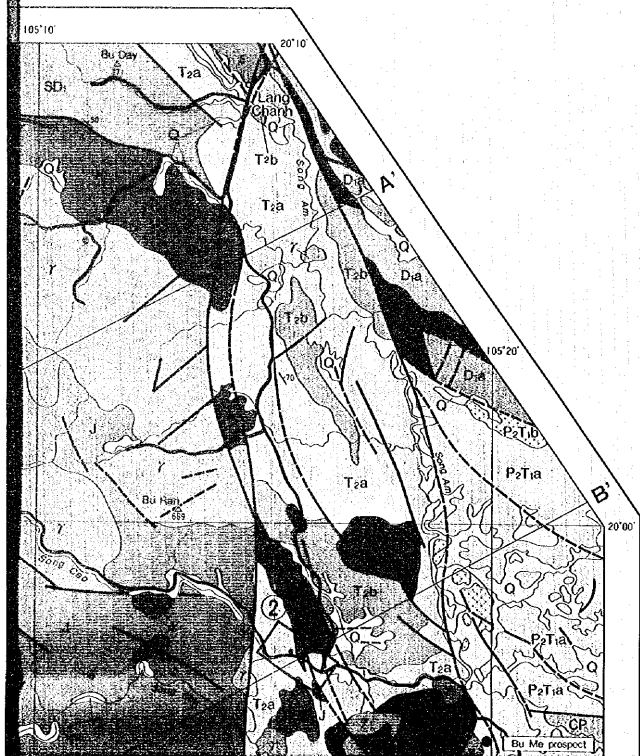
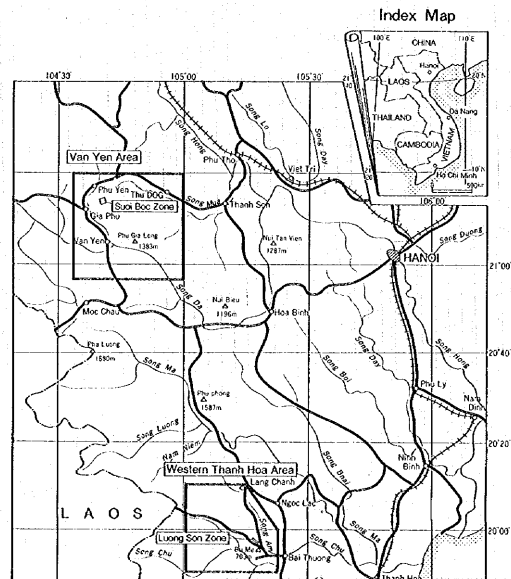


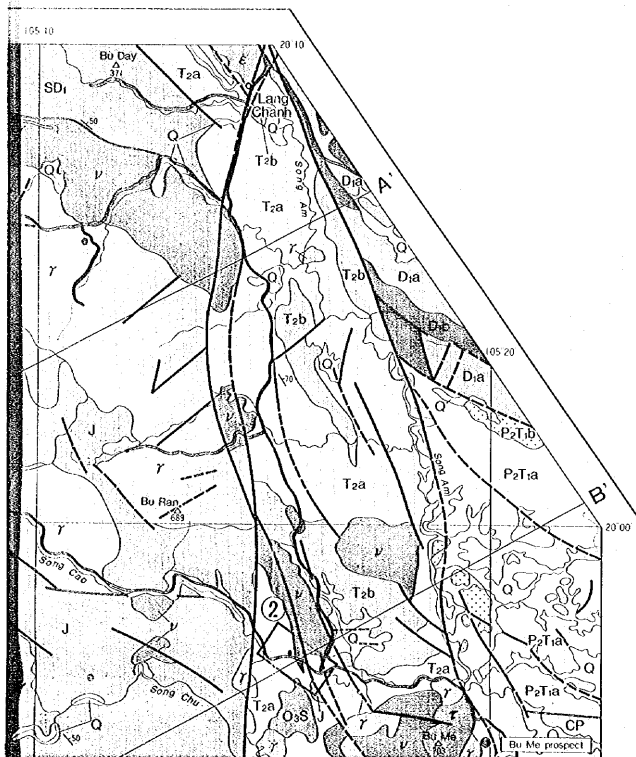
THANH HOA AREAS



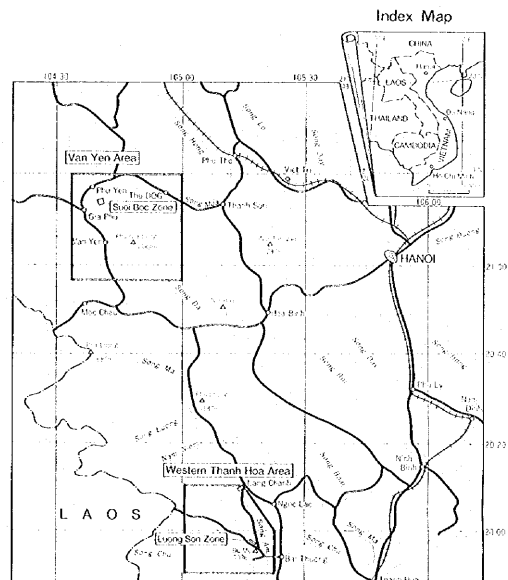
THE COOPERATIVE MINERAL EXPLORATION BY JICA/MMAJ-VIETNAM, 1993-1996

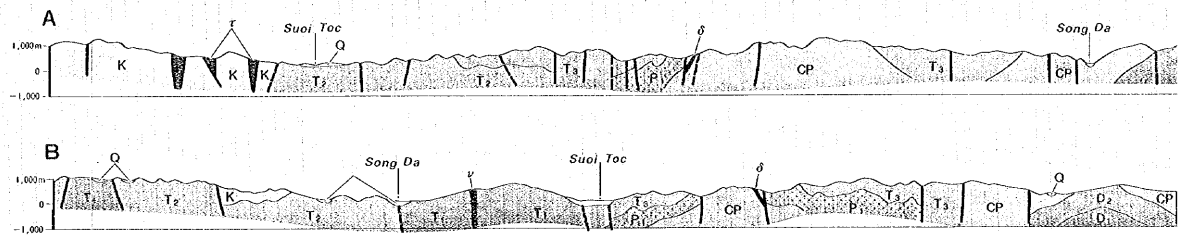
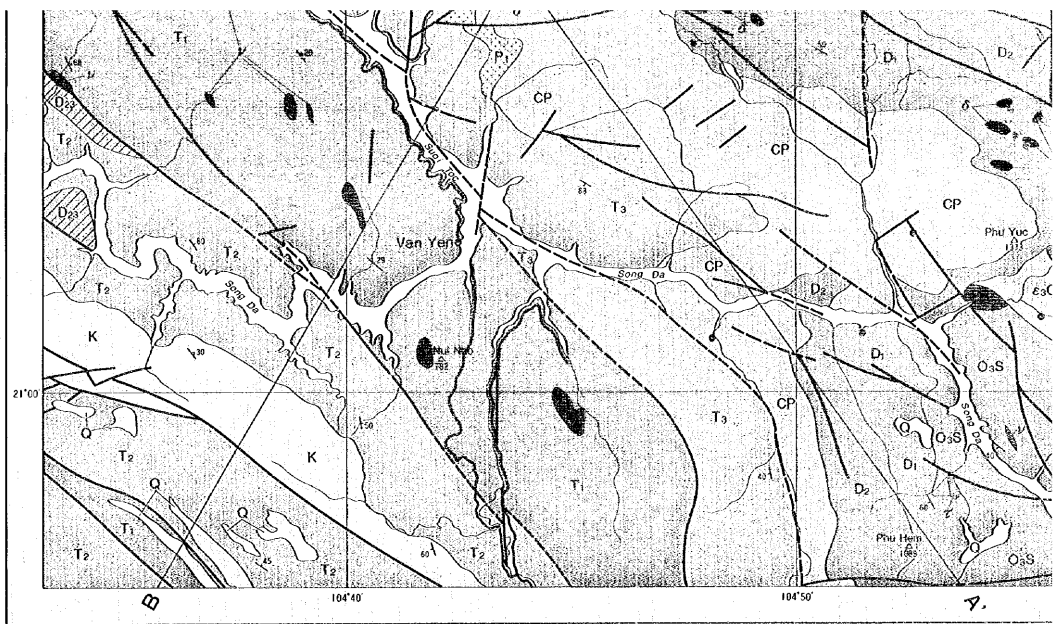


THANH HOA AREAS



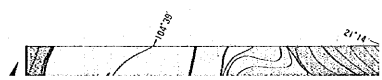
THE COOPERATIVE MINERAL EXPLORATION BY JICA/MMAJ-VIETNAM, 1993-1996

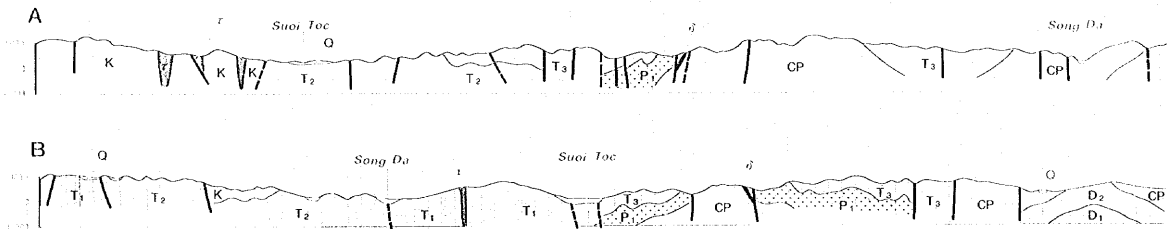
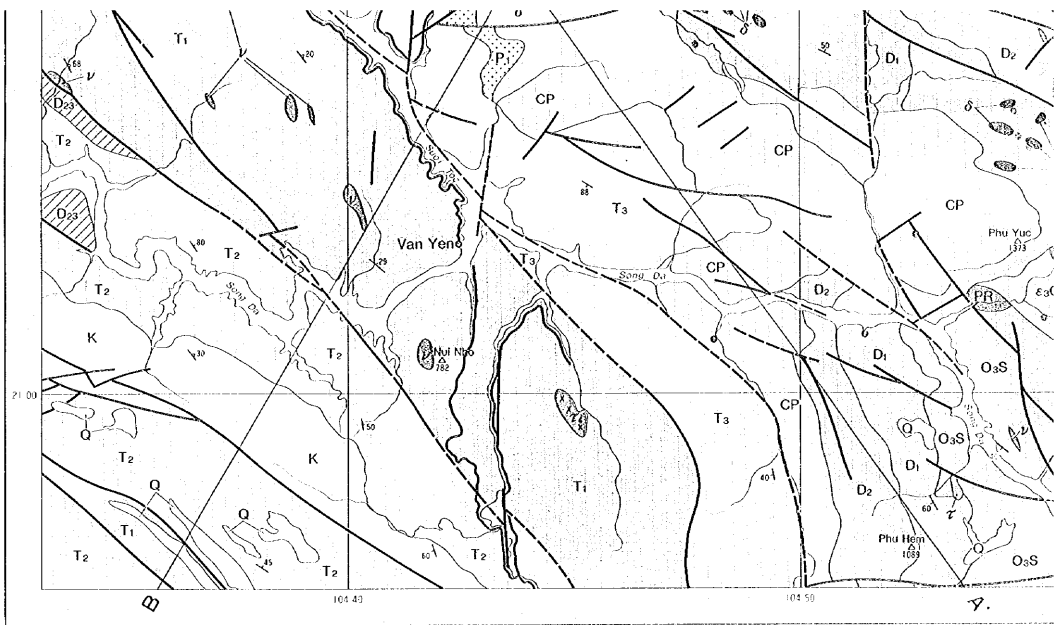




(A) Suoi Boc Zone

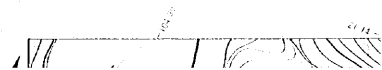
① Suoi Boc-Suoi Cu Zone

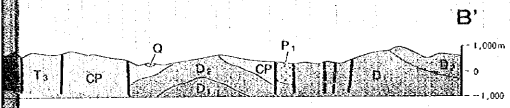
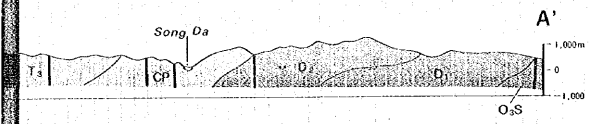
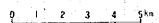
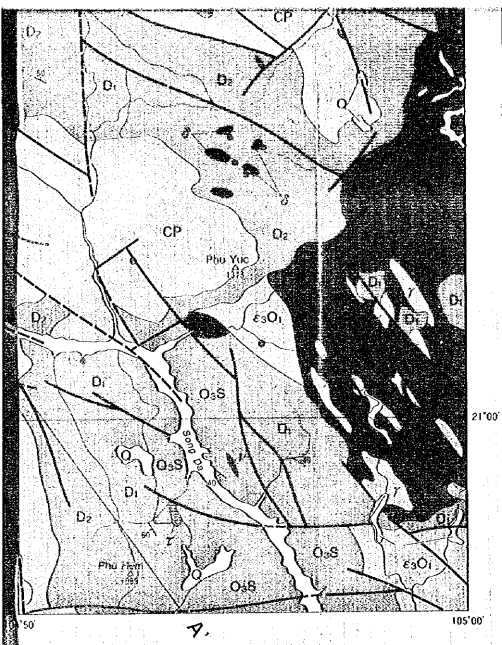




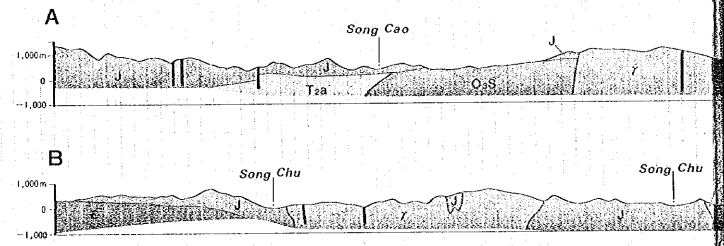
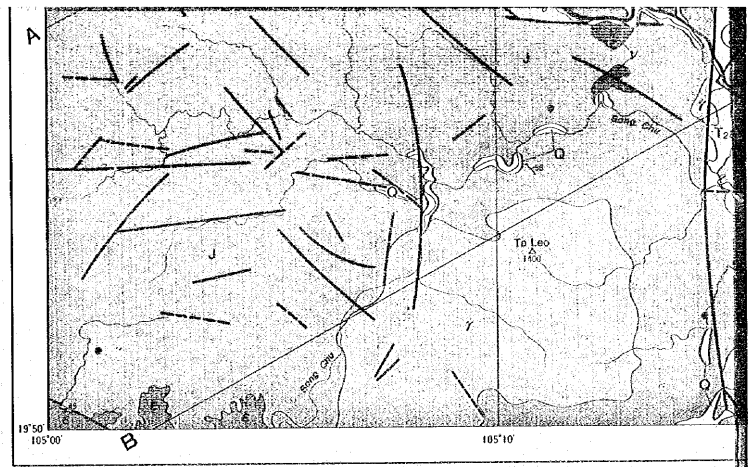
(A) Suoi Boc Zone

① Suoi Boc—Suoi Cu Zone



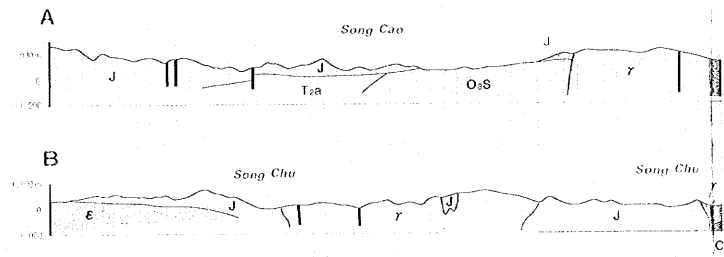
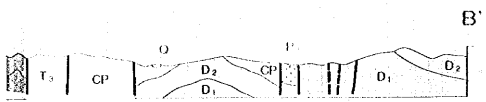
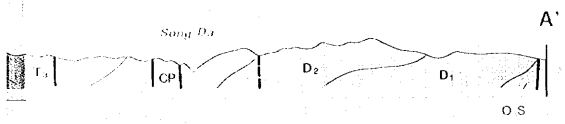
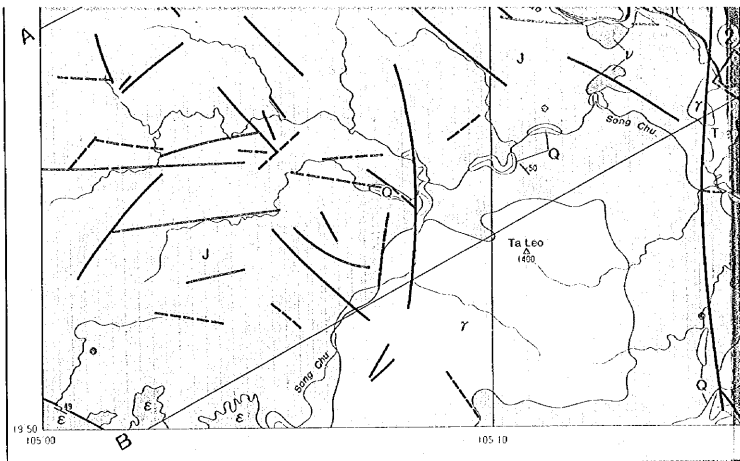
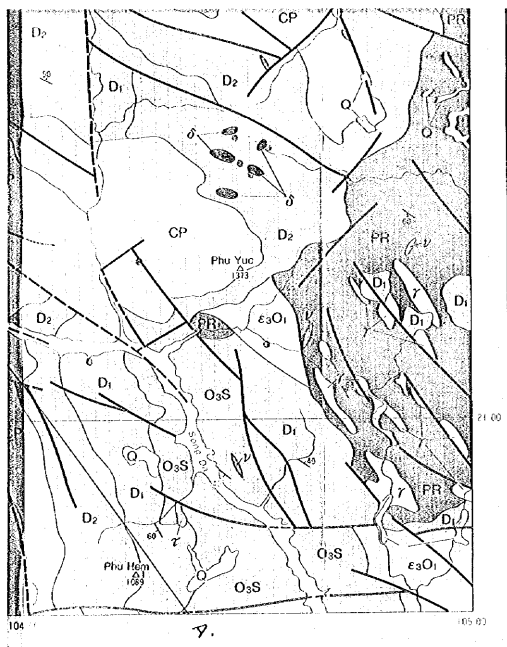


Boc Zone



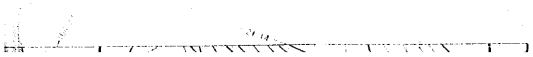
② Luong Son Zone



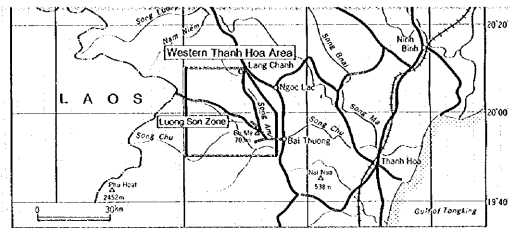
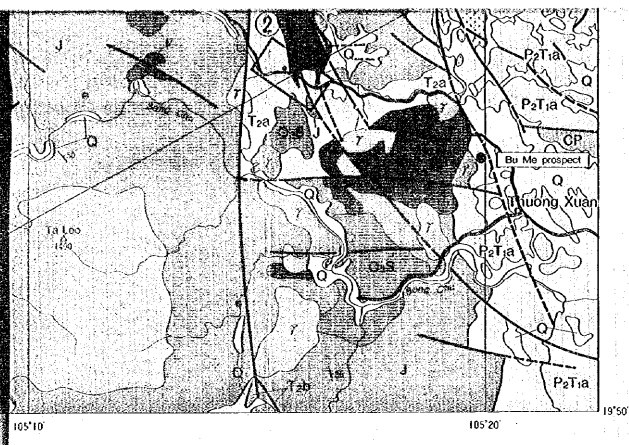


② Luong Son Zone

oi Boc Zone



10a
10b
10c
10d
10e
10f



Members of Survey Team

Phase 1

[Metal Mining Agency of Japan]

Yoshiaki IGARASHI (Coordinator, Mining Engineer)

[Vietnamese Members]

Van Yen Area

Nguyen Cong Luong (Geological Mapping Division, GSV) Team Leader

Trinh Huu Nghi (Geological Mapping Division, GSV) Geologist

Dirh Van Tuy (Geological Mapping Division, GSV) Geologist

Nguyen Van Cu (Geological Mapping Division, GSV) Geologist

Le Van Dieu (Geological Mapping Division, GSV) Geologist

Western Thanh Hoa Area

Ho Nhim (Division No.4, GSV) Team Leader

Dau Ba Quang (Division No.4, GSV) Geologist

Tran Cong Bong (Division No.4, GSV) Geologist

Nguyen The Phuc (Division No.4, GSV) Geologist

La Ich Nhi (Division No.4, GSV) Geologist

[Japanese Members]

Yuya FURUKAWA (NED) Team Leader

Masataka OCHI (NED) Geologist

Motonu GOTO (NED) Geologist

Kazuyasu SUGAWARA (NED) Geologist

Nozohiro NAGANO (NED) Geologist

Phase 2

[Metal Mining Agency of Japan]

Nachi SATO (Coordinator, Geophysicist)

[Vietnamese Members]

Van Yen Area

Nguyen Dal Lu (Geological Mapping Division, GSV) Team Leader

Pham Van Duong (Geological Mapping Division, GSV) Geologist

Nguyen The Cu (Geological Mapping Division, GSV) Geologist

Nguyen Huy Than (Geological Mapping Division, GSV) Geologist

Tran Dang Hung (Geological Mapping Division, GSV) Geologist

Dan Nguyen Viet (Geological Mapping Division, GSV) Geophysicist

Nguyen Xuan Dong (Geological Mapping Division, GSV) Geophysicist

Nguyen Duc Nhuong (Geological Mapping Division, GSV) Geophysicist

Tran Thanh Dy (Geological Mapping Division, GSV) Geophysicist

Western Thanh Hoa Area

Ho Nhim (Division No.4, GSV) Team Leader

Dau Ba Quang (Division No.4, GSV) Geologist

Nguyen The Phuc (Division No.4, GSV) Geologist

Tran Cong Bong (Division No.4, GSV) Geologist

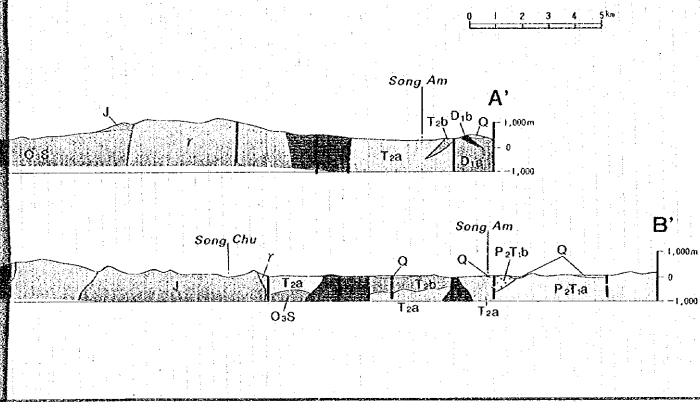
Nguyen Xuan Toan (Division No.4, GSV) Geologist

Nguyen Phi Tien (Division No.4, GSV) Geologist

[Japanese Members]

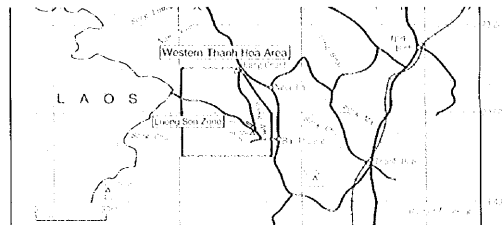
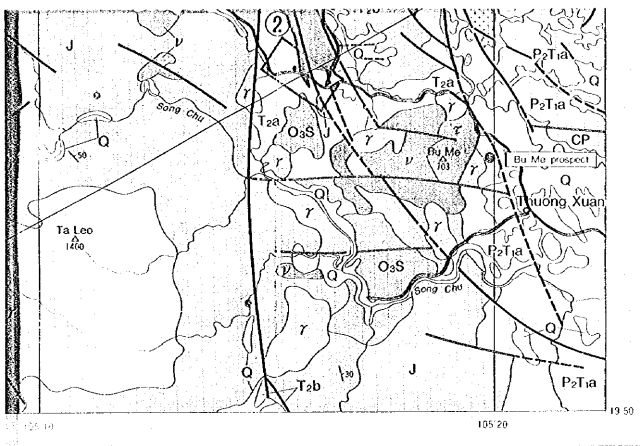
Masataka OCHI (NED) Team Leader

Motonu GOTO (NED) Geologist



LEGEND

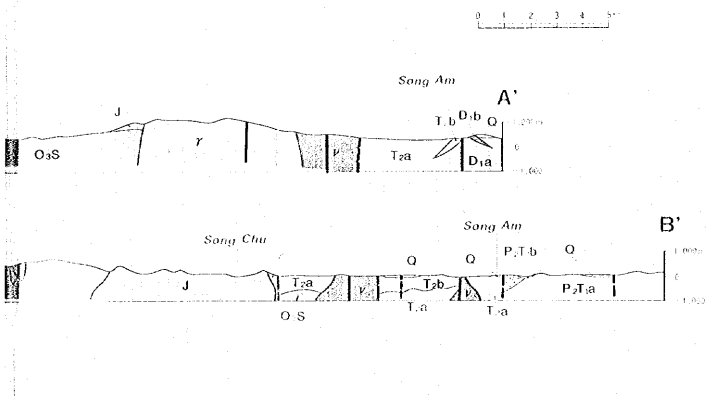
Quaternary	Q	Gravel, Sand, Clay
Cretaceous	K	Mudstone, Sandstone, Conglomerate, Trachybasalt, Trachybasaltic Tuff, Trachyandesite, Trachyandesitic Tuff and Trachyte
Jurassic	O ₃ S	Basalt Tuff (partly welded), Dacite, Rhyolite, Sandstone Interbeds of Sandstone and Siltstone
Upper Triassic	T ₂ a	Limestone, Interbeds of Mudstone and Sandstone,
Middle Triassic	T ₂ a	Interbeds of Mudstone and Siltstone, Sandstone Limestone
	P ₂ T ₁ a	Trachybasalt, Trachyte, Trachytic Tuff, Limestone, Mudstone, Sandstone and Conglomerate
Lower Triassic	P ₂ T ₁ a	Trachybasalt, Trachybasaltic Tuff, Trachytic Tuff, Mudstone, Sandstone, Interbeds of Limestone and Marl



Members of Survey Team

- Phase 1**
- [Metal Mining Agency of Japan]
 - Yoshiaki IGARASHI (Coordinator, Mining Engineer)
 - [Vietnamese Members]
 - Van Yen Area
 - Nguyen Cong Luong (Geological Mapping Division, GSV) Team Leader
 - Trinh Hai Nghi (Geological Mapping Division, GSV) Geologist
 - Dinh Van Huy (Geological Mapping Division, GSV) Geologist
 - Nguyen Van Cu (Geological Mapping Division, GSV) Geologist
 - Le Van Dieu (Geological Mapping Division, GSV) Geologist
 - Western Thanh Hoa Area
 - Ho Nhoen (Division No.4, GSV) Team Leader
 - Dau Ba Quang (Division No.4, GSV) Geologist
 - Tran Cong Bong (Division No.4, GSV) Geologist
 - Nguyen The Phuc (Division No.4, GSV) Geologist
 - Le Thi Nhi (Division No.4, GSV) Geologist
 - [Japanese Members]
 - Yuya FURUKAWA (NED) Team Leader
 - Masataka OCHI (NED) Geologist
 - Mitsuru GOTO (NED) Geologist
 - Kazuyasu SUGAWARA (NED) Geologist
 - Nihiro NAGANO (NED) Geologist

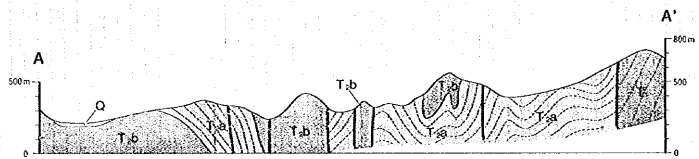
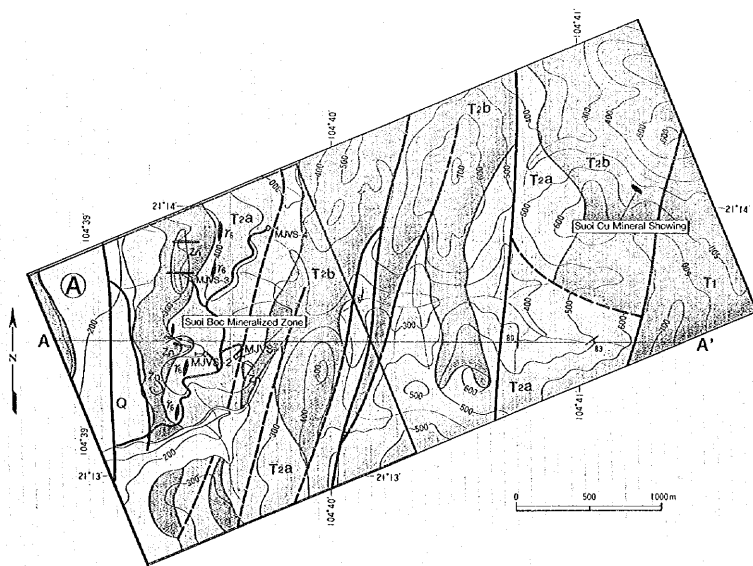
- Phase 2**
- [Metal Mining Agency of Japan]
 - Naki SATO (Coordinator, Geophysicist)
 - [Vietnamese Members]
 - Van Yen Area
 - Nguyen Dai Lu (Geological Mapping Division, GSV) Team Leader
 - Pham Van Duong (Geological Mapping Division, GSV) Geologist
 - Nguyen Thi Du (Geological Mapping Division, GSV) Geologist
 - Nguyen Huy Thanh (Geological Mapping Division, GSV) Geologist
 - Tran Dong Hung (Geological Mapping Division, GSV) Geologist
 - Don Nguyen Viet (Geological Mapping Division, GSV) Geologist
 - Nguyen Xuan Dong (Geological Mapping Division, GSV) Geophysicist
 - Nguyen Duc Nhung (Geological Mapping Division, GSV) Geophysicist
 - Tran Thanh Vy (Geological Mapping Division, GSV) Geophysicist
 - Western Thanh Hoa Area
 - Ho Nhoen (Division No.4, GSV) Team Leader
 - Dau Ba Quang (Division No.4, GSV) Geologist
 - Nguyen The Phuc (Division No.4, GSV) Geologist
 - Tran Cong Bong (Division No.4, GSV) Geologist
 - Nguyen Xuan Toan (Division No.4, GSV) Geologist
 - Nguyen Phi Ton (Division No.4, GSV) Geologist
 - [Japanese Members]
 - Masataka OCHI (NED) Team Leader
 - Mitsuru GOTO (NED) Geologist



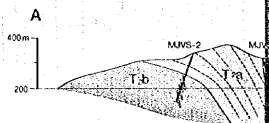
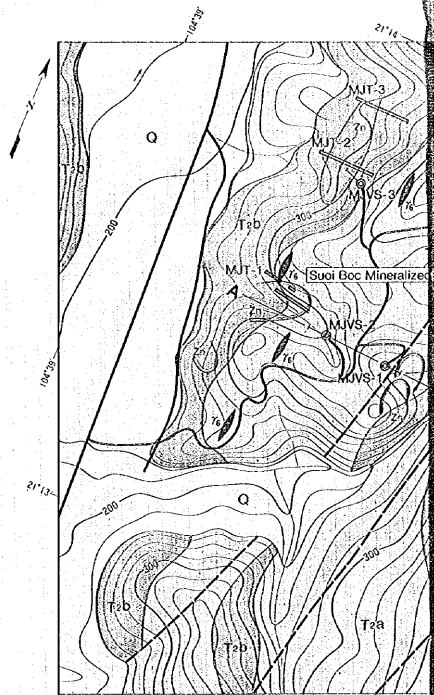
LEGEND

Quaternary	Q	Quartz Sand, Clay
Cretaceous	K	Mudstone, Sandstone, Conglomerate, Trachyte, Trachyte Tuff, Trachyte, Trachyte Tuff and Trachyte
Tertiary	J	Dacite Tuff, tuff welded, Dacite, Rhyolite, Sandstone, Interbeds of Sandstone and Siltstone
Upper Triassic	T₃	Limestone, Interbeds of Mudstone and Sandstone
Middle Triassic	T_{2a} T_{2b} T₂	Interbeds of Mudstone and Siltstone, Sandstone, Limestone, Trachyte, Trachyte Tuff, Limestone, Mudstone, Sandstone and Conglomerate
Lower Triassic	T₁	Trachyte, Trachyte Tuff, Trachyte Tuff, Mudstone, Sandstone, Interbeds of Limestone and Msl

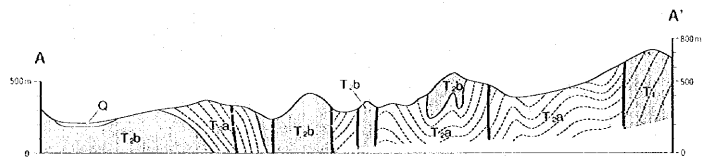
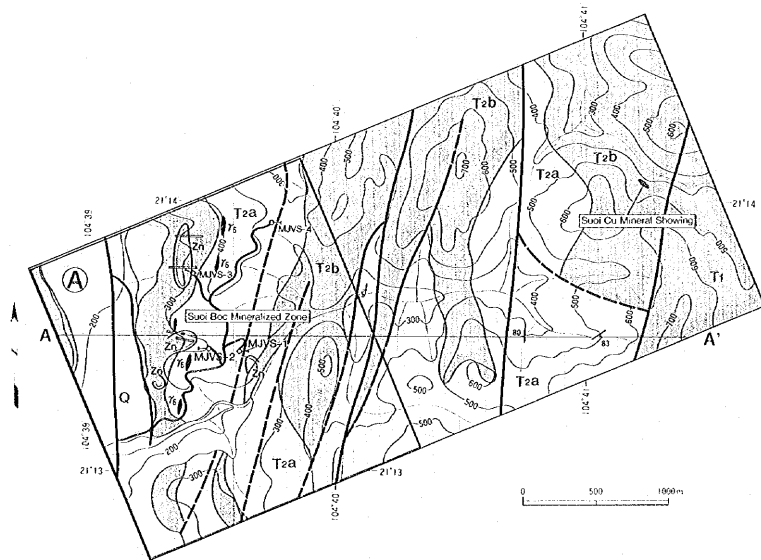
① Suoi Boc—Suoi Cu Zone



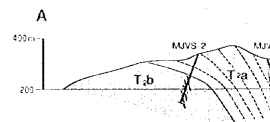
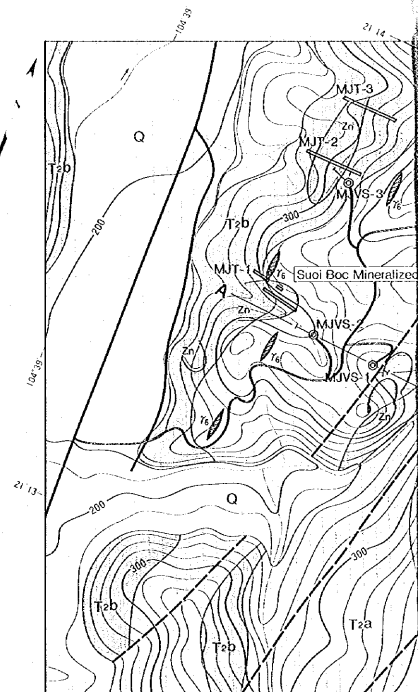
② Suoi Boc Zone



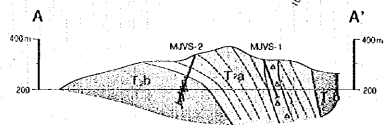
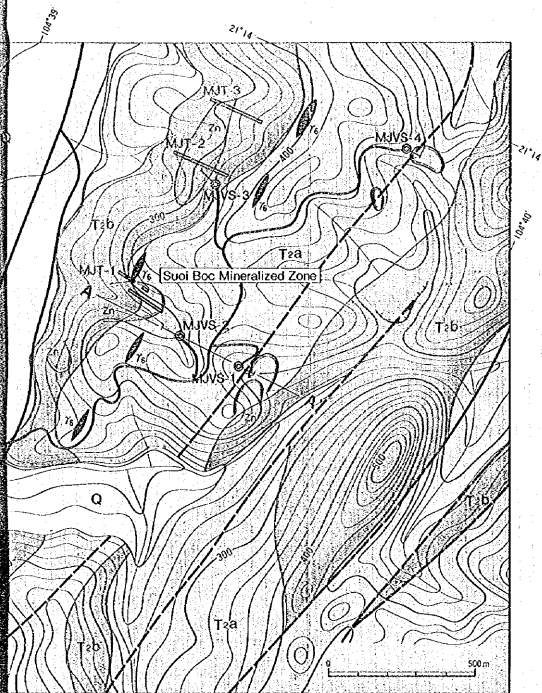
① Suoi Boc—Suoi Cu Zone



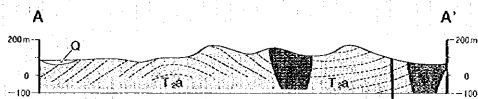
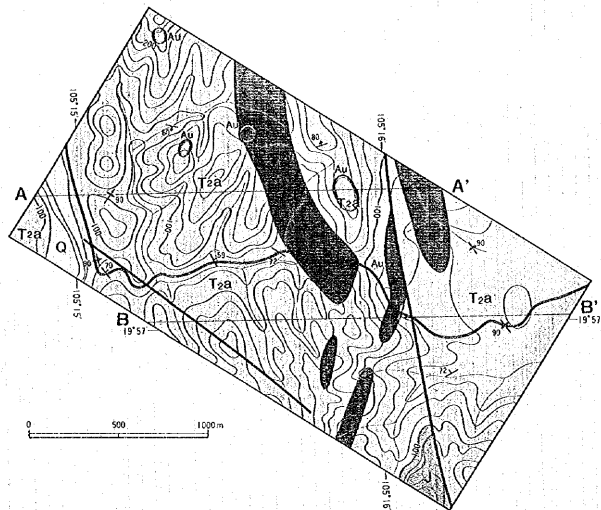
② Suoi Boc Zone



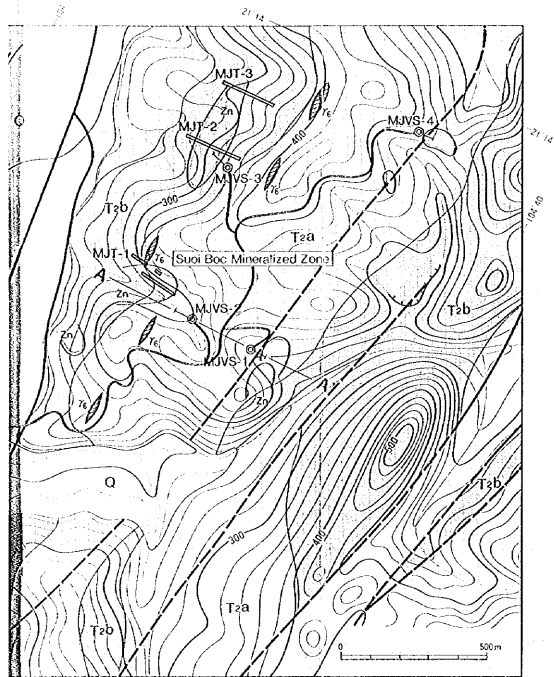
Boc Zone



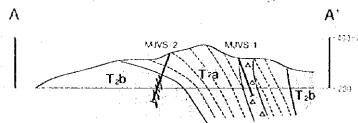
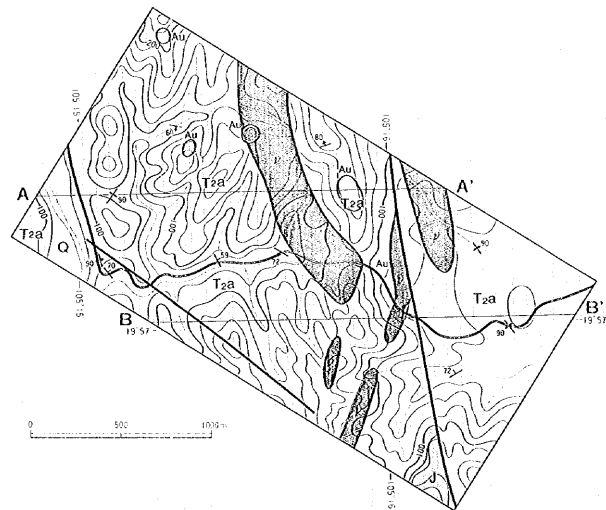
② Luong Son Zone











































Bi Boc Zone



② Luong Son Zone



Cretaceous		Mudstone, Sandstone, Conglomerate, Trachybasalt, Trachybasaltic Tuff, Trachyandesite, Trachyandesitic Tuff and Trachyte
Jurassic		Dacitic Tuff (partly welded), Dacite, Rhyolite, Sandstone Interbeds of Sandstone and Siltstone
Upper Triassic		Limestone, Interbeds of Mudstone and Sandstone,
Middle Triassic	  	Interbeds of Mudstone and Siltstone, Sandstone Limestone Trachybasalt, Trachyte, Trachytic Tuff, Limestone, Mudstone, Sandstone and Conglomerate
Lower Triassic	 	Trachybasalt, Trachybasaltic Tuff, Trachytic Tuff, Mudstone, Sandstone, Interbeds of Limestone and Marl
Upper Permian to Lower Triassic	 	Dacitic Tuff, Mudstone and Sandstone Limestone
Permian		Mudstone, Limestone, Interbeds of Mudstone and Sandstone
Carboniferous to Permian		Mudstone, Sandstone and Limestone
Middle to Upper Devonian	 	Mudstone, Limestone and Andesitic Tuff
Middle Devonian	 	Limestone Mudstone, Sandstone and Siltstone Limestone and Basaltic Tuff
Lower Devonian	 	Mudstone, Sandstone, Limestone, Interbeds of Sandstone and Mudstone, Conglomerate and Basaltic Tuff
Silurian to Devonian	 	Mudstone, Sandstone, Interbeds of Siltstone and Mudstone, Limestone
Upper Ordovician to Silurian	 	Sandstone, Mudstone, Limestone and Pelitic Schist
Upper Cambrian to Lower Ordovician	 	Sandstone, Mudstone, Conglomerate, Pelitic Schist and Psammitic Schist
Gambrian	 	Pelitic Schist, Gneiss, Granodiorite and Diorite
Proterozoic	 	Pelitic Schist, Green Schist, Psammitic Schist, Quartzite, Biotite Gneiss and Amphibole Gneiss
Intrusive Rock	 	Granite
	 	Dacite Porphyry, Aplite
	 	Syenite
	 	Trachyte
	 	Gabbro and Diorite
	 	Ultramafic Rocks
	 	Fault
	 	Shear Zone
	 	Dip and Strike of Bed
	 	Dip and Strike of Schistosity
 	Vein	
 	Mineralization	
 	Geochemical Anomalous Zone	
 	High Chargeability Zone	
 	Drilling Hole	
 	Trench	
 	Working Mine	
	Profile Line	

Tran Thanh Vi (Geological Mapping Division, GSV) Geophysicist
Western Thanh Hoa Area
Ho Nham (Division No.4, GSV) Team Leader
Dau Ba Quang (Division No.4, GSV) Geologist
Nguyen The Phuc (Division No.4, GSV) Geologist
Tran Cong Bong (Division No.4, GSV) Geologist
Nguyen Xuan Toan (Division No.4, GSV) Geologist
Nguyen Phi Tien (Division No.4, GSV) Geologist
[Japanese Members]
Masataka OCHI (NED) Team Leader
Motomu GOTO (NED) Geologist
Masami HIGASHIHARA (NED) Geologist
Takumi ONUMA (NED) Geologist
Kazuyasu SUGAWARA (NED) Geologist
Tomoji SANGA (NED) Geologist
Takashi YAMASHII (NED) Geophysicist
Shinichi SUGIYAMA (NED) Geophysicist
Tadanori IWASAKI (NED) Geophysicist

Phase 3 [Vietnamese Member]
Hoang Minh Hue (Division No.3, GSV) Geologist
[Japanese Members]
Yoneharu MATANO (NED) Team Leader
Saichi ISHII (NED) Drilling Engineer

Summary of Exploration Work in the Van Yen and Western Thanh Hoa Areas

Phase	Survey	Area	Amount of Work
First	Regional Geological Survey and Geochemical Exploration	Van Yen Area	Area: 1,000 km ² Stream Sediments 899 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates 193 pcs
		Western Thanh Hoa Area	Area: 650 km ² Stream Sediments 632 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates 147 pcs
	Semi-detailed Geochemical Exploration	Bu Me Zone, Western Thanh Hoa Area	Area: 4.5 km ² Soil Samples 241 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn)
		Van Yen Area	Area: 1,000 km ² Stream Sediments 915 pcs (Au, Ag, As, Cr, Cu, Hg, Ni, Pb, Zn) Pan Concentrates 240 pcs
Second	Regional Geological Survey and Geochemical Exploration	Van Yen Area	Area: 1,000 km ² Stream Sediments 915 pcs (Au, Ag, As, Cr, Cu, Hg, Ni, Pb, Zn) Pan Concentrates 240 pcs
		Western Thanh Hoa Area	Area: 650 km ² Stream Sediments 469 pcs (Au, Ag, As, Cr, Cu, Hg, Ni, Pb, Sn, W, Zn) Pan Concentrates 120 pcs
	Detailed Geological Survey and Geochemical Exploration	Suoi Boc-Suoi Cu Zone, Van Yen Area	Area: 10 km ² Soil Samples 100 pcs (Au, Ag, As, Cu, Cd, Hg, Pb, Sb, Zn)
		Luong Son Zone, Western Thanh Hoa Area	Area: 4 km ² Soil Samples 207 pcs (Au, Ag, As, Cu, Hg, Pb, Sb, Zn) Pan Concentrates 15 pcs
	Geophysical Survey	Suoi Boc Zone, Van Yen Area	Area: 4.5 km ² IP Lines 15.8 km
		Suoi Boc Zone, Van Yen Area	Area: 4.5 km ² Drilling (4 holes) 742.70 m Trench 600.00 m
Third	Drilling Exploration	Suoi Boc Zone, Van Yen Area	Drilling (4 holes) 742.70 m Trench 600.00 m

Cretaceous		Mudstone, Sandstone, Conglomerate, Trachyte, Trachybasalt Tuff, Trachyandesite, Trachyandesitic Tuff and Trachyte
Jurassic		Basaltic Tuff (partly welded), Diabase (Rhyolite), Sandstone, Interbeds of Sandstone and Siltstone
Upper Triassic		Limestone, Interbeds of Mudstone and Sandstone,
Middle Triassic		Interbeds of Mudstone and Siltstone, Sandstone
		Limestone
		Trachybasalt, Trachyte, Trachytic Tuff, Limestone, Mudstone, Sandstone and Conglomerate
Lower Triassic		Trachybasalt, Trachybasaltic Tuff, Trachytic Tuff, Mudstone, Sandstone, Interbeds of Limestone and Muai
U. per Permian to Lower Triassic	 	Basaltic Tuff, Mudstone and Sandstone Limestone
Permian		Mudstone, Limestone, Interbeds of Mudstone and Sandstone
Carboniferous to Permian		Mudstone, Sandstone and Limestone
M. J. to Upper Devonian		Mudstone, Limestone and Andesitic Tuff

M. J. to Devonian		Limestone
Lower Devonian		Mudstone, Sandstone and Siltstone
		Limestone and Basaltic Tuff
		Mudstone, Sandstone, Limestone, Interbeds of Sandstone and Mudstone, Conglomerate and Basaltic Tuff
Silurian to Devonian		Mudstone, Sandstone, Interbeds of Siltstone and Mudstone, Limestone

Upper Ordovician to Silurian		Sandstone, Mudstone, Limestone and Pelitic Schist
Upper Cambrian to Lower Ordovician		Sandstone, Mudstone, Conglomerate, Pelitic Schist and Psammite Schist

Cambrian		Pelitic Schist, Gneiss, Granodiorite and Diabase
Proterozoic		Pelitic Schist, Green Schist, Psammite Schist, Quartzite, Biotite Gneiss and Amphibole Gneiss

Intrusive Rock		Granite
		Diabase Porphyry, Aplite
		Syende
		Trachyte
		Gabbro and Diabase
		Ultrabasic Rocks
		Fault
		Shear Zone
		Dip and Strike of Bed
		Dip and Strike of Schistosity
		Vein
		Mineralization
		Geochemical Anomalous Zone
		High Chargeability Zone
		Drilling Hole
	Trench	
	Working Mine	

A—A' Profile Line

Tran Thanh Dy (Geological Mapping Division, GSV) Geophysicist
 Western Thanh Hoa Area
 Ho Nhim (Division No.4, GSV) Team Leader
 Dau Ba Quang (Division No.4, GSV) Geologist
 Nguyen The Phuc (Division No.4, GSV) Geologist
 Tran Cong Bang (Division No.4, GSV) Geologist
 Nguyen Xuan Tuan (Division No.4, GSV) Geologist
 Nguyen Phi Tien (Division No.4, GSV) Geologist
 [Japanese Members]
 Masataka OCHI (JED) Team Leader
 Motomu GOTO (JED) Geologist
 Masami HIGASHIHARA (JED) Geologist
 Takumi ONUMA (JED) Geologist
 Kazuyasu SUGAWARA (JED) Geologist
 Tomoji SANGA (JED) Geologist
 Takashi YAMASHIHI (JED) Geophysicist
 Shinichi SUGIYAMA (JED) Geophysicist
 Tadanori IWASAKI (JED) Geophysicist

Phase 3 [Vietnamese Member]
 Hoang Minh Hue (Division No.3, GSV) Geologist
 [Japanese Members]
 Yoshitaro MATANO (JED) Team Leader
 Saichi ISHII (JED) Drilling Engineer

Summary of Exploration Work in the Van Yen and Western Thanh Hoa Areas

Phase	Survey	Area	Amount of Work
First	Regional Geological Survey and Geochemical Exploration	Van Yen Area	Area: 1,000 km ² Stream Sediments: 839 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates: 193 pcs
		Western Thanh Hoa Area	Area: 650 km ² Stream Sediments: 532 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates: 117 pcs
	Semi-detailed Geochemical Exploration	Bu Me Zone, Western Thanh Hoa Area	Area: 4.5 km ² Soil Samples: 241 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn)
		Van Yen Area	Area: 1,000 km ² Stream Sediments: 915 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates: 240 pcs
Second	Regional Geological Survey and Geochemical Exploration	Van Yen Area	Area: 1,000 km ² Stream Sediments: 915 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates: 240 pcs
		Western Thanh Hoa Area	Area: 650 km ² Stream Sediments: 469 pcs (Au, Ag, As, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, W, Zn) Pan Concentrates: 120 pcs
	Detailed Geological Survey and Geochemical Exploration	Sua Boc-Sua Cu Zone, Van Yen Area	Area: 10 km ² Soil Samples: 160 pcs (Au, Ag, As, Cr, Cu, Hg, Pb, Sb, Zn)
		Luong Son Zone, Western Thanh Hoa Area	Area: 4 km ² Soil Samples: 207 pcs (Au, Ag, As, Cr, Cu, Hg, Pb, Sb, Zn) Pan Concentrates: 15 pcs
Third	Drilling Exploration	Sua Boc Zone, Van Yen Area	Area: 4.5 km ² IP Lines: 15.8 km
		Sua Boc Zone, Van Yen Area	Area: 4.5 km ² Drilling (4 holes): 742.70 m Trench: 600.00 m

JICA