

Chapter 5 Conclusions and Recommendations

5 -1 Conclusions

The following conclusions were obtained from the geological survey carried out in four districts of Eastern Java during the third-year survey.

5-1-1 Selection of Geological Survey Area

The surveyed areas are the following four districts extracted as the result of the third-year survey.

- (a) Tempursari District: Located to the west of Lumajang; target was gold-copper mineralization and alteration zones.
- (b) Purwoharjo District: Located to the northeast of Purwodadi District; target was copper geochemical anomaly zones.
- (c) Seweden District: Located to the south of Blitar; target was alteration zone associated with gold and copper mineralization.
- (d) Prambon District: Trenggalek is located in the southern part of this district; target was quartz vein zone in gold-silver geochemical anomaly zone.

Of the above four districts, not only geochemical anomalies but occurrence of alteration zones associated with mineralization was confirmed on the surface in three districts (a), (c), and (d). Seweden District (c) and Prambon district (d) were considered to have high mineral potential because alteration occurred over a wide area and gold-copper mineralization was observed in quartz veinlets in the former and gold mineralization was found in many quartz vein outcrops in the latter district.

5-1-2 Conclusions concerning Tempursari District

Copper and gold mineralization is notably strong at the Ngrawan River in this district.

- Distribution of quartz veins: Quartz network is developed in a tributary of the Ngrawan River with gold grade of 0.146g/t Au (sampled width 1m). Although low at 0.08g/t Au, gold was noted to exist in a quartz network float analyzed during the second-year survey. Although low, existence of Cu was detected in these samples. In the upper reaches of the River, gold mineralization was found with highest content of 0.301g/t Au (quartz float).
- Oxidized copper exposures: Oxidized copper (malachite) was discovered in propylitized

andesite in the same tributaries of the Ngrawan River. Chalcopyrite was observed microscopically. Although the maximum analytical value was 0.11% Cu, copper-gold mineralization exceeding 0.04~0.11% Cu, 0.04~0.164g/t Au occur for 16m.

- Pyrite dissemination: Pyrite dissemination occurs over a wide area, concentration along joints is observed at Ngrawan River.
- Results of geochemical survey: High gold contents in soil are concentrated at two localities, Ngrawan River and along the central ridge. The copper value is not as notable as gold, but content exceeding 100ppm occurs widely.
- Results of geophysical survey: The chargeability in the area trends to be higher in the western part and to be lower in the eastern part. Some chargeability anomalies exceeding 30 mV/V are detected in all four survey lines. They form two anomalous zones. One of the two zones has the highest chargeability of exceeding 50 mV/V. Both anomalous zones show vertical structure. The anomalous zone would reflect pyrite dissemination in intruding rocks and silicified vein zones because of its high chargeability, high resistivity and vertical structure.

There is a possibility that these mineral showings are surface manifestations of upper part of porphyry copper deposit.

5-1-3 Conclusions concerning Purwoharjo District

Mineralization is not found in this district.

5-1-4 Conclusions concerning Seweden District

In this district, 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 0.81% 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. Covellite 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 part; they are Cekelan River (western tributary of Putih), eastern tributaries of upper to middle reaches of Kuning River (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.
- Some chargeability anomalies exceeding 30 mV/V are detected in the central-eastern deep parts. They form two north-south trending anomalous zones on the chargeability map of SL -100 m. These anomalous zones distribute in the low resistivity zone.
- Drilling Results: Argillic alteration continues from the 37.30m, which is the lower boundary of oxidation zone to the bottom of the hole. No significant base and precious metal mineralization was encountered by one hole that was drilled at the western high chargeability zone, while strong pyrite dissemination occurs quite consistently below the oxidation zone of 3.90-37.30 m. The pyrite occurs as dissemination of altered andesitic rock or in-veinlets along hair cracks such as joints. A molybdenite-pyrite-quartz-clay veinlet of 2 mm width occurs at 368.40m. Copper mineral occurs only as exsolution mineral from pyrite under microscopy (Polished sample at 188.75m, 290.30 m, 326.15 m and 389.15 m). Sphalerite, galena, cerusite and anglesite occur under microscopy.

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

5-1-5 Conclusion of Prambon District

Present and previous 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 no more 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. Therefore, four holes were drilled to confirm the mineralization of the veins continues to depth, which is indicated by fluid inclusion study.

Two holes of the four intercepted wide silicified and argillized zones. The assay results show the highest gold values 10.40g/t over 0.60m width intercepted by MJIE-P1. Three samples returned 1-5 g/t Au, and most samples returned less than 1 g/tAu. However, 14 samples among 16 polished samples contain sphalerite, chalcopyrite and galena, indicating these minerals may relate with gold mineralization. Acanthite is identified in two samples from MJIE-P2 adjacent to pyrite grains. The gangue and alteration minerals in and adjacent to veins are quartz, calcite, sericite, chlorite and mixed layer mineral. The study of fluid inclusion of quartz or calcite vein shows the homogenization temperatures are about 200 °C and salinities are low. Therefore, it is concluded that epithermal mineralization occurs widely, mainly in the northern part distributed in Prambon district.

5 -2 Recommendations

5-2-1 Outlines

Based on the results of present geological and geophysical surveys, it is recommended that drilling be carried out aimed at targets listed in the following sections of Tempursari. In the Prambon District, it would be desirable to carry out follow-up drilling aiming at the northern extension of the mineralized zones intercepted by two holes drilled in the present survey. Also it is concluded that the lateral extension of the wide alteration zones which were intercepted by one scout drilling in the Seweden Districts should be confirmed by follow-up drilling.

5-2-2 Recommendations on the Tempursari District

In Tempursari district, it would be desirable to carry out deep drilling at steep angle aimed at mineralized zones confirmed at the surface, especially high chargeability zones extracted by geophysical survey in order to confirm the porphyry copper potential

- (a) Tributaries of Ngrawan: Lower part of the copper mineralized zones.
- (b) The main Ngrawan River: Below the alteration zone at the contact of andesite and diorite.
- (c) Ridge of the central part: Zone with high Au-Cu soil geochemical content.

5-2-3 Recommendations for future work in the Seweden District

It is recommended that the lateral extension of the wide alteration zones which were intercepted by one scout drilling in the Seweden Districts should be follow-up drilling, at the following localities.

- (a) Putih River: Below the strong copper mineralization zone within silicified and argillized zones.
- (b) Centung River: Below the quartz vein network zones.
- (c) Cekelan River: Below high Au-As-Cu soil geochemical anomaly zones.
- (d) Kuning River: Below high Au-Ag-As-Cu soil geochemical anomaly zones

5-2-4 Recommendations for future work in the Prambon District

- (a) The quartz veins in the northern extension of the vein that intercepted by two holes should be given higher priority. Also the zones on both eastern and western sides of the above two zones are also important targets and drilling should be carried out.
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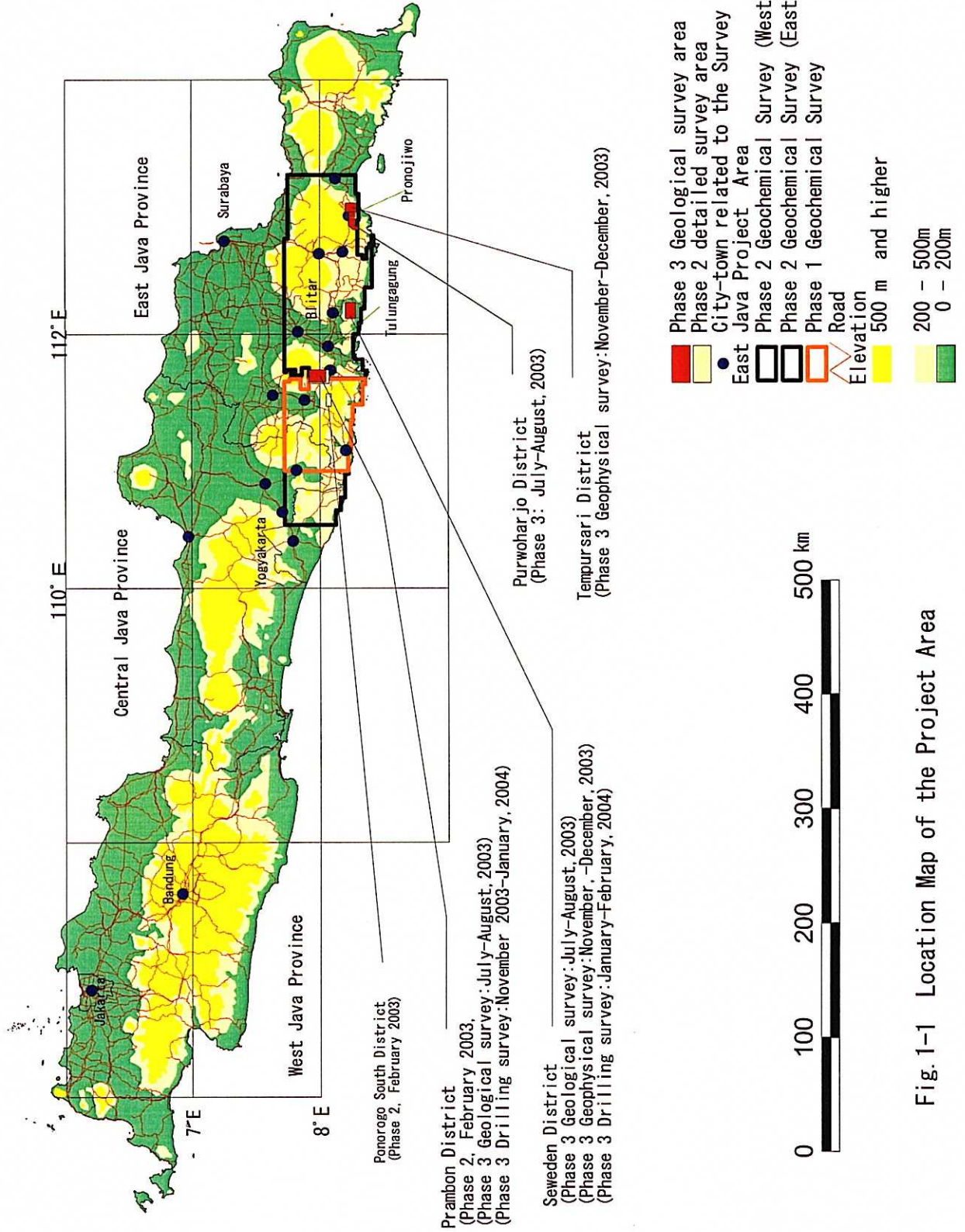
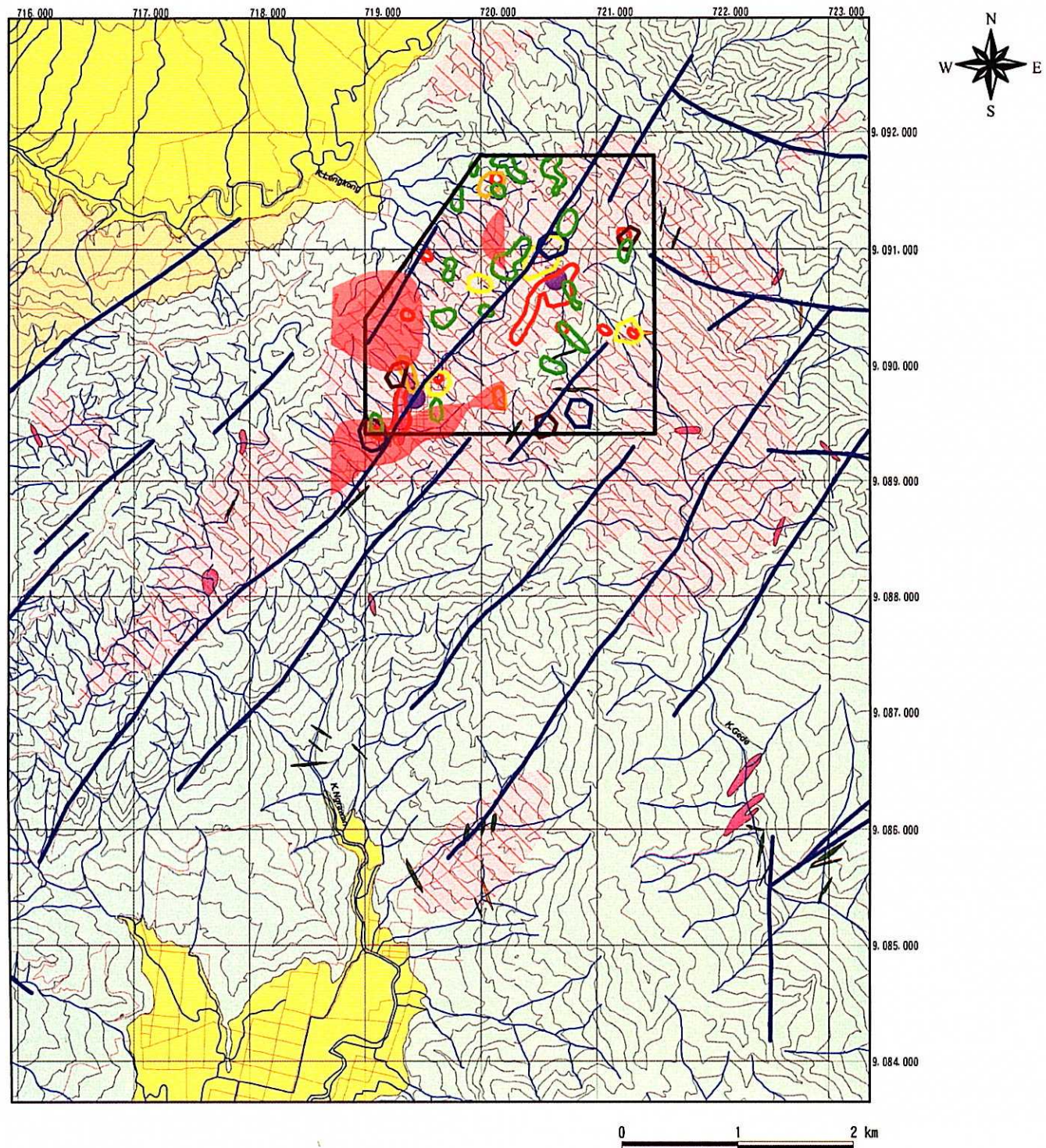


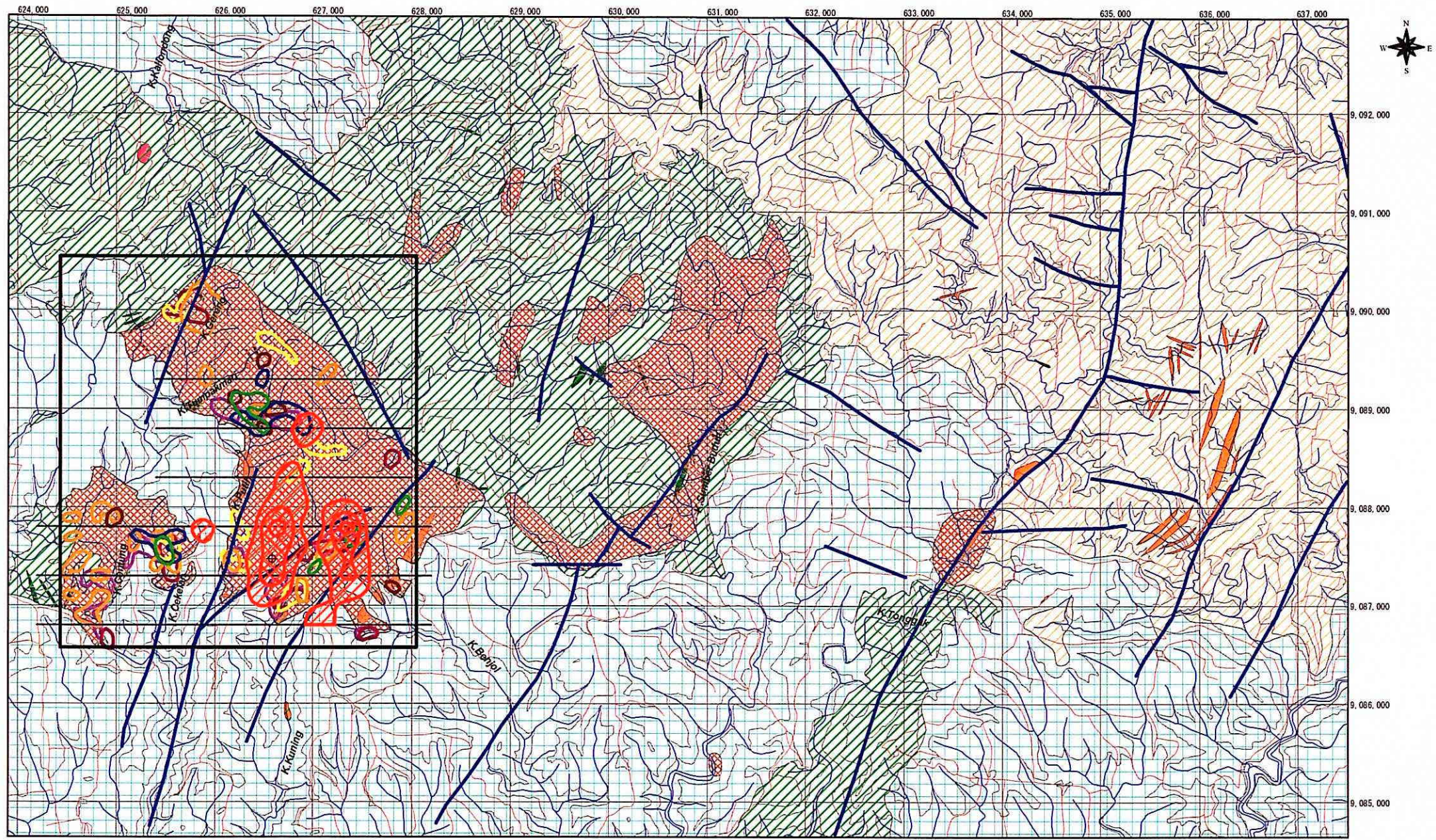
Fig. 1-1 Location Map of the Project Area



- Soil Geochemical survey area
- Fault
- Soil Cu anomaly (Cu>100ppm)
- Soil Pb anomaly (Pb>50ppm)
- Soil Zn anomaly (Zn>200ppm)
- Soil As anomaly (As>30ppm)
- Soil Ag anomaly (Ag>0.1ppm)
- Soil Au anomaly (Au>0.01ppm)
- Soil Mo anomaly (Mo>2ppm)
- Pyritization**
- Moderate
- Intense
- Geologic units**
- Qa: Alluvium
- Tmwv: Wuni Formation (andesitic-basaltic lava and volcanoclastics)
- Tomi (da): Intrusive (dacite)
- Tomi (an): Intrusive (andesite)
- Tomi (di): Intrusive (diiorite)
- Alteration Zone**
- Sericite-kaoline dominant zone
- Chlorite dominant zone
- Geophysical Anomaly (Chargeability>30mV/V)

Fig.1-2 Compilation Map of the Phase 3 Survey Results (1): Tempursari District

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- ⊕ Drill hole MJIE-S1
- Chargeability (mV/V)
 - 50-
 - 40-50
 - 30-40
- IP line
- Soil geochemical survey area
- Fault
- Soil Cu anomaly (Cu>100ppm)
- Soil Pb anomaly (Pb>50ppm)
- Soil Zn anomaly (Zn>200ppm)
- Soil As anomaly (As>30ppm)
- Soil Ag anomaly (Ag>0.1ppm)
- Soil Au anomaly (Au>0.01ppm)
- Soil Mo anomaly (Mo>2ppm)
- Alteration Zone
 - Limestone cover
 - Sericite-kaoline-pyrite zone
 - Propylitic zone
 - Unaltered -diagenetic alteration zone
- Geologic unit
 - Tomi (da): Intrusive (dacite)
 - Tomi (an): Intrusive (andesite)
 - Tomi (di): Intrusive (diorite)

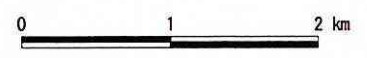
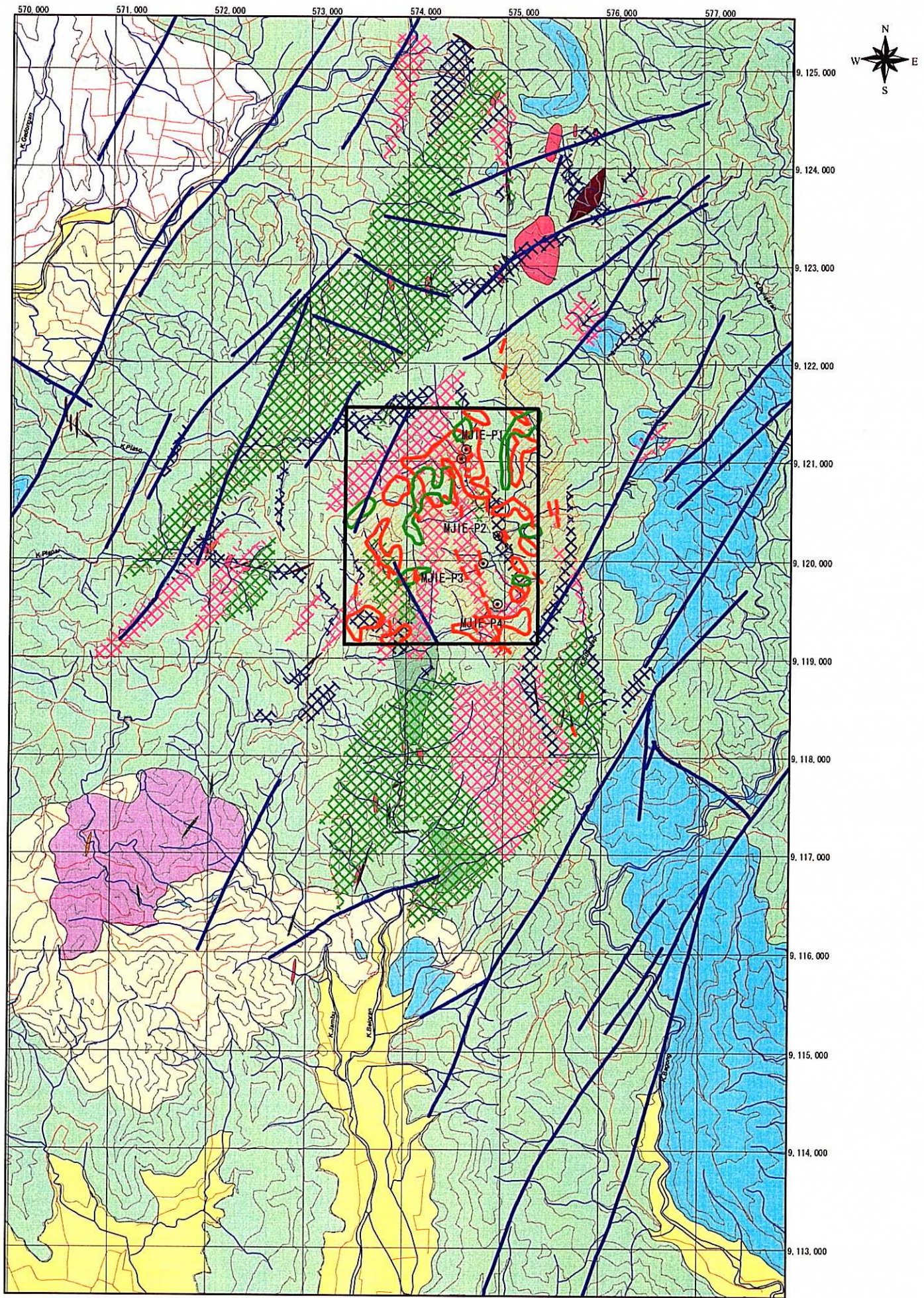


Fig.1-3 Compilation Map of the Phase 3 Survey Results (2): Seweden District



- Prambon_drill_collar.shp
- Soil geochemical survey area
- Fault
- Quartz vein line
- Soil Cu anomaly (Cu>0.01%)
- Soil Au anomaly (Au>0.1ppm)
- Quartz vein area
- Alteration Zone
- Argillic Zone
- Propylitic Zone
- Silicified Zone
- Geologic units
- Qa: Alluvium
- Qv: Quaternary volcanics
- Imvl: Monosari Formation (limestone)
- Imjb: Jaten Formation (basalt lava)
- Imja: Jaten Formation (andesitic tuff breccia, sedimentary rocks)
- Toms: Mandalika Formation (Andesitic lava, volcanoclastics)
- Tomi (da): Intrusive (dacite)
- Tomi (an): Intrusive (andesite)
- Tomi (pa): Intrusive (porphyritic andesite)
- Tomi (di): Intrusive (diorite)
- Tomi (ba): Intrusive (basalt)

Fig.1-4 Compilation Map of the Phase 3 Survey Results (3): Prambon District