lep : lepidochrocite
Mal : malachite
Py : pyrite
Ten : tennantite
Wil : willemite

Rock name

ls : limestone
Ss : sandstone

Amounts of minerals

◎ Abundant
◯ common
o few
• rare

Rock forming minerals

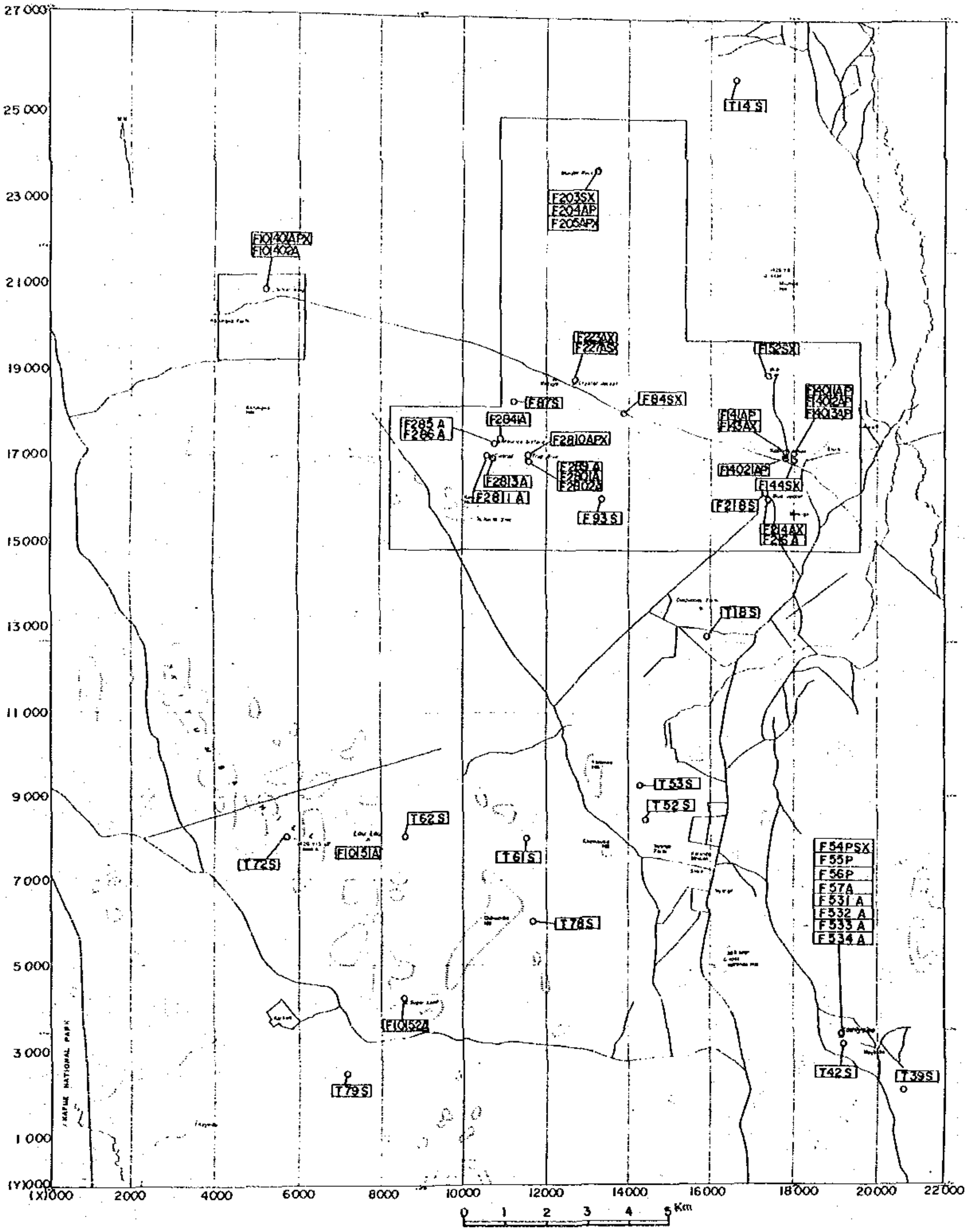
Au : augite
Bi : biotite
Ca : calcite
Cl : chlorite
Dio : diopside
Do : dolomite
Ep : epidote
Fe : ferronous mineral
Ho : hornblende
K : kaoline mineral
Kf : potash felsper
Ma : micaceous mineral
Mf : mafic mineral
Pl : plagioclase
Q : quartz
Ro : rock fragments
Se : sericite
Sp : specularite
To : tourmaline
Zi : zircon

Sample

F116 APSX

F116 : sample number
A : chemical analysis
P : polished section
S : thin section
X : X ray diffractive analysis

Appendices



LEGEND

F 54 APSX ⟶ F 54 : Sample number

A : Chemical analysis

P : Polished section

S : Thin section

X : X ray diffractive analysis

Ap. I Location Map of Laboratory Examination Samples

Ap. 2 The Results of Chemical Analysis of Ore

No.	Sample No.	Coordinates			Analytical Results			
		X	Y		Ag s/t	Cu %	Pb ppm	Zn ppm
1	F101401APX	5250	20950	Silver King	42	2.02	70	661
2	F101402A	"	"	"	16.5	0.48	80	338
3	F204AP	13175	23850	Wonder Rocks	2.3	0.04	1,150	16,000
4	F205APX	"	"	"	*13,700 11,600	*47.47 53,10	640	3,800
5	F223AX	12650	18825	Crystal Jacket	118	7.6	90	138
6	F227ASX	"	"	"	68	3.0	100	237
7	F2841A	11000	17375	Maurice Gifford	21	5.2	660	1,130
8	F285A	10875	17300	"	0.4	0.02	80	73
9	F286A	"	"	"	3.7	0.16	80	58
10	F2811A	10600	17050	Colonel	129	12.3	30	252
11	F2813A	10675	"	"	1.0	0.07	140	124
12	F2801A	11750	17125	True Blue	340	39.25	50	6,200
13	F2802A	"	"	"	27	2.4	90	520
14	F289A	"	"	"	2.6	0.26	70	968
15	F2810APX	11750	17200	"	255	26.50	190	855
16	F141AP	17875	17150	Sable Antelope	22	25.90	80	808
17	F143AX	"	"	"	5.1	3.50	90	564
18	F14011AP	18050	"	"	99	23.25	70	344
19	F14012AP	"	"	"	19.3	2.50	60	187
20	F14013AP	"	"	"	108	24.10	60	284
21	F14021AP	17850	17000	"	37	19.45	100	14,200
22	F214AX	17400	16750	Blue Jacket	17.5	31.45	140	365
23	F216A	"	"	"	10.7	4.4	50	51
24	F57A	19500	3925	Kamiyobo	0.3	3.6	40	102
25	F531A	"	"	"	2.6	1.20	30	82
26	F532A	"	"	"	2.4	1.11	50	154
27	F533A	"	"	"	5.3	0.69	50	56
28	F534A	"	"	"	2.0	1.15	50	127
29	F10151A	7725	8100	Lou Lou	49	4.8	70	113
30	F10152A	8625	4100	Sugar Loaf	3.0	3.9	110	15

* reassay of another part of the vein

Ap. 3 The Results of Microscopic Observation of Polished Section

No.	Sample No.	Coordinates X	Coordinates Y	Locality	Kinds of ore	Observed minerals Cp	Ten	Cov	Cc	Bo	Di*	Mal*	Bro*	Py	Go	He	Remarks
1	F-101401APX	5250	20950	Silver King	ore dump		o?		o	o	o?			•			X-ray
2	F-204AP	13175	23850	Wonder Rocks	Mal stains in iron oxides							?				◎	
3	F-205APX	"	"	"	iron oxides with Mal network			○	○		o?	◎	o		o?	o?	(o?) Wil X-ray
4	F-2810APX	11750	17200	True Blue	ore dump		◎	•	○			o		•			X-ray
5	F-141AP	17875	17150	Sable Antelcpe	Copper disseminated	o	◎		o	o				o			
6	F-14011AP	18050	"	"	ore dump	o		•	o	◎				o			
7	F-14012AP	"	"	"	"	o	○	o	o	o				o			
8	F-14013AP	"	"	"	"	◎			○	○				o			
9	F-14021AP	17850	17000	"	"	o	○		o	o				o			
10	F-54PSX	19500	4925	Kamiyobo	iron oxides with Mal							o			○	◎	(o?) Lep X-ray
11	F-55P	"	"	"	"							o				◎	
12	F-56P	"	"	"	iron vein-nets with Mal							o		o		◎	

* detected by X-ray diffractive analysis

Ap. 4 The Results of X-ray Diffractive Analyses

No.	Sample No.	Coordinates		Rock facies	Rock unit	Locality	Detected minerals												
		X	Y				Ten	Cc	Bo	Cov	Mal	Bro	At	Py	Q	Se	Ca	Do	Others
1	F101401APX	5250	21950	Cc disseminated silicified ls	Pm	Silver King	•?	•			•?		o		o	•	•?	◎	(o?) Dio
2	F203SX	13175	24850	brecciated dolomitic ls	"	Wonder Rocks					o?					o	◎		(o) Ch
3	F205APX	"	"	Cu - ore	-	"		o		○	◎	o				•			(o)K, (o)Dio, (o?)Wi, (o?)Go
4	F223AX	12650	19825	sideritic ls with Mal	Ps	Crystal Jacket					○				○	•	o	◎	(o) Go
5	F227ASX	"	"	"	"	"								•	o	•?	◎	○	
6	F2810APX	11750	17200	Cu - ore	-	True Blue	◎	o	•?		o			•				◎	(o) Go
7	F152SX	17475	20000	whitish dolomitic ls	Pm	Bob Zinc									o		○	○	
8	F143AX	17875	18150	weak disseminated(Cu) ore	"	Sable Antelope					•?					o	o	◎	
9	F144SX	18000	18000	brecciated silicified ls	"	"					o				•		○	○	
10	F214AX	17400	17050	Mal - ore	-	Blue Jacket					○				◎	o			(•?) K (o) Go
11	F54PSX	19500	4925	iron-Cu oxides ore	-	Kamiyobo					o				◎	○			(○) He (○) Go (o?) Lep
12	F84SX	13900	19075	dark grey ls	Ps	-					o?				•?		◎	o	

Ap. 5 The Results of Microscopic Observation of Thin Section

No.	Sample No.	Coordinates		Rock facies	Rock unit	Texture	Phenocryst/Fragment															Groundmass/matrix									Remarks
		X	Y				Q	Kf	Pl	Bi	Ho	Au	Fe	Mf	Ca	Do	Cl	Ep	To	Sp	Zi	Q	Pl	Mf	Fe	Cl	Ep	To	Ma	Ro	
1	F54PSX	19500	3925	metasandstone (Cu-ore)	R		◎																		○	○			o		
2	F84SX	13900	18075	limestone	PS	mosaic	•						•		◎	•															
3	F87S	11225	18350	-	"	bedded	o						•		◎		•												o		Ma:illite
4	F93S	13300	16025	fine-metasandstone	R		◎	o	o				o				o					o			◎	o			o		
5	F144SX	18000	17000	dolomitic limestone	Pm	mosaic									○	○															
6	F152SX	17475	19000	dolomite	"	"	o								○	○															
7	F203SX	13175	23850	dolomitic limestone	"	"							o		◎		o												o		
8	F218S	17350	16175	calcareous metasandstone	R	"	○						•		◎																
9	F227ASX	12650	18825	dolomitic limestone	PS		o						○		◎	○	o												o		
10	T14S	16650	26000	fine-metasandstone	R		◎						o				o				•	o			o	◎			o		
11	T18S	15850	12850	medium-metasandstone	R		◎	o					o				o		•		•				o	o			o	o	
12	T39S	20600	2000	syenite	H		○				o	◎	o		o			o													
13	T42S	19475	3775	coarse-metasandstone	R		◎															o			o	◎	o				ore mineral(?)
14	T52S	14400	8425	contaminated rock	R(?)	granoblastic	o		o		◎		o		o		o	o		o											
15	T53S	14300	9300	syenite	H	homogranular		o	◎	o?	○									o									o		
16	T61S	11500	8000	muddy rock	Q	phyllitic	○						o				◎												o		
17	T62S	8600	8000	syenite	H	homogranular	o	o	○		o		o					○		•											
18	T72S	5725	8000	quartz porphyry	R	porphyritic	○	o	○				o									◎	?	o	o	o		•			Dacitic
19	T78S	11700	6000	"	"	"	○	o	○				○	o								○	?	o	o	○					"
20	T79S	7050	2450	"	"	homogranular	◎	(?)	○				o	o?			◎														

Ap. 6 The Results of Chemical Analysis of Geochemical Samples (Soil)

Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
3	1	16800	2550	<1	74	33	31
2	2	18500	2825	<1	33	27	60
1	3	16000	3050	<1	110	50	147
〃	4	15475	2900	<1	100	47	145
〃	5	15000	2850	<1	94	33	24
〃	6	14525	2800	<1	170	46	32
〃	7	14000	2800	<1	33	21	21
〃	8	13500	2850	<1	27	18	9
〃	9	13000	3000	<1	9	12	8
〃	10	12475	3100	<1	177	28	20
〃	11	12000	3150	<1	700	35	30
〃	12	11425	3200	<1	85	18	18
〃	13	11000	3200	<1	30	24	22
3	14	10550	3175	<1	53	29	23
〃	15	10000	3275	<1	63	23	16
〃	16	9450	3400	<1	120	31	23
〃	17	9000	3425	<1	118	27	15
〃	18	8475	3325	<1	219	32	25
〃	19	8000	3250	<1	211	28	16
1	20	7475	3300	<1	206	30	24
〃	21	7150	3800	<1	102	25	16
〃	22	6850	4300	<1	232	38	14
〃	23	6300	4525	<1	113	30	19
〃	24	5775	4650	<1	246	43	63
3	25	5275	4925	<1	133	44	86
〃	26	5050	5325	<1	134	77	166
〃	27	4850	5775	<1	83	34	181
〃	28	4650	6150	<1	51	36	34
〃	29	4400	6525	<1	54	46	40
〃	30	4150	6825	<1	128	51	47
〃	31	4000	7000	<1	134	35	26
〃	32	3750	7175	<1	113	30	19
〃	33	3425	7225	<1	120	33	21
〃	34	3075	7450	<1	65	20	12
〃	35	2625	7725	<1	52	23	13
1	36	2275	7950	<1	206	40	24
〃	37	1825	8125	<1	62	27	43
〃	38	1425	8050	<1	52	25	18
〃	39	1000	8325	<1	125	51	52
〃	40	550	8750	<1	66	30	23
〃	41	16950	2050	<1	124	28	38
〃	42	16800	1525	<1	12	27	13
〃	43	16825	1000	<1	14	22	14
〃	44	16900	475	<1	16	20	12
〃	45	16925	0	<1	9	14	10
〃	46	17450	300	<1	26	31	22
〃	47	17925	300	<1	15	23	9
〃	48	18450	350	<1	13	22	13
〃	49	19050	400	<1	83	26	27
2	50	16775	3000	<1	98	40	100

Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
1	51	16650	3575	<1	83	24	57
〃	52	16450	4000	<1	19	19	35
〃	53	16050	4450	<1	13	18	29
〃	54	15750	4350	<1	11	16	12
〃	55	15775	5400	<1	12	16	12
〃	56	15850	5900	<1	42	29	25
〃	57	15900	6400	<1	10	14	9
〃	58	16000	6950	<1	21	21	12
〃	59	16100	7400	<1	25	23	15
〃	60	16250	7925	<1	71	47	57
〃	61	16350	8400	<1	55	17	13
3	62	16400	8800	<1	9	18	9
〃	63	16350	9325	<1	24	19	12
〃	64	16325	9800	<1	55	26	46
1	65	16275	10250	<1	22	15	8
3	66	16275	10675	<1	30	47	22
〃	67	16350	11050	<1	24	23	12
〃	68	16450	11550	<1	25	20	12
1	69	16600	12050	<1	64	33	46
〃	70	16900	12475	<1	15	18	16
〃	71	17150	12975	<1	23	17	17
〃	72	17550	13350	<1	22	28	21
〃	73	17950	13700	<1	32	29	24
〃	74	18200	14200	<1	20	20	20
〃	75	18300	14675	<1	12	15	17
〃	76	18500	15125	<1	50	41	73
〃	77	18600	15675	<1	21	21	19
2	78	18375	16050	<1	47	20	29
〃	79	18200	16425	<1	110	26	40
〃	80	18225	16900	<1	140	50	222
〃	81	18775	17350	<1	70	28	67
〃	82	19075	17850	<1	49	36	132
〃	83	19475	18250	<1	26	23	85
〃	84	19900	18650	<1	33	28	85
〃	85	20225	19025	<1	35	27	69
〃	86	20425	19475	<1	43	19	56
1	87	20350	20000	<1	29	21	45
〃	88	20275	20300	<1	11	16	26
〃	89	20225	20700	<1	7	11	13
〃	90	20300	21075	<1	6	11	8
〃	91	20125	21575	<1	28	20	20
〃	92	20000	22000	<1	17	12	13
2	93	20000	22575	<1	31	16	13
〃	94	19900	23050	<1	23	14	13
1	95	19650	23525	<1	27	15	10
〃	96	19475	24000	<1	17	13	20
〃	97	19225	24400	<1	21	15	20
〃	98	18275	24775	<1	6	7	4
〃	99	18575	25150	<1	6	9	4
〃	100	18500	25650	<1	3	6	4

Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
1	101	18475	26075	<1	3	8	4
〃	102	18350	26600	<1	5	10	4
〃	103	18300	27025	<1	3	6	3
〃	104	18850	27000	<1	4	10	5
〃	105	19325	27000	<1	16	14	9
〃	106	19850	27000	<1	48	32	29
〃	107	18000	26000	<1	5	9	8
〃	108	17500	26000	<1	3	9	6
〃	109	17000	26000	<1	6	21	8
〃	110	16525	26000	<1	3	11	6
〃	111	16000	26000	<1	23	19	17
〃	112	19125	26000	<1	6	15	7
〃	113	19675	26000	<1	9	15	9
〃	114	19225	25000	<1	4	13	4
〃	115	19750	25000	<1	20	16	17
〃	116	19000	24000	<1	5	9	5
〃	117	18550	24000	<1	5	10	5
〃	118	18000	24000	<1	8	11	11
〃	119	17525	24000	<1	8	16	14
〃	120	17000	24000	<1	6	11	8
〃	121	16525	23950	<1	6	10	7
〃	122	16000	23875	<1	9	10	7
〃	123	15500	23875	<1	4	12	6
2	124	15225	22000	<1	13	16	22
1	125	15700	22000	<1	19	15	16
〃	126	16125	22000	<1	10	12	14
〃	127	18700	22000	<1	8	12	9
〃	128	17150	22000	<1	42	26	17
〃	129	17675	22000	<1	22	11	10
〃	130	18200	22000	<1	13	14	9
〃	131	18675	22000	<1	10	13	10
〃	132	19250	22000	<1	30	20	29
〃	133	19750	22000	<1	15	16	14
2	134	18500	16650	<1	40	21	20
〃	135	18900	16250	<1	12	14	11
1	136	19250	15875	<1	11	15	10
〃	137	19575	15475	<1	8	15	8
〃	138	19975	15100	<1	19	19	15
〃	139	20350	14750	<1	19	15	11
〃	140	20750	14400	<1	47	25	20
2	141	21225	14000	<1	69	28	37
1	142	19550	15000	<1	15	22	13
〃	143	18900	14800	<1	14	19	13
〃	144	19750	16150	<1	10	13	10
2	145	20125	16000	<1	15	17	12
1	146	20575	16000	<1	35	25	21
〃	147	21000	16000	<1	57	37	26
2	148	19125	17225	<1	54	35	34
〃	149	19650	17250	<1	37	25	23
1	150	20250	17300	<1	30	17	16

※ Classification of Rock Units

1. Argillaceous ∿ Arenaceous Metasediments
2. Carbonates
3. Intrusives

- continue -

Sample ※	No.	Coordinate X	Y	ppm Ag	ppm Cu	ppm Pb	ppm Zn
1	151	20800	17400	<1	26	18	12
2	152	20350	18800	<1	51	33	34
1	153	20850	18725	<1	30	22	19
″	154	18125	13425	<1	13	16	13
″	155	18750	13900	<1	47	29	31
″	156	16125	12275	<1	21	18	19
″	157	15700	12575	<1	19	20	17
″	158	15275	12950	<1	6	15	10
″	159	14850	13250	<1	11	19	13
″	160	14450	13375	<1	21	26	22
″	161	14900	13800	<1	27	21	23
″	162	15475	14250	<1	28	20	31
″	163	15875	14625	<1	31	29	54
″	164	16250	14950	<1	26	21	33
″	165	16600	15300	<1	36	29	44
″	166	16900	15550	<1	24	22	27
″	167	17250	15850	<1	230	59	46
″	168	14050	13000	<1	40	40	31
″	169	13650	12650	<1	45	36	31
″	170	14700	12200	<1	35	28	24
″	171	15000	12450	<1	30	26	20
″	172	15600	13200	<1	13	20	15
″	173	14275	11850	<1	64	39	36
″	174	13400	11475	<1	58	33	28
3	175	13000	10900	<1	87	35	73
″	176	16675	11000	<1	33	23	19
1	177	17000	11000	<1	49	23	11
″	178	17575	11000	<1	36	11	8
″	179	18000	11000	<1	10	13	6
3	180	18525	11000	<1	13	16	10
″	181	19000	11000	<1	14	24	14
1	182	19550	11025	<1	23	26	21
2	183	20000	11000	<1	95	46	63
1	184	20500	11000	<1	33	20	21
2	185	21000	11000	<1	45	46	30
″	186	21000	12000	<1	25	21	17
″	187	20550	12000	<1	19	32	18
1	188	20000	12000	<1	81	58	80
″	189	19550	12000	<1	40	40	41
″	190	19000	12000	<1	39	25	31
3	191	18550	12000	<1	53	32	45
″	192	18000	12000	<1	23	18	20
″	193	17600	12000	<1	24	19	16
″	194	17025	12000	<1	55	32	46
2	195	21000	13000	<1	63	29	36
″	196	20500	13100	<1	37	25	18
1	197	19875	13350	<1	30	21	23
″	198	19200	13250	<1	11	17	11
″	199	19500	13900	<1	9	13	8
″	200	19200	14150	<1	16	16	16

Sample ※	No.	Coordinate X	Y	ppm Ag	ppm Cu	ppm Pb	ppm Zn
1	201	18675	14500	<1	10	18	14
″	202	16700	8000	<1	5	15	11
″	203	17150	8000	<1	45	36	185
2	204	17750	8000	<1	70	41	148
″	205	18150	8000	<1	15	26	100
″	206	18750	8000	<1	24	31	84
″	207	19150	8000	<1	52	36	69
″	208	19700	8000	<1	73	63	66
″	209	20125	8000	<1	66	35	64
″	210	20750	8000	<1	32	29	99
″	211	21000	9000	<1	100	73	44
″	212	20550	9000	<1	56	37	34
″	213	20000	8925	<1	88	42	29
″	214	19600	8925	<1	18	18	27
″	215	19000	8925	<1	23	85	212
1	216	18550	8925	<1	13	15	10
2	217	18000	8925	<1	18	18	9
1	218	17800	8975	<1	21	19	16
″	219	17000	8875	<1	7	13	9
2	220	21000	10000	<1	43	26	32
″	221	20500	10000	<1	84	42	48
1	222	20000	10000	<1	18	22	34
2	223	19500	10000	<1	20	20	13
″	224	19000	10000	<1	12	17	15
3	225	18500	10000	<1	25	30	23
″	226	18000	10000	<1	8	14	12
″	227	17500	10000	<1	36	16	10
1	228	17000	10000	<1	5	14	7
″	229	16250	5000	<1	6	21	21
2	230	16650	4625	<1	32	24	26
″	231	17000	4900	<1	45	29	21
″	232	17625	4925	<1	54	38	33
″	233	18000	4900	<1	40	29	21
″	234	18500	4900	<1	107	35	83
″	235	19000	5000	<1	18	17	12
″	236	19550	5000	<1	19	15	7
″	237	20000	5000	<1	34	14	9
″	238	20450	4900	<1	25	31	37
″	239	21000	4875	<1	74	48	46
″	240	21000	6000	<1	12	15	8
2	241	20600	5875	<1	33	21	36
″	242	20000	5900	<1	10	18	35
″	243	19500	5875	<1	58	29	132
″	244	19000	5925	<1	57	42	108
1	245	18400	5975	<1	73	27	27
″	246	18000	5900	<1	18	36	106
″	247	17500	5925	<1	21	29	27
″	248	17000	5925	<1	52	26	28
2	249	16300	5925	<1	18	23	27
1	250	21000	6925	<1	16	20	11

Sample ※	No.	Coordinate X	Y	ppm Ag	ppm Cu	ppm Pb	ppm Zn
2	251	20500	6925	<1	130	16	8
″	252	20000	6925	<1	42	20	18
″	253	19500	6925	<1	30	28	41
″	254	19000	6925	<1	43	48	138
″	255	18500	6925	<1	15	24	24
″	256	18000	6900	<1	46	32	30
″	257	17600	6925	<1	34	28	17
″	258	17050	6925	<1	76	40	35
1	259	17500	2000	<1	21	16	12
″	260	18000	2000	<1	290	253	523
″	261	18500	2000	<1	206	129	136
″	262	19000	2000	<1	53	22	24
″	263	19500	2000	<1	101	96	107
3	264	20000	2000	<1	40	28	16
″	265	20500	2000	<1	36	28	27
″	266	21000	2000	<1	79	37	22
″	267	21000	3000	<1	85	28	19
″	268	20500	3000	<1	64	40	22
″	269	20000	3000	<1	81	37	33
1	270	19500	3000	<1	103	63	50
″	271	19000	3000	<1	86	61	57
2	272	18500	3000	<1	23	18	43
″	273	18000	3000	<1	39	22	49
″	274	17500	3000	<1	36	53	28
3	275	17075	3000	<1	42	22	20
2	276	21000	4000	<1	52	28	29
1	277	20500	4000	<1	51	40	32
″	278	20000	4000	<1	47	31	24
″	279	19500	4000	<1	29	20	15
2	280	19000	4000	<1	20	27	167
″	281	18500	4000	<1	28	22	45
″	282	18000	4000	<1	27	20	17
″	283	17500	4000	<1	38	26	21
″	284	17000	4000	<1	76	39	45
1	285	11500	12000	<1	45	27	28
″	286	11000	12000	<1	146	51	47
″	287	10500	12000	<1	173	63	56
″	288	10000	12000	<1	83	53	41
″	289	9500	12000	<1	91	59	45
″	290	9000	12000	<1	61	33	24
″	291	8500	12000	<1	84	38	43
″	292	8000	12000	<1	101	46	43
″	293	7500	12000	<1	134	69	46
″	294	7000	12000	<1	116	66	40
″	295	6500	12000	<1	145	68	50
″	296	6000	12000	<1	152	40	32
″	297	5500	12000	<1	77	53	86
″	298	5000	12000	<1	122	42	71
″	299	4500	12000	<1	78	33	47
″	300	4000	12000	<1	144	30	40

- continue -

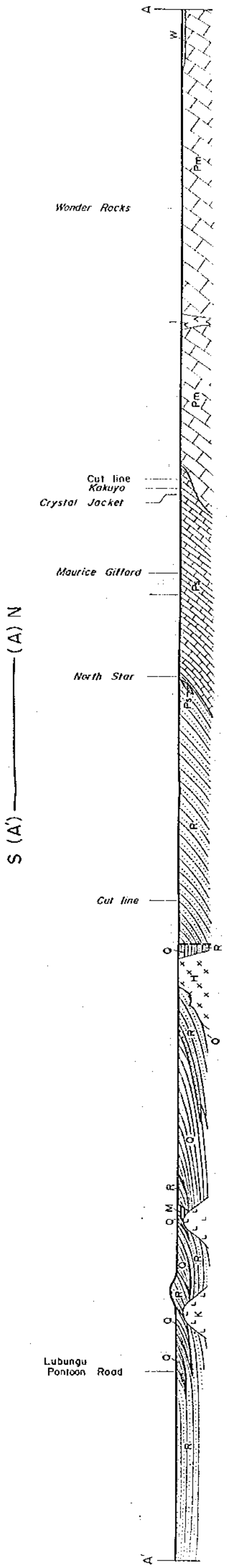
Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
1	301	3500	12000	<1	152	28	35
〃	302	3050	12000	2	670	35	52
〃	303	3600	7850	<1	114	31	46
〃	304	3450	8075	<1	92	33	23
〃	305	3125	8500	<1	77	32	23
〃	306	3000	8900	<1	146	43	37
〃	307	2850	9475	<1	82	32	24
〃	308	2725	9925	<1	105	37	24
〃	309	2625	10350	<1	134	41	23
〃	310	2375	10800	<1	280	36	37
〃	311	2350	11350	<1	182	38	33
3	312	2375	11875	<1	251	39	43
1	313	2350	12325	<1	244	34	40
〃	314	2150	12750	1	108	45	81
〃	315	2000	13100	1	203	36	55
〃	316	1700	13325	<1	51	15	8
〃	317	1575	13750	<1	94	27	18
〃	318	1350	14050	<1	41	20	11
〃	319	1125	14300	<1	34	20	16
〃	320	800	14625	<1	16	19	11
〃	321	700	15100	<1	22	20	11
〃	322	600	15550	1	17	16	8
〃	323	575	16025	<1	19	19	10
〃	324	575	16550	<1	18	16	11
〃	325	975	17025	<1	19	23	13
〃	326	550	17575	<1	21	27	20
〃	327	400	17975	<1	24	30	21
〃	328	300	18400	<1	12	18	9
〃	329	2000	14000	<1	24	15	9
〃	330	2500	14025	<1	31	19	14
〃	331	3000	14025	<1	64	28	28
〃	332	3500	14025	<1	53	27	28
〃	333	4000	14025	<1	154	56	69
3	334	2700	12025	<1	430	41	44
1	335	15000	3300	<1	18	23	24
〃	336	14925	3700	<1	25	34	133
〃	337	14825	4150	<1	7	17	18
〃	338	14600	4575	<1	9	18	9
〃	339	14625	5100	<1	14	18	9
〃	340	14650	5575	<1	25	20	8
3	341	14950	6125	<1	16	20	8
〃	342	15300	6600	<1	29	23	11
〃	343	15700	6750	<1	14	15	11
〃	344	14625	6400	<1	35	20	10
1	345	14400	6850	<1	56	25	15
3	346	14300	7400	<1	101	27	17
〃	347	15525	7400	<1	235	22	21
〃	348	15000	7500	<1	40	28	32
〃	349	14250	8075	<1	11	18	7
〃	350	14275	8725	<1	9	19	3

Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
3	351	14250	9100	<1	6	16	6
〃	352	14000	9525	<1	5	15	8
〃	353	13925	10000	<1	13	15	8
〃	354	13875	10500	<1	21	15	11
1	355	13600	10000	<1	27	22	11
〃	356	13100	10000	<1	29	22	13
〃	357	12700	10000	<1	27	16	10
3	358	12100	10000	<1	47	27	20
1	359	4500	14025	<1	24	40	70
〃	360	5000	14000	<1	20	30	42
〃	361	5500	14025	<1	140	77	91
〃	362	6000	14025	<1	38	51	59
〃	363	6500	14025	<1	15	30	37
〃	364	7000	14025	<1	30	40	46
3	365	11500	10000	<1	69	40	22
1	366	11000	10000	<1	66	30	25
〃	367	10500	10000	<1	142	67	62
〃	368	10000	10000	<1	97	84	60
〃	369	9500	10000	<1	48	43	29
〃	370	9000	10000	<1	77	51	41
〃	371	8500	10000	<1	94	47	58
〃	372	8000	10000	<1	134	74	72
〃	373	7500	10000	<1	121	57	52
〃	374	7000	10000	<1	107	50	71
〃	375	6500	10000	<1	192	48	45
〃	376	6000	10000	<1	36	39	46
〃	377	5500	10000	<1	59	33	49
〃	378	5000	10000	<1	51	34	63
〃	379	4500	10000	<1	33	32	137
3	380	4000	10000	<1	32	34	140
〃	381	3500	10000	<1	158	33	46
〃	382	3150	10000	<1	310	25	56
〃	383	13600	8000	<1	51	20	10
1	384	13225	8000	<1	25	24	18
〃	385	13000	8000	<1	45	27	28
〃	386	12500	8000	<1	33	24	13
〃	387	12000	8000	<1	27	20	20
〃	388	11500	8000	<1	20	15	12
〃	389	11000	8000	1	115	85	119
3	390	10500	8000	<1	119	90	197
〃	391	10000	8000	<1	103	25	23
〃	392	9500	8000	1	173	30	34
〃	393	9000	8000	<1	157	24	19
1	394	8500	8000	<1	213	30	32
〃	395	8000	8000	<1	248	31	24
3	396	7500	8000	<1	300	32	33
〃	397	7000	8000	<1	180	31	27
1	398	6500	8000	<1	122	31	25
〃	399	6000	8000	<1	206	34	38
3	400	5500	8000	<1	96	25	17

Sample ※	No.	Coordinate X	Coordinate Y	Ag ppm	Cu ppm	Pb ppm	Zn ppm
3	401	5000	8000	<1	50	22	14
1	402	4500	8000	<1	149	26	26
〃	403	4000	8000	<1	156	32	43
3	404	8000	6000	<1	138	26	11
〃	405	7500	6000	<1	170	41	15
〃	406	7000	6000	<1	290	36	19
〃	407	6500	6000	<1	330	32	30
〃	408	6000	6000	<1	65	20	10
〃	409	5500	6000	<1	105	28	32
〃	410	8800	3900	<1	370	28	18
〃	411	8800	4350	<1	340	33	21
1	412	8700	4825	<1	290	38	14
3	413	8675	5300	<1	226	33	12
〃	414	8325	5675	<1	164	31	17
〃	415	8100	6575	<1	160	29	17
〃	416	8050	7000	<1	101	24	32
〃	417	7700	7500	<1	260	32	81
〃	418	4200	6000	<1	32	31	43
〃	419	3725	6000	<1	63	48	112
〃	420	3125	6000	<1	47	45	97
〃	421	2500	6000	<1	49	21	29
1	422	2050	6000	<1	158	27	18
〃	423	1500	6000	<1	114	25	20
〃	424	1075	6000	<1	47	14	10
〃	425	1025	6575	<1	61	23	25
〃	426	1025	6975	<1	57	21	9
〃	427	1000	7600	<1	37	22	16
〃	428	8500	6000	<1	228	37	23
〃	429	9000	6000	<1	133	29	16
〃	430	9500	6000	<1	126	20	14
〃	431	10000	6000	<1	83	26	24
3	432	10500	6000	<1	85	31	21
〃	433	11000	6000	<1	94	22	14
〃	434	11500	6000	<1	81	26	19
1	435	12000	6000	<1	56	26	49
〃	436	12500	6000	<1	55	24	27
〃	437	13000	6000	<1	61	18	18
〃	438	13500	6000	<1	33	17	12
〃	439	14000	6000	<1	59	20	13
〃	440	14500	6000	<1	37	15	11
〃	441	6500	4000	<1	310	30	44
〃	442	6000	4000	<1	65	22	10
〃	443	5500	4000	<1	31	21	10
〃	444	5000	4000	<1	23	22	10
〃	445	4500	4000	<1	31	21	17
〃	446	4000	4000	<1	42	28	20
〃	447	3500	4000	<1	71	24	20
〃	448	3000	4000	<1	30	21	11
〃	449	2500	4000	<1	38	21	42
〃	450	2000	4000	<1	66	20	14

- continue -

Sample ※	No.	Coordinate X	Y	ppm Ag	ppm Cu	ppm Pb	ppm Zn
1	451	1500	4000	<1	111	24	33
〃	452	1000	4000	<1	130	26	59
3	453	7175	2900	<1	77	32	13
〃	454	7000	2550	<1	21	24	16
1	455	6900	2100	<1	8	14	6
3	456	7075	1525	<1	30	23	11
〃	457	7500	1000	<1	15	22	19
〃	458	7000	1000	<1	34	22	8
1	459	8000	1000	<1	25	19	6
〃	460	8500	1000	<1	17	20	5
〃	461	9000	1000	<1	30	15	6
〃	462	9500	1000	<1	10	16	9
〃	463	10000	1000	<1	15	16	11
〃	464	10500	1000	<1	17	13	10
〃	465	11000	1000	<1	8	8	3
〃	466	11500	500	<1	6	9	4
〃	467	12000	1000	<1	4	10	6
〃	468	12500	1000	<1	14	14	21
〃	469	13000	1000	<1	105	16	7
〃	470	13500	1000	<1	63	23	17
2	471	14000	1000	<1	82	31	30
1	472	14500	1000	<1	9	18	11
〃	473	15000	1000	<1	8	16	10
〃	474	15500	1000	<1	42	18	13
〃	475	16000	1000	<1	19	12	9
3	476	16500	1000	<1	32	17	11
1	477	2150	10000	<1	162	51	75
〃	478	1625	10000	<1	50	44	40
〃	479	1075	10000	<1	88	15	18
3	480	1875	12000	<1	225	17	20
1	481	1250	12000	<1	610	34	53
〃	482	17150	1125	<1	10	19	13
〃	483	17500	1075	<1	7	13	10
〃	484	18000	1025	<1	62	20	23
〃	485	18500	1000	<1	242	30	74
2	486	19000	1025	<1	25	13	20
1	487	19500	1025	<1	38	21	16
〃	488	20000	1025	<1	56	32	22
3	489	20500	1000	<1	48	26	16
1	490	14500	14050	<1	21	17	24
〃	491	14000	14050	<1	42	25	41
〃	492	13500	14050	<1	27	23	19
〃	493	13000	14025	<1	30	25	24
〃	494	12500	14025	<1	57	38	43
〃	495	12000	14025	<1	83	62	58
〃	496	11500	14025	<1	56	51	38
〃	497	11000	14000	<1	57	50	42
〃	498	10500	14025	<1	68	62	50
〃	499	10000	14000	<1	78	69	58
〃	500	9500	14025	<1	85	76	59

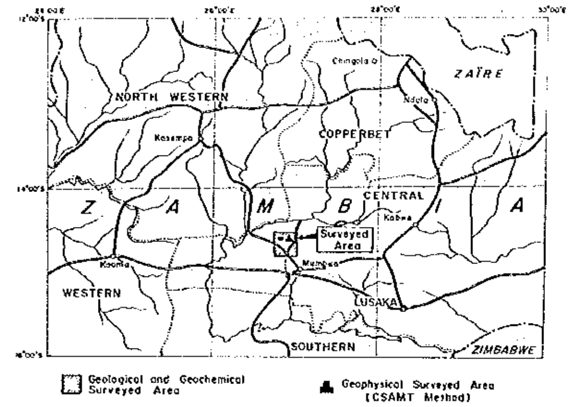


PL. I

REPORT ON THE MINERAL EXPLORATION
OF KARENDA AREA, THE REPUBLIC OF ZAMBIA

GEOLOGICAL MAP OF THE SURVEYED AREA

Scale 1:50,000

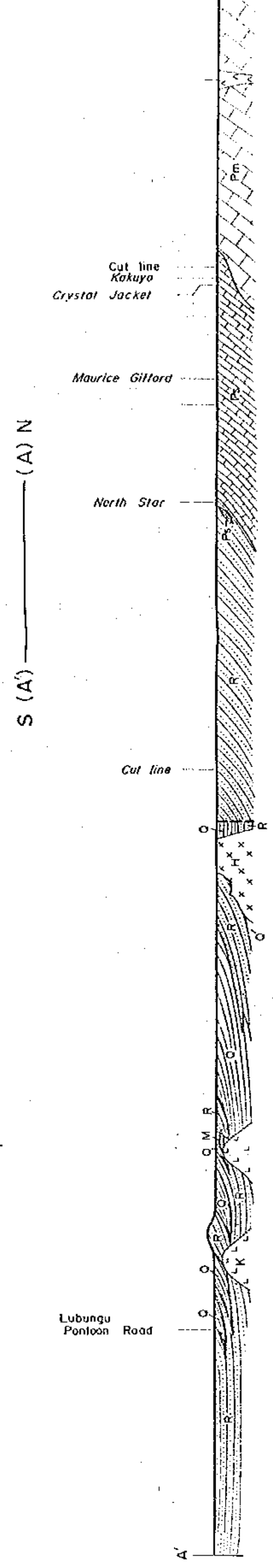


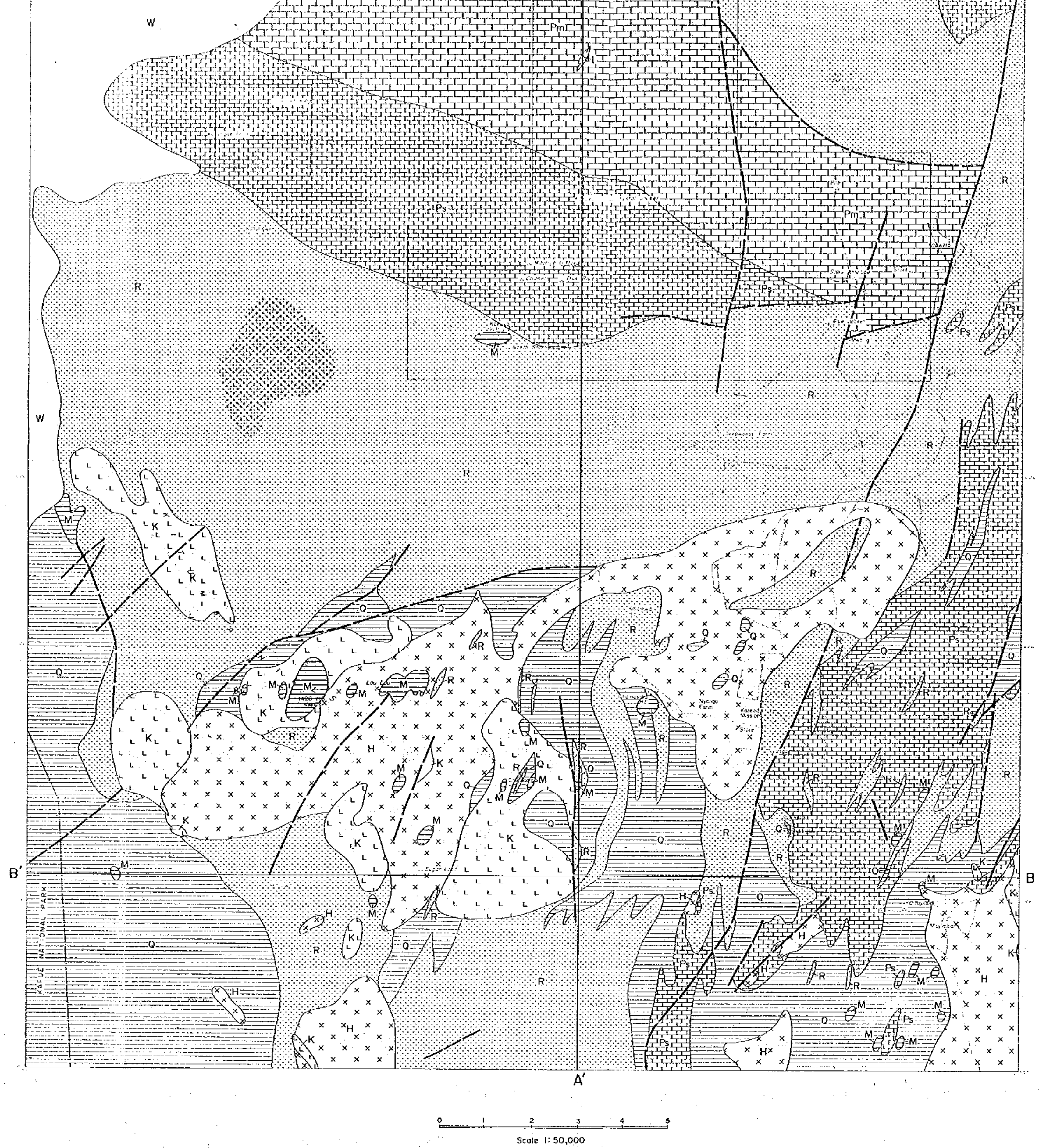
Geological and Geochemical Surveyed Area
Geophysical Surveyed Area (CSAMT Method)

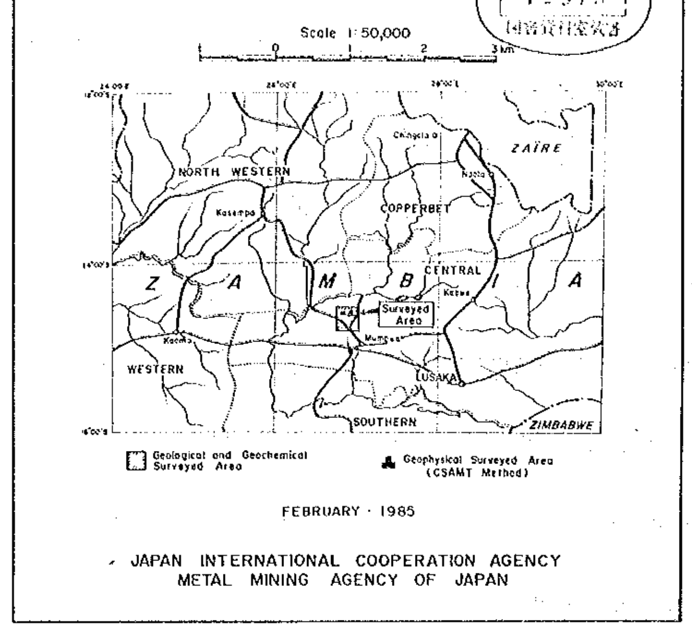
FEBRUARY · 1985

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

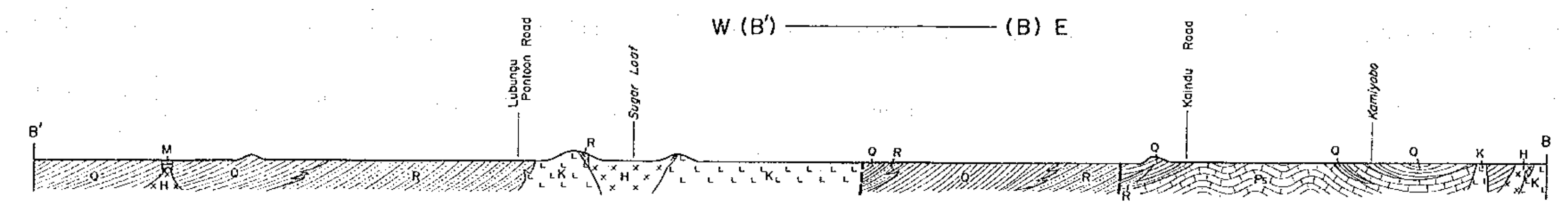
Quaternary	W	Alluvial Deposits
Lower ~ Middle Kundelungu Series	R	Metasandstons, quartzite with intercalated Shale and limestone
	Q	Shale with intercalated metasandston and limestone
	Ps	Bedded limestone with intercalated metasediments
	Pm	Massive dolomitic limestone ~ dolomite
Intrusive Rocks	I	Porphyrity
	K	Quartz porphyry
	H	Syenites
		Brecciated part
	M	Iron oxides
	⚒	Disused mine or Mineralized Area
	B'— B	Geological profile line

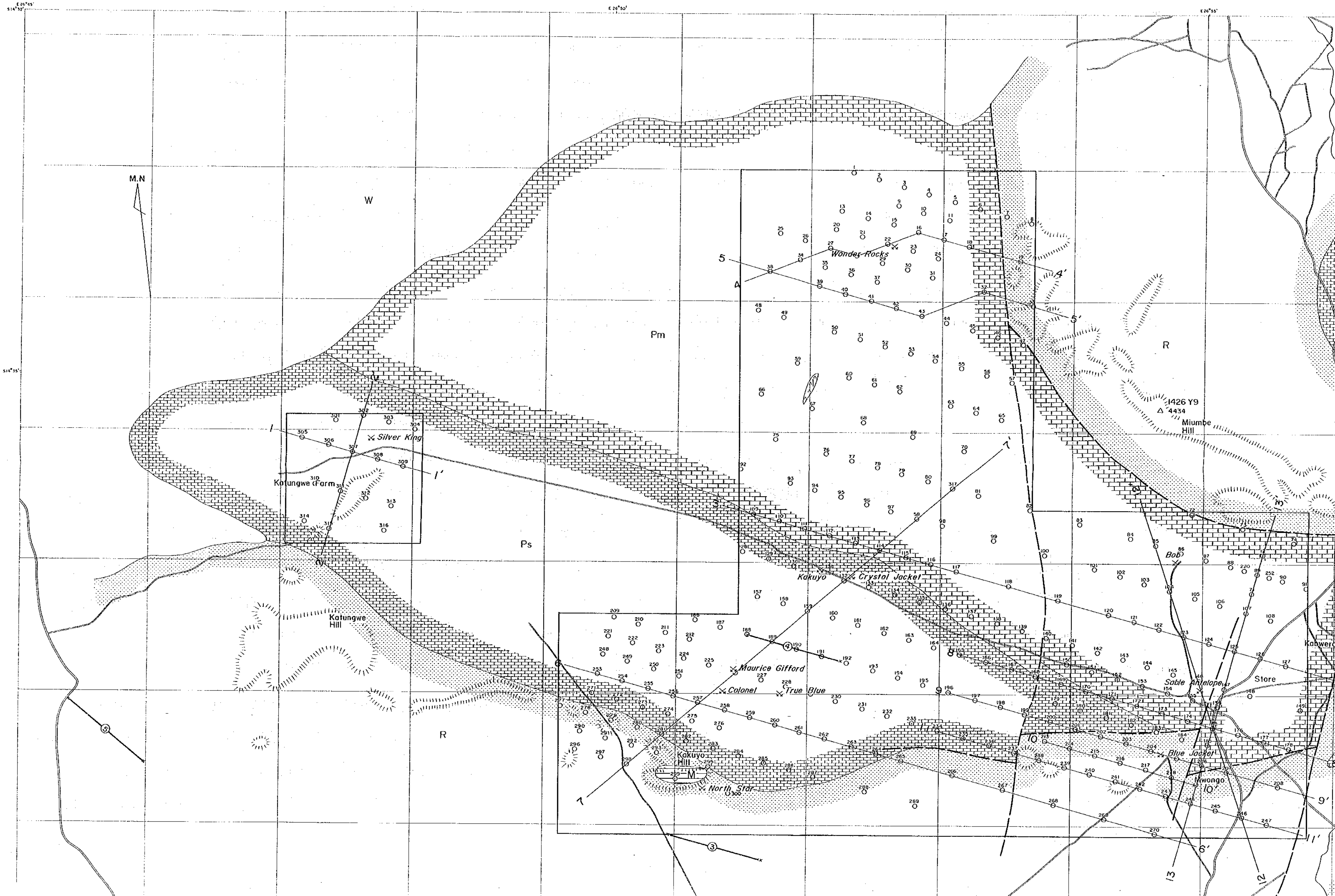


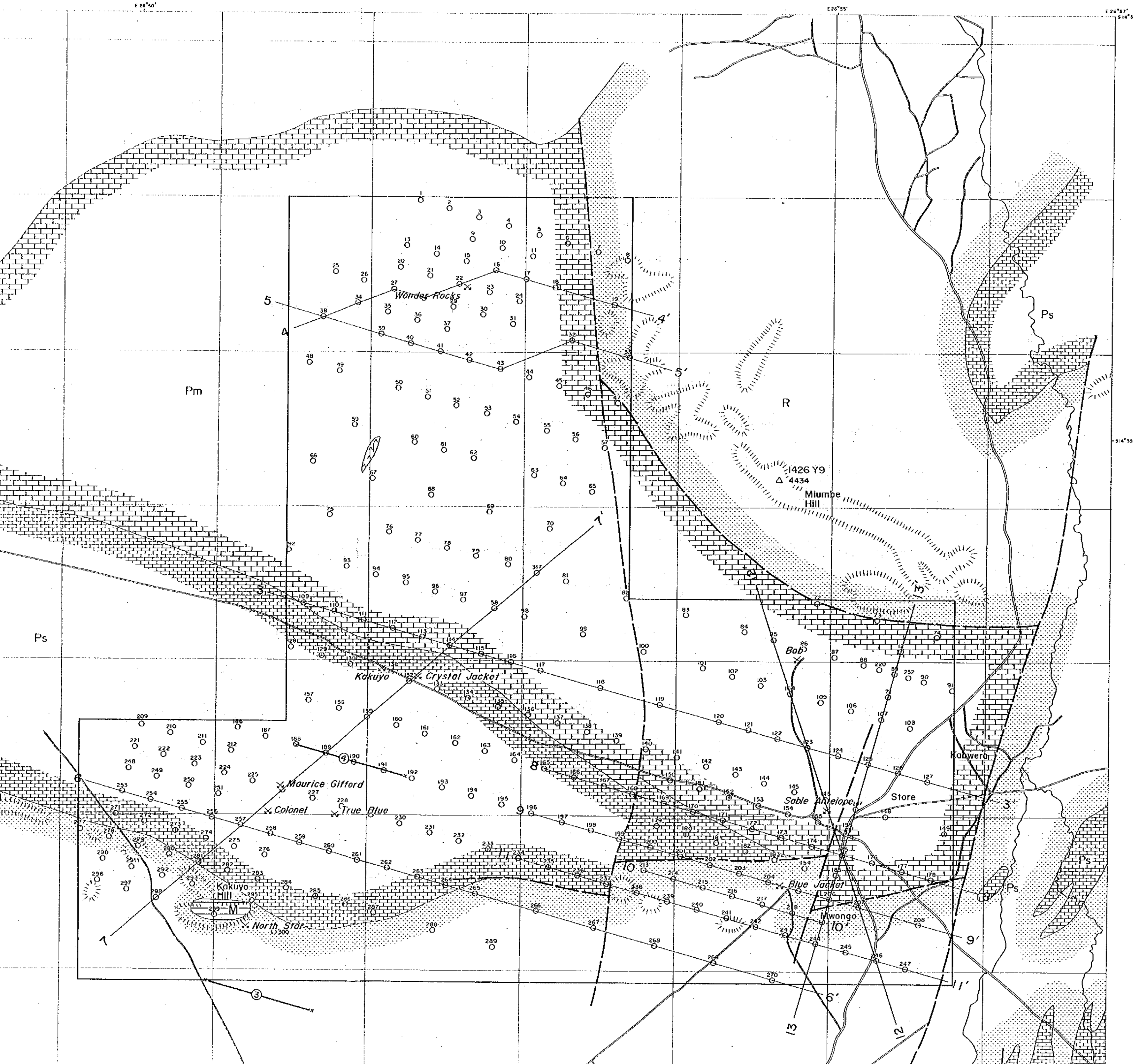




Quaternary	W	Alluvial Deposits
Lower ~ Middle Kundelungu Series	R	Metasandstone, quartzite with intercalated Shale and limestone
	Q	Shale with intercalated metasandston and limestone
	Ps	Bedded limestone with intercalated metasediments
	Pm	Massive dolomitic limestone ~ dolomite
Intrusive Rocks	I	Porphyrity
	K	Quartz porphyry
	H	Syenites
		Brecciated part
	M	Iron oxides
	✕	Disused mine or Mineralized Area
	B'— B	Geological profile line




M.N
W
Pm
Ps
R
Wonder Rocks
Silver King
Katungwe Farm
Katungwe Hill
Kakuyo
Crystal Jacket
Maurice Gifford
Colonel
True Blue
Kakuyo Hill
North Star
Sable Antelope
Store
Bob
Blue Jacket
Mwongo
1426 Y9
4434
Miumbe Hill



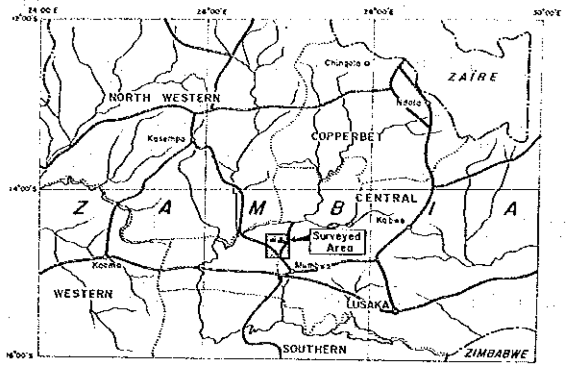
PL. 2

REPORT ON THE MINERAL EXPLORATION
OF KARENDA AREA, THE REPUBLIC OF ZAMBIA

LOCATION OF CSAMT SURVEY STATION

Scale 1:25,000

0 0.5 1 1.5 2 km



Geological and Geochemical Surveyed Area

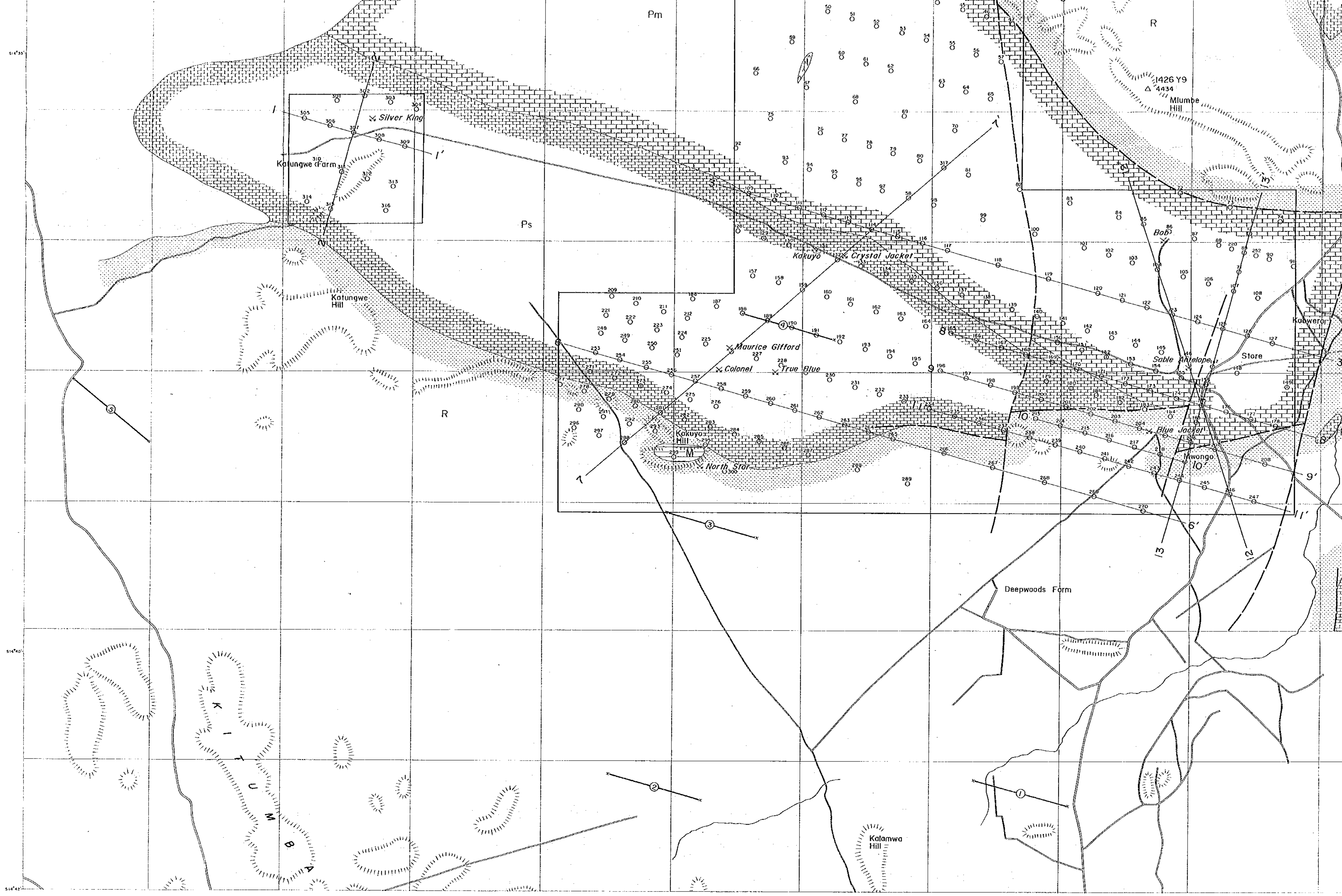
Geophysical Surveyed Area (CSAMT Method)

FEBRUARY · 1985

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

LEGEND

o	Station
1 o	Station Number
I – I'	Section Line
x——x	Transmitter Dipole


Pm
Ps
R
Silver King
Katungwe Farm
Katungwe Hill
Kakuyo
Crystal Jacket
Maurice Gifford
Colonel
True Blue
Kokuyo Hill
North Star
1426 Y9
4434
Mlumbe Hill
Bob
Sable Antelope
Store
Kabwera
Blue Jacket
Mwongo
Deepwoods Farm
Kalamwa Hill
K I T U M B A

SOUTHERN
ZIMBABWE
Geological and Geochemical Surveyed Area
Geophysical Surveyed Area (CSAMT Method)
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