

Alternative Route C of Headrace Tunnel

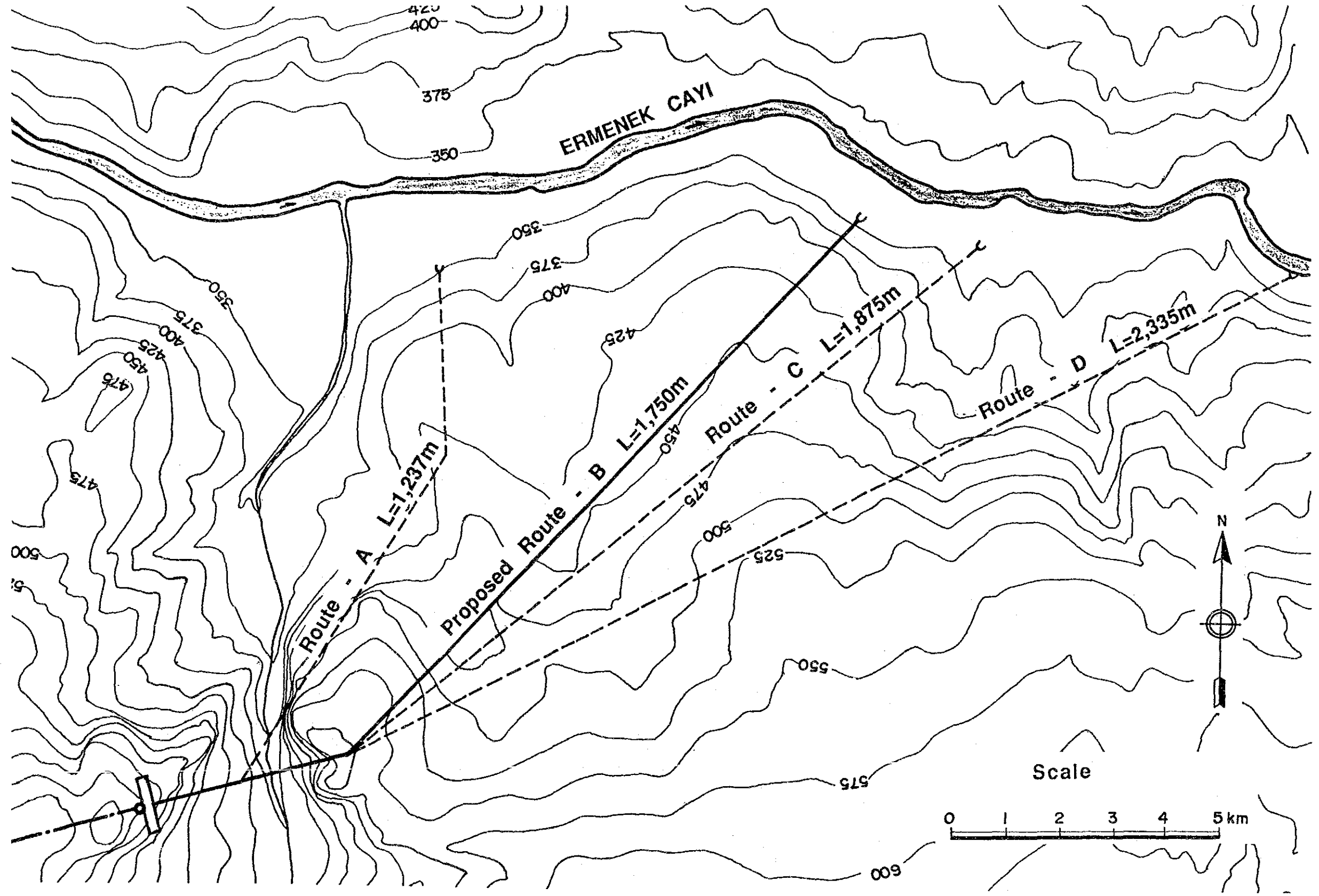
Length of headrace tunnel 9,180m
Length of work shafts 1,940m




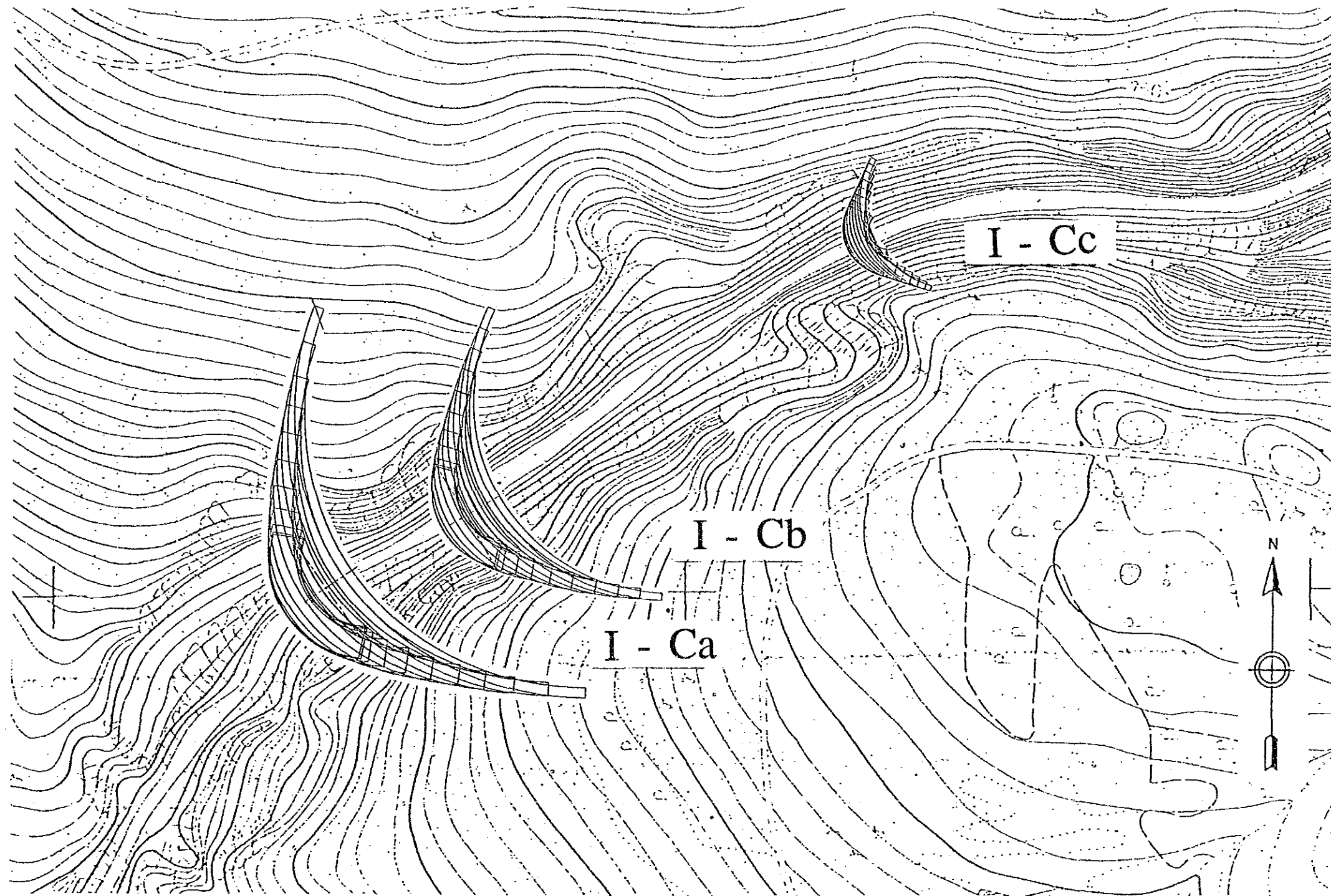
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ELEKTRİK İŞLERİ ETÜD İDARESİ
GENEL MÜDÜRLÜĞÜ

ERMENEK HYDROELECTRIC POWER
DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY


TITLE
A32
Alternative Route-C
of Headrace Tunnel



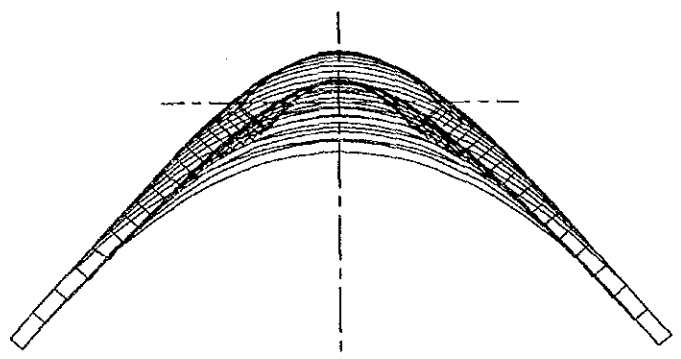
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE A33 Alternative Routes and Outlets of Tailrace Tunnel



Note: All the 3 dams shown
are for the same crest
elevation of 660 m.

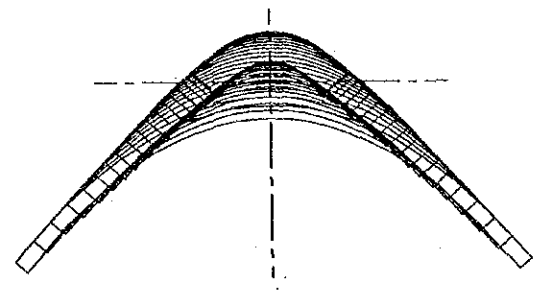
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE A34 Location Map of Dam Axes in the Görmel Gorge
		JAPAN INTERNATIONAL COOPERATION AGENCY	

I-Ca Axis



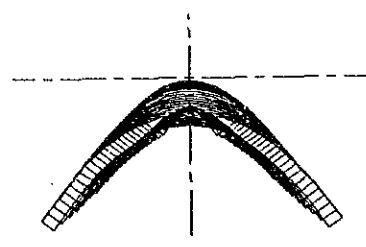
Dam Crest El.670m

I-Cb Axis

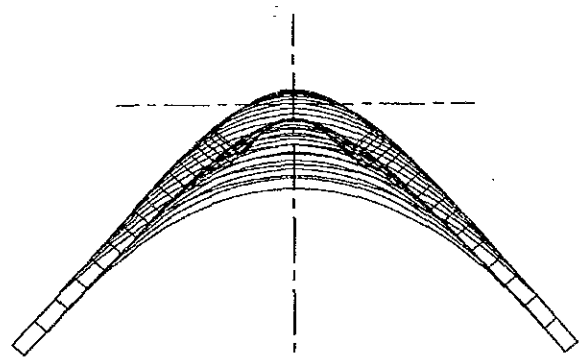


Dam Crest El.670m

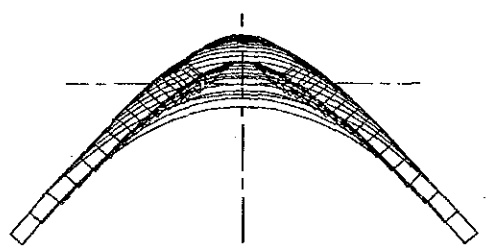
I-Cc Axis



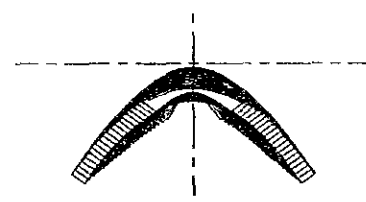
Dam Crest El.700m



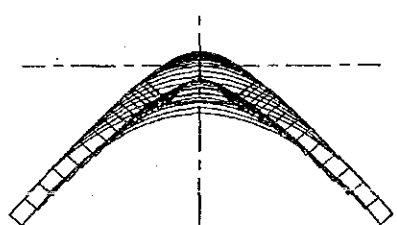
Dam Crest El.660



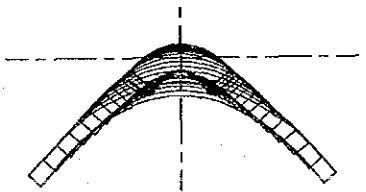
Dam Crest El.660



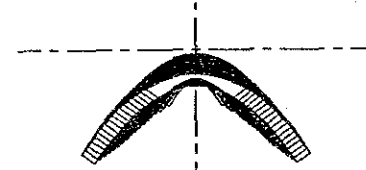
Dam Crest El.680



Dam Crest El.640



Dam Crest El.640



Dam Crest El.660

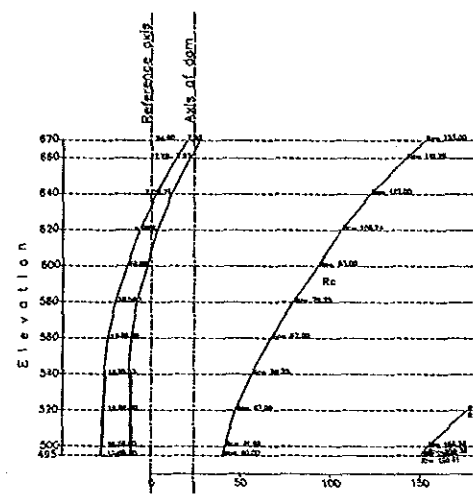


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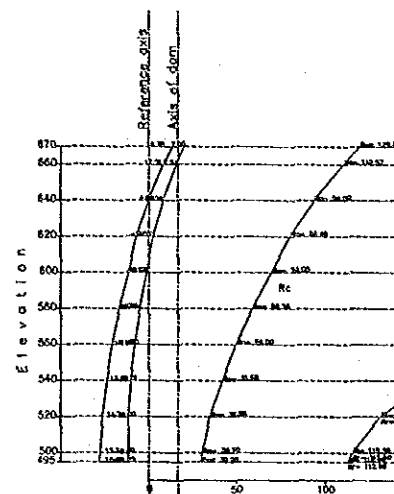
TITLE
A35
Plan of
Alternative Arch Dams

I-Ca Axis



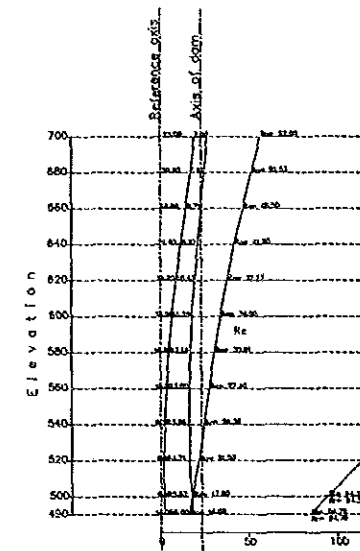
Dam Crest El.670m

I-Cb Axis

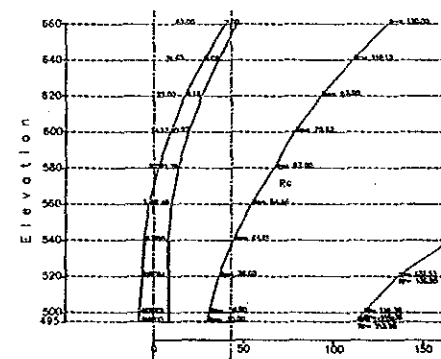


Dam Crest El.670m

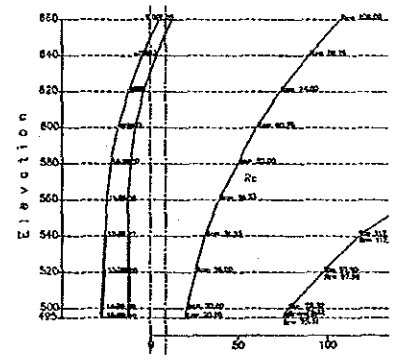
I-Cc Axis



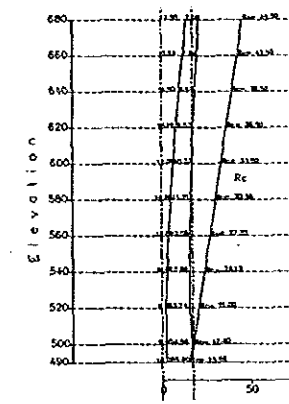
Dam Crest El.700m



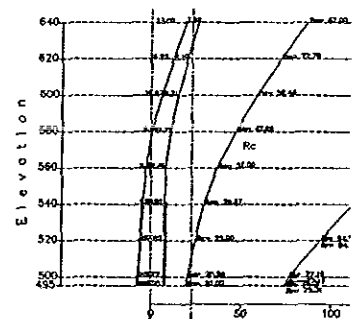
Dam Crest El.660



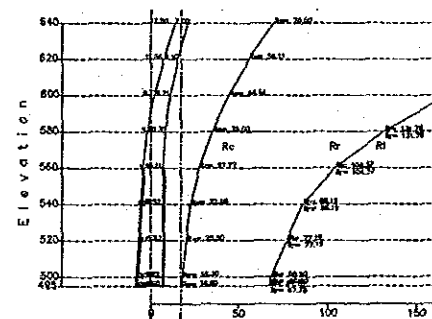
Dam Crest El.660



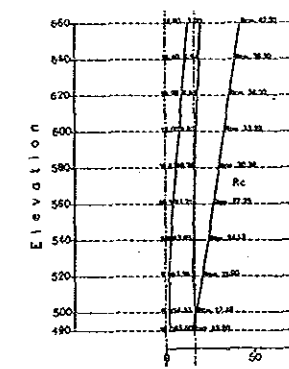
Dam Crest El.680



Dam Crest El.640



Dam Crest El.640



Dam Crest El.660



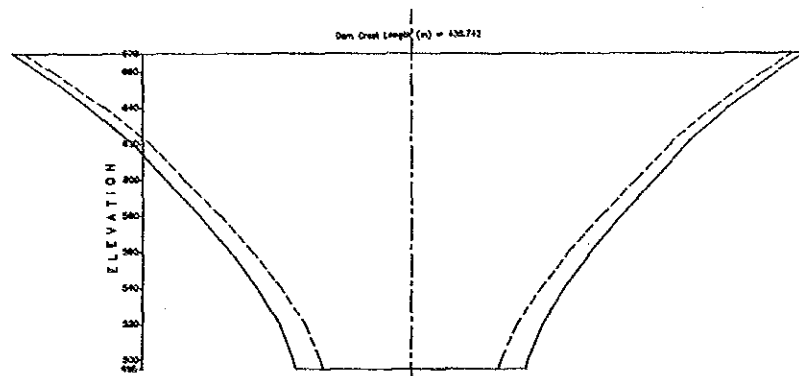
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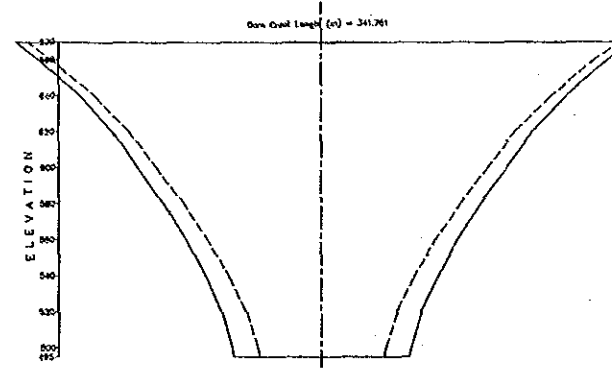
TITLE
A36
Crown Cantilever of
Alternative Arch Dams

I-Ca Axis



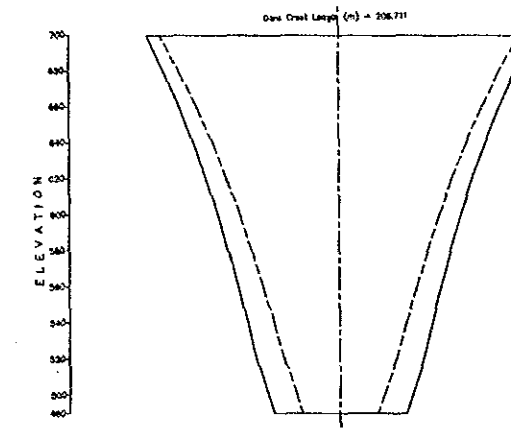
Dam Crest El.670m

I-Cb Axis



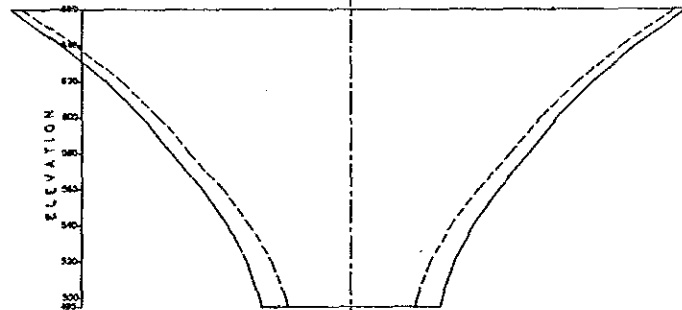
Dam Crest El.670m

I-Cc Axis



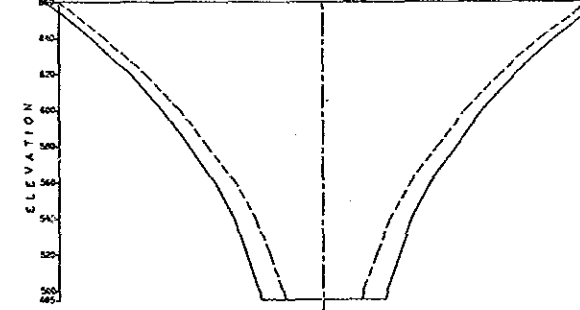
Dam Crest El.700m

Dam Crest Length (m) = 370.248



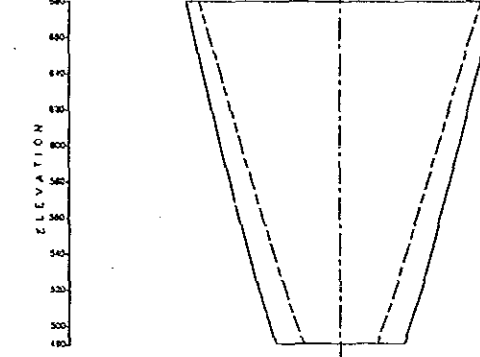
Dam Crest El.660

Dam Crest Length (m) = 302.088



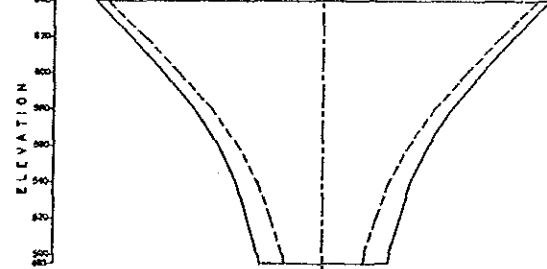
Dam Crest El.660

Dam Crest Length (m) = 183.011



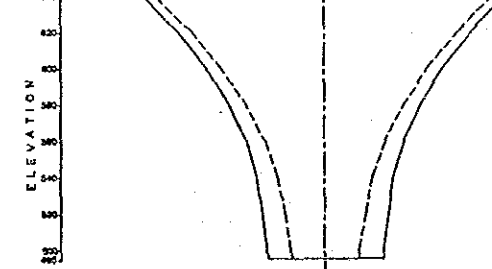
Dam Crest El.680

Dam Crest Length (m) = 217.791



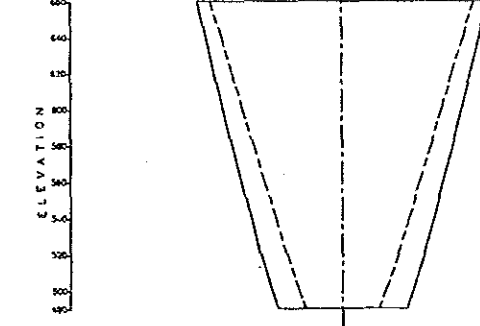
Dam Crest El.640

Dam Crest Length (m) = 122.369




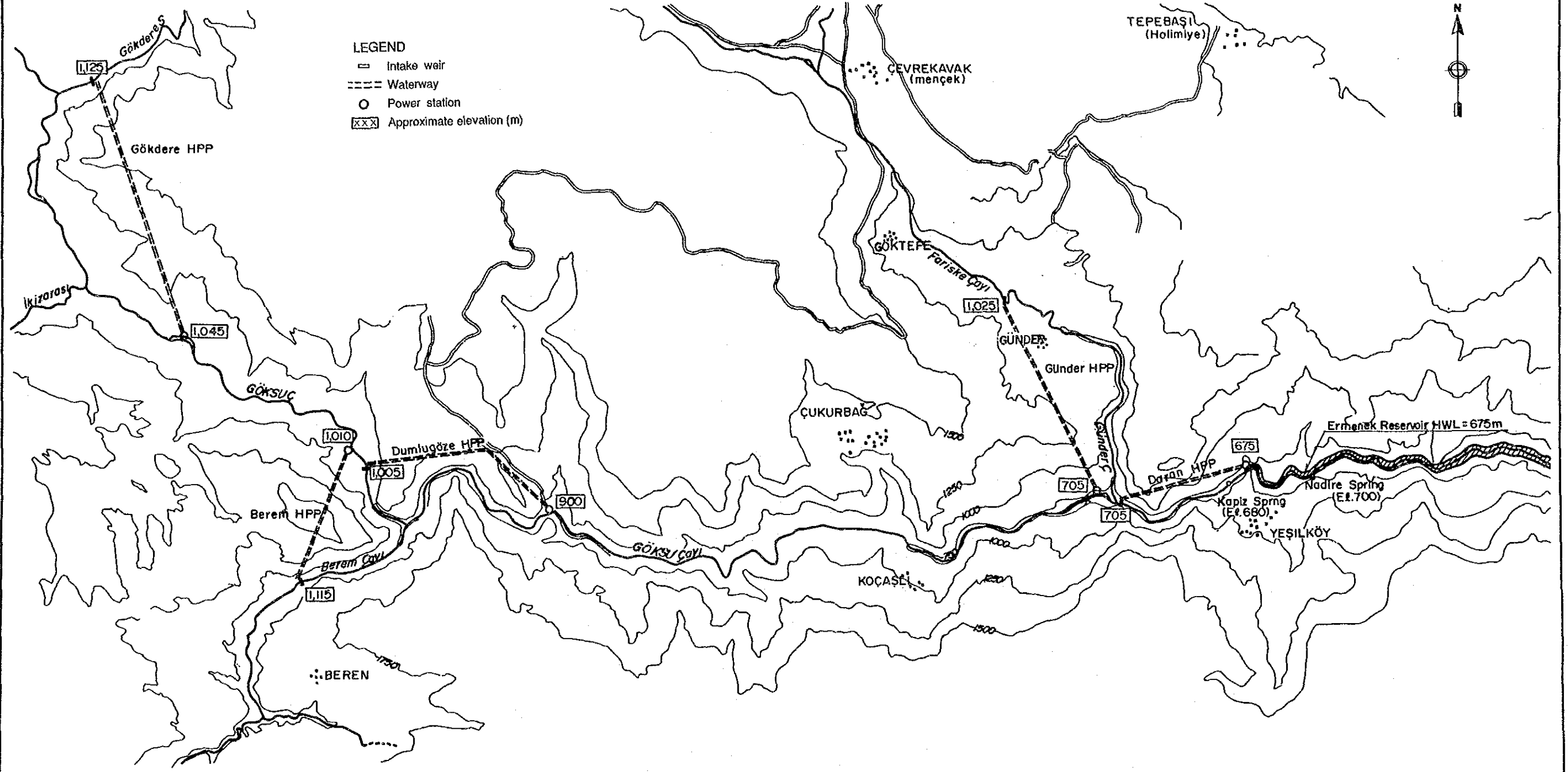
Dam Crest El.640

Dam Crest Length (m) = 154.132



Dam Crest El.660

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LEGEND
 = Intake weir
 --- Waterway
 ○ Power station
 XXX Approximate elevation (m)

SCALE 0 5km

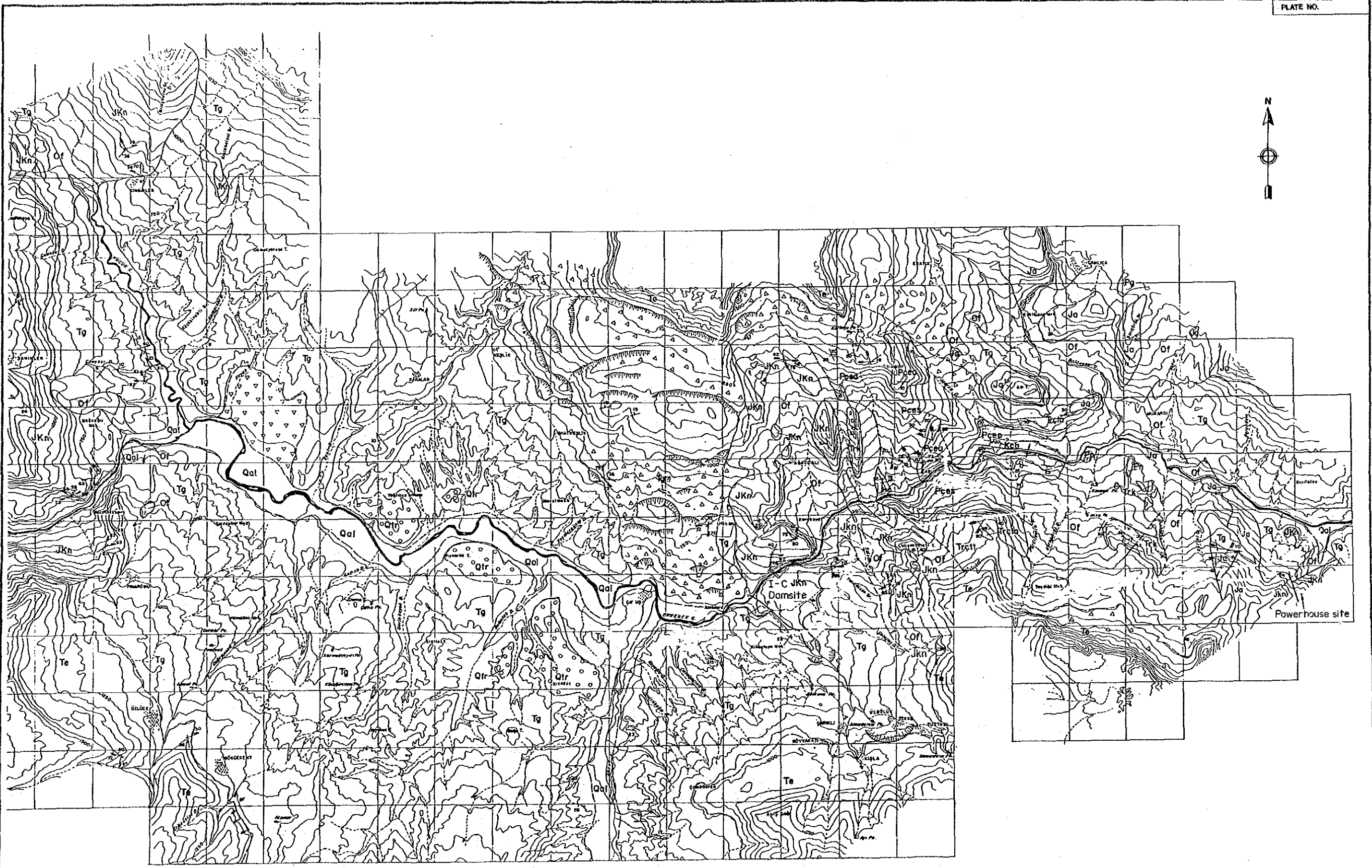


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 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE
A38
 A Development Idea
 of Upper Ermenek River

PART-3 Plates of Geology



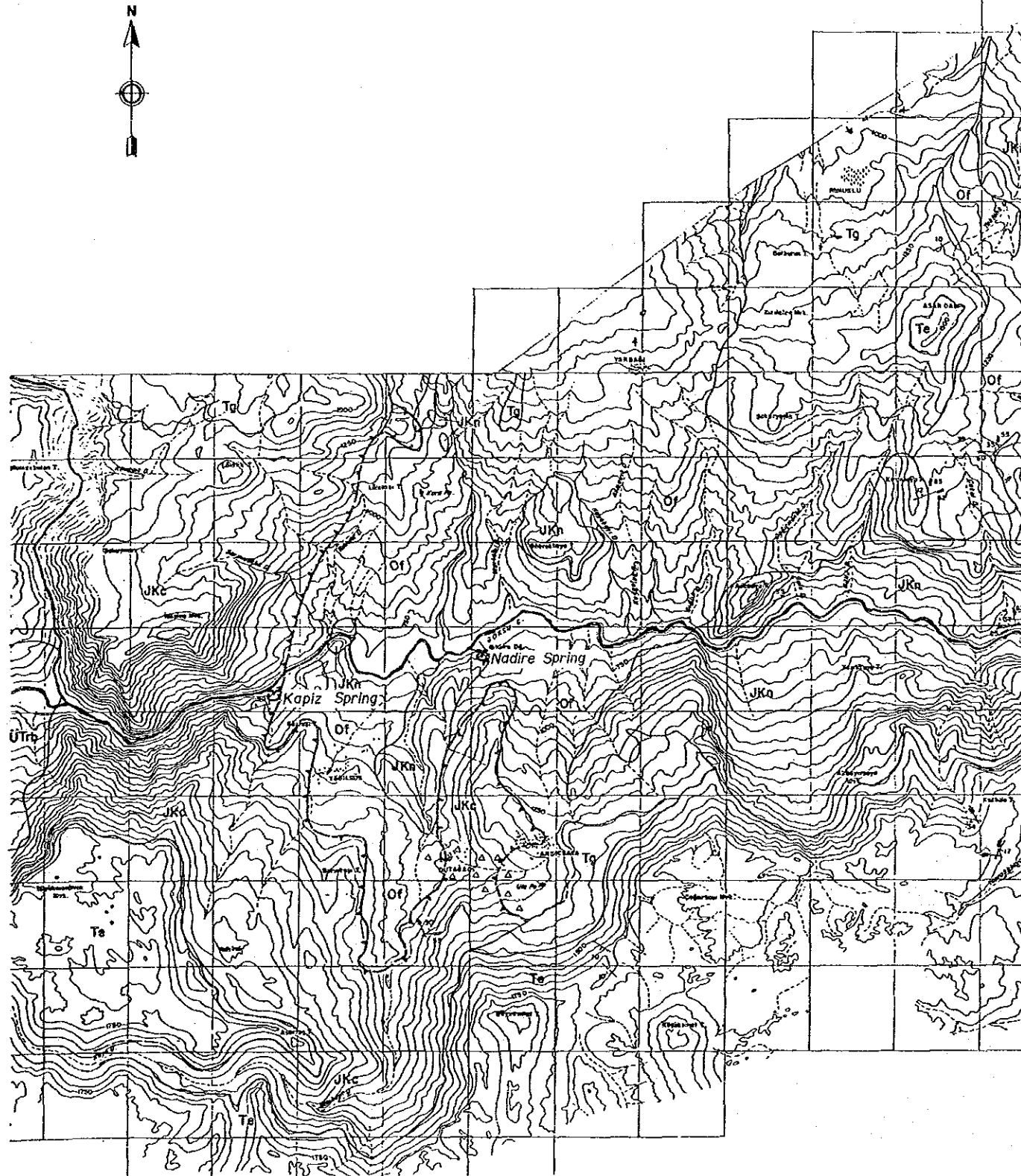
SCALE 0 2,500m



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DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE
G1
Geological Map
of Reservoir Area (1/2)



SCALE 0 2,500m

GEOLOGY OF THE PROJECT AREA

QUATERNARY	ALLUVIUM	Qal	Qalr	River bed deposit
			Qalt	Talus deposit
	DILUVIUM	Qtr	Qtrt	Terrace deposit
TERTIARY	MIDDLE MIOCENE	Te	ERMENEK FORMATION (Mainly chalky limestone.)	
	LOWER MIOCENE	Tg	GÖRMEL FORMATION (Marl, sandstone, conglomerate, limestone.)	
CRETACEOUS	UPPER CRETACEOUS	Ofm	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)	
	LOWER CRETACEOUS	Jkc	ÇİHANDERE FORMATION (Limestone.)	
JURASSIC				ALADAĞ GROUP
TRIASSIC	UPPER TRIASSIC	ÜTrb	BALCILAR FORMATION (Limestone.)	

ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinized peridotite, gabbro, etc.)	
		Jkn	NADİRE FORMATION	
JURASSIC		Ja	AZİTEPE FORMATION	
TRIASSIC	UPPER TRIASSIC	Trk	KÜKÜRCE FORMATION	
		Trtt	TAHTAÇI FORMATION	ÇİMENE GROUP
		Trçta		
PERMIAN		Pçes	ESKİCE FORMATION	
		Pçea		
		Pcep		
CARBONIFEROUS		Kçb	BALKUSAN FORMATION	
			Pn	NİSA FORMATION

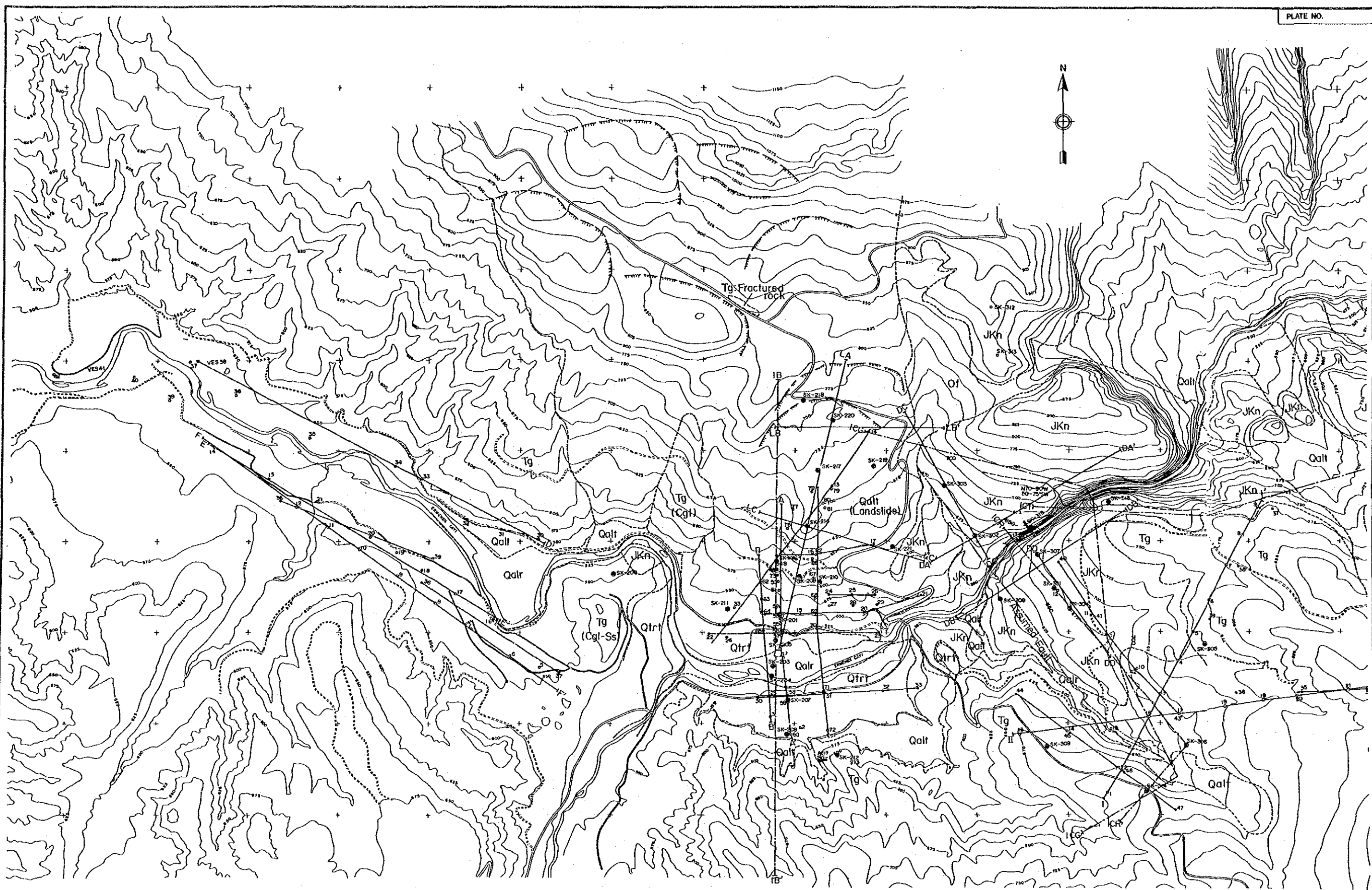
Blocks (Mostly limestone.)



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DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

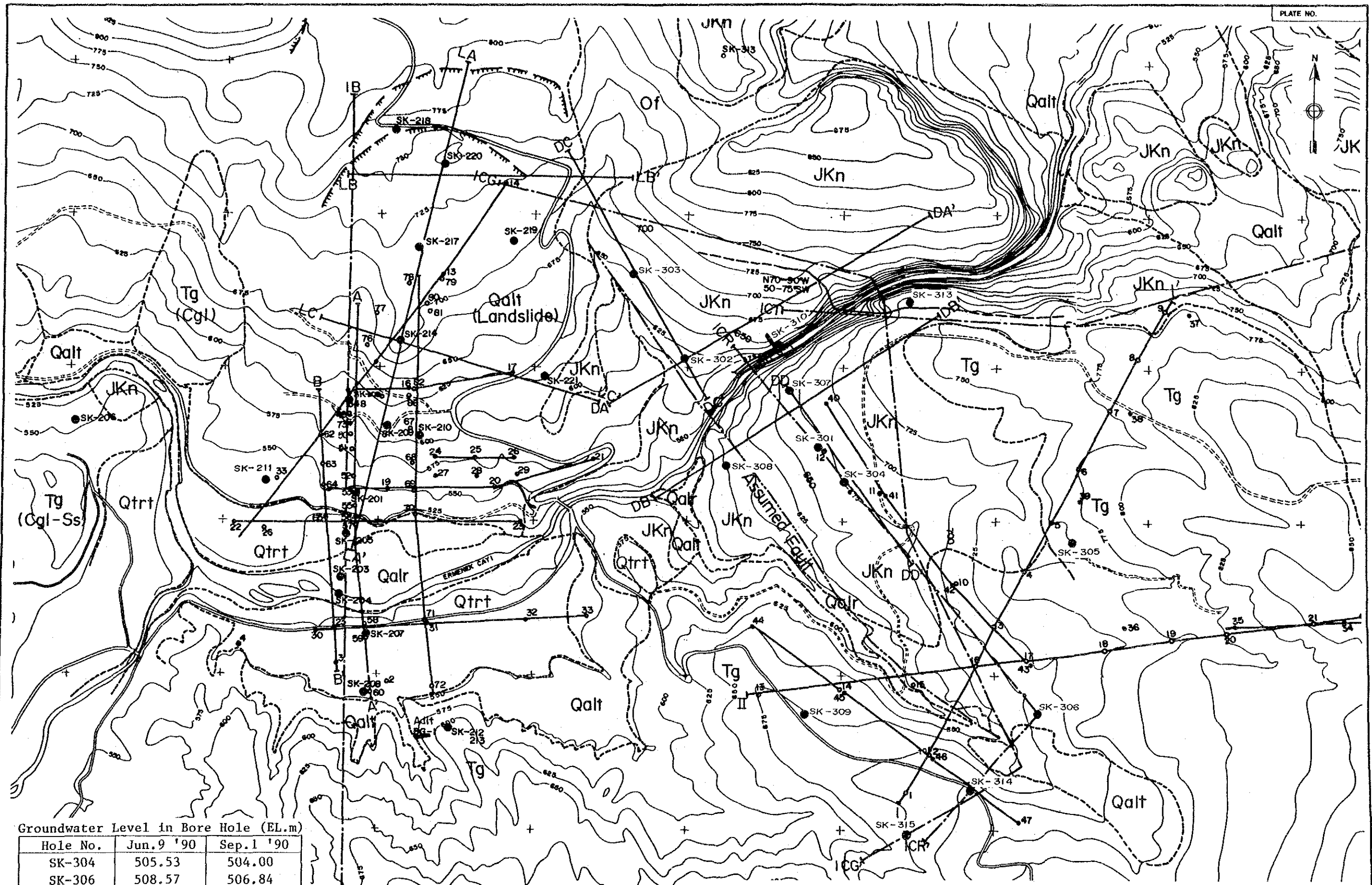
TITLE
G1
Geological Map
of Reservoir Area (2/2)



SCALE 0 10km

Note: See next page for details around dam sites.

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			JAPAN INTERNATIONAL COOPERATION AGENCY




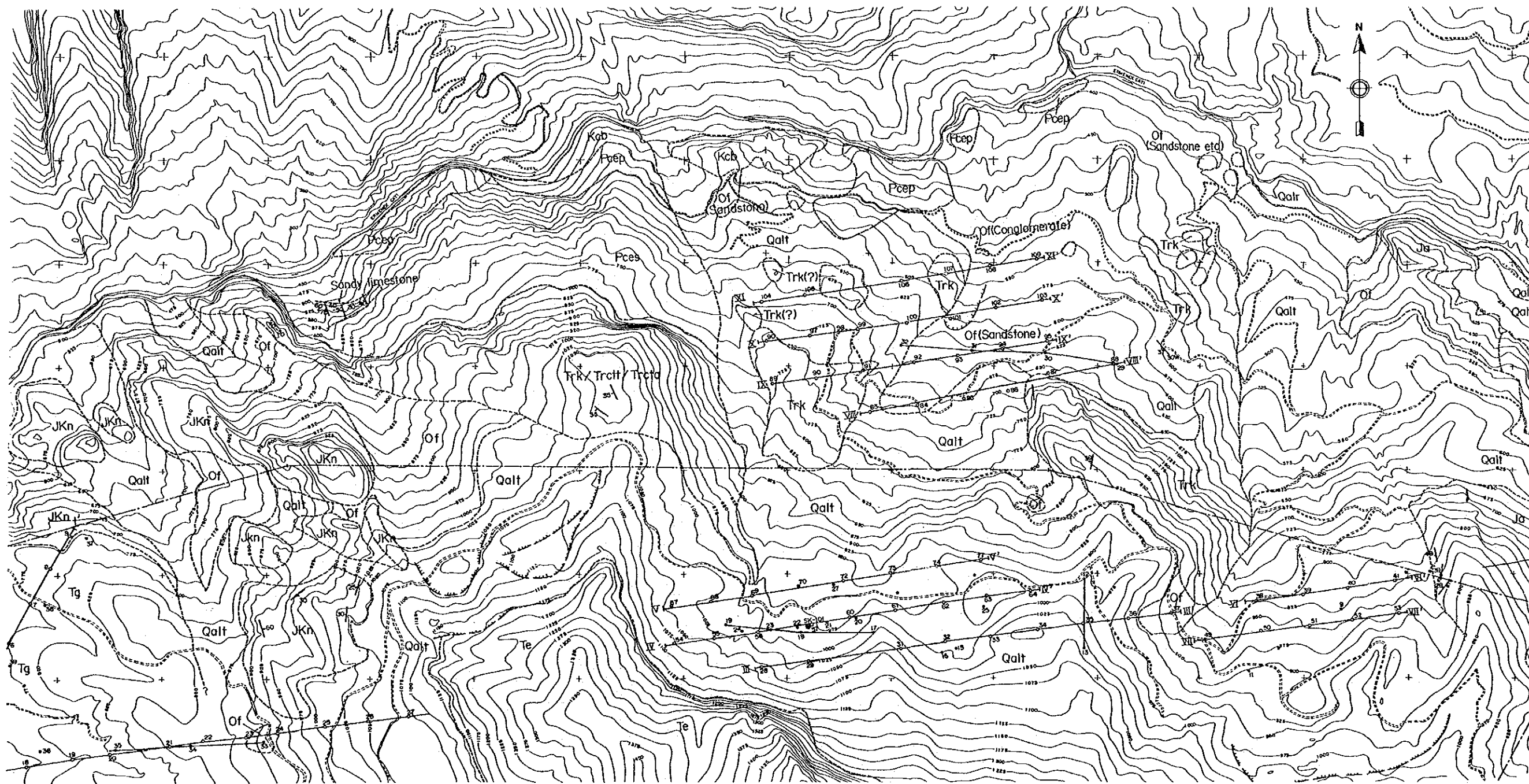
Groundwater Level in Bore Hole (EL.m)

Hole No.	Jun.9 '90	Sep.1 '90
SK-304	505.53	504.00
SK-306	508.57	506.84
SK-308	506.12	505.80
SK-314	507.98 ^v	504.98
SK-315	—	504.54


^v: 506.58m after 10 days.

SCALE 0 500m

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SCALE 0 10km

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G2 (3/4) Geological Map of Project Area and Location of Geological Investigation
		JAPAN INTERNATIONAL COOPERATION AGENCY	

GEOLOGY OF THE PROJECT AREA

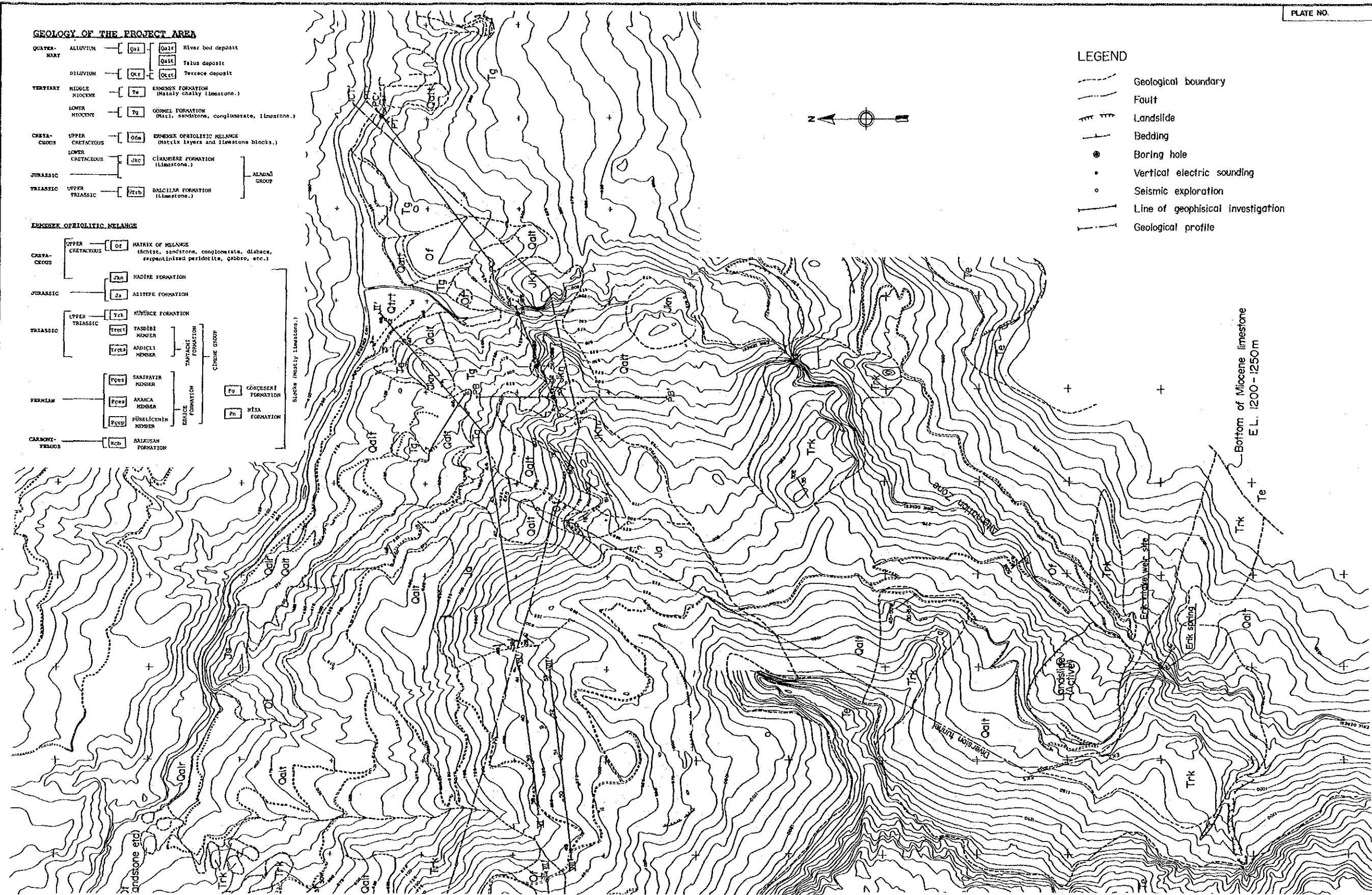
QUATERNARY	ALLUVIUM	Qa1	Qa1f	River bed deposit
		Qa1t	Qa1t	Talus deposit
		Qa1s	Qa1s	Terrace deposit
TERTIARY	MIDDLE MIOCENE	Te		ERMENEK FORMATION (Mainly chalky limestone.)
	LOWER MIOCENE	Tg		GÖRSEL FORMATION (Silt, sandstone, conglomerate, limestone.)
CRETACEOUS	UPPER CRETACEOUS	Of		ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)
	LOWER CRETACEOUS	Jkc		CIHANGİRE FORMATION (Limestone.)
JURASSIC				ALANIN GRUBU
TRIASSIC	UPPER TRIASSIC	Trk		

ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Silt, sandstone, conglomerate, diabase, serpentinitised peridotite, gabbro, etc.)
		Jka	NADİRE FORMATION
JURASSIC		Ja	ARİTİPE FORMATION
TRIASSIC	UPPER TRIASSIC	Trk	MÜRŞEK FORMATION
		Trca	FARİDE MEMER
		Trca	ARİCİLİ MEMER
			TAMPAKLI FORMATION
			ÇİRME GRUBU
PERMIAN		Ppa	SARIBAYIR MEMER
		Ppa	ARASCA MEMER
		Ppa	PÜRÜLÇİNLİ MEMER
			BAĞI FORMATION
CARBONIFEROUS		Kcb	BALEKAN FORMATION
		Pg	GÖRGELEN FORMATION
		Pn	MİSA FORMATION
			SİĞİRCİ (Mainly limestone.)

LEGEND

- Geological boundary
- Fault
- Landslide
- Bedding
- Boring hole
- Vertical electric sounding
- Seismic exploration
- Line of geophysical investigation
- Geological profile

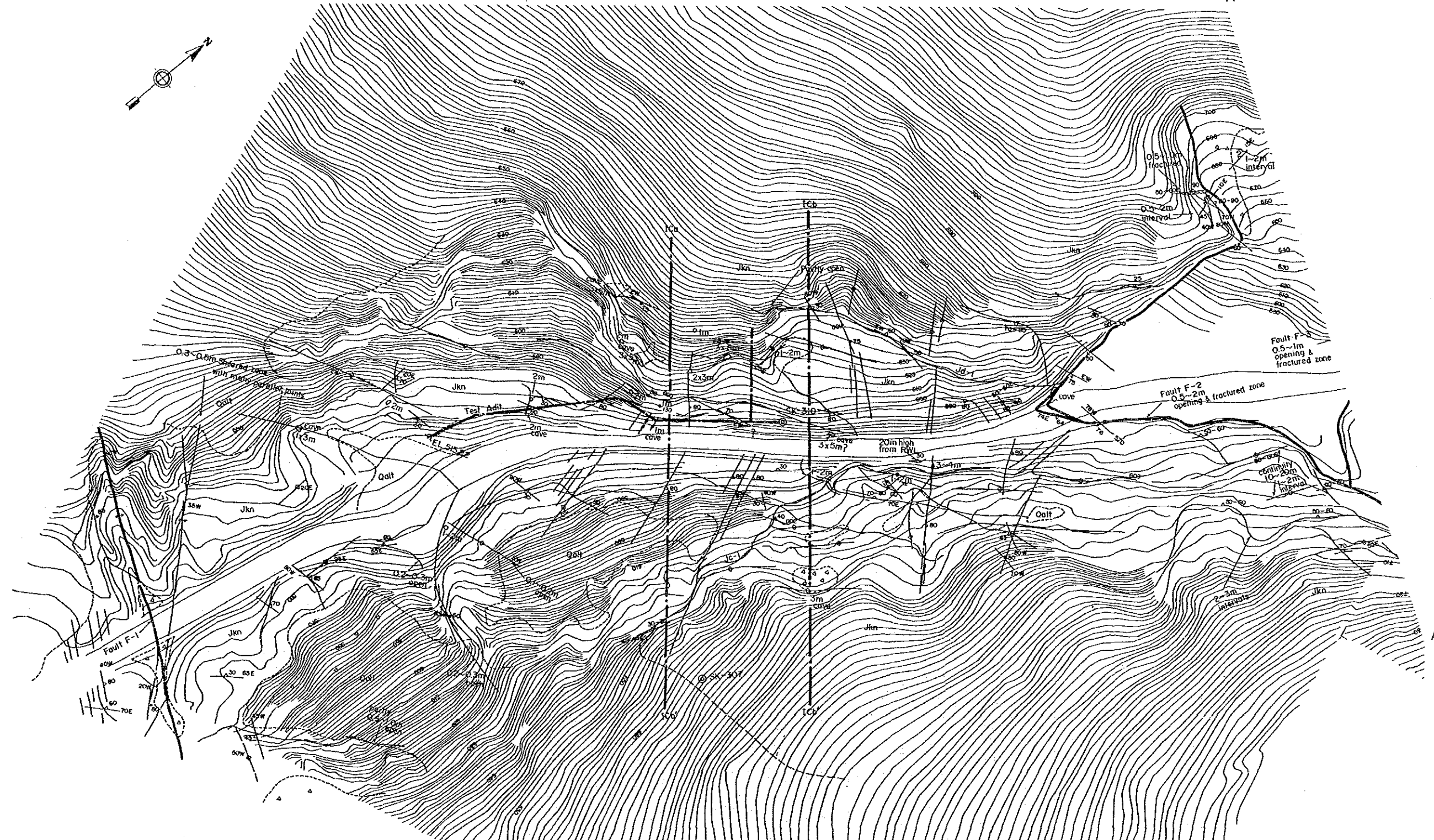


Bottom of Miocene limestone
E.L. 1200 - 1250m

SCALE 0 10km


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	JAPAN INTERNATIONAL COOPERATION AGENCY		

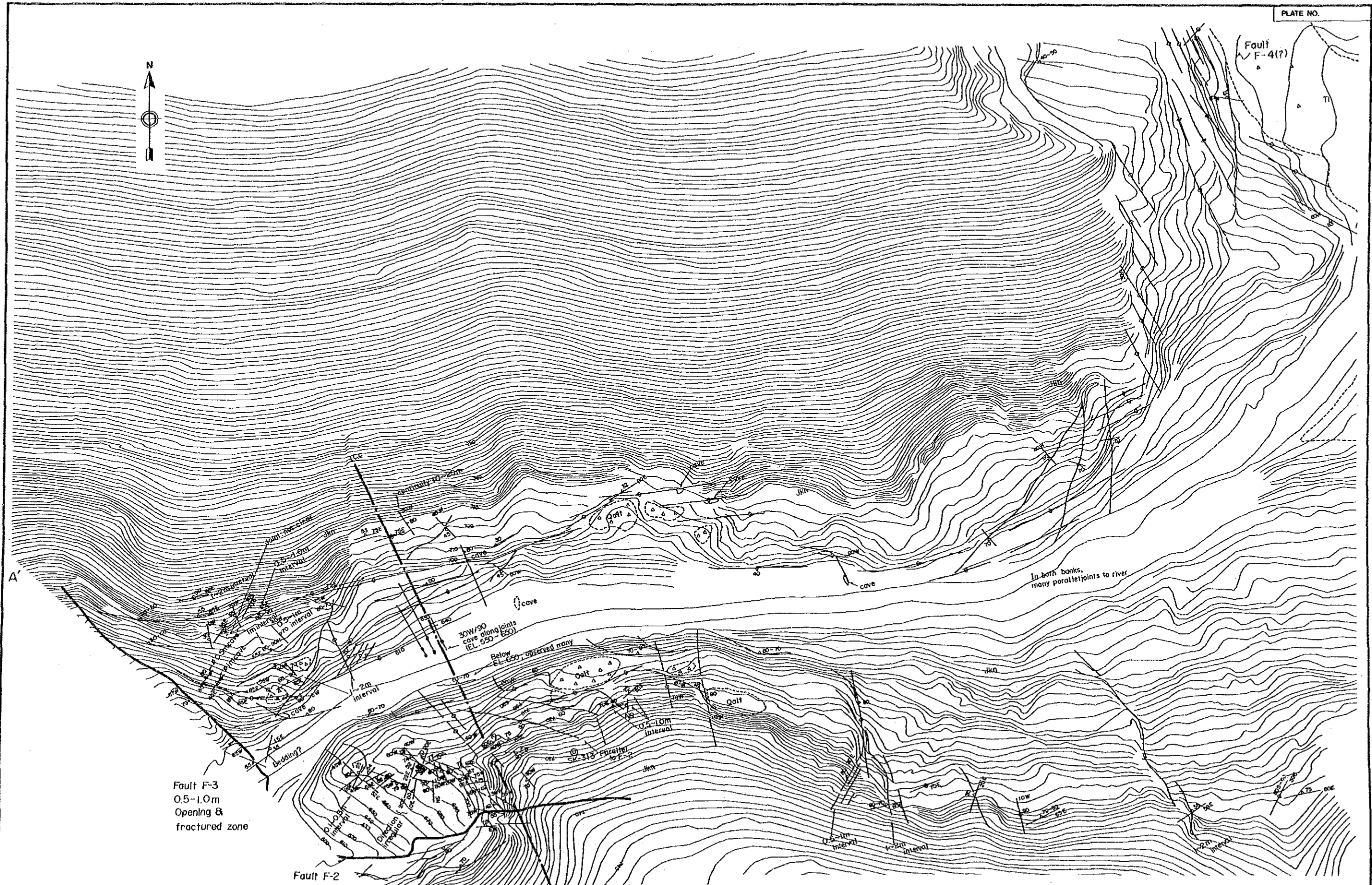
A



Qalt : Talus deposit
 Jkn : Limestone (Nadire formation)
 — : Joint, dip and strike
 - - - : Geological boundary

SCALE 0 100m

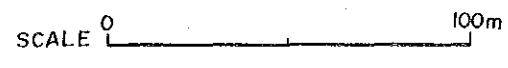
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G3 Geological Map of Dam site I-C (1/2)



Fault F-3
0.5-1.0m
Opening &
fractured zone

Fault F-2

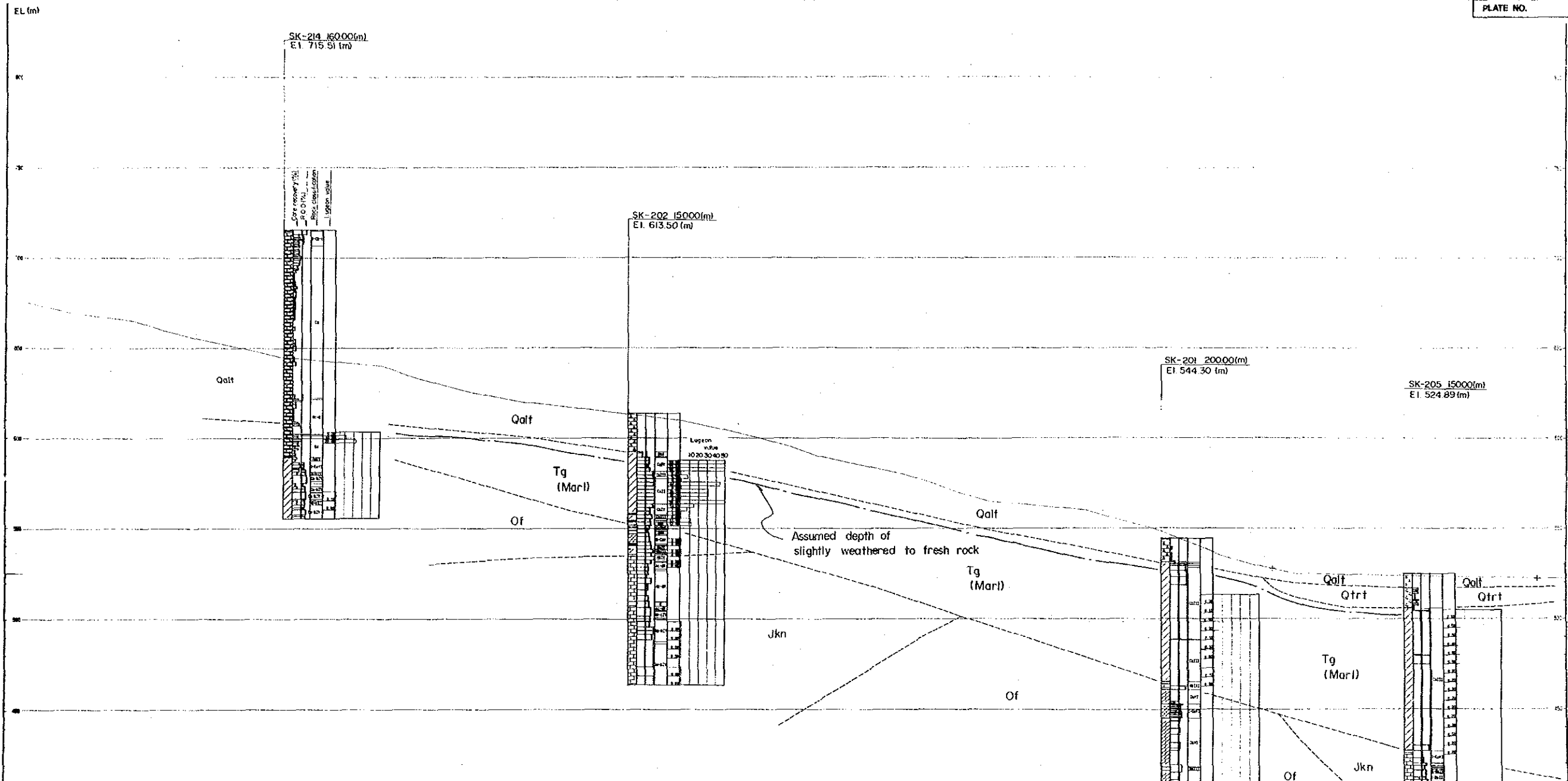
In both banks,
many parallel joints to river



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DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE
G3
Geological Map
of Damsite I-C (2/2)



GEOLOGY OF THE PROJECT AREA

QUATERNARY	ALLUVIUM	Qal	Qalr	River bed deposit
			Qalt	Talus deposit
	DILUVIUM	Qtr	Qtr	Terrace deposit
TERTIARY	MIDDLE MIocene	Tg		ERMENEK FORMATION (Mainly chalky limestone.)
	LOWER MIocene	Tg		GÖRMEÇLİ FORMATION (Marl, sandstone, conglomerate, limestone.)
	UPPER CRETACEOUS	Of		ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)
JURASSIC	LOWER CRETACEOUS	Jkc		ÇİRANDEPE FORMATION (Limestone.)
	UPPER TRIASSIC	Jtrb		BALÇILAR FORMATION (Limestone.)

ERMENEK OPHIOLITIC MELANGE

CRETA-CEOG	UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinitized peridotite, gabbro, etc.)
JURASSIC		Jkn	HADIŞ FORMATION
		Ja	AŞITEPE FORMATION
TRIASSIC	UPPER TRIASSIC	Jrk	KÜRÜÇE FORMATION
		Jrkt	TASDİLEL ÜYE
		Jrka	ARDIÇLI ÜYE
		Jrkb	ERMENEK OPHIOLITIC MELANGE
PERMIAN		Ppca	SARIBAYIR ÜYE
		Ppcc	AKARCA ÜYE
		Ppccp	PÜNELİCENİN ÜYE
CARBONIFEROUS		Pcb	BALKUSAN FORMATION

Blocks (Mainly limestone.)

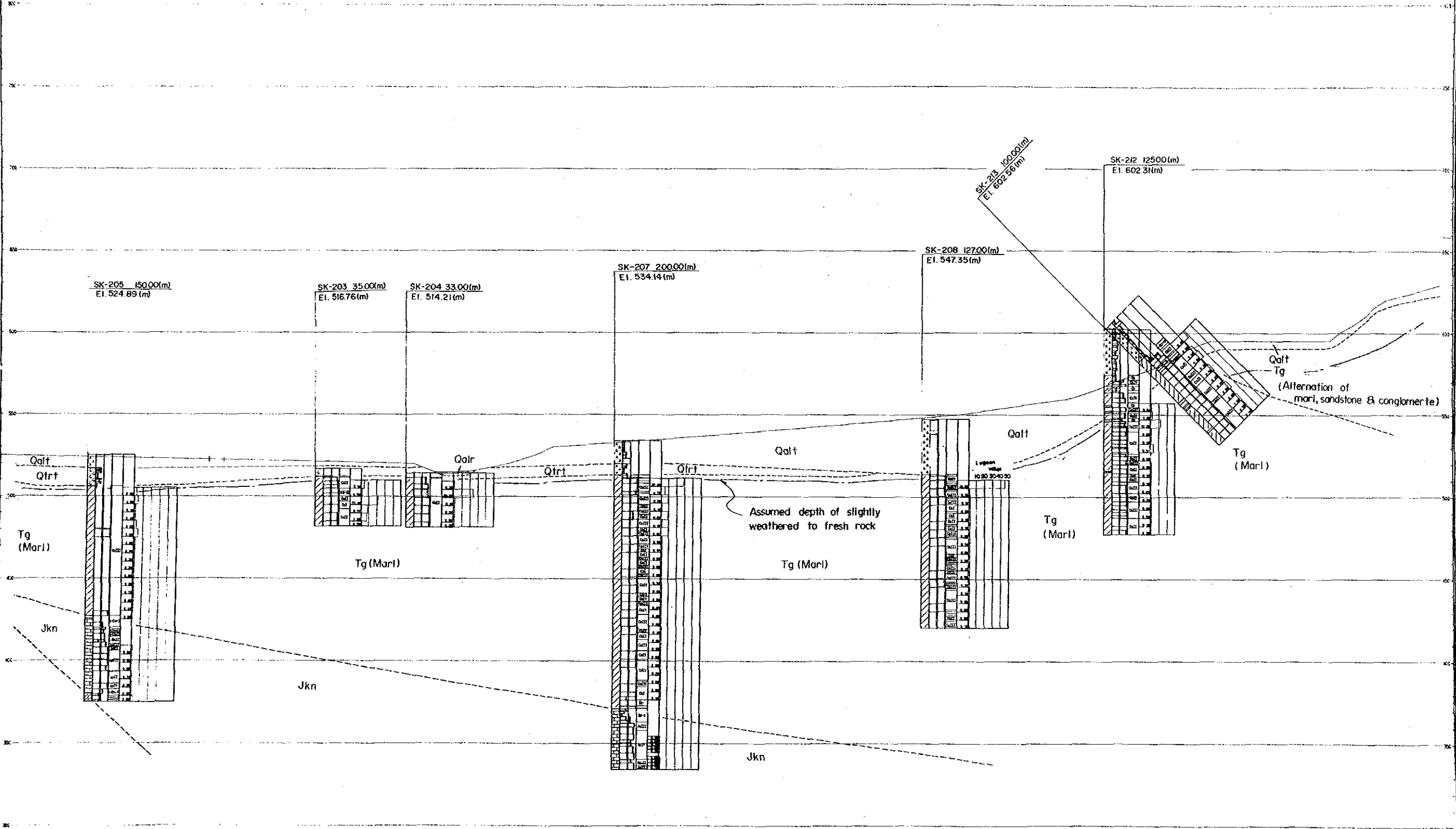


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TITLE **G4**
Geological Profile
of Dam Site I-B (1/2)
(Section IB-IB')

EL. (m)



ICa'

ICa

EL. (m)

800

750

700

650

600

550

500

450

400

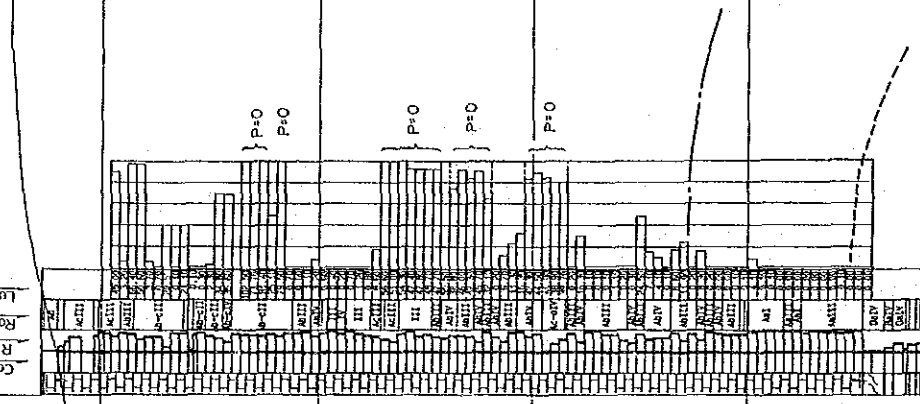
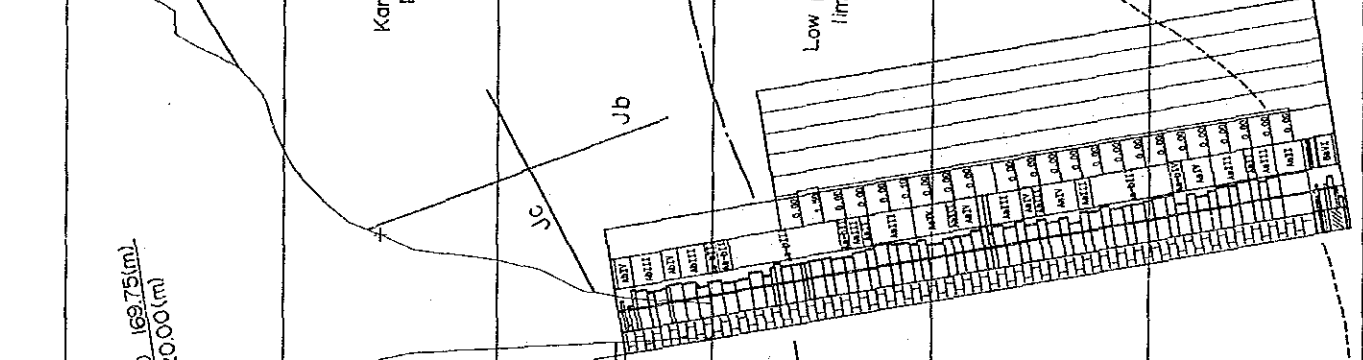
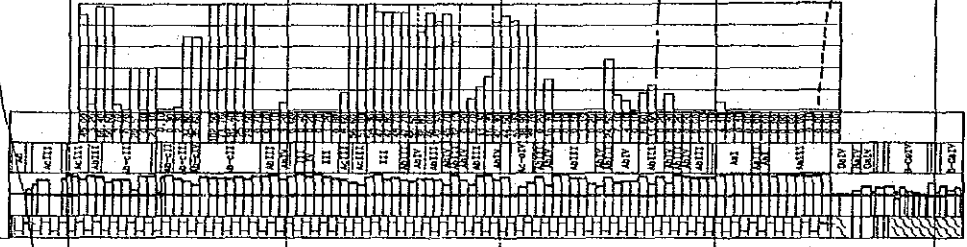
350

300

SK-307 22020(m)
El. 663.85(m)

SK-310 16975(m)
El. 520.00(m)

Core recovery(%)
RQD(%)
Rock classification
Lugeon value



Boundary between karstic limestone and low pervious limestone

Boundary between low pervious limestone and ophiolitic rock

P=0 : Gauge pressure =0

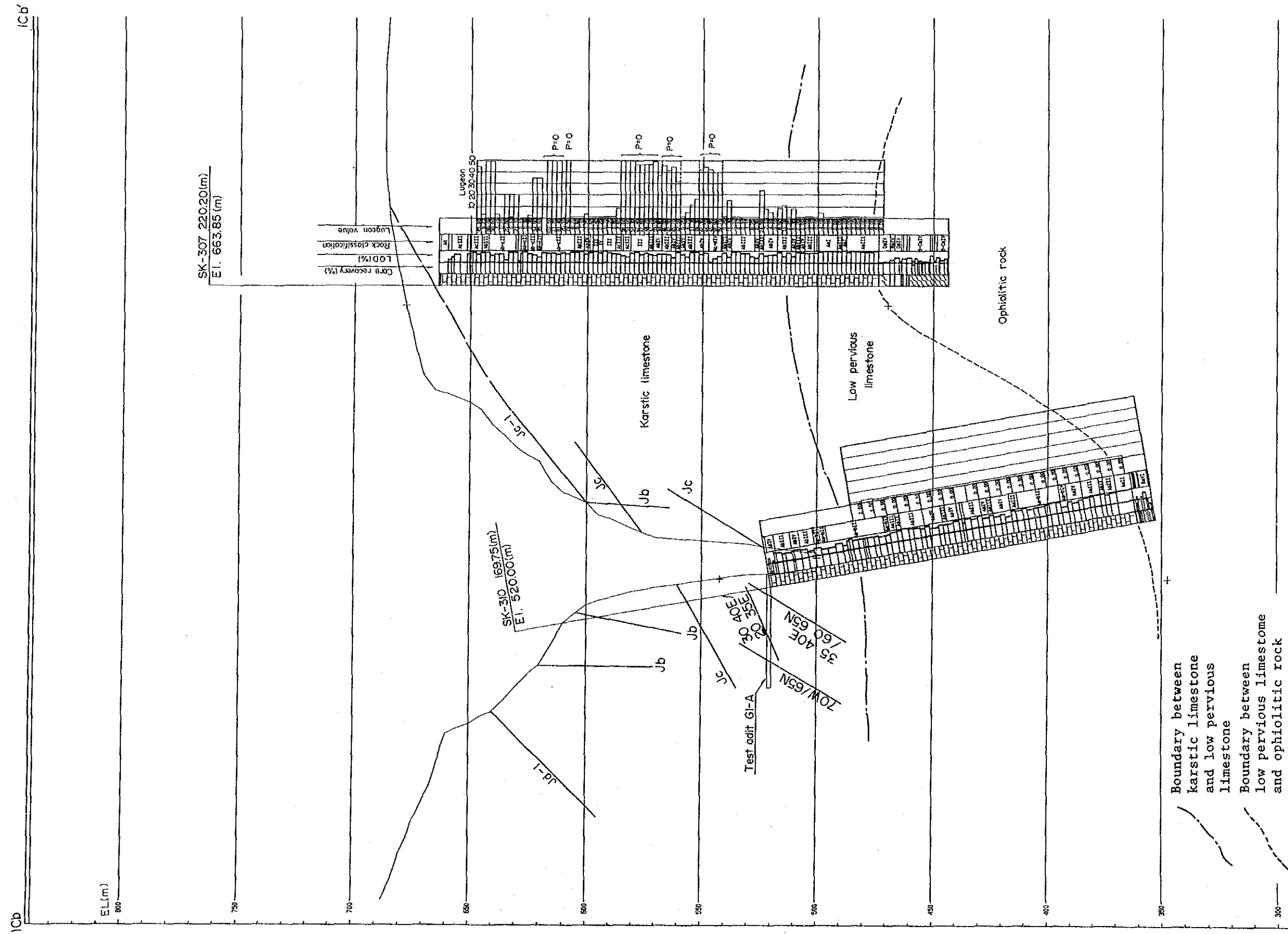
SCALE 0 100m



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TITLE G5
Geological Profile
of Dam site I-Ca
(Section ICa-ICa')



Boundary between karstic limestone and low pervious limestone
 Boundary between low pervious limestone and ophiolitic rock
 P=0 : Gauge pressure =0

SCALE 0 100m



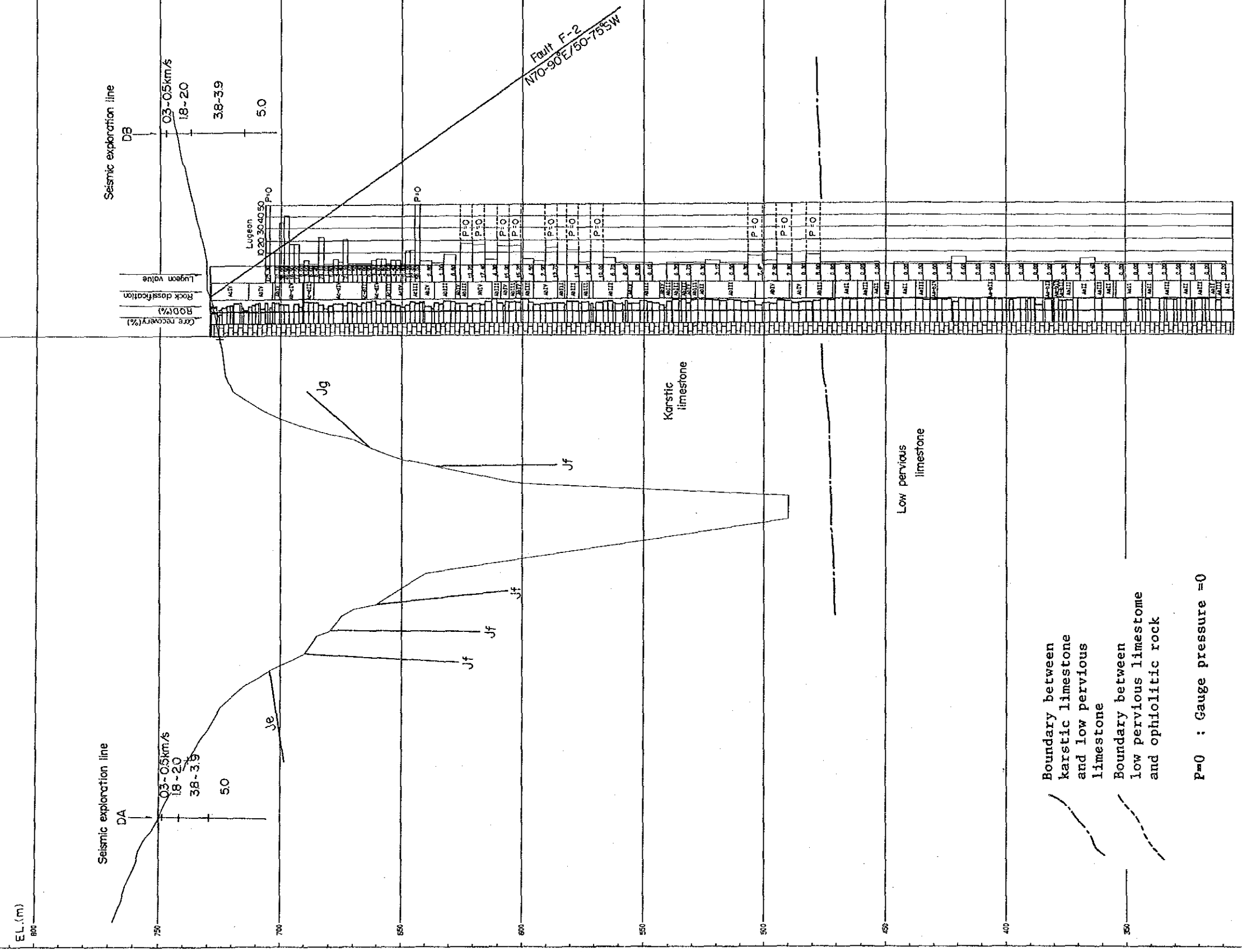
THE REPUBLIC OF TURKEY
 ELEKTRİK İŞLERİ ETÜD İDARESİ
 GENEL MÜDÜRLÜĞÜ

ERMENEK HYDROELECTRIC POWER
 DEVELOPMENT PROJECT
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE **G6**
Geological Profile of Dam Site I-Cb (Section ICB-ICb')

ICc'

SK-313 425.00(m)
El. 729.65(m)



Boundary between karstic limestone and low pervious limestone

Boundary between low pervious limestone and ophiolitic rock

P=0 : Gauge pressure =0

SCALE 0 100m

ICc

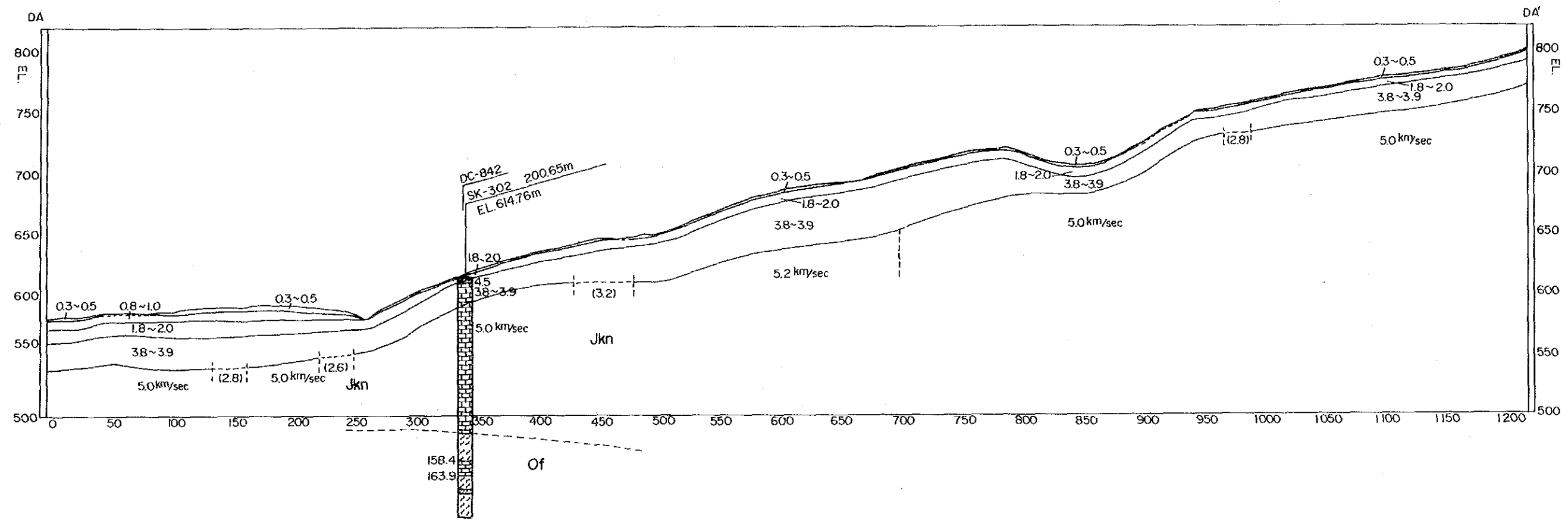
EL.(m)
800
750
700
650
600
550
500
450
400
350
300




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GENEL MÜDÜRLÜĞÜ

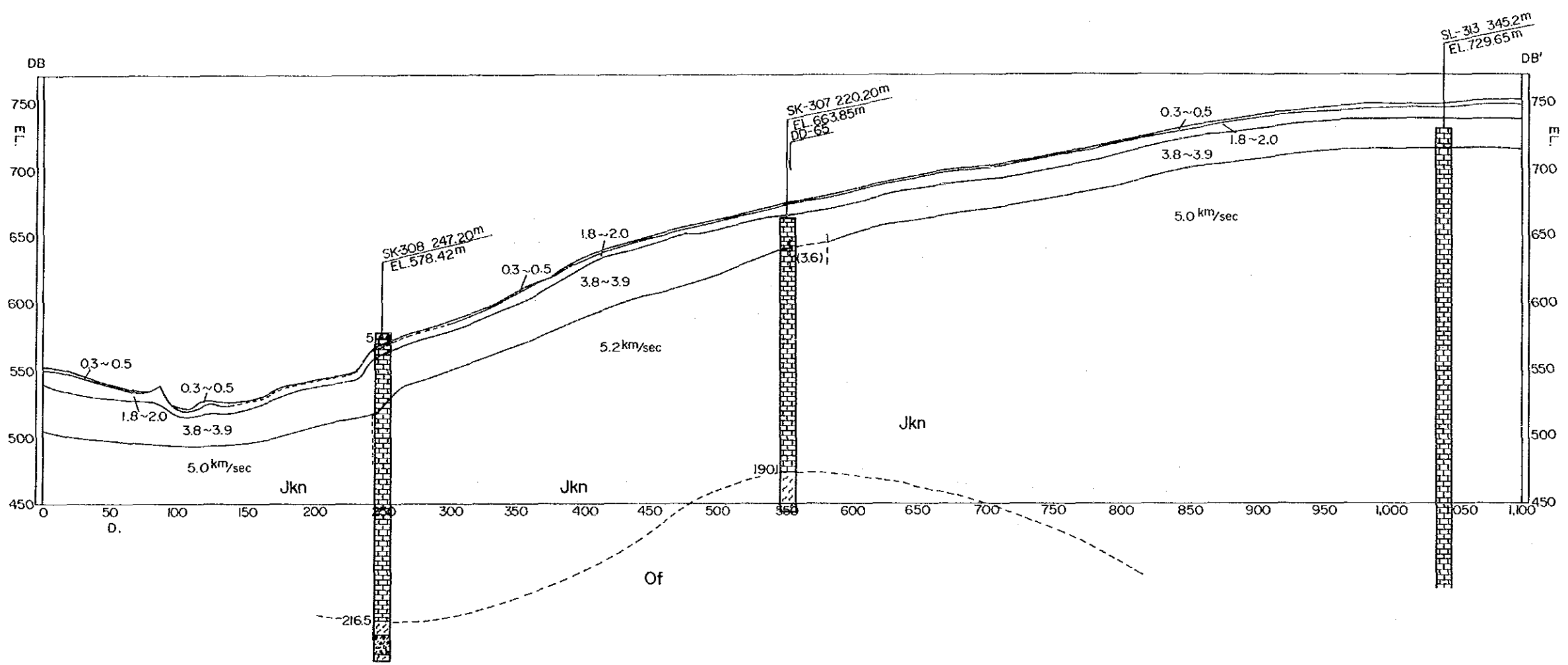
ERMENEK HYDROELECTRIC POWER
DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE **G7**
**Geological Profile
of Dam site I-Cc
(Section ICc-ICc')**



- LEGEND**
- Qalt : Talus deposit
 - Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
 - Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
 - Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
 - $\frac{1.8-2.0}{3.8-3.9}$: Seismic velocity (km/sec) and its boundary
 - - - : Geological boundary

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G8 Geological Profile along Seismic Line DA
		JAPAN INTERNATIONAL COOPERATION AGENCY	



LEGEND

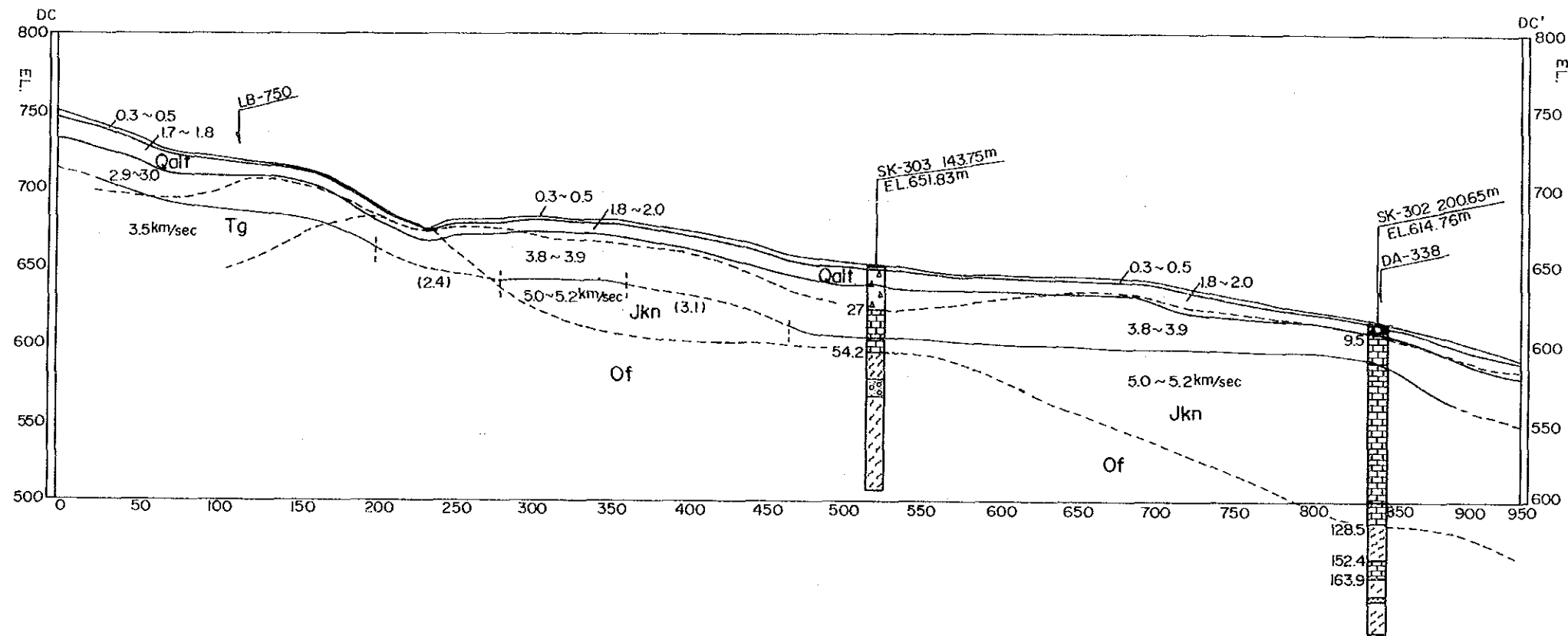
- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- 1.8-2.0
3.8-3.9 : Seismic velocity (km/sec) and its boundary
- - - - : Geological boundary



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GENEL MÜDÜRLÜĞÜ

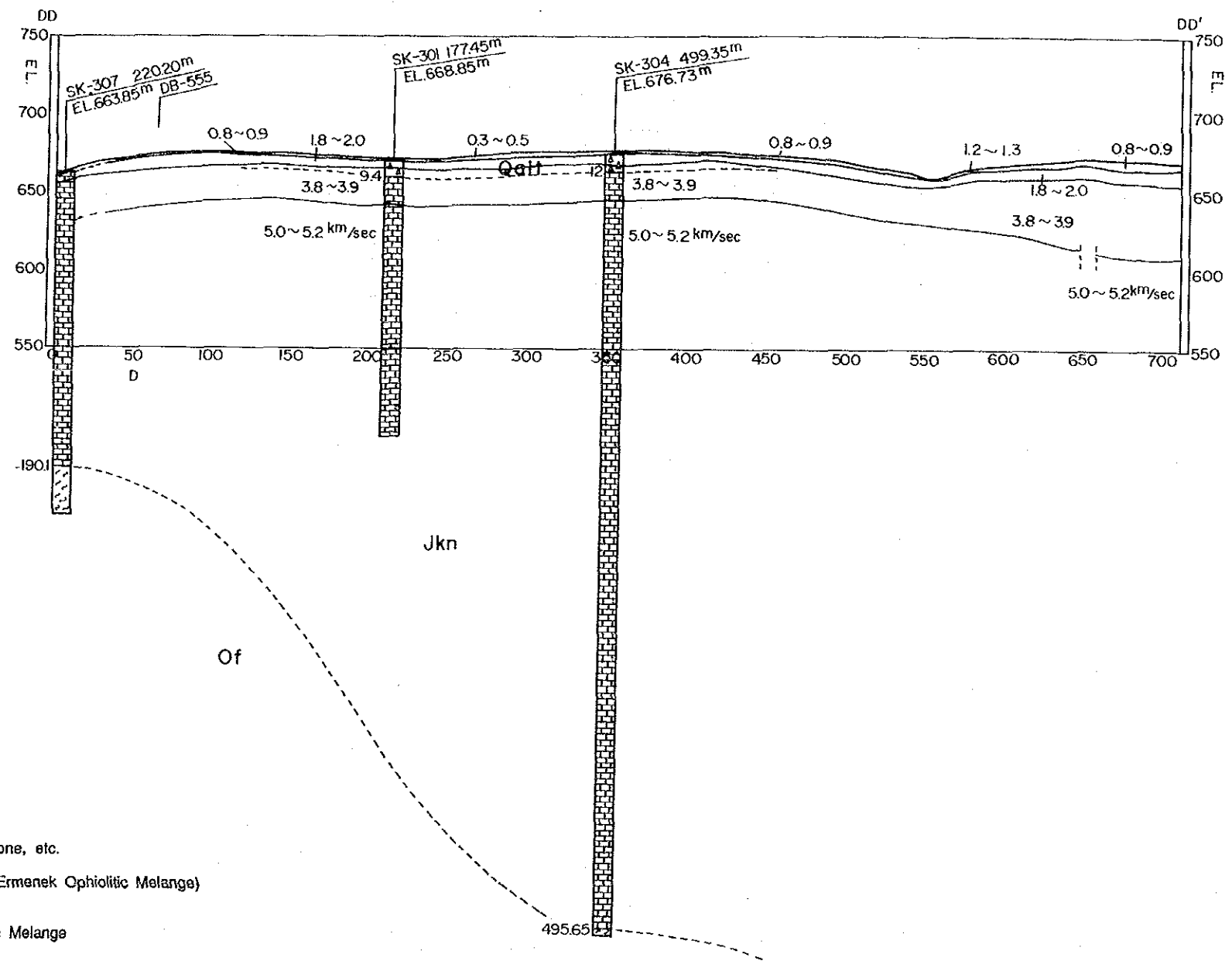
ERMENEK HYDROELECTRIC POWER
DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE
G9
Geological Profile
along Seismic Line DB



LEGEND

- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- $\frac{1.8 \sim 2.0}{3.8 \sim 3.9}$: Seismic velocity (km/sec) and its boundary
- - - : Geological boundary



LEGEND

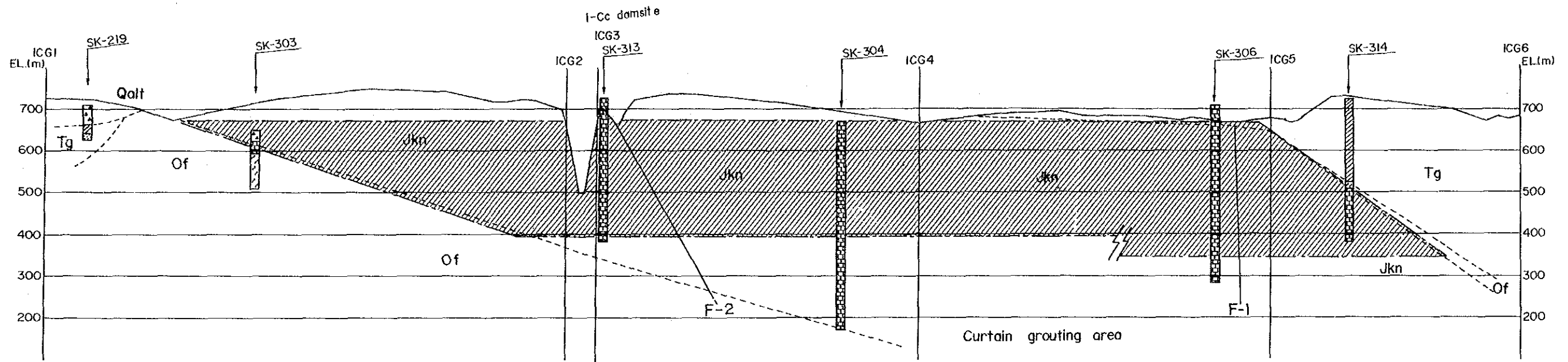
- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- $\frac{1.8 \sim 2.0}{3.8 \sim 3.9}$: Seismic velocity (km/sec) and its boundary
- : Geological boundary



THE REPUBLIC OF TURKEY
ELEKTRİK İŞLERİ ETÜD İDARESİ
GENEL MÜDÜRLÜĞÜ

ERMENEK HYDROELECTRIC POWER
DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE
G11
Geological Profile
along Seismic Line DD

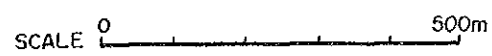


GEOLOGY OF THE PROJECT AREA

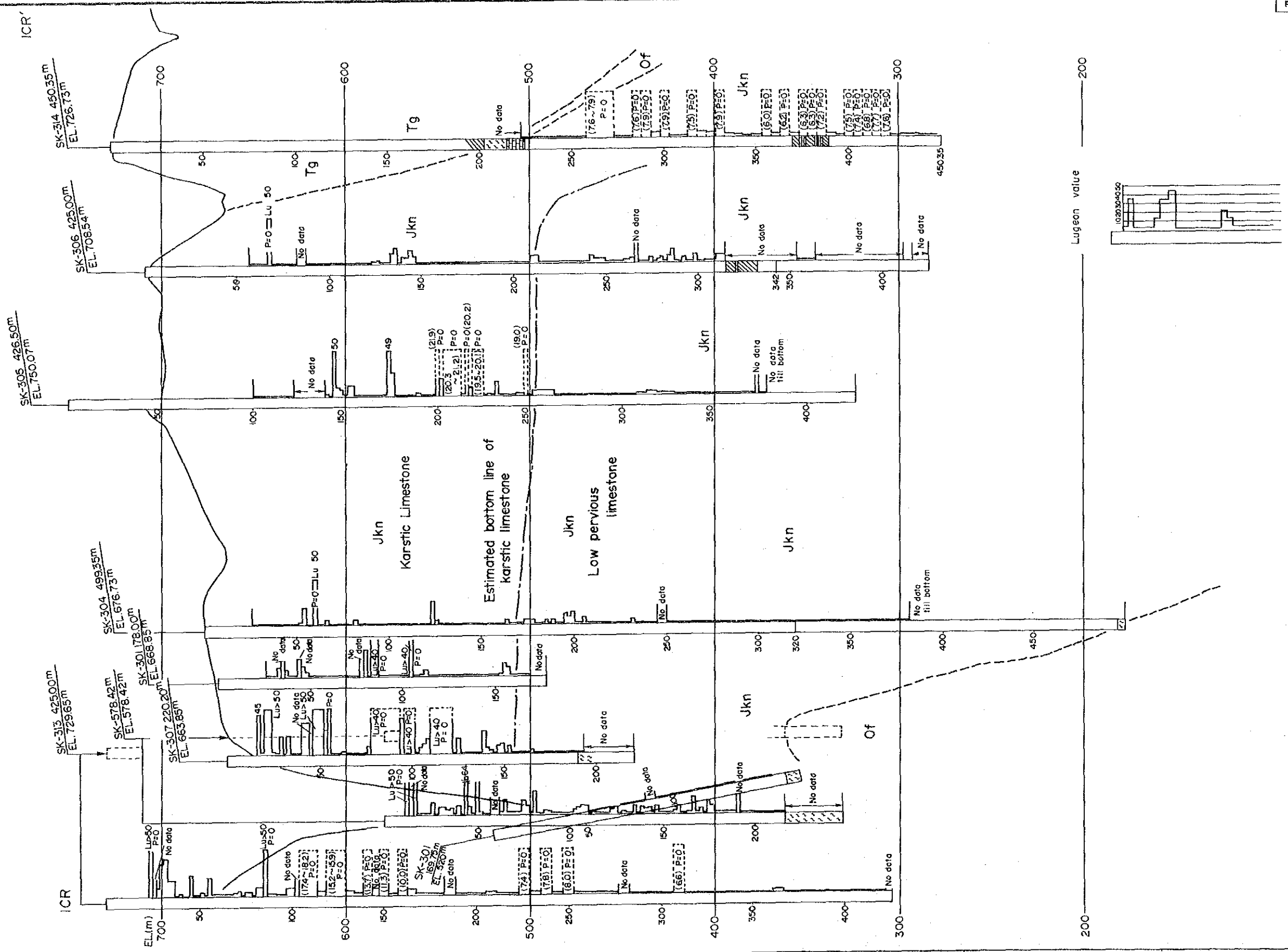
QUATERNARY	ALLUVIUM	Qal	River bed deposit
		Qalt	Yalus deposit
		Qat	Terrace deposit
TERTIARY	MIDDLE MIOCENE	Te	ERMENEK FORMATION (Mainly chalky limestone.)
	LOWER MIOCENE	Tg	GÖRSEKİ FORMATION (Marl, sandstone, conglomerate, limestone.)
	UPPER CRETACEOUS	Of	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)
	LOWER CRETACEOUS	Jkc	CİVANCIK FORMATION (Limestone.)
JURASSIC			ALADAĞ GROUP
TRIASSIC	UPPER TRIASSIC	Jtb	


ERMENEK OPHIOLITIC MELANGE

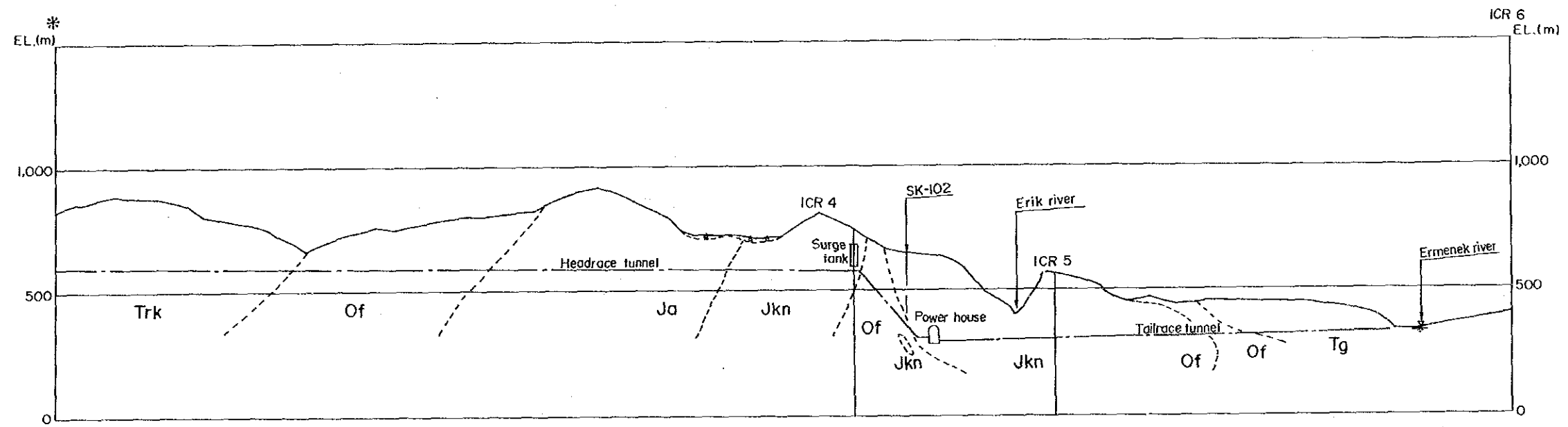
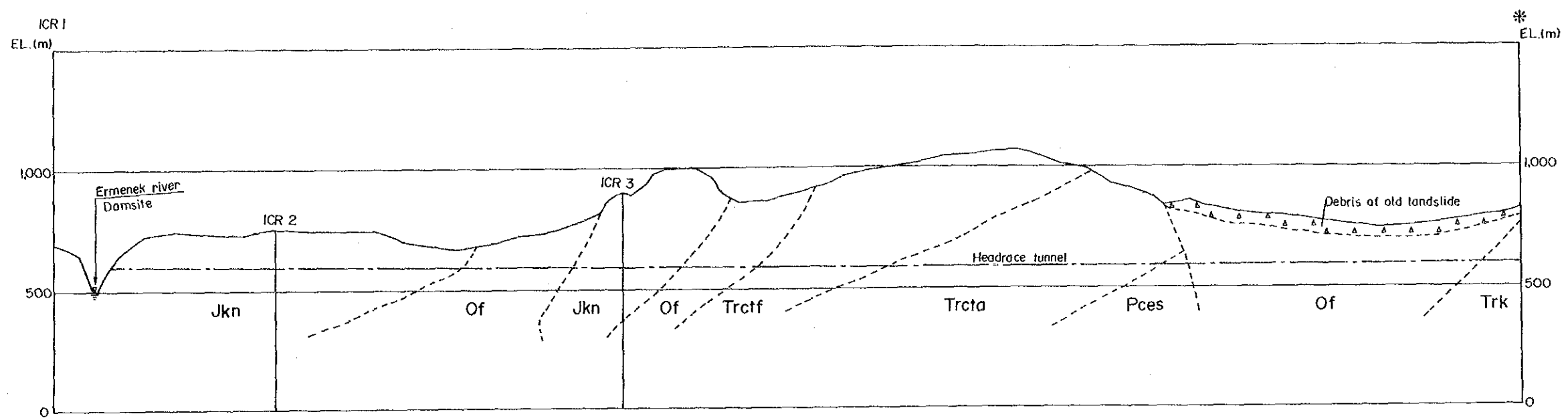
UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinitized peridotite, gabbro, etc.)	
JURASSIC	Jkn	NADİRE FORMATION	
	Ja	AZİTİPE FORMATION	
TRIASSIC	UPPER TRIASSIC	Tek	KÜRÜRCİ FORMATION
		Tçdt	TAŞDİBİ ÜYESİ
		Tçtl	ARDIÇLI ÜYESİ
			TAŞDİBİ FORMATION (ÇİNEK GRUBU)
PERMIAN	Pçus	SARIBAYIR ÜYESİ	
	Pçoa	AKARCA ÜYESİ	
	Pçop	PÜRELİCENİN ÜYESİ	
			ESKİCE FORMATION (NİSA GRUBU)
CARBONIFEROUS	Kçb	BALKUSAN FORMATION	



	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G12 Geological Profile along Proposed Grouting Line for I-Cc Dam site (Section ICG1-ICG6)
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	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G13 Permeability Condition in Right Bank of I-C Dam site (Section ICR-ICR')
		JAPAN INTERNATIONAL COOPERATION AGENCY	



GEOLOGY OF THE PROJECT AREA

QUATERNARY	ALLUVIUM	Qal	Qalr	River bed deposit
			Qalt	Talus deposit
	DILUVIUM	Qtr	Qtrt	Terrace deposit
TERTIARY	MIDDLE MIOCENE	Te	ERMENEK FORMATION (Mainly chalky limestone.)	
	LOWER MIOCENE	Tg	GÖRMEL FORMATION (Marl, sandstone, conglomerate, limestone.)	
CRETACEOUS	UPPER CRETACEOUS	Ofm	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)	
	LOWER CRETACEOUS	Jkc	ÇİMANDERE FORMATION (Limestone.)	
JURASSIC			ALADAĞ GROUP	
TRIASSIC	UPPER TRIASSIC	Hib		

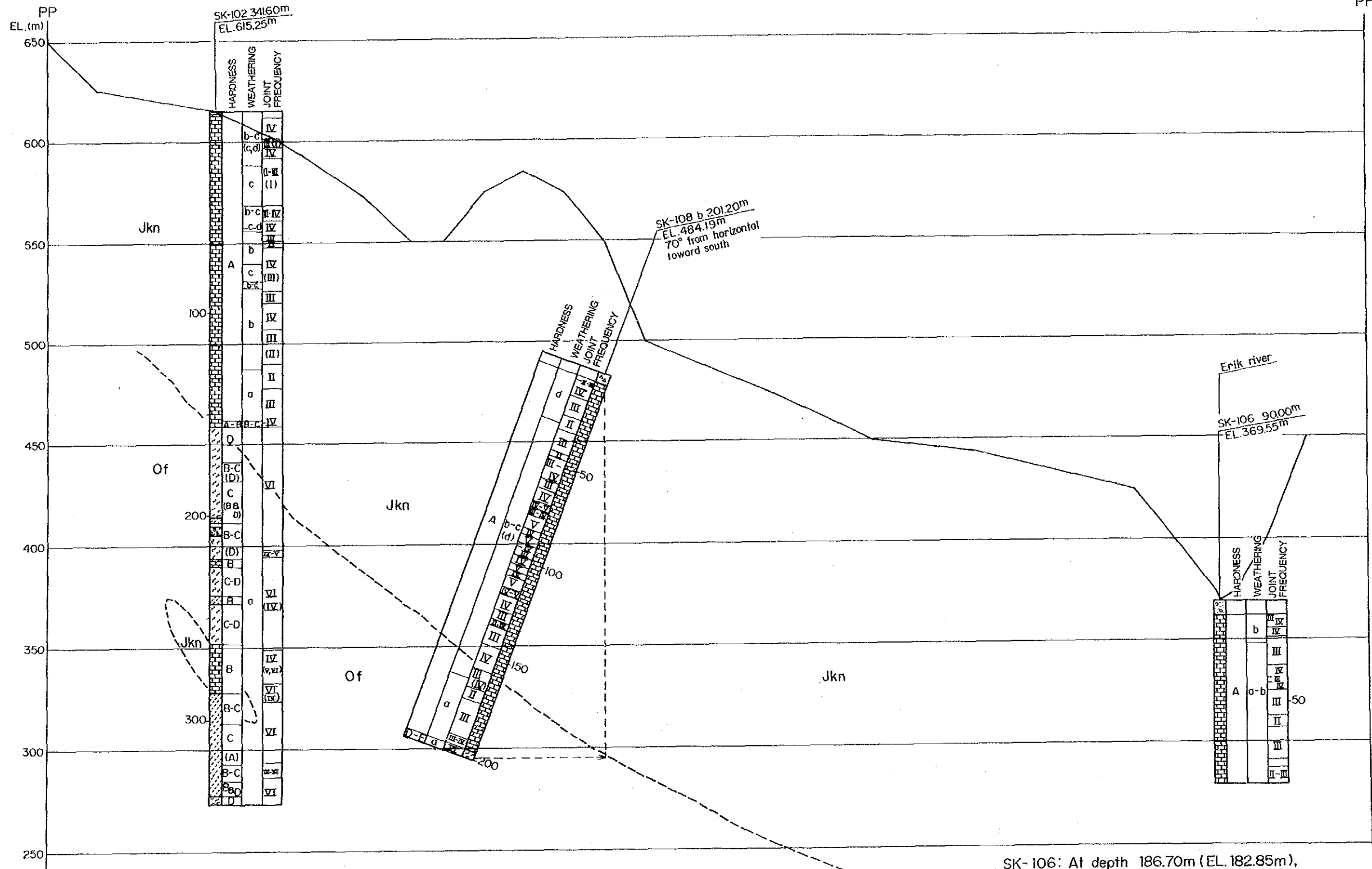
ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinized peridotite, gabbro, etc.)	
		Jkn	NADIRE FORMATION	
JURASSIC		Ja	AZITEPE FORMATION	
TRIASSIC	UPPER TRIASSIC	Trk	KÜKÜRCE FORMATION	
		Trçtt	TAŞIŞI MEMBER	
		Trçta	ARDIÇLI MEMBER	
		Pces	SARIBAYIR MEMBER	
		Pcea	AKARCA MEMBER	
		Pcep	FÜRELİCENİN MEMBER	
PERMIAN			ESKİCE FORMATION	
CARBONIFEROUS		Kçb	BALKUSM FORMATION	
		Eg	GÖRÇESEKİ FORMATION	
		Pn	NİSA FORMATION	

Blocks (mostly limestone.)



	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G14 Geological Profile along Headrace Tunnel (Section ICR1-ICR6)
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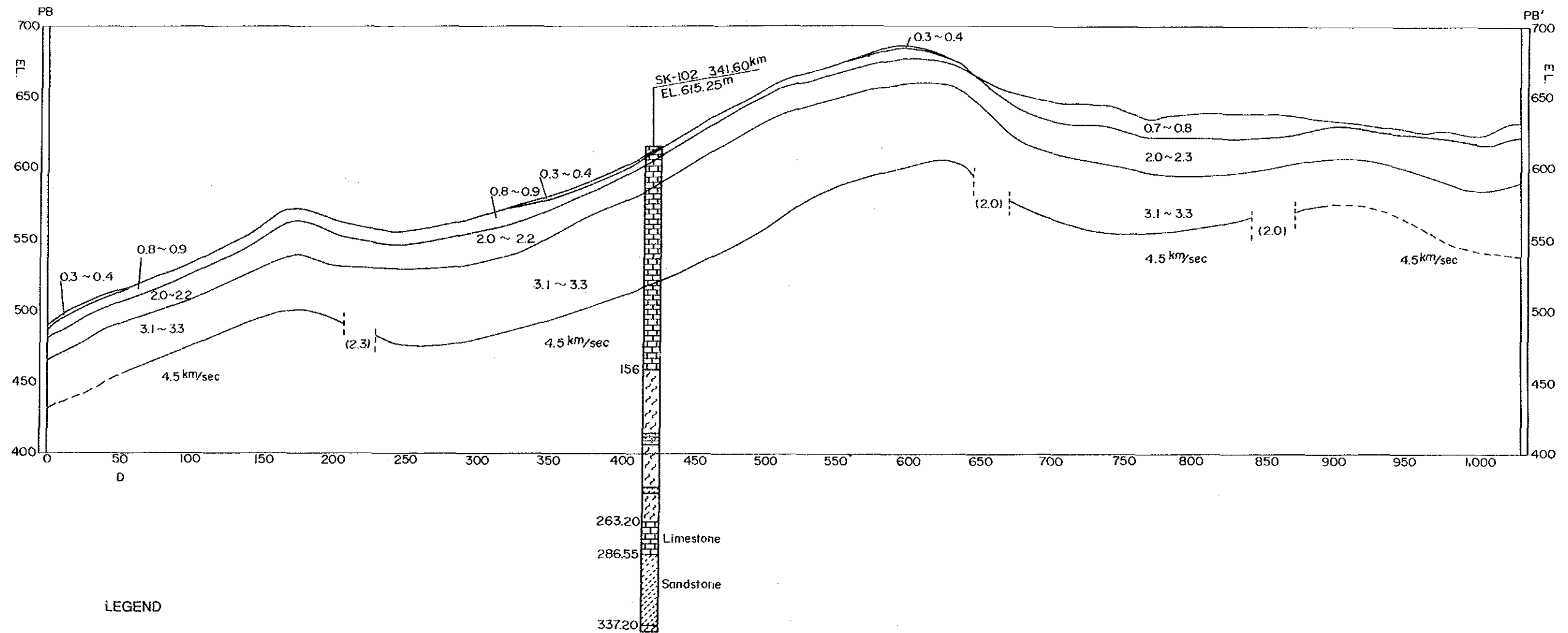
Jkn : Limestone (Nadire formation)
 Of : Matrix layers of Melange

--- Geological boundary

SK-106: At depth 186.70m (EL. 182.85m),
 penetrated into matrix layers of Melange.
 (Sep. 1990)


SCALE 0 200m

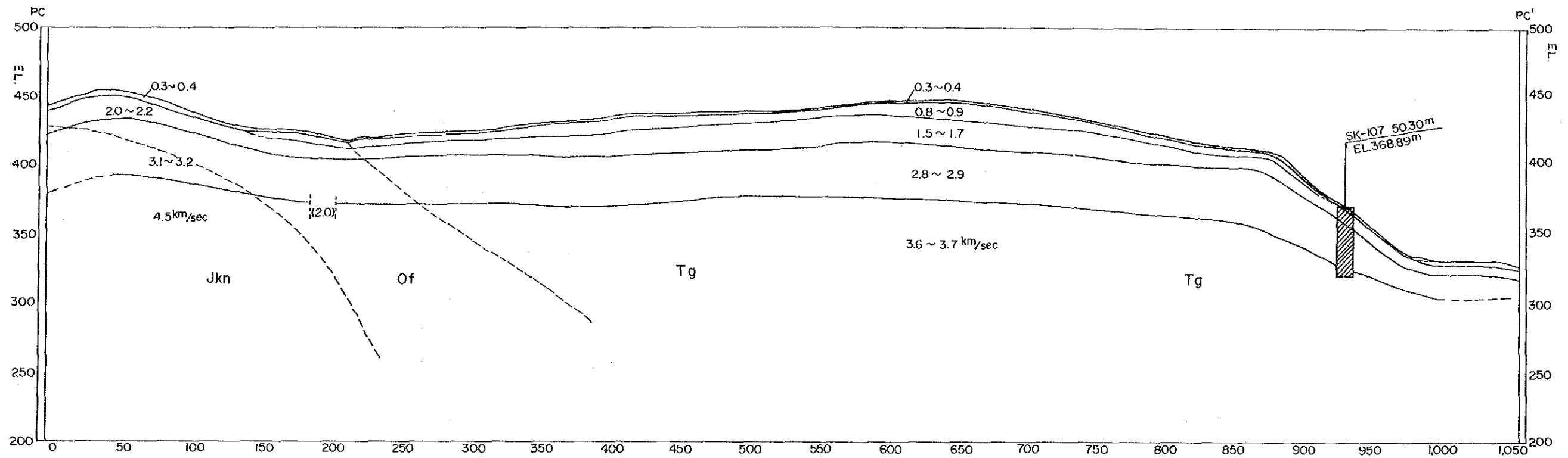
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G15 Geological Profile of Power House Area (Section PP-PP')



LEGEND


- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- $\frac{18 \sim 2.0}{3.8 \sim 3.9}$: Seismic velocity (km/sec) and its boundary
- - - : Geological boundary

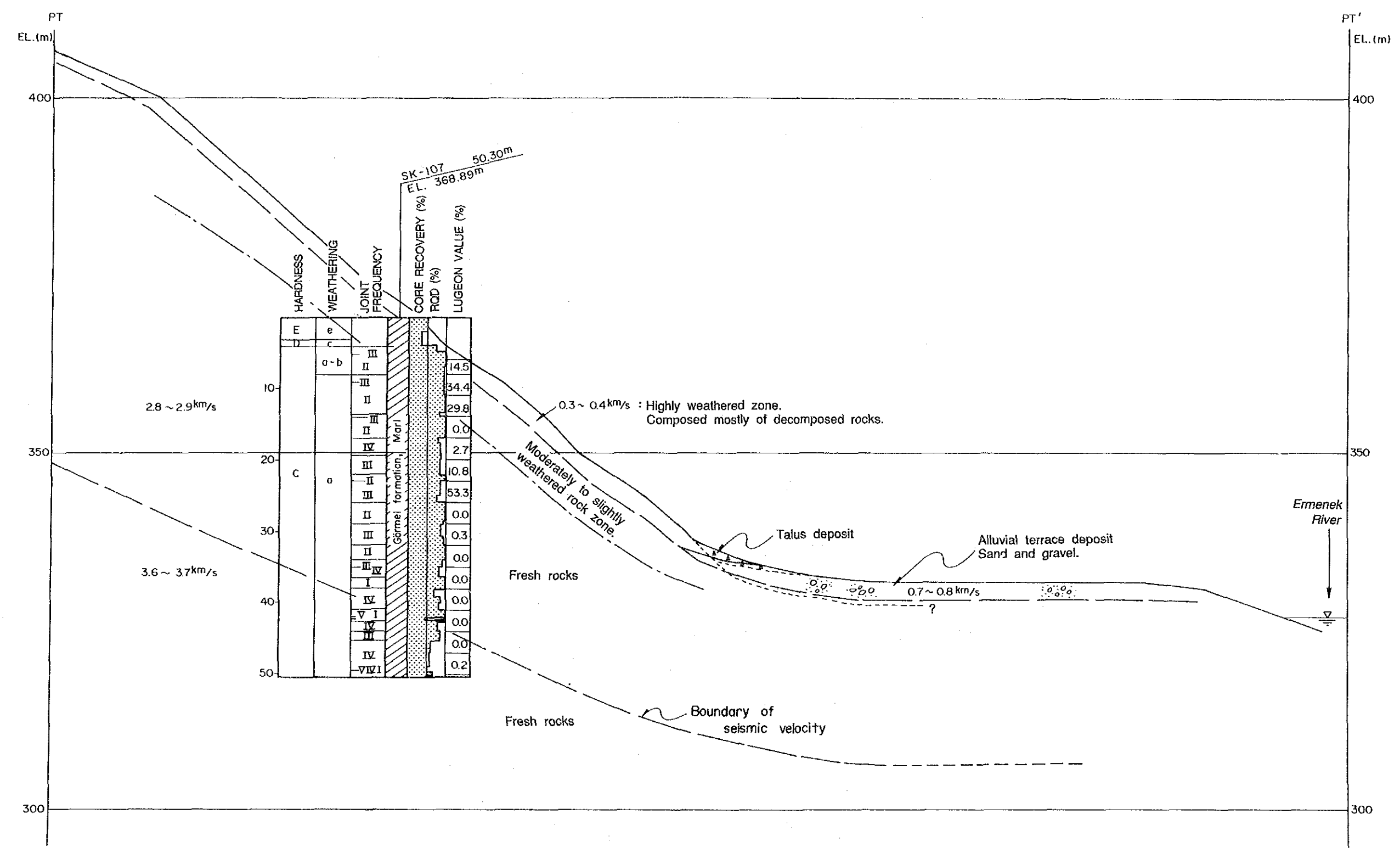
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G16 Geological Profile along Seismic Line PB
		JAPAN INTERNATIONAL COOPERATION AGENCY	

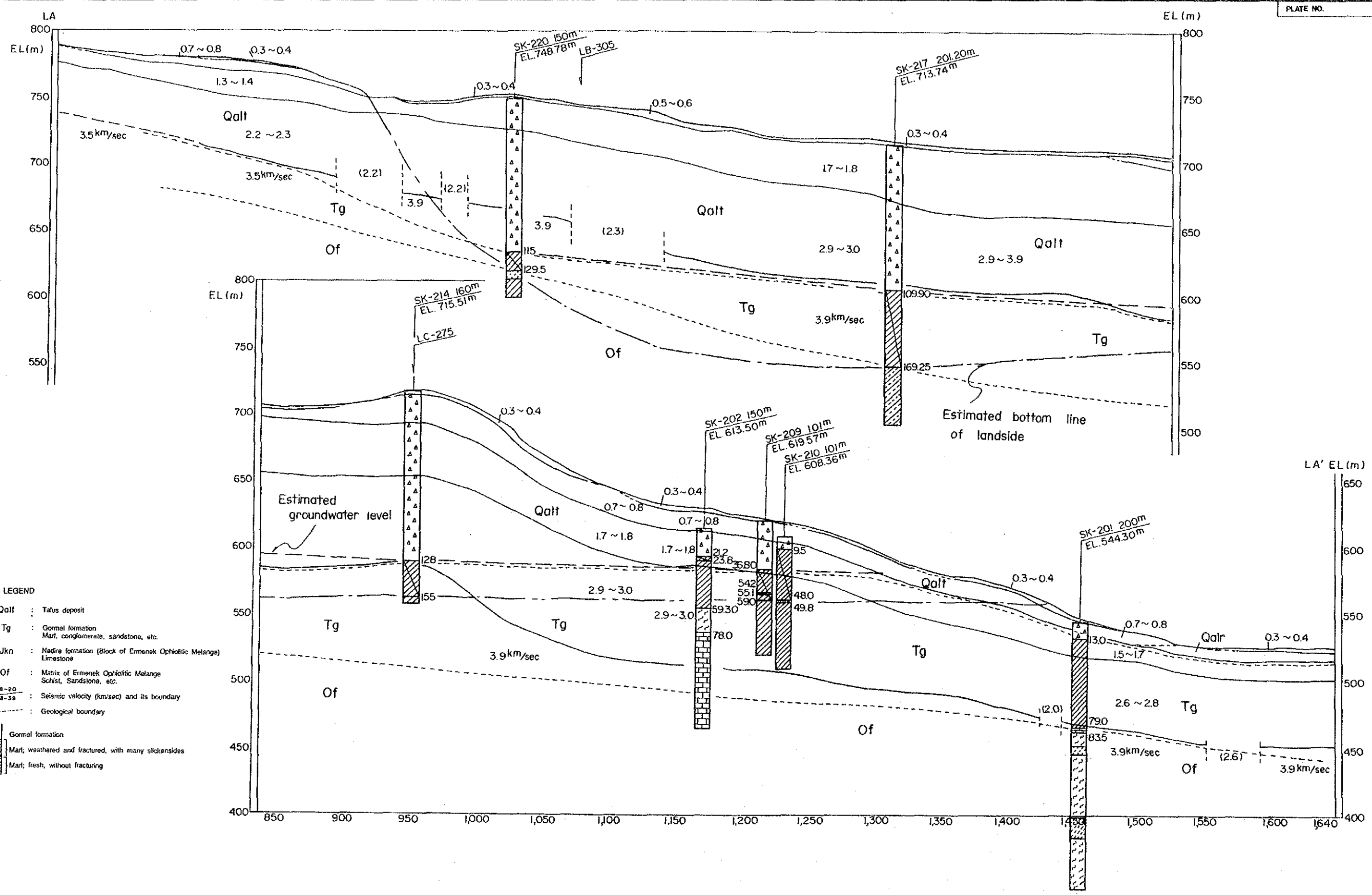


LEGEND

- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- $\frac{1.8-2.0}{3.8-3.9}$: Seismic velocity (km/sec) and its boundary
- - - : Geological boundary

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G17 Geological Profile along Seismic Line PC
		JAPAN INTERNATIONAL COOPERATION AGENCY	





LEGEND

Qalt : Talus deposit

Tg : Gormel formation
Marl, conglomerate, sandstone, etc.

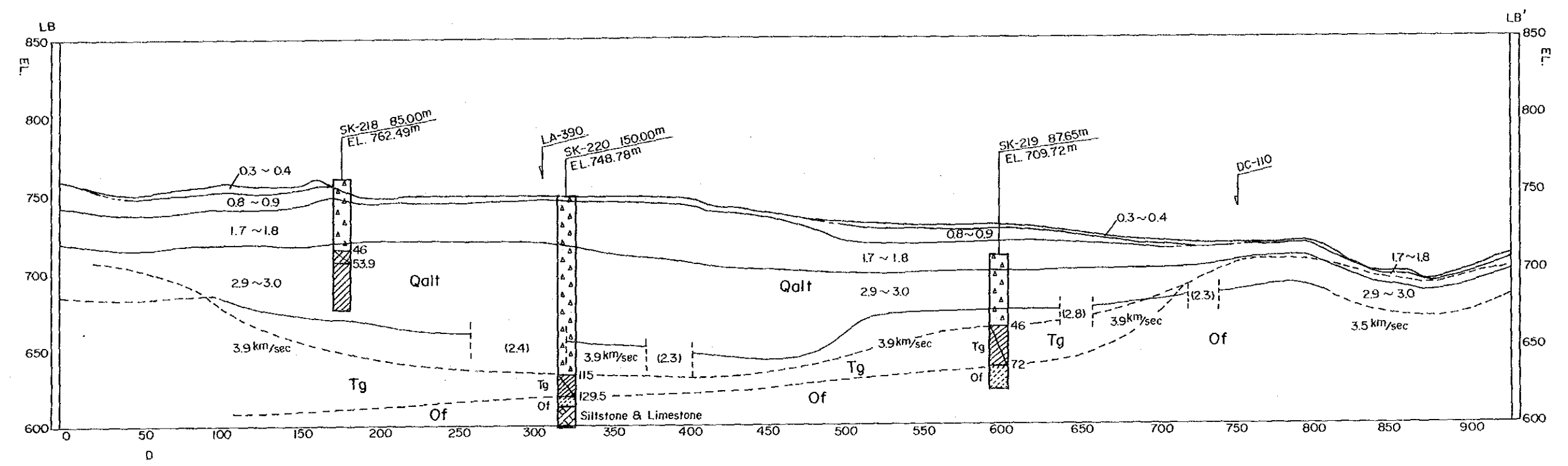
Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone

Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.


1.8-2.0 : Seismic velocity (km/sec) and its boundary
3.8-3.9

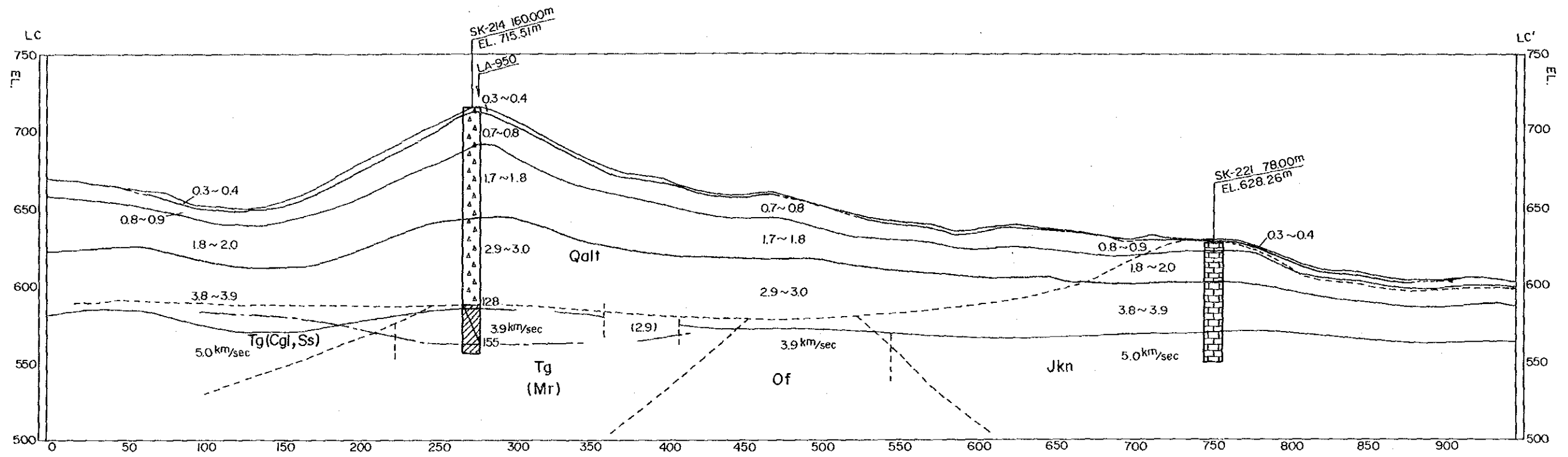
----- : Geological boundary

□ : Gormel formation
▨ : Marl; weathered and fractured, with many slickensides
▩ : Marl; fresh, without fracturing



- LEGEND**
- Qalt : Talus deposit
 - Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
 - Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
 - Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
 - 1.8~2.0
3.8~3.9 : Seismic velocity (km/sec) and its boundary
 - - - : Geological boundary
 - [Hatched Box] : Gormel formation
 - [Diagonal Hatched Box] : Marl; weathered and fractured, with many slickensides
 - [Horizontal Hatched Box] : Marl; fresh, without fracturing

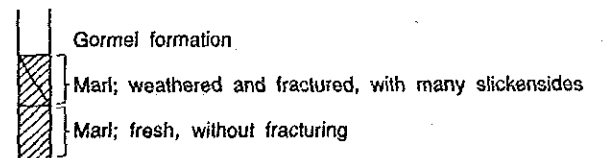
	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G20 Geological Profile of Landslide Area Seismic Line LB
		JAPAN INTERNATIONAL COOPERATION AGENCY	




Cgl : Conglomerate
 Ss : Sandston
 Mr : Marl

LEGEND

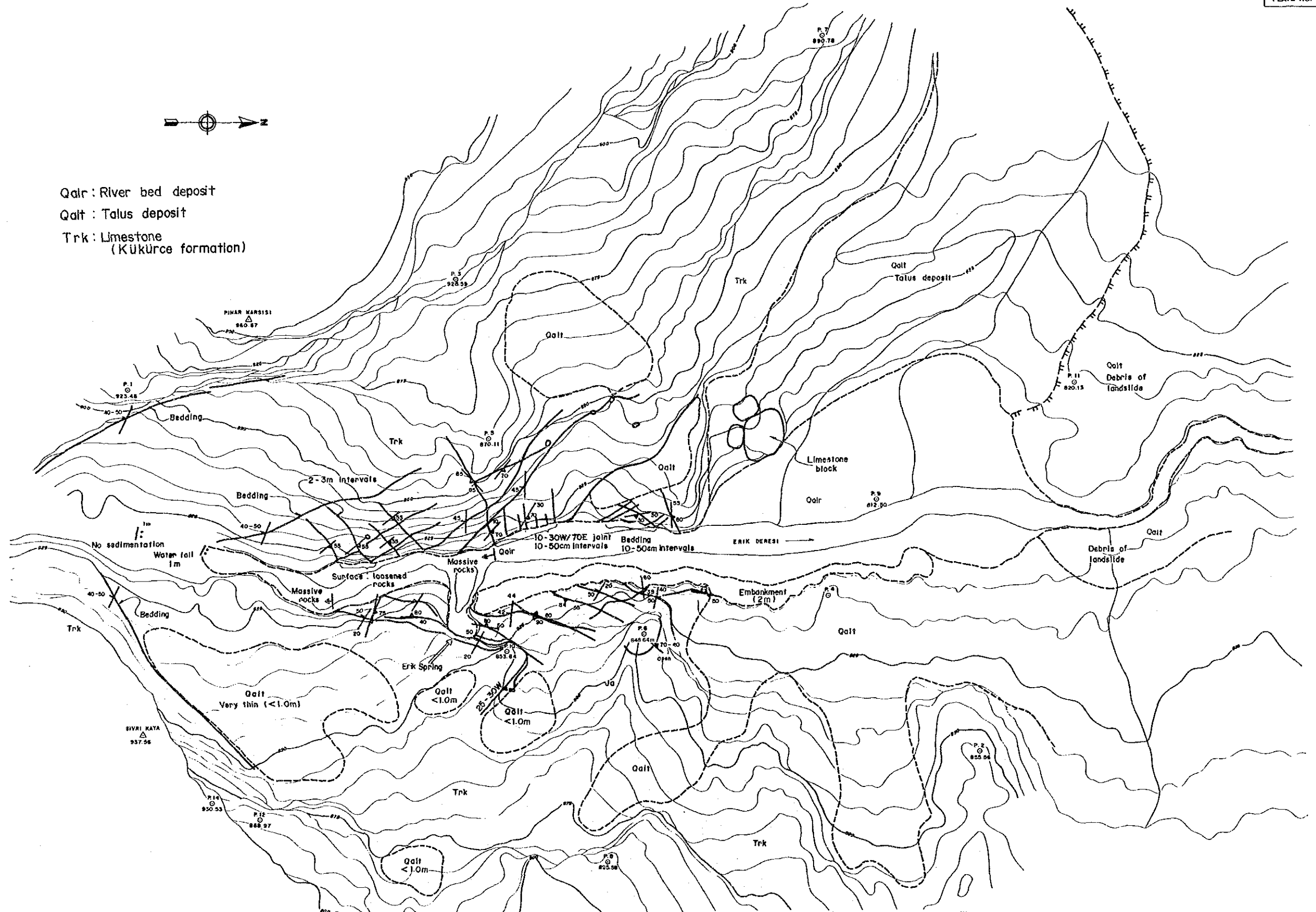
- Qalt : Talus deposit
- Tg : Gormel formation
Marl, conglomerate, sandstone, etc.
- Jkn : Nadire formation (Block of Ermenek Ophiolitic Melange)
Limestone
- Of : Matrix of Ermenek Ophiolitic Melange
Schist, Sandstone, etc.
- $\frac{1.8 \sim 2.0}{3.8 \sim 3.9}$: Seismic velocity (km/sec) and its boundary
- - - : Geological boundary




	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G21 Geological Profile of Landslide Area Seismic Line LC

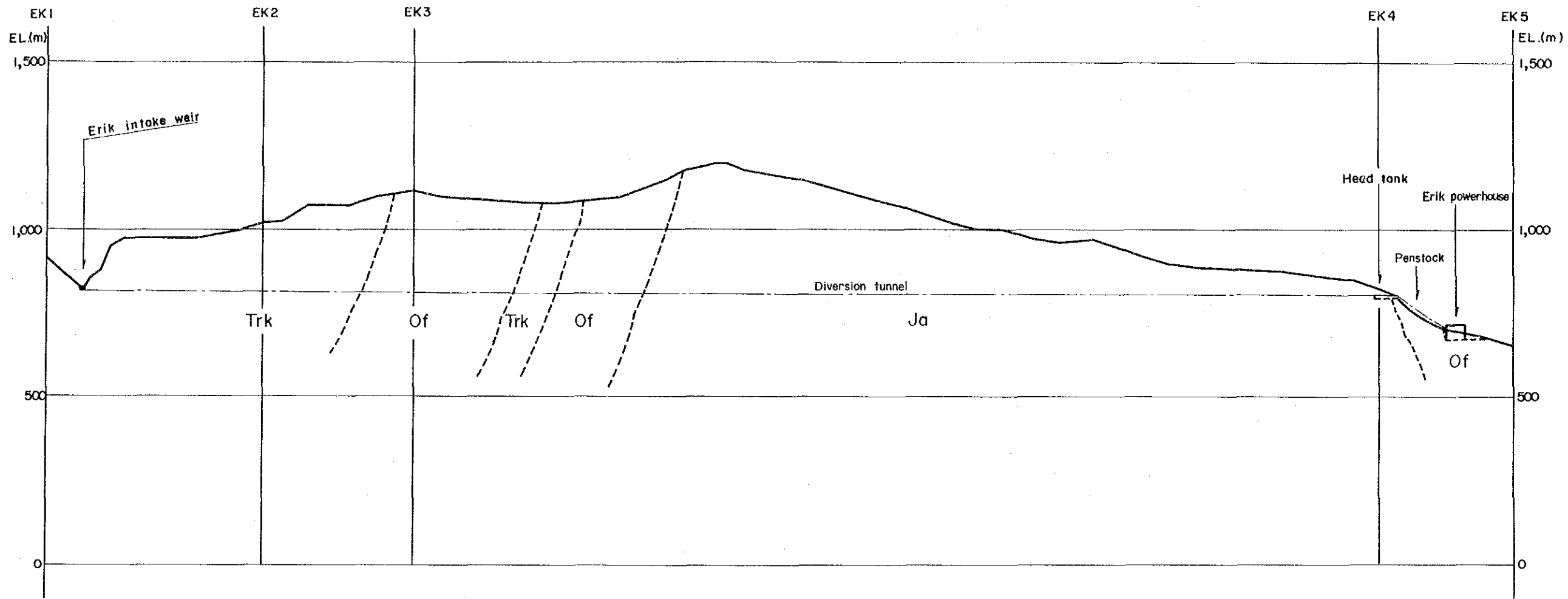


Qalr : River bed deposit
 Qalt : Talus deposit
 Trk : Limestone
 (Kükürce formation)



SCALE 0 100m

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G22 Geological Map of Erik Intake Weir Site
		JAPAN INTERNATIONAL COOPERATION AGENCY	




GEOLOGY OF THE PROJECT AREA

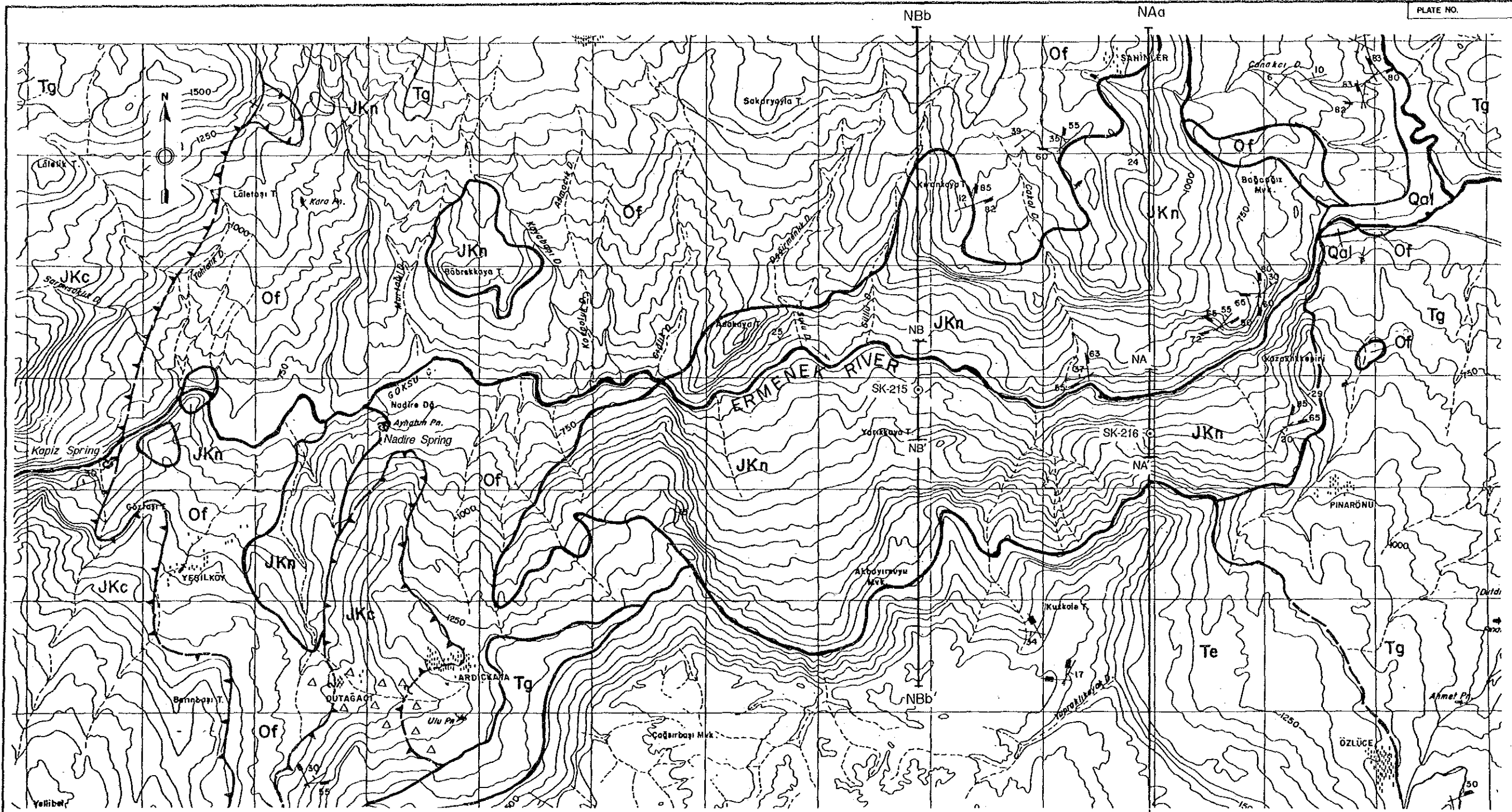
QUATERNARY	ALLUVIUM	[Qal]	River bed deposit
		[Qalt]	Talus deposit
		[Qtr]	Terrace deposit
TERTIARY	MIDDLE MIOCENE	[Te]	ERMENEK FORMATION (Mainly chalky limestone.)
	LOWER MIOCENE	[Tg]	GÖRMEL FORMATION (Marl, sandstone, conglomerate, limestone.)
CRETACEOUS	UPPER CRETACEOUS	[Ofn]	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)
	LOWER CRETACEOUS	[Jkc]	ÇİHAMDERE FORMATION (Limestone.)
JURASSIC			ALADAĞ GROUP
TRIASSIC	UPPER TRIASSIC	[Jrb]	

ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	[Of]	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentized peridotite, gabbro, etc.)
		[Jkn]	NADİRE FORMATION
JURASSIC		[Ja]	AZİTEPE FORMATION
TRIASSIC	UPPER TRIASSIC	[Trk]	MÜKÜRCE FORMATION
		[Trkt]	TAŞDİBİ MEMBER
		[Trcta]	ARDIÇLI MEMBER
PERMIAN		[Pcea]	SARIBAYIR MEMBER
		[Pca]	AKARCA MEMBER
		[Pcep]	PÜRELİCENİN MEMBER
		[Kpd]	BALKUSAN FORMATION
CARBONIFEROUS			ÇİHNE GROUP

Blocks (Mostly limestone.)

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE G23 Geological Profile of Erik Diversion Tunnel (Section EK1-EK5)
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LEGEND


- ☉ Spring
- ⊙ Borehole
- NA Geological profile
- NA

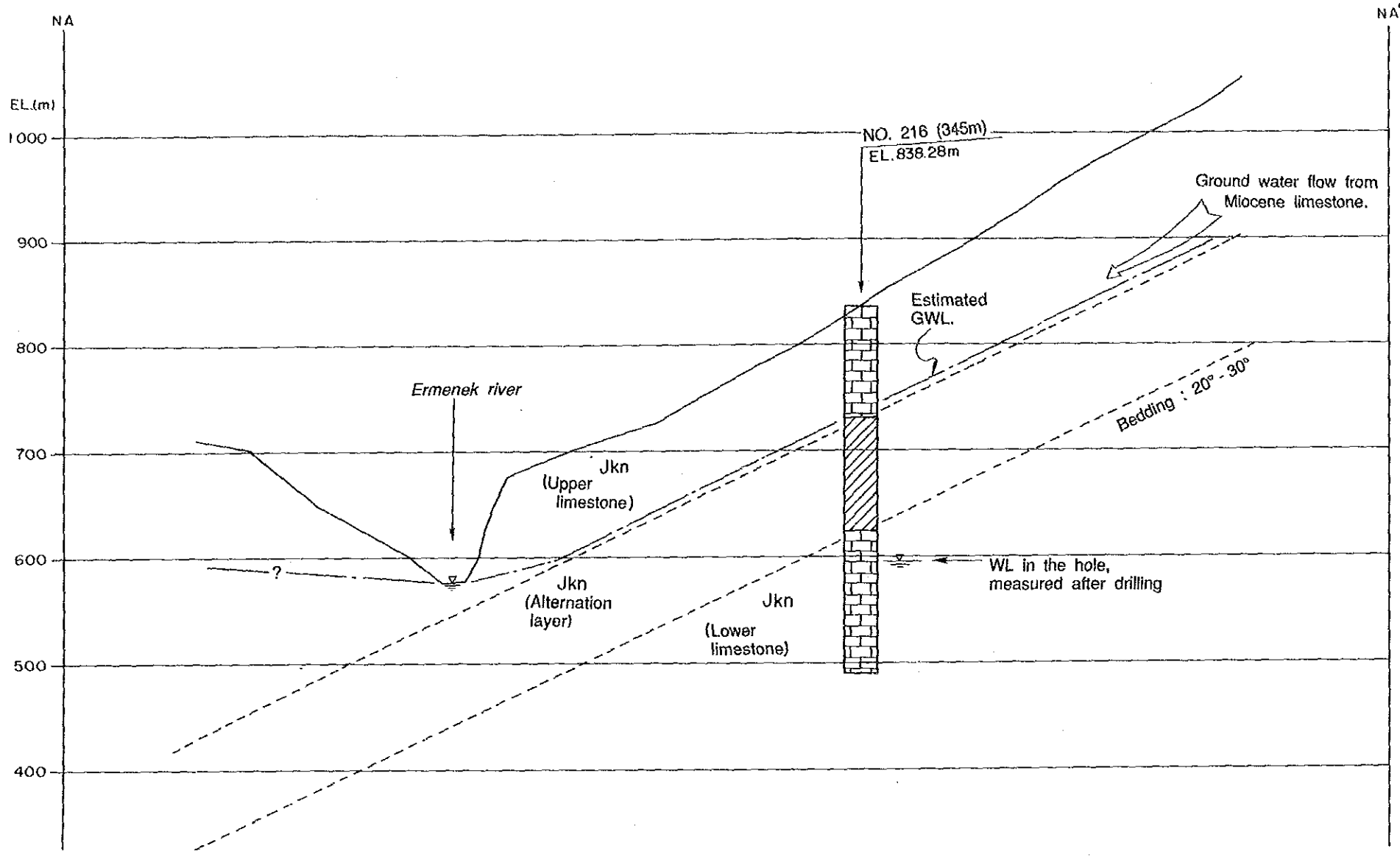
- ↔ Thrust fault
- Geological boundary

- Qal : Alluvial deposit
- Te : Ermenek formation (Chalky limestone)
- Tg : Gormel formation (Marl. etc.)
- Of : Matrix of Ophiolitic Melange
- Jkn : Limestone block of Ophiolitic Melange (Nadire Formation)
- Jkc : Cretaceous limestone (Chandere Forallon)

Tertiary
Cretaceous

SCALE 0 1,000m

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G24 Geological Map of Backwater Area
	JAPAN INTERNATIONAL COOPERATION AGENCY		



GEOLOGY OF THE PROJECT AREA

QUATERNARY	ALLUVIUM	Qal	Qalr	River bed deposit
			Qalt	Talus deposit
	DILUVIUM	Qlr	Qrt	Terrace deposit
TERTIARY	MIDDLE MIOCENE	To		ERMENEK FORMATION (Mainly chalky limestone.)
	LOWER MIOCENE	Tg		GÖRMEK FORMATION (Marl, sandstone, conglomerate, limestone.)
CRETACEOUS	UPPER CRETACEOUS	Om		ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)
	LOWER CRETACEOUS	Jkc		CİHANLIRE FORMATION (Limestone.)
JURASSIC				ALADAĞ GROUP
TRIASSIC	UPPER TRIASSIC	Trb		

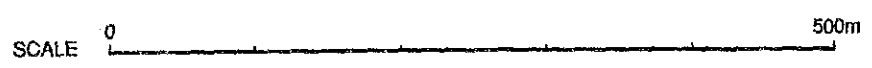
ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	Of		MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinitized peridotite, gabbro, etc.)	
		Jkn		NADİRE FORMATION	
JURASSIC		Ja		ALİYEPE FORMATION	
TRIASSIC	UPPER TRIASSIC	Trk		MÜKÜRCE FORMATION	
		Trct		TANTACI FORMATION	
		Trctb			ARDIÇLI MEMBER
PERMIAN		Pca		SİSİÇE FORMATION	
		Pca			SARIBAYIR MEMBER
		Pca			AKARCA MEMBER
		Pcep		PÜRELİCENİN MEMBER	
CARBONIFEROUS		Kcb		BALKISAN FORMATION	
			Pg	GÖKÇESEKİ FORMATION	
			Pn	NİSA FORMATION	

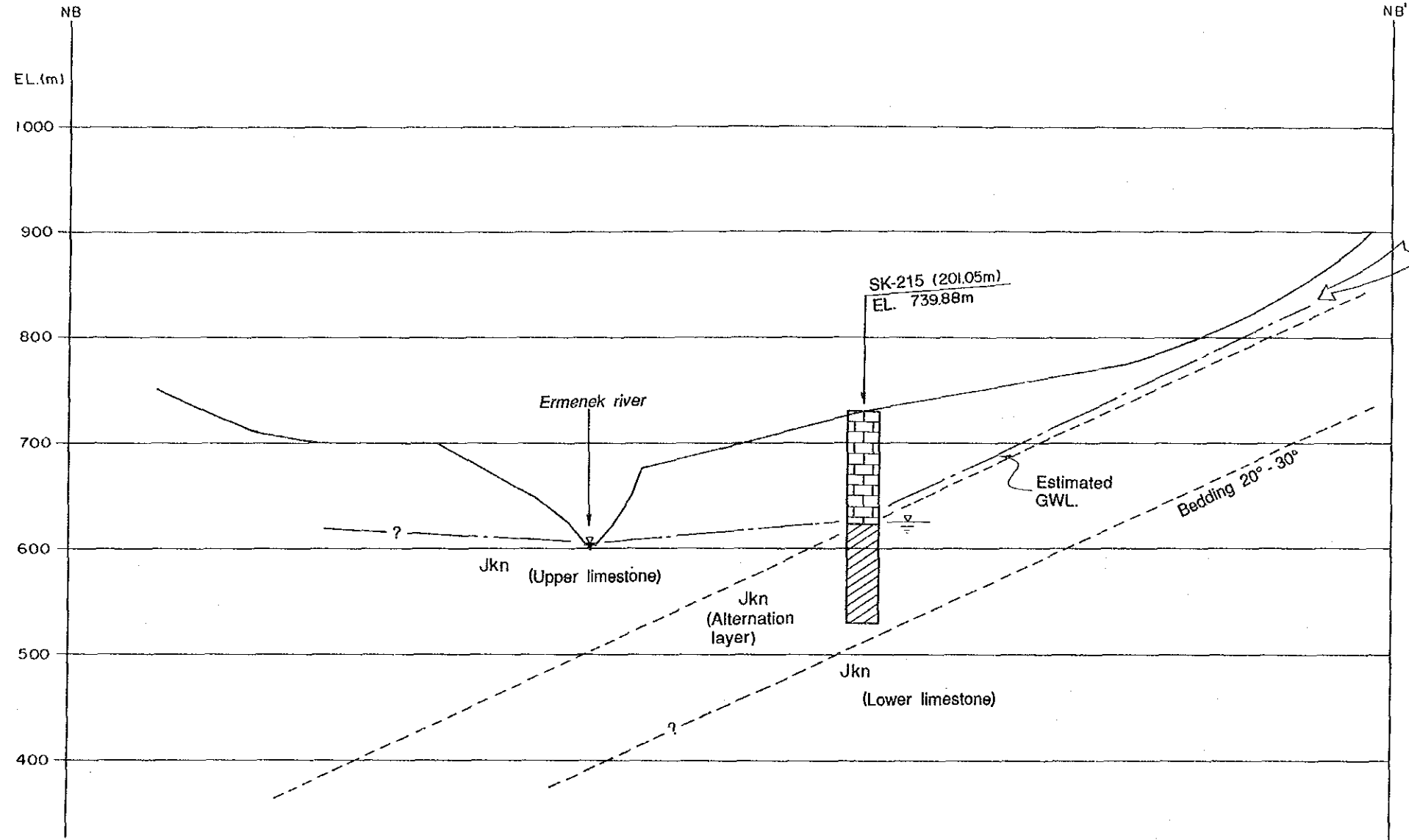
Blocks (Mostly Limestone.)

SECTION NA-NA'

- Upper limestone : High pervious layer, with many openings. Mostly weathered.
- Jkn Alternation layer : Mainly clayey silt, and partly sandstone and limestone. Reddish brown ~ gray. Impervious layer.
- Lower limestone : Low pervious layer. Fresh rocks.



	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G25 Geological Profile of Backwater Area (1/3)
	JAPAN INTERNATIONAL COOPERATION AGENCY		



SECTION NB - NB'



Ground water flow from Miocene limestone.

GEOLOGY OF THE PROJECT AREA

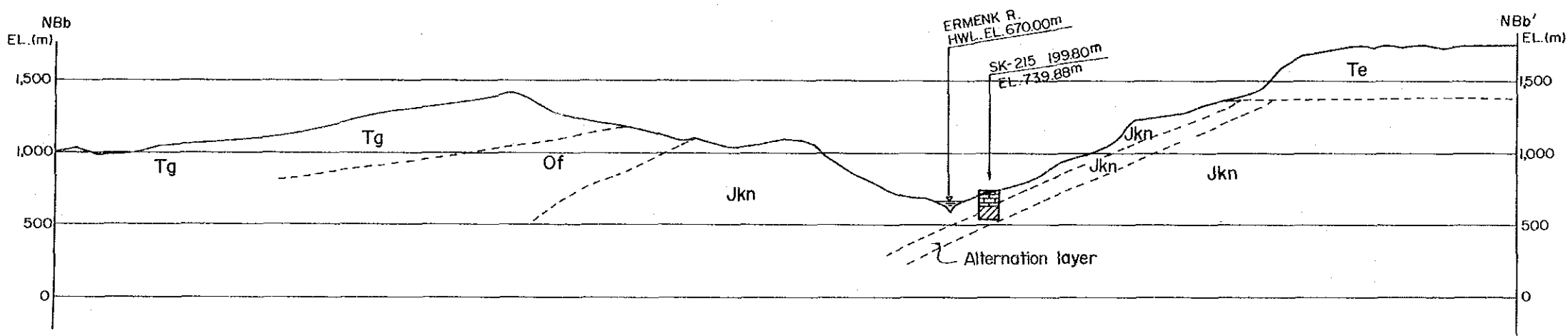
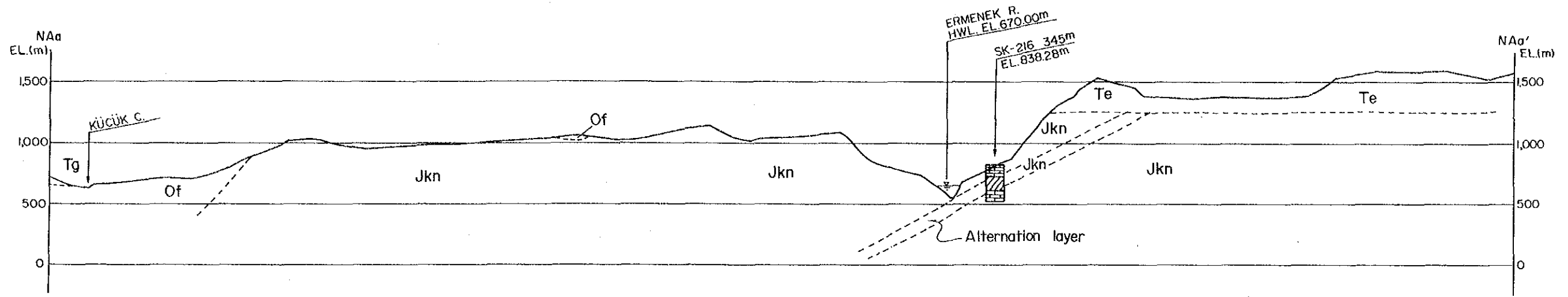
QUATERNARY	ALLUVIUM	[Qal]	[Qalr]	River bed deposit
			[Qalt]	Talus deposit
			[Qrt]	Terrace deposit
TERTIARY	MIDDLE MIOCENE	[Te]	ERMENEK FORMATION (Mainly chalky limestone.)	
	LOWER MIOCENE	[Ty]	GÖRMEL FORMATION (Marl, sandstone, conglomerate, limestone.)	
CRETACEOUS	UPPER CRETACEOUS	[Ofm]	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)	
	LOWER CRETACEOUS	[Jkc]	ÇİHANCI FORMATION (Limestone.)	
JURASSIC			ALADAĞ GROUP	
TRIASSIC	UPPER TRIASSIC	[Ütb]		

ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	[Of]	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentinitized peridotite, gabbro, etc.)	
		[Jkn]	NADIRE FORMATION	
JURASSIC		[Ja]	AZİTEPE FORMATION	
TRIASSIC	UPPER TRIASSIC	[Trk]	KÜRÜRCE FORMATION	
		[Trctt]	TAŞDIBİ FORMATION	CİPENE GROUP
		[Trcta]		
PERMIAN		[Pces]	ESKİCE FORMATION	GÖRÇEŞEKİ FORMATION
		[Pca]		
		[Pcep]		
CARBONIFEROUS		[Kcb]	BALKUSAN FORMATION	NİSA FORMATION

Blocks (Mostly limestones.)

	THE REPUBLIC OF TURKEY ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ	ERMENEK HYDROELECTRIC POWER DEVELOPMENT PROJECT	TITLE G25 Geological Profile of Backwater Area (2/3)
		JAPAN INTERNATIONAL COOPERATION AGENCY	



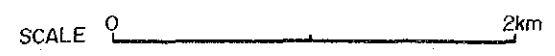
GEOLOGY OF THE PROJECT AREA

QUATERNARY	ALLUVIUM	Qal	Qalr	River bed deposit
			Qalt	Talus deposit
	DILUVIUM	Qlx	Qlxt	Terrace deposit
TERTIARY	MIDDLE MIOCENE	Te	ERMENEK FORMATION (Mainly chalky limestone.)	
	LOWER MIOCENE	Tg	GÖRMEL FORMATION (Marl, sandstone, conglomerate, limestone.)	
CRETACEOUS	UPPER CRETACEOUS	Ofm	ERMENEK OPHIOLITIC MELANGE (Matrix layers and limestone blocks.)	
	LOWER CRETACEOUS	Jkc	ÇİHANDERE FORMATION (Limestone.)	
JURASSIC			ALADAĞ GROUP	
TRIASSIC	UPPER TRIASSIC	ÜTrb		

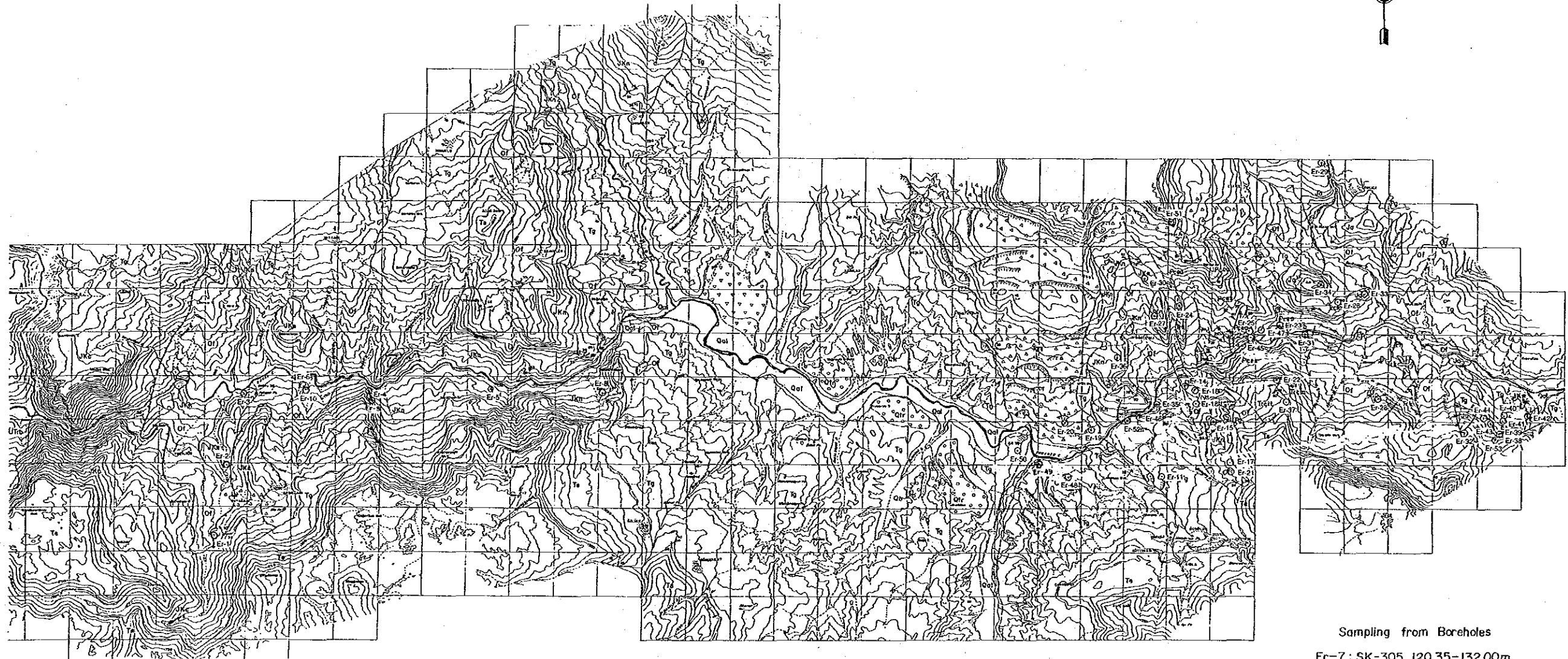
ERMENEK OPHIOLITIC MELANGE

CRETACEOUS	UPPER CRETACEOUS	Of	MATRIX OF MELANGE (Schist, sandstone, conglomerate, diabase, serpentized peridotite, gabbro, etc.)	
		Jkn	NADİRE FORMATION	
JURASSIC		Ja	AZİTEPE FORMATION	
TRIASSIC	UPPER TRIASSIC	Trk	KÜKÜRCE FORMATION	
		Trçtt	TAŞDİBİ MEMBER	
		Trçta	ARDIÇLI MEMBER	
		Pçes	SARIBAYIR MEMBER	
PERMIAN		Pçea	AKARCA MEMBER	
		Pçep	PÜRELİCENİN MEMBER	
CARBONIFEROUS		Kçb	BALKUSAN FORMATION	

ÇİMENE GROUP (Mostly limestone.)



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Sampling from Boreholes
Er-7 : SK-305, 120.35-132.00m
Er-12 : SK-219, 74.50-76.65m
Er-13 : SK-219, 63.00-72.00m

SCALE 0 5,000m

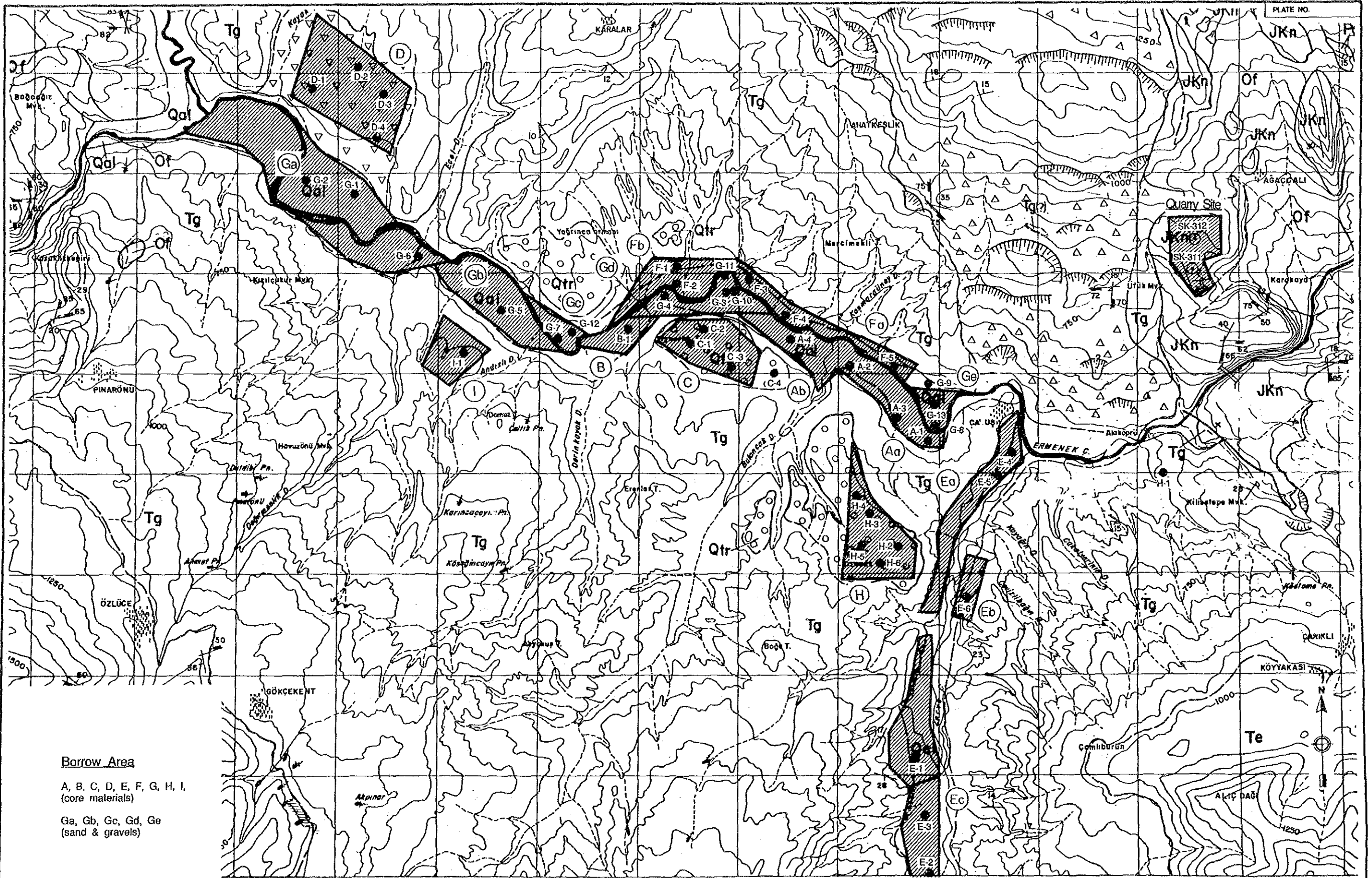


THE REPUBLIC OF TURKEY
ELEKTRİK İŞLERİ ETÜD İDARESİ
GENEL MÜDÜRLÜĞÜ

ERMENEK HYDROELECTRIC POWER
DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE **G26**
**Sampling Location
for Micropaleontological
and Mineralogical Study**



Borrow Area

A, B, C, D, E, F, G, H, I,
(core materials)

Ga, Gb, Gc, Gd, Ge
(sand & gravels)

SCALE 0 2km



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TITLE G27
Location Map
of Borrow Area and
Quarry Site