PART II

DETAILED DISCUSSION

Chapter 1 Outline of the Survey

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Chapter 1 Geological Survey

1-1 Outline

1-1-1 Method Geological Survey

(1) Major items of the survey

Traversing and integrated analyses of mineralized rocks and soils by geochemical samplings were carried out to extract drilling targets within the four districts.

(a) The results of geological survey were compiled on 1:10,000 scale maps.

(b) Microscopic studies was carried out on 50 samples representing geologic units and also on those with different lithology. X-ray diffractometry was carried out for 80 samples. A total of 50 rock samples was analyzed for major rock forming elements: whole rock analysis, to analyze the behavior of those element by alteration.

(c) Regarding ore and mineralized rock samples, chemical anlysis for 250 samples and polished section studies for 50 samples were made. Chemical analysis was made by appropriate methods in due consideration of detection limit after right preparation.

XRD Generator	Philips PW 1010 36KW, 28mA
Angular Range	6° ～45°
Radiation	CuKa (1.7902Å)
Slits	1° － 0.3mm
Angular Speed	1° / min
Time Constant	2 second

(2) Geochemical Survey

Geochemical survey was carried out in the Tempursari, Seweden and Prambon Districts. Magnetic cmpasses and measuring tapes, and GPS equipment were used for the survying the sample locations. The samples were taken along rigdes at intervals of about 100-200m in the Tempursari District. The samples were taken on grids of 100 intervals in the Seweden and Prambon districts.

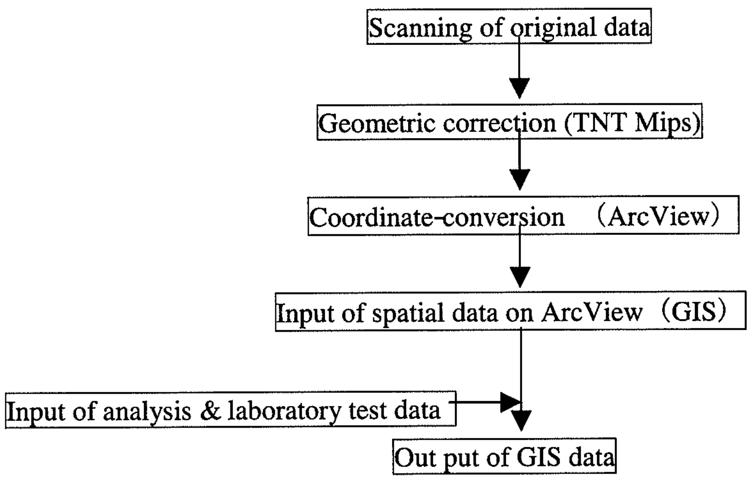
The soil samples were taken at the depth of 30-40cm within the B horizon at the points excluded drainages, regidential places and paddy fields. The UTM cooridnates, elevation, bedrock lithology, sampled depth, color of soil and other data will be described in the defined format.

The 28 soil duplicate samples were be taken for evaluation of error of chemical analysis. Chemical analysis was conducted at ALSChemex Lab. In Canada. Gold was anlyzed by fusion method.Mercury was analyzed by cold vapor method. Other 33 elements were anlyzed by ICP method.

(3) Data analysis

Data analysis was conducted for seven days in DMRI office in Bandung, and later in Japan. Geological maps, sample location maps, geochemical anomaly maps and maps of mineralization zones are to be converted into the ArcView format.

- Software used: TNT Mips, ArcView, MS Excel
- Procedure:



1-1-2 Outline of Geological Survey

(1) Geologic maps

The geology of the survey area consists mainly of Oligocene to Pleistocene volcanic rocks and volcaniclastic rocks. Miocene to Pliocene limestone occurs in the Seweden and Prambon district. Intrusive bodies of basalt, andesite, dacite, diorite, porphyry, and quartz porphyry were observed. The schematic geologic column of the four districts and the correlation table over the project area are shown, Fig.2-1 and Table 2-1, respectively. The geologic maps and profiles of the four districts at a scale of 1:10,000 are attached as PLATE s 1 to 4 at the end of this report. The geologic map at a scale of 1:50,000 are inserted in this document for convenience as Figs. 2-3, 2-20, 2-23 and 2-42.

(2) Mineralization

Gold and Base metals mineralization in the three districts: Tempursari, Seweden and Prambon Districts. In Purwoharjo district no outcrops of mineralization was found. Therefore, most of rock samples were taken from the three districts. The sample locations of laboratory examination are shown on the Figs. 2-4, 2-21, 2-24 and 2-43. The detailed results of the examinations are shown in the respective chapter of each district, while general overview is as follows.

・Tempursari District: Chalcopyrite dissemination was confirmed in green altered rocks in the Ngrawan River Basin. The maximum copper and gold grades are low at 0.11% Cu and 0.164g/t Au but copper (0.04~0.11%) and gold (0.043~0.164g/t) mineralization is confirmed along the strike direction of 12km. White argillized zones occur widely, but they are controlled largely by the NW-SE fault system. Also green alteration zone consists mainly of chlorite and epidote, and is distributed widely in the Tempursari District from Gede River to Ngrawan River and it is difficult to distinguish regional alteration from that associated with mineralization. Pyrite dissemination occurs widely in both the white argillized zones and green alteration zones, particularly in the smectite-bearing white alteration zone along the Ngrawan River and green alteration Zone of the Gede River.

・Purwoharjo District : Hypogene mineralization was not found by the survey. Quaternary conglomerate which occur along the Coban River contain Mandalika gravel and volcanic breccia and tuff of the Wuni Formation. They all contain 0.01~0.02% Cu which is higher than other unaltered rocks in the area. Thus the background Cu value of the soil in this area is believed to be high.

・Seweden District: Copper and gold mineralization was observed along the Putih River, Cekelan River, and Centung River in the western part of this district. The maximum copper contents of the samples collected at the Putih River this year are 0.81% Cu for silicified and argillized rocks and 0.57% for green altered rock with pyrite dissemination (floater). Copper contents of the quartz veins of the Centung River are low at <0.01% Cu, but although low at 0.064g/t Au, gold mineralization is observed. Chalcopyrite grains are detected microscopically from a sample collected at the Putih River. White argillized zone is widely distributed in this district and sericite is found in many samples from the vicinity of the Putih River.

・Prambon District: Occurrence of gold-silver-copper-lead-zinc bearing quartz veins have been confirmed during the second-year survey. Continuation of the mainly gold mineralization at the Suren River in the north and of silver-copper-lead-zinc quartz veins at the Sumurup and Beloran Rivers in the central part was inferred at that time, but it could not be confirmed by surface survey of the third year. Therefore, emphasis was laid on detailed survey of the northern gold-bearing quartz veins this year. Regarding alteration minerals, sericite is developed adjacent to the veins, and volcanic and volocanilastic rocks are widely affected by green alteration.

(3) Laboratory work

X-ray diffractometry in the laboratory was carried out on 80 samples on the conditions as shown in Table. Identified alteration minerals are shown in Tables 3-3, 5-3, and 6-3. Of identified minerals the following minerals are considered to be related to mineralization: sericite, mixed-layer clay minerals (smectite/sericite and smectite/chlorite), and some of smectite and kaolin minerals (kaolinite and dickite). Chlorite and epidote are also considered to be a probable product of alteration related to mineralization while some of them may have produced by regional alteration such as burial metamorphism.

The results of chemical analysis are described in each chapter of the district: Chapter 2 through Chapter 5. In comparison between districts, the Prambon district is outstanding because many samples of quartz and silicified samples returned the anomalous gold values The Tempursari and Seweden districts indicated copper and gold mineralization.

1-1-3 Outline of Geochemical Survey

(a) Sampling errors

As seen in Table 2-2 and Fig. 2-2 for duplicate samples, the analytical results of the elements are judged to be within analytical errors.

(b) Analytical results

A total of 1, 447 localities were selected in the four geological survey districts. Then 28 samples are divided into 2 portions.

The samples are analyzed for the 35 elements shown Table 1-1 at the ALS Chemex Lab in Canada.

The results are appended in Table A-1 to A-3.

Table 2-1 Correlation of Geologic Units

		1408-3 SURAKARTA	1508-1 PONOROGO	1507-4 PACITAN	1508-2 MADIUN	1507-5 TULUNGAUNG	1508-3 KEDIRI	1507-6 BLITAR	1608-1 MALANG	1607-4 TUREN	1608-2 PROBOLINGGO	1607-5 LUMAJANG
Qa	Alluvium & Quarternary deposits	Qa Alluvium	Qa Alluvium Qaf Alluvium, Fan Deposits	Qa Alluvium	Qa Alluvium	Qa Alluvium	Qa Alluvium Qt Terrace Deposits	Qa Alluvium	Qa Alluvium Qt Terrace Deposits	Qal Alluvium and Coastal deposits Qas Swampand River Deposits	Qa Alluvium	Qa Alluvium Qc Coastal Deposits
Ql	Quarternary limestone										Ql Coral Limestome	
Qs	Pleistocene Sedimenatary Rocks	Qb Baturetno Formation Qt Older Alluvium		Qpk Kalipucang Formation	Qpnv Notopuro Formation Qpk Kabuh Formation		Qpnv Notopuro Formation Qpk Kabuh Formation Qpp Pucangan Formation		Qpw Welang Formation Qpj Jambang Formation Qpk Kabuh Formation			
Qhv	Quarternary (Holocene) volcanics	Qvm Merapi Volcanic Rocks Qvl Lawu Volcanic Rocks	Qlla Lawu Lahar Qvcl Condrodimuko Lava Qval Anak Lava Qvl Lawu Volcanics				Qd Kelud Debris Qvlh Laharic Deposits Qvk Young Kelud Volcanics Qv(n,p) Upper Quarternary Volcanics Qhvp Young Parasitic Volcanics	Qvlh Laharic Deposits Qvk Kelud Volcanics Qptm Tuff	Qvs Tengger Volcanic Sands Qvb Bromo Volcanics Qtt Cemaratiga Debris Qv(n,p) Upper Quarternary Volcanics Qvtm Malang Tuff	Qlv Avalanche deposits Qlks Lava Qls Lava Qlk Lava Qptm Tuff Qpvb Volcanics Qvs Volcanics Qvk Volcanics	Qvl Lamangan Volcanic Rocks Qvll Lamangan Lava Qtt Cemeratiga Debris	Qlks Lava Qls Lava Qvs Semeru Volcanic Rocks Qvk Karangduren Volcanic Dune
Qpv	Quarternary (Pleistocene) volcanics		Qvw Wilis Volcanics Qvjl Jobolarangan Lava Qvsl Sidoramping Lava Qvjb Jobolarangan Breccia Qvtt Tambal Tuff Qvbl Butak Lava Qvbt Butak Tuff Qvjt Jobolangan Tuff		Qav Argokalangan Morphocet Qas Sedudo Morphonit Qp Pawonsewu Morphonit Qpg Gajahmungkur Morphonit Qj Patukbanteng-jeding Morphocet Qjt Tanjungsari Morphonit Qjn Ngebel Morphonit Qjd Dangean Morphonit Qjk Klotok Morphonit	Qpwv Wilis Volcanic Rocks	Qpvp Old Parasitic Volcanics Qpkb Kawa-Butak Volcanics Qpva Young Anjasmara Volcanics Qpat Old anjasmara Volcanics Qpvk Old Kelud Volcanics	Opvk Old Kelud Volcanics Qlk Parasite Andesitic Lava Qpkb Butak Volcanics	Qvtr Rabano Tuff Qvt Tengger Volcanics Qvaw Arjuna-Welirang Volcanics Qpv Middle Quarternary Volcanics Qp Lower Quarternary Volcanics Qpat Old Anjasmara Volcanics	Qvt Volcanics Qvj Volcanics Qpkb Lava	Qvt Tengger Volcanic Rocks Qva Argoporo Volcanic Rocks Qpvt Old Tengger Volcanic Rocks Qvp Pandak Volcanic Rocks Qvtr Rabano Tuff	Qvt Tengger Vocanic Rocks Qvj Jembangan Volcanic Rocks Qvl Lamongan Volcanic Rocks Qvab Argopuro Breccia Qvat Argopuro Tuff
Qi	Quarternary intrusives				Qppr Parang Andesite Intrusive Qpp Punjul Andesite Intrusive							
Tns	Neogene (Miocene-Pliocene) sediments	Tmo Oyo Formation		Tmo Oyo Formation								
Tms	Miocene sediments	Tmn Nampol Formation Tmss Sambipitu Formation Tmj Jaten Formation	Tmcs Cendono Formation	Tmn Nampol Formation Tmj Jaten Formation	Tmj Jaten Formation	Tmn Nampol Formation Tmj Jaten Formation		Tmn Nampol Formation		Tmn Nampol Formation		
Tnl	Neogene (Miocene-Pliocene) limestones	Tmpk Kepek Formation Tmwl Wonosari Formation	Tmwl Wonosari Formation	Tmwl Wonosari Formation	Tmwl Wonosari Formation	Tmwl Wonosari Formation		Tmwl Wonosari Formation		Tmwl Wonosari Formation	Tpl Leprak Formation	
Tml	Miocene limestones		Tmal Sampung Formation	Tmcl Campurdarat Formation		Tmcl Campurdarat Formation		Tmcl Campurdarat Formation				Tmp Puger Formation
Tmv	Miocene volcanics	Tmng Nglanggran Formation Tmw Wumi Formation Tms Semilir Formation	Tmn Nglanggran Formation Tms Semilir Formation	Tmw Wuni Formation Tms Semilir Formation	Tmw Wuni Formation	Tmw Wuni Formation		Tmw Wuni Formation		Tmw Wuni Formation		
Tni	Neogene intrusives	Tpdi Pendul Diorite	Tm (a b d) Intrusive Rocks	Tomi Intrusive Rocks	Tomi Intrusive Rocks	Tomi Intrusive Rocks		Tomi Intrusive Rocks		Tomi Intrusive Rocks		Tmid Intrusive Rocks
Toms	Oligocene-Miocene sediments	Tomk Kebobutak Formation	Tomd Dayakan Formation	Toma Arjosari Formation		Toma Arjosari Formation						
Tomv	Oligocene-Miocene volcanics	Tomm Mandalika Formation	Tomw Watupatok Formation Tomp Panggang Formation	Tomw Watupatok Formation Tomm Mandalika Formation	Tomm Mandalika Formation	Tomm Mandalika Formation		Tomt Tuff member of Mandalika Formation Tomm Mandalika Formation		Tomt Tuff member of Mandalika Formation Tomm Mandalika Formation		Tomm Mandalika Formation
Tps	Paleogene sediments	Tew Gamping Wungkal Formation										
pTm	Pre-Tertinary rocks	KTm Metamorphic Rocks										

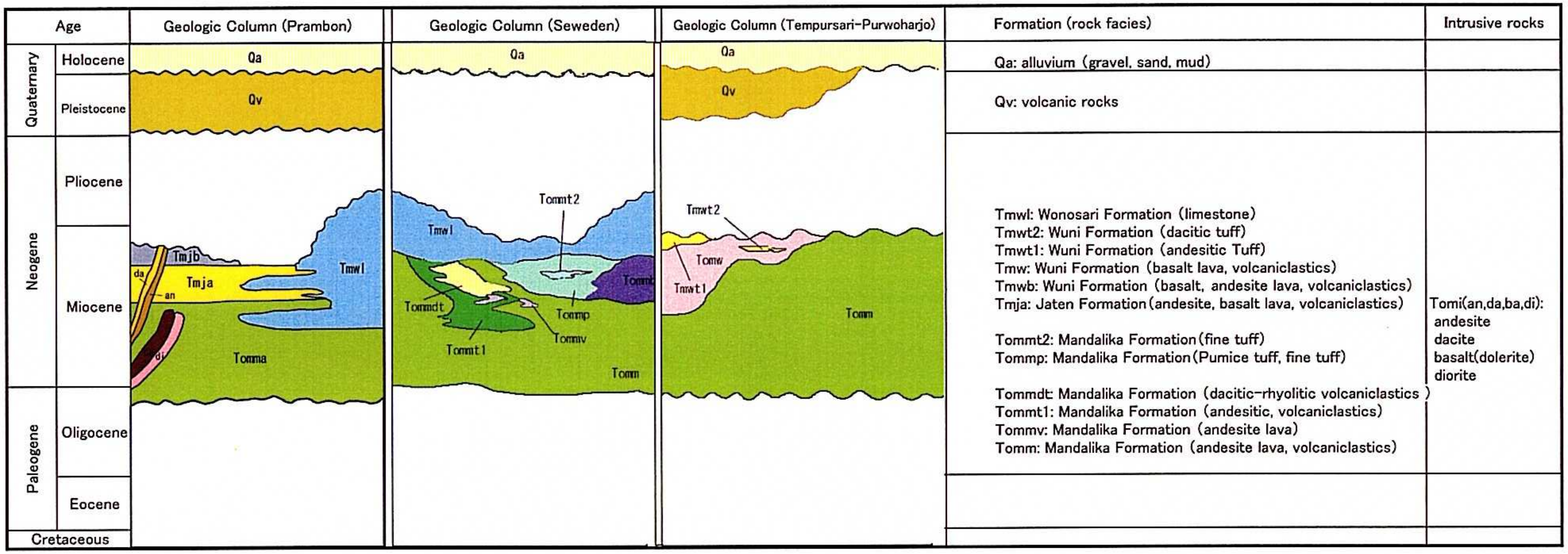


Fig 2-1 Schematic Geologic Column of the Survey Area

Table 2-2 Results of Chemical Analysis of Duplicate Soil Samples

	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	U	V	W	Zn
SAMPLE	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
T007Z	0.004	<0.2	7.11	5	<10	100	0.5	<2	0.25	<0.5	28	6	128	7.07	10	0.05	0.01	10	0.85	1645	<1	0.04	11	260	7	0.07	<2	22	34	0.34	<10	<10	256	<10	79
Y041Z	<0.001	<0.2	7.91	2	<10	120	0.5	3	0.29	<0.5	32	6	134	7.50	20	0.07	0.02	10	0.87	1780	1	0.05	10	300	17	0.08	<2	20	40	0.35	<10	<10	256	<10	80
U015Z	0.003	<0.2	7.37	9	<10	310	0.5	<2	0.44	<0.5	19	6	70	6.01	10	0.09	0.02	10	0.41	1175	<1	0.08	9	330	9	0.07	<2	14	106	0.32	<10	<10	184	<10	40
Y042Z	0.003	<0.2	7.5	6	<10	310	0.5	4	0.53	<0.5	23	8	70	6.05	20	0.11	0.02	10	0.42	1170	<1	0.1	8	320	15	0.07	<2	12	117	0.34	<10	<10	199	<10	41
V023Z	0.002	0.3	5.68	9	<10	50	<0.5	<2	0.44	<0.5	15	3	54	4.24	10	0.09	0.02	10	0.3	712	<1	0.08	2	330	7	0.09	<2	8	36	0.29	<10	<10	132	<10	31
Y043Z	0.003	<0.2	5.73	3	<10	50	<0.5	3	0.51	<0.5	16	3	56	4.37	10	0.12	0.02	10	0.34	739	<1	0.1	5	300	13	0.09	<2	8	43	0.29	<10	<10	137	<10	31
W031Z	<0.001	<0.2	7.58	<2	<10	240	<0.5	<2	0.58	<0.5	29	8	95	6.60	10	0.06	0.04	10	0.59	1540	<1	0.09	14	260	8	0.03	<2	16	128	0.29	<10	<10	238	<10	88
Y044Z	0.009	<0.2	6.84	5	<10	250	<0.5	3	0.53	<0.5	29	7	95	6.40	10	0.07	0.04	10	0.58	1500	<1	0.09	10	250	11	0.03	<2	15	127	0.28	<10	<10	230	<10	89
X42Z	0.001	<0.2	11.6	<2	<10	70	<0.5	<2	0.72	<0.5	28	4	109	6.84	20	<0.01	0.01	10	1.18	1315	1	0.14	7	350	<2	0.1	<2	15	48	0.41	<10	<10	240	<10	47
Y045Z	<0.001	<0.2	11.65	3	<10	70	<0.5	5	0.66	<0.5	26	4	120	6.61	20	0.08	0.02	10	1.05	1310	<1	0.14	9	370	15	0.11	<2	15	49	0.41	<10	<10	234	<10	48
Y028Z	0.003	<0.2	6.18	5	<10	150	<0.5	4	0.36	<0.5	25	6	88	6.08	10	0.07	0.02	10	0.63	1285	<1	0.07	9	300	10	0.06	<2	14	50	0.26	<10	<10	204	<10	66
Y046Z	0.002	<0.2	6.4	3	<10	160	<0.5	5	0.38	<0.5	24	6	91	6.24	10	0.07	0.02	10	0.63	1320	<1	0.07	9	300	12	0.06	<2	15	51	0.27	<10	<10	204	<10	69
T 111 Z	<0.001	<0.2	1.94	7	<10	90	<0.5	<2	0.39	<0.5	10	3	20	3.50	<10	0.01	0.06	10	0.3	536	1	0.02	2	180	3	0.01	<2	7	37	0.01	<10	<10	58	<10	37
U 211 Z	<0.001	<0.2	2.03	5	<10	90	<0.5	<2	0.36	<0.5	10	2	15	3.32	10	0.02	0.05	10	0.28	521	<1	0.02	4	160	6	0.01	<2	7	40	0.01	<10	<10	56	<10	35
T 159 Z	<0.001	0.3	5.63	17	<10	370	0.6	<2	0.37	0.5	29	9	73	6.94	10	0.03	0.04	10	0.13	1590	2	0.03	5	80	14	0.02	<2	17	91	0.18	<10	<10	208	<10	48
U 212 Z	<0.001	<0.2	5.72	13	<10	380	0.5	<2	0.36	<0.5	27	9	70	6.60	10	0.04	0.03	10	0.13	1610	<1	0.03	6	80	18	0.02	<2	16	98	0.17	<10	<10	197	<10	43
T 167 Z	0.002	<0.2	4.7	16	<10	260	0.6	<2	0.45	<0.5	43	88	65	7.76	10	0.02	0.02	10	0.57	2450	1	0.05	55	120	12	0.01	<2	22	64	0.26	<10	<10	283	<10	51
U 213 Z	<0.001	<0.2	4.91	18	<10	300	<0.5	<2	0.44	<0.5	45	89	67	7.80	10	0.02	0.02	10	0.55	2510	<1	0.05	50	130	14	0.01	<2	21	75	0.27	<10	<10	294	<10	48
U 104 Z	0.002	<0.2	4.34	8	<10	140	<0.5	<2	0.48	<0.5	29	53	68	5.79	10	0.01	0.04	10	1.34	1330	<1	0.03	31	290	3	0.01	<2	18	59	0.07	<10	<10	177	<10	59
U 214 Z	<0.001	0.2	4.24	7	<10	130	<0.5	<2	0.49	<0.5	28	53	65	5.77	10	0.01	0.04	10	1.36	1350	<1	0.03	30	290	9	0.01	<2	18	60	0.07	<10	<10	173	<10	58
U 113 Z	0.003	<0.2	7.03	3	<10	320	0.6	<2	0.54	<0.5	29	15	67	7.35	20	0.03	0.04	10	0.18	1810	<1	0.07	10	190	7	0.02	<2	17	150	0.41	<10	<10	281	<10	68
U 215 Z	<0.001	<0.2	6.34	<2	<10	290	0.5	<2	0.61	<0.5	26	16	59	7.01	10	0.03	0.03	10	0.17	1700	<1	0.09	8	190	17	0.02	<2	17	151	0.4	<10	<10	266	<10	62
U 177 Z	0.001	<0.2	4.67	15	<10	120	0.5	<2	0.64	<0.5	36	169	37	6.16	10	0.02	0.02	10	2.02	1205	<1	0.02	125	380	2	0.02	<2	21	60	0.14	<10	<10	171	<10	54
U 216 Z	0.001	<0.2	4.48	11	<10	110	0.5	<2	0.61	<0.5	33	158	30	5.81	10	0.02	0.02	10	1.97	1165	<1	0.02	114	350	8	0.01	<2	21	59	0.14	<10	<10	156	<10	49
V 109 Z	0.003	<0.2	4.71	8	<10	100	<0.5	<2	0.80	<0.5	34	110	65	6.10	10	0.01	0.03	<10	2.33	1310	<1	0.03	96	220	2	0.01	<2	22	75	0.12	<10	<10	190	<10	60
U 217 Z	<0.001	0.3	5	7	<10	100	<0.5	<2	0.76	<0.5	32	112	64	6.16	10	0.01	0.03	<10	2.3	1240	<1	0.03	95	210	8	0.01	<2	23	82	0.12	<10	<10	191	<10	59
V 165 Z	0.003	<0.2	6.72	2	<10	420	0.7	<2	0.44	<0.5	33	11	69	8.09	20	0.03	0.03	10	0.19	2370	<1	0.05	8	170	14	0.02	<2	19	148	0.37	<10	<10	280	<10	59
U 218 Z	0.004	0.2	7.19	3	<10	390	0.7	<2	0.43	<0.5	30	13	63	8.16	20	0.03	0.03	10	0.2	2170	<1	0.06	7	170	26	0.02	<2	20	161	0.37	<10	<10	279	<10	57
W 110 Z	0.002	<0.2	6.76	4	<10	510	0.6	<2	1.07	<0.5	38	12	82	6.91	20	0.03	0.05	10	0.33	2740	<1	0.09	8	660	8	0.03	<2	17	168	0.28	<10	<10	256	10	65
U 219 Z	<0.001	<0.2	6.43	5	<10	460	0.5	<2	1.00	<0.5	35	13	71	6.77	10	0.03	0.05	10	0.32	2490	<1	0.09	8	620	18	0.03	<2	16	180	0.27	<10	<10	260	<10	61
W 156 Z	0.015	<0.2	5.56	13	<10	320	0.6	<2	0.57	<0.5	25	12	82	7.77	20	0.04	0.03	10	0.16	1610	<1	0.07	7	140	12	0.03	<2	17	100	0.36	<10	<10	267	<10	62
U 220 Z	0.008	<0.2	5.5	11	<10	320	0.6	<2	0.52	<0.5	25	11	72	7.01	10	0.04	0.03	10	0.15	1530	<1	0.07	6	150	17	0.03	<2	17	106	0.33	<10	<10	236	<10	55
X 169 Z	0.001	<0.2	5.46	11	<10	630	0.7	<2	1.02	<0.5	39	11	63	6.50	10	0.03	0.02	20	0.28	3100	<1	0.09	6	150	11	0.01	2	15	96	0.23	<10	<10	222	<10	58
U 221 Z	<0.001	<0.2	6.09	11	<10	670	0.7	<2	1.10	<0.5	39	13	66	7.17	10	0.03	0.02	20	0.28	3430	<1	0.1	9	190	20	0.01	<2	15	117	0.28	<10	<10	250	<10	61
X 196 Z	0.003	<0.2	8.37	7	<10	450	0.6	2	0.46	<0.5	23	9	63	7.77	20	0.02	0.03	10	0.16	1615	<1	0.06	8	550	13	0.05	<2	17	190	0.3	<10	<10	231	<10	67
U 222 Z	0.006	<0.2	8.26	12	<10	420	0.6	<2	0.42	<0.5	23	10	58	7.51	20	0.02	0.03	10	0.15	1510	<1	0.05	6	500	23	0.05	<2	18	206	0.3	<10	<10	238	<10	62
Y 139 Z	<0.001	<0.2	3.88	5	<10	180	<0.5	<2	0.56	<0.5	21	14	41	6.42	10	0.02	0.05	10	0.35	1690	<1	0.05	7	150	5	0.02	<2	13	60	0.27	<10	<10	213	<10	63
U 223 Z	<0.001	<0.2	3.75	7	<10	170	<0.5	<2	0.50	<0.5	20	13	35	6.01	10	0.02	0.05	10	0.33	1575	<1	0.05	5	150	11	0.02	<2	13	61	0.27	<10	<10	207	<10	58
Y 175 Z	0.001	<0.2	3.96	8	<10	180	0.6	<2	0.43	<0.5	16	6	62	5.93	10	0.02	0.04	10	0.26	900	<1	0.03	4	140	12	0.01	<2	14	65	0.1	<10	<10	160	<10	54
U 224 Z	0.001	<0.2	3.94	5	<10	170	<0.5	<2	0.47	<0.5	17	7	58	6.01	10	0.02	0.03	10	0.24	908	<1	0.04	3	120	12	0.01	2	13	79	0.12	<10	<10	179	<10	47
T 305 Z	0.003	<0.2	3.93	6	<10	190	<0.5	<2	0.37	<0.5	24	11	45	6.50	10	0.04	0.05	10	0.14	1760	<1	0.04	9	170	12	0.02	<2	12	47	0.21	<10	<10	207	<10	61
T 381 Z	0.004	<0.2	3.63	7	<10	170	<0.5	<2	0.35	<0.5	24	10	44	6.11	10	0.04	0.05	10	0.13	1880	<1	0.04	8	160	12	0.02	<2	11	45	0.2	<10	<10	207	<10	57
T 310 Z	0.008	<0.2	4.03	14	<10	250	<0.5	<2	0.34	<0.5	31	23	52	6.63	10	0.06	0.05	10	0.21	1505	<1	0.02	18	170	8	0.02	<2	16	45	0.14	<10	<10	195	<10	62
T 382 Z	0.003	<0.2	3.69	15	<10	220	<0.5	<2	0.33	<0.5	30	22	50	6.42	10	0.05	0.05	10	0.21	1545	<1	0.02	18	160	8	0.02	<2	15	44	0.15	<10	<10	207	<10	61
U 309 Z	<0.001	<0.2	3.87	<2	<10	190	0.5	<2	0.48	<0.5	17	6	32	5.61	10	0.03	0.07	10	0.17	1255	<1	0.06	5	250	6	0.02	<2	9	62	0.11	<10	<10	170	<10	58
T 383 Z	0.001	<0.2	3.9	<2	<10	190	0.5	<2	0.50	<0.5	17	6	32	5.53	10	0.03	0.07	10	0.17	1265	<1	0.06	5	250	7	0.02	<2	9	63	0.11	<10	<10	165	<10	57
U 330 Z	0.003	<0.2	3.56	<2	<10	110	0.5	<2	0.48	<0.5	24	5	32	7.30	10	0.03	0.03	10	0.14	1285	<1	0.05	4	360	5	0.02	<2	16	51	0.03	<10	<10	188	<10	63
T 384 Z	0.002	<0.2	3.41	<2	<10	110	0.5	<2	0.47	<0.5	24	6	31	7.18	10	0.04	0.03	10	0.14	1255	<1	0.05	5	350	6	0.02	<2	16	50	0.03	<10	<10	189	<10	63
V 304 Z	0.003	<0.2	4.18	2	<10	230	<0.5	<2	0.52	<0.5	23	20	59	5.60	10	0.04	0.12	10	0.54	1650	<1	0.05	8	230	9	0.02	<2	12	71	0.17	<10	<10	179	<10	66
T 385 Z	0.001	<0.2	4.14	<2	<10	230	<0.5	<2	0.51	<0.5	25	20	57	5.65	10	0.04	0.12	10	0.56	1685	<1	0.05	10	220	8	0.02	<2	12	69	0.18	<10	<10	190	<10	65
W 341 Z	0.009	<0.2	2.9	9	<10	130	<0.5	<2	0.40	<0.5	20	8	50	5.46	10	0.03	0.07	10	0.22	999	<1	0.03	6	200	18	0.02	<2	9	48	0.08	<10	<10	149	<10	54
T 386 Z	0.008	0.2	3.11	7	<10	130	<0.5	<2	0.44	<0.5	21	9	52	5.49	10	0.03	0.07	10	0.23	1040	<1	0.04	6	180	16	0.02	<2	9	50	0.09	<10	<10	164	<10	60
X 306 Z	0.026	<0.2	5.72	7	<10	410	0.5	<2	0.46	<0.5	25	11	52	7.49	20	0.06	0.11	10	0.15	1680	<1	0.06	5	290	15	0.03	<2	15	104	0.38	<10	<10	275	<10	66
T 387 Z	0.01	<0.2	6.02	6	<10	420	0.5	<2	0.51	<0.5	27	12	54	7.74	20	0.06	0.12	10	0.16	1760	<1	0.07	8	270	16	0.03	<2	15	110	0.41	<10	<10	294	<10	68
Y 312 Z	0.007	<0.2	3.01	6	<10	110	0.5	<2	0.65	<0.5	20	11	27	6.16	10	0.04	0.04	10	0.12	1195	1	0.09	6	200	10	0.02	<2	6	63	0.18	<10	<10	195	<10	53
T 388 Z	0.007	<0.2	2.8	8	<10	100	<0.5	<2	0.71	<0.5	21	12	27	6.24	10	0.03	0.03	<10	0.12	1170	<1	0.1	7	190	7	0.02	<2	6	68	0.22	<10	<10	224	<10	57

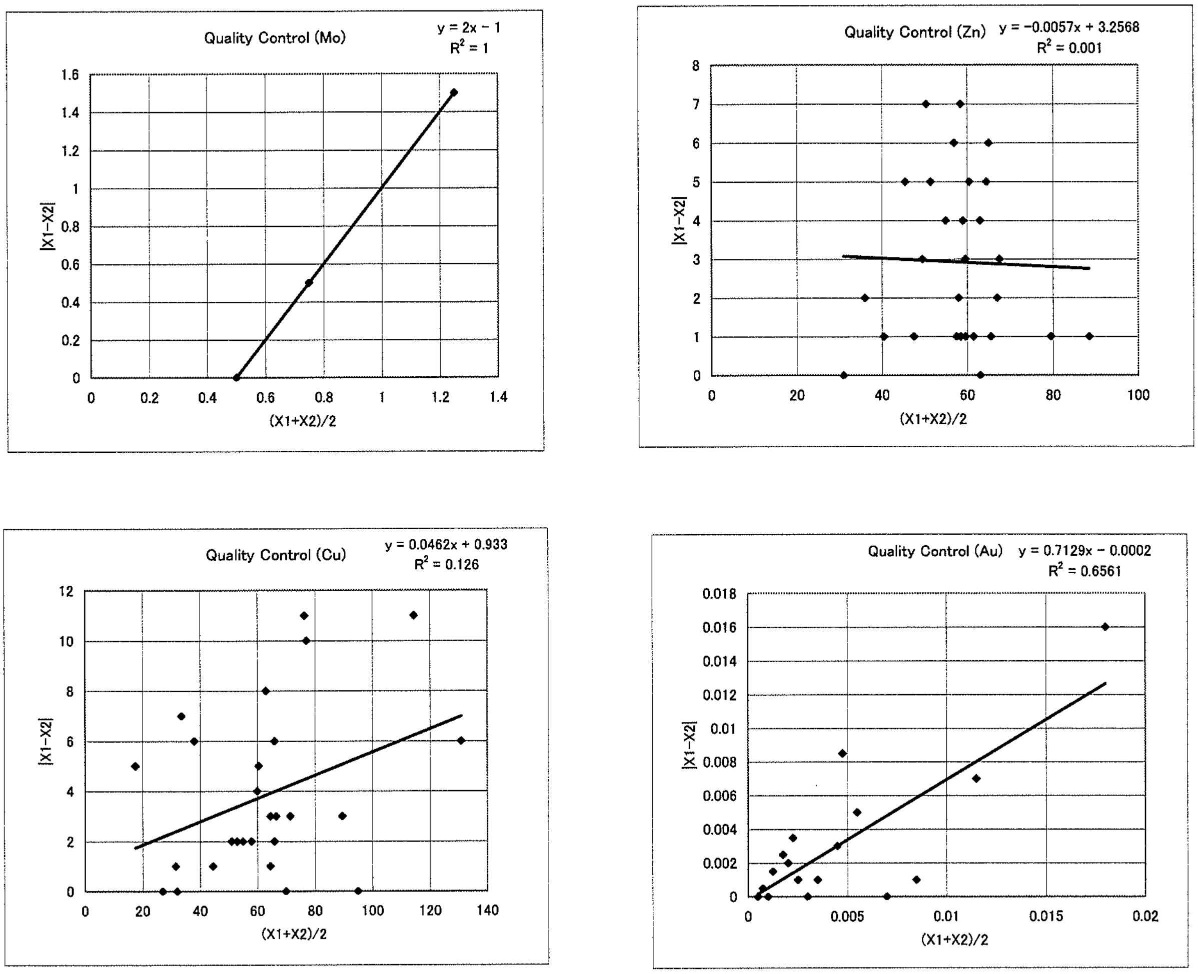


Fig. 2-2 Quality Control Diagram of Soil Chemical Analysis

1-2 Tempursari District

1-2-1 Outline of Geological Survey

The area extent of Prambon district is 50km2 and traversed length is a total of 120 km. The base camps were set up at Pronojiwo. The access from the base camp to the traversing area in the northern part was via main road between Malang and Lumajang, and or in the southern part via a paved road between Pronojiwo and the Tempursari village. It takes about one hour from Pronojiwo to the village. The survey route was determined base on the Phase 2 survey geochemical results: the gold and copper anomaly in stream sediments and gold pins in the pan concentrates are found in the K. Ngrawan. Dioritic intrusive rocks and surrounding volcanic rocks are undergone intense pyrite dissemination and silicification-argillic alteration. Sericite, mixed layered minerals, kaolin mineral and smectite were identified. Consequently, geological traversing was concentrated in the K. Ngrawan area. A total of 15 rock samples for thin sections, 9 samples for polished sections 33 samples for chemical analysis, 3 samples for fluid inclusion examination, 27 samples for whole rock analysis and 40 samples for X-ray diffraction analysis. A total of 320 soil samples for geochemical survey were taken mainly in the pyrite disseminated and white colored clay alteration zones.

1-2-2 Results of Geological Survey

1-2-2-1 Geology

(1) Stratigraphy

The geology of the district is comprised of Tertiary volcanic-products. Tertiary system consists mainly of Oligocene-Miocene andesitic-basaltic lava and volcaniclastics of the Mandalika Formation and Miocene andesitic lava and volcaniclastics of the Wuni Formation, based on the geologic map of the Lumajang Quadrangle sheet.

(a) Mandalika Formation (Tommv, Tommt)

Distribution: Distributed widely in the district.

Composition: Composed of andesitic-basaltic (Tommav) lava and volcaniclastic rocks. Generally massive volcaniclastic rocks without bedding are abundant and stratigraphy and structure is difficult to clarify, but fine-grained volcaniclastic rocks (Tommt) are intercalated in some parts. The volcanic and volcaniclastic rocks of the formation are characterized by wide propylitization.

Pyrite dissemination is widely observed in northern to central part of the districts.

Structure: Fine-grained volcaniclastic rocks sometimes strike E-W to N-S and dip to the southern direction, while E-W trending gentle anticlines and synclines occur repeatedly southward from the north. Several NE-SW trending faults are dominant in the area

Stratigraphy and correlation: This formation is covered by Wuni Formation in the northwestern part of the district, and correlated to Mandalika Formation of the Lumajang and the Turen Quadrangle sheets.

Thickness: More than 500m.

(b) Wuni Formation (Tmw)

Distribution: This formation is distributed in a narrow in the northwest part of the district.

Composition: This unit is composed of basaltic to andesitic volcaniclastic rocks. The volcanic breccia and tuff breccia are dominant. The volcaniclastic materials have not unaltered and show grayish color. The outcrops show rough surface with angular fragments.

Stratigraphy and correlation: This contacts with the lower Mandalika Formation, and is believed to be underlain by the Mandalika Formation.

Thickness: More than 100m in the district

(c) Intrusive rocks

Diorite-quartz diorite, basalt andesite and dacite intrusive rocks crop out in the district.

Andesite (V016)

PRIMARY FEATURES: THE sample is a porphyritic volcanic with phenocrysts of plagioclase and mafic minerals in a fine-grained quartz-feldspar groundmass. Plagioclase forms blocky to tabular grains 0.5-3mm in length. Composition is calcic (labradorite, An66). The mafic phenocrysts are augite and hornblende. Augite is minor, having been extensively replaced and pseudomorphed by green magmatic hornblende, producing grains with hornblende mineralogy but relict pyroxene morphology. In addition, hornblende forms separate phenocrysts and aggregates that have not replaced pyroxene and have amphibole morphology. There are microphenocrysts of magnetite and rare quartz.

The groundmass is very fine grained, with granular feldspar/quartz averaging 0.01-0.02mm in size, slightly coarser tabular plagioclase, and fine magnetite.

SECONDARY FEATURES: ALTERATION is minor. There is weak alteration of plagioclase phenocrysts to narrow crosscutting zones of orthoclase with adularia-type twinning. Amphibole is variably replaced by masses of fine chlorite with anomalous blue interference colours. A brown clay mineral with higher birefringence (chlorite/smectite?) variably replaces mafics and feldspar.

Diorite (X016)

PRIMARY FEATURES: The rock is completely altered and primary textures obscured. A porphyritic texture is poorly preserved, with chlorite-altered mafics, and a few relict plagioclase grains, about 1-3mm in size, in a groundmass of subhedral interlocking plagioclase grains 0.05-0.1mm in size, and interstitial alteration minerals.

SECONDARY FEATURES: Discrete areas of fine-grained chlorite 1-3mm in size are inferred to have replaced original mafic phenocrysts. The few plagioclase phenocrysts remaining are albitised. The groundmass of the rock is composed of fine-grained albitised plagioclase grains with poor albite twinning, and abundant interstitial chlorite.

Secondary quartz has replaced areas of the groundmass; the quartz is anhedral about 0.01-0.5mm in size. Fine-grained secondary biotite and pyrite are disseminated throughout.

The rock is cut by sub parallel veinlets of quartz-pyrite.

(2) Geologic Structure

Northeast-southwest trending faults in the district control the distribution of the Mandalika Formation.

No clear bedding was observed in the district. Fine tuff beds in the Mandalika Formation show NE-SW - E-W strikes and gentle dip towards south. Major folding structures are not conspicuous, while E-W trending folds are inferred from the sporadic intercalated fine tuff beds.

1-2-2-2 Alteration and Mineralization

(1) Alteration

Alteration minerals identified by X ray diffraction meter are shown on Table 2-5. Sericite, mixed clay minerals (smectite and sericite) and smectite, kaolinite, pyrophyllite and sulfosalt minerals (gypsum and alunite) are presumed to be related mineralization in the district. Chlorite and epidote may be partly produced by hydrothermal fluid related to mineralization.

Sericite: widely identified widely in the mineralization district in the central to the southern part of the district.

Mixed clay minerals: smectite/ sericite is identified in or adjacent to the area where sericite occurs.

Smectite: identified with mixed layered minerals.

Kaolinite, pyrophyllite and sulfosalt (gypsum and alunite) are identified isolated in the western and eastern and southern parts.

(2) Mineralization

Mineralization was observed along the K. Ngrawan and K. Gede. The mineralization of the both areas is characterized by propylitic and -white colored clay (sericite) alteration with significant pyrite dissemination. Dioritic intrusive rocks are observed in the both areas. Especially in the northern part of the K. Ngrawan area, intense argillization - silicification and pyrite dissemination develops in the andesitic rocks of Mandalika Formation and diorite. A narrow quartz stockwork zone is emplaced in a branch of K. Ngrawan, where low copper and gold mineralization occurs: 0.146g/tAu over the 1 m interval. (A float of quartz stockwork returned 0.08g/tAu during the Phase 2 survey.) At the upper stream of the K. Ngrawan a quartz float returned the 0.301 g/t Au, which is the highest in the district. Along the above-mentioned branch malachite was found in propylitic andesite. Chalcopyrite gains were identified in a polished section of the rock under microscopy. Assayed values of the samples over an interval of 16 m returned 0.04-0.11%Cu and 0.04-0.164g/tAu. That demonstrates copper and gold mineralization occurred in the zone. Mineralization is not well observed along the ridges of the district since exposures are limited in the area.

1-2-3 Results of Geochemical Survey

(1) Results of analysis

The results are appended in Table A-1. The statistics of the components are laid out in Table 2-8.

(2) Sampling errors

As seen in Figure 2-2 for duplicate samples, the analytical results of the elements are judged to be within analytical errors.

(3) Correlation among elements

The correlations between the elements are shown in Table 2-9 and Fig. 2-13. Major elements related to mineralization are briefly described as follows:

Au: Au does not show any clear correlation with other elements.

Ag: does not show any clear correlation with other elements.

Cu: Positive correlation exists with Al, Co, Cr, Fe, Mg, Mn, Sc and Ti, V since correlation coefficient is higher than 0.5.

Pb: Pb has show small correlation efficient with other elements.

Zn: Positive correlation exists with Ba, Co., Mn, Ni and Sc as correlation coefficients are higher than 0.5.

Mo: Positive correlation may exist with Au and correlation coefficient is 0.31, although most of Mo values are less than lower detection limit of analysis (1ppm).

(4) Distribution of anomalies by elements

Gold and copper values in soil samples are shown on the Fig.2-14 and Fig.16. The high gold values are concentrated in the some part of alteration zones along the Ngrawan River and ridges between the Gede River and the Ngrawan River. No high copper values are concentrated. Cu and Au are presumed to be effective pathfinders, while S (sulfur) and Hg (Mercury) are thought to be possible pathfinder element. Threshold values to distinguish copper and gold anomalies are 100 ppm and 0.01 g/t Au, respectively. The silicification zone surrounding Mt. Kukusan does not show high gold values.

(5) Bed rock lithology

The soils sample area is mostly underlain the Mandalika andesitic rocks with small bodies if intrusive rocks. Therefore, it is assumed that the difference of bedrocks does no influence on the Cu, Au and other elements values significantly.

Au (Fig. 2-14): The high gold values are concentrated in the some part of alteration zones along the Ngrawan River and ridges between the Gede River and the Ngrawan River. No clear relation between high gold values and alteration zones are inferred since bedrock exposures are limited on the ridges.

Ag (Fig. 2-15): Ag shows comparatively high value (0.8ppm) from an sample taken along the K. Ngrawan and other high values from an sample taken along K. Gede.

Cu (Fig. 2-16): Cu values higher than 130ppm appear to be concentrated on the wide area along the K. Ngrawan, in the northeastern part of the district. Lower values are concentrated in the eastern part. It shows a contrast to Au and shows similar distribution with As.

Pb (Fig.2-17): Pb does not show significant high values.

Mo: Most of samples ado not show lower than detection limit of chemical analysis with two exception; 2 ppm from K. Ngrawan and from the ridges parallel to K. Ngrawan.

As:(Fig.2-18): As shows high values in the western part of the central ridge compared to the eastern part. Within the western part, northern boundary of the sampled area and the southern boundary along the K. Ngrawan, As is high.

1-2-4 Mineral Potential

Mineralization along the K. Ngrawan is the strongest within the district.

-Silicification and quartz veining surrounded with argillic alteration zones: a quartz stockwork zone is developed along a branch of K. Ngrawan, where 0.146g/tAu returned over a width of 1 m. Highest gold value is 0.309g/tAu from a float of quartz.

-Copper mineralization (malachite) and strong pyrite dissemination: the highest copper value is only 0.11%Cu, low copper and gold mineralization continues more than 0.04-0.11%Cu and 0.04-0.164g/tAu.

-Fluid inclusion study: Homogenization temperatures of fluid inclusions show epithermal nature, which means still higher hydrothermal activities may have occurred below the current surface.

-Widespread argillic alteration zones within propylitic alteration zones with pyrite dissemination: alteration mineral assemblages indicate that wide hydrothermal activities.

-Possible potash alteration zone inferred from secondary magnetite and biotite (?) occurrences

-Diorite intrusion into the Tertiary Mandalika Formation

-Faults preferable for emplacement of porphyry copper type mineralization: northeast to southwest trending parallel faults

-Concentration of high gold values and some copper high values of several soil samples

The above mentioned survey results support the assumption that porphyry copper type mineralization occurs under the surface in the Ngrawan River area.

Table 2-3 Rusults of Microscopic Observation of Thin Sections, Tempursari District

Sampl	Rock type	Texture	Phenocrysts								Groundmass								Alteration minerals												
No.			pl	kf	q	ol	opx	cpx	hb	bi	pl	kf	q	opx	cpx	ol	bi	mt	q	ab	kf	ep	ac	bi	ch	se	sm	k	ca	ti	ru
T002	basalt	porphyritic, vesicular	○			△		×			○				△			△									△				
T044	basalt	porphyritic, vesicular	○			?		×			○				△	?		×									△		•		
U007	basalt	porphyritic, holocrystalline	△					?			◎				?			△							×				△	•	
U008	basalt	porphyritic, pilotaxitic	○								○								×						×				△	•	
U016	tuff	lithic-crystal-vitric																	×			×			×	×			×		
V012	basalt	porphyritic, holocrystalline	○						?										?		×	×			△	×			×		
V016	basalt	porphyritic, cryptocrystalline	○		•			×	△									△	•		•				×		×				
V035	basalt	porphyritic, cryptocrystalline	○					?	?		×											•			△	•			△		
V039	basalt	porphyritic, pilotaxitic	△								◎								△			×			△				×		
V046	microgabbro	inequigranular	◎		×			○										△					△		•				•		
W005	volcanic breccia																		•								•		△		
W012	basalt	porphyritic, amygdaloidal	○			?	△				◎				△			△							○						
W029	basalt	inequigranular									◎								△						○				•		
W047	gabbro	equigranular	◎		△			?														•	○		△						
X006	dacite	porphyritic, holocrystalline	○		△					?	△	◎									×	•			△	×					
X016	felsic intr/volc?	(quartz and K-silicate altered)																	○		◎			×	△	×			×		
Y013	basalt/andesite	porphyritic, holocrystalline	○					?	?									×							△				△		

ol:olivine, cpx:clino-pyroxene, opx:ortho-pyroxene, op:opaque mineral, hb:hornblende, bio:biotite

kf:potash-feldspar, qz:quartz, ap:apatite, frag:fragment,leu:leucoxene, ser:sericite, kao:kaolin, cal:calcite, sm:smectite, ep:epidote

chl:chlorite, zeo:zeolite, pl:plagioclase, pre:prehnite, ill: illite, zr: zircon

Amount:◎>○>△>・>×

Table 2-4 Results of Whole Rock Analysis, Tempursari District

Sample No.	SiO2 (%)	Al2O3 (%)	Fe2O3 (%)	CaO (%)	MgO (%)	Na2O (%)	K2O (%)	Cr2O3 (%)	TiO2 (%)	MnO (%)	P2O5 (%)	SrO (%)	BaO (%)	LOI (%)	Total (%)	K2O#	T/A
T022	58.20	15.89	9.99	3.78	2.67	2.96	0.37	0.05	0.93	0.15	0.10	0.03	0.01	4.36	99.50	0.04	1.16
T036	57.00	16.91	6.22	4.47	3.10	3.45	1.00	<0.01	0.67	0.09	0.12	0.02	0.03	6.76	99.84	0.08	1.07
T048	55.68	16.58	9.36	4.10	4.00	2.61	0.28	<0.01	1.03	0.27	0.15	0.03	0.02	5.59	99.69	0.03	1.08
T049	55.73	16.58	8.90	1.33	3.71	1.82	1.44	0.01	1.08	0.10	0.12	0.03	0.02	8.35	99.22	0.17	1.19
T051	54.59	17.75	9.05	3.62	3.95	2.87	1.18	<0.01	1.07	0.28	0.16	0.05	0.02	4.73	99.34	0.10	1.06
U007	52.06	18.27	9.77	7.83	3.73	2.76	0.16	<0.01	1.17	0.27	0.13	0.03	0.01	3.41	99.61	0.01	0.93
V013	65.10	16.75	6.46	0.16	0.96	0.88	0.94	0.01	0.88	0.03	0.09	0.01	0.02	7.30	99.58	0.32	1.68
V016	63.36	16.51	6.14	3.49	2.56	3.31	0.14	<0.01	0.70	0.20	0.12	0.02	0.02	3.35	99.91	0.01	1.21
V019	58.75	15.51	8.67	4.33	3.32	1.43	1.09	<0.01	0.86	0.25	0.10	0.02	0.02	5.07	99.41	0.11	1.06
V024	61.88	16.08	5.27	4.60	2.47	2.57	0.41	<0.01	0.58	0.22	0.11	0.04	0.02	5.30	99.55	0.04	1.12
V025	58.63	15.69	6.74	5.79	3.61	2.04	0.15	<0.01	0.92	0.20	0.18	0.04	0.02	5.03	99.04	0.01	1.02
V029	67.11	14.54	5.33	1.07	0.76	2.96	1.40	<0.01	0.81	0.06	0.19	0.02	0.03	5.47	99.76	0.23	1.49
V035	65.11	14.91	4.94	5.25	1.75	2.65	1.07	<0.01	0.62	0.15	0.11	0.02	0.03	2.88	99.49	0.10	1.09
V039	53.08	19.33	7.96	7.87	2.65	2.88	0.41	<0.01	1.08	0.11	0.16	0.03	0.02	4.20	99.77	0.03	0.96
V046	50.50	20.10	9.18	9.75	3.43	2.87	0.49	<0.01	1.13	0.18	0.13	0.02	0.02	1.28	99.07	0.03	0.86
W012	49.41	19.69	8.15	8.22	3.79	2.75	0.68	<0.01	0.95	0.16	0.14	0.03	0.02	4.89	98.86	0.04	0.89
W028	56.18	16.91	7.30	4.94	3.27	2.07	1.02	<0.01	0.76	0.07	0.12	0.06	0.02	7.18	99.92	0.09	1.03
W029	46.23	19.74	12.16	9.49	3.10	2.79	0.19	<0.01	1.11	0.14	0.14	0.04	0.02	3.45	98.60	0.01	0.89
W047	49.75	19.43	11.24	6.28	5.32	2.82	0.49	<0.01	0.98	0.24	0.10	0.03	0.02	3.06	99.77	0.03	0.92
X008	54.48	16.02	9.35	2.93	4.25	2.54	0.60	0.01	0.91	0.10	0.10	0.03	0.02	7.31	98.65	0.06	1.10
X016	57.08	15.94	8.68	2.98	4.05	3.47	0.88	<0.01	0.87	0.20	0.11	0.02	0.02	4.26	98.54	0.08	1.10
X018	59.07	16.89	7.38	5.36	2.85	2.62	0.16	<0.01	0.79	0.15	0.10	0.03	0.01	4.49	99.91	0.01	1.08
X019	56.00	18.92	8.71	0.19	3.31	0.27	3.96	0.01	0.87	0.12	0.02	<0.01	0.03	7.46	99.87	0.51	1.13
X023	59.73	15.76	6.13	5.12	2.44	2.46	0.67	<0.01	0.61	0.14	0.11	0.03	0.02	5.04	98.26	0.06	1.08
Y013	60.88	16.47	6.48	6.11	2.42	2.67	0.83	<0.01	0.62	0.14	0.12	0.03	0.02	2.98	99.78	0.07	1.03
Y015	53.29	18.20	8.32	5.09	4.16	2.84	0.10	<0.01	0.76	0.19	0.12	0.03	0.02	6.48	99.60	0.01	1.03
Y030	48.40	18.84	10.02	5.36	4.97	2.43	0.46	<0.01	1.08	0.26	0.13	0.02	0.03	7.34	99.35	0.03	0.96

Table 2-5 Results of X-ray Diffraction Analysis, Tempursari District

Mineral	Quartz	Plagioclase	Muscovite	Kaolinite	Chlorite	Pyrophyllite	Other clay	Zeolite	Rutile or K-feldspar	Anatase	Pyrite	Calcite	Calcite or chalcopyrite	Other
T020	◎	·	○	·-△		△	△ (Sm+ML)		·		△			
T022	◎	○			△		△(Sm)				·	·-△		·(Mt)
T024	◎	△	○		·						△		·	
T031	△				△		◎(ML)△(Sm)		·		·	○		·(Dol)
T036	△	◎			△			·-△(L)						·(Mt)
T048	△	◎			△			·-△(Ch)			·			
U006	△	◎	△		·			△(Ep)			△			
U011	○	△-○	◎		△						·			
U015	◎		○(1M)				·(V)		·		·			
U021	△-○	◎			·		△(ML)·(V)	·(Ep)			△		·	
V003	·	△					◎(U)						·	·(Mh)
V013	△	◎	○		·						·-△			
V015	◎c		◎c		·-△				·		·-△			
V017	◎c		◎c				·(Pa)		·		·			
V019	◎				△		○(U)				·			
V020	△	◎			△			·(Ep)			·-△			
V024	○	◎						·(Ep)			·			
V025	○	◎			△						·-△		·	·(Unid)
V029	◎c	◎c					△(U)				·-△			
V032	△				·	◎		○(St,Ep)			·			△(An),·-△(?Pr)
V046	△	◎					△(V)	·(Z)			·			△(Mt),·-△(Am)
W016	○	◎			·-△						·			
W025	○		◎(1M)							·	·			
W028	○	◎			·-△			·(Ep)			·-△			
W032	△-○		◎								·			
W046	○	◎			△									
W049	·	◎					△(Sm)							·(Go)
X003	·						◎(?Ha)	·(H)						
X006	○	◎	·-△		·			·(H)			·		·	
X008	△-○	◎			△									·(Gy,unid)
X009	○		◎		△			△(St)·(L)			△			
X010	△-○	△	◎					△(Ep)			·			·(J)
X016	△-○	◎	△		△						·		·	
X019	○		◎		△						·-△			
X022	◎						○(ML)			·	·-△			
X024	◎	△-○	△-○		△									
X032	○	·-△	◎		△				·		·			·(Px)
Y016	○		◎(1M)								△			
Y022	○		◎(2M1+1M)							·	·			
Y030	○	◎			△						·			

1M	Type of muscovite which is less common and less crystalline than the $2M_1$-type
Al	Alunite
Am	Amphibole(mono clinic)
An	Analcite or wairakite
Ang	Anglesite – $PbSO_4$
Ba	Barite
Ch	Chabazite (zeolite)
Di	Dickite
Dol	Dolomite
Ep	Epistilbite (zeolite)

Ga	Galena
Go	Goethite
Gy	Gypsum
Ha	Halloysite
H	Heulandite group
J	Jarosite
L	Laumontite (zeolite)
Mo	Mordenite(zeolite)
ML	Mixed layer smectite-illite
Mh	Maghemite
Mt	Magnetite
Pa	Paragonite

Pr	Prehnite
Px	Pyroxene
Sm	Smectite
St	Stilbite(zeolite)
U	Unidentified clay – very poorly crystalline
Unid	Unidentified
V	Vermiculite
Z	Zeolite (too low in abundance for type to be identified)

◎: Dominant. Used for the component apparently most abundant, regardless of its probable
◎c: Co-dominant. Used for two (or more) predominating components, both or all of which are
◎: Sub-dominant. The next most abundant component(s) providing its percentage level is
△: Accessory. Components judged to be present between the levels of roughly 5 and 20%.
·: Trace. Components judged to be below about 5%.

Table 2-6 Results of Microscopic Observation of Polished Sections, Tempursari District

Sample	Ore minerals								Gangue minerals								
No.	Py	Cp	Sph	Asp	Au	Aca	Gn	Bar	others	si	ser	pl	kf	chl	epi	cal	others
T035	○	•								○		◎	△	△	○		tit(△)
T048		△							Hem(○)	△		◎		△		△	tit(△)
V030	○		•				•			◎				◎			apa(•)
V046							•		Mt(○)Ilm(△)	△		◎		△			cpx(○)
W016	○	△								○		○		○		○	tit(△)apa(•)
W021	△								Goe(△)	◎							kao(○)tit(△)
X008	○									○		◎		○			Ti(△)
X024	•	△							Goe(△)Hem(○)	◎	○			△			apa(•)Ti(•)
Y030	○									○		◎		○	△		

Py=pyrite,Cp=chalcopyrite,Asp=arsenopyrite, Gn=galena, Goe=goethite, Aca=acanthite, Ja=jarosite, Co=covellite
Sph=sphalerite, Bar=barite, Ang=anglesite, Au=gold, Hem=hematite, Mt=magnetite, Mel=melonite, Cas=cassiterite,Ili=ilme
si=SiO2 minerals, pl=plagioclase, chl=chlorite or clay minerals, epi=epidote, cal=calcite, kao=kaollinite, tit=titanite
kf=K-feldspar, se=sericite or muscovite, apa=apatite, Ti=TiO2 polymorph, mon=monazite, cpx=clinopyroxene,

◎=abundant, ○=common, △=small, • =rare

Table 2-7 Chemical Analysis Reuslts of Rock Samples, Tempursari District

Sample No.	UTM		Au	Ag	Cu	Pb	Zn	Mo	As	Hg	Sb
unit	North	East	ppm	ppm	%	%	%	%	%	ppm	ppm
u021	9092127	723044	0.002	<1	0.01	<0.01	0.01	<0.001	<0.01	0.03	8
W046	9090860	722462	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
V 046	9086548	722260	0.001	<1	0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
T035	9090750	721980	0.006	1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
X032	9088340	721880	0.006	1	0.01	<0.01	0.01	<0.001	<0.01	0.04	<5
Y030	9089385	721770	0.003	<1	<0.01	<0.01	0.01	<0.001	<0.01	0.01	5
Y020	9090450	721395	0.019	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	5
V 032	9090400	721370	0.012	<1	<0.01	<0.01	<0.01	0.001	<0.01	<0.01	6
V 033	9090400	721370	0.018	1	<0.01	<0.01	0.01	0.002	<0.01	0.01	5
V 030	9091155	721270	0.007	<1	0.01	0.01	0.01	<0.001	<0.01	<0.01	5
V 029	9091370	721210	0.001	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	<5
W023	9091640	720970	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.06	<5
W021	9092450	720910	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.14	5
u015	9091305	720210	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	8
X008	9086042	720070	0.002	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
u006	9085347	719948	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.03	<5
Y017	9092825	719920	0.022	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.02	6
X006	9085888	719847	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
T050	9089474	719375	0.164	1	0.04	<0.01	0.02	<0.001	<0.01	<0.01	<5
u011	9090971	719371	0.003	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	6
T049	9089475	719370	0.104	<1	0.04	<0.01	0.01	<0.001	<0.01	<0.01	<5
T048	9089473	719368	0.124	<1	0.11	<0.01	0.02	<0.001	<0.01	<0.01	5
T051	9089472	719363	0.103	1	0.05	<0.01	0.02	0.001	<0.01	<0.01	<5
T052	9089471	719358	0.043	<1	0.04	<0.01	0.02	<0.001	<0.01	<0.01	<5
X016	9089641	719303	0.019	1	0.03	<0.01	0.02	<0.001	<0.01	<0.01	<5
X024	9089450	719289	0.146	<1	0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
T020	9089360	719225	0.301	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
T022	9089250	719120	0.162	<1	0.09	<0.01	0.02	<0.001	<0.01	<0.01	5
T024	9089100	719040	0.005	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	5
W008	9086700	718950	0.003	<1	<0.01	<0.01	<0.01	0.001	<0.01	0.01	5
V 024	9089330	717925	0.002	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	8
V 015	9087942	717723	0.007	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	8
W016	9087352	716714	0.006	<1	0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5

Table 2-8 Statistic Data of Chemical Analysis Results of Soil Samples, Tempursari District

Element	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La
unit	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
Sample number	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
Average (Av)	0.005	0.12	6.88	6	5.22	153	0.38	1.5	0.43	0.26	22	5	**80**	5.86	12	**0.070**	0.02	10
Standard deviation (SD)	0.007	0.07	1.63	5	1.02	93	0.14	0.9	0.24	0.08	6	3	26	1.28	4	0.044	0.03	1
Av+SD	0.012	0.19	8.51	11	6.24	246	0.51	2.4	0.67	0.34	27	8	106	7.14	15	0.114	0.05	11
Av+2・SD	0.019	0.26	10.14	16	7.27	338	0.65	3.4	0.91	0.41	33	11	131	8.42	19	0.158	0.08	12
Av+3・SD	0.026	0.33	11.77	21	8.29	431	0.79	4.3	1.15	0.49	39	13	157	9.70	23	0.202	0.11	13
max	**0.100**	0.80	11.70	39	10.00	420	0.70	5.0	3.73	1.60	40	20	**154**	9.17	20	0.760	0.48	10

Element	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	U	V	W	Zn
unit	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
Sample number	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
Average (Av)	0.64	1,212	**0.59**	0.077	8	298	**9**	0.0683	1.07	14	57.4	0.30	5.4	5.0	190	5.0	**53**
Standard deviation (SD)	0.35	349	0.21	0.032	3	73	10	0.0254	0.30	5	29.4	0.09	1.3	0.0	52	0.0	17
Av+SD	0.99	1,561	0.80	0.108	11	371	19	0.0937	1.37	19	86.9	0.40	6.7	5.0	242	5.0	70
Av+2・SD	1.34	1,909	1.01	0.140	15	444	28	0.1191	1.68	24	116.3	0.49	8.0	5.0	294	5.0	87
Av+3・SD	1.69	2,258	1.23	0.171	18	518	38	0.1446	1.98	28	145.7	0.58	9.3	5.0	347	5.0	104
max	1.73	2,880	2.00	0.170	21	710	**158**	0.1600	4.00	28	246.0	0.51	10.0	5.0	317	5.0	140

Table 2-9 Correlation Coefficients between Elements in Soil Samples, Tempursari District

Element	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	V	Zn
Au	1.00	0.00	-0.02	-0.05	0.03	-0.08	0.04	-0.04	-0.02	-0.02	-0.02	0.02	-0.06	-0.01	-0.02	-0.03	-0.04	-0.03	-0.04	-0.03	0.31	-0.02	-0.03	-0.01	-0.01	0.07	0.09	-0.04	-0.01	-0.06	0.18	-0.02	-0.02
Ag		1.00	-0.04	0.12	-0.06	0.06	0.08	-0.11	-0.07	0.16	0.01	-0.01	0.02	-0.01	-0.06	-0.01	-0.02	0.05	-0.04	0.01	-0.05	-0.09	0.02	0.05	0.16	0.01	0.02	0.03	0.04	-0.01	-0.08	0.00	-0.01
Al			1.00	-0.06	0.27	0.21	0.19	-0.02	0.08	-0.22	0.67	0.37	0.76	0.68	0.62	-0.01	-0.01	0.21	0.68	0.36	-0.12	0.18	0.52	-0.11	-0.08	0.28	0.05	0.65	0.18	0.83	0.29	0.77	0.20
As				1.00	-0.20	0.25	0.10	-0.11	-0.18	0.13	-0.01	0.09	0.06	0.16	0.07	-0.08	-0.02	0.01	-0.05	0.07	-0.18	-0.34	0.03	0.03	0.11	-0.09	-0.11	0.20	0.05	-0.07	-0.28	0.08	0.02
B					1.00	-0.21	-0.05	-0.07	0.12	-0.02	0.15	0.07	0.21	0.10	0.10	-0.03	-0.09	0.04	0.24	-0.03	0.05	0.25	0.04	0.03	-0.08	0.22	0.10	0.06	-0.10	0.26	0.15	0.16	-0.11
Ba						1.00	0.28	0.05	-0.27	-0.06	0.44	0.42	0.34	0.56	0.28	-0.16	0.10	0.07	0.03	0.59	-0.17	-0.42	0.46	-0.23	0.13	-0.52	-0.07	0.55	0.61	0.07	-0.01	0.42	0.53
Be							1.00	-0.10	-0.40	-0.03	-0.04	-0.04	0.01	0.08	0.17	0.04	-0.06	0.14	-0.23	0.05	0.01	-0.37	-0.05	-0.16	0.00	0.12	-0.01	0.18	0.01	0.14	-0.01	0.02	0.00
Bi								1.00	0.07	-0.04	0.04	0.11	-0.03	-0.04	0.04	0.18	0.14	-0.06	-0.08	0.05	0.14	0.01	-0.01	0.04	0.17	-0.08	0.00	-0.09	0.09	-0.14	0.04	-0.05	0.13
Ca									1.00	-0.01	-0.10	-0.11	-0.06	-0.21	0.03	0.67	0.70	-0.24	0.18	-0.03	-0.03	0.49	-0.07	0.13	-0.06	-0.03	0.04	-0.24	0.27	-0.05	0.04	-0.12	-0.12
Cd										1.00	-0.04	0.02	-0.05	-0.18	-0.10	0.00	0.05	-0.28	-0.06	-0.16	-0.03	-0.07	-0.05	-0.05	0.06	-0.09	-0.02	-0.13	-0.03	-0.15	-0.02	-0.08	-0.01
Co											1.00	0.67	0.79	0.88	0.51	-0.31	-0.09	0.07	0.72	0.71	-0.19	-0.12	0.77	-0.29	-0.01	-0.19	-0.03	0.82	0.36	0.55	0.23	0.91	0.55
Cr												1.00	0.58	0.58	0.33	-0.24	-0.04	-0.08	0.44	0.42	-0.13	-0.15	0.76	-0.27	0.02	-0.29	-0.08	0.55	0.38	0.32	0.20	0.64	0.37
Cu													1.00	0.79	0.49	-0.22	-0.10	0.11	0.72	0.50	-0.20	-0.03	0.72	-0.19	-0.03	-0.05	-0.04	0.79	0.23	0.67	0.19	0.85	0.36
Fe														1.00	0.56	-0.33	-0.12	0.14	0.65	0.70	-0.18	-0.22	0.72	-0.20	0.01	-0.16	-0.01	0.90	0.35	0.59	0.17	0.92	0.47
Ga															1.00	0.05	0.13	0.01	0.42	0.34	-0.09	-0.10	0.43	-0.11	0.03	0.01	0.02	0.52	0.26	0.48	0.12	0.56	0.22
Hg																1.00	0.78	-0.18	-0.26	-0.16	0.06	0.07	-0.29	0.10	0.05	0.11	0.04	-0.29	0.13	-0.16	-0.07	-0.31	-0.26
K																	1.00	-0.32	-0.07	0.15	-0.02	-0.13	-0.04	-0.04	0.04	-0.29	-0.01	-0.09	0.43	-0.24	-0.01	-0.15	0.08
La																		1.00	-0.05	0.05	0.04	0.20	0.00	0.06	-0.01	0.32	0.04	0.07	-0.10	0.30	-0.01	0.15	-0.09
Mg																			1.00	0.42	-0.25	0.19	0.66	-0.13	-0.07	0.00	-0.02	0.62	0.11	0.62	0.25	0.77	0.36
Mn																				1.00	-0.20	-0.33	0.55	-0.23	0.05	-0.48	-0.01	0.71	0.48	0.15	0.13	0.61	0.69
Mo																					1.00	0.08	-0.24	0.08	-0.02	0.20	0.06	-0.25	-0.14	-0.08	0.01	-0.22	-0.22
Na																						1.00	-0.12	0.29	-0.15	0.47	0.13	-0.36	-0.11	0.32	0.09	-0.04	-0.32
Ni																							1.00	-0.21	-0.01	-0.28	-0.06	0.70	0.39	0.45	0.18	0.78	0.52
P																								1.00	0.03	0.33	0.02	-0.36	-0.21	-0.08	0.00	-0.25	-0.24
Pb																									1.00	-0.12	-0.06	0.00	0.09	-0.14	-0.07	-0.06	0.13
S																										1.00	0.04	-0.24	-0.55	0.46	-0.01	-0.03	-0.59
Sb																											1.00	-0.02	-0.02	0.03	-0.03	0.00	-0.03
Sc																												1.00	0.34	0.52	0.09	0.87	0.56
Sr																													1.00	0.00	0.08	0.31	0.42
Ti																														1.00	0.15	0.73	-0.03
Tl																															1.00	0.21	0.17
V																																1.00	0.44
Zn																																	1.00

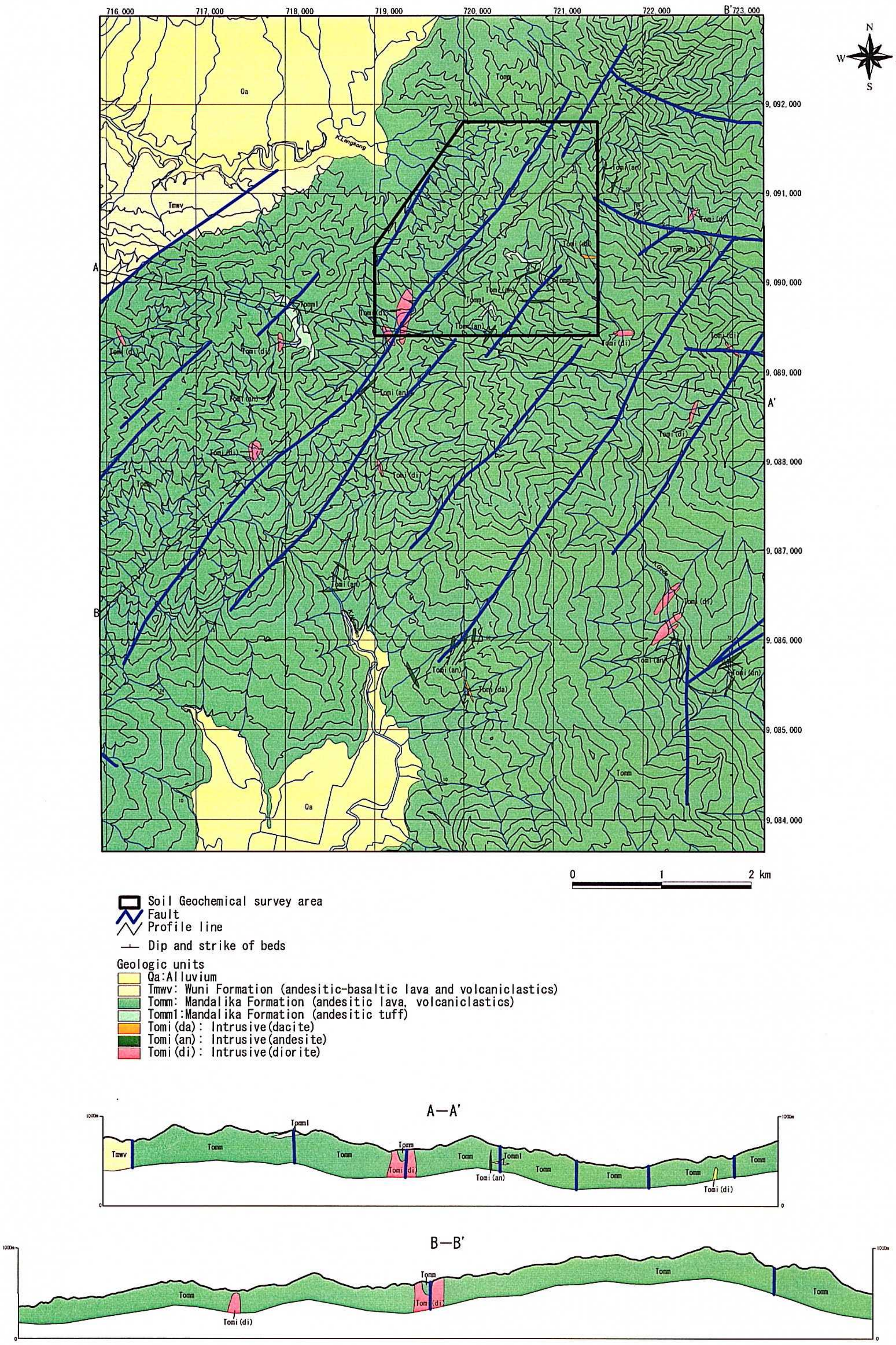


Fig.2-3 Geologic Map and Profiles of the Tempursari District

Fig.2-3 Geologic Map and Profiles
of the Tempursari District

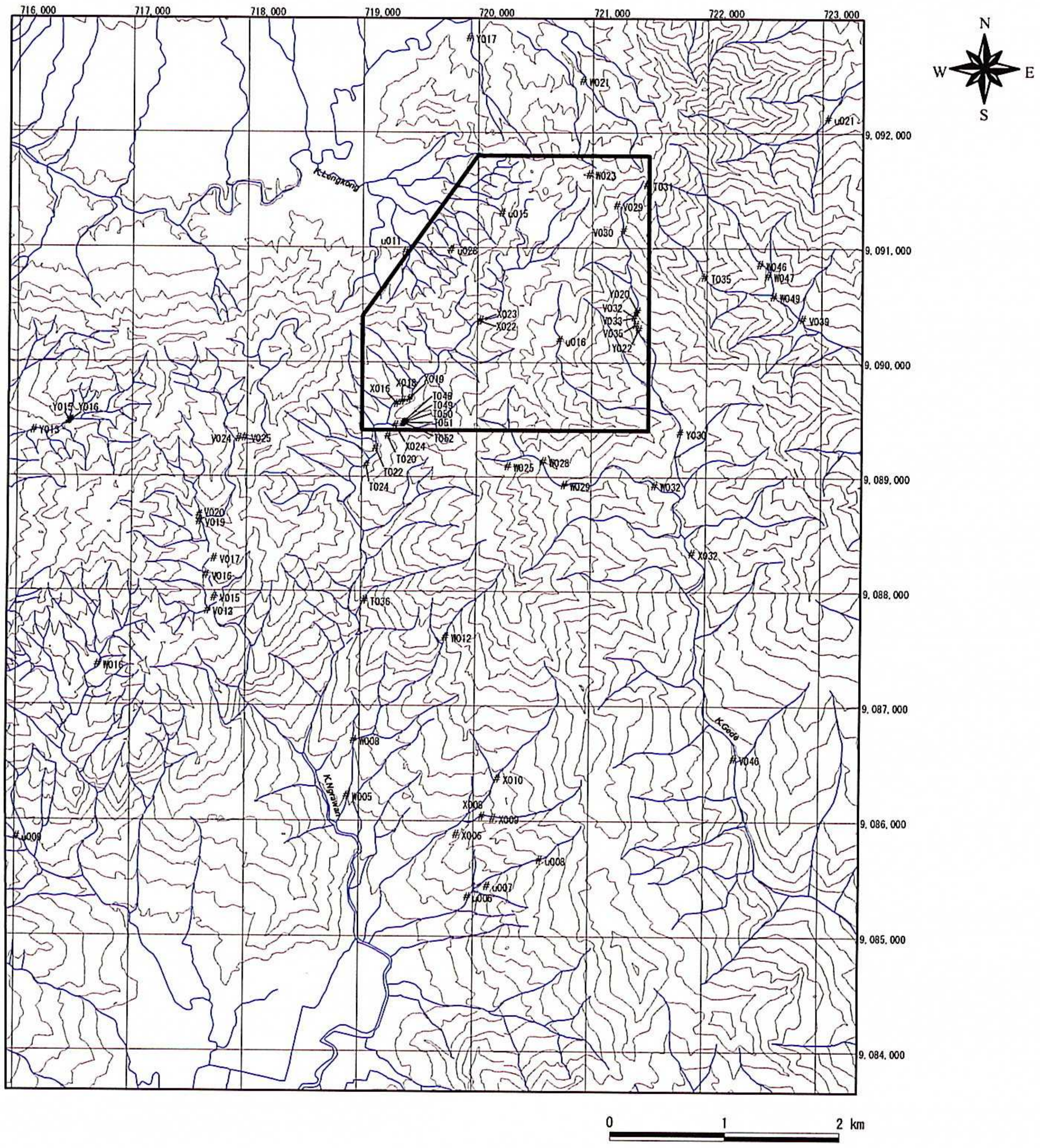


Fig.2-4 Location Map of Rock Samples in the Tempursari District

Fig.2-4 Location Map of Rock Samples in the Tempursari District

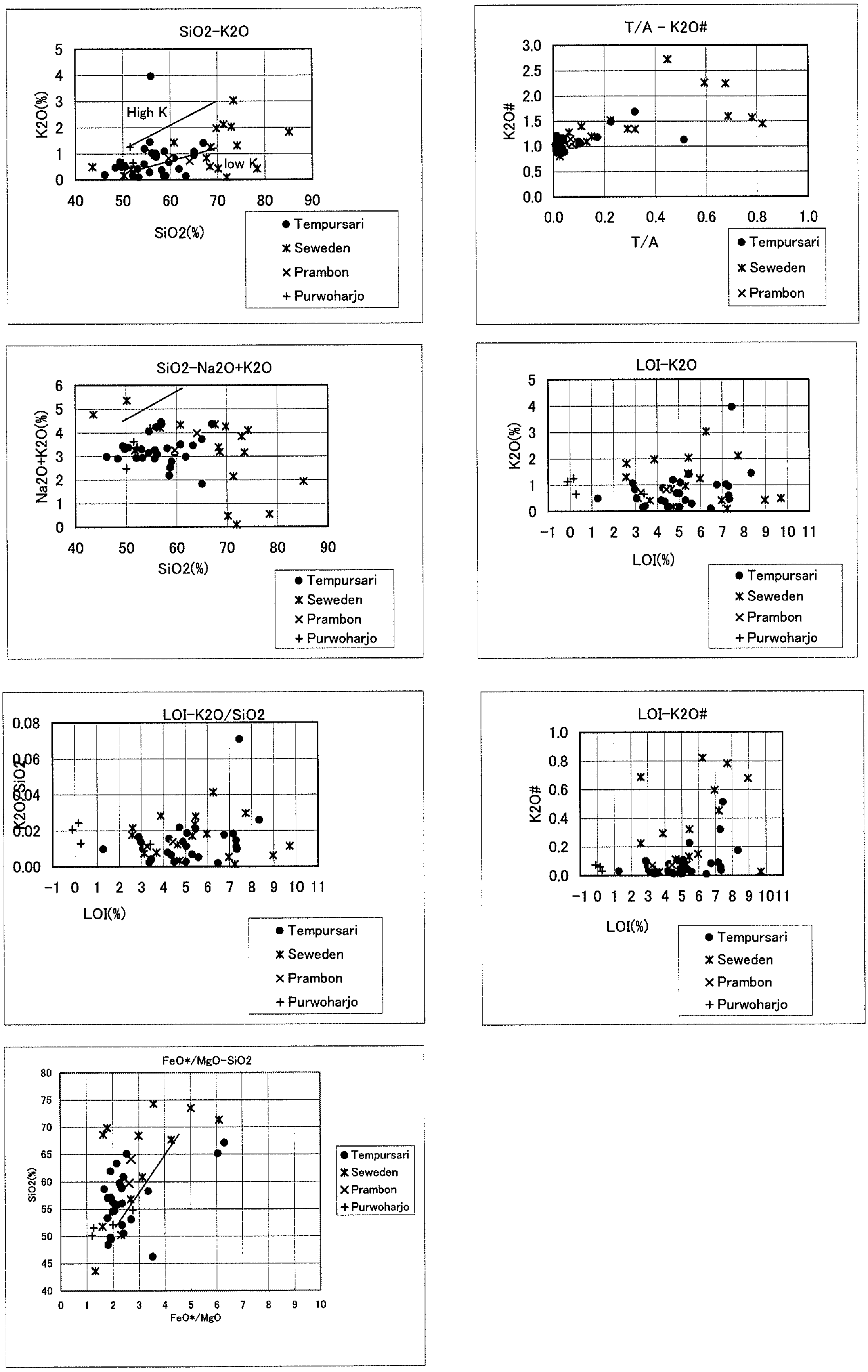
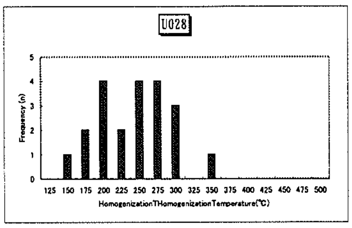
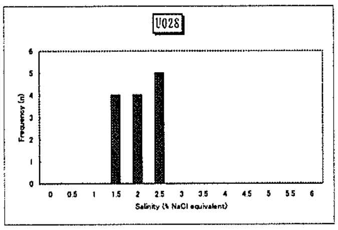


Fig. 2-5 Diagrams of Rock Forming Elements in Volcanic Rocks, Tempursari District

U028

number:	21
average	231 ℃
maximum:	328 ℃
minimum:	142 ℃
standard deviation	65 ℃

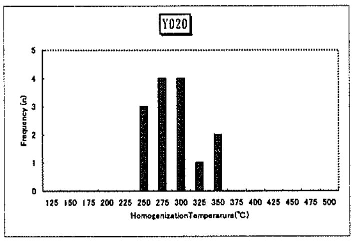


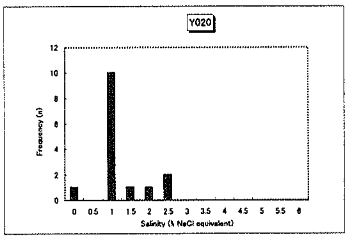


	13
	1.8 %
	5.4 %
	1.3 %
	1.1 %

Y020

number:	14
average	276 ℃
maximum:	337 ℃
minimum:	226 ℃
standard deviation	36 ℃

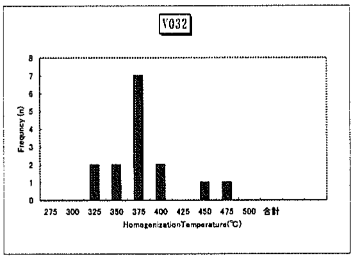


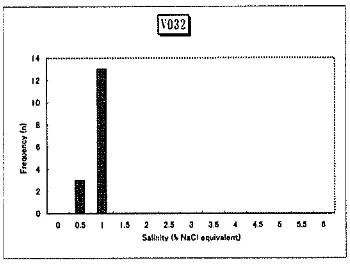


	15
	1.1 %
	2.5 %
	0.0 %
	0.6 %

V032

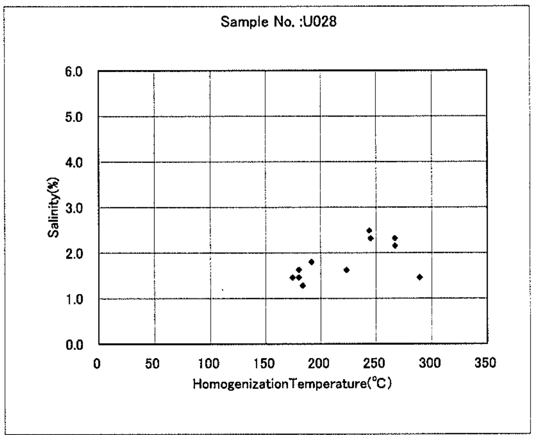
number:	15
average	220 ℃
maximum:	306 ℃
minimum:	163 ℃
standard deviation	39 ℃

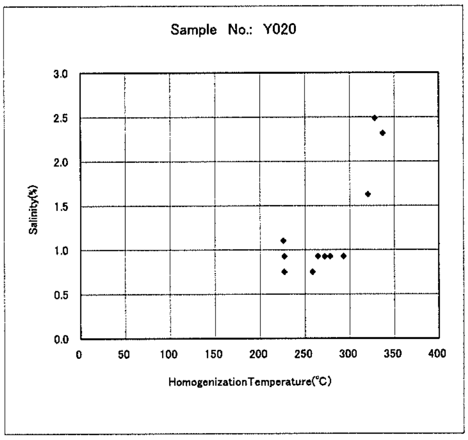




	16
	0.6 %
	0.9 %
	0.0 %
	0.3 %

Fig. 2-6 Homegenization Temperatures and Salinities of Fluid Inclusions, Tempursari District





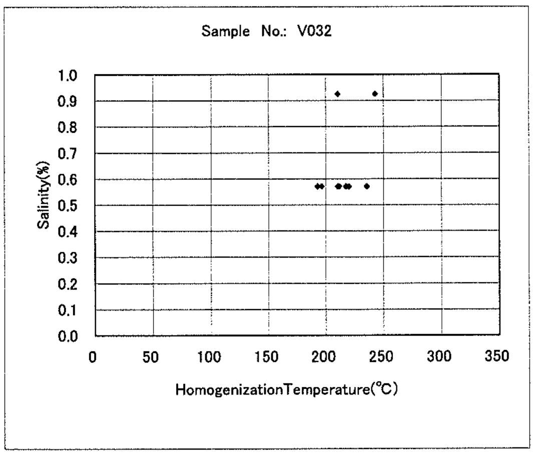


Fig. 2-7 Correlations between Temperatures and Salinities of Fluid Inclusions,Tempursari District

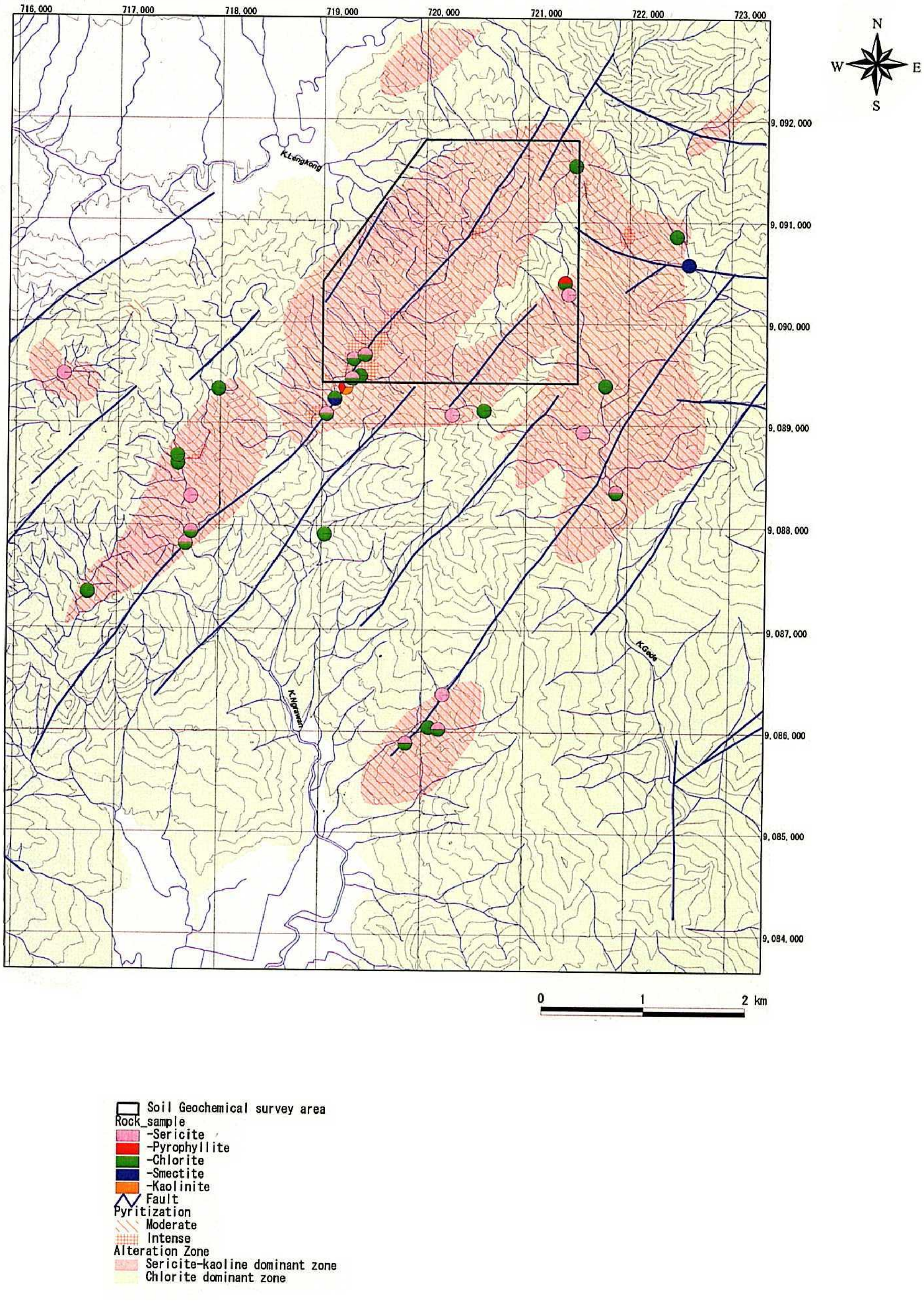


Fig.2-8 Mineralized and Alteration Zones of the Tempursari District

Fig.2-8 Mineralized and Alteration Zones of the Tempursari District

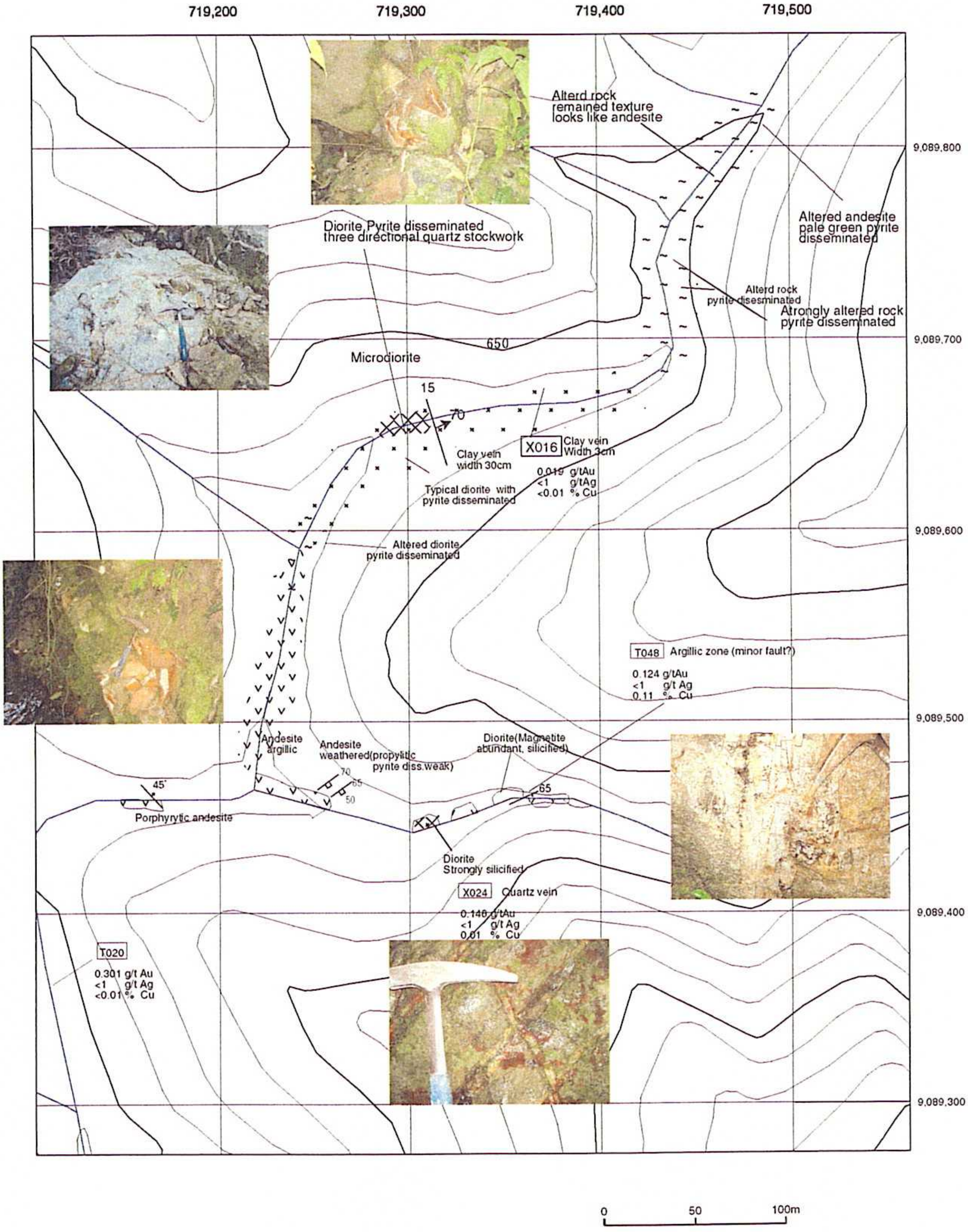


Fig.2-9 Mineralized zones in the Tempursari Disirict

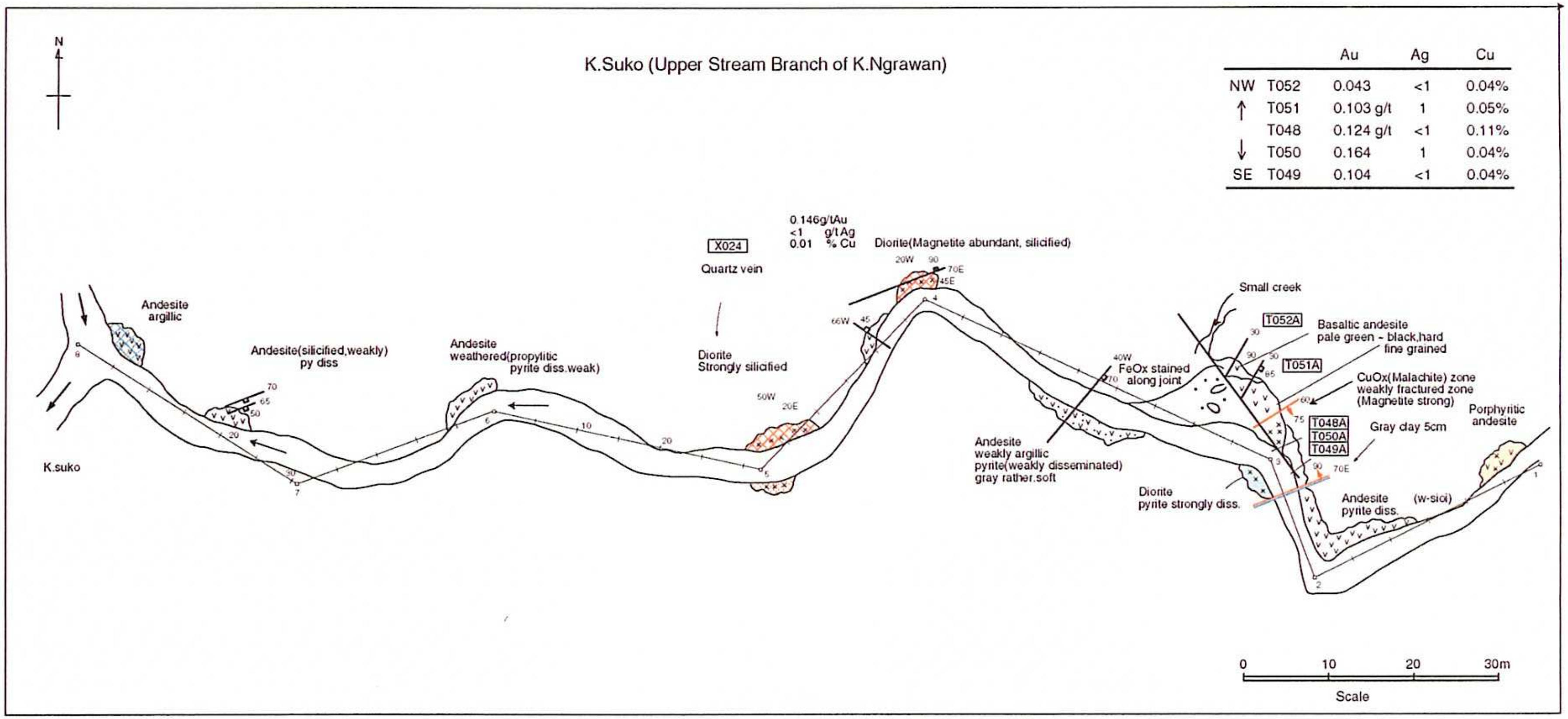
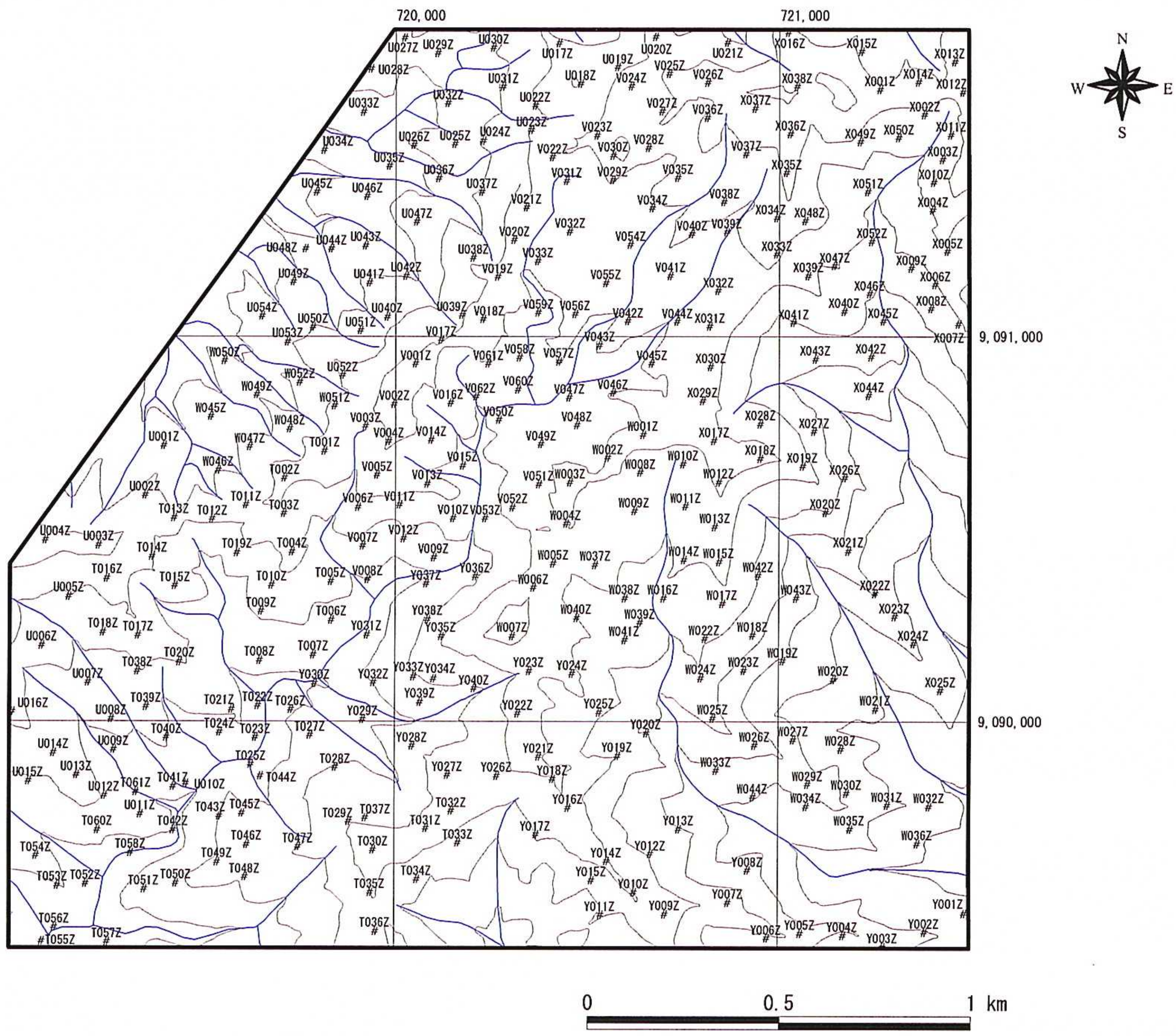


Fig.2-10 Sketch of the Mineralized zones along the K. Ngrawan in the Tempurusari District.



Soil Geochemical survey area
Soil Sample Location

Fig.2-11 Location Map of Soil Samples : Tempursari District

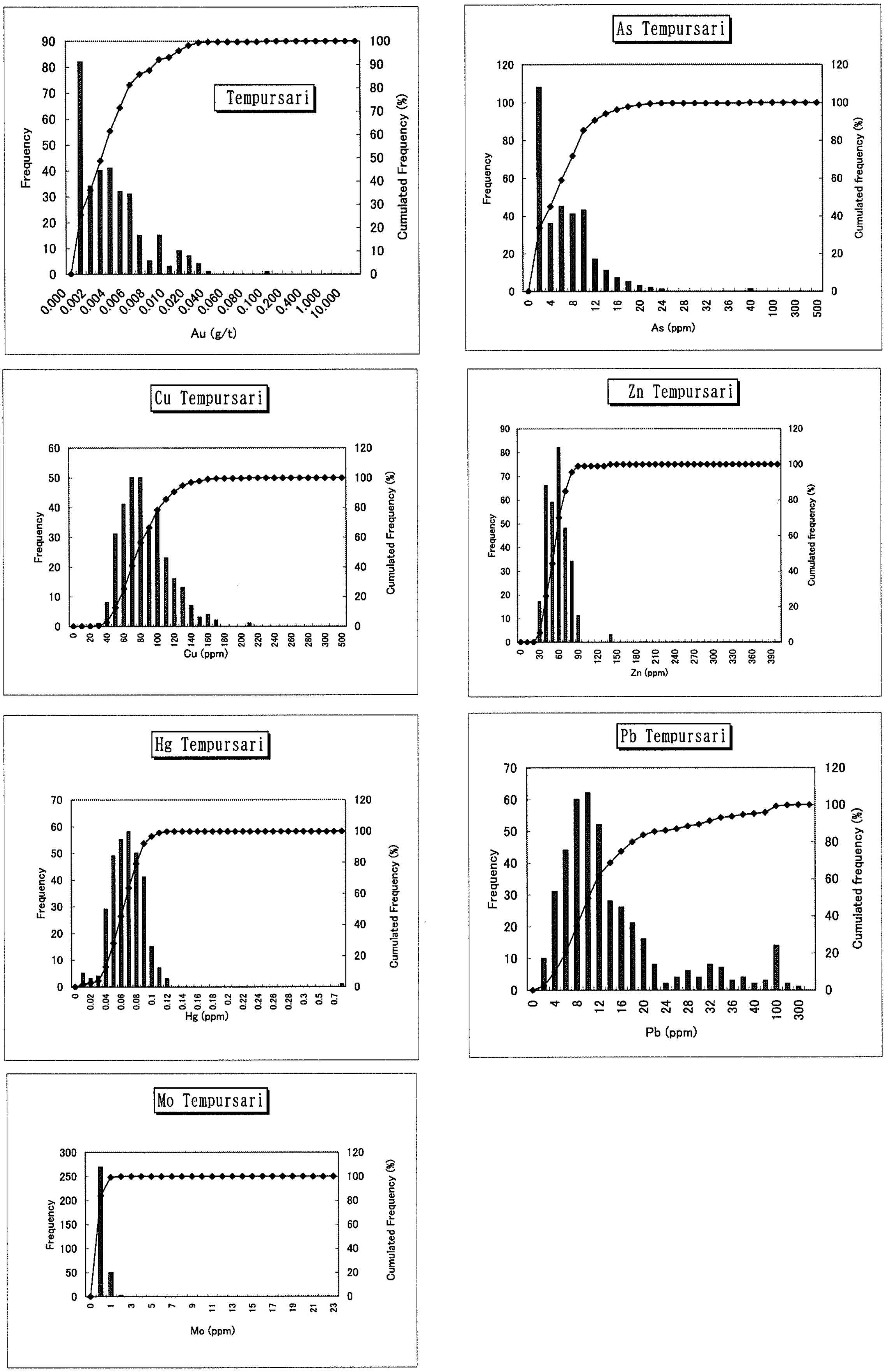


Fig. 2-12 Histograms of Chemical Analysis Data of Soil Samples, Tempursari District

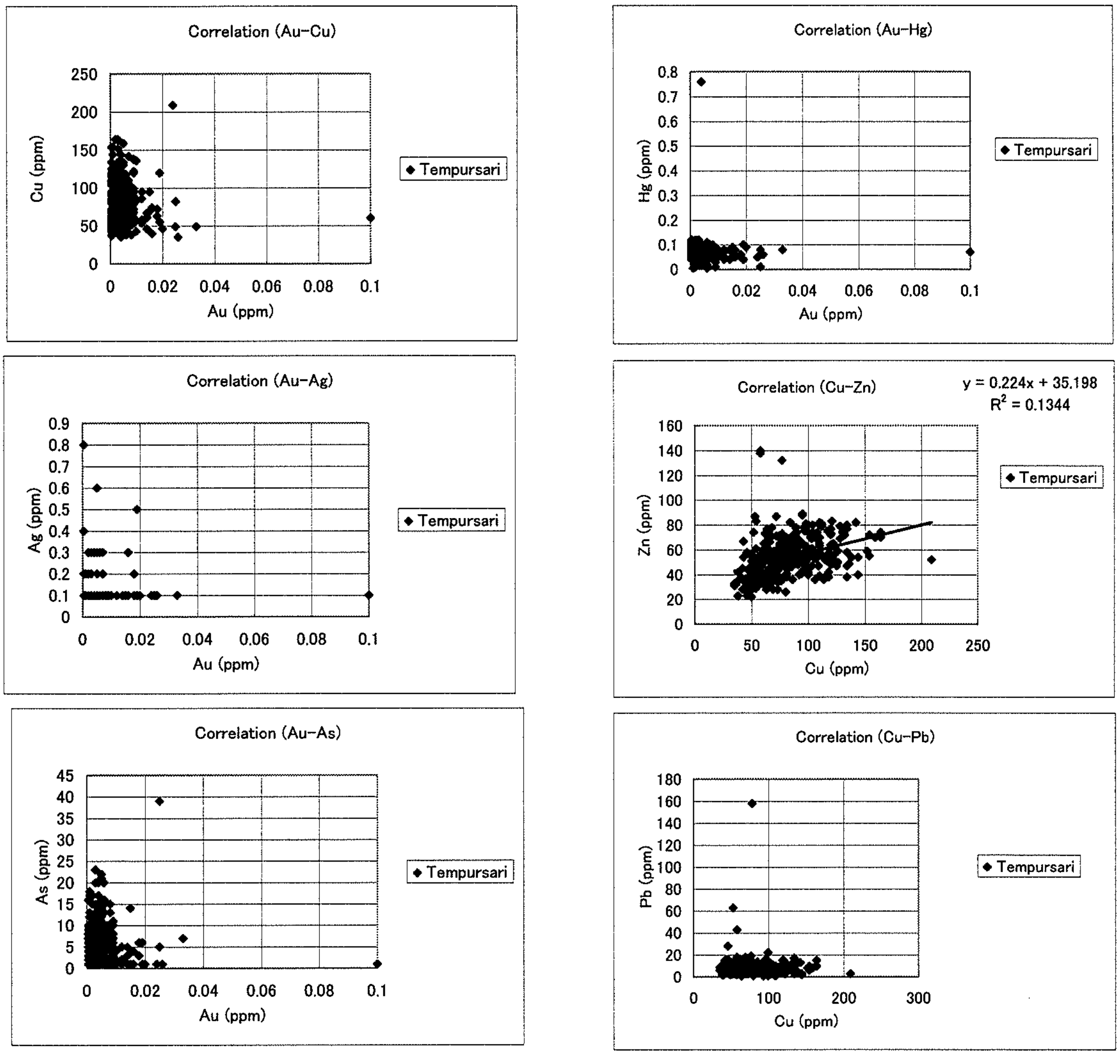


Fig.2-13 Correlations between Elements in Soil Samples in the Tempursari District

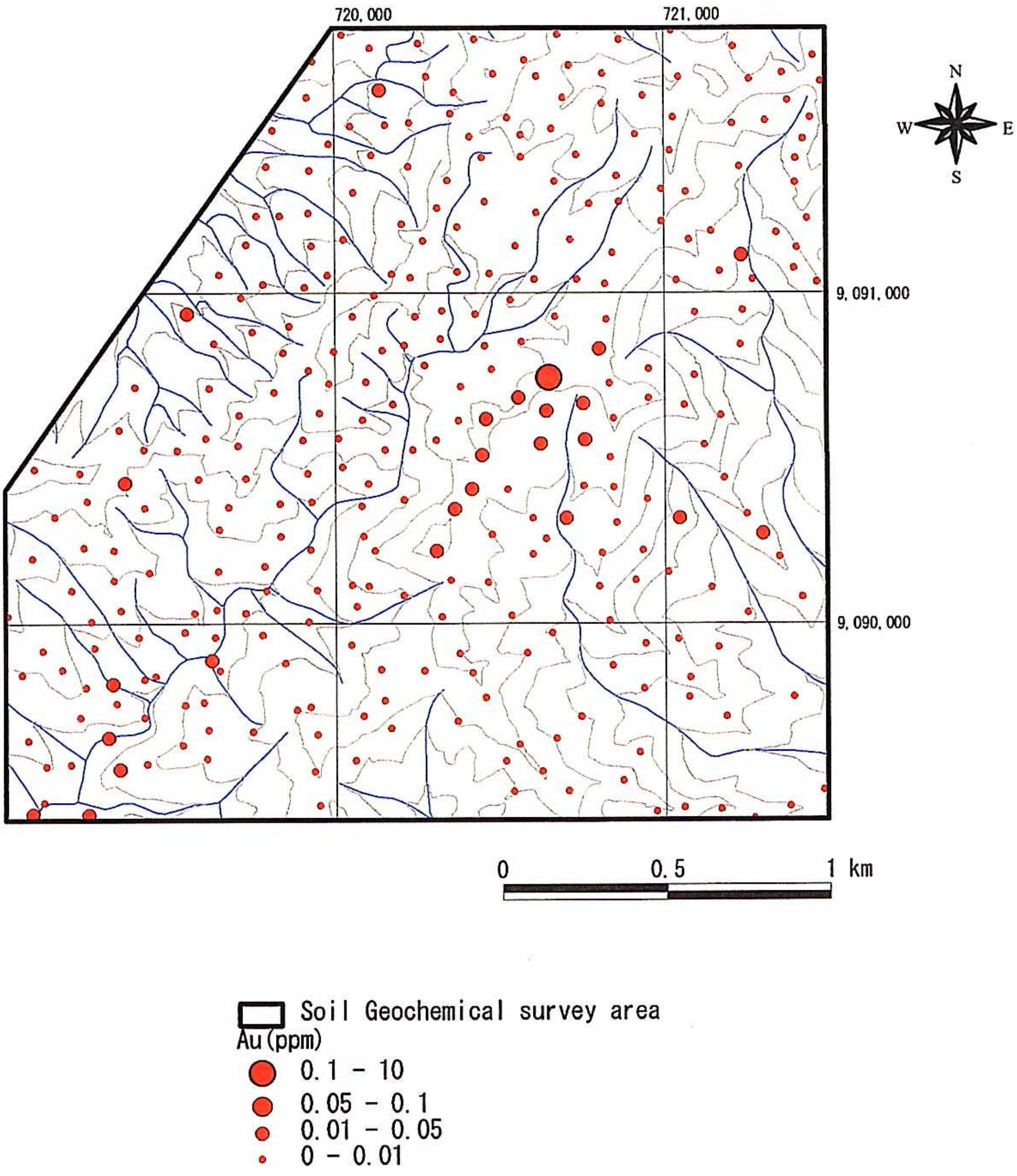


Fig.2-14 Geochemical Anomaly of Soil Samples in the Tempursari District (Au)

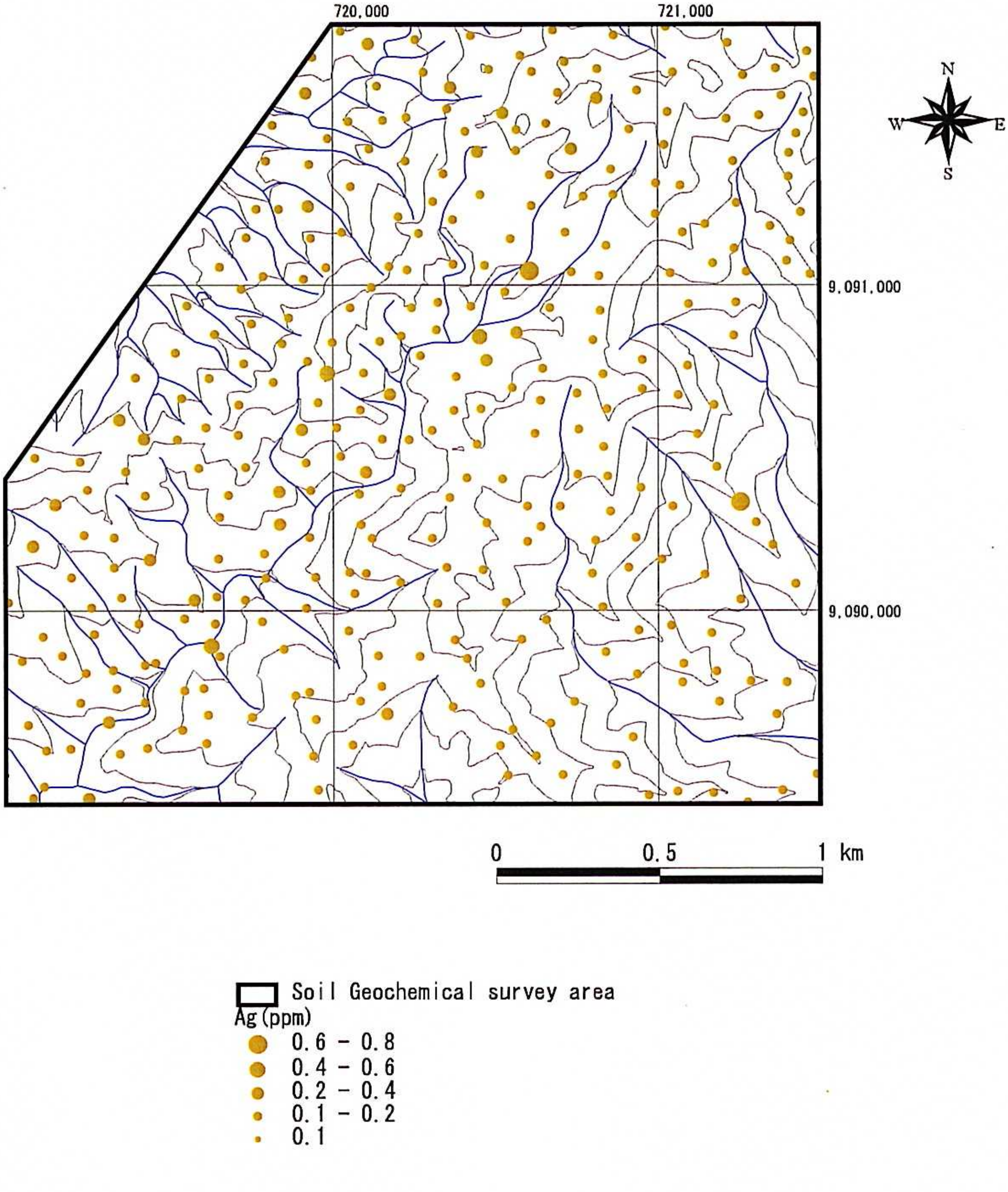


Fig.2-15 Geochemical Anomaly of Soil Samples in the Tempursari District (Ag)

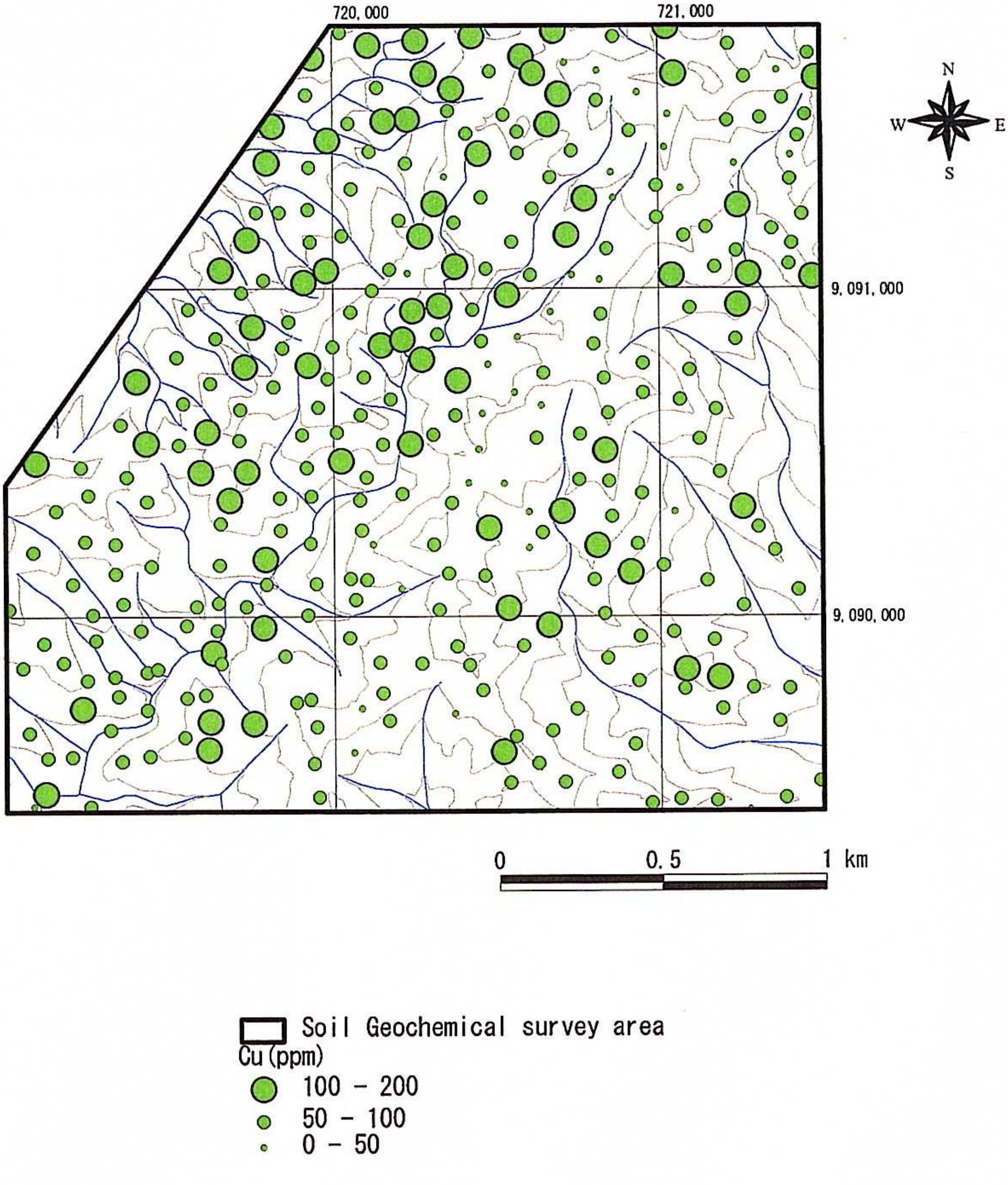


Fig.2-16 Geochemical Anomaly of Soil Samples in the Tempursari District (Cu)

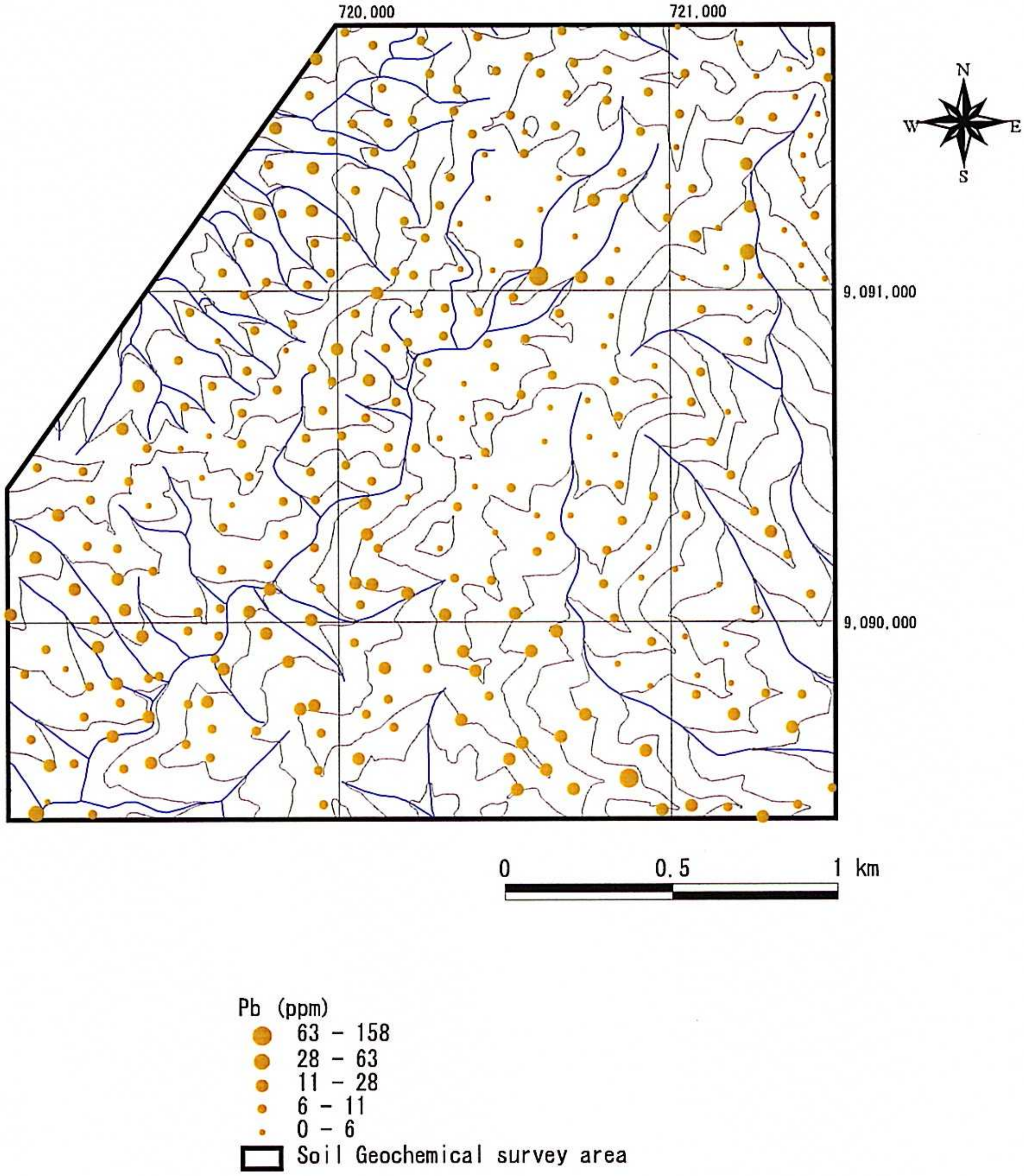
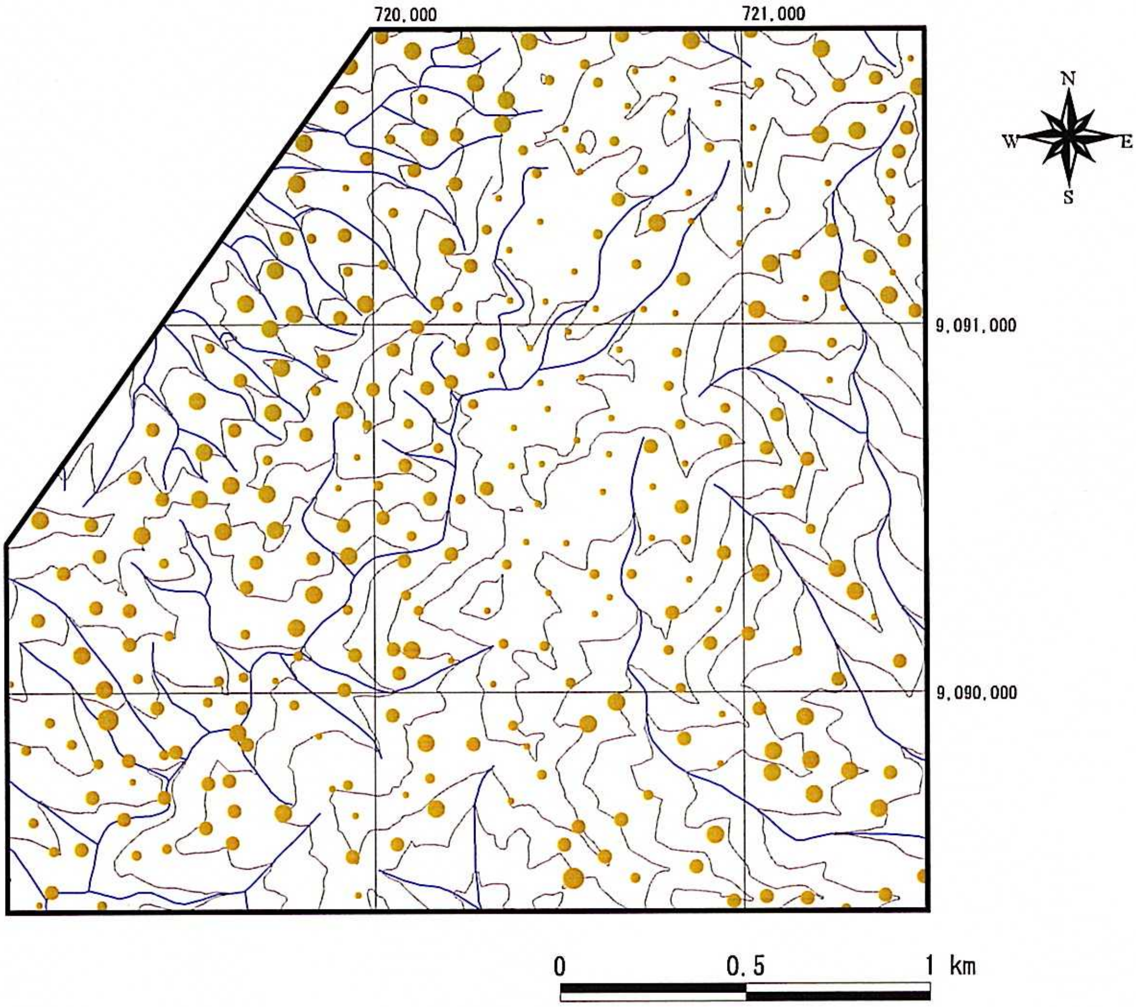


Fig.2-17 Geochemical Anomaly of Soil Samples in the Tempursari District (Pb)



Soil Geochemical survey area

Zn (ppm)

- 89 - 140
- 67 - 88
- 52 - 66
- 40 - 51
- 22 - 39

Fig.2-18 Geochemical Anomaly of Soil Samples in the Tempursari District (Zn)

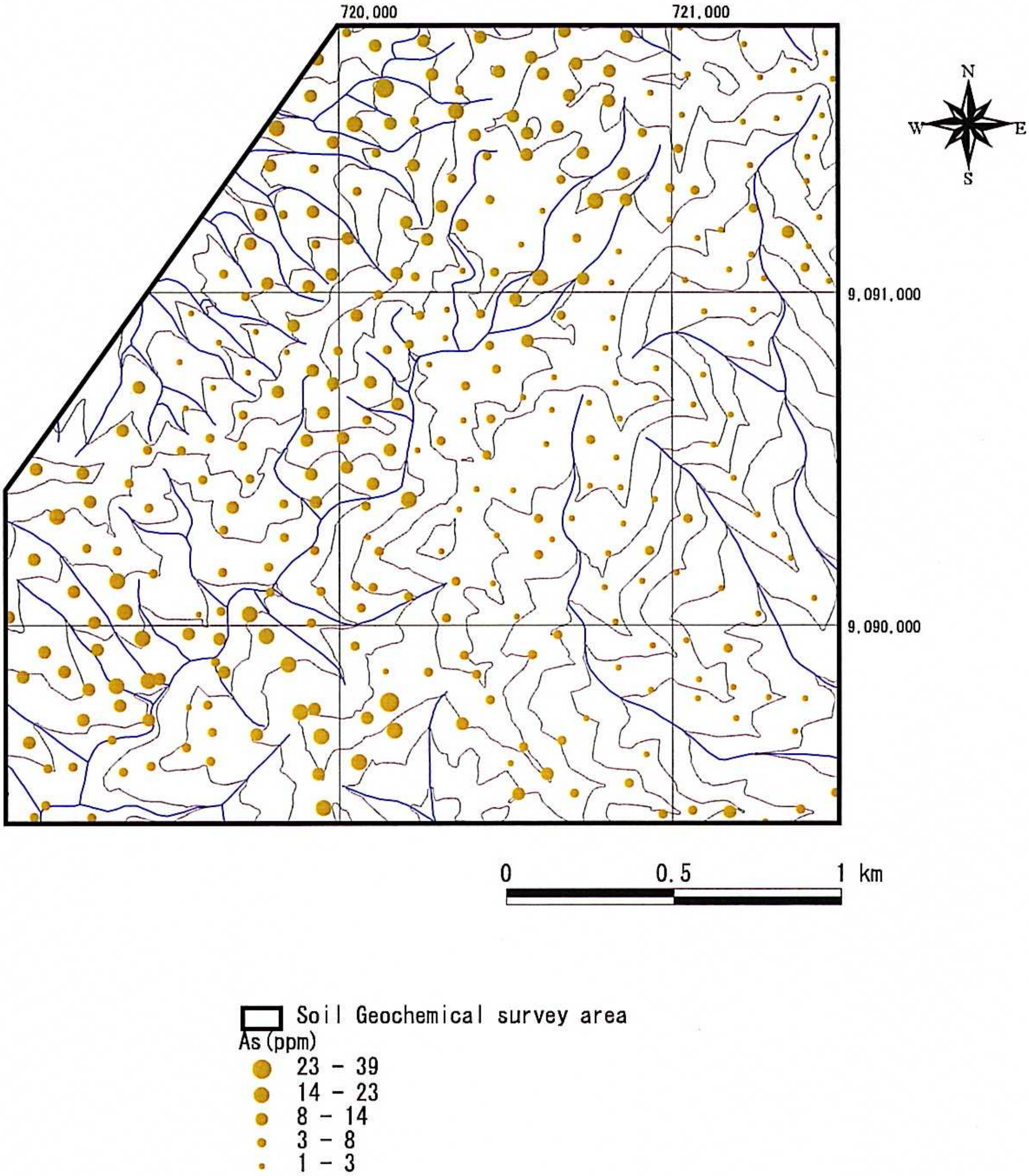


Fig.2-19 Geochemical Anomaly of Soil Samples in the Tempursari District (As)

Chapter 3 Results of the Survey

1-3 Purwoharjo District

1-3-1 Outline of Geological Survey

The Purwoharjo district was selected for the geological survey based on the phase 2 geochemical survey results and it showed that Cu values in soil samples were higher than in other area. The area is underlain by the Wuni Formation. Therefore, it is suspected that the bedrocks contained high Cu values without copper mineralization. It was recommended to investigate to reveal the source of Cu by cursor field traversing.

The area extent of geological survey was 70 kme2. The base camp is set up at Turen, later at Pronojiwo. As a result of traversing, no mineralization is encountered. Consequently, no geochemical survey was conducted. A total of 9 samples for thin sections, 11 samples for chemical analysis, 4 samples for whole rock analysis were taken during the field traversing. No samples are taken for polished section, fluid inclusion study and X-ray diffractometry.

1-3-2 Results of Geological Survey

(1) Geology
The geology of the district is comprised of Tertiary through Quaternary volcanic-products with intercalated thin limestones and conglomeratic rocks. Tertiary system consists mainly of Miocene andesitic lava and volcaniclastics of the Wuni Formation, while andesitic rocks of the Mandalika Formation cropped out in the eastern part of the district. Dacitic to rhyolitic volcanic rocks, which is correlated to the upper part of the Wuni Formation, are overlain in the western part of the district. Quaternary volcanic rocks are underlain in the northwestern part of the district.

(a) Mandalika Formation (Tomm)
Distribution: Distributed only in the southeastern part of the district and along the Coban.
Composition: Composed of andesitic (Tomma) volcaniclastic rocks. Generally massive volcaniclastic rocks without bedding are abundant and stratigraphy. The volcanic and volcaniclastic rocks of the formation are characterized by wide propylitization.
Stratigraphy and correlation: This formation is covered by Wuni Formation in the southeastern part of the district, and correlated to Mandalika Formation of the Lumajang and the Turen Quadrangle sheets.
Thickness: More than 500m in the adjacent Tempursari district.

[Thin section observation: Basalt (u010)]

The specimen is a porphyritic volcanic. Phenocrysts are abundant plagioclase, augite and an altered mafic. Plagioclase forms blocky to tabular grains of highly calcic composition, with cores of bytownite (An75) with oscillatory zoning, and narrow rims of labradorite (An57). Mafic minerals form phenocrystic aggregates. Augite is preserved, but another mineral is completely replaced and identified as amphibole based on characteristic morphology. Phenocrysts show poor flow alignment.

The groundmass is composed of plagioclase, altered mafic minerals, magnetite, and intergranular alteration products. Plagioclase forms lathy grains around 0.1mm in length.

Alteration is weak, to a high birefringent clay (smectite/chlorite?), chlorite and calcite. Former amphibole is pseudomorphed by smectite/chlorite, with minor chlorite and calcite. Augite is weakly altered to calcite and minor smectite/chlorite. Alteration minerals pervade the groundmass.

(b) Wuni Formation (Tmwv, Tmwt, Tmwt2)

Distribution: This formation is distributed widely in the district.

Composition: This unit is composed of basaltic to andesitic volcaniclastic rocks. The volcanic breccia and tuff breccia are dominant. The volcaniclastic materials have not unaltered and show grayish color. The outcrops show rough surface with angular fragments.

Stratigraphy and correlation: This contacts with the Wuni Formation, and is believed to be underlain by the Mandalika Formation.

Thickness: More than 500m.

[Thin section observation: Basalt (X024)]

The sample is a virtually unaltered, porphyritic, basic volcanic rock. Phenocrysts are plagioclase, augite and olivine. Plagioclase forms blocky to tabular grains and aggregates about 0.5-3mm in length. Composition is calcic, bytownite An75, with rims of labradorite. Augite is of similar grain size. Olivine is finer grained, about 0.2-0.5mm in size.

The groundmass is composed of plagioclase microlites about 0.1mm in length, abundant granular augite, magnetite, and minor olivine. Dark brown glass lies in the interstices of mineral grains. There is no preferred orientation of feldspar grains.

(c) Quaternary volcanic and volcaniclastic rocks (Qv)

Distribution: This formation is distributed in the northern part of the district and along the major rivers.

Composition: This unit is composed of basaltic to andesitic volcaniclastic rocks. The volcanic breccia and tuff breccia are dominant. The volcaniclastic materials have not unaltered and show grayish-black color. This formation contains lahar deposits and volcanic conglomeratic beds dipping 10-30 degrees. The volcanic conglomerate contains pebbles of volcanic rocks of the Mandalika Formation.

Stratigraphy and correlation: This covers the Wuni Formation with unconformity.

Unaltered basaltic lava and volcanic breccia -conglomerate distributed in the northwestern part is correlated to Quaternary, while exiting data correlates part of the rocks to the Wuni Formation.

Thickness: It appears the maximum thickness is more than 500m along the Coban River.

[Thin section observation: Basalt-microdiorite (u024)]

The sample is a basic igneous rock with a fine-grained, inequigranular or porphyritic texture. The main primary constituents are calcic plagioclase, augite and olivine. Plagioclase grains 1-3mm in length, and slightly finer olivine and augite, form scattered phenocrysts. The groundmass is composed of plagioclase laths averaging 0.5mm in length, with abundant intergranular augite and fine magnetite. Plagioclase is calcic and zoned, with cores of bytownite (An75) zoned to rims of labradorite (~ An 60). There is weak flow alignment of phenocrysts and groundmass plagioclase.

Alteration is minor. Olivine is weakly altered to red-brown iddingsite.

(d) Intrusive rocks: Basaltic dyke intruded into the Quaternary volcanic conglomerate along the Coban River. A small outcrop of Mandalika Formation underwent propylitic alteration, which may be an intrusive body.

(2) Geologic Structure

Northeast-southwest trending faults in the eastern part of the district control the distribution of the Mandalika Formation and the Wuni Formation. The north-south trending fault is assumed along the Glidik River. A northwest-southeast to east-west trending fault appears to cross the Coban River. Narrow quaternary basaltic dykes runs in the east-west direction.

(3) Mineralization

No mineralization occurs in the district. The geochemical anomalies of copper in the district may be due to the high background value of Wuni Formation or may be deprived from the pebbles of Mandalika Formation contained in the Quaternary volcanic conglomerates.

1-3-3 Results of Geochemical Survey

Geochemical survey was not conducted in the Purwoharjo district due to the above-mentioned reason.

1-3-4 Mineral Potential

No significant mineralization was expected to occur in the Purwoharjo district. It is estimated the Cu content in the rock of Wuni Formation. The unmineralized rocks of Mandalika Formation in the Seweden District show Cu content less than 0.01% Cu, while Cu content in most of the samples in the Purwoharjo district is 0.01-0,02% Cu. Therefore, the Cu anomalous values in stream sediments taken during phase 2 geochemical surveys are thought to be mainly due to the Cu contents in Wuni Formation. Therefore, it is concluded that the mineral potential of the Purwoharjo district is low, based on the mineralization on the surface has not been encountered during field traversing during the survey.

Table 2-10 Rusults of Microscopic Observation of Thin Sections, Purwoharjo District

Sampl	Rock type	Texture	Phenocrysts								Groundmass								Alteration minerals												
No.			pl	kf	q	ol	opx	cpx	hb	bi	pl	kf	q	opx	cpx	ol	bi	mt	q	ab	kf	ep	ac	bi	ch	se	sm	k	ca	ti	ru
U009	basalt	porphyritic, holocrystalline	○					△			○								△							×	△				
U010	basalt	porphyritic, holocrystalline	◎					△	?		×							△							×		△		×		
U024	microdiorite	inequigranular/porphyritic	◎			△		○										×									×				
U026	basalt	porphyritic, holocrystalline	○			・	×				○			△				△													
V003	tuff	vitric-crystal																								?		?			
X001	basalt	sparsely porphyritic	×								◎				△			×									○				
X004	basalt	porphyritic, vesicular	○			△	△				○				○	△		△									・				

ol:olivine, cpx:clino-pyroxene, opx:ortho-pyroxene, op:opaque mineral, hb:hornblende, bio:biotite

kf:potash-feldspar, qz:quartz, ap:apatite, frag:fragment,leu:leucoxene, ser:sericite, kao:kaolin, cal:calcite, sm:smectite, ep:epidote

chl:chlorite, zeo:zeolite, pl:plagioclase, pre:prehnite, ill: illite, zr: zircon

Amount:◎>○>△>・>×

Table 2-11 Results of Whole Rock Analysis, Purwoharjo District

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	Cr_2O_3	TiO_2	MnO	P_2O_5	SrO	BaO	LOI	Total	K_2O#	T/A
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)		
U010	52.10	19.01	8.59	7.85	3.85	2.73	0.64	<0.01	1.02	0.17	0.19	0.05	0.01	3.40	99.61	0.04	0.91
U024	51.54	16.03	10.46	9.01	7.45	2.37	1.25	0.04	0.97	0.18	0.23	0.04	0.08	0.17	99.81	0.06	0.75
U026	54.77	20.61	7.66	8.61	2.49	3.06	1.13	<0.01	0.79	0.16	0.19	0.05	0.06	-0.11	99.48	0.07	0.91
X004	50.08	15.15	11.39	10.94	8.52	1.82	0.65	0.06	0.69	0.20	0.09	0.02	0.06	0.28	99.95	0.03	0.70

Table 2-12 Chemical Analysis Results of Rock Samples, Purwoharjo District

Sample No.	UTM		Au	Ag	Cu	Pb	Zn	Mo	As	Hg	Sb
unit	North	East	ppm	ppm	%	%	%	%	%	ppm	ppm
X015	9088801	715170	<0.001	<1	0.02	<0.01	<0.01	<0.001	<0.01	<0.01	<5
T045	9089400	713550	0.005	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
T028	9086992	713512	0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	7
T007	9084922	709118	0.001	1	0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
u004	9087183	706109	<0.001	1	0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
X004	9088895	705930	0.004	<1	0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
T003	9085482	704705	0.002	<1	0.02	<0.01	0.01	<0.001	<0.01	<0.01	<5
V 006	9087242	704158	0.007	1	0.02	<0.01	0.01	0.001	<0.01	<0.01	9
T005	9082460	702498	<0.001	<1	0.01	<0.01	0.01	<0.001	<0.01	<0.01	5
u001	9084236	702301	0.001	<1	0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
u003	9084065	701058	0.001	1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5

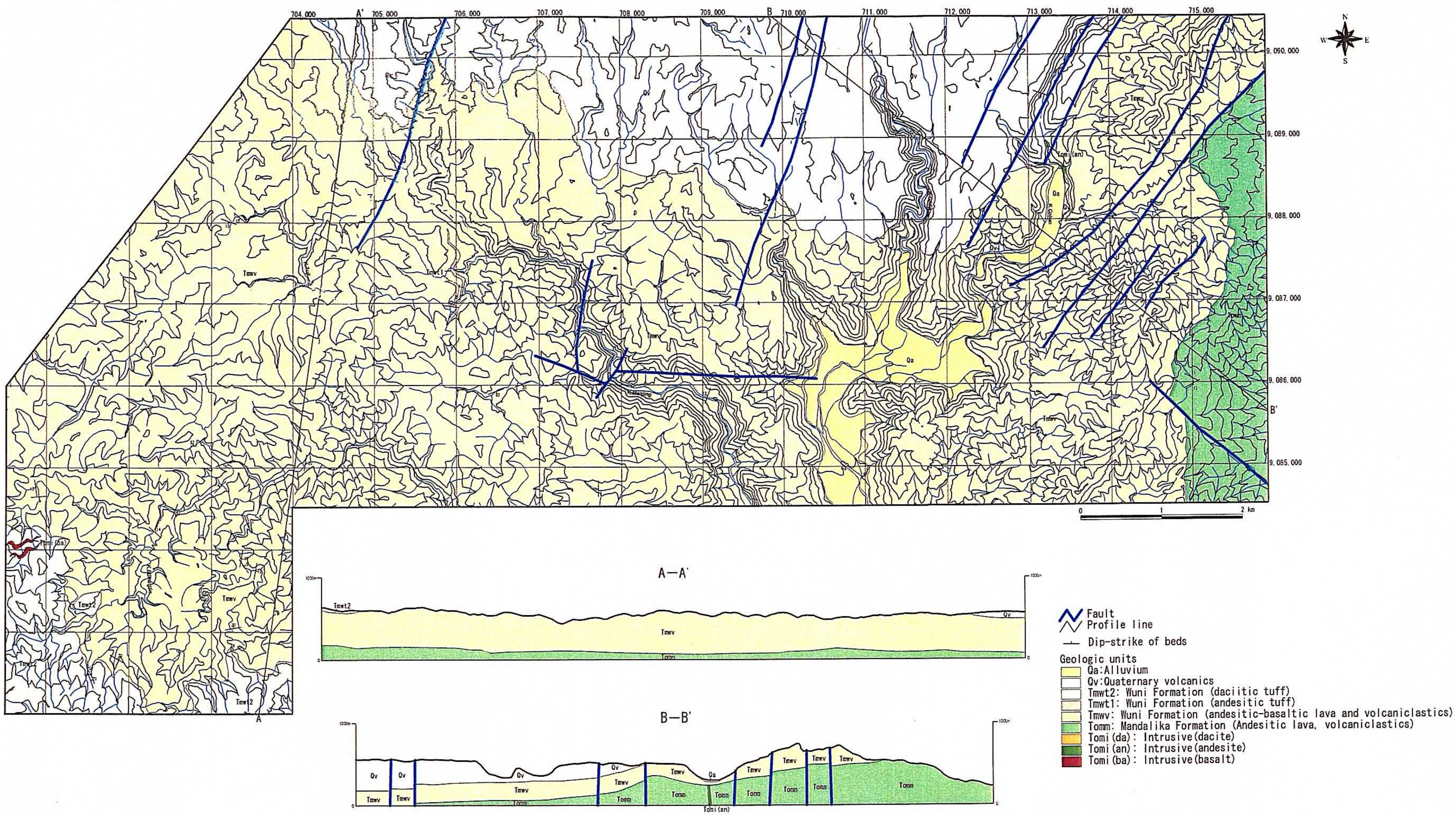


Fig.2-20 Geologic Map and Profiles of the Purwoharjo District

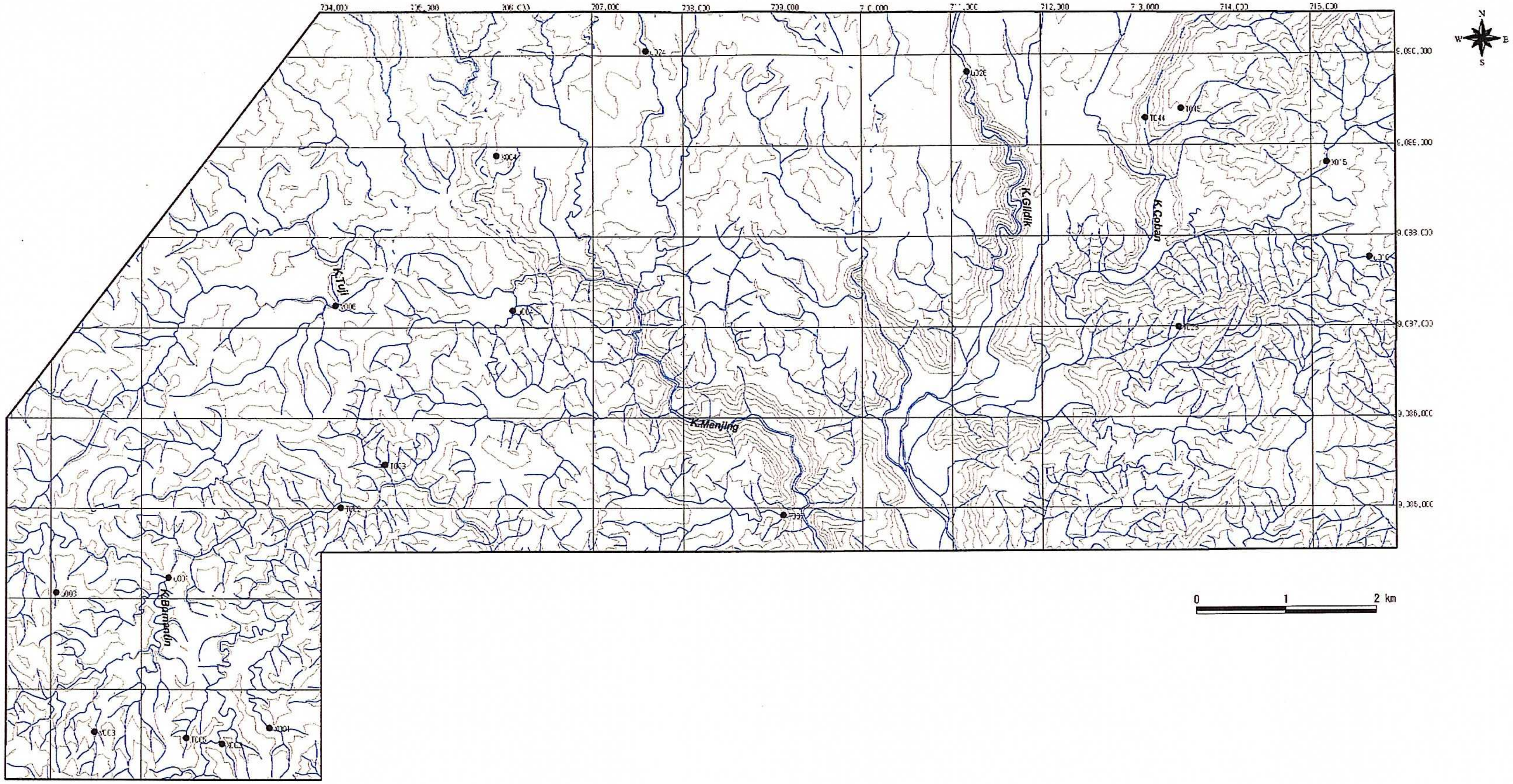


Fig.2-21 Location Map of Rock Samples in the Purwoharjo District

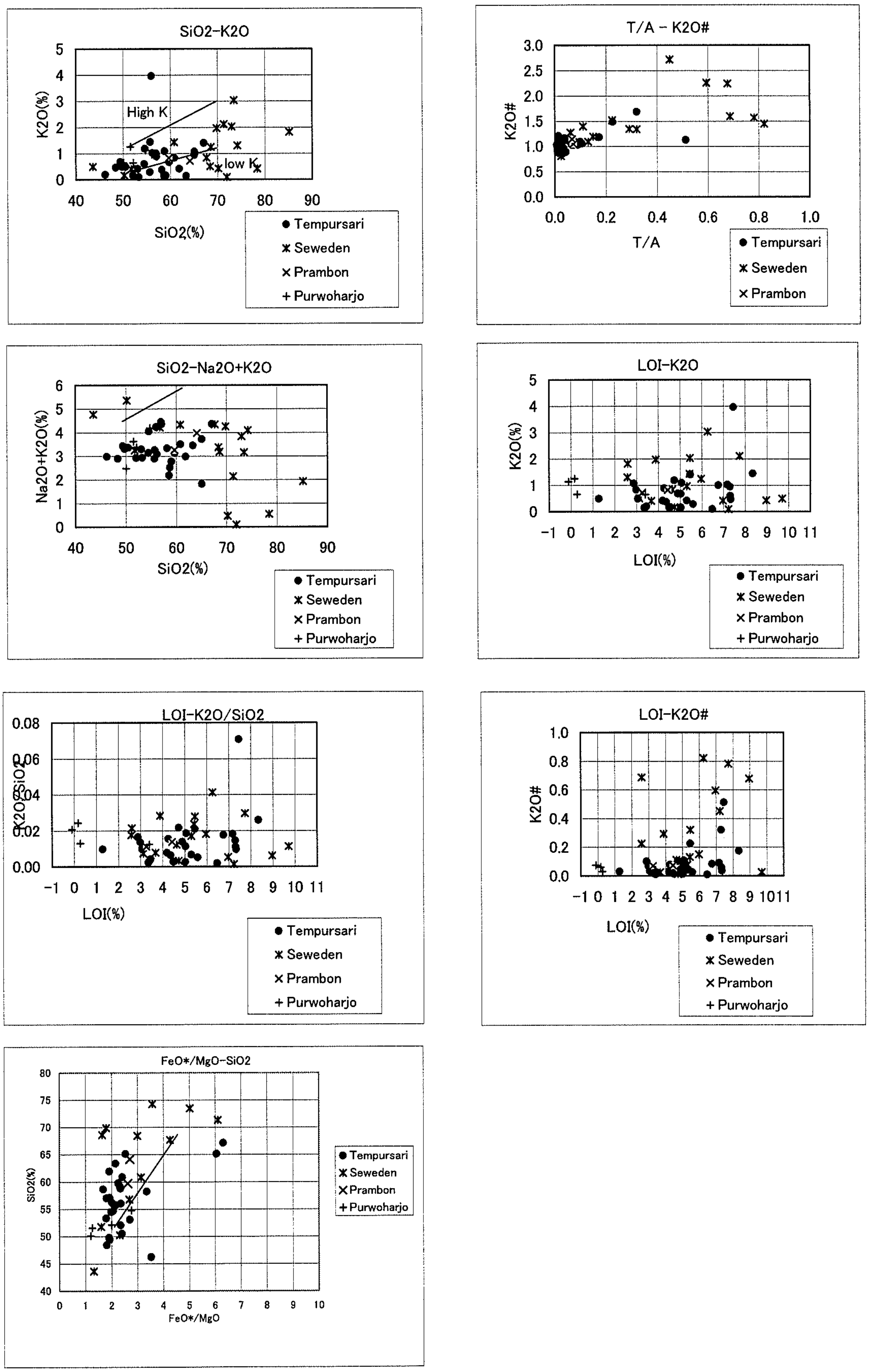


Fig. 2-22 Diagrams of Rock Forming Elements in Volcanic Rocks, Purwoharjo District

Chapter 4 Evaluation

1-4 Seweden

1-4-1 Method of Survey

Seweden district was selected for geological survey based on gold geochemical anomalies and a narrow quartz vein with maximum grade of 2.8%Cu in silicification and argillic alteration zone during the phase 2 geochemical survey. Also chalcopyrite grains were found in the pan concentrates. Consequently, copper mineral potential was expected to be high.

The area extent of geological survey is 90 km^2 and a traversed length is about 126 km. Topographic maps at a scale of 1:10, 000 were used for base maps. The base camp is set up in the city of Blitar. The survey area is reached within one hour from the base camp by car. The topography is undulated mildly, and rocks are well exposed. The geological survey of this year revealed that white colored clay mineral and pyrite dissemination were widely distributed and gold and copper mineralization were confirmed in the western part of the district. Consequently, geochemical survey was conducted in the eastern part of the district.

A total of 22 samples for thin sections, 12 samples for polished samples of mineral rocks 3 sample for fluid inclusion study, 17 sample for whole rock analysis, 44 samples for chemical analysis of mineralized rocks and 28 samples for X-ray analysis were taken during the traversing.

1-4-2 Results of Geological Survey

1-4-2-1 Geology

(1) Geology

The geology of the district is comprised of Tertiary volcanic-products with overlying limestones in the southern part. Main Tertiary system consists mainly of Oligocene to Miocene basaltic-andesitic and dacitic lava and volcaniclastics. It is correlated to Mandalika Formation (Tomm) and Wuni Formation (Tmw). Limestone is correlated to Campurdarat Formation (Tmcl) and Wonosari Formation (Tmwl) in the Blitar Quadrangle sheet. It was difficult to separate the boundary. Consequently, Mandalika Formation and Wuni Formation, Campurdarat Formation and Wonosari Formation are not distinguished (PLATE 2, Fig.2-23).

(1) Mandalika Formation (Tomm, Tommv, Tommt1, Tommdt, Tommb, Tommpt)

Distribution: Widely distributed in the district.

Composition: Andesitic rocks in composition are mostly widespread, while basaltic rocks also crop out in the northeastern and western parts of the district. Dacitic rocks are dominant in the upper part of the Mandalika Formation of the district. Limestone crops out in northern and southern parts of the district. This formation is divided into several members. The upper members are mainly comprised of pumice tuff and fine tuffs (Tommp, Tommt2) and basaltic rocks (Tommb) and distributed in the eastern part. The lower members are mainly comprised of andesitic rocks (Tomm, Tommv, Tommt1) and dacitic rocks (Tommdt), and distributed in the western part. The rocks of the lower members are mainly massive and no layered coarse-grained volcaniclastic rocks, while fine tuff beds are intercalated in the Formation. This formation is undergone intense white colored clay or propylitic alteration with pyrite dissemination.

The pumice tuff, fine tuff and basaltic lava in the eastern part are less altered and show black colored.

Correlation: Most widely distributed volcanic rocks and volcaniclastic rocks are correlated to Mandalika Formation. Unaltered basaltic lava distributed in the eastern part is included in Mandalika Formation, while they are correlated to Wuni Formation based on the existing data (Blitar Quadrangle sheet).

(b) Wonosari Formation

Distribution: Limestone is distributed in the southern part and in the north central part of the district.

Composition: Limestone shows generally gray to whitish colored, porous with abundant fossils (coral and molluscas). It is generally massive and does not show beddings, but shows 30cm to 40 cm bedding in places.

Correlations: Limestones are correlated to Wonosari Formation, while some of the limestones are correlated to Campurdarat Formation by existing data. Only massive limestone covering Mandalika is correlated to Wonosari Formation, while thin layers of limestone that are intercalated with volcaniclastic rocks are included in Mandalika Formation.

Thickness: more than 200m.

(2) Geologic Structure

North northeast-south southwest trending faults are most abundant and conspicuous. Northwest-southeast to east-west trending faults shorter in strike length are also observed. Fine tuff beds in Mandalika Formation show NE-SW and N-S strikes and gentle dips to north in the southern part and to south in the southern part. Therefore, folding structures appear to exist in the central part of the district.

1-4-2-2 Alteration and Mineralization

(1) Alteration

Alteration minerals identified by X ray diffraction meter are shown on Table 2-15. Sericite, mixed clay minerals (smectite and sericite) and smectite, kaolinite, pyrophyllite and sulfosalt minerals (gypsum and alunite) are presumed to be related mineralization in the district. Chlorite and epidote may be partly produced by hydrothermal fluid related to mineralization.

Sericite: widely identified widely in the mineralization district in the southern part of the district.

Mixed clay minerals: smectite/ sericite is identified in or adjacent to the area where sericite occurs.

Smectite: identified with mixed layered minerals.

Kaolinite, pyrophyllite and sulfosalt (jarosite and alunite) are identified isolated in the western and eastern and southern parts.

(2) Mineralization

Several prominent mineralization outcrops of copper and alteration zones are found widely in the central part to western part. A wide argillization zone is traversed in the Putih River (Fig.2-29) and surrounding area, and copper mineralization was found within the alteration zone: abundant quartz veinlets n the Cekelan River (Fig.2-30), where significant mineralization has not been found.

The two outcrops of a pyrite disseminated and silicified zone in the Putih River show the most prominent mineralization. No primary copper mineral was found in the field. But chalcopyrite and covellite were identified by the microscopic observation of samples from Putih River. Copper oxides (malachite) and sphalerite were found in quartz veining and silicified rock from the Centung River. Silicified -argillized rock returned 0.54%Cu over about 0.2m width. And a propylitic float with malachite returned 0.81%Cu. Abundant floats of strongly silicified rocks were found in several creaks of the areas. Widths of individual veins range from less than 0.2 m to 07m. And the strike lengths of the veins along the Putih River are expected to be more than 500 m. Intensely argillic alteration zones are distributed in the Cekelan River. Within the zones quartz veins and silicification occur. The general trends of the veins may be N-S to NNE-SSW and dip steeply.

1-4-3 Results of Soil Geochemical Survey

(1) Selection of the Soil Geochemical Survey Area

During the course of traversing, gold and copper mineralization is found surrounding the Putih

River including Cekelan, Centung to the west and Kuning River to the east.

Geochemical survey area is defined on the alteration zones in the alteration and mineralization excluding limestone area. The area extent is 4km in north - south direction and 3.5 km in the east and west direction.

(2) Survey Method

A total of 680 samples are taken at the grid points of 100m and 100m. The sampling points are located by measuring tape and compass with an aide of GPS. The thickness of B-horizon fluctuates largely. Soils from C-horizon were taken at several locations where B-horizon is thin and C-horizon is at the depth of 30-40cm. "A" horizon soil was contaminated in the samples where "A" horizon is more than 50cm.

(3) Results of Geochemical Survey

(a) Results of analysis

The results are appended in Table A-2. The statistics of the components are laid out in Table 2-18.

(b) Distribution of anomalies by elements

In addition to one high values (0.45ppm) in the eastern part, high values of Pb, Zn, As, Mo, and Cu are concentrated in three zones, namely Putih River and vicinity, southeastern part (Kuning River), and northwestern part. Concentration of these elements indicates epithermal to mesothermal mineralization. From the study of surface silicified zones and quartz veins, it is believed that the indicated epithermal mineralization is of low sulfidation type because of the lack of As sulfides which often occur in high sulfidation system, but at the same time high sulfidation characteristics are inferred from strong pyrite dissemination, occurrence of pyrophyllite as an altered mineral.

Au (Fig. 2-34): High values are concentrated in the zone along the Kuning River and Putih River, and Gereng River. A high gold value (0.45ppmAu) is isolated in the eastern part of the geochemical survey area. These anomalies correspond to strong argillic and silicified -pyrite disseminated zones

Ag (Fig. 2-35): There are no significant high values. Several samples show higher than detection limit of chemical analysis in the Putih River and Kuning River and Gereng River.

Cu (Fig. 2-36): Comparatively high values are located in the Cekelan River, Putih River and upper stream of Kuning Rivers and to eastern ward. The high Cu values distribution show similar patterns with Au.

Pb (Fig. 2-37): Rather high Pb values appears to distribute like overlapping Au, As, Cu and Zn in the Cekelan, Putih Upstream of the K. Kuning

Zn (Fig. 2-38): High values are located in the upstream of Cekelan and Centung River, and upstream of the Putih River.

As (Fig. 2-39): High values are concentrated on the surrounding area of the Gereng River. Comparatively high values are concentrated on the Cekelan River-Centung River area and upstream and middle stream of the Putih River.

Hg (Fig. 2-40): Comparatively high values are concentrated in the upstream to the Kuning River. The distribution is similar to Au, As and Mo, but the details show different distribution.

(c) Correlation among elements

The correlations between elements are shown on Table 2-19 and Fig.2-33. Correlation between Au, Ag, Cu Pb and Zn and other elements are as follows:

Au: Au does not have any significant correlation with other elements.

Ag: Ag does not have any significant correlation with other elements.

Cu: Correlation coefficients between Cu, and Al, Ba, Co, Fe, Ga, Mn, Sc, Ti and Zn shows more than 0.5, indicating positive correlation, while correlation coefficients with Pb and Mo are low.

Pb: Correlation coefficient between Pb and Cu is 0.26.

Zn: Correlation coefficient between Zn, and Al, Ba, Be, Co, Cu, Fe, Ga, Mn, Sc, Sr and Ti are more than 0.5, indicating positive correlation.

Mo: Correlation coefficients between Mo, and Hg and Sb is 0.25 and 0.26, respectively, But other coefficients are lower than them.

1-4-4 Mineral Potential

Copper and gold mineralization is most notable in the Putih River, Cekelan River, and Centung River areas in the western part, and also gold, silver, copper, lead, zinc mineralization is observed in nearby areas of Kuning River in the northwestern part.

Distribution of silicified and argillized zones: Argillized zones are widely developed in the Seweden District, and Silicification and pyrite dissemination are most notable in the Putih River Basin. In this zone, strongly silicified andesite zone (sampled width 1m) contain 081% Cu and 0.016g/t Au. Strongly argillized dacite zone (sampled width 0.5m) contains 0.54% Cu, 0.022g/t Au. Also andesitic float containing malachite contained 0.57% Cu and 0.314g/t Au. Covelline and chalcopyrite are identified in these samples. Au anomaly was detected along a length of 500m sampled in Putih River.

Galena, sphalerite, oxidized copper minerals (malachite) are found in the quartz network in Centung River, a tributary of Putih. Although the gold and copper assay results are low at 0.021g/t Au (sampled width 0.1m), and <0.01% Cu, Mo content of same samples is somewhat high at 0.032%. Also many samples show high content of elements associated with epithermal mineralization such as As, Sb, and Hg.

Highest gold content of 0.301g/t Au (quartz float) was observed in Kuning River and to the east.

Pyrite dissemination occurs widely, particularly concentrated along small faults and joints in Putih River.

Results of geochemical survey: In soil samples particularly high gold content occurs at one point. High gold is concentrated in the three zones in the northern parts. They are Cekelan River (western tributary of Putih), eastern tributaries of upper to middle reaches of Kuning (east of Putih), and another site. These three zones overlap with the As, Pb, Zn, Mo anomaly zones. Although high copper content is not as notable as gold, there are several sites showing Cu content higher than 100ppm in the two zones of Cekelan and Kuning Rivers.

These mineral prospects are considered to be manifestations of porphyry copper deposits.

Table 2-13 Rusults of Microscopic Observation of Thin Sections, Seweden District

Sampl No.	Rock type	Texture	Phenocrysts								Groundmass								Alteration minerals												
			pl	kf	q	ol	opx	cpx	hb	bi	pl	kf	q	opx	cpx	ol	bi	mt	q	ab	kf	ep	ac	bi	ch	se	sm	k	ca	ti	ru
T066	rhyolite	porphyritic		?	○							?	○															○			
T069	rhyolite	porphyritic, holocrystalline		○	○				?			?	?												△	×			△		•
T082	volcanic	porphyritic	△																△		△	×			△				×		
T086	volcanic	porphyritic	○																△	◎	△	△			△						
T089	dacite?	sparsely porphyritic	△		•														◎	△						△					
T090	basalt	porphyritic	△																◎										×		
U039	basalt	porphyritic, holocrystalline	○								○								△						△		△			×	
U042	tuff	lithic-crystal-vitric																								×					
U043	basalt	porphyritic, cryptocrystalline	△				?	?										×	?						△						
V052	volcanic	porphyritic																	○	◎		•			•	×					
V055	microgabbro	inequigranular	◎					?										△				×	○		△						
V070	volcanic	porphyritic																	△	◎					△	△	•		△		
W074	basalt	weakly porphyritic	△								×							○	○					×		×					
W082	dacite/rhyolite	porphyritic	△		△							×	△				△														
X046	diorite/gabbro	equigranular	◎					?	?											◎		•			○						
X049	gabbro	equigranular	◎					○												◎		•			○		△				
X056	andesite/basalt	porphyritic, amygdaloidal	○					?	?		○									◎					○				○		
X057	dacite	sparsely porphyritic	△		×				?																△	○					
X072	andesite	porphyritic, silicified	△					?	?										○						△				△		△
X077	basalt	aphyric, pilotaxitic,	◎					?											×						◎				△	△	
Y037	volcanic	porphyritic																	△			×			△				△		
Y072	quartz diorite	inequigranular	◎	?	△				?																△	△			△	×	

ol:olivine, cpx:clino-pyroxene, opx:ortho-pyroxene, op:opaque mineral, hb:hornblende, bio:biotite
kf:potash-feldspar, qz:quartz, ap:apatite, frag:fragment,leu:leucoxene, ser:sericite, kao:kaolin, cal:calcite, sm:smectite, ep:epidote
chl:chlorite, zeo:zeolite, pl:plagioclase, pre:prehnite, ill: illite, zr: zircon
Amount:◎>○>△>•>×

Table 2-14 Results of Whole Rock Analysis, Seweden District

Sample No.	SiO2 (%)	Al2O3 (%)	Fe2O3 (%)	CaO (%)	MgO (%)	Na2O (%)	K2O (%)	Cr2O3 (%)	TiO2 (%)	MnO (%)	P2O5 (%)	SrO (%)	BaO (%)	LOI (%)	Total (%)	K2O#	T/A
T066	70.21	14.65	4.79	0.11	0.04	0.05	0.42	0.04	0.41	<0.01	0.06	0.01	0.02	8.97	99.77	0.68	2.24
T069	68.60	12.82	3.36	3.28	1.84	1.94	1.24	0.02	0.34	0.09	0.05	0.01	0.02	5.97	99.60	0.15	1.19
T088	60.81	14.78	6.49	4.75	1.86	2.90	1.43	<0.01	0.65	0.14	0.14	0.02	0.02	5.43	99.41	0.13	1.09
T089	74.25	12.44	4.02	0.70	1.01	2.79	1.30	<0.01	0.40	0.07	0.06	0.03	0.02	2.58	99.68	0.22	1.52
T090	68.44	13.18	5.63	3.08	1.69	2.87	0.50	0.02	0.60	0.14	0.12	0.02	0.01	3.12	99.42	0.06	1.28
T098	85.16	6.48	2.45	0.21	0.51	0.11	1.82	0.03	0.28	0.01	0.05	0.01	0.02	2.60	99.73	0.69	1.59
V052	67.70	14.01	4.92	2.14	1.04	3.51	0.83	<0.01	0.57	0.18	0.13	0.02	0.03	4.64	99.73	0.11	1.40
V055	51.75	16.82	9.95	7.40	5.60	2.85	0.40	0.01	0.79	0.20	0.12	0.02	0.01	3.67	99.59	0.02	0.87
W082	72.99	11.43	3.02	2.38	0.12	1.81	2.03	0.01	0.26	0.05	0.03	0.01	0.02	5.46	99.63	0.32	1.34
X046	50.23	16.96	11.40	2.77	4.42	5.20	0.16	<0.01	1.89	0.12	0.30	0.02	0.02	4.73	98.21	0.01	1.13
X056	43.58	16.65	8.46	9.11	5.78	4.28	0.49	<0.01	0.84	0.15	0.13	0.04	0.01	9.71	99.22	0.02	0.81
X057	69.85	14.18	4.10	0.46	2.05	2.28	1.97	0.01	0.47	0.12	0.12	0.02	0.02	3.88	99.54	0.29	1.35
X062	73.48	14.12	2.12	0.15	0.38	0.13	3.03	0.01	0.31	<0.01	0.03	0.01	0.02	6.27	100.05	0.82	1.45
X086	71.33	14.06	2.85	0.14	0.42	0.03	2.11	<0.01	0.48	<0.01	0.06	0.01	0.04	7.74	99.27	0.78	1.57
X106	71.95	18.59	0.63	0.07	0.03	0.01	0.09	0.01	0.83	<0.01	0.05	0.02	0.02	7.23	99.52	0.45	2.72
X107	78.42	4.86	8.25	0.08	0.06	0.14	0.41	0.02	0.35	<0.01	0.02	0.01	0.01	6.97	99.60	0.59	2.26
Y072	56.75	17.07	7.09	5.90	2.37	3.25	0.96	0.01	0.71	0.14	0.12	0.03	0.02	5.30	99.73	0.08	1.03

Table 2-15 Results of X-ray Diffraction Aanlysis, Seweden District

Mineral	Quartz	Plagioclase	Muscovite	Kaolinite	Chlorite	Pyrophyllite	Other clay	Zeolite	Rutile or K-feldspar	Anatase	Pyrite	Calcite	Calcite or chalcopyrite	Other
T072	◎			△		△								○(Al)
T081	◎						△(ML)				△			
T084	◎c	◎c					△(U)							·(J)
T087	◎		△(1M)		·									
T089	◎	○	△		△								·	
T097	◎				△-○		△(U)				△		·	
U030	◎		○(1M)											
U033	◎		△(1M)											
U038	◎	△	△								·		·	·(J)
V050	◎	○	△		·						·			
V053	◎c	◎c			·		·(?Sm)				·-△			
V054	◎	·-△	·-△					·(Ep)			·		·	·(?Pr),·(An)
V077	◎	△	△											
W063	·	△						◎(Mo)						
W097	◎		△(1M)		·						·-△			
W098	◎		△(1M)		·						△			·(Gy)
X046	·	◎			△-○				·		·			
X064	◎c		◎c								·			
X075	◎		△(1M)											
X082	◎			○										
X084	◎		○(1M)	·-△							·			
X085	◎		○(1M)											
X086	◎		△(1M)	·-△							·			
X089	◎		△	·-△	△						△			
X094	◎			·-△									·(△l)	·(J)
X104	◎						·-△(U)				○		△(G△)	·(Ang)
X106	◎			○(◎i)		·-△				·			·	
Y036	◎	○	△		·-△									

1M	Type of muscovite which is less common and less crystalline than the $2M_1$-type
Al	Alunite
Am	Amphibole(monoclinic)
An	Analcite or wairakite
Ang	Anglesite – $PbSO_4$
Ba	Barite
Ch	Chabazite (zeolite)
Di	Dickite
Dol	Dolomite
Ep	Epistilbite (zeolite)

Ga	Galena
Go	Goethite
Gy	Gypsum
Ha	Halloysite
H	Heulandite group
J	Jarosite
L	Laumontite (zeolite)
Mo	Mordenite(zeolite)
ML	Mixed layer smectite-illite
Mh	Maghemite
Mt	Magnetite
Pa	Paragonite

Pr	Prehnite
Px	Pyroxene
Sm	Smectite
St	Stilbite(zeolite)
U	Unidentified clay – very poorly crystalline
Unid	Unidentified
V	Vermiculite
Z	Zeolite (too low in abundance for type to be identified)

◎: Dominant. Used for the component apparently most abundant, regardless of its probable
◎c: Co-dominant. Used for two (or more) predominating components, both or all of which are
◎: Sub-dominant. The next most abundant component(s) providing its percentage level is judged
△: Accessory. Components judged to be present between the levels of roughly 5 and 20%.
·: Trace. Components judged to be below about 5%.

Table 2-16 Results of Microscopic Observation of Polished Sections, Seweden District

Sample	Ore minerals									Gangue minerals							
No.	Py	Cp	Sph	Asp	Au	Aca	Gn	Bar	others	si	ser	pl	kf	chl	epi	cal	others
T096	○		・						Co(△)	◎	△						
T097	○	○	△							◎				△			
T135	○		△				△			◎							
u039	◎	・	△							△		◎		○	△		apa(・)tit(△)
V051	○		・							△	△	◎		○			
V075	○	・	・				・		Mel(・)	○		◎		○	△	○	Ti(・)
X046	○									△		◎		◎			apa(・)tit(・)
X064	◎									◎				○			
X070	○		・						Goe(△)Ja(△)	◎							mon(・)
X075	△		・				・			◎	○						Ti(・)
X105	○									◎							
Y064									Hem(◎)	◎	△						apa(・)

Py=pyrite,Cp=chalcopyrite,Asp=arsenopyrite, Gn=galena, Goe=goethite, Aca=acanthite, Ja=jarosite, Co=covellite
Sph=sphalerite, Bar=barite, Ang=anglesite, Au=gold, Hem=hematite, Mt=magnetite, Mel=melonite, Cas=cassiterite,Ili=ilme
si=SiO2 minerals, pl=plagioclase, chl=chlorite or clay minerals, epi=epidote, cal=calcite, kao=kaollinite, tit=titanite
kf=K-feldspar, se=sericite or muscovite, apa=apatite, Ti=TiO2 polymorph, mon=monazite, cpx=clinopyroxene,

◎=abundant, ○=common, △=small, ・=rare

Table 2-17 Chemical Analysis Results of Rock Samples, Seweden District

Sample No.	UTM		Au	Ag	Cu	Pb	Zn	Mo	As	Hg	Sb
unit	North	East	ppm	ppm	%	%	%	%	%	ppm	ppm
u039	9088768	634523	0.001	1	<0.01	<0.01	0.01	<0.001	0.01	<0.01	9
V 075	9090337	631651	<0.001	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
V 077	9090117	631398	<0.001	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	7
Y037	9090015	631346	0.002	1	<0.01	0.01	0.02	<0.001	<0.01	<0.01	6
V 051	9089032	631155	<0.001	<1	<0.01	<0.01	0.01	0.001	<0.01	<0.01	<5
W097	9085392	631090	0.007	1	<0.01	0.01	<0.01	0.001	0.01	<0.01	<5
W098	9085392	631090	0.005	2	<0.01	0.02	0.01	0.001	<0.01	0.01	<5
V 054	9088780	631020	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	6
T077	9087744	630621	<0.001	<1	<0.01	<0.01	<0.01	0.001	0.01	0.01	<5
T079	9087378	629674	0.001	<1	<0.01	<0.01	0.01	<0.001	0.01	<0.01	<5
T081	9087641	629370	0.008	<1	<0.01	0.01	0.04	<0.001	<0.01	0.12	<5
Y064	9093194	629307	0.002	<1	0.22	<0.01	0.06	<0.001	<0.01	0.03	<5
T085	9088472	629197	0.003	1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
Y059	9092775	628700	0.003	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.05	<5
Y057	9092454	628090	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	5
T058	9086779	627768	0.003	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.13	7
T094	9088450	627280	0.128	15	0.08	0.01	0.01	0.001	<0.01	0.05	38
T074	9087454	627001	0.012	<1	<0.01	<0.01	<0.01	<0.001	0.03	0.01	7
T071	9087052	626756	0.089	<1	<0.01	0.01	<0.01	0.002	<0.01	0.04	5
X079	9088208	626710	0.021	<1	<0.01	0.01	<0.01	<0.001	<0.01	0.16	<5
X080	9088102	626705	0.001	<1	0.01	<0.01	<0.01	<0.001	0.01	0.01	5
X055	9088980	626513	0.077	1	<0.01	0.1	0.05	<0.001	0.02	0.01	<5
X057	9088440	626347	0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
X046	9089460	626315	<0.001	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
X106	9087144	626217	0.006	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.13	<5
X105	9087140	626202	0.032	<1	<0.01	0.01	0.01	0.001	<0.01	0.13	<5
X094	9087152	626199	0.029	<1	<0.01	<0.01	<0.01	0.001	<0.01	1.2	<5
X107	9087152	626195	0.022	7	0.54	0.01	0.01	0.004	0.16	0.32	10
X084	9087582	626178	0.009	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.07	<5
X093	9087222	626154	0.041	<1	0.08	<0.01	0.01	0.001	<0.01	<0.01	<5
X089	9087282	626106	0.019	1	0.04	<0.01	0.05	<0.001	<0.01	0.11	<5
T096	9087400	626100	0.016	4	0.81	<0.01	0.03	0.004	0.3	0.03	11
T097	9087250	626100	0.314	4	0.57	<0.01	0.02	0.009	<0.01	<0.01	<5
X087	9087292	626098	0.006	<1	<0.01	<0.01	0.01	0.001	<0.01	0.08	<5
X064	9087317	626080	0.014	1	<0.01	<0.01	<0.01	0.001	<0.01	0.02	<5
X086	9087354	626067	0.013	1	<0.01	0.01	<0.01	<0.001	<0.01	0.01	<5
X068	9087218	625432	0.02	<1	0.01	<0.01	<0.01	0.001	0.05	<0.01	7
X067	9087218	625431	0.024	3	<0.01	<0.01	<0.01	0.003	0.01	<0.01	<5
X069	9087712	625090	0.01	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
X070	9087263	625085	0.017	2	<0.01	0.01	0.01	<0.001	<0.01	0.01	<5
T135	9087520	624962	0.021	4	<0.01	<0.01	0.01	<0.001	0.01	<0.01	<5
X076	9087585	624922	0.01	2	<0.01	<0.01	<0.01	0.001	<0.01	<0.01	<5
X075	9087293	624912	0.011	1	<0.01	<0.01	0.01	0.032	<0.01	<0.01	<5
X052	9087994	624772	0.064	1	<0.01	<0.01	<0.01	<0.001	0.01	0.05	<5

Table 2-18 Statistic Data of Chemical Analysis Results of Soil Samples, Seweden District

Element	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La
unit	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
Sample number	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680
Average (Av)	0.004	0.11	4.80	15	5.00	267	0.44	1.2	0.75	0.31	24	**21**	**53**	6.07	12	**0.026**	0.04	10
Standard deviation (SD)	0.018	0.06	2.06	24	0.00	177	0.20	0.6	0.93	0.22	11	35	22	1.57	4	0.018	0.03	3
Av+SD	0.022	0.17	6.86	39	5.00	444	0.64	1.8	1.67	0.53	35	57	75	7.64	16	0.044	0.07	13
Av+2・SD	0.040	0.22	8.92	63	5.00	621	0.84	2.4	2.60	0.75	46	92	97	9.21	21	0.063	0.10	16
Av+3・SD	0.058	0.28	10.98	88	5.00	798	1.05	2.9	3.53	0.97	57	128	118	10.79	25	0.081	0.12	19
max	**0.453**	1.10	11.4	437	5	1,220	1.10	11.0	12.25	3.30	108	418	**170**	10.45	20	0.29	0.2	30

Element	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	U	V	W	Zn
unit	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
Sample number	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680
Average (Av)	0.42	1,605	**0.81**	0.06	13	206	**13**	0.0155	1.21	14	93.2	0.20	5.0	5.0	191	5.4	**60**
Standard deviation (SD)	0.49	943	1.12	0.04	22	129	20	0.0070	0.59	5	45.7	0.13	0.3	0.3	76	1.3	32
Av+SD	0.91	2,548	1.93	0.10	35	335	33	0.0225	1.79	19	139.0	0.34	5.4	5.3	266	6.7	92
Av+2・SD	1.39	3,491	3.05	0.14	58	464	53	0.0295	2.38	24	184.7	0.47	5.7	5.6	342	8.0	124
Av+3・SD	1.88	4,434	4.18	0.18	80	592	73	0.0365	2.97	29	230.4	0.61	6.0	5.8	418	9.3	156
max	4.23	9460	22	0.21	340	1530	**256**	0.05	5.00	29	366	0.64	10	10	447	10	371

Table 2-19 Correlation Coefficients between Elements in Soil Samples, Seweden District

Element	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	V	Zn
Au	1.00	*0.23*	0.00	0.05	0.00	-0.03	0.07	0.03	0.03	-0.01	-0.03	0.04	0.01	-0.02	0.07	-0.03	-0.01	-0.05	0.00	0.02	0.13	-0.03	-0.03	0.04	0.09	0.03	-0.04	0.02	0.02	-0.01	0.02	0.01
Ag		1.00	-0.07	0.07	-0.04	-0.05	0.12	0.03	0.05	-0.09	-0.05	0.00	-0.08	-0.08	0.13	0.00	-0.03	-0.06	-0.06	0.17	0.06	-0.05	-0.03	0.08	0.11	0.10	-0.11	-0.06	-0.05	-0.01	-0.01	-0.09
Al			1.00	-0.27	0.79	0.80	-0.02	-0.06	0.03	0.66	-0.02	0.68	0.81	0.77	0.19	-0.10	0.36	-0.11	0.61	-0.20	0.23	0.00	-0.03	-0.03	0.22	0.04	0.73	0.88	0.74	0.03	-0.04	0.74
As				1.00	-0.20	-0.17	0.05	0.05	-0.01	-0.20	-0.01	-0.06	-0.15	-0.20	0.02	0.05	-0.05	-0.06	-0.20	0.15	-0.13	-0.03	0.02	0.10	-0.01	0.21	-0.23	-0.25	-0.26	-0.02	0.05	-0.20
Ba					1.00	0.77	0.00	-0.05	0.08	0.73	-0.21	0.55	0.66	0.60	0.30	-0.10	0.57	-0.34	0.87	-0.14	0.21	-0.19	-0.14	0.09	0.21	0.08	0.46	0.70	0.57	0.08	-0.04	0.59
Be						1.00	-0.07	-0.10	0.05	0.56	-0.20	0.49	0.72	0.61	0.19	-0.03	0.45	-0.30	0.60	-0.15	0.13	-0.16	-0.01	0.05	0.20	0.07	0.54	0.68	0.64	0.05	-0.05	0.62
Bi							1.00	0.00	0.14	-0.02	-0.07	0.05	0.06	-0.08	0.29	-0.09	-0.07	-0.13	-0.03	0.20	0.25	-0.07	-0.05	0.00	0.20	*0.36*	-0.09	0.01	0.16	-0.02	-0.01	0.08
Ca								1.00	0.03	-0.04	0.00	-0.02	-0.12	-0.11	0.00	-0.06	0.02	0.01	-0.02	0.01	0.18	0.01	-0.03	0.00	0.05	0.04	-0.08	0.01	-0.08	0.00	0.67	-0.05
Cd									1.00	0.13	-0.04	0.20	0.07	-0.11	0.14	-0.03	0.04	-0.09	0.12	0.02	0.19	-0.04	0.00	0.21	0.13	0.28	-0.01	0.00	0.13	-0.02	-0.01	0.13
Co										1.00	0.31	0.63	0.72	0.47	0.15	-0.20	0.46	0.20	0.87	-0.16	0.18	0.31	-0.04	0.04	0.10	0.08	0.69	0.49	0.50	0.08	-0.04	0.70
Cr											1.00	0.13	0.05	-0.10	-0.20	-0.17	-0.08	0.80	-0.03	-0.01	-0.18	0.94	0.09	-0.02	-0.18	-0.05	0.42	-0.13	-0.11	-0.01	-0.02	0.06
Cu												1.00	0.68	0.54	0.24	-0.17	0.29	0.01	0.52	-0.10	0.22	0.09	-0.06	0.26	*0.31*	0.07	0.65	0.52	0.56	0.03	-0.01	*0.69*
Fe													1.00	0.67	0.21	-0.14	0.33	-0.06	0.61	-0.13	0.25	0.04	0.02	0.02	0.25	0.11	0.74	0.68	0.81	0.02	-0.08	0.92
Ga														1.00	0.13	-0.03	0.30	-0.15	0.47	-0.17	0.15	-0.08	-0.03	-0.02	0.23	-0.10	0.54	0.71	0.60	0.00	-0.05	0.60
Hg															1.00	-0.06	0.11	-0.36	0.22	0.26	0.33	-0.19	-0.14	0.06	0.47	0.22	0.00	0.14	0.34	-0.03	-0.02	0.24
K																1.00	-0.03	-0.08	-0.10	-0.11	-0.11	-0.15	0.29	-0.01	0.08	-0.05	-0.20	-0.04	-0.04	0.00	-0.02	-0.17
La																	1.00	-0.12	0.58	-0.11	0.08	-0.06	-0.08	0.05	0.04	0.03	0.25	0.26	0.20	0.15	-0.01	0.27
Mg																		1.00	-0.11	-0.08	-0.29	0.80	0.24	-0.14	-0.36	-0.12	0.39	-0.20	-0.30	0.02	-0.02	-0.10
Mn																			1.00	-0.14	0.18	-0.03	-0.08	0.10	0.13	0.05	0.46	0.50	0.45	0.08	-0.01	0.57
Mo																				1.00	-0.08	-0.03	-0.16	0.05	0.02	0.23	-0.19	-0.21	-0.13	0.00	0.00	-0.15
Na																					1.00	-0.16	-0.11	-0.02	0.44	0.15	-0.03	0.32	0.43	-0.05	-0.05	0.40
Ni																						1.00	0.10	-0.05	-0.17	-0.06	0.37	-0.11	-0.09	0.01	-0.01	0.02
P																							1.00	-0.03	0.04	0.02	0.06	0.01	-0.01	-0.05	-0.01	-0.02
Pb																								1.00	0.11	0.01	-0.04	-0.04	0.00	-0.01	-0.01	0.03
S																									1.00	0.08	0.02	0.20	0.42	-0.05	0.00	0.31
Sb																										1.00	-0.02	0.03	0.15	-0.02	-0.02	0.14
Sc																											1.00	0.53	0.50	0.00	-0.04	0.68
Sr																												1.00	0.69	-0.01	0.01	0.63
Ti																													1.00	-0.05	-0.05	0.87
Tl																														1.00	0.00	-0.03
V																															1.00	-0.04
Zn																																1.00

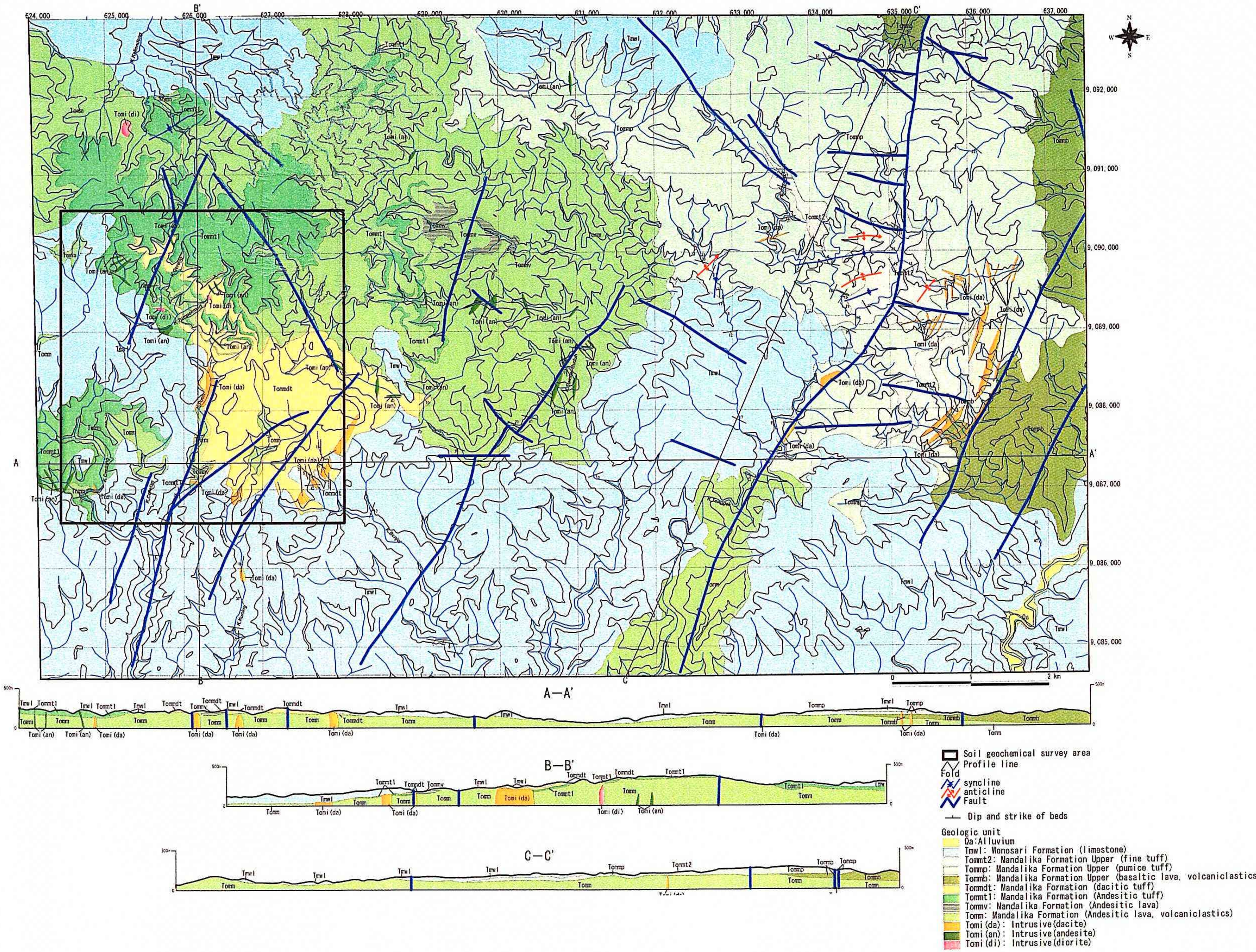


Fig.2-23 Geologic Map and Profiles of the Seweden District

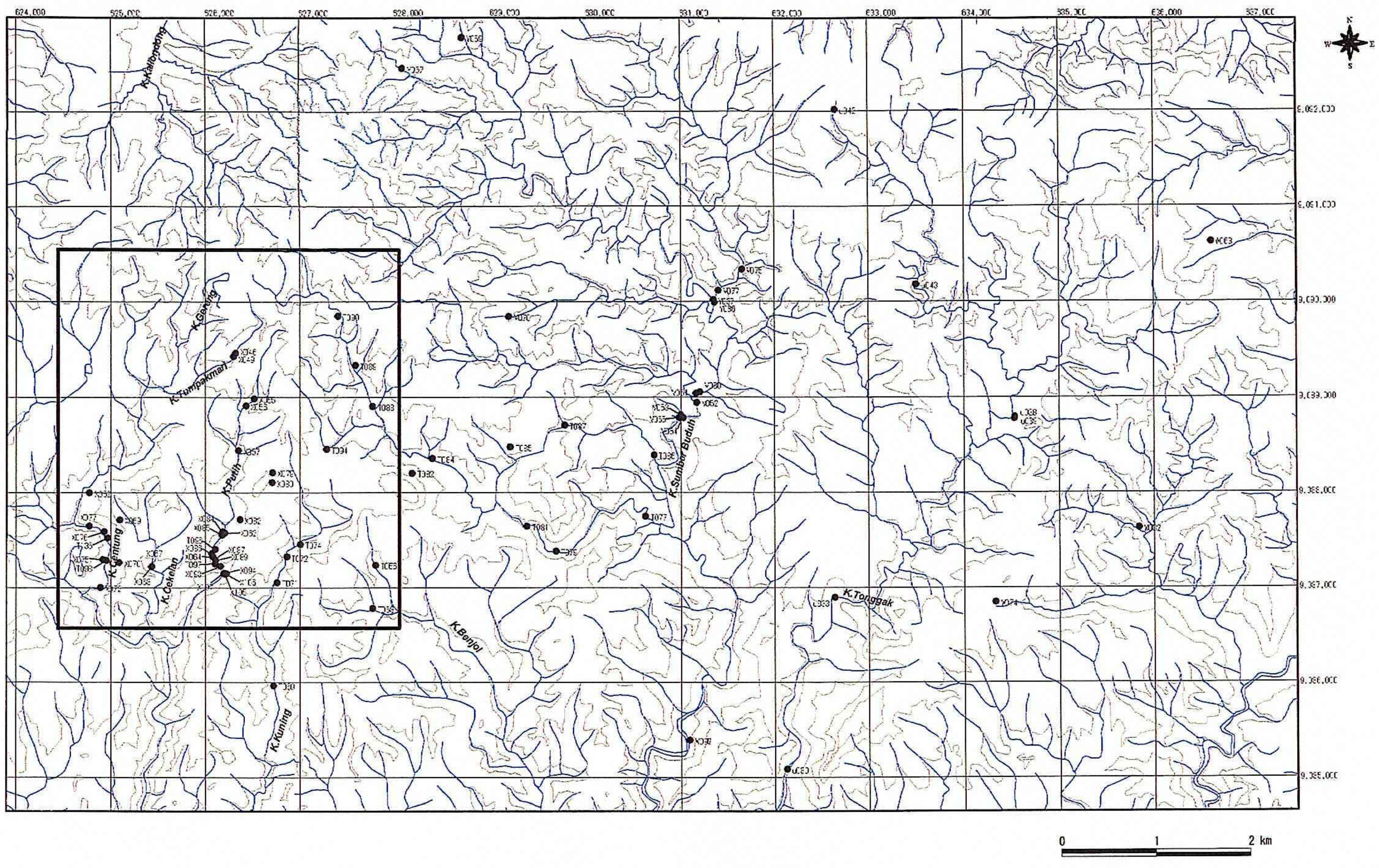


Fig.2-24 Location Map of Rock Samples in the Seweden District

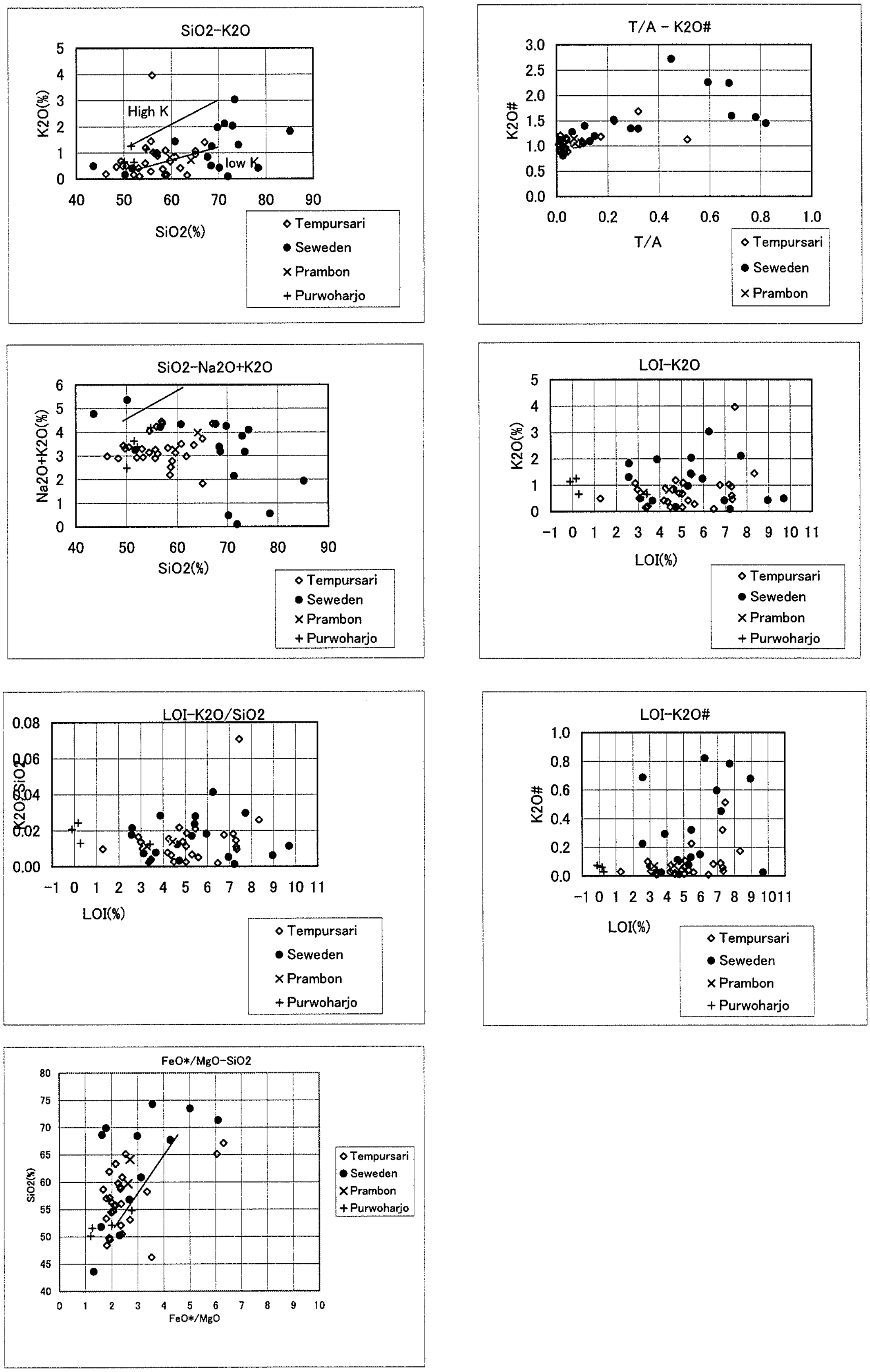


Fig. 2-25 Diagrams of Rock Forming Elements in Volcanic Rocks, Seweden District

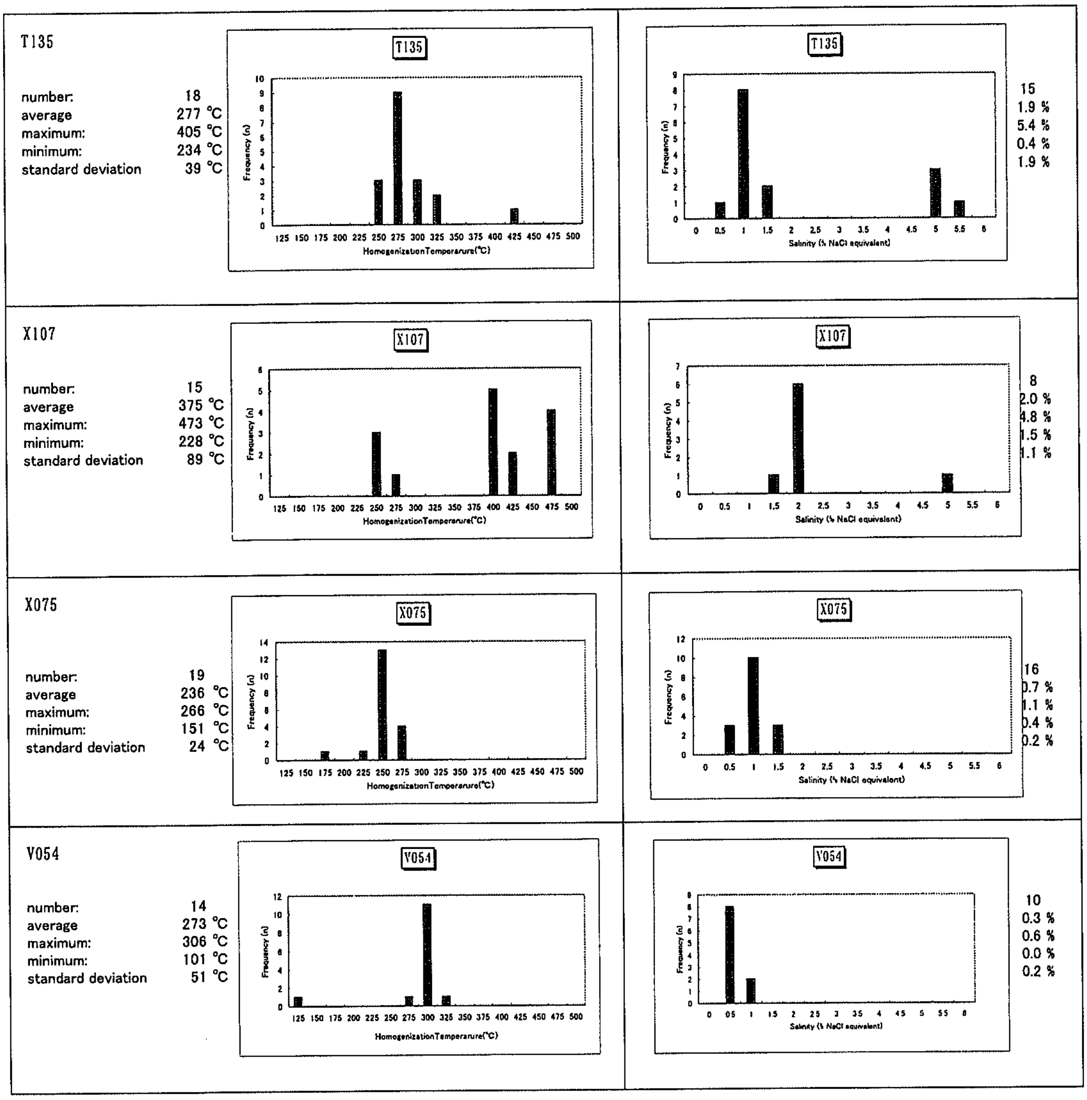


Fig. 2-26 Homogenization Temperatures and Salinities of Fluid Inclusions,Seweden District

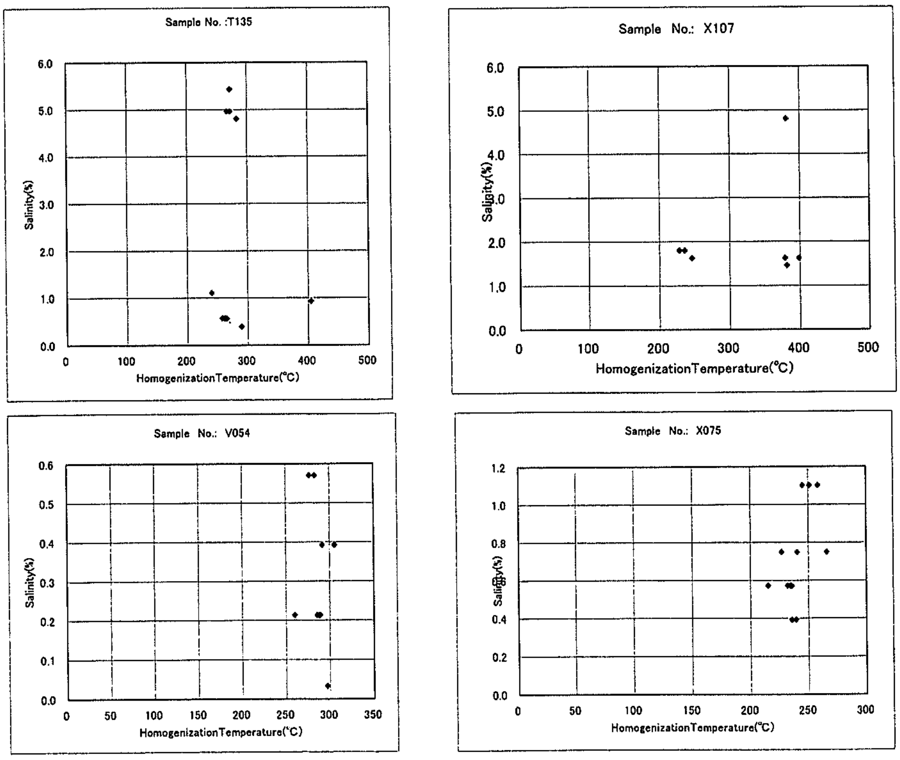


Fig. 2-27 Correlations between Temperatures and Salinities of Fluid Inclusions, Seweden District

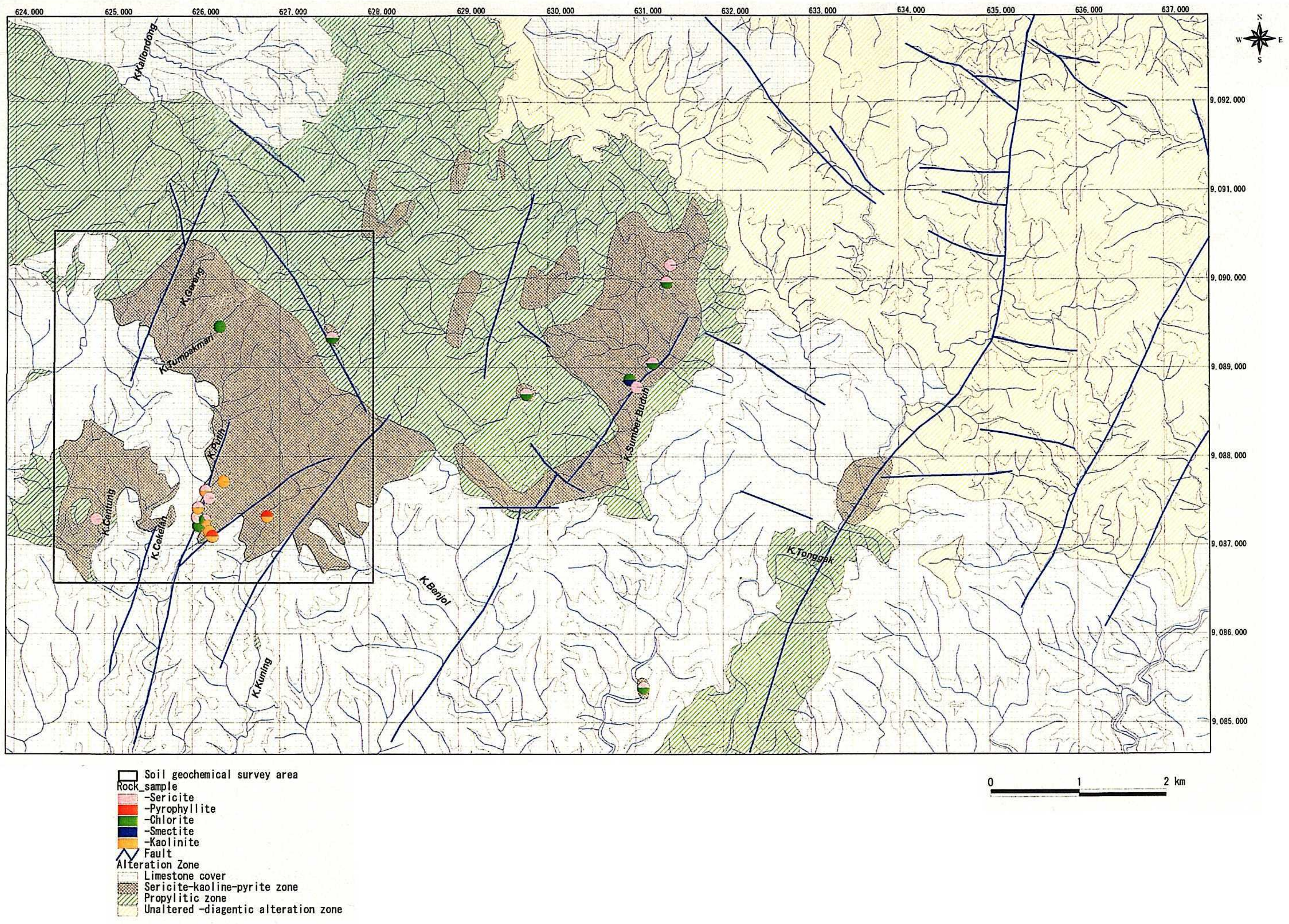


Fig.2-28 Mineralized and Alteration Zones of the Seweden District

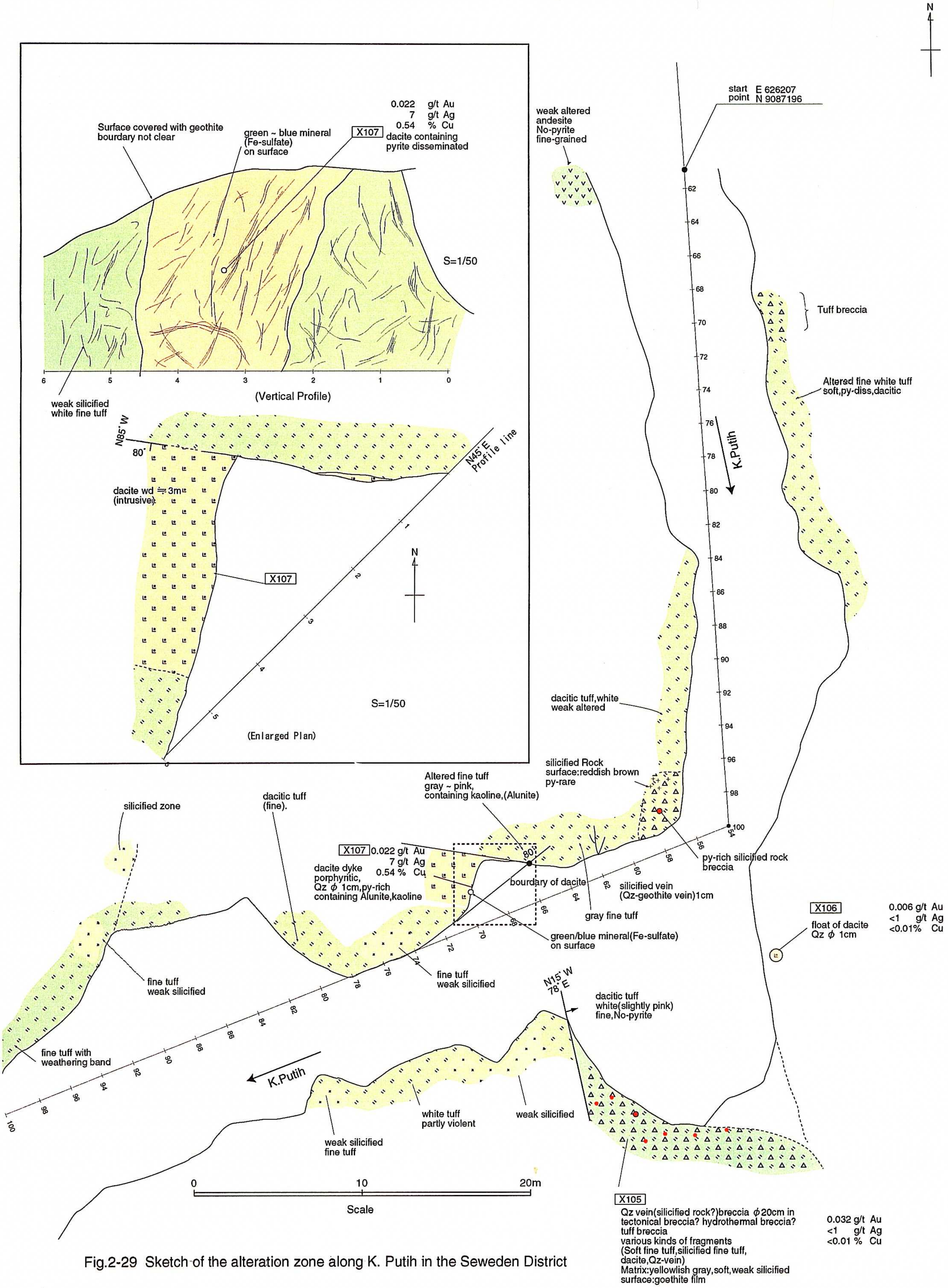


Fig.2-29 Sketch of the alteration zone along K. Putih in the Seweden District

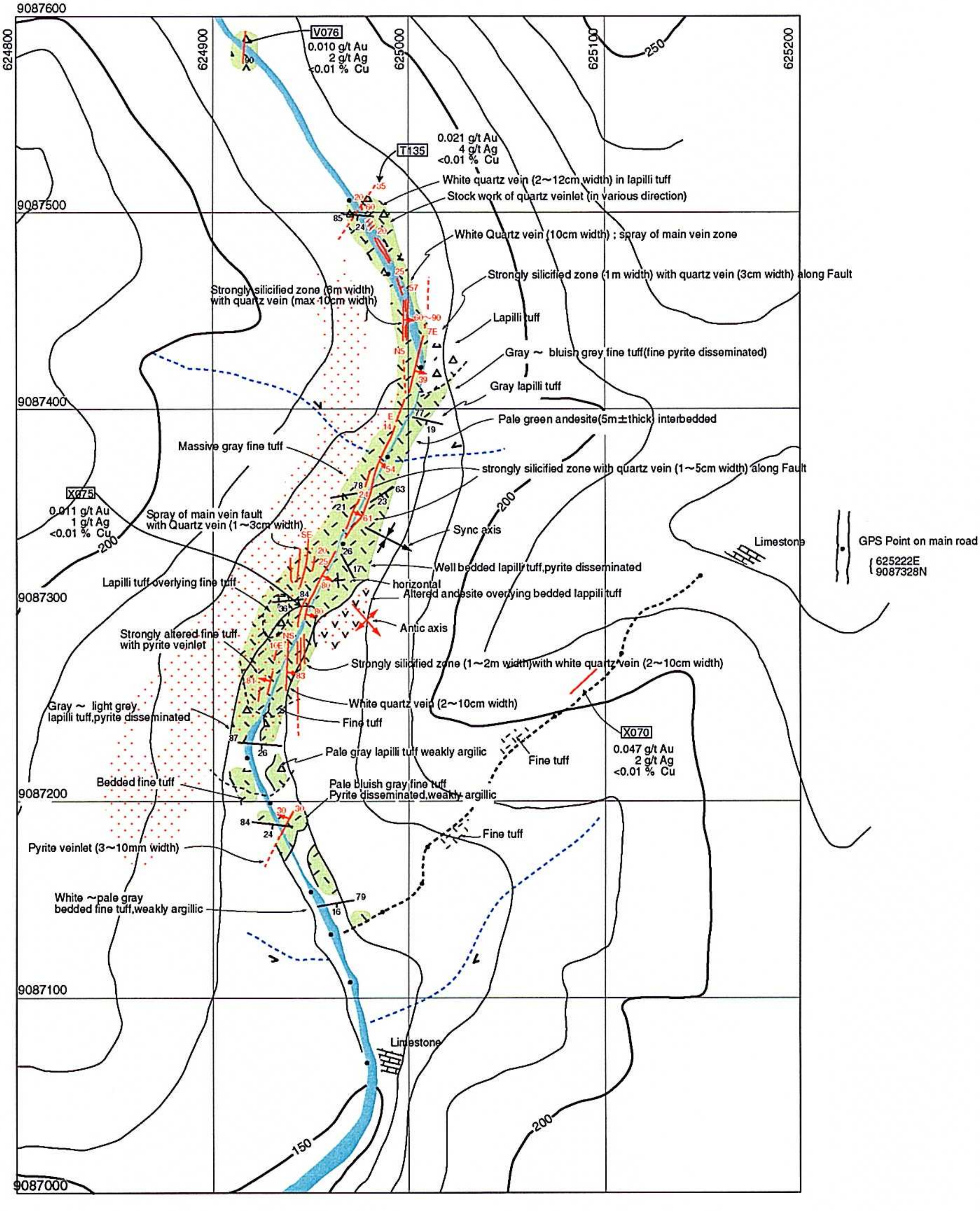


Fig. 2-30 Sketch of the Mineralized Zone of the Seweden District (2): K. Centung

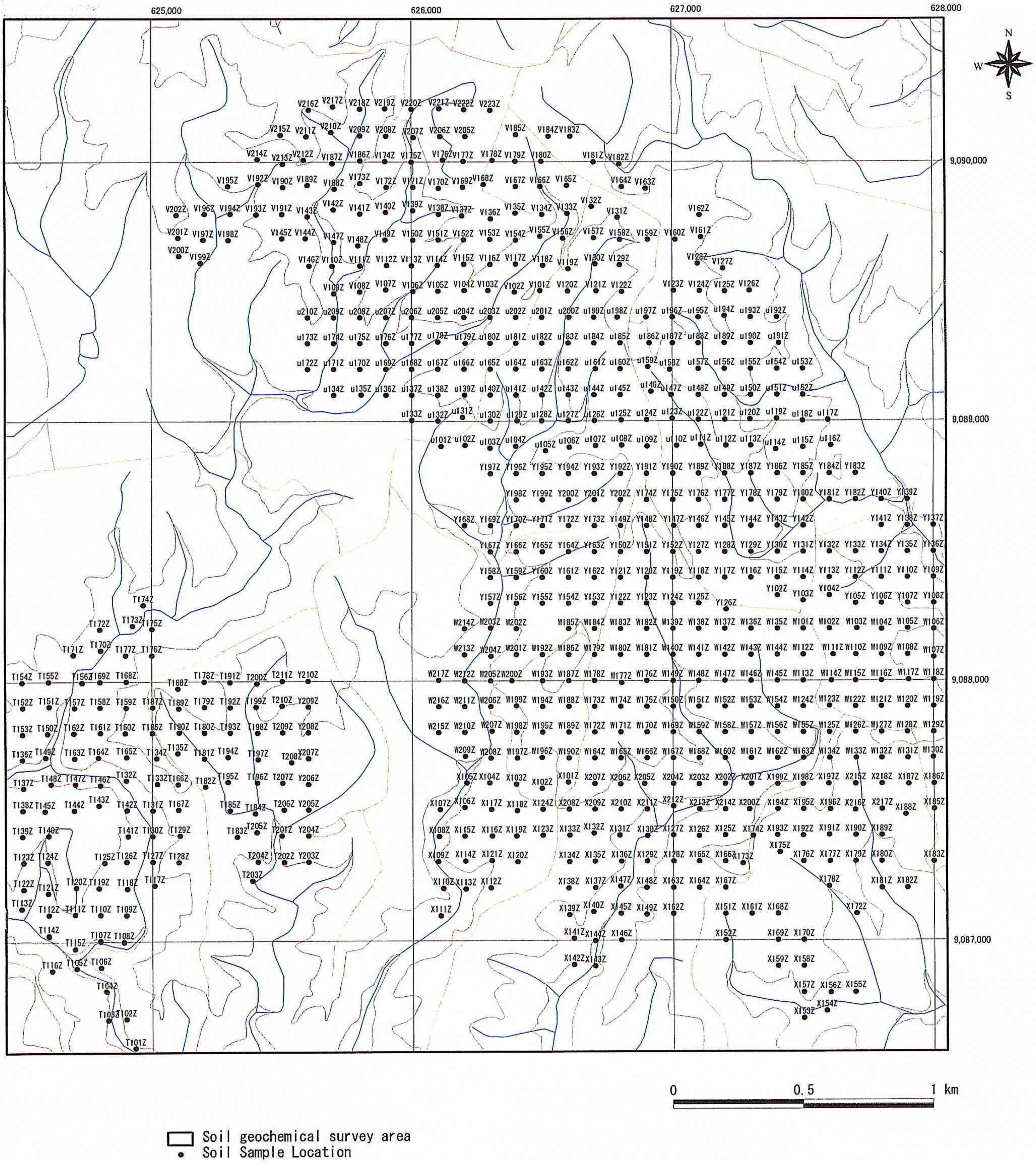
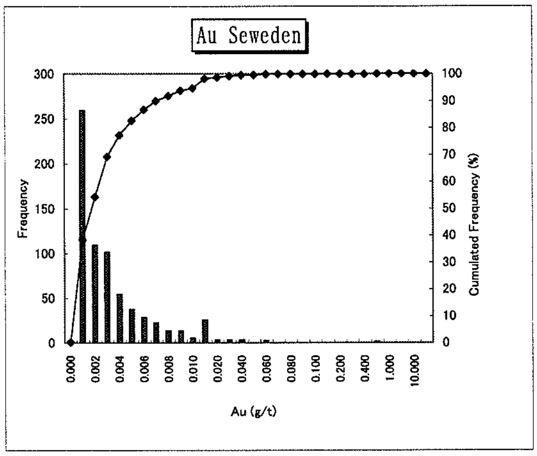
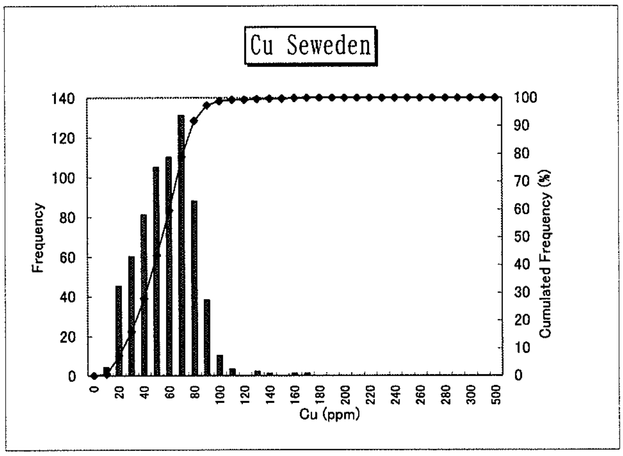
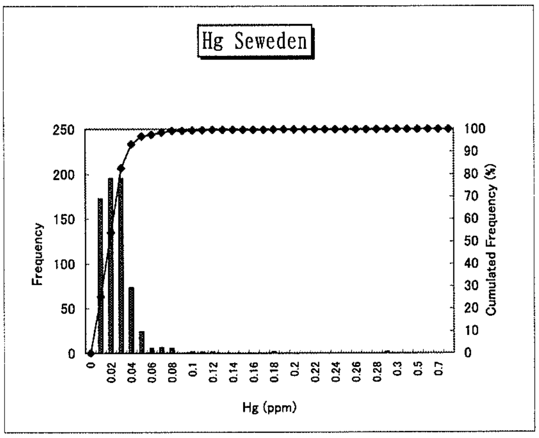
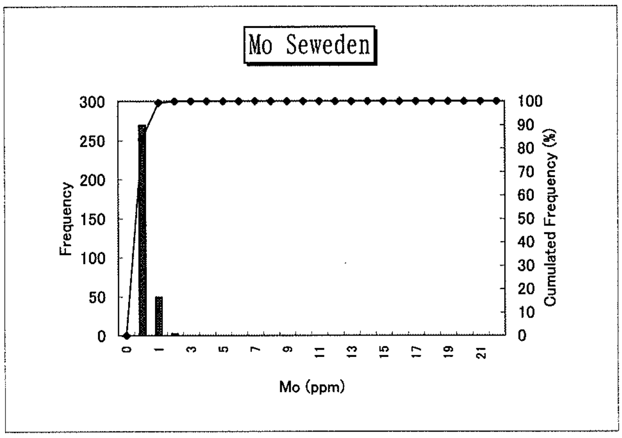


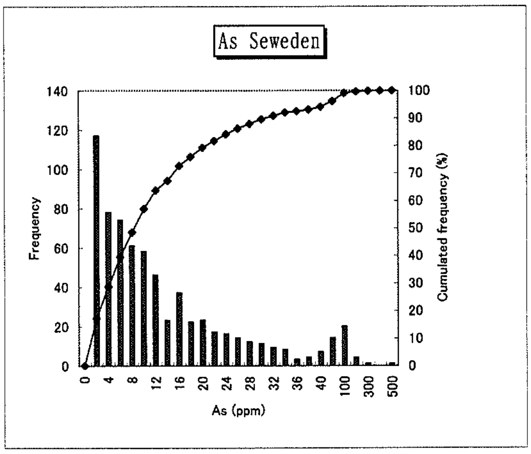
Fig.2-31 Location Map of Soil Samples : Seweden District

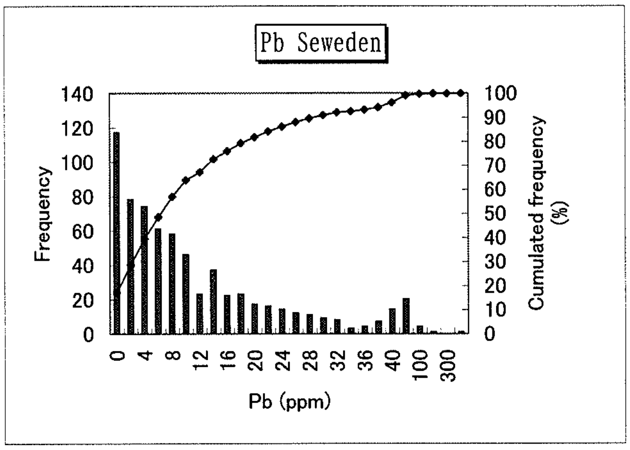












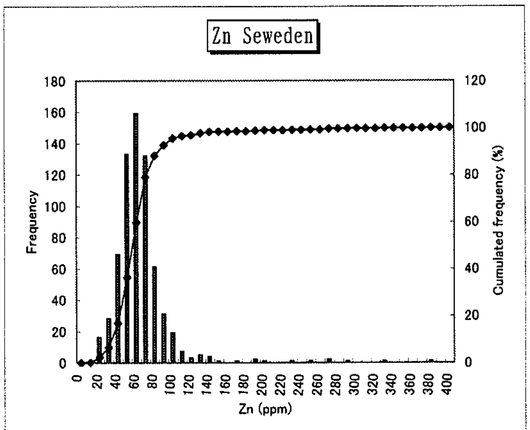


Fig. 2-32 Histograms of Chemical Analysis Data of Soil Samples, Seweden District

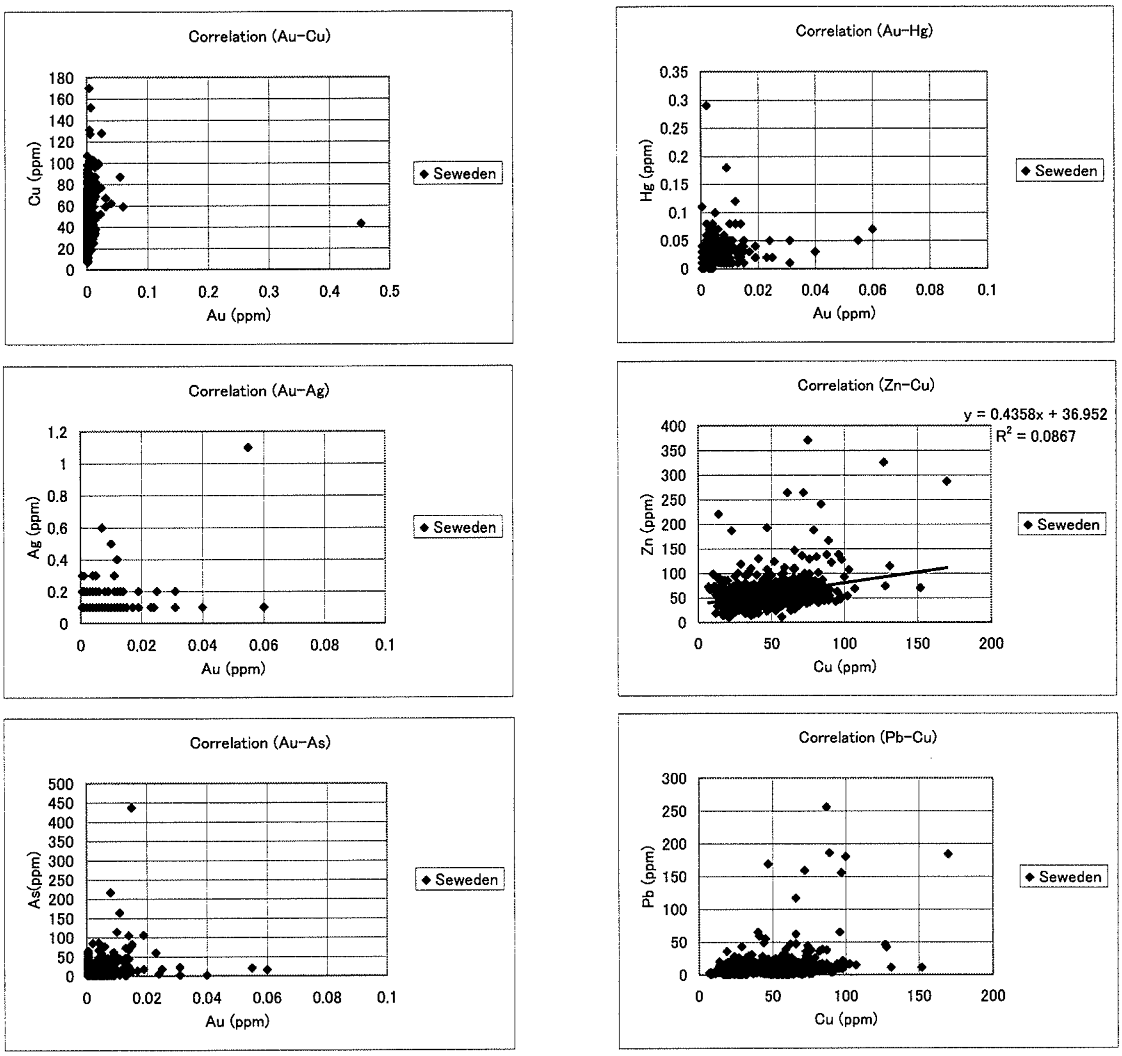
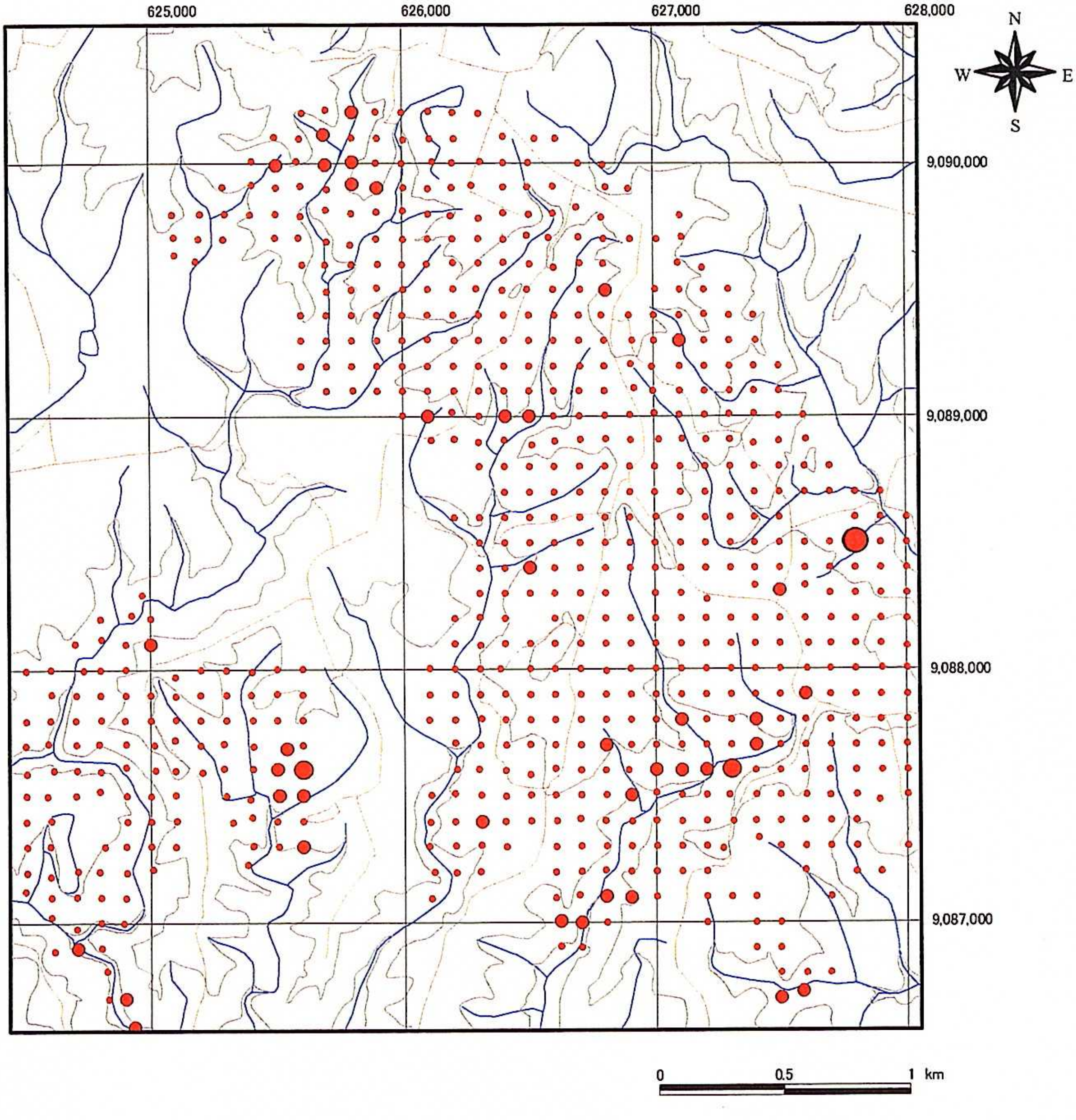


Fig.2-33 Correlations between Elements in Soil Samples in the Seweden District

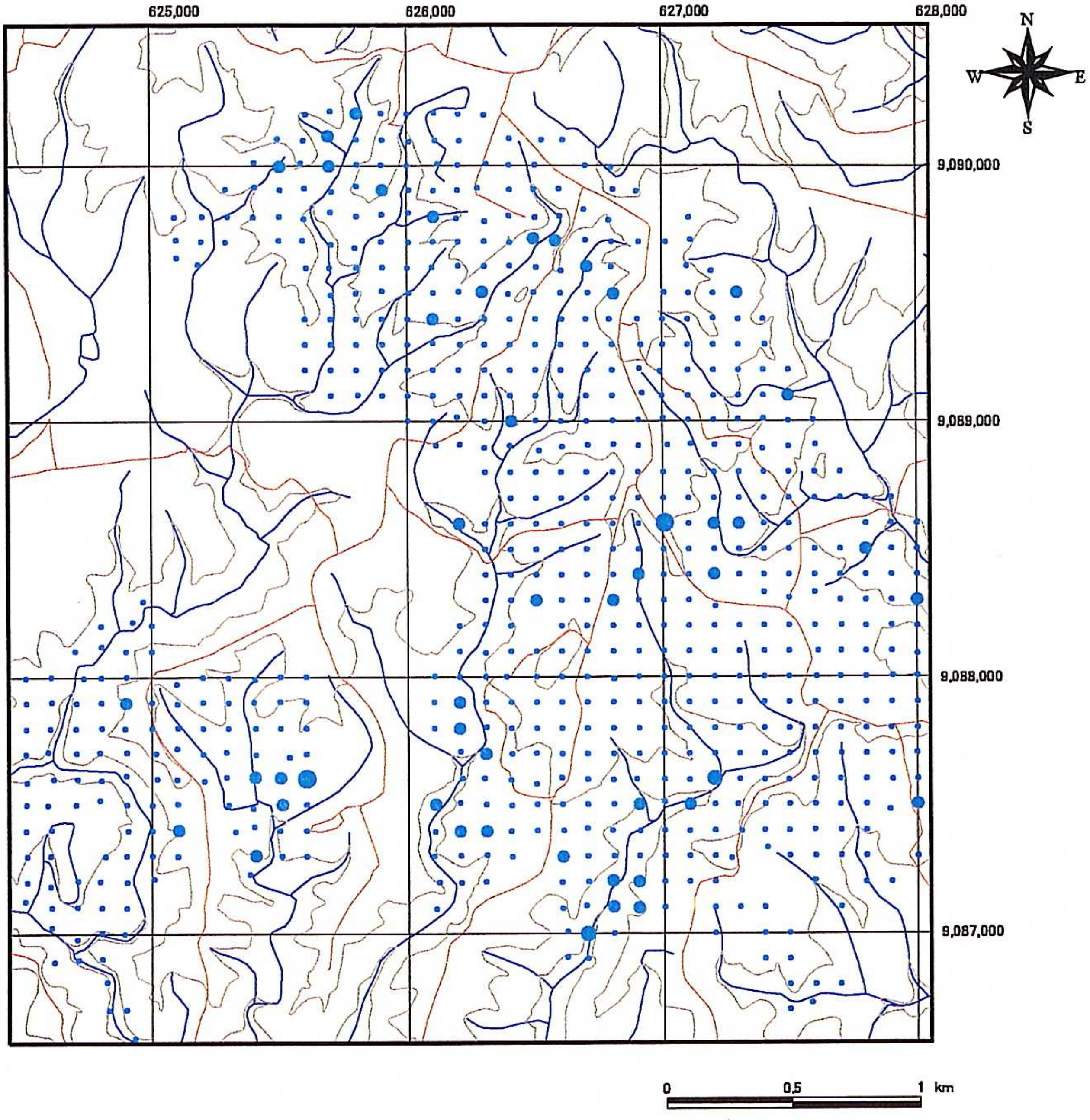


Soil geochemical survey area

Au(ppm)

- 0.1 - 10
- 0.05 - 0.1
- 0.01 - 0.05
- 0 - 0.01

Fig.2-34 Geochemical Anomaly of Soil Samples in the Seweden District (Au)



Soil geochemical survey area
Ag(ppm)
0.6 - 1.1
0.4 - 0.6
0.2 - 0.4
<0.2

Fig.2-35 Geochemical Anomaly of Soil Samples in the Seweden District (Ag)

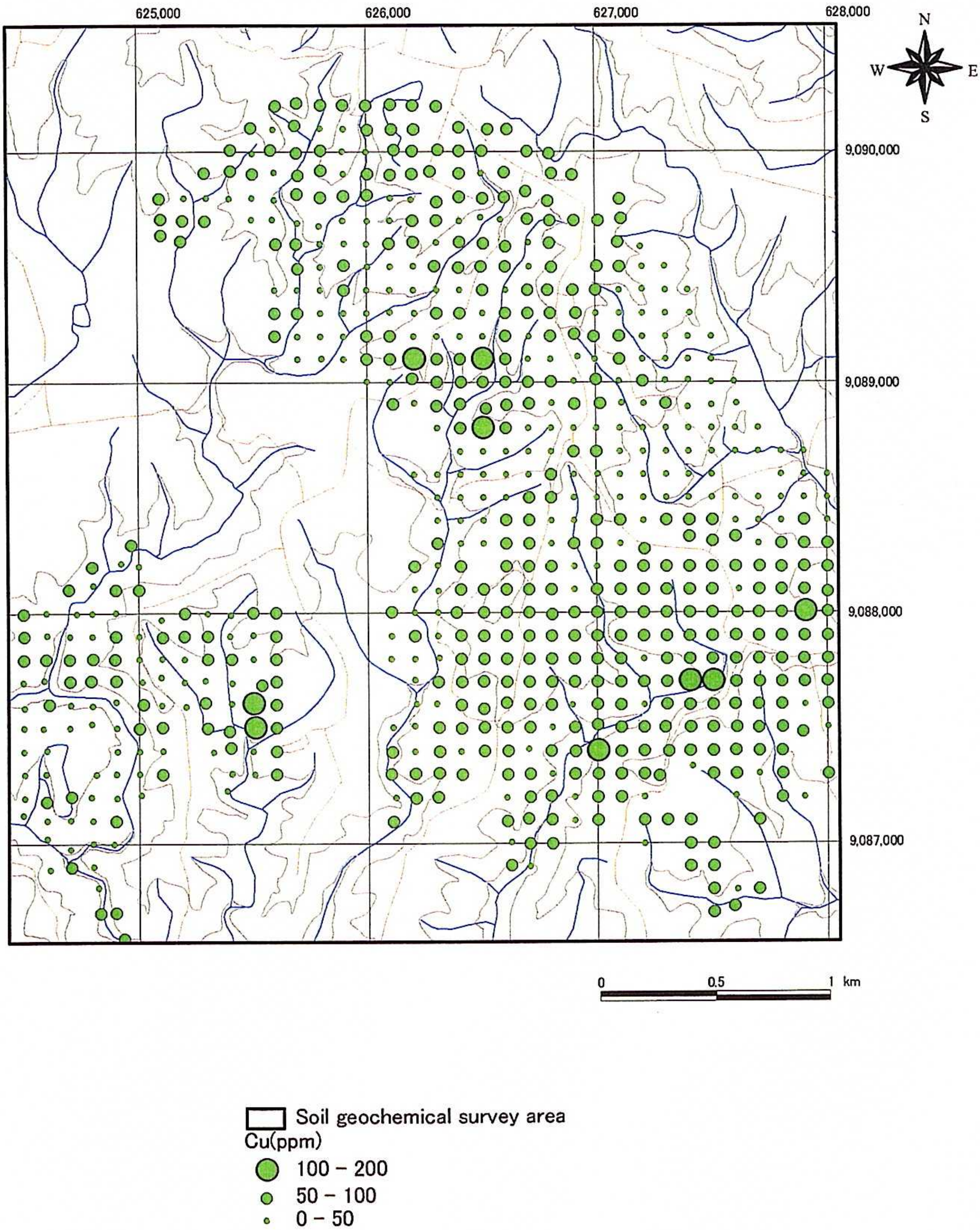


Fig.2-36 Geochemical Anomaly of Soil Samples in the Seweden District (Cu)

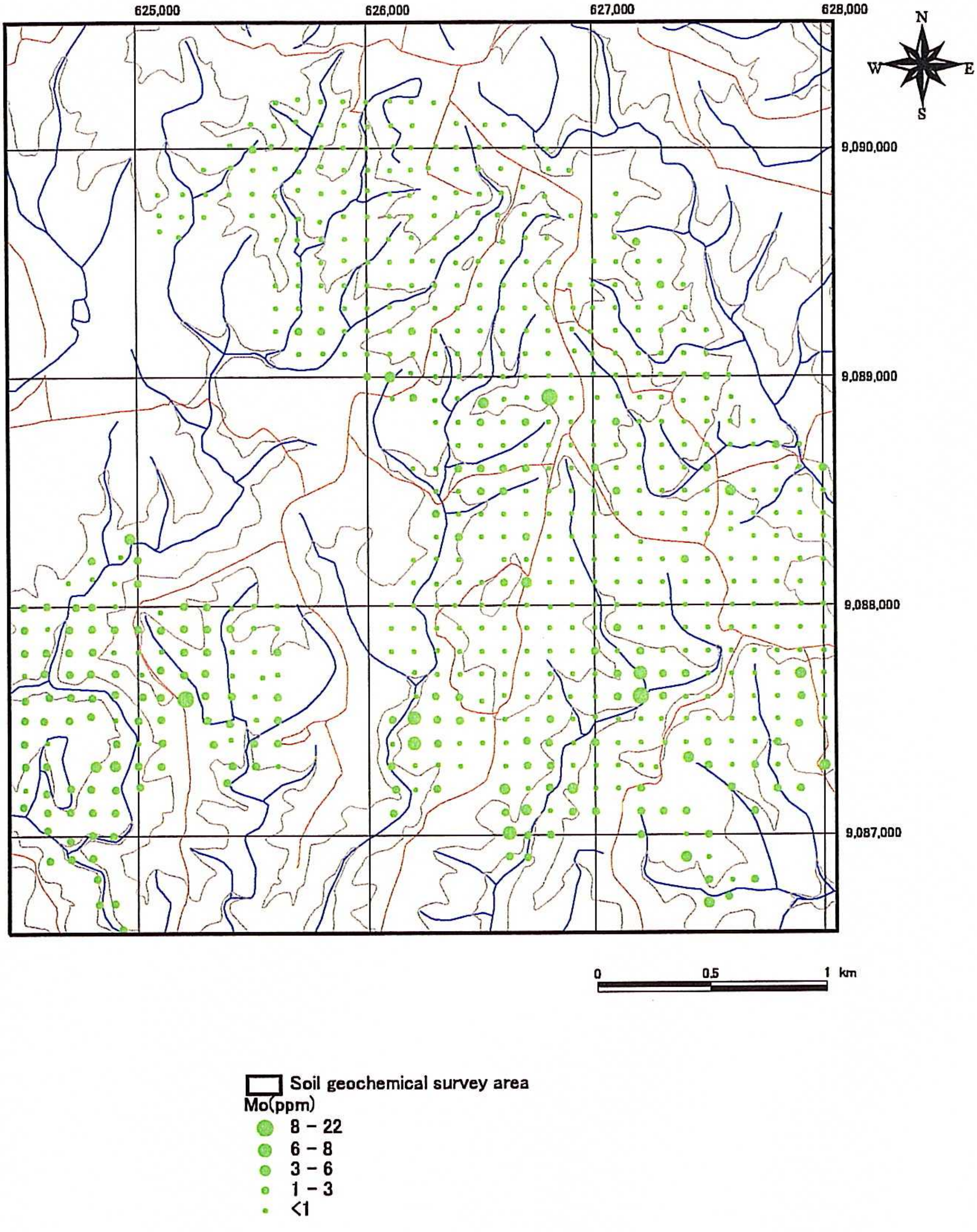


Fig.2-37 Geochemical Anomaly of Soil Samples in the Seweden District (Mo)

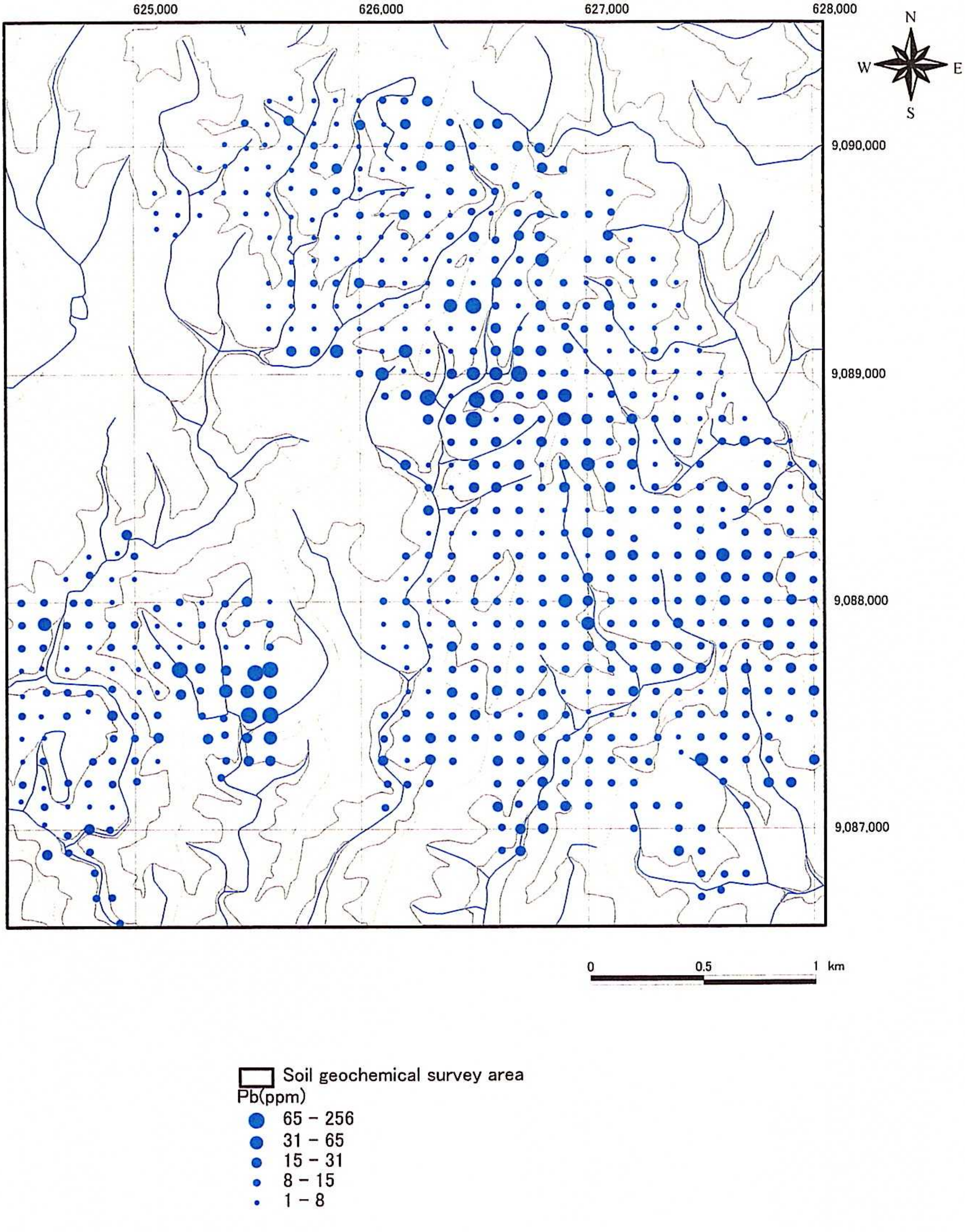


Fig.2-38 Geochemical Anomaly of Soil Samples in the Seweden District (Pb)

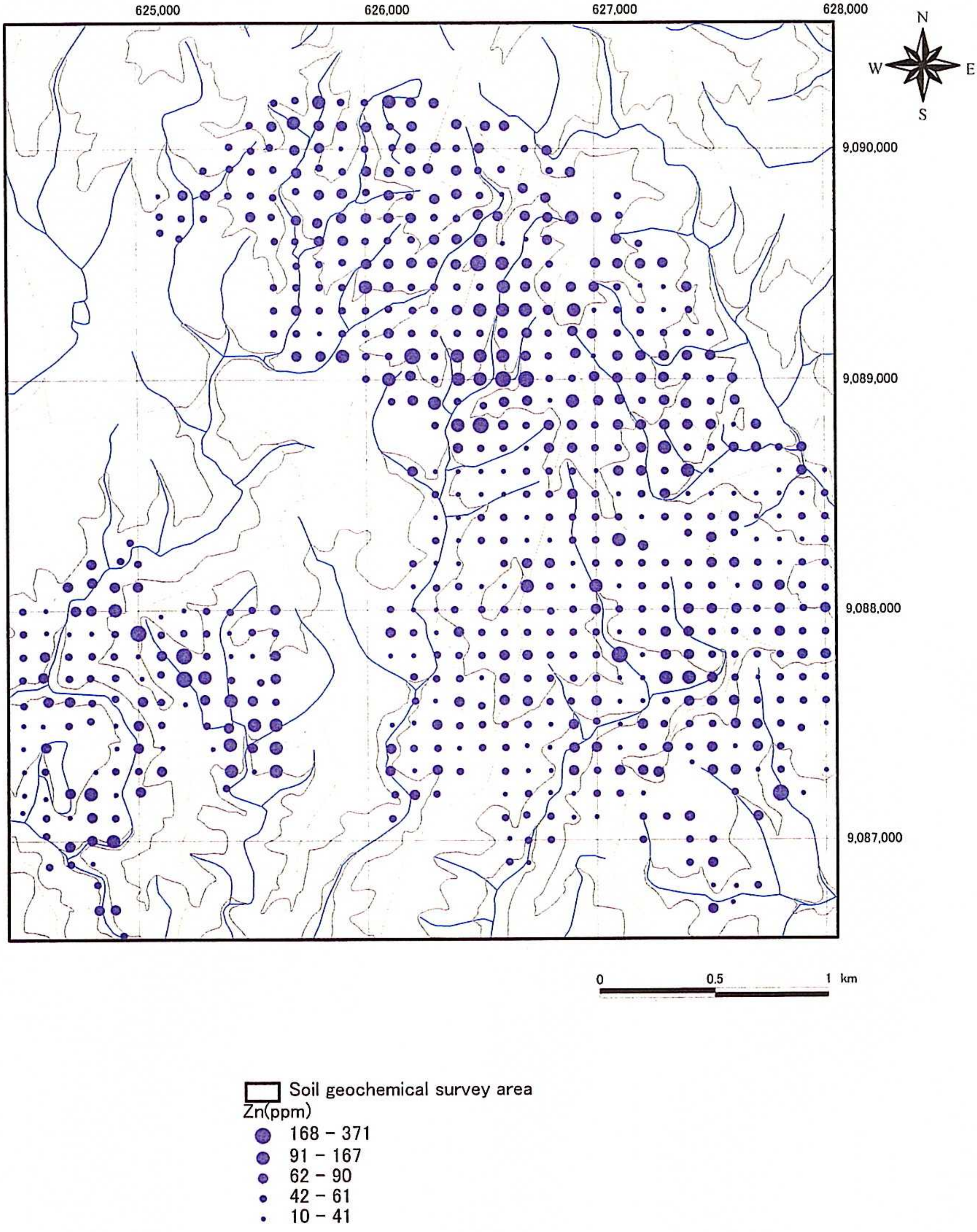


Fig.2-39 Geochemical Anomaly of Soil Samples in the Seweden District (Zn)

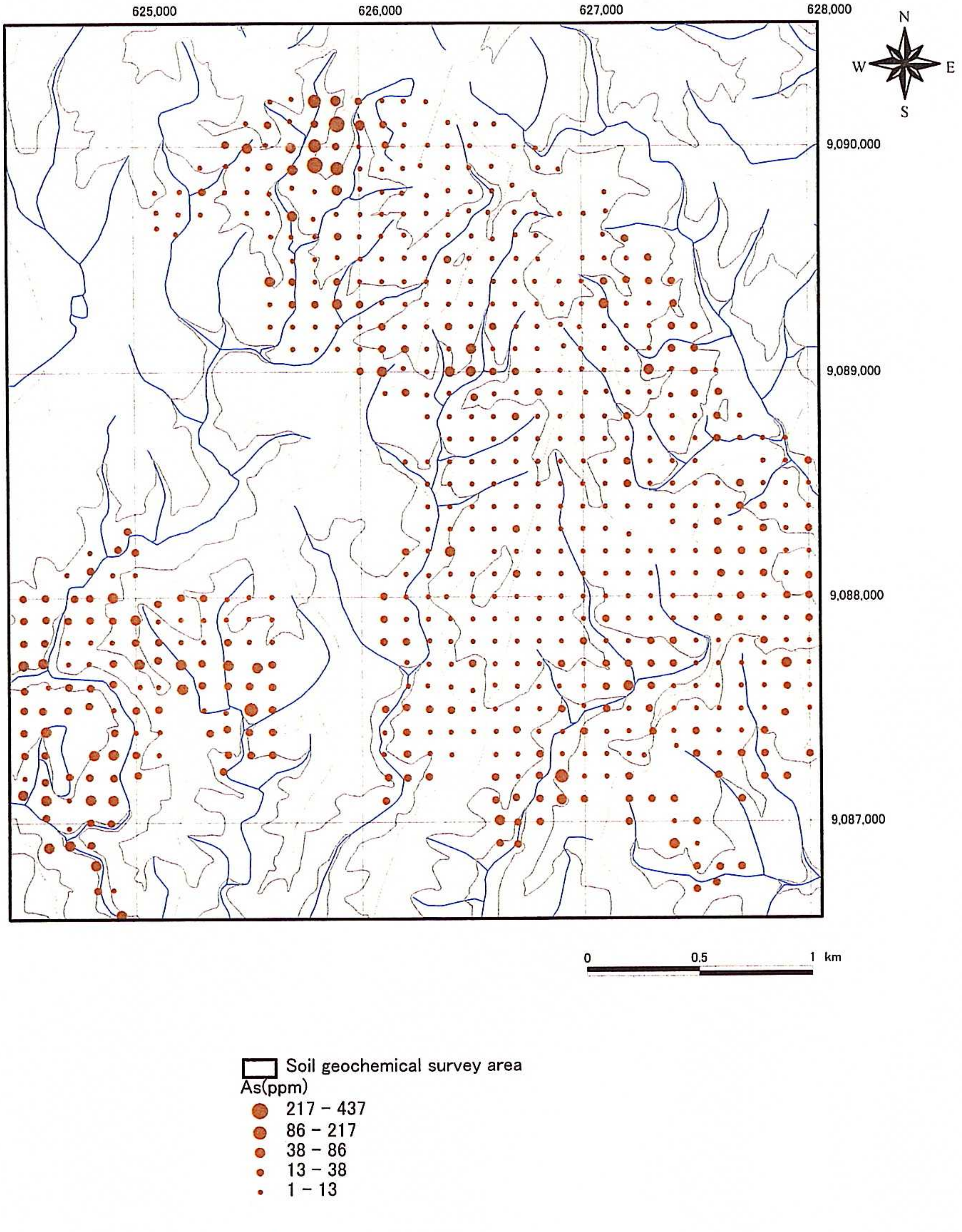
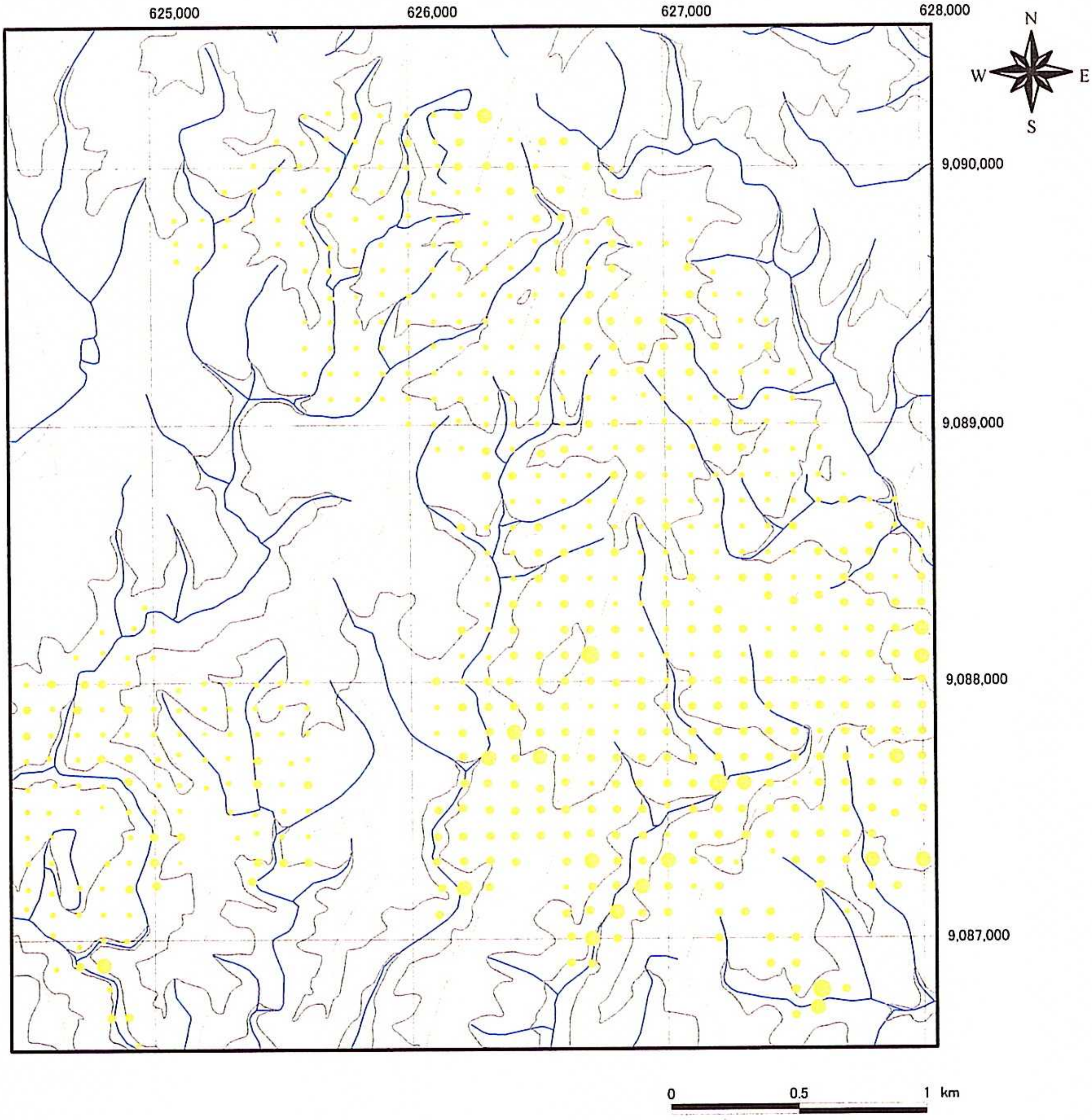


Fig.2-40 Geochemical Anomaly of Soil Samples in the Seweden District (As)



Soil geochemical survey area

Hg(ppm)

- 0.12 - 0.29
- 0.06 - 0.12
- 0.03 - 0.06
- 0.01 - 0.03
- < 0.01

Fig.2-41 Geochemical Anomaly of Soil Samples in the Seweden District (Hg)

Chapter 5 Mining Right

1-5 Prambon District

1-5-1 Method of Survey

The areal extent of the Prambon District is 50km2 and traversed length is 27km. The base camp was set up at the Tulungagung. The survey area is reached via main road between Tulungagung and Trenggalek, then local road between Trenggalek and the Suren village. It takes one and half-hours from the base camp to the survey area.

Geological survey was conducted in the area extracted by geochemical survey during the phase 2 survey and revealed Au, Ag, Cu, Pb and Zn mineralization. Gold mineralization along the Suren River, Cu-Pb-Zn mineralization along the Beloran and Sumurup Rivers were considered to be most interesting zones within the Prambon district.

This year's survey was conducted in order to reveal the continuity of above-mentioned mineralization zones and delineate drilling targets. This year's geological survey concluded that quartz and silicified zones in the Suren continues well based on the outcrops and float distribution. To confirm the mineralization, geochemical survey was conducted.

A total of 4 samples for thin sections, 20 samples for polished sections of mineralized rocks, 72 samples of chemical analysis, 3 samples for fluid inclusion study, 2 samples for whole rock analysis and 12 samples for X-ray analysis were taken during the field traversing.

1-5-2 Results of Geological Survey

1-5-2-1 Geology

(1) Stratigraphy

The Prambon sub-district is underlain by andesitic and basaltic volcanic and volcaniclastic rocks. The existing map of Ponorogo and Tulungagung quadrangles correlate those volcanic and volcaniclastic rocks to Oligocene-Lower Miocene Mandalika Formation, Jaten Formation (Tmj), and limestone to the Wonosari Formation. It is difficult to define the boundary of the Mandalika Formation and the Jaten Formation in the Prambon district. Therefore, the volcanic and volcaniclastic rocks that are intercalated with fine volcaniclastic rocks are correlated to the Jaten Formation and the boundary is defined based on the existing geologic map of the Tulungagung Quadrangle sheet.

(a) Mandalika Formation (Tomma)

Distribution: Distributed widely in the western to central part of the district.

Composition: Composed of andesitic-basaltic (Tomma) lava and volcaniclastic rocks. Generally massive volcaniclastic rocks without bedding are abundant and stratigraphy and structure is difficult to clarify, but fine-grained volcaniclastic rocks and mudstone intercalated in some parts. The volcanic and volcaniclastic rocks of the formation are characterized by wide propylitization, while unaltered rocks are exposed in western and other parts.

Structure: Strike E-W to N-S in the northeastern part, and ENE-WSW trending gentle anticline and syncline occur repeatedly southward from the north.

Stratigraphy and correlation: This formation is correlated to Mandalika Formation of the Ponorogo and the Tulungagung Quadrangle sheets,

Thickness: More than 500m.

(b) Jaten Formation (Tmja, Tmjb)

Distribution: Distributed in the Northwestern and southwestern part of the district.

Composition: This is composed of black basalt lava (Tmjb) and andesitic lava and volcaniclastic rocks (Tmja). This formation is bedded with intercalation of green tuff and tuffaceous sandstone. It appears that alteration of the formation is weaker than the alteration of Mandalika Formation.

Structure: This is harmonious with Mandalika Formation. An open synclinal structure is inferred in the western part of the areas.

Stratigraphy and correlation: This formation overlies Mandalika Formation, but partly interfingers with Mandalika Formation.

Thickness: More than 200m.

(c) Wonosari Formation

Distribution: Distributed narrowly in eastern and southern part of the district.

Composition: This is composed of white-gray limestone, and is generally non-bedded and massive. In the district, two types of limestone occurrence are distinguished: thin bed intercalated in andesitic rocks, and massive thick beds exposed usually on the high elevation area. Several beds of the formation are intercalated with andesitic lava of Mandalika Formation. Those rocks may be separated from the Wonosari Formation and be included into the Wonosari Formation.

Structure: Thin beds intercalated with Mandalika Formation obviously appear to be harmonious with Mandalika Formation, but Massive body near ridges appears to be flat lying.

Stratigraphy and correlation: This formation may interfinger with Mandalika Formation. Recent survey is presuming that the lower part of the formation is partly re-crystallized and correlated to the Campurdarat Formation.

Thickness: Less than 300m in the district.

(d) Quaternary volcanic rocks

Distribution: Distributed in northwestern part of the district.

Composition: This is composed of andesitic volcanics and volcaniclastic rocks of the Quaternary including reworked tuffs and lahar deposits. They are distinguished in the field by difference of alteration and consolidations from the Tertiary volcaniclastics.

Stratigraphy and correlation: This formation overlie on the Tertiary rocks uncomformably.

(2) Intrusive rocks

Diorite to quartz diorite, basalt and andesite intruded into Mandalika and/or the Jaten Formations.

(3) Geologic structure

Generally massive volcaniclastic rocks without bedding are abundant also in the stratigraphy. Therefore geologic structure is difficult to clarify. But fine-grained volcaniclastic rocks and mudstone intercalated in some parts show gentle dips and open foldings with NE-SW and N-S trending axes are inferred. In the district, NE-SW trending faults are dominant. One of them running in the eastern part of the district is inferred to displace the limestone largely.

Directions of the intrusive rocks are various as in N-S, NE-SW to ENE-WSW, and NW-SE, but N-S directions are most dominant. Dominant strike of quartz veins in the northern part of the district strikes in the direction of N-S to N30° W.

1-5-2-2 Alteration and Mineralization

(1) Alteration

Identified alteration minerals by X-ray diffractometry in the laboratory are shown in Table 2-2. Of these sericite and chlorite are major clay minerals. Mixed clay minerals (smectite/sericite), smectite, kaolin minerals are also distributed in the district. Propylitic and sericite alterations are developed widely. It may be presumed that sericite alteration is developed adjacent to the quartz and silicified veins and propylitic alteration zones are developed outer zones. Sulfosalt mineral (jarosite) is identified at only location,

(2) Mineralization

The geological survey was conducted in the northern part of the district, especially along the upstream of the Suren River and near Sengon villages. Along and near the Suren River, four (4) quartz /silicified veining targets are delineated during this geological survey

The results show that 71 samples, of the 72 quartz vein and altered rock samples analyzed, contained gold in excess of the detection limit, and 11 contained more than 1g/t Au. The maximum value is not high at 3.03g/t Au, but native gold with 50-micron diameter was found to occur in pyrite together with acanthite microscopically in one sample (V107). Acanthite was also found in 2 other samples (T124, U066). Chalcopyrite was confirmed in 3 samples, sphalerite in 10 samples, and galena in 9 samples. Regarding alteration minerals, sericite is developed adjacent to the veins, and volcanic and volocanilastic rocks are widely affected by green alteration.

Target	Direction (Strike & Dip)	Strike Length Width	Assay results ( ) : phase 2
1.Eastern zone: Quartz vein/silicified zone	N-S, Near vertical	- 500 m - Silicified zone: 5 m	Quartz vein: 50cm 2.3g/tAu, 111g/tAg
2. Central east zone: Quartz vein zones	N30° W, 60-90 SW	- 1,500m - Quartz vein: 40 cm, and parallel veins	Quartz vein: 40 cm 1.8g/tAu (27g/tAu)
3. Central west zone: Quartz vein zones	N30° W, 80° SW-NE	- 800 m - Quartz vein: 70 cm, and parallel veins	Quartz vein:70 cm, 3.0g/tAu (21g/tAu)
4. Western zone: Quartz vein/silicified zone	N-S, Near vertical	- 1,000m - Strongly silicified zone: 1 m	Silicified zone: 5m, 0.23g/tAu

1-5-3 Results of Geochemical Survey

(1) Survey Area

An area of 3km in the east south direction by 6km in the north-south direction was selected where quartz and silicified zone were developed densely.

(2) Survey method

A total of 419 samples were taken on the 100m by 100m grids. The survey method is similar to one in the Seweden. The geochemical survey area in the Prambon District is underlain only by volcanic rocks and no limestone is underlain. The area is covered by pine trees in the northern part and vegetation is not dense in the southern part. The "A" horizon is thicker than in other districts, but it was not difficult to take soil samples from " B" horizon. A total of eight samples are divided into two to check the accuracy of chemical analysis.

(3) Results of analysis

(a) Analytical results

The results are appended in Table A-3. The statistics of the components are laid out in Table 2-25.

(c) Correlation among elements

The correlations between elements are shown on Table 2-26 and Fig.2-53. Correlation between Au, Ag, Cu Pb and Zn and other elements are as follows:

Au: Au has low correlation coefficients with Ag and As, but does not show clear relations with other elements.

Ag: Ag has low positive correlation with Au, As and Pb.

Cu: Positive correlation exists with Al, Ba, Co, Fe, Sc, and V. The correlation coefficients are low with other mineralization element such as Pb and Mo.

Pb: Pb does not have strong positive correlation with other elements. Low correlation exists with Ag, Cd, Hg, S and Zn, Those correlation coefficients range between 0.24 and 0.47.

Zn: There are very weak correlation between Al, Cd, Co, Cu, Mn, Pb, Sc and Ti. The correlation coefficients range more than 0.3.

Mo: Correlation coefficient of Mo is more than 0.2 with Au, As, B, Sb and Tl.

(b) Distribution of anomalies by elements

Au (Fig. 2-54): In addition to one sample show higher than 10ppm, anomalies occur in the northern part and southeastern part, especially the east quartz zone and central east zone show significant anomalies.

Ag (Fig. 2-55): Low but higher than detection limit of chemical analysis values distribute in a similar pattern with Au.

Cu (Fig. 2-56): Only one sample returned more than 100ppm. It appears that comparatively high values (>50ppm) exist along the quartz veins in the lower zone, in the eastern part. The distribution pattern shows similar to As.

Mo (Fig. 2-57): There are no significantly high values. Comparatively high values (>92ppm) are found along or near quartz veins. It is considered to be due to mineralization

Pb (Fig. 2-58): There are no significantly high values. Comparatively high values are found in the southern part of the western zone to the central east zone.

Zn (Fig. 2-59): The western zone show comparatively high values.

As (Fig. 2-60): The northern part of the eastern zone - the central east zone and southern part of the western zone show high values (>13ppm).

Hg (Fig. 2-61): Northern part of the area and the southern part of the western zone show high values (>0.08ppm).

1-5-4 Mineral Potential

Mineralization is found widely and a particularly promising zone was discovered by the second-year survey.

Several prominent mineralization outcrops of base metals and an alteration area are found in the Sumurup River and the Beloran River areas in the central to northern part of the Prambon district. The two outcrops of a sphalerite-galena-quartz vein zones in the Sumurup River and three outcrops of sphalerite-galena-quartz vein zones in the Beloran River are two of the most prominent mineralization. A zone of with quartz veins with sporadic copper mineralization occurs in the Suren River drainage area, to north of the Sumurup River area. The mineralization occurs as quartz veins or silicified veins with chalcopyrite and minor amount of galena. An outcrop of strongly silicified ledge is identified near the top of mountains between the Sumurup River and Beloran River.

Present geological survey in the Suren River Basin in the northern part of the area, where many epithermal gold-bearing quartz veins were found and some have high gold grade. This quartz vein zone is considered to have the highest gold-silver potential in this district. Four quartz veining and silicified vein zones are delineated. Each zone is estimated to continue mo than 0.5 to 1.0 km in strike length. The maximum width of quartz vein is about 1.0 m and highest value is about 27g/tAu. There is no evidence of continuities to the depth. But fluid inclusion study indicates that the mineralization of the veins continues to depth

Also lead-zinc bearing quartz veins to the south in the basins of Sumurup and Beloran Rivers are considered to have high mineral potential, but these areas were not surveyed this year.

Table 2-20 Results of Microscopic Observation of Thin Sections, Prambon District

Sample No.	Rock type	Texture	Phenocrysts								Groundmass						Alteration minerals								
			pl	kf	q	ol	opx	cpx	hb	bi	pl	kf	q	opx	cpx	mt	q	kf	ep	ac	ch	se	sm	ca	ru
W117	basalt	porphyritic, cryptocrystalline	△					?	?		×							·	·		△	×		△	
W122	basalt	porphyritic, cryptocrystalline	○						?		×						×				△			△	
W129	basalt	porphyritic	○					?			○					×	×				○			△	
X095	basalt	aphyric, pilotaxitic, amygdaloidal	◎					?									·						○	△	

ol:olivine, cpx:clino-pyroxene, opx:ortho-pyroxene, op:opaque mineral, hb:hornblende, bio:biotite

kf:potash-feldspar, qz:quartz, ap:apatite, frag:fragment,leu:leucoxene, ser:sericite, kao:kaolin, cal:calcite, sm:smectite, ep:epidote
chl:chlorite, zeo:zeolite, pl:plagioclase, pre:prehnite, ill: illite, zr: zircon
Amount:◎>○>△>·>×

Table 2-21 Results of Whole Rock Analysis, Prambon District

Sample No.	SiO2	Al2O3	Fe2O3	CaO	MgO	Na2O	K2O	Cr2O3	TiO2	MnO	P2O5	SrO	BaO	LOI	Total	K2O#	T/A
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)		
W117	64.12	16.37	4.79	4.88	1.59	3.26	0.71	0.01	0.47	0.11	0.13	0.03	0.03	3.26	99.76	0.07	1.14
W122	59.68	16.71	6.81	5.64	2.33	2.44	0.82	<0.01	0.52	0.14	0.13	0.03	0.03	4.43	99.71	0.07	1.05

Table 2-22 Results of X-ray Diffraction, Prambon District

Mineral	Quartz	Plagioclase	Muscovite	Kaolinite	Chlorite	Pyrophyllite	Other clay	Zeolite	Rutile or K-feldspar	Anatase	Pyrite	Calcite	Calcite or chalcopyrite	Other

1M	Type of muscovite which is less common and less crystalline than the $2M_1$-type
Al	Alunite
Am	Amphibole(monoclinic)
An	Analcite or wairakite
Ang	Anglesite – $PbSO_4$
Ba	Barite
Ch	Chabazite (zeolite)
Di	Dickite
Dol	Dolomite
Ep	Epistilbite (zeolite)

Ga	Galena
Go	Goethite
Gy	Gypsum
Ha	Halloysite
H	Heulandite group
J	Jarosite
L	Laumontite (zeolite)
Mo	Mordenite(zeolite)
ML	Mixed layer smectite- illite
Mh	Maghemite
Mt	Magnetite
Pa	Paragonite

Pr	Prehnite
Px	Pyroxene
Sm	Smectite
St	Stilbite(zeolite)
U	Unidentified clay – very poorly crystalline
Unid	Unidentified
V	Vermiculite
Z	Zeolite (too low in abundance for type to be identified)

◎: Dominant. Used for the component apparently most abundant, regardless of its
◎c: Co-dominant. Used for two (or more) predominating components, both or all of which
◎: Sub-dominant. The next most abundant component(s) providing its percentage level is
△: Accessory. Components judged to be present between the levels of roughly 5 and
・: Trace. Components judged to be below about 5%.

Table 2-23 Results of Observation of Polished Sections, Prambon District

Sample No.	Ore minerals									Gangue minerals							
	Py	Cp	Sph	Asp	Au	Aca	Gn	Bar	others	si	ser	pl	kf	chl	epi	cal	others
T109	◎		○				△			◎							
T124	○					・		△	Ja(△)	◎							
T126	○									◎	△						Ti(・)
T131	◎		△				○			◎							
u066	△		・			・			Goe(・)Hem(・)	◎	・						
u067	◎		・				△		Ang(△)	◎							
u069	○		△				・		Goe(○)	◎							apa(○)
V089	○		△					○		◎							
V090	○								Goe(△)Ja(○)	◎							
V102	○		・				・		Goe(△)	◎				・			
V103	○		・				・	・	Co(・)	◎	△						
V107	○	・			・	・		・	Cas(・)	◎	○						
V111	○						・		Goe(△)Ja(○)	◎				△			
V112	○	△						△	Goe(△)	◎							
W126	○									◎							kao(◎)
W133	○						・		Goe(△)	○		◎		△		○	apa(△)mon(・)
X104	◎		○	△			△			◎	○						Ti(・)
Y085	○													○		◎	apa(・)
Y090	○	△	△							◎	△					◎	
Y097	○									◎	△						apa(・)

Py=pyrite,Cp=chalcopyrite,Asp=arsenopyrite, Gn=galena, Goe=goethite, Aca=acanthite, Ja=jarosite, Co=covellite
Sph=sphalerite, Bar=barite, Ang=anglesite, Au=gold, Hem=hematite, Mt=magnetite, Mel=melonite, Cas=cassiterite,Ili=ilm
si=SiO2 minerals, pl=plagioclase, chl=chlorite or clay minerals, epi=epidote, cal=calcite, kao=kaollinite, tit=titanite
kf=K-feldspar, se=sericite or muscovite, apa=apatite, Ti=TiO2 polymorph, mon=monazite, cpx=clinopyroxene,

◎=abundant, ○=common, △=small, ・=rare

Table 2-24 Chemical Analysis Results of Rock Samples, Prambon District

Sample No.	UTM		Au	Ag	Cu	Pb	Zn	Mo	As	Hg	Sb
unit	North	East	ppm	ppm	%	%	%	%	%	ppm	ppm
V 113	9120049	575775	0.063	3	<0.01	<0.01	<0.01	0.001	0.02	0.65	5
X104	9118602	575769	3.29	78	0.01	3.25	1.15	<0.001	1.08	67.2	1295
X098	9118284	575756	0.481	26	<0.01	<0.01	<0.01	<0.001	0.04	0.59	18
T115	9120120	575740	0.024	6	<0.01	<0.01	<0.01	<0.001	0.01	0.57	5
V 112	9120054	575608	0.366	72	0.01	0.02	0.01	0.001	0.03	0.8	9
V 103	9120439	575535	1.095	64	0.01	0.04	0.01	<0.001	0.07	0.35	<5
u069	9120534	575519	2.33	111	0.01	0.02	0.03	0.004	0.01	0.1	30
V 106	9120488	575452	0.054	6	<0.01	0.01	<0.01	<0.001	0.01	0.25	<5
T103	9119915	575446	0.14	32	<0.01	<0.01	<0.01	<0.001	0.03	0.06	<5
T102	9120063	575344	0.013	<1	<0.01	<0.01	<0.01	0.001	0.01	0.04	<5
X101	9119354	575341	0.553	74	<0.01	0.01	0.01	0.001	0.01	0.01	7
X102	9118962	575296	0.529	19	<0.01	0.01	0.03	0.002	0.02	0.83	<5
T105	9119816	575240	1.825	110	0.02	0.11	0.11	0.002	0.03	0.21	37
u061	9120973	575219	0.463	3	<0.01	<0.01	<0.01	<0.001	0.01	0.02	9
T119	9122027	575198	0.006	1	<0.01	<0.01	0.02	<0.001	0.01	0.02	<5
T107	9119760	575170	0.52	34	<0.01	0.03	0.01	0.002	0.08	0.23	27
T106	9119765	575160	2.03	18	<0.01	0.02	0.01	0.001	0.02	0.13	9
u062	9121684	575075	0.146	2	<0.01	<0.01	<0.01	<0.001	0.02	0.03	10
T114	9119100	575035	0.152	4	<0.01	<0.01	<0.01	0.001	0.05	0.27	21
T124	9120080	575001	0.007	51	<0.01	0.05	0.19	0.002	0.05	2.92	38
u063	9121919	574990	0.002	<1	<0.01	<0.01	0.01	<0.001	<0.01	0.05	8
T131	9120254	574968	0.357	16	<0.01	0.16	0.18	<0.001	0.01	0.56	8
T113	9119100	574965	0.268	22	0.04	0.04	0.23	0.001	0.02	0.04	6
V 111	9119315	574920	0.194	4	<0.01	0.01	<0.01	0.003	0.03	0.21	15
Y088	9117492	574902	0.235	2	<0.01	<0.01	0.01	<0.001	0.02	0.01	8
T132	9120601	574899	0.039	<1	0.01	0.03	0.08	<0.001	0.01	0.02	<5
Y087	9117483	574869	0.226	38	0.01	0.24	0.62	0.001	0.05	0.1	25
T110	9119515	574850	0.271	8	0.03	0.07	0.08	0.001	0.02	0.01	8
T109	9119512	574849	2.57	85	0.04	0.24	0.13	<0.001	0.06	0.05	11
T108	9119500	574846	1.385	23	0.03	0.09	0.03	0.001	0.03	0.06	13
V 107	9119522	574832	2.97	74	0.07	0.15	0.1	0.001	0.02	<0.01	<5
Y097	9120824	574814	0.708	6	<0.01	<0.01	0.01	<0.001	0.06	0.3	<5
u065	9119901	574791	0.355	74	<0.01	0.02	<0.01	0.002	0.02	0.09	23
T133	9120540	574778	0.013	2	<0.01	<0.01	0.01	<0.001	0.01	0.06	<5
V 108	9119697	574768	0.166	13	<0.01	0.01	0.02	0.001	0.02	1.03	<5
u068	9120073	574751	0.029	3	<0.01	<0.01	<0.01	0.001	0.02	0.38	16
T111	9119390	574720	0.406	30	0.01	0.02	0.01	0.001	0.04	0.01	11
T112	9119300	574700	0.778	57	0.03	0.04	0.01	0.002	0.06	<0.01	10
Y095	9120200	574700	0.008	1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	6
Y096	9120982	574629	0.722	7	0.06	0.21	0.03	<0.001	0.02	0.12	<5
u066	9119856	574596	0.026	4	<0.01	<0.01	0.01	<0.001	0.01	<0.01	10
Y090	9117760	574590	0.153	6	0.03	0.13	0.45	<0.001	0.07	0.02	6
Y089	9117742	574582	0.799	67	0.15	0.32	1.3	<0.001	0.06	0.05	18
V 110	9119920	574560	1.09	42	<0.01	0.01	<0.01	0.001	0.01	0.07	<5
u067	9120095	574518	1.945	46	<0.01	0.25	0.03	0.001	0.05	0.19	22
Y078	9120910	574450	<0.001	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.08	<5
Y080	9120922	574438	0.004	<1	0.01	<0.01	0.01	<0.001	<0.01	0.02	<5
Y081	9121004	574252	0.312	8	0.08	0.3	1.34	<0.001	0.03	0.02	11
Y085	9121006	574251	0.019	<1	<0.01	<0.01	0.01	0.001	<0.01	0.03	6
T126	9120096	574217	1.825	50	0.02	0.06	0.37	<0.001	0.01	0.4	<5
Y082	9120999	574203	0.917	19	0.17	0.77	1.84	0.001	0.12	0.02	17
Y083	9120996	574201	3.03	8	0.02	0.02	0.02	0.001	0.03	0.04	7
V 101	9120433	574110	0.01	<1	<0.01	0.01	<0.01	<0.001	<0.01	0.02	<5
V 102	9120433	574110	0.162	10	0.01	0.05	0.12	<0.001	<0.01	0.07	<5
V 100	9120428	574106	0.115	9	0.01	0.07	0.13	0.001	<0.01	0.09	<5
V 088	9119862	574081	0.212	4	0.02	0.06	0.07	0.001	0.01	0.12	6
V 084	9119529	574052	0.003	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.01	6
V 087	9119748	574035	0.347	8	0.01	0.05	0.02	<0.001	0.05	0.04	8
V 086	9119573	574033	0.088	2	0.02	0.07	0.12	<0.001	0.01	0.55	5
V 089	9119811	573971	0.097	2	0.02	0.16	0.47	0.001	0.01	0.33	<5
V 098	9120139	573850	0.06	<1	<0.01	<0.01	<0.01	0.007	<0.01	0.07	<5
V 096	9119319	573837	0.005	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
V 090	9119876	573819	0.319	4	0.01	0.01	<0.01	<0.001	0.01	<0.01	<5
V 091	9119826	573808	0.28	2	0.01	<0.01	<0.01	<0.001	<0.01	0.04	<5
W128	9119878	573783	0.397	18	0.03	0.06	0.02	<0.001	0.03	<0.01	<5
W133	9119212	573781	0.005	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
V 097	9120430	573778	0.041	<1	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<5
W127	9120132	573751	0.004	<1	<0.01	<0.01	<0.01	<0.001	0.01	0.01	<5
V 095	9119603	573742	0.078	<1	0.01	0.03	<0.01	<0.001	<0.01	0.01	<5
V 092	9119987	573710	0.002	<1	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<5
W126	9120120	573698	0.132	3	<0.01	<0.01	<0.01	<0.001	0.01	0.27	<5
V 093	9119661	573486	0.015	<1	<0.01	<0.01	<0.01	<0.001	<0.01	0.02	<5

Table 2-25 Statistic Data of Chemical Analysis Results of Soil Samples, Prambon District

Element	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La
unit	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
Sample number	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	418	419	419
Average (Av)	0.029	0.12	3.95	8	5.43	205	0.41	1.1	0.41	0.26	21	**12**	**46**	6.15	12	**0.043**	0.07	10
Standard deviation (SD)	0.488	0.07	1.79	8	1.40	135	0.20	0.4	0.13	0.06	7	9	12	1.44	5	0.024	0.04	2
Av+SD		0.20	5.73	16	6.83	341	0.61	1.5	0.54	0.32	28	22	58	7.58	17	0.067	0.10	12
Av+2・SD		0.27	7.52	24	8.24	476	0.80	1.9	0.66	0.39	35	31	70	9.02	22	0.091	0.14	13
Av+3・SD		0.34	9.31	32	9.64	611	1.00	2.3	0.79	0.45	42	40	83	10.46	27	0.114	0.17	15
max	**10.000**	0.80	11.9	100	10	670	1.20	5.0	0.82	1.10	38	89	**100**	10.4	30	0.26	0.21	20

*average, SD:except 10ppm

Element	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	U	V	W	Zn
unit	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
Sample number	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419	419
Average (Av)	0.21	1,326	**0.68**	0.04	8	247	**16**	0.0202	1.25	12	67.0	0.16	5.4	5.0	175	5.0	**62**
Standard deviation (SD)	0.14	516	0.33	0.02	4	107	20	0.0198	0.65	5	41.9	0.14	1.3	0.0	71	0.0	27
Av+SD	0.35	1,842	1.01	0.06	12	355	36	0.0400	1.90	17	108.9	0.30	6.6	5.0	247	5.0	89
Av+2・SD	0.49	2,357	1.34	0.08	17	462	56	0.0597	2.56	21	150.8	0.43	7.9	5.0	318	5.0	116
Av+3・SD	0.63	2,873	1.67	0.10	21	570	76	0.0795	3.21	26	192.7	0.57	9.2	5.0	390	5.0	143
max	1.08	3120	3	0.1	37	970	**243**	0.4	6.00	27	293	0.62	10	5	426	5	324

Table 2-26 Correlation Coefficients between Elements in Soil Samples, Prambon District

Element	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Ti	Tl	V	Zn
Au	1.00	0.16	0.00	0.18	-0.04	0.00	-0.05	-0.03	-0.08	0.04	-0.11	-0.08	-0.09	-0.01	0.01	0.07	0.01	0.04	-0.10	-0.10	0.27	-0.02	-0.07	0.00	0.10	0.07	-0.02	0.01	-0.05	0.01	0.08	-0.02	-0.02
Ag		1.00	-0.15	0.40	-0.09	-0.05	-0.20	-0.05	0.12	0.05	-0.15	-0.13	-0.17	-0.18	-0.13	0.18	0.12	-0.14	-0.12	-0.05	0.09	0.16	-0.11	0.06	0.26	0.26	0.14	-0.21	-0.08	-0.10	-0.04	-0.14	0.04
Al			1.00	-0.21	0.41	0.89	0.68	0.24	-0.26	-0.05	0.63	0.17	0.59	0.72	0.75	0.42	-0.10	0.19	-0.02	0.57	-0.08	0.07	0.26	-0.01	0.03	0.08	0.24	0.85	0.87	0.87	0.09	0.79	0.33
As				1.00	-0.07	-0.12	-0.18	0.00	-0.11	0.05	-0.21	-0.13	-0.12	-0.17	-0.10	0.27	0.07	-0.19	-0.23	-0.21	0.28	-0.07	-0.12	0.02	0.19	0.06	0.24	-0.18	-0.14	-0.14	-0.02	-0.18	-0.14
B					1.00	0.42	0.55	0.27	-0.20	-0.03	0.38	0.09	0.27	0.56	0.62	0.16	-0.11	0.06	-0.08	0.29	0.28	-0.04	0.08	0.03	-0.07	0.03	0.25	0.49	0.36	0.50	0.31	0.50	0.11
Ba						1.00	0.64	0.23	-0.29	-0.03	0.59	0.09	0.56	0.69	0.71	0.49	-0.09	0.14	-0.19	0.57	-0.03	0.05	0.20	0.02	0.07	0.10	0.22	0.79	0.82	0.82	0.08	0.73	0.29
Be							1.00	0.34	-0.35	-0.07	0.54	0.12	0.49	0.70	0.73	0.19	-0.13	0.23	-0.03	0.45	0.11	-0.16	0.19	0.13	-0.09	0.01	0.17	0.72	0.54	0.63	0.23	0.61	0.23
Bi								1.00	-0.07	0.05	0.19	0.03	0.18	0.25	0.36	0.10	-0.02	0.02	-0.01	0.22	-0.03	0.06	0.05	0.06	0.10	0.02	-0.04	0.24	0.17	0.32	0.08	0.28	0.14
Ca									1.00	-0.02	-0.13	0.07	-0.38	-0.34	-0.27	-0.06	0.29	-0.14	0.25	0.08	-0.03	0.81	-0.05	-0.01	-0.01	0.00	-0.13	-0.47	-0.16	-0.14	-0.02	-0.13	0.00
Cd										1.00	-0.09	-0.07	-0.03	-0.10	-0.04	0.02	0.12	-0.04	0.03	0.02	-0.02	0.01	-0.08	0.02	0.41	0.22	0.00	-0.09	-0.04	-0.02	-0.03	-0.08	0.32
Co											1.00	0.44	0.61	0.75	0.60	0.26	-0.06	0.18	0.14	0.79	-0.03	0.02	0.54	0.01	-0.07	-0.07	0.10	0.74	0.40	0.66	0.14	0.78	0.45
Cr												1.00	0.25	0.22	0.14	-0.04	-0.03	0.02	0.55	0.23	0.02	-0.01	0.85	-0.06	-0.11	-0.07	-0.01	0.30	0.04	0.14	0.02	0.26	0.22
Cu													1.00	0.62	0.49	*0.24*	-0.04	0.13	0.04	0.42	-0.07	-0.26	0.35	0.16	0.12	0.02	0.05	0.68	0.43	0.47	0.05	0.52	*0.43*
Fe														1.00	0.74	0.33	-0.20	0.10	-0.14	0.56	0.11	-0.09	0.26	0.14	0.00	0.09	0.22	0.87	0.55	0.77	0.21	0.87	0.29
Ga															1.00	0.34	-0.15	0.13	-0.11	0.51	0.18	-0.02	0.17	0.06	0.00	0.03	0.32	0.75	0.63	0.74	0.21	0.72	0.25
Hg																1.00	-0.04	-0.07	-0.28	0.26	0.06	0.18	-0.02	0.00	0.24	0.16	0.25	0.34	0.39	0.48	0.03	0.42	0.18
K																	1.00	-0.01	0.27	0.12	-0.12	0.19	-0.01	0.25	0.05	0.13	-0.08	-0.21	-0.06	-0.05	-0.12	-0.15	0.17
La																		1.00	0.06	0.18	-0.05	-0.12	0.09	-0.01	-0.12	-0.15	0.01	0.19	0.13	0.11	0.06	0.07	0.13
Mg																			1.00	0.12	-0.12	-0.02	0.47	0.06	-0.11	-0.10	-0.14	-0.03	-0.10	-0.12	-0.03	-0.12	0.29
Mn																				1.00	-0.09	0.27	0.27	0.08	0.08	-0.01	0.09	0.54	0.42	0.67	0.10	0.67	0.56
Mo																					1.00	-0.03	-0.07	0.02	-0.05	-0.02	0.24	0.01	-0.07	-0.02	0.30	0.02	-0.11
Na																						1.00	-0.13	-0.06	0.09	0.13	0.01	-0.21	0.13	0.24	0.03	0.20	0.05
Ni																							1.00	-0.05	-0.13	-0.11	-0.04	0.38	0.10	0.14	0.02	0.26	0.24
P																								1.00	0.05	0.20	0.03	0.04	0.04	-0.03	0.12	-0.07	0.20
Pb																									1.00	0.47	0.04	-0.03	0.04	0.08	-0.08	0.03	0.47
S																										1.00	0.04	0.01	0.11	0.12	0.01	0.09	0.08
Sb																											1.00	0.20	0.25	0.24	0.15	0.20	0.00
Sc																												1.00	0.66	0.79	0.14	0.82	0.32
Sr																													1.00	0.73	0.04	0.60	0.19
Ti																														1.00	0.11	0.93	0.34
Tl																															1.00	0.13	0.05
V																																1.00	0.32
Zn																																	1.00

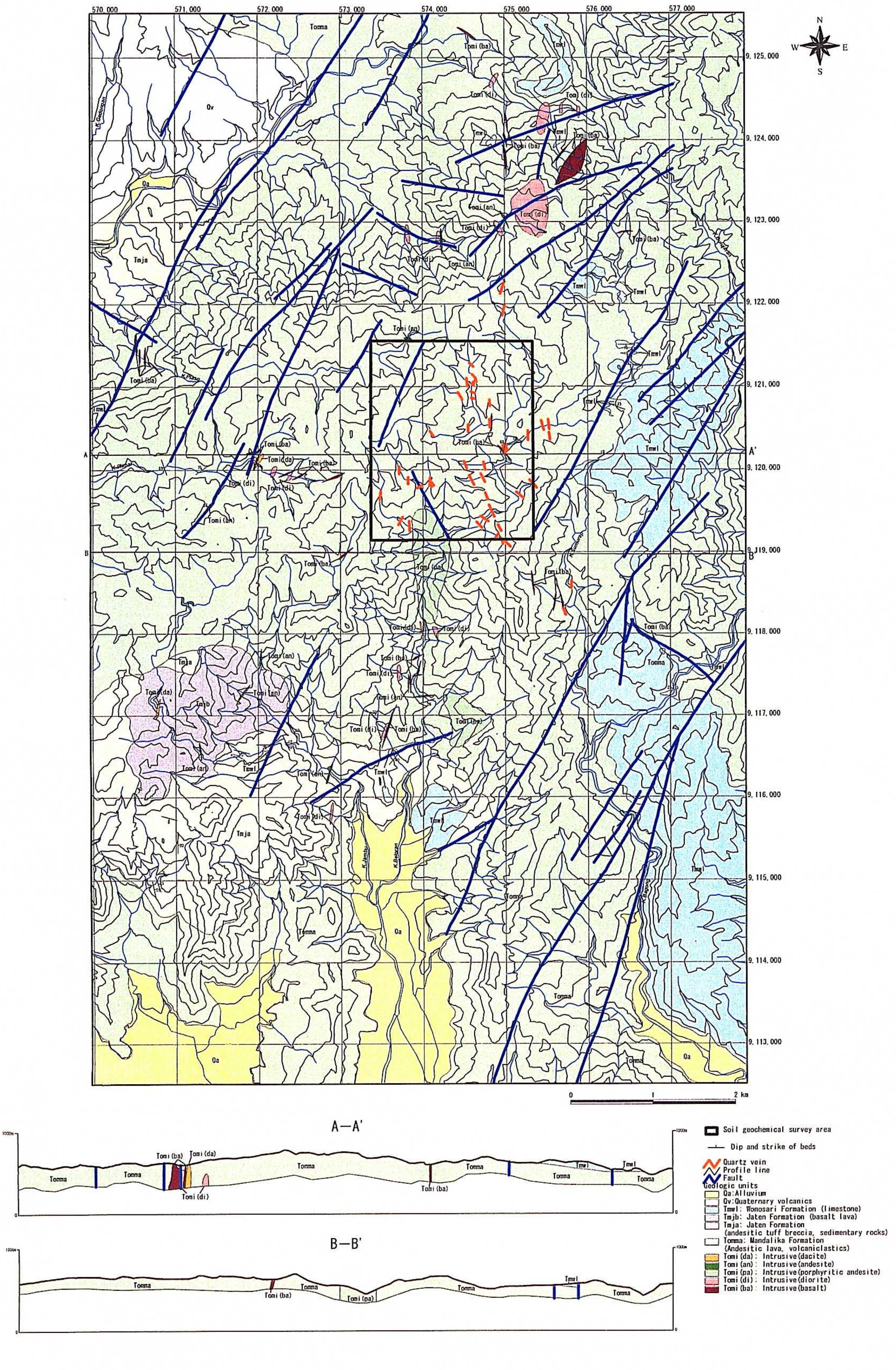


Fig.2-42 Geologic Map and Profiles of the Prambon District

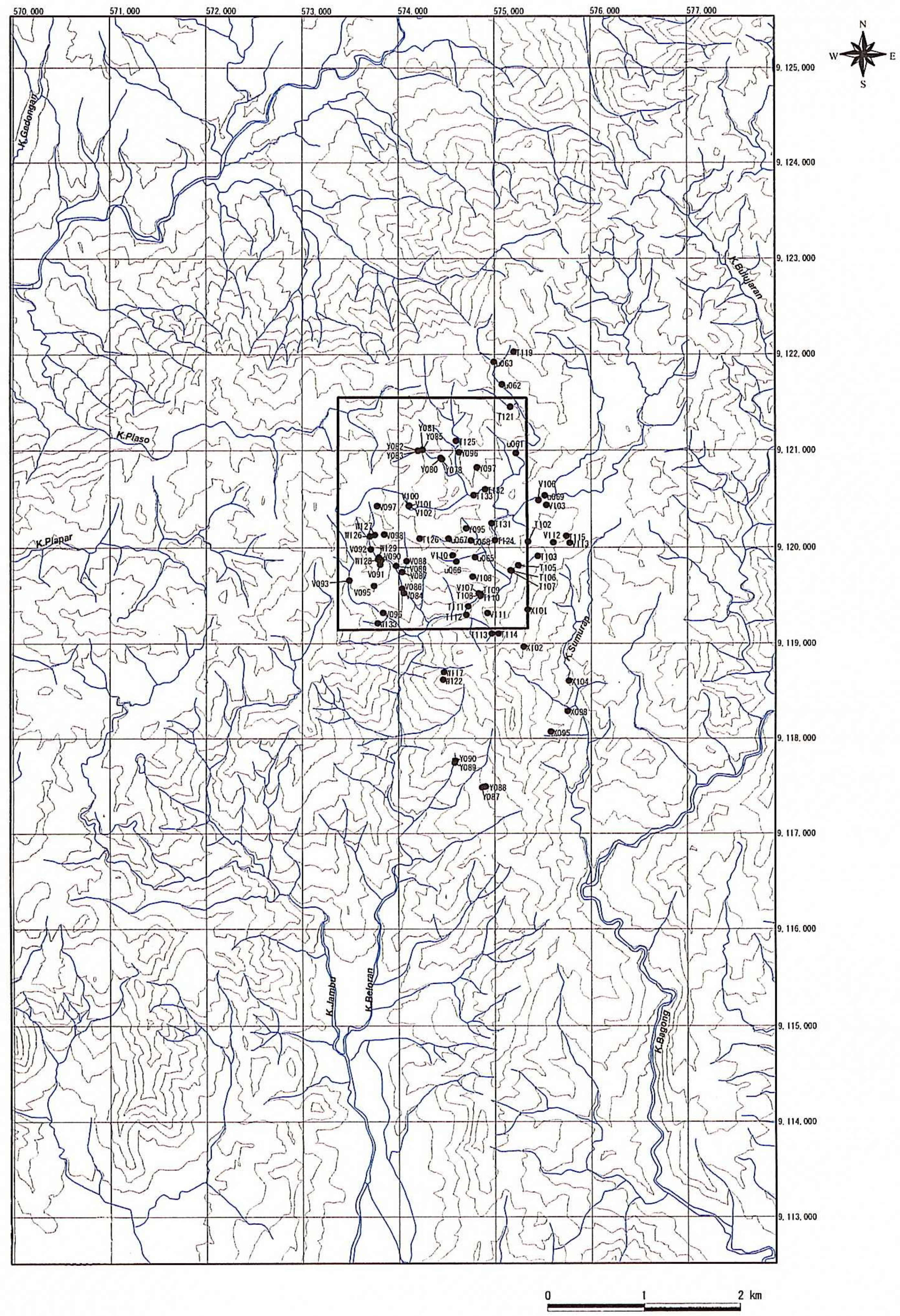


Fig.2-43 Location Map of Rock Samples in the Prambon District

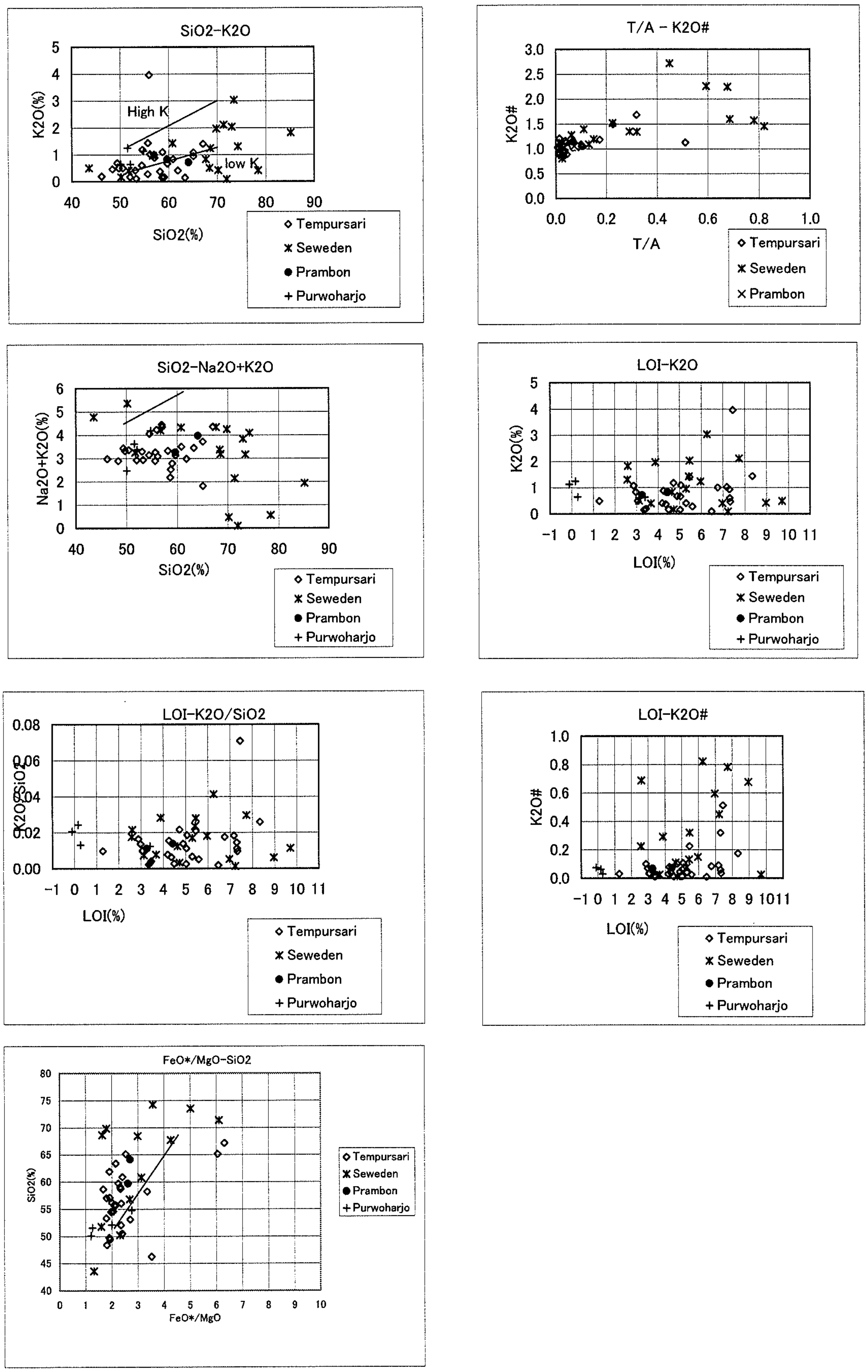
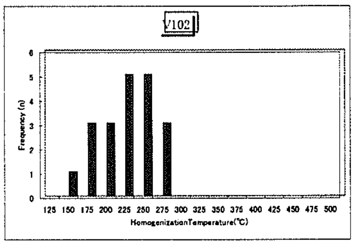
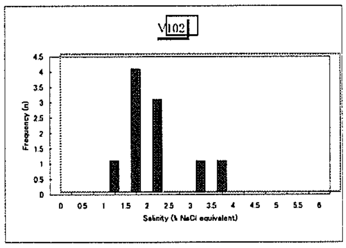


Fig. 2-44 Diagrams of Rock Forming Elements in Volcanic Rocks, Purambon District

Fig. 2-27 Correlations between Temperatures and Salinities of Fluid Inclusions, Seweden District

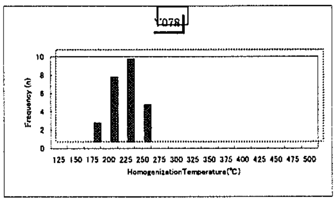
V102

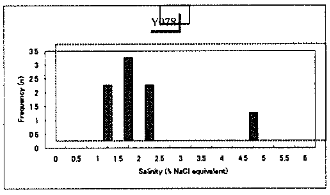




	Homogenization Temperature	Salinity
number: (exclude :	20	10
average	214 °C	1.8 %
maximum:	272 °C	3.3 %
minimum:	149 °C	0.9 %
standard deviation:	34 °C	0.8 %

Y078



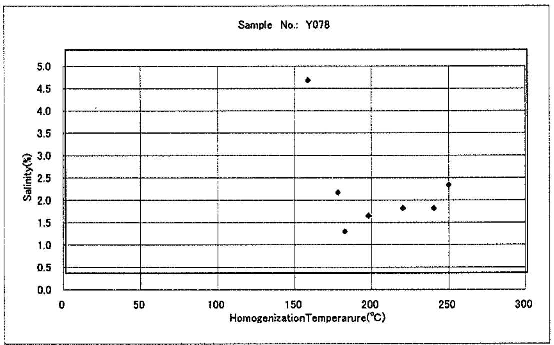


	Homogenization Temperature	Salinity
number:	22	8
average	203 °C	1.7 %
maximum:	249 °C	4.3 %
minimum:	157 °C	0.7 %
standard deviation	24 °C	1.1 %

V090

	HomogenizationTemperature(°C)	Salinity (% NaCl equivalent)
number:	1	1
average	155 °C	4.2 %
maximum:	155 °C	4.2 %
minimum:	155 °C	4.2 %
standard deviation	- °C	- %

Fig. 2-45 Homogenization Temperatures and Salinities of Fluid Inclusions, Prambon District



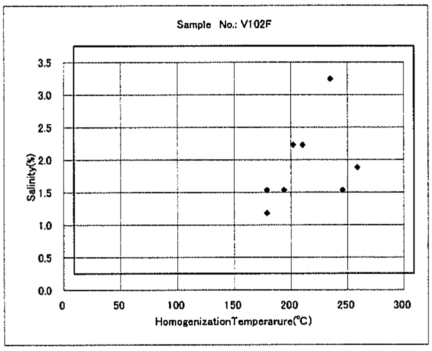


Fig. 2-46 Correlations between Temperatures and Salinities of Fluid Inclusions, Prambon Distirct

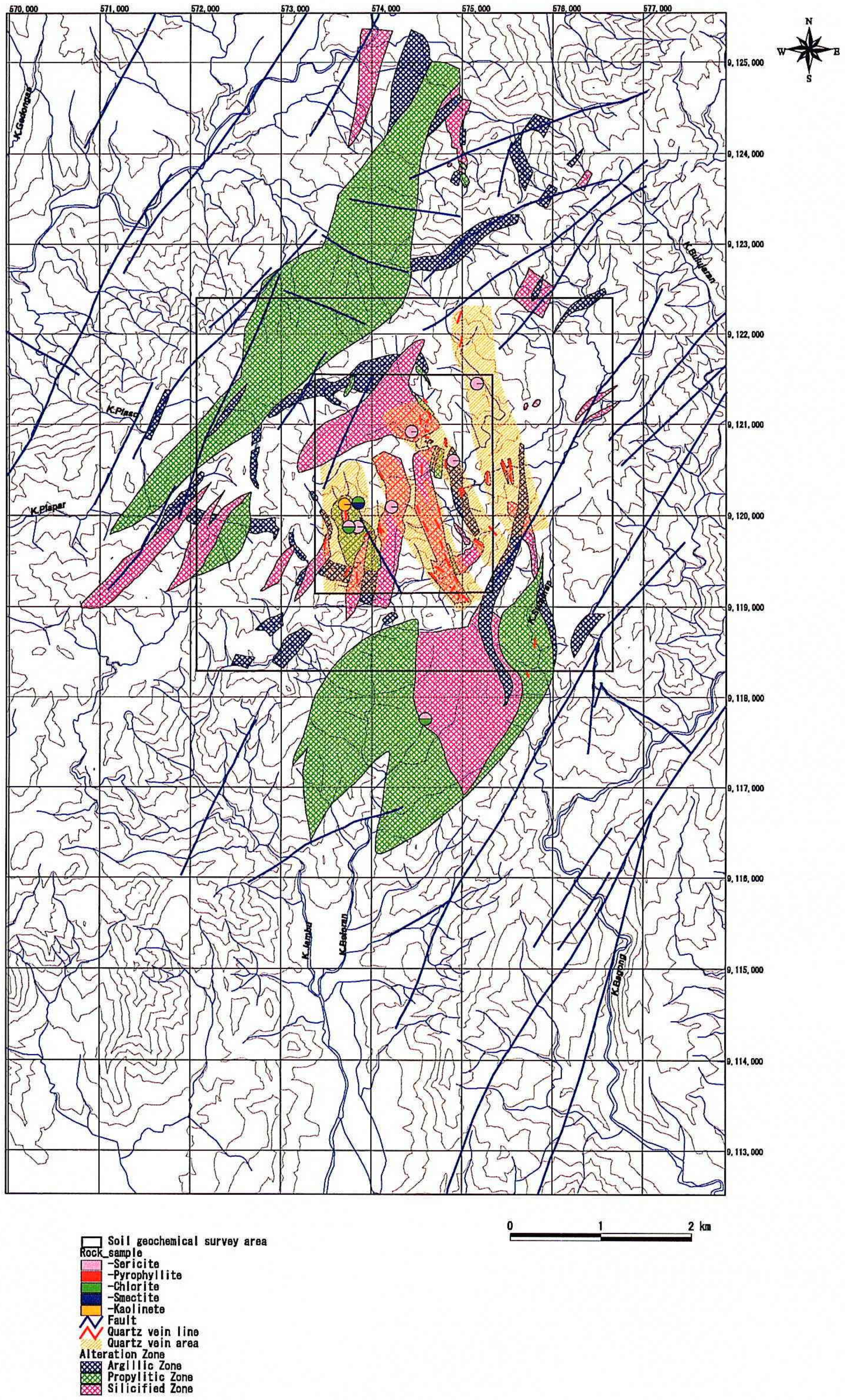


Fig.2-47 Mineralized and Alteration Zones of the Prambon District

Fig.2-47 Mineralized and Alteration Zones of the Prambon District

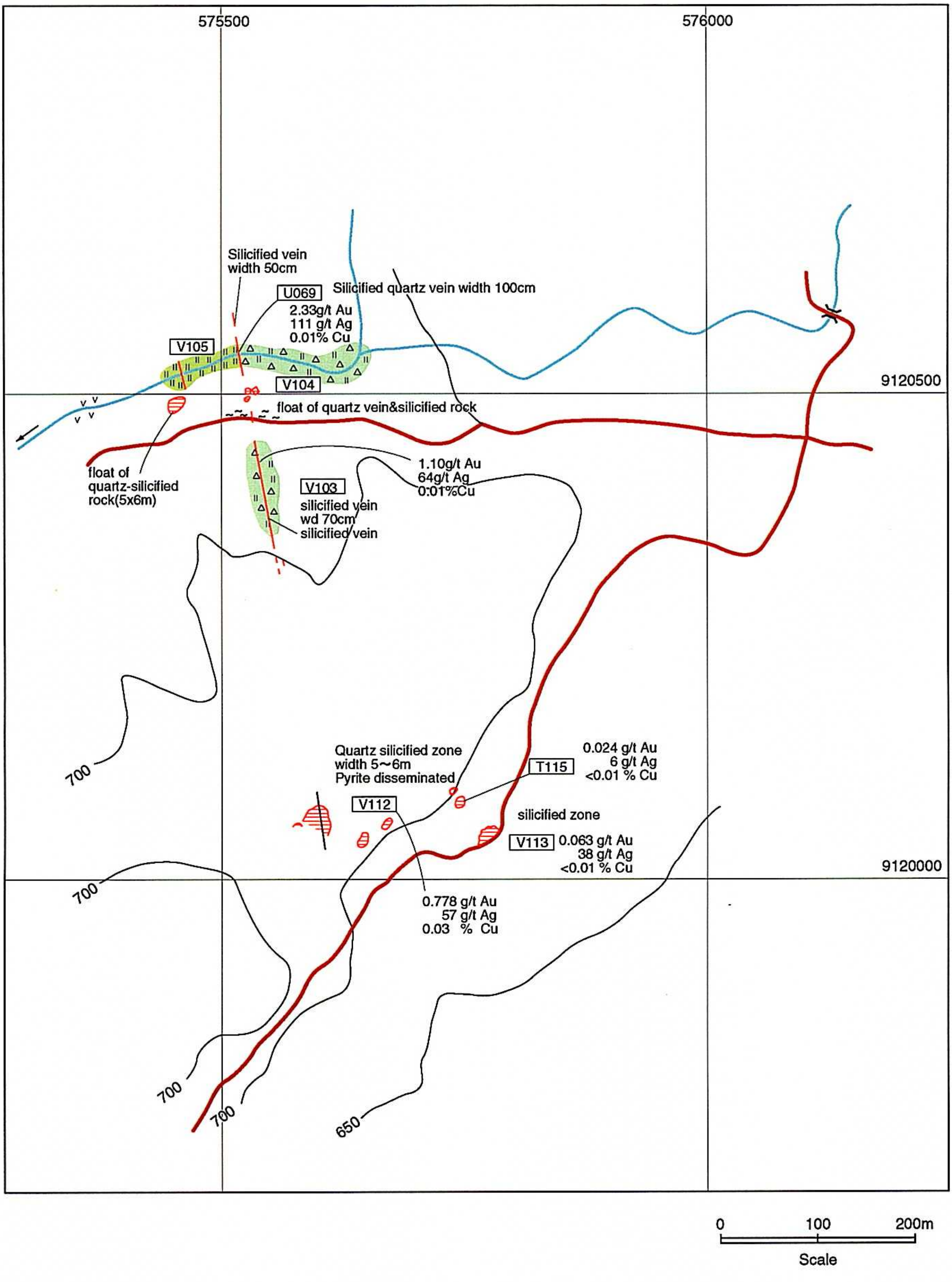


Fig. 2-48 Sketch of the Silicified Zones in the Prambon District(1)

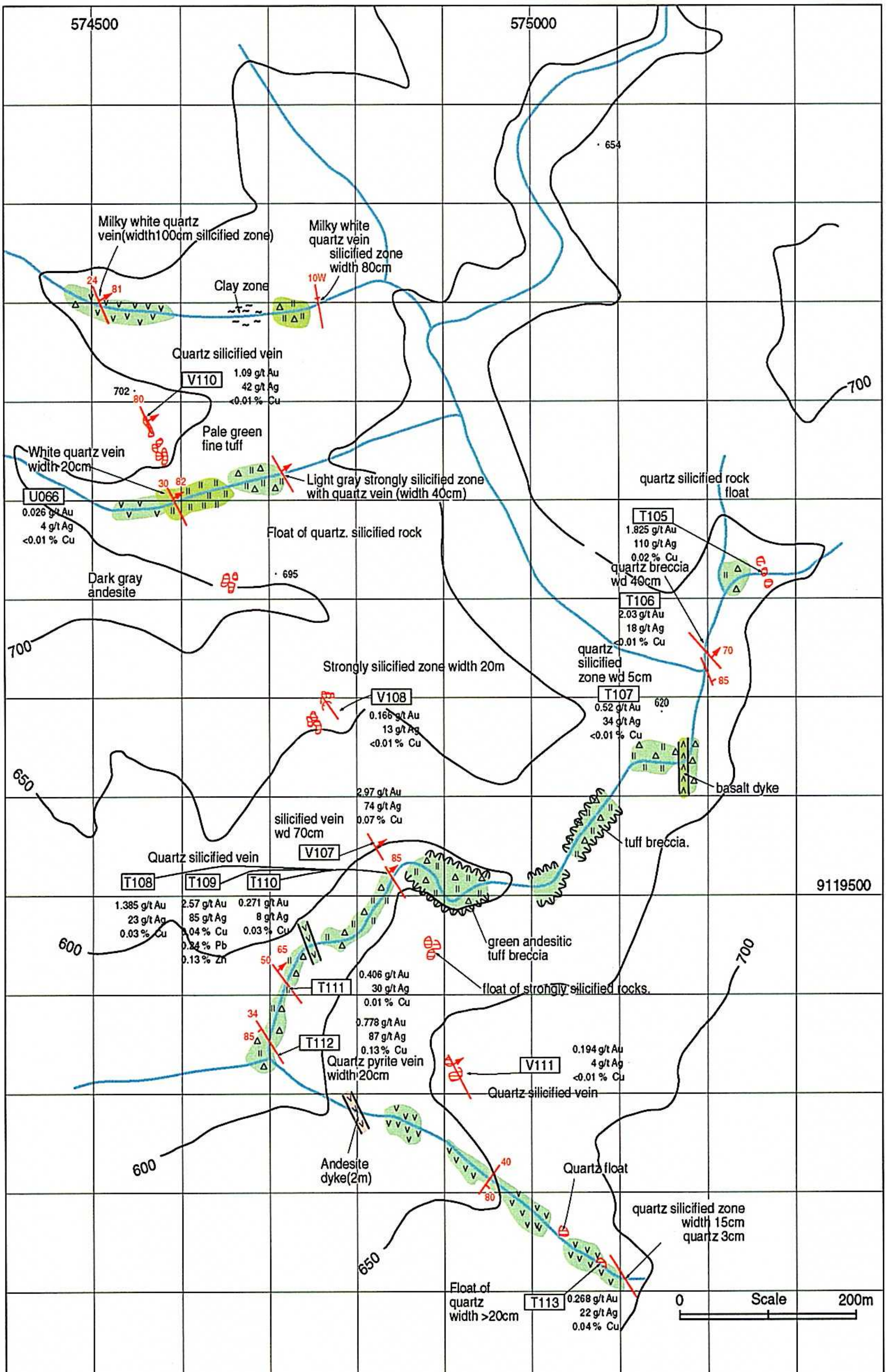


Fig.2-49 Sketch of Quartz veins along the Suren River in the Prambon District(2)

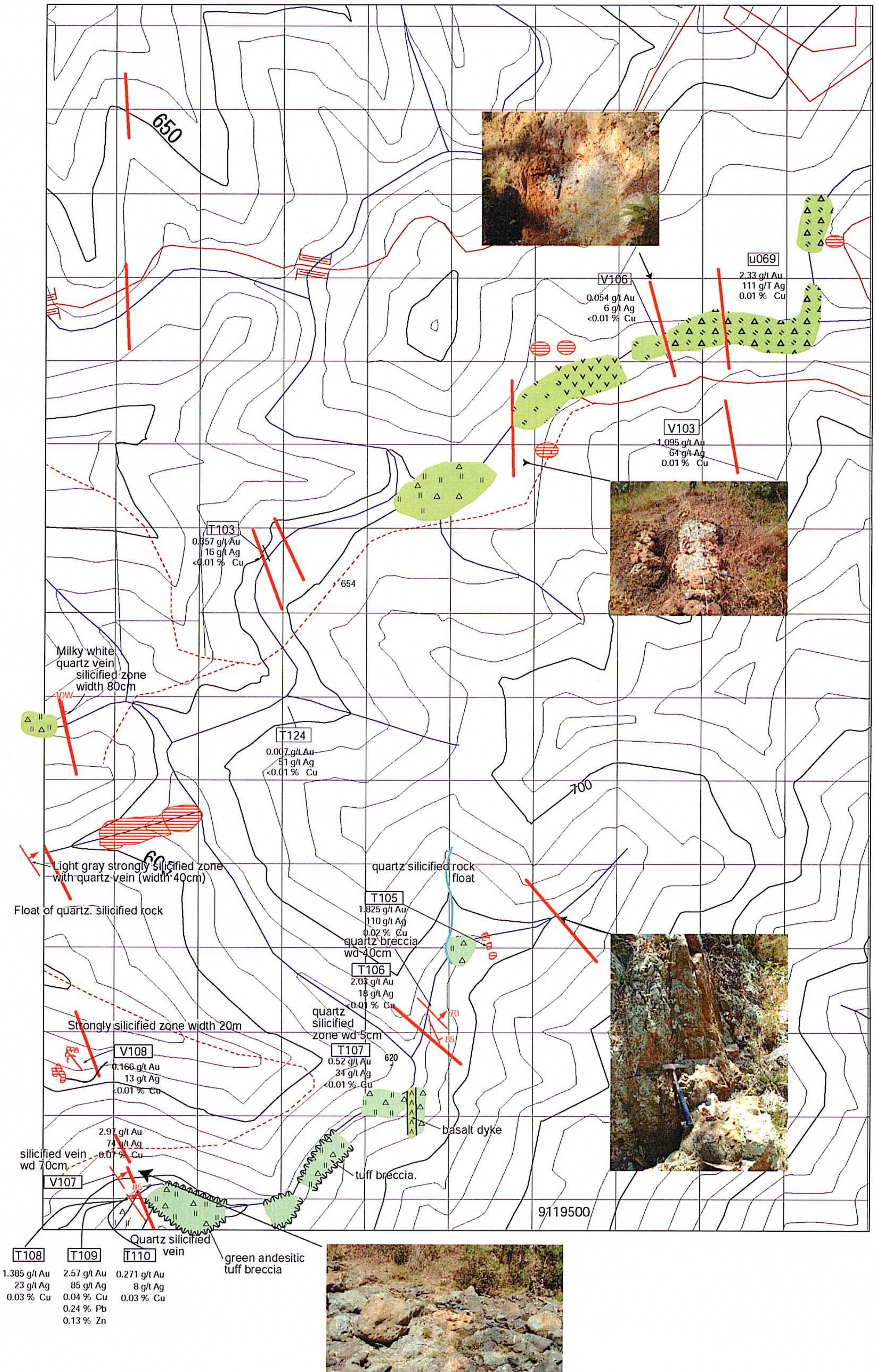


Fig.2-50 Mineralized Zones along the Suren River, Prambon Disrict (3)

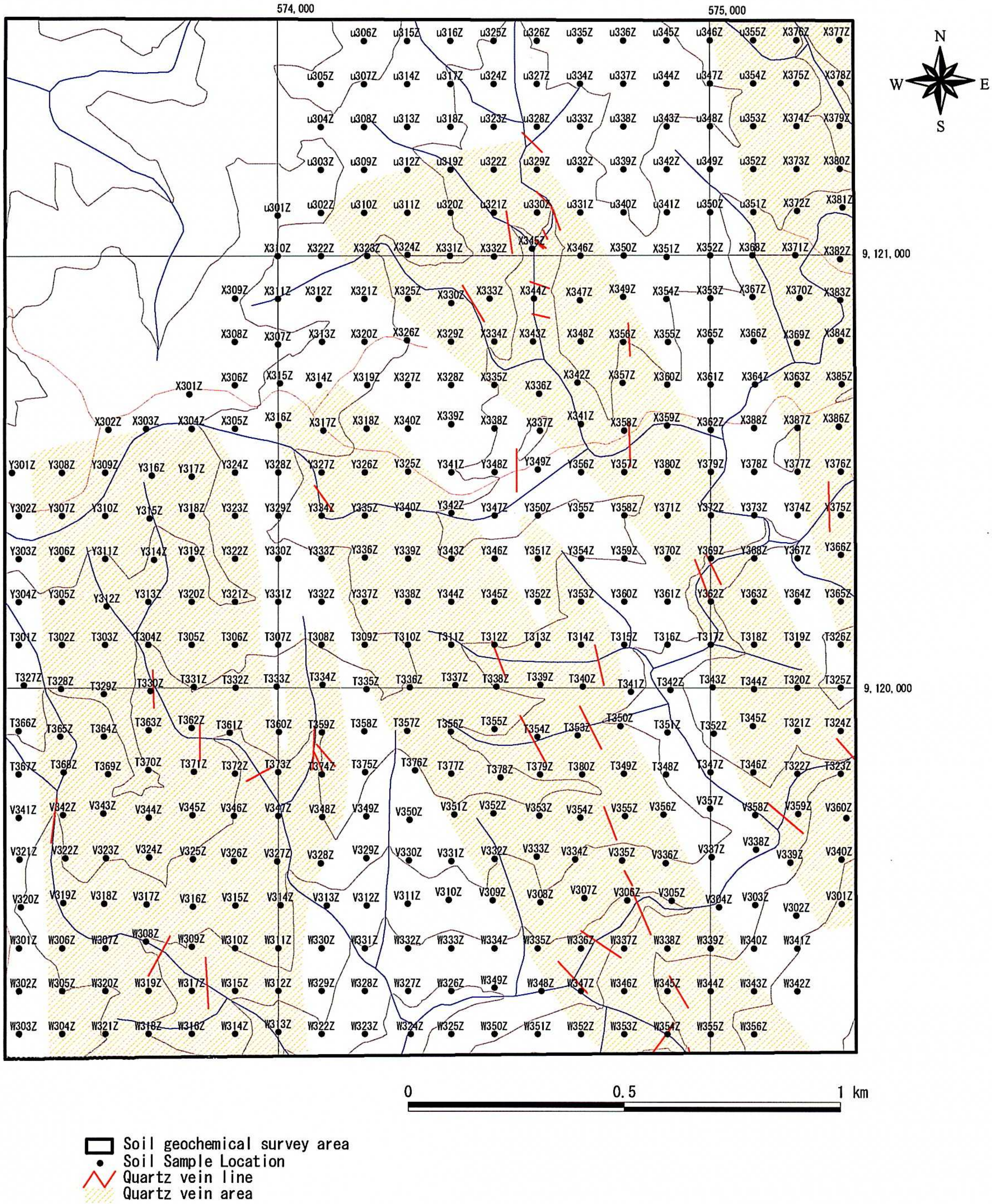


Fig.2-51 Location Map of Soil Samples : Prambon District

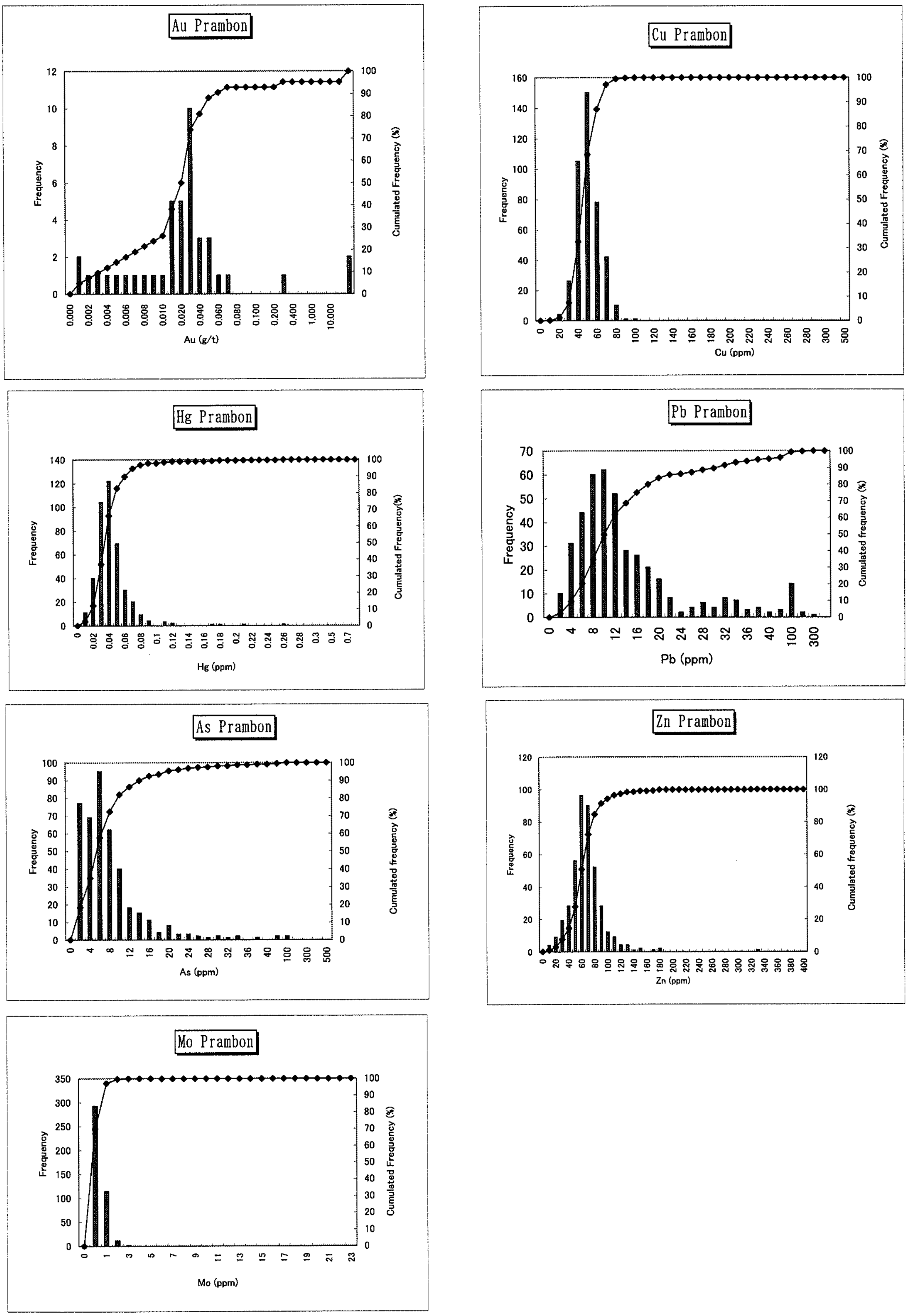


Fig. 2-52 Histograms of Chemical Analysis Data of Soil Samples, Prambon District

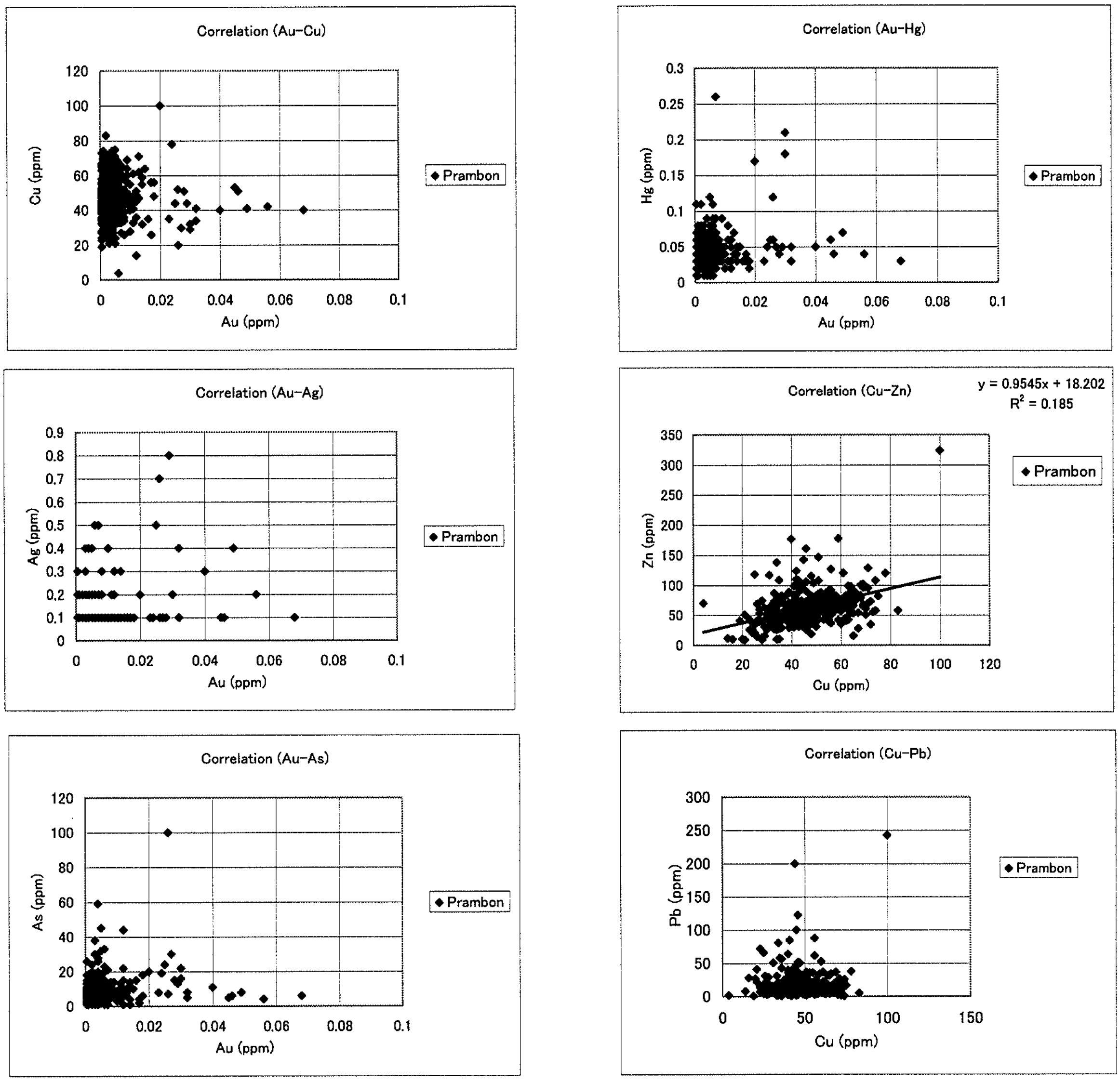
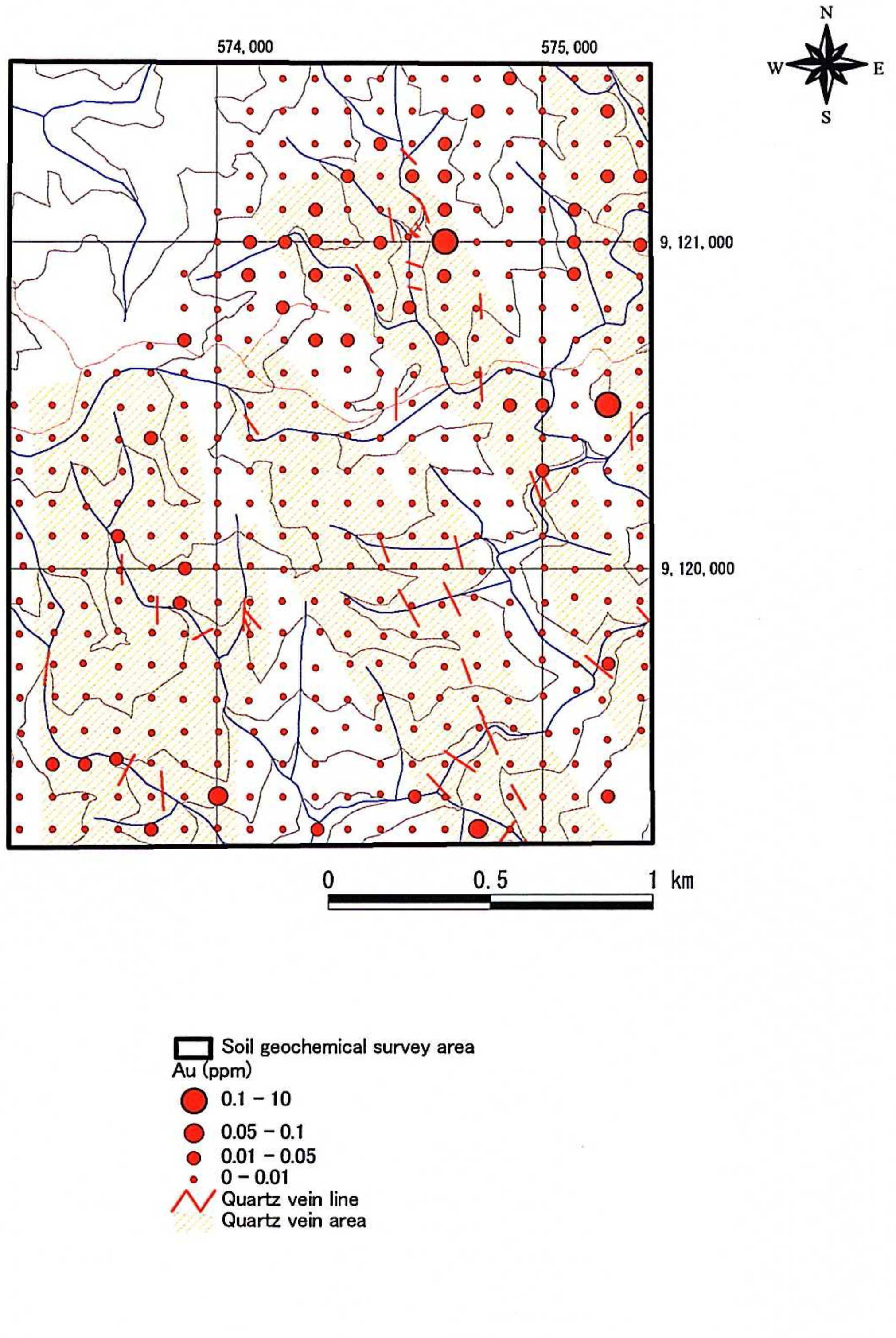


Fig.2-53 Correlations between Elements in Soil Samples in the Prambon District



Fif.2-54 Geochemical Anomaly of Soil Samples in the Prambon District (Au)

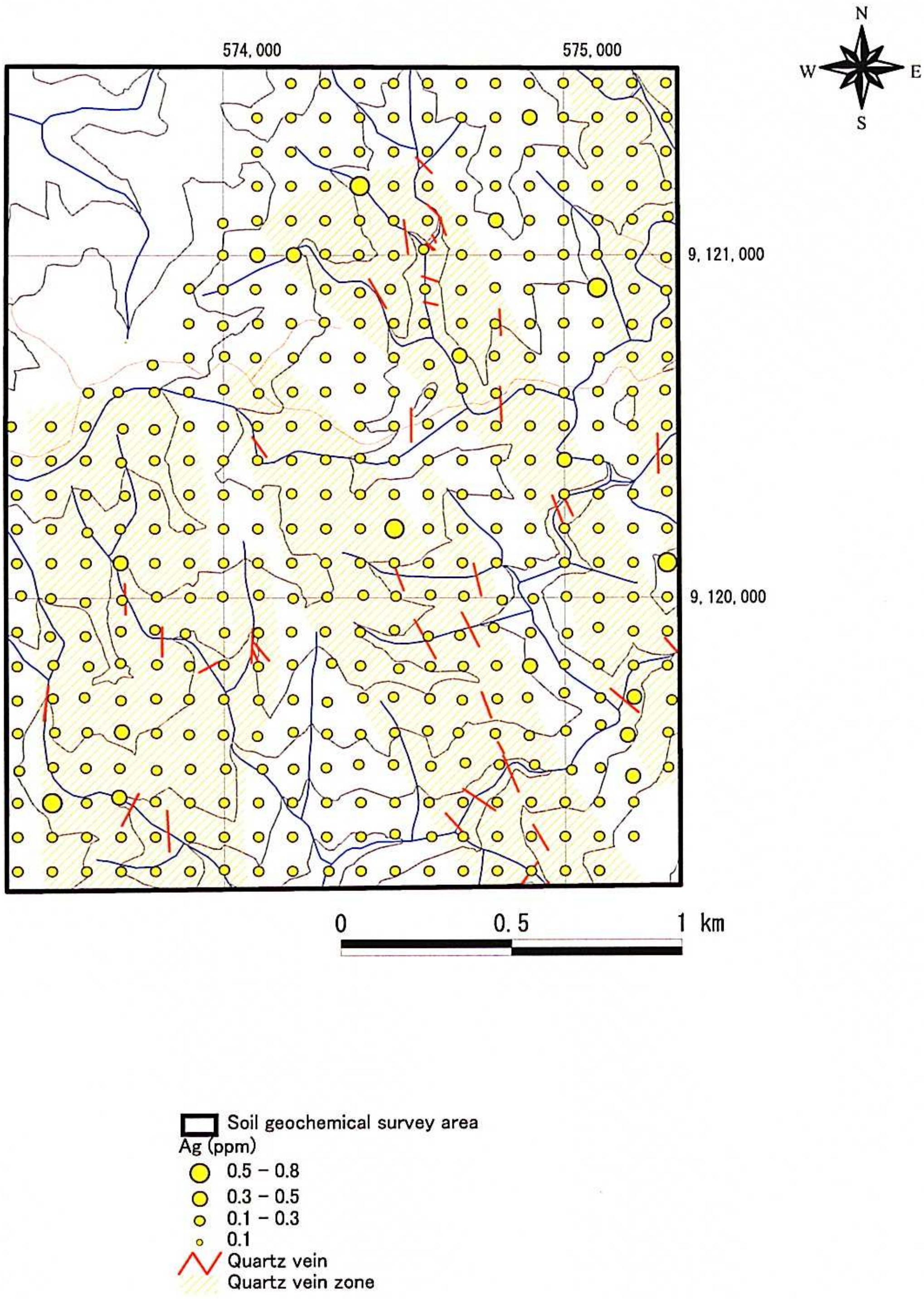
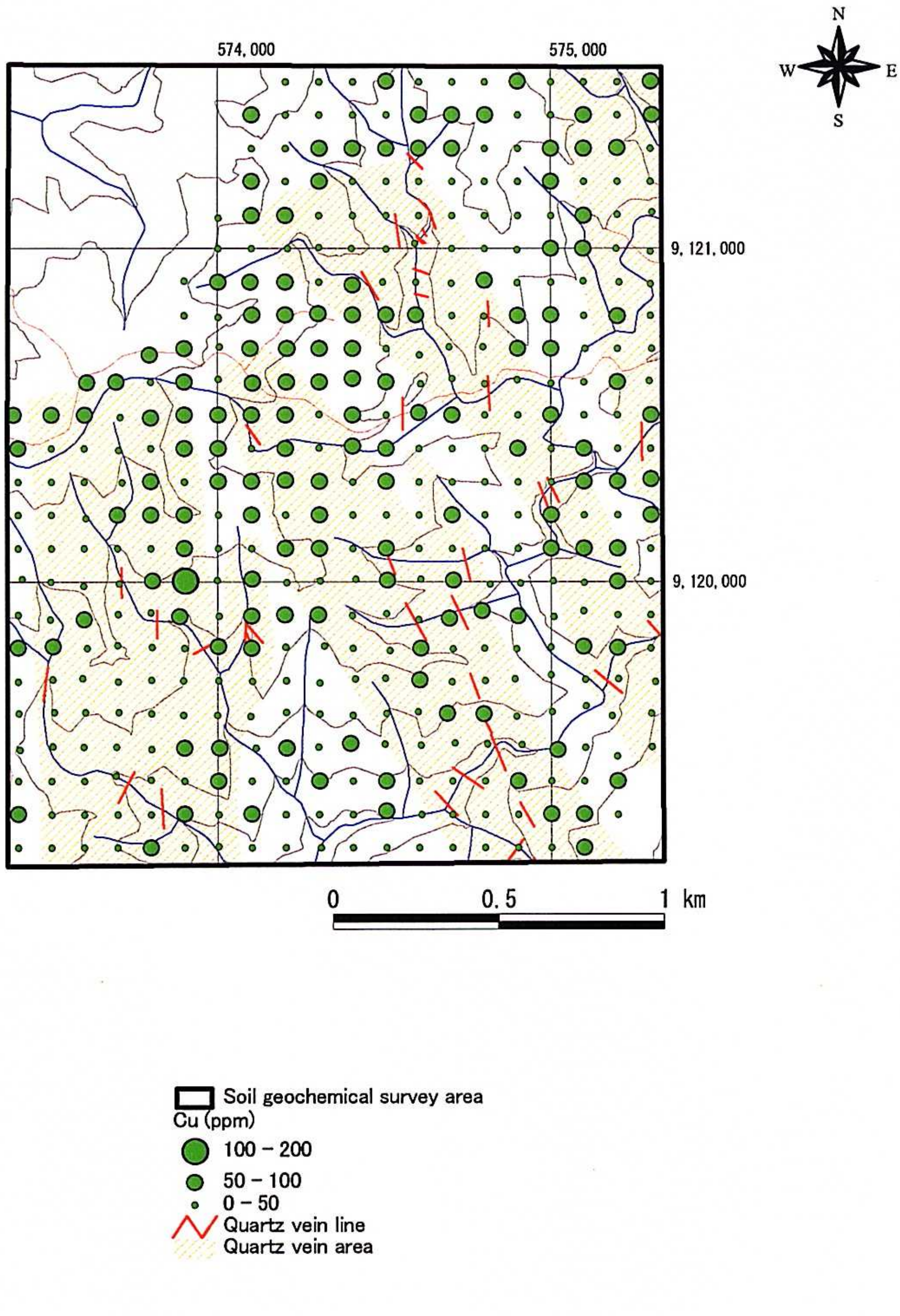


Fig.2-55 Geochemical Anomaly of Soil Samples in the Prambon District (Ag)



Fif.2-56 Geochemical Anomaly of Soil Samples in the Prambon District (Cu)

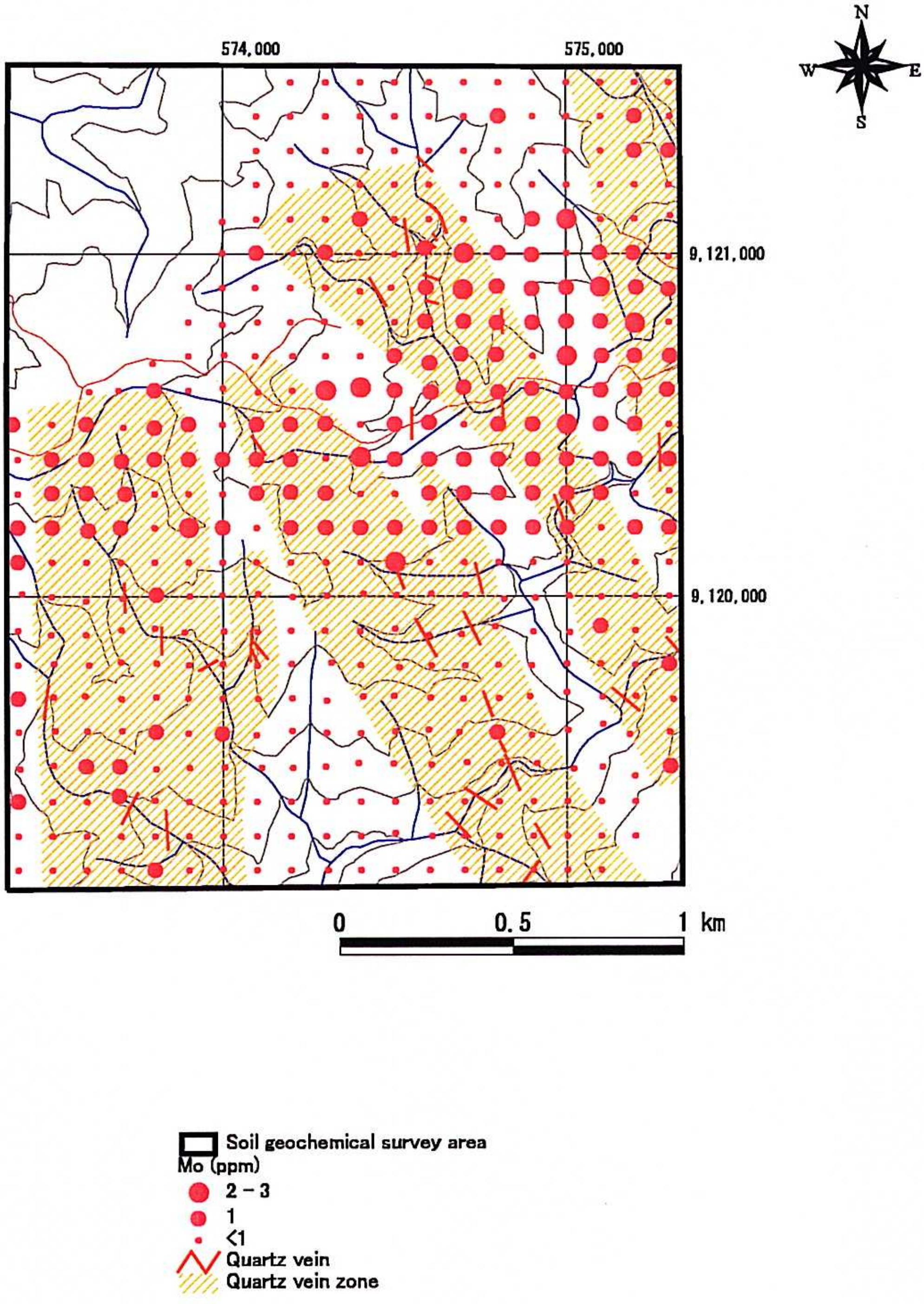


Fig.2-57 Geochemical Anomaly of Soil Samples in the Prambon District (Mo)

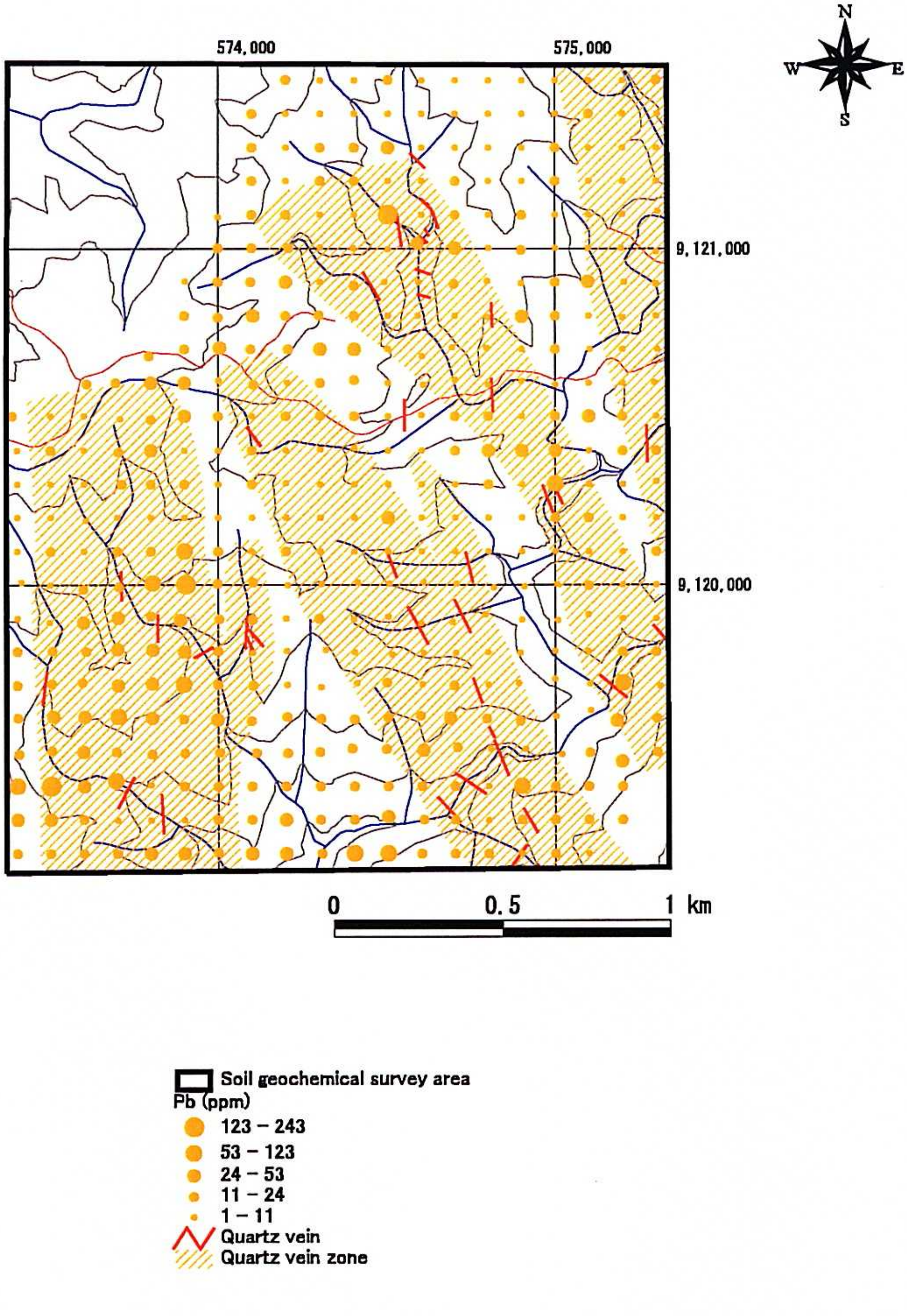


Fig.2-58 Geochemical Anomaly of Soil Samples in the Prambon District (Pb)

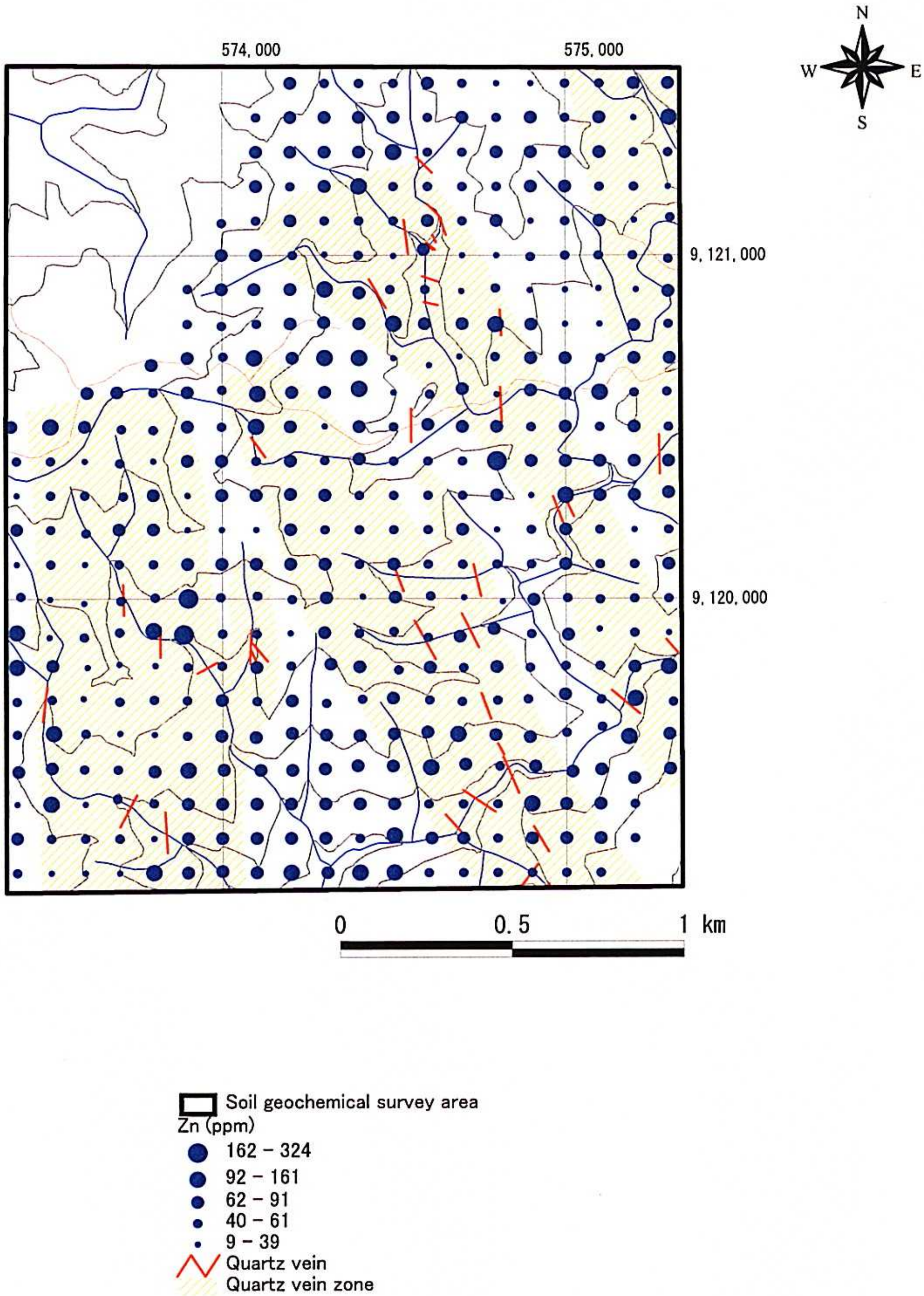


Fig.2-59 Geochemical Anomaly of Soil Samples in the Prambon District (Zn)

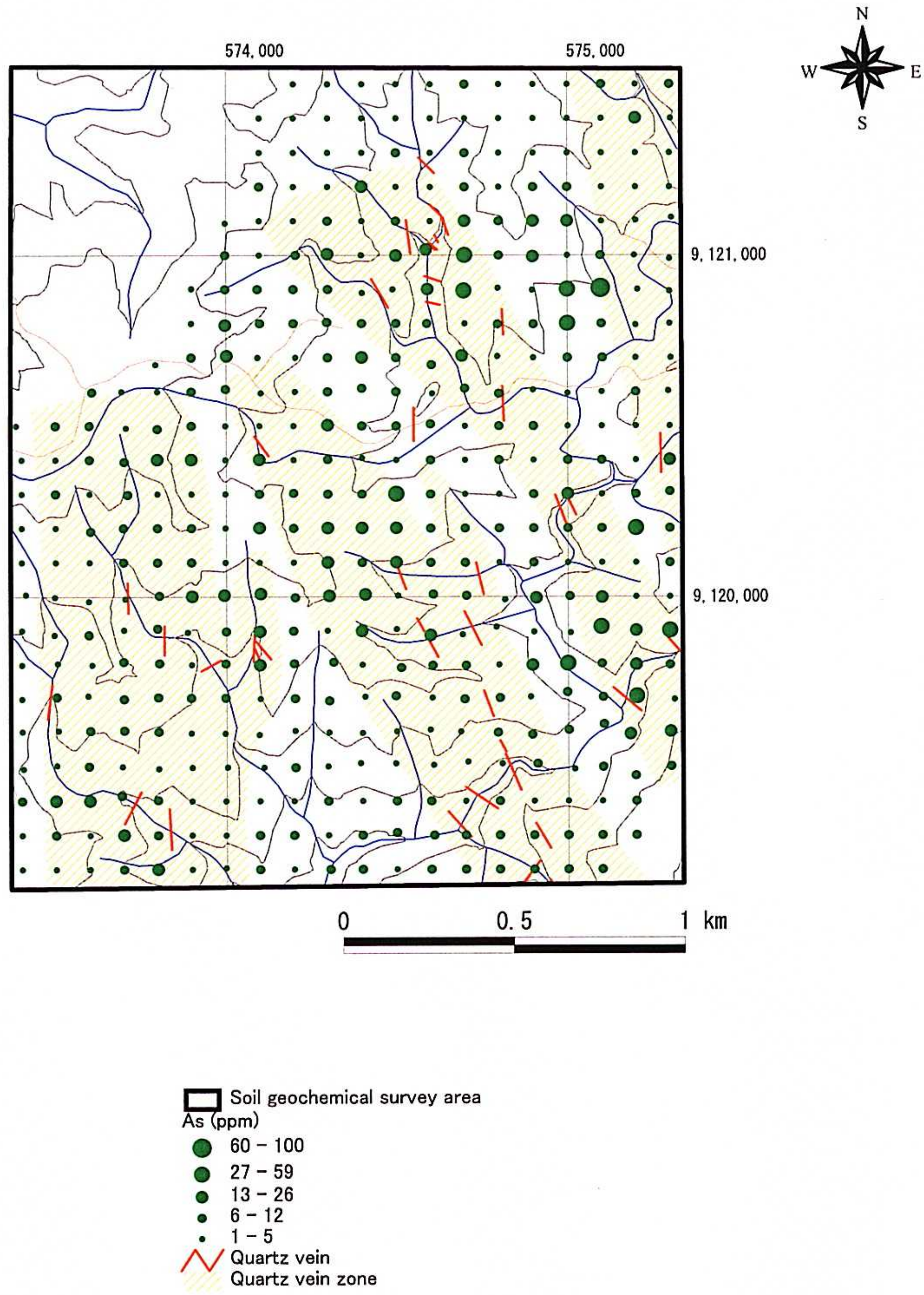


Fig.2-60 Geochemical Anomaly of Soil Samples in the Prambon District (As)

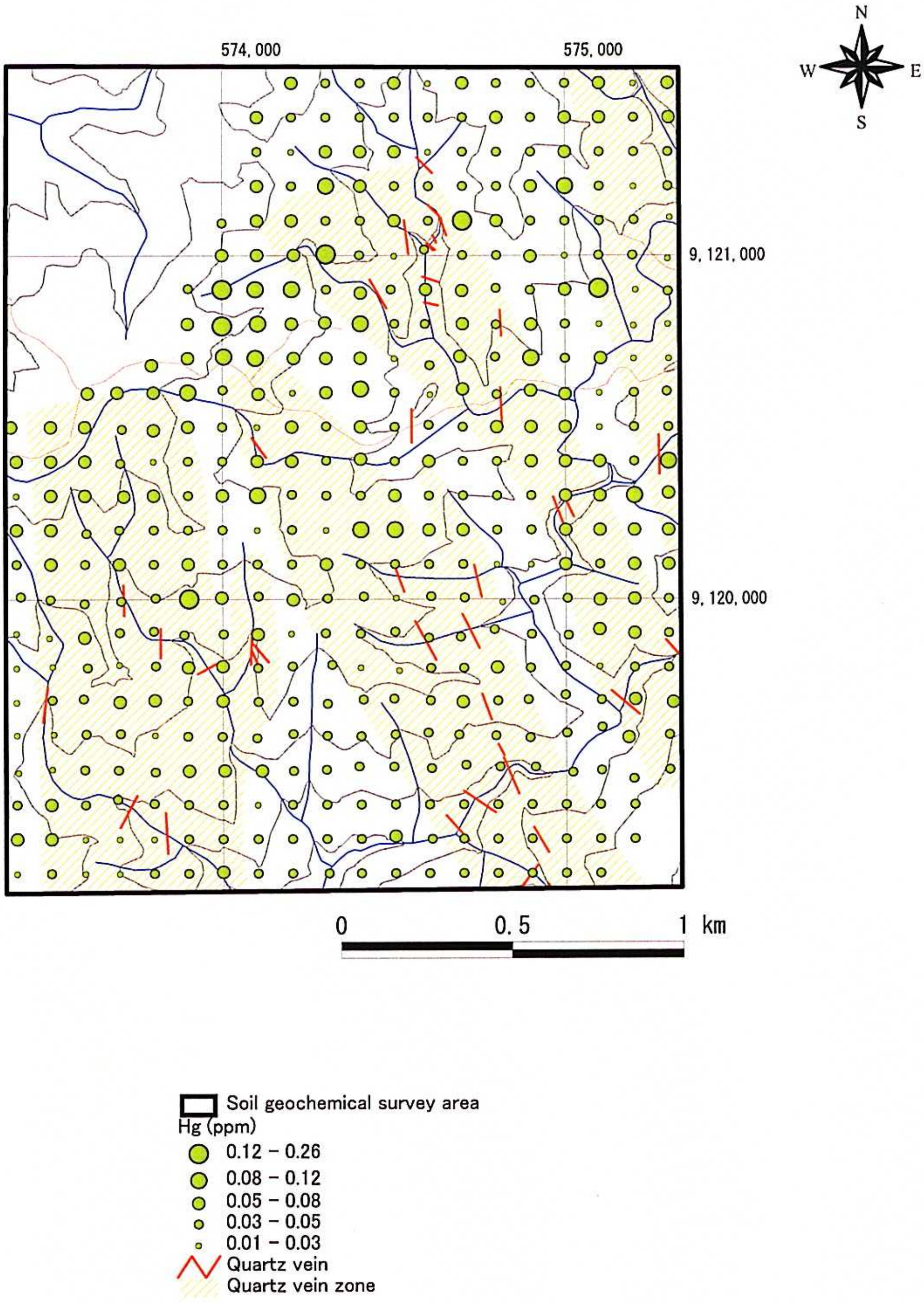


Fig.2-61 Geochemical Anomaly of Soil Samples in the Prambon District (Hg)