PL. II-2-2-4

THE MINERAL EXPLORATION IN THE SOUTHERN NURATAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE II)

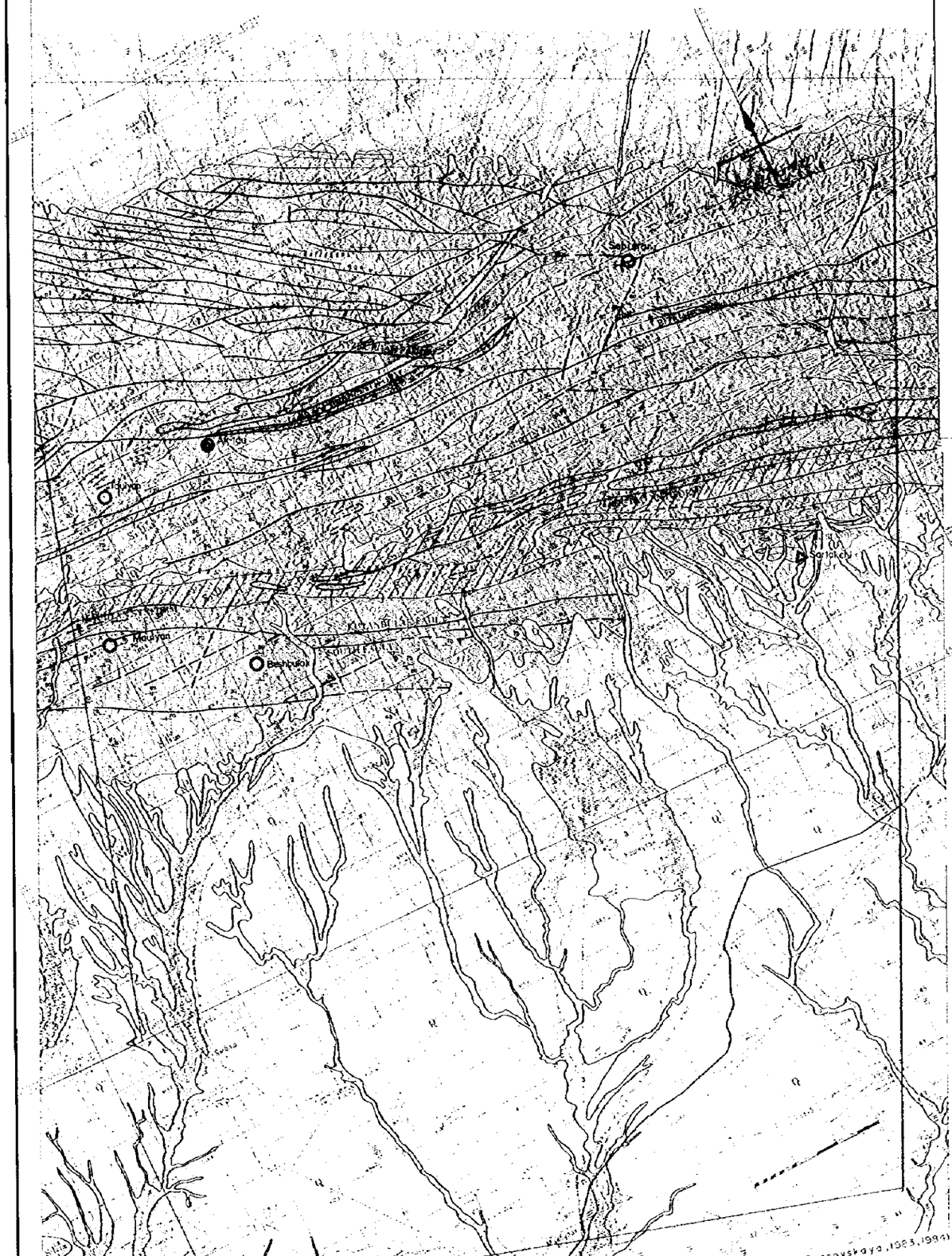
Geologic Map of the General Survey Area (I)

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
FEBRUARY 1998

Prepared by MINDECO

1 : 25,000

0 5 10 15 20KM



Legend

Blanket

- Quaternary: Q — present-river bed sediments ... sand, gravel, silt; Q — terrace, fan and proluvial sediments ... sand, gravel, silt
- Neogene: N — ... sandstone, clay, sand, siltstone
- Paleogene: P — ... sandstone, siltstone, clay, sand — Blanket sediments of platform
- Cretaceous: K — ... sandstone, siltstone, shale, clay

Basement Complex

- Carboniferous: C₁v — Bitab formation ... conglomerate, sandstone
- Devonian: D₃b — Bukbultau formation ... limestone; D₃ch — Charkhasan formation ... limestone, chert, shale; D₂p — Paraoi formation ... shale, siltstone, sandstone, conglomerate, limestone; S-D₁an — Angidan formation ... limestone, dolomitic limestone; S-D₁ak — Aktau formation ... limestone, shale; S-D₁t — Tamsaran formation ... sandstone, shale, chert, limestone, conglomerate
- Silurian: S1t — Tumsas formation ... sandstone, siltstone, shale, chert; S1s — Saribulak formation ... sandstone, siltstone, shale, conglomerate
- Ordovician: O₃t — Tu-un formation ... siltstone, sandstone, shale, conglomerate; O-O₁k — Karakurgan formation ... shale, siltstone, sandstone
- Cambrian: €₂sh — Shurchin formation ... limestone, phyllite, sandstone, shale; €₁k — Kuruntulek formation ... shale, sandstone, limestone, conglomerate

Intrusive Rocks

- Permian: γ-P₁k — Karatau granite body ... granite, granodiorite; γ-P₁gn — Gurbin granodiorite ... granodiorite
- Carboniferous: γ-C₂sh — Shurak granodiorite ... granodiorite, diorite — Watau granodiorite complex; γ-C₂o — Ozarsai granodiorite ... granite, granodiorite

Dike

- ... quartz porphyry, granite porphyry, pegmatite
- ... aplite, pegmatite
- ... granite porphyry, granodiorite porphyry, pegmatite
- ... quartz porphyry, granite, felsite
- ... basalt, diabase

(after I. A. Pyanovskaya, 1983, 1984)

Legend

Blanket

- Quaternary
  - a — present river bed sediments: sand, gravel, silt
  - Q — terrace, fan and proluvial sediments: sand, gravel, silt
- Neogene — N — conglomerate, clay, sand, siltstone
- Paleogene — ₽ — marl, clay, sand, siltstone
- Cretaceous — K — sandstone, siltstone, shale, coal, limestone

(Paleogene and Cretaceous: Blanket sediments of platform)

Basement Complex

- Carboniferous — **Batsh formation**: conglomerate, sandstone
- Devonian
  - **Bakhaltau formation**: limestone
  - **Charkhansai formation**: limestone, chert, dolomite
  - **Darasai formation**: slate, siltstone, sandstone, conglomerate, limestone
- Silurian
  - **Angidan formation**: limestone, dolomitic limestone
  - **Aktau formation**: limestone, slate
  - **Tansura formation**: sandstone, slate, siltstone, limestone, conglomerate
  - **Tumsai formation**: sandstone, siltstone, slate, tuff
  - **Saribulak formation**: sandstone, siltstone, slate, conglomerate
- Ordovician
  - **Tusun formation**: siltstone, sandstone, slate, "multicolored slate"
  - **Karakargin formation**: slate, siltstone, sandstone
- Cambrian
  - **Shorchin formation**: limestone, phyllite, sandstone, chert, siltstone
  - **Kutanbulak formation**: slate, sandstone, siltstone, limestone and volcanics

Intrusive Body

- Permian — **Karatau granite body**: two mica granite, hornblende biotite granite
- Carboniferous (Aktau granitoid complex)
  - **Gatchin granitoids**: two mica granite
  - **Shurak granitoids**: hornblende biotite granite, adamellite
  - **Darasai granitoids**: granodiorite, quartz diorite

Dike

- quartz porphyry, granite porphyry
- aplite, pegmatite
- granite porphyry, granodiorite porphyry
- two mica granite, leucogranite
- lamprophyre
- serpentinite
- spessartite, olivine diorite porphyry
- gabbro, diorite, quartz diorite

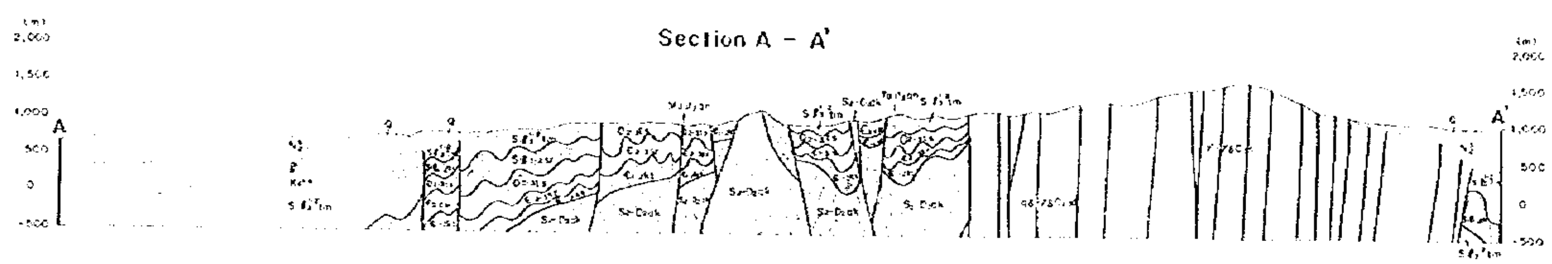
Ore Manifestation

- ○ Au
- △ Nb, Ta
- □ W
- ▽ Fe, Mn

Others

- conglomerate
- limestone
- slate
- quartz vein
- skarn
- hornfels
- fault (inferred)
- dip and strike bedding plane
- dip and strike fault plane

Section A – A'



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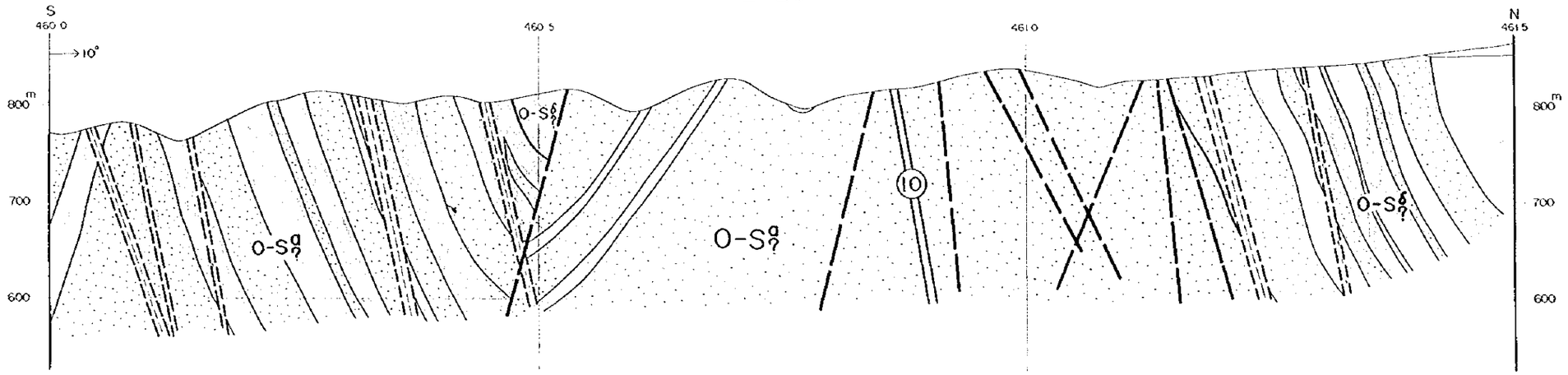

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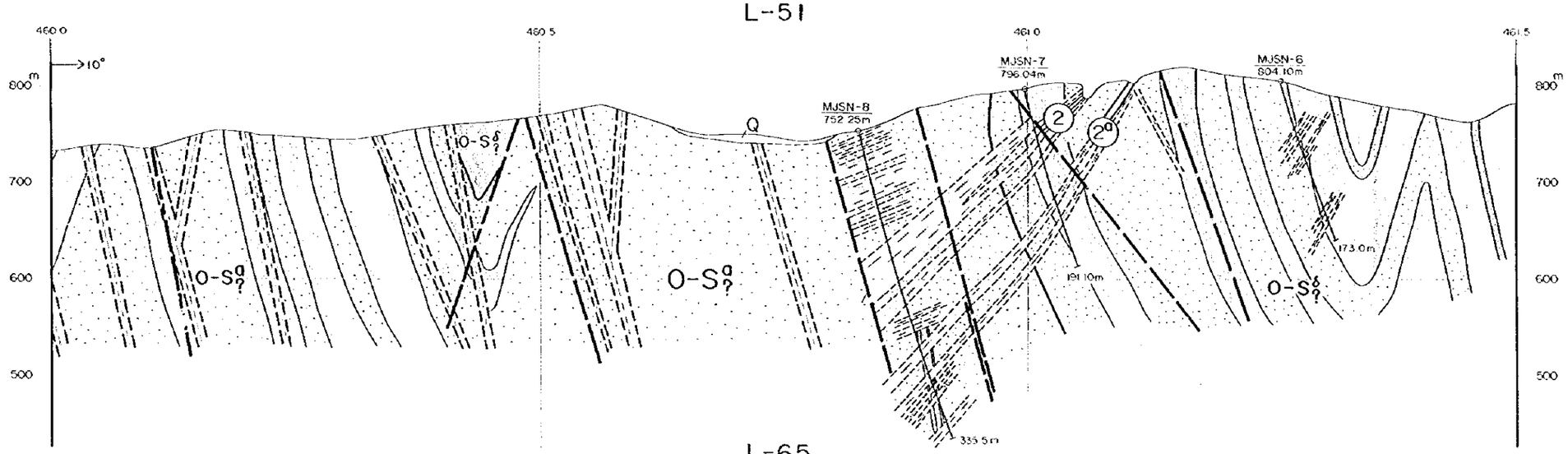

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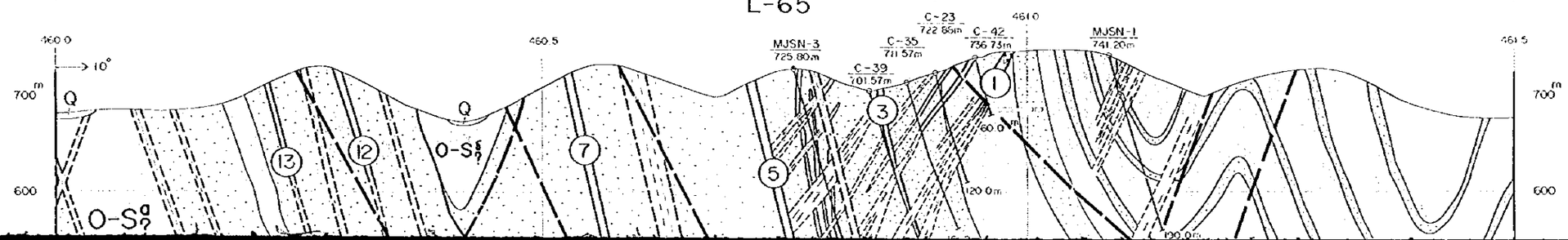


Quaternary

Lower Silurian

Silurian

Ordovician

Dyke

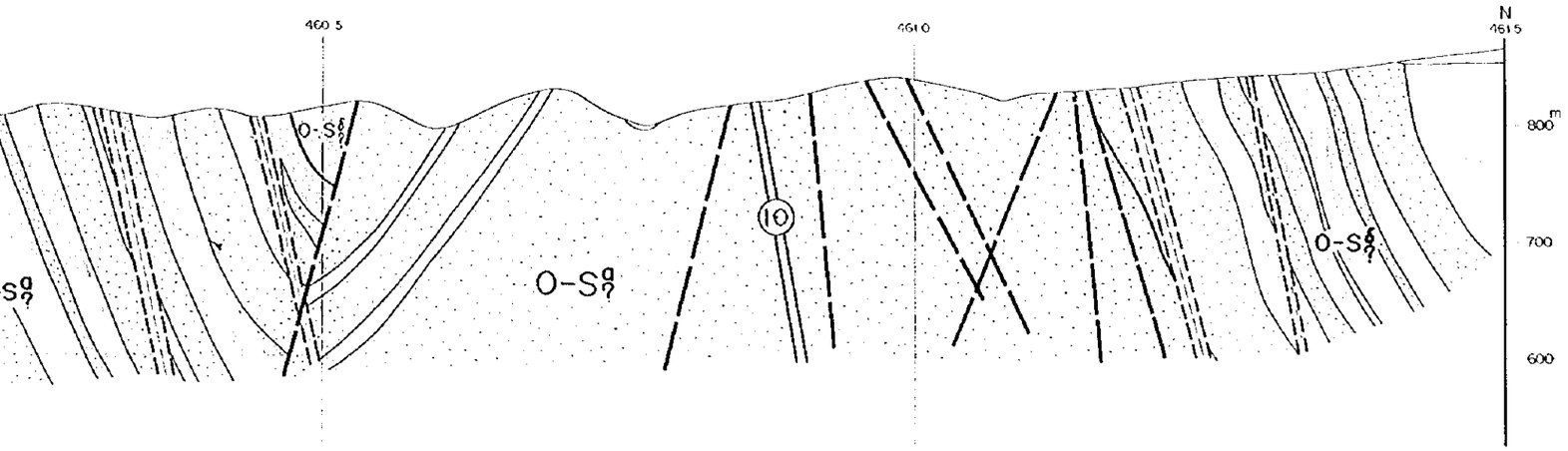
PL. II-3-1-2

THE MINERAL EXPLORATION IN THE SOUTHERN NURATAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I) GEOLOGIC CROSS SECTIONS OF THE ACHYNSAI DISTRICT

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
FEBRUARY 1998

Prepared by MINDECO

L-20



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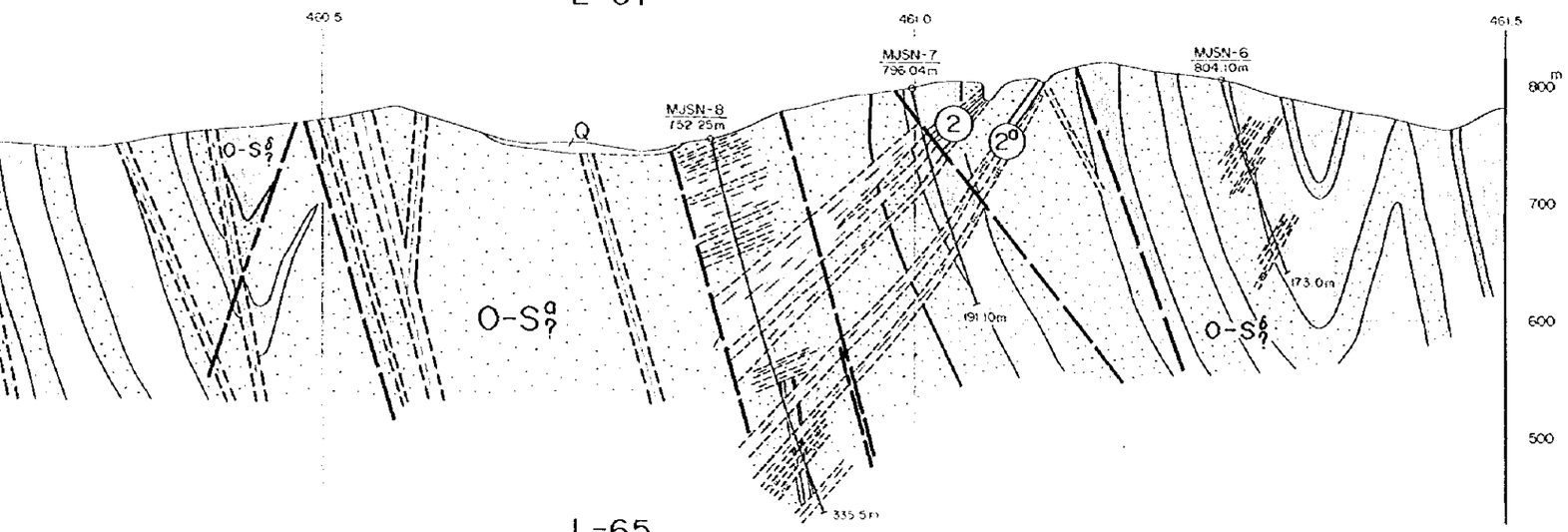

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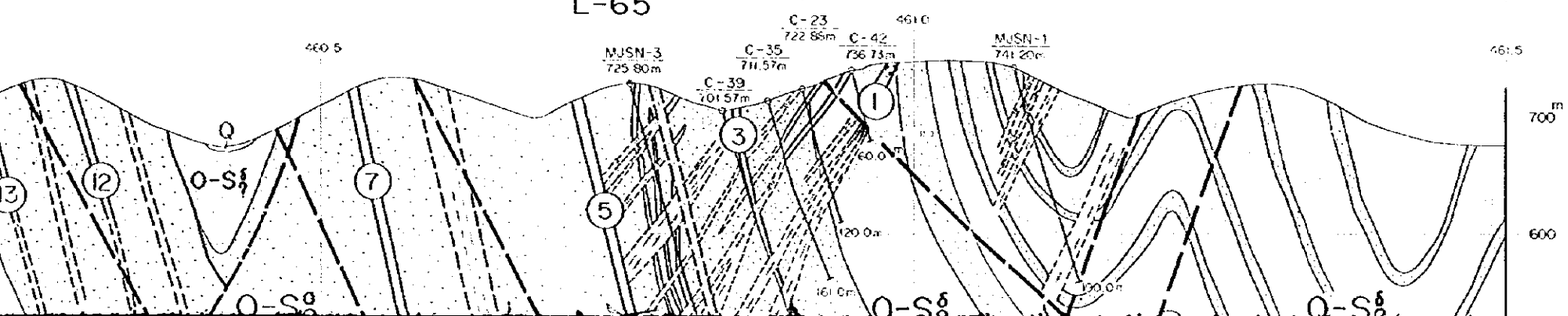
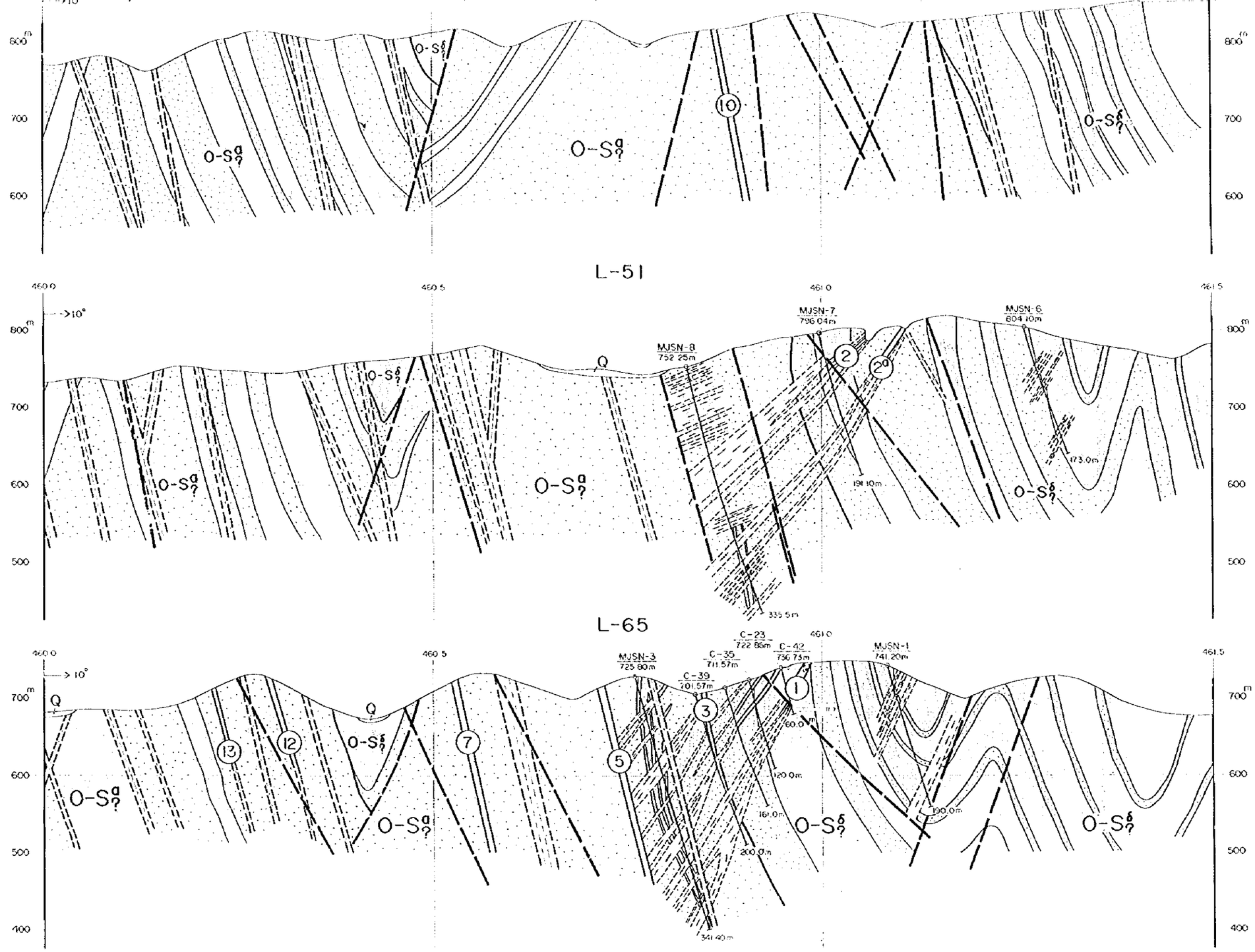
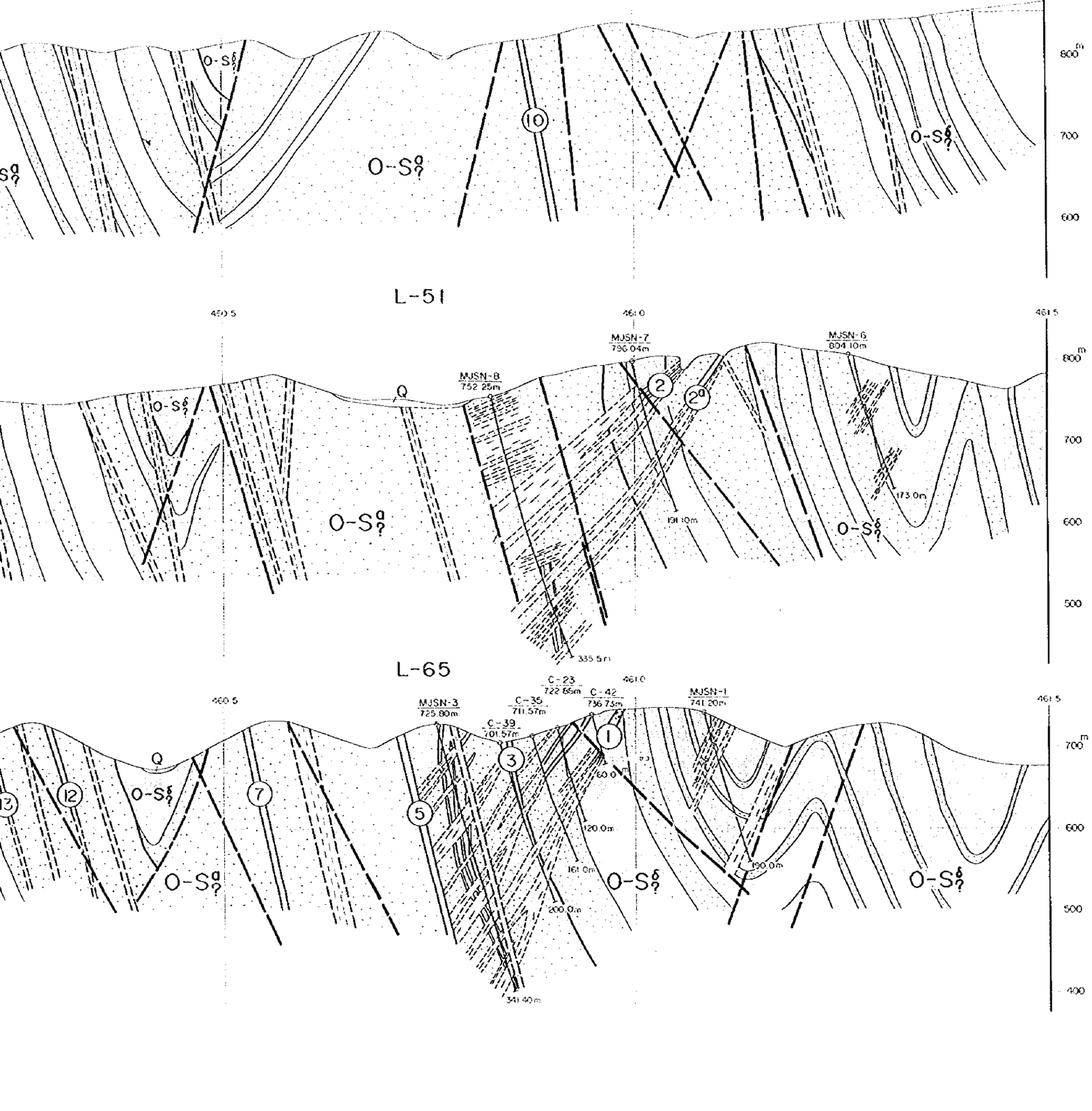


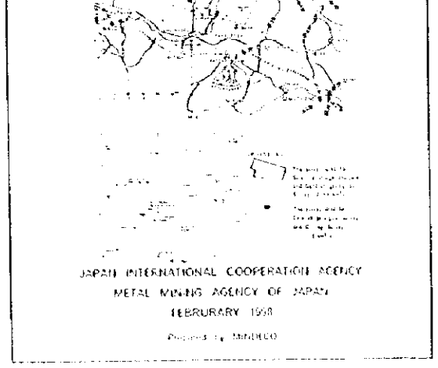
0 100 200 300 m
Scale 1 : 2,500

Legend

- Quaternary — Q — Talus, gravel, sand
- Lower Silurian — S $^{a}_{1-2}$ — Slates, Siltstones
- Lower Silurian — S $^{s}_{1-2}$ — Quartz sandstones
- Silurian / Ordovician — O-S$^{\delta}_{?}$ — Cherty slates — Middle Formation
- Silurian / Ordovician — O-S$^{a}_{?}$ — Sandstones — Middle Formation
- Ordovician — O-S$^{\delta}_{?}$ — Cherty slates — Lower Formation
- Ordovician — O-S$^{a}_{?}$ — Sandstones — Lower Formation
- Dyke — Lamprophyres
- Fractures : 1. Freced 2. Supposed
- Zones of brecciation and silicification
- Zones of quartz veins and veinlets
- Ore zone and its number
- Drillholes : 1. Existed 2. MMAJ(1997)


L-51
L-65
460.0
460.5
461.0
461.5
800m
700
600
500
400
->10°
O-S?a
O-S?δ
Q
10
2
2a
13
12
7
5
3
1
MJSN-7
796.04m
MJSN-8
752.25m
MJSN-6
804.10m
MJSN-3
725.80m
C-23
722.86m
C-35
711.57m
C-39
701.57m
C-42
736.75m
MJSN-1
741.20m
173.0m
191.10m
335.5m
60.0m
120.0m
161.0m
200.0m
100.0m
341.40m

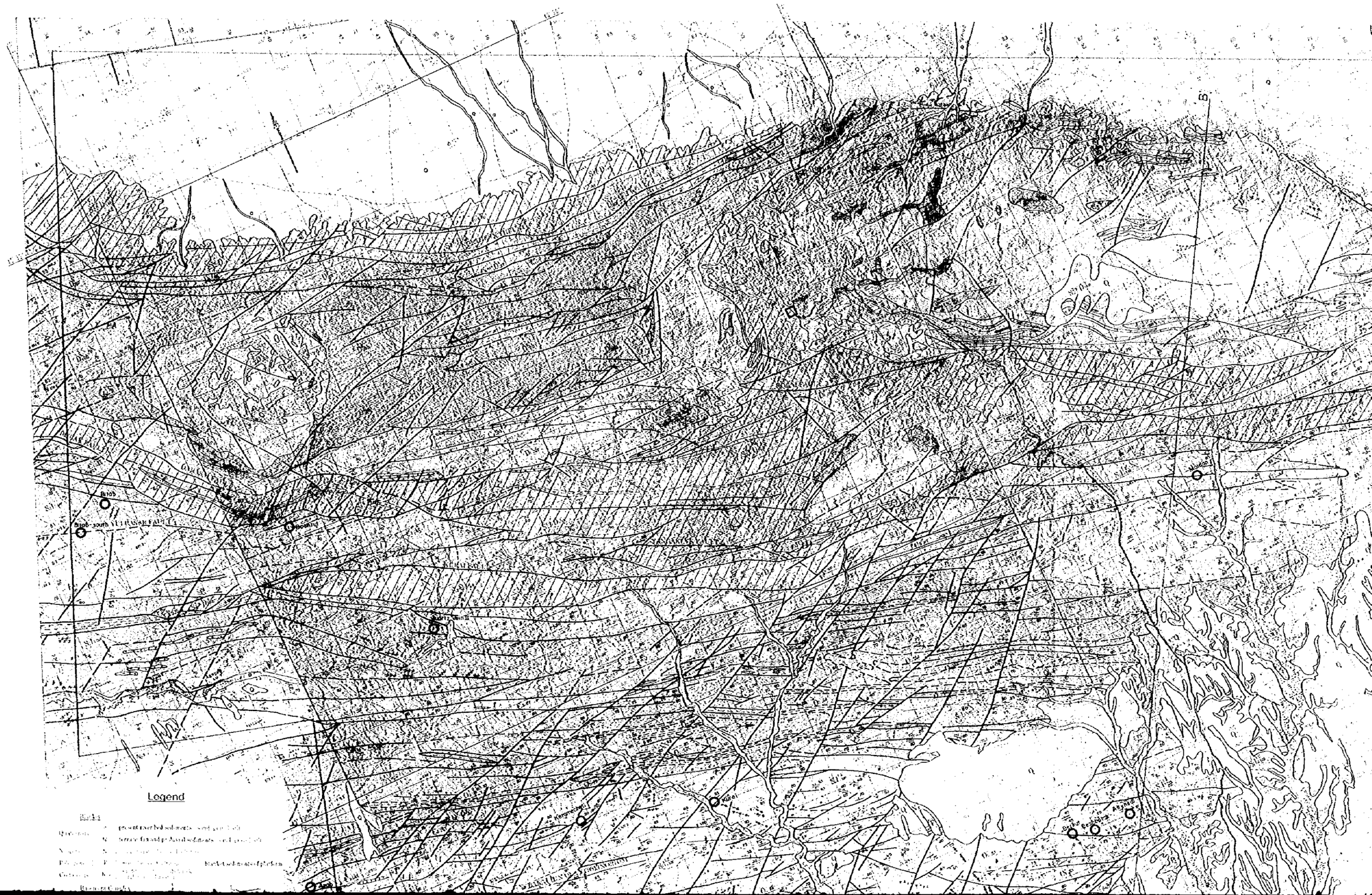


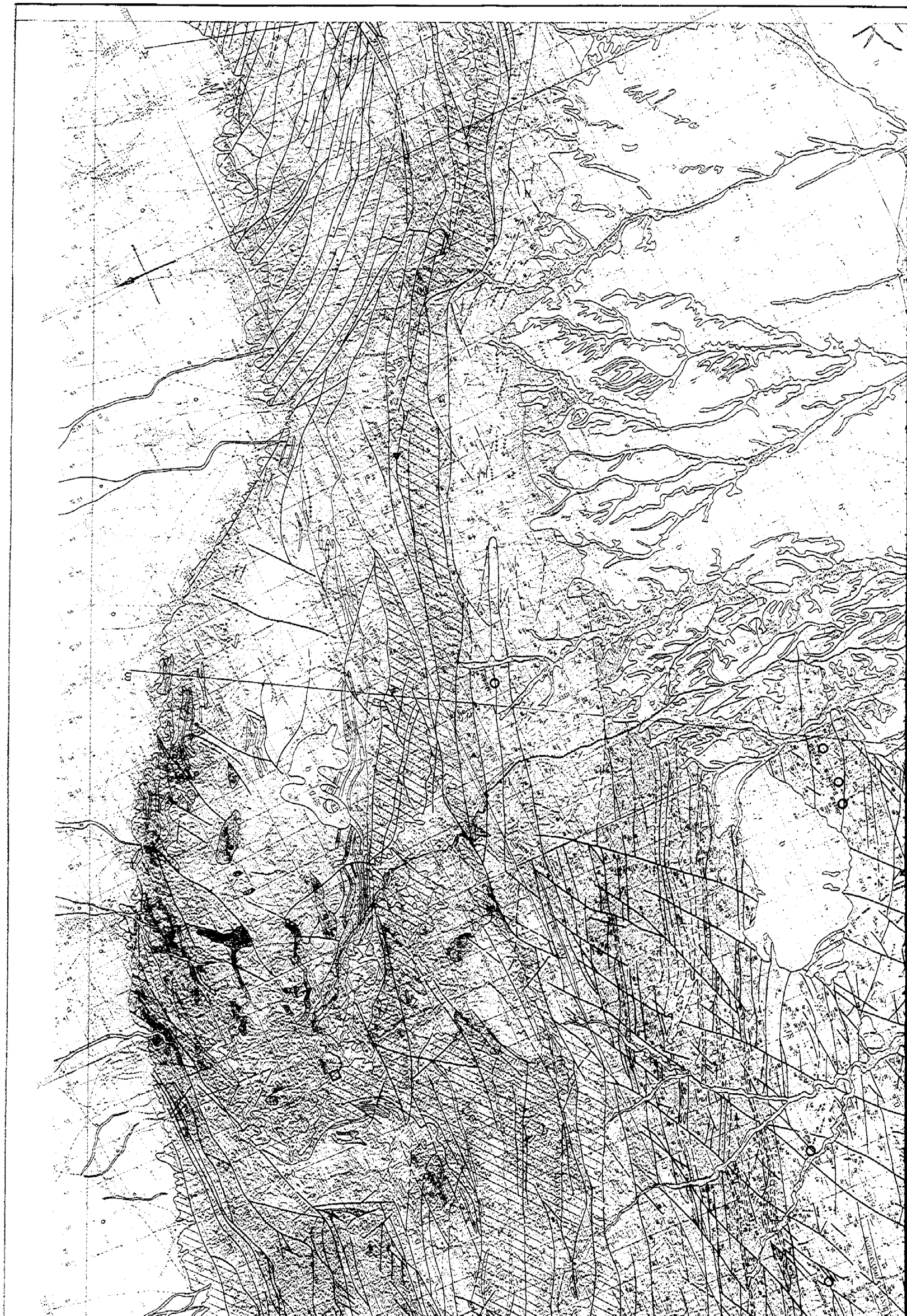


0 100 200 300m
Scale 1 : 2,500

Legend

- Quaternary — Q — Talus, gravel, sand
- Lower Silurian — S_3^1 — Slates, Siltstones
- Lower Silurian — S_3^2 — Quartz sandstones
- Silurian — $O\text{-}S_?^{\delta}$ — Cherty slates — Middle Formation
- Silurian — $O\text{-}S_?^{a}$ — Sandstones — Middle Formation
- Ordovician — $O\text{-}S_?^{1}$ — Cherty slates — Lower Formation
- Ordovician — $O\text{-}S_?^{2}$ — Sandstones — Lower Formation
- Dyke — Lamprophyres
- Fractures : 1. Traced 2. Supposed
- Zones of brecciation and silicification
- Zones of quartz veins and veinlets
- (5) — Ore zone and its number
- C-1 MJSN-1 — Drillholes : 1. Existed 2. MMAJ(1997)


Legend
Bruges
Ostend
Nieuport
Dunkerque
Calais
Gravelines
Boulogne
Le Touquet
Berck
Abbeville
Le Crotoy
Somme
Authie
Canche
Liane
Aa
Slijkens
Middelkerke
Bank
Trench
Ridge
Channel
Fault



Legend

Rocks

Quaternary	Q	present unsorted sediments – sand, gravel, silt
	Q	terrace, fan and pediment sediments – sand, gravel, silt
Neogene	N	conglomerate, sandstone
Paleogene	P	sandstone, siltstone, claystone — blanket sediments of platform
Cretaceous	K	sandstone, siltstone, shale, chalk

Basement Complex

Carboniferous	C₁	Ritab formation: conglomerate, sandstone
Devonian	D₃	Bakhilau formation: limestone
	D₂	Charkhan-sai formation: limestone, chert, dolomite
	D₂	Daraut-sai formation: slate, siltstone, sandstone, conglomerate, limestone
	S–D	Angidan formation: limestone, shale, dolomite, limestone
	S–D	Aktau formation: limestone, shale
Silurian	S₂	Tamsaral formation: sandstone, slate, siltstone, limestone, conglomerate
	S₂	Tamsay formation: sandstone, siltstone, shale, marl
	S₁	Sarybulak formation: sandstone, siltstone, slate, conglomerate
O–Lower Silurian	O	Tesun formation: siltstone, sandstone, slate; "sandstone-red shale"
	O–S	Karakargan formation: slate, siltstone, sandstone
Cambrian	C₂	Shurchin formation: limestone, phyllite, sandstone, chert, siltstone
	C₁	Kutanbulak formation: slate, sandstone, siltstone, limestone, metabasalt

Intrusive Rocks

Permian	P	Karatau granite body: leucocratic granite, subordinate biotite granite	
Carboniferous	C₂	Gatchin granitoids: monzogranite	Aktau granitoid complex
	C₂	Shorak granitoids: hornblende-biotite granite, granodiorite	
	C₂	Darsen granitoids: quartz diorite, granodiorite	

Dike

- quartz porphyry, granite porphyry
- aplite granitoids
- granite porphyry, granodiorite porphyry
- leucocratic granite, leucogranite
- lamprophyre
- serpentinite
- spessartite, diorite porphyrite
- gabbro-diorite, quartz diorite

Ore Manifestations

- Au
- Sb, Hg
- W
- Fe, Mn

Others

- geological boundary
- fault, inferred
- thrust, inferred
- dip and strike of bedding, inclined
- dip and strike of bedding, overturned

Section B – B'

(after I.A. Pyanovskaya, 1983, 1984)

Section B – B'

1 : 25,000

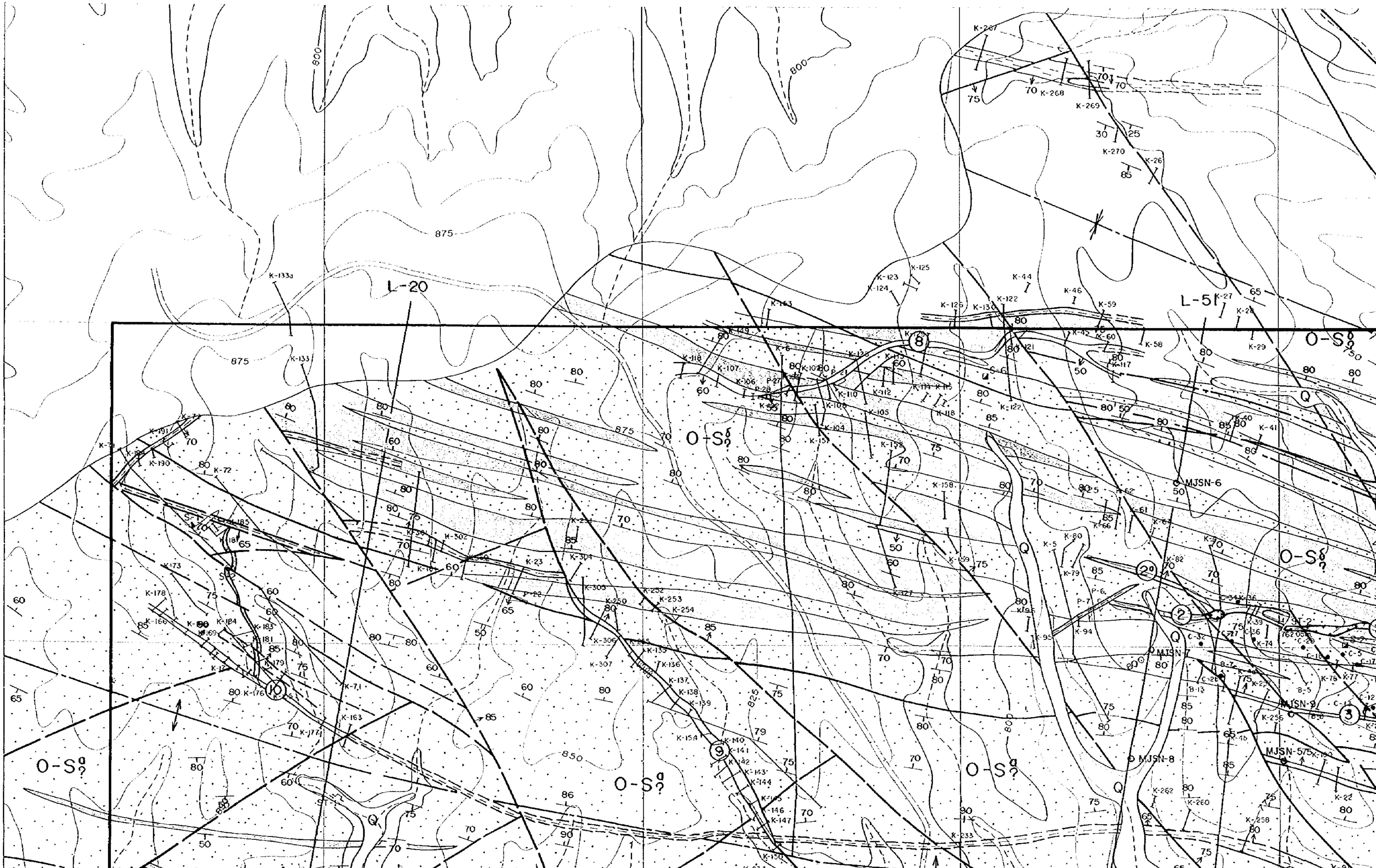
0 5 10 15 20km

PL-II-3-2-1

THE MINERAL EXPLORATION
IN
THE SOUTHERN NURATAU AREA
THE REPUBLIC OF UZBEKISTAN
(PHASE I)

Geologic Map of the General Survey Area (2)

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN



L-20
L-51
800
875
850
825
MJSN-6
MJSN-7
MJSN-8
MJSN-9
MJSN-575
S-6
S-1
S-2
ST-2
K-133
K-133a
K-267
K-268
K-269
K-270
K-122
K-123
K-124
K-125
K-126
K-130
K-44
K-46
K-59
K-58
K-60
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K-27
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K-154
K-163
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K-183
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K-185
K-190
K-191
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K-73
P-6
P-7
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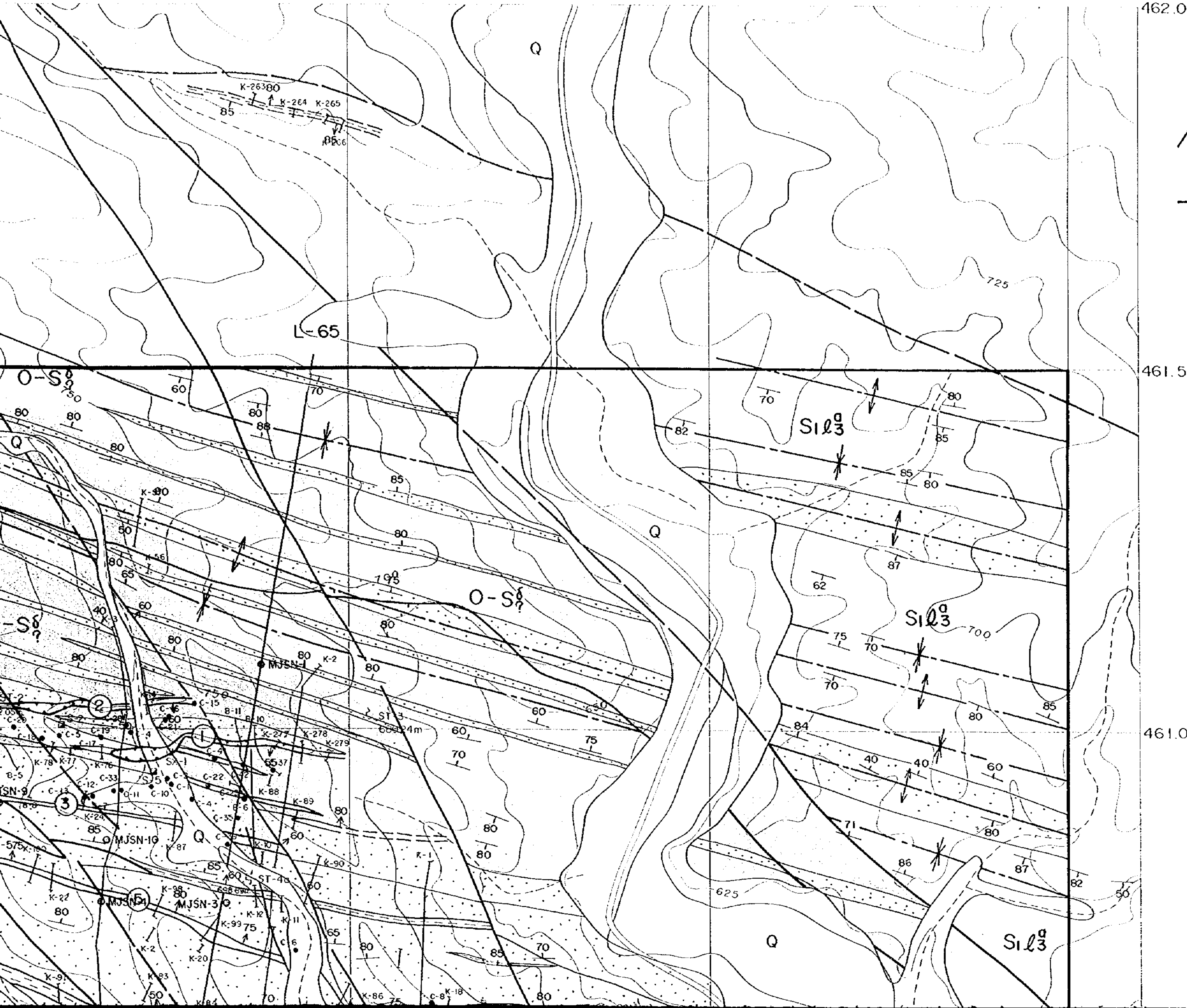
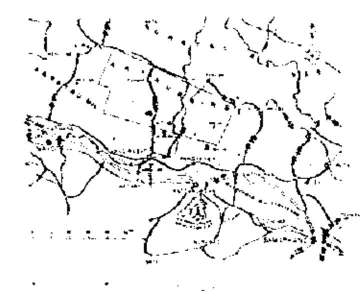
P-27
P-28
C-32
C-34
C-36
B-5
B-13



Pl. II-3-1-1

THE MINERAL EXPLORATION
IN
THE SOUTHERN NURATAU AREA
THE REPUBLIC OF UZBEKISTAN
(PHASE I)

GEOLOGIC MAP OF THE AUTYSSAI DISTRICT



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
FEBRURARY 1998

Prepared by MINDECO

0 100 200 300m
Scale 1 : 2,500

Legend

Quaternary	Q	Talus, gravel, sand
Lower Silurian	Slℓ^{a}_{3}	Slates, Siltstones
	Slℓ^{a}_{3}	Quartz sandstones
Silurian – Ordovician	O-S$^{\delta}_{?}$	Cherty slates } Middle Formation
	O-S$^{\delta}_{?}$	Sandstones } Middle Formation
	O-S$^{\gamma}_{?}$	Cherty slates } Lower Formation
	O-S$^{\gamma}_{?}$	Sandstones } Lower Formation
Dyke		Lamprophyres
		Fractures : 1. Treced 2. Supposed
		Zones of brecciation and silicification
		Zones of quartz veins and veinlets
		Ore zone and its number
		Strike and dip : 1. Bedding 2. Fractures
		1. Anticlinal axes 2. Synclinal axes
		Trench and its number
		Shaft and its number
		Adit and its number
		Old workings