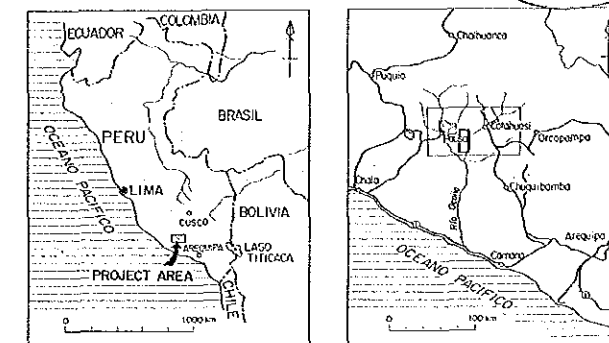


MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

GEOLOGICAL PROFILES OF THE
DETAILED SURVEY AREA
(B)

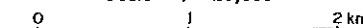
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15147
図書資料室蔵

LOCATION INDEX



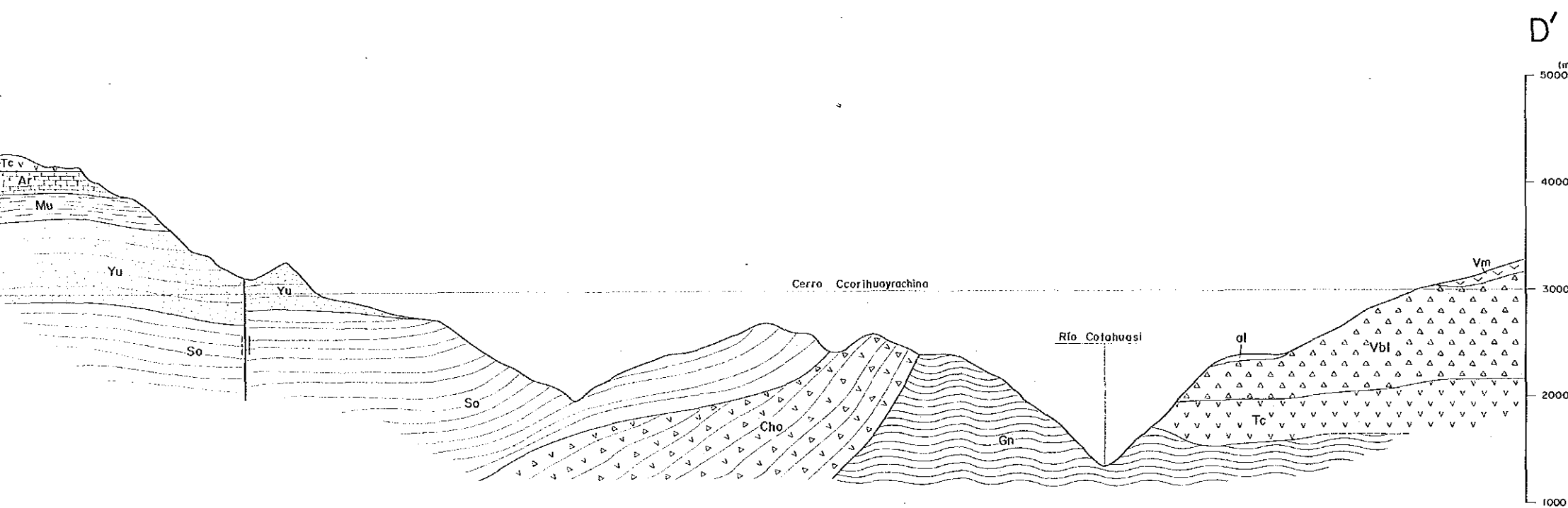
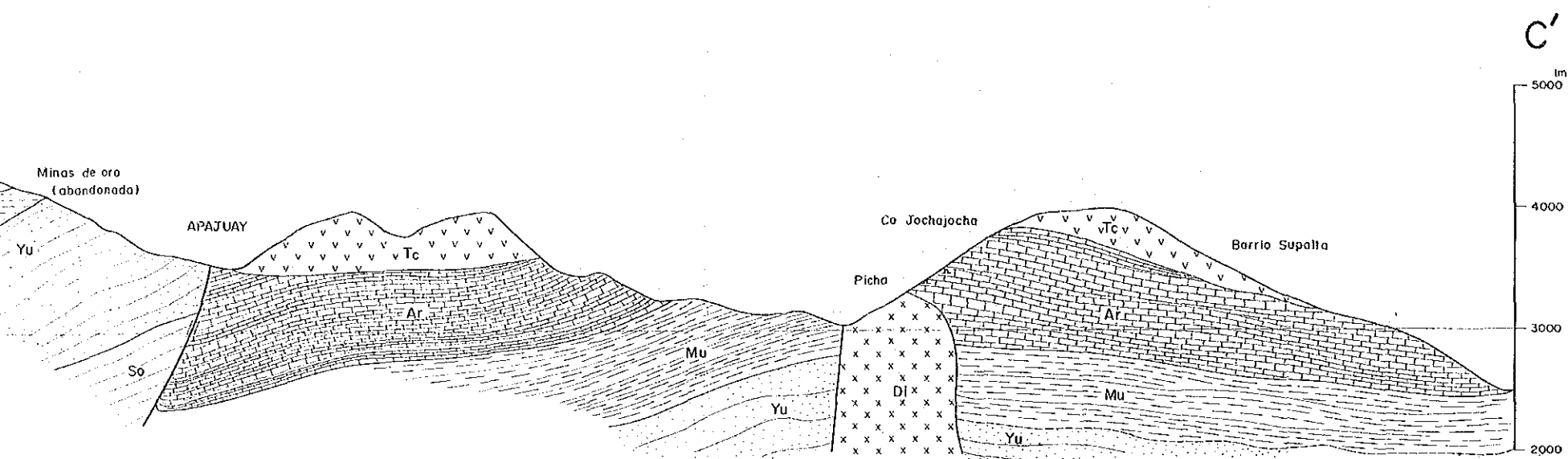
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METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

Scale 1 : 25,000



LEGEND

Quaternary	alluvium	al	Sand, mud and gravel
Cenozoic	Mollebamba Volcanic Rocks	vM	Andesite lava and volcanic ash
	Volcanic Sediment of Puno	vSp	Volcanic ash, sand and gravel
	Longo Volcanic Rocks	vL	Andesite/basaltic, volcanic breccia
	Murco Sediment	mu	Gravel, sand and mud
Mesozoic	Barriso Group (Upper)	vb	Acidic tuff
	Barriso Group (Lower)	vl	Andesite lava and pyroclastic rocks
	Seneca Volcanic Rocks	vS	Murblande-basite dacite lava, Apitid tuff and tuff
	Maypitas Formation	vm	Dacitic tuff (partly purple bearing)
	Algarrobo Formation	al	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff
	Taraca Formation	ta	Tuffite with dacite lava as andesitic joint and dacitic tuff breccia (greenish grey)
	Huacra Formation	hu	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone/gymsa grey
	Arcuquina Formation	ar	Limestone and marl with sandstone and chert nodules
	Murco Formation	mu	Red shale and sandstone with opium bearing conglomerate
	Yara Group	ya	Quartzite, siliceous sandstone, black shale and alteration of quartzite and shale
Precambrian	Socsoni Formation	so	Black shale, limestone with sandstone and tuff
	Chocolate volcanic rocks	ch	Andesite tuff breccia, tuff, andesite and tuffaceous sandstone
		gn	Gneiss, gneissic granite and diorite
Tertiary	Inkawasi Rocks (Stock and Dyke)	id	Murblande andesite, andesite
	Achoa Stock	as	Diorite and quartz diorite
	La Osa Batholith	ob	Quartz diorite and granodiorite
Geological			Fault
			Inferred fault
			Anticline
			Syncline
			Geological boundary
			Strike and dip of bedding
			Strike and dip of foliation
			Strike and dip of flow structure
			Mine working or closed
			Hot spring

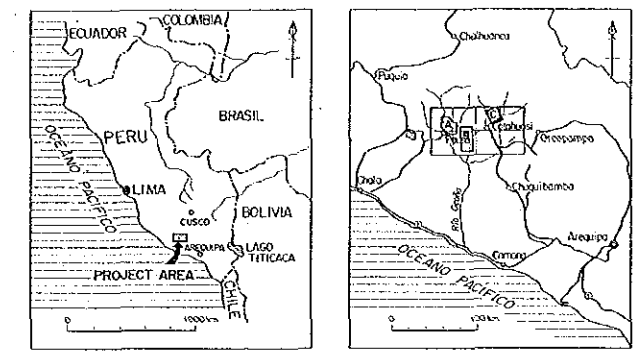


MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

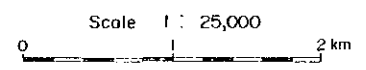
GEOLOGICAL MAP OF THE DETAILED SURVEY AREA (C)

15147
圖書資料室

LOCATION INDEX

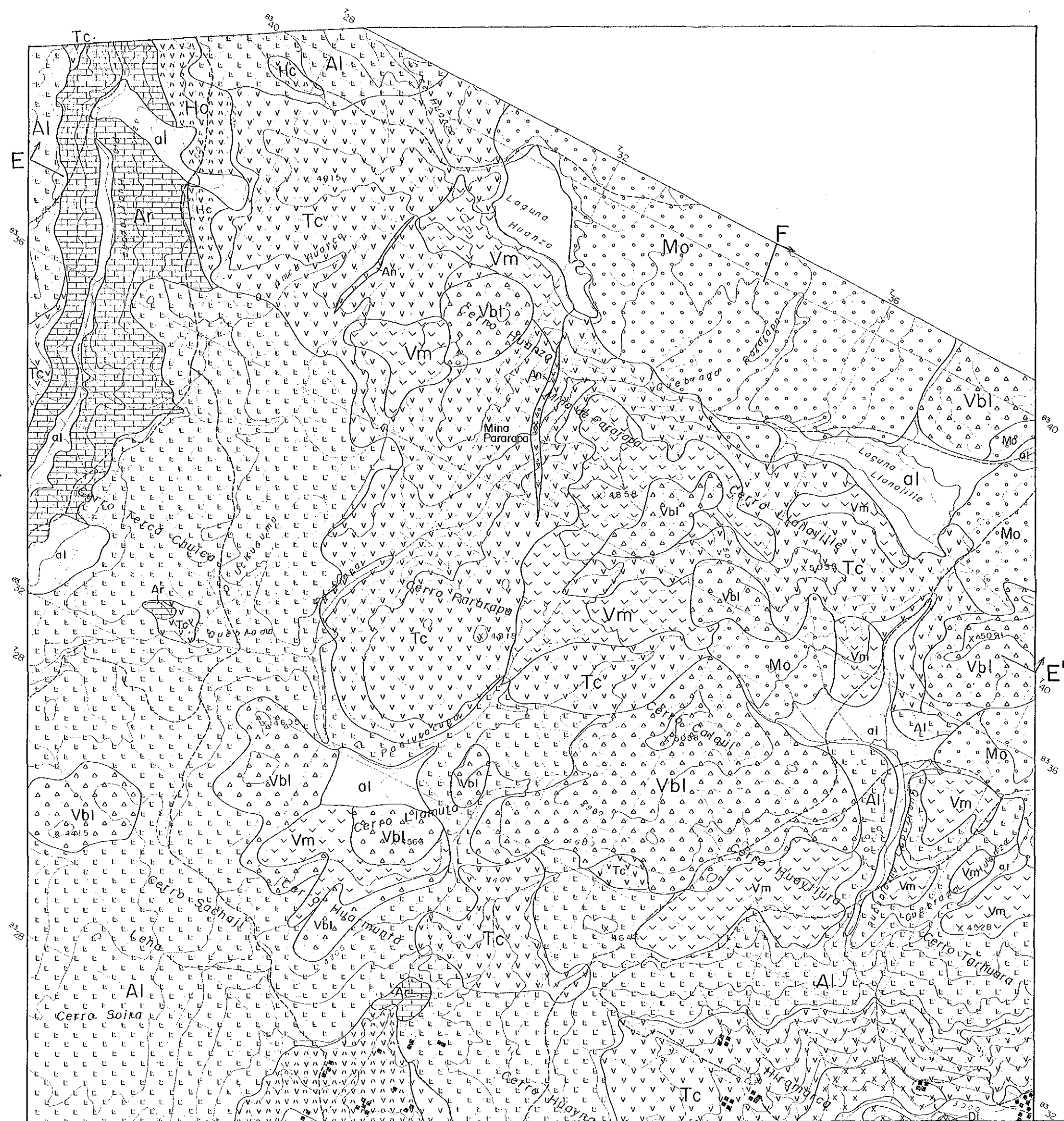


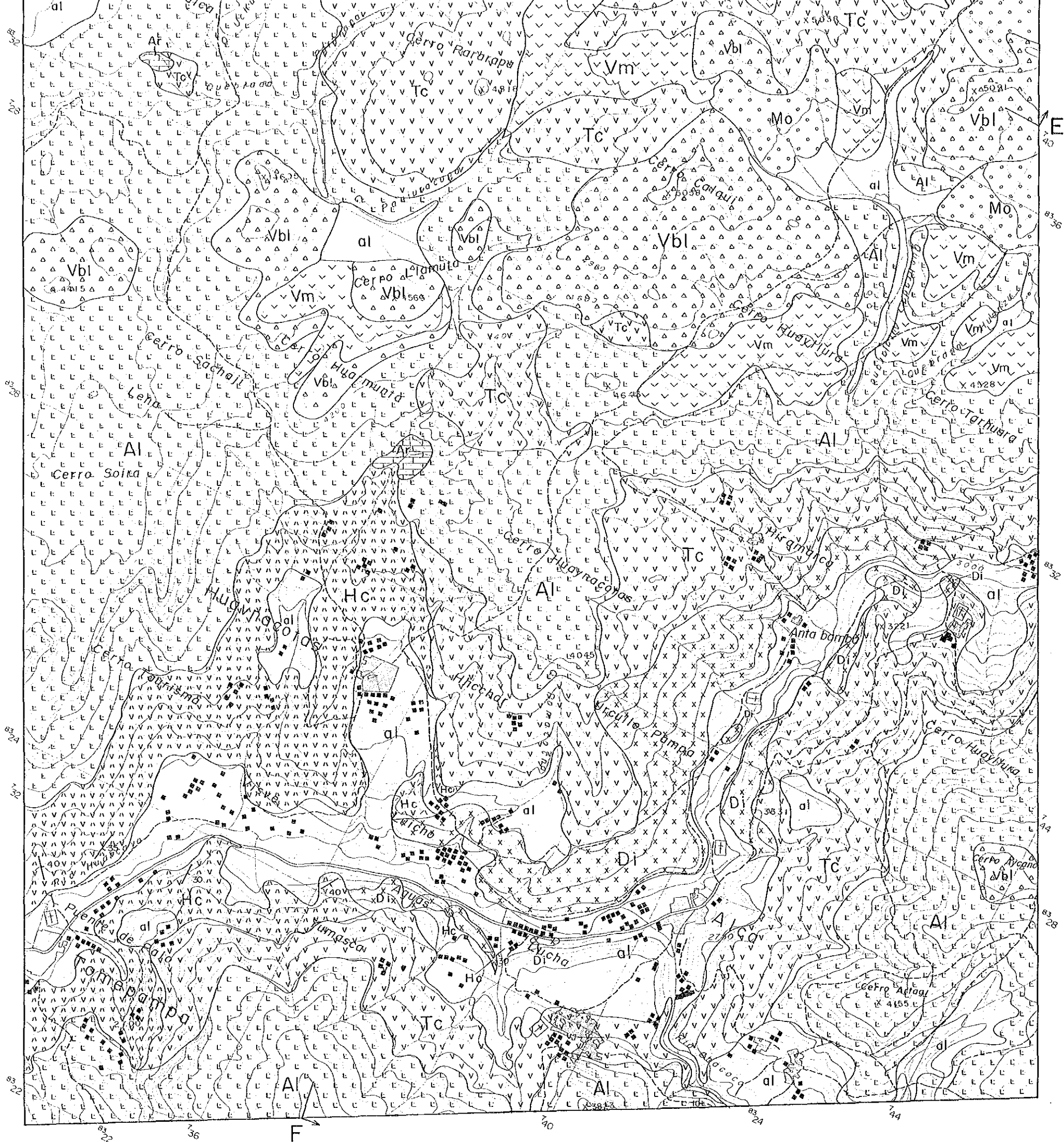
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INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986



LEGEND

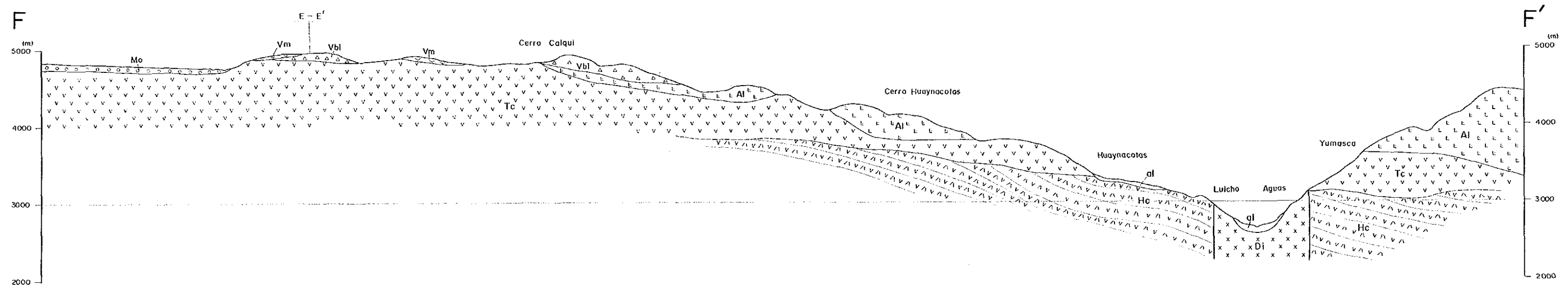
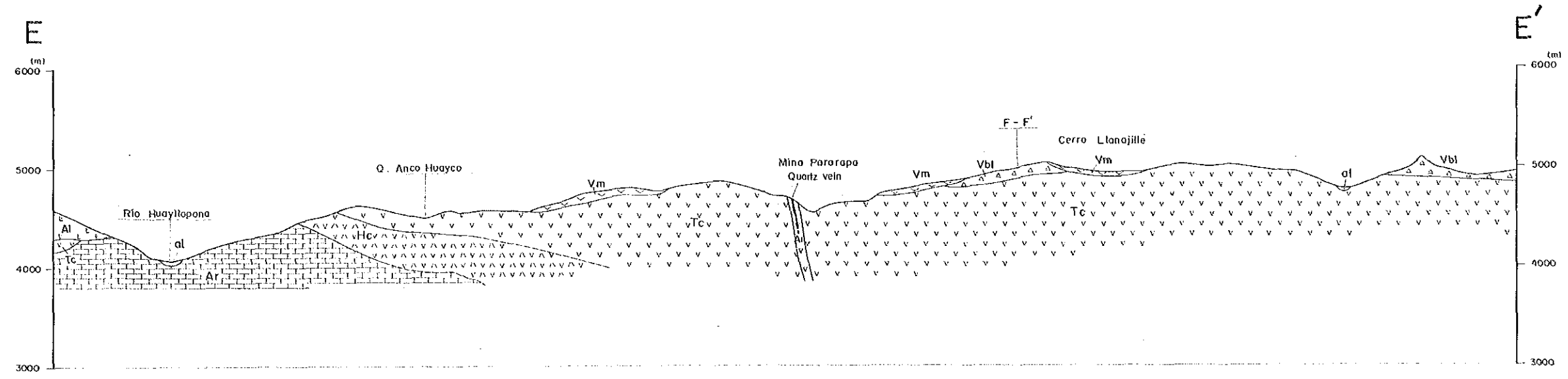
Cenozoic	Quaternary	Atluvium	al	Sand, mud and gravel		
		Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash		
			Vm	Volcanic ash, sand and gravel		
		Lampa Volcanic Rocks	Vm	Andesite (basaltic), volcanic breccia		
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud		
		Barroso Group	Upper	Vbu	Acidic tuff	
			Lower	Vbl	Andesite lava and pyroclastic rocks	
		Tertiary	Pliocene	Sanca Volcanic Rocks	Vsc	Hornblende-biotite dacite lava, welded tuff and tuff
				Huayllillas Formation	Hy	Dacitic tuff (partly pumice bearing)
			Miocene	Alpabamba Formation	Al	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)
Tacaza Formation	Tc			Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)		
Mesozoic	Cretaceous	Huanga Formation	Hc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)		
		Arcurquina Formation	Ar	Limestone and marl with sandstone and chert nodule		
	Jurassic	Murco Formation	Mu	Red shale and sandstone with gypsum bearing conglomerate		
		Yura Group	Yu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale		
Precambrian	Socosaní Formation	So	Black shale, limestone with sandstone and tuff			
	Chocolate volcanic rocks	Cho	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone			
Intrusive Rocks	Tertiary	Stock and Dyke	An	Hornblende andesite, andesite		
		Gn	Gneiss, gneissose granite and diorite			





LEGEND

Cenozoic	Quaternary	Alluvium	al	Sand, mud and gravel	
		Mollebamba Volcanic Rocks	Vm	Andesite lava and volcanic ash	
		Volcanic Sediment of Pausa	Vsp	Volcanic ash, sand and gravel	
		Lampa Volcanic Rocks	Vla	Andesite (basaltic), volcanic breccia	
	Pleistocene	Moraine Sediment	Mo	Gravel, sand and mud	
		Bartoso Group	Upper	Vbu	Acidic tuff
	Lower		Vbl	Andesite lava and pyroclastic rocks	
	Tertiary	Pliocene	Sencca Volcanic Rocks	Vse	Hornblende-biotite dacite lava, welded tuff and tuff
			Huayllillas Formation	Hy	Dacitic tuff (partly pumice bearing)
		Alpabamba Formation		LAL	Dacitic tuff, lapilli tuff, tuff breccia and welded tuff (partly with dacite lava or andesite lava)
Tacozo Formation			VTC	Andesitic tuff breccia, Andesite, tuff and dacitic tuff breccia (greenish grey)	
Palaocene		Huanca Formation	VHc	Andesitic volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)	
		Arcuquina Formation	Arq	Limestone and marl with sandstone and chert nodule	
Murco Formation			Mu	Red shale and sandstone with gypsum bearing conglomerate	
		Yura Group	Yu	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale	
Jurassic			Socsoni Formation	So	Block shale, limestone with sandstone and tuff
		Chocolate volcanic rocks	Chc	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone	
Precambrian		Gn	Gneiss, gneissose granite and diorite		
Tertiary	Intrusive Rocks	Stock and Dyke	An	Hornblende andesite, andesite	
		Accha Stock	DI	Diorite and quartz diorite	
	Cretaceous	La Costa Batholith	CB	Quartz diorite and granodiorite	
Fault					
Inferred fault					
Anticline					
Syncline					
Geological boundary					
Geological profile line					
Strike and dip					
Mine (working or closed)					



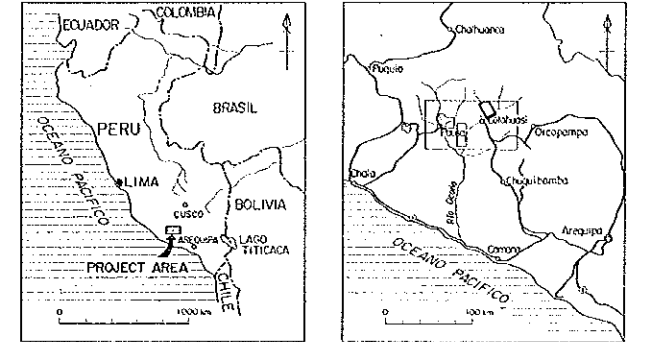
MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

GEOLOGICAL PROFILES OF THE
DETAILED SURVEY AREA

(C)

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15147
図書資料室

LOCATION INDEX



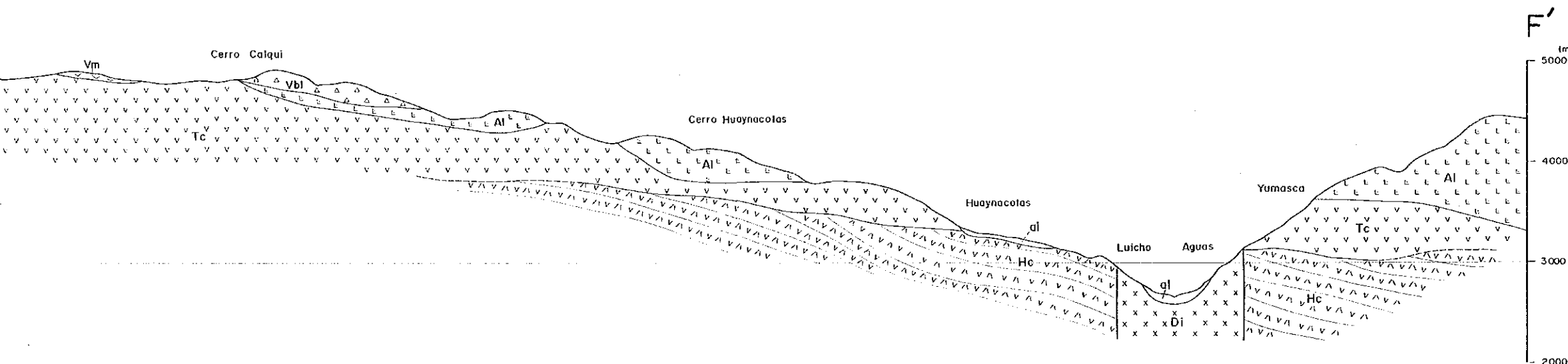
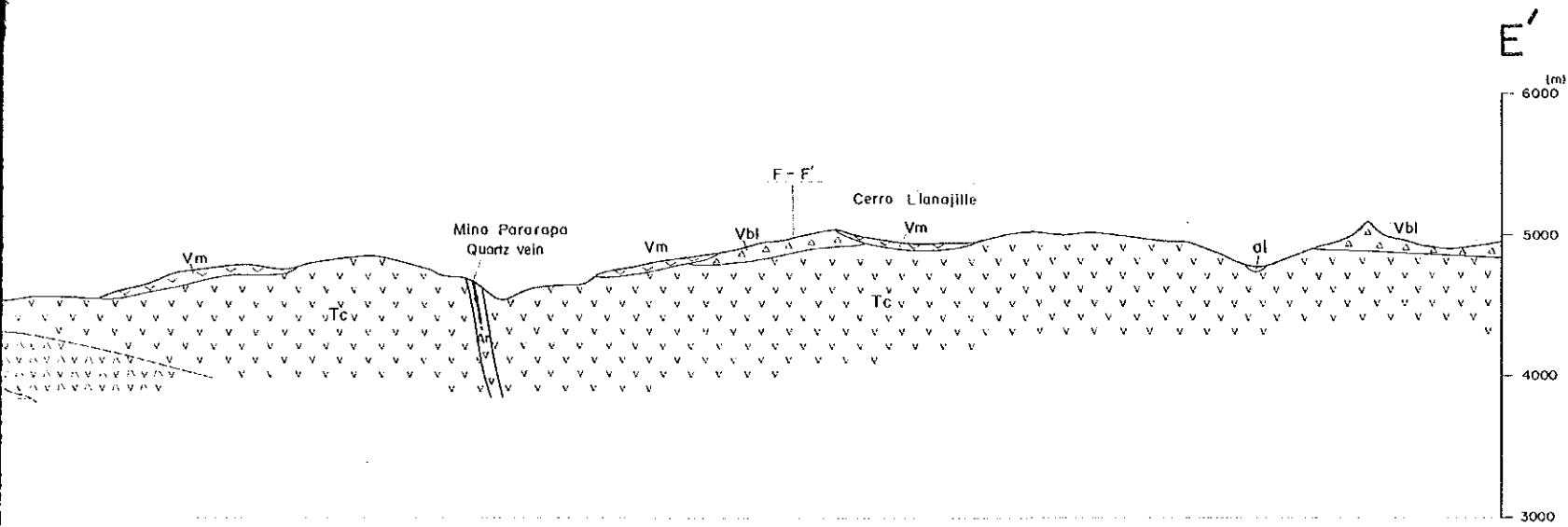
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INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

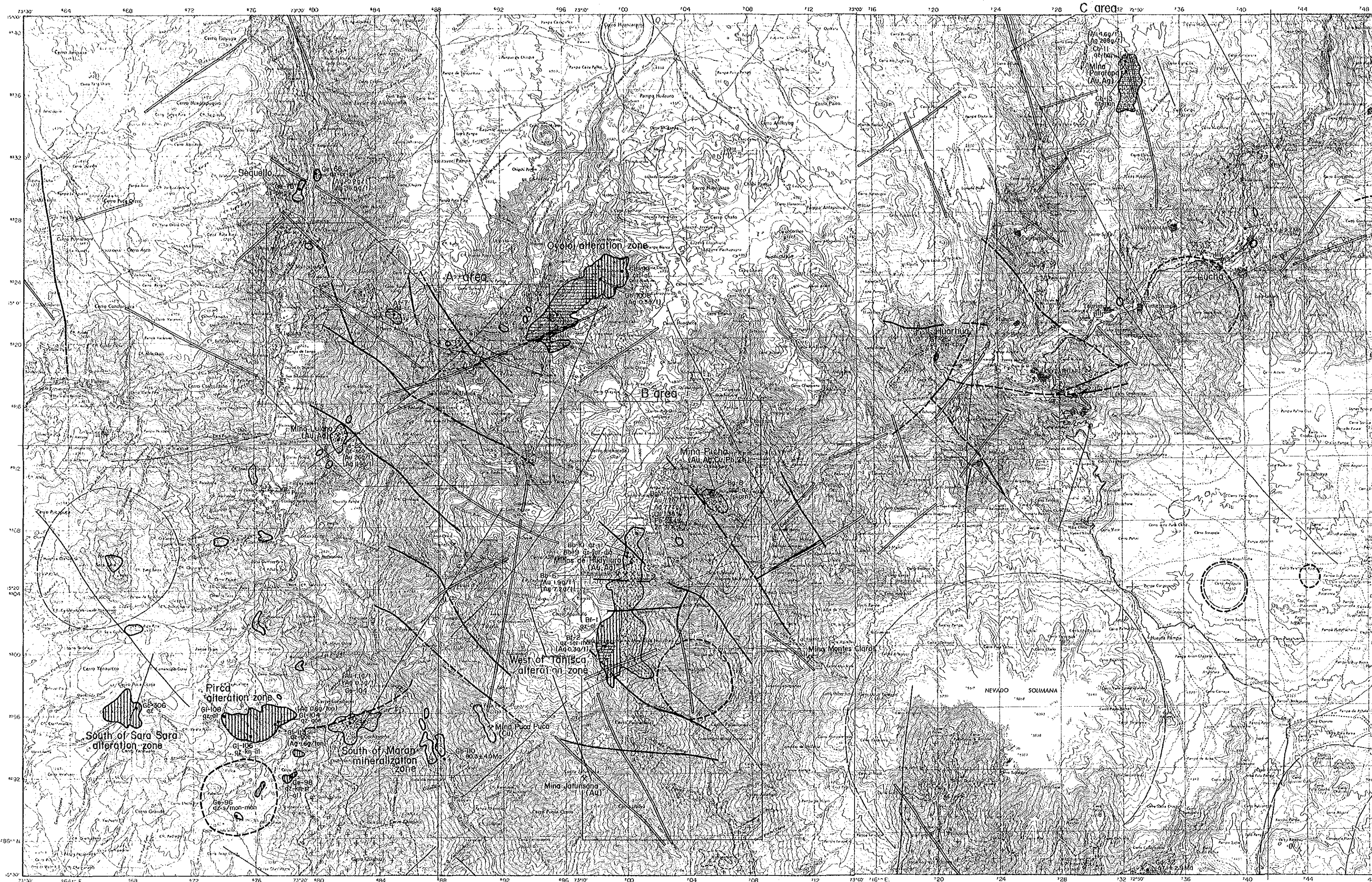
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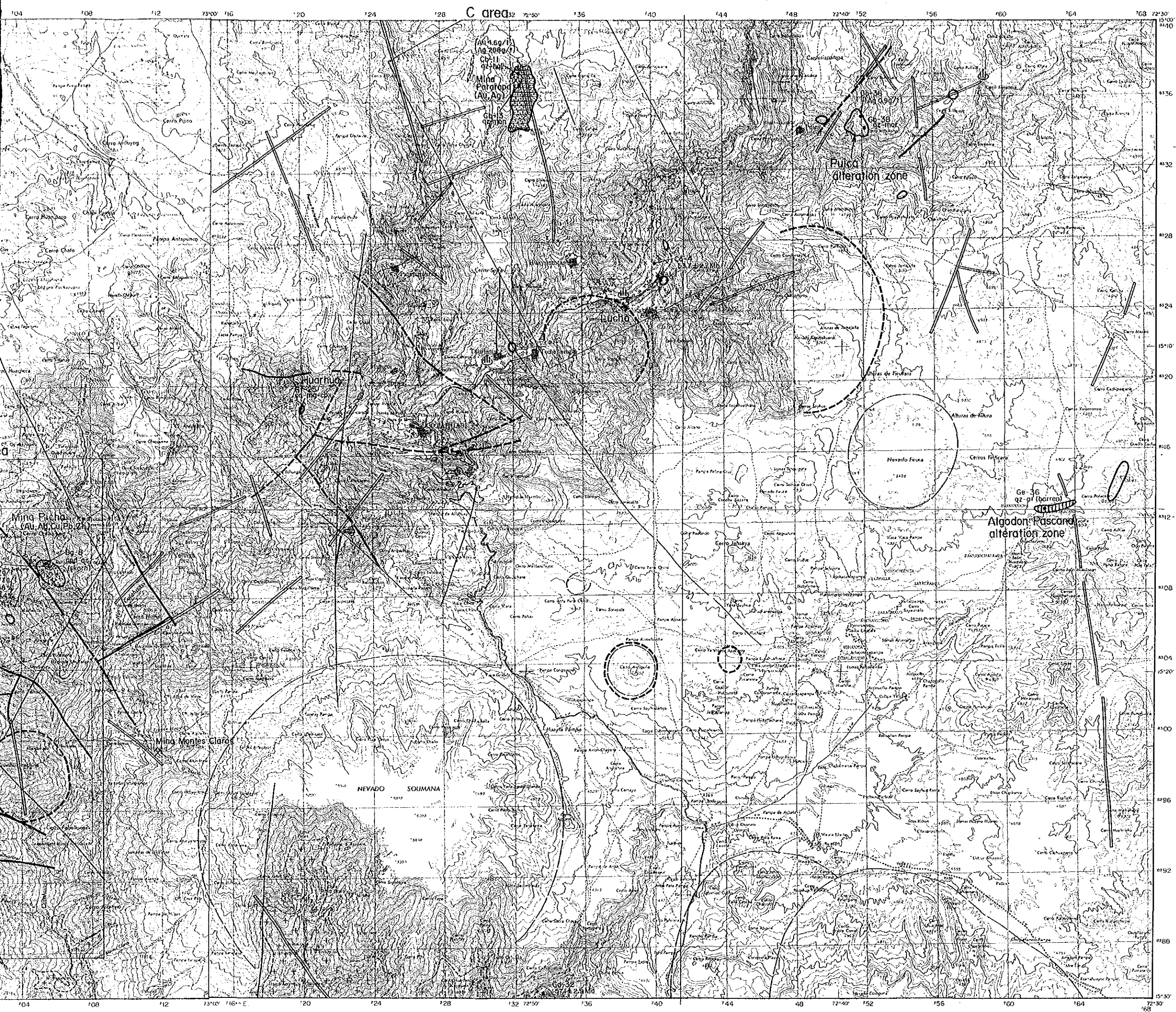
LEGEND

Quaternary	Aluvium	al	Sand, mud and gravel
Cenozoic	Mishebonbo Volcanic Rocks	Vm	Andesite lava and volcanic ash
	Volcanic Sediment of Puno	Vs	Volcanic ash, sand and gravel
Tertiary	Lorpo Volcanic Rocks	Lv	Andesite/basaltic, volcanic breccia
	Morane Sediment	Ms	Gravel, sand and mud
Miocene	Barrasa Group	Bg	Acidic tuff
	Senca Volcanic Rocks	Sv	Andesite lava and gneissic rocks
Pliocene	Huayllillas Formation	Hf	Monzonite-basaltic dike lava, welded tuff and tuff
	Alpambayo Formation	Af	Basaltic tuff (partly breccia bearing) and welded tuff
Quaternary	Tacaza Formation	Tf	Partly with basalt lava or andesite lava
	Huayra Formation	Hu	Andesite tuff breccia, andesite tuff and dacitic tuff breccia (greenish grey)
Cenozoic	Huayra Formation	Hu	Andesite, volcanic conglomerate, tuff breccia and tuffaceous sandstone (greenish grey)
	Atacama Formation	At	Limestone and marl with sandstone and chert nodules
Miocene	Murco Formation	Mf	Red shale and sandstone with gypsum bearing conglomerate
	Yura Group	Yg	Quartzite, siliceous sandstone, black shale and alternation of quartzite and shale
Pliocene	Seopash Formation	Sf	Block shale, limestone with sandstone and tuff
	Chocolate volcanic rocks	Ch	Andesitic tuff breccia, tuff, andesite and tuffaceous sandstone
Precambrian	Intrusive Rocks	Ir	Gneiss, gneissic granite and diorite
	Stockant Dyke	St	Monzonitic andesite, andesite
Tertiary	Asha Stock	As	Diorite and quartz diorite
	La Costa Basaltic	Lc	Quartz diorite and granodiorite

—	Fault
- - -	Inferred fault
~	Anticline
∩	Syncline
○	Geological boundary
↗	Strike and dip of bedding
↘	Strike and dip of foliation
↖	Strike and dip of flow structure
x	Mine workings or closest
•	Hot spring








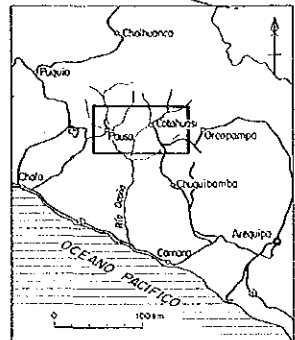
PL. 10

MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

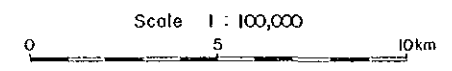
LOCATION MAP OF ALTERATION AND MINERALIZED ZONES

国際協力
1511
図書資料

LOCATION INDEX

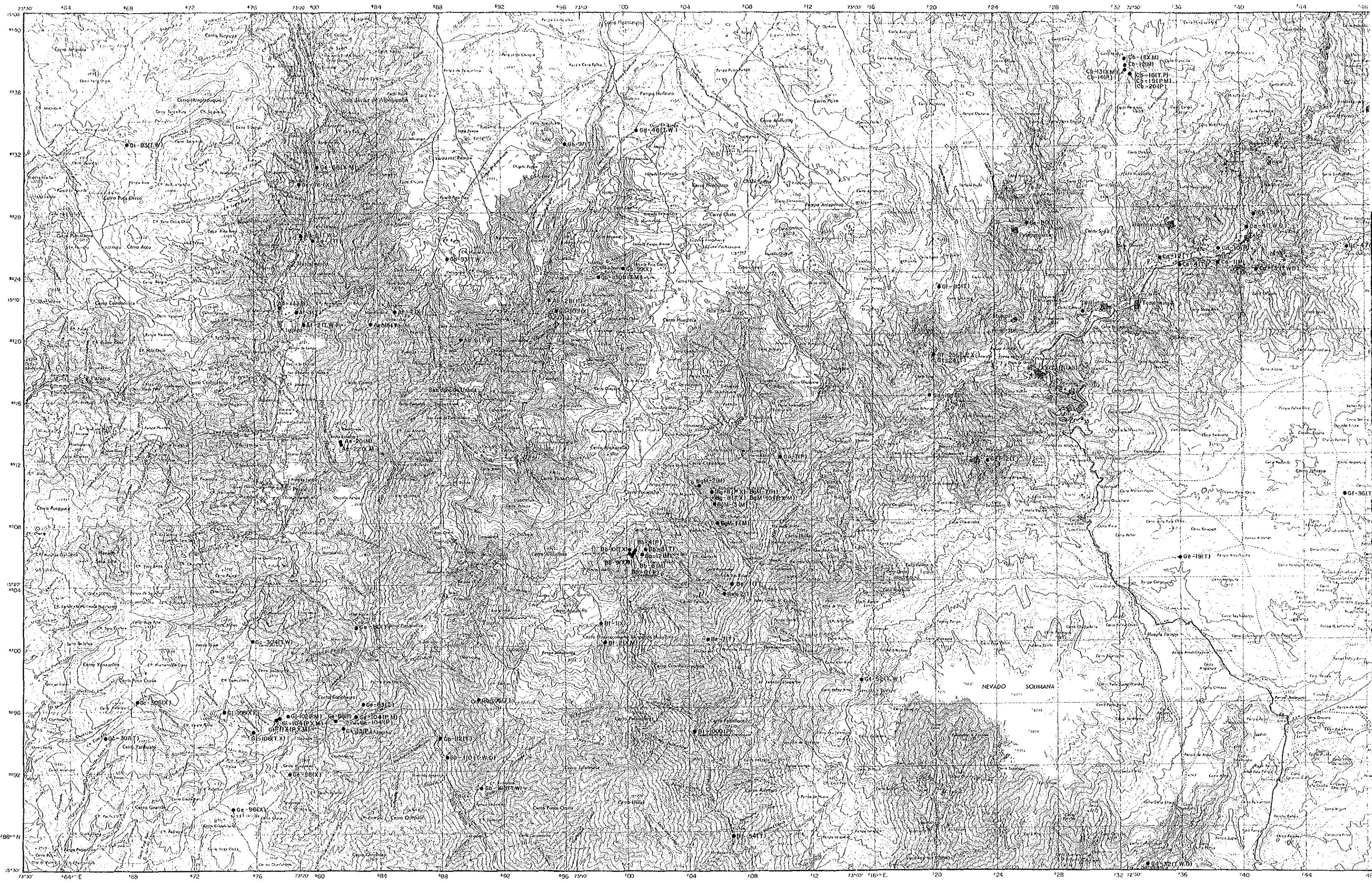



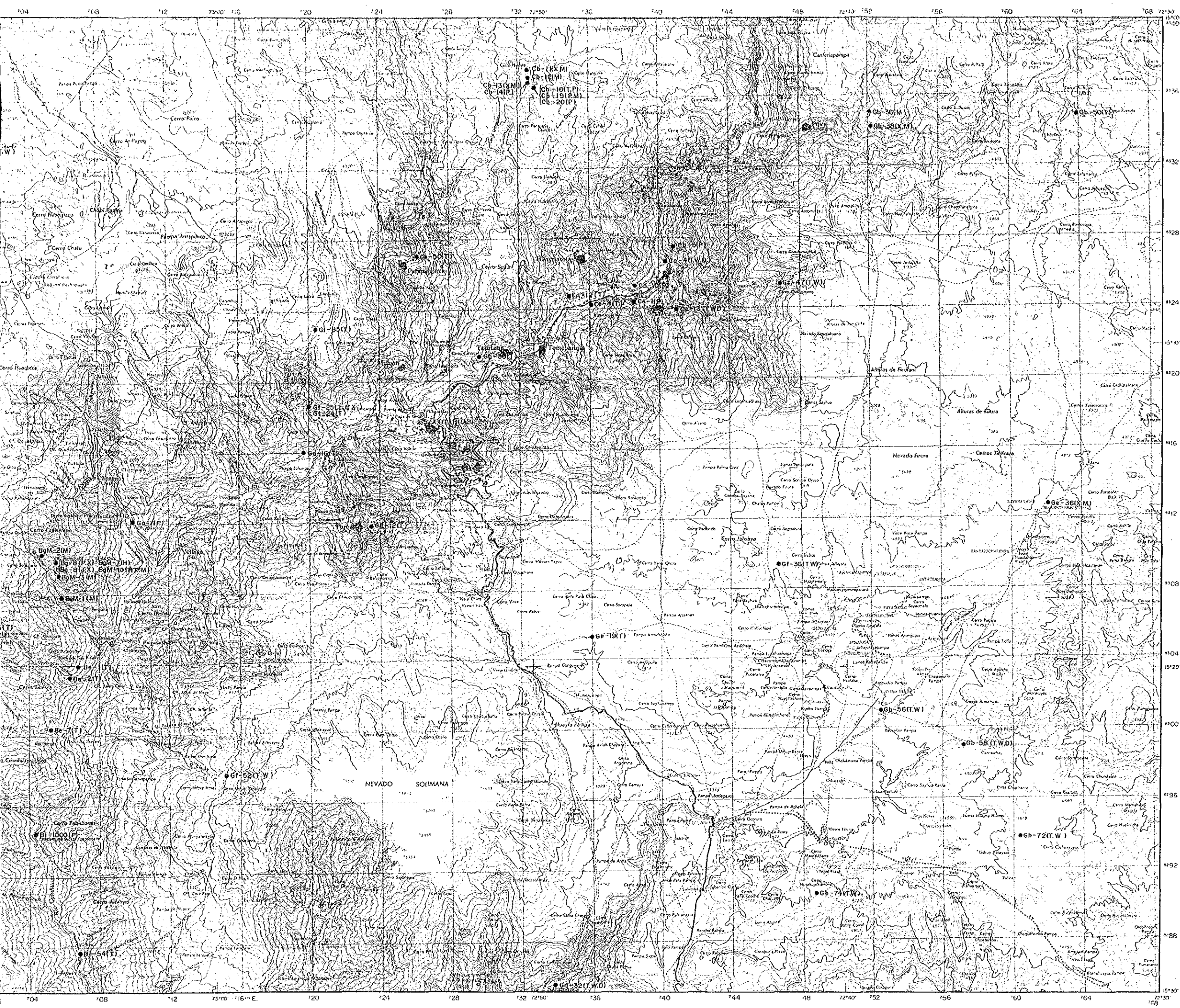
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METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986



LEGEND

- | | | | | | |
|--|---|------------------------|--|---|-----------------------|
| | mainly silicification
(qz ± oi ± kn) | Alteration zone | | silicification + argillization | minerals |
| | others (iron oxides stained zone) | | skarn | qz : quartz | pl : plagioclase |
| | samples | | mineralization zone | or : orthoclase | al : alunite |
| | mine | | hot spring | kn : kaolinite | hol : halloysite |
| | Batholith granitic rocks | | Stock dioritic rocks | sr : sericite | mon : montmorillonite |
| | Stock and dyke andesitic rocks | | lineament (Landsat) | s/mon : sericite-montmorillonite
mixed layer | dia : diaspore |
| | fault | | lineament (aerial photograph) | mor : mordenite | and : andradite |
| | Curvicular structure (Landsat) | | Curvicular structure (aerial photograph) | cpx : clinopyroxene | ca : calcite |
| | | | | py : pyrite | mg : magnetite |
| | | | | goe : goethite | sco : scorodite |
| | | | | jar : jarosite | |



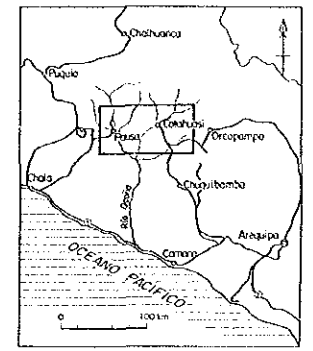
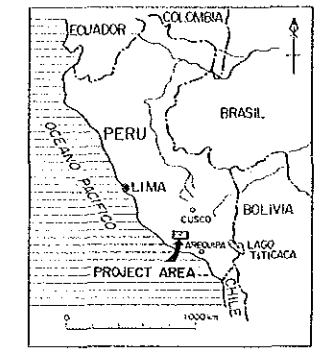


MINERAL EXPLORATION
IN
COTAHUASI AREA
(PHASE I)

LOCATION MAP OF
ROCK AND ORE SAMPLES

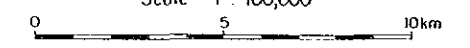
国際協力事業団
15147
調査資料室蔵書

LOCATION INDEX



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
INSTITUTO GEOLOGICO MINERO Y METALURGICO
February 1986

Scale 1 : 100,000



LEGEND

- (P) : Polished Section
- (T) : Thin Section
- (X) : X-Ray Powder diffraction
- (M) : Chemical Analysis of Ore
- (W) : Chemical Analysis of Rock (13 element)
- (D) : K-Ar Radiometric Age Determination