

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

ULAANBAATAR MUNICIPALITY
THE GOVERNMENT OF MONGOLIA

**THE STUDY ON WATER SUPPLY SYSTEM
IN
ULAANBAATAR AND SURROUNDINGS
FINAL REPORT
VOLUME V
DRAWINGS**

JUNE 1995

PACIFIC CONSULTANTS INTERNATIONAL
MITSUI MINERAL DEVELOPMENT ENGINEERING CO., LTD.

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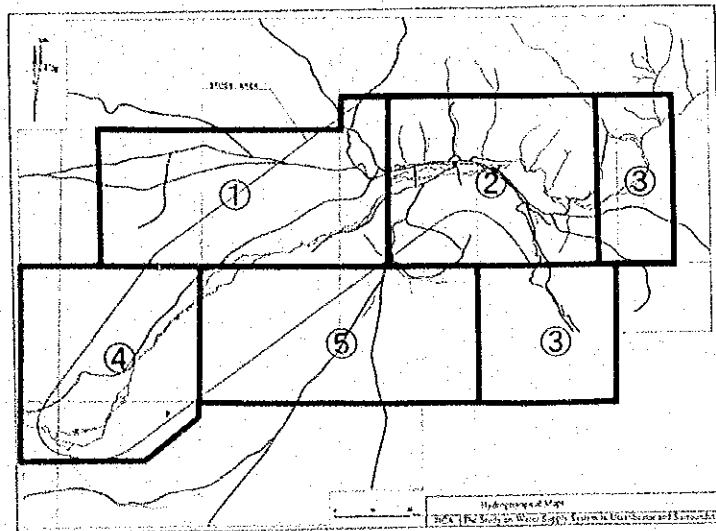
**THE STUDY ON WATER SUPPLY SYSTEM
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CONTENTS

	Sheet No.
Fig. I.1 Hydrogeological Map ①	1
Fig. I.2 Hydrogeological Map ②	2
Fig. I.3 Hydrogeological Map ③	3
Fig. I.4 Hydrogeological Map ④	4
Fig. I.5 Hydrogeological Map ⑤	5
 Inventory of Exploration Boreholes and JICA Test Wells	 6
Fig. II.1 Schematic Geological Profiles (Upper Water Source, Central Water Source)	7
Fig. II.2 Schematic Geological Profiles (Lower Part of Power Plant, Buheg River)	8
Fig. II.3 Schematic Geological Profiles of Lower Part of Nalaih	9
 Fig. III.1 Drillhole Logs of JICA Test Wells (A-1, A-2, A-3, A-4, B-1, B-2, B-3)	 10
Fig. III.2 Drillhole Logs of JICA Test Wells (C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8)	11
 Fig. IV.1 Groundwater Table in the Central Area (Sep. 1993)	 12
Fig. IV.2 Groundwater Table in the Central Area (Apr. 1994, Sep. 1994)	13
 Fig. V Recorded Groundwater Levels and Rainfall	 14
 Fig. VI Geological Map	 15
 Quality of Groundwater	 16
 Quality of River Water	 17



LEGEND

<p>1. Highly productive aquifers</p> <p>Quaternary L gravelly deposits recent river deposit along Tuul River--- sand and rounded gravel with clay</p>		<p>Geological boundary Fault Concealed fault Inferred fault Anticlinal axis Synclinal axis Main surface water divide Secondary surface water divide</p>
<p>2. Locally Productive aquifers</p> <p>Quaternary FD arenaceous deposits Alluvial fan, talus, terrace deposit--- clay, sand and pebble to boulder(sub-rounded to sub-angular) (Fissured aquifers may occur along a fault)</p>		
<p>3. Local and limited groundwater resources</p> <p>Tertiary N argillaceous deposits hill--- reddish clay and sand with pebble to cobble(sub-rounded to angular)</p> <p>Cretaceous K sandstone hill---porous sandstone and sandstone with coal/fossil</p>		
<p>4. Strata with essentially no groundwater resources</p> <p>Permian Pre-Cambrian base basement rocks mountain---sandstone, shale, slate, chert, granites</p>		

<p>JICA Test Wells</p> <p>Well No./Depth(m) Static water level(C.L.-m), Specific capacity(m³/day/m), TDS(g/l)</p>	<p>Exploration wells for previous studies</p> <p>Well No./Depth(m) Static water level(C.L.-m), Specific capacity(m³/day/m), TDS(g/l)</p>
<p>Flowing well</p> <p>Production Wells for Water Supply System of Ulaanbaatar and Power Plants</p> <p>Observation wells installed water level recorder</p> <p>Stream gauging station</p>	<p>Mean annual runoff(m³/s) Catchment area(Km²)</p>

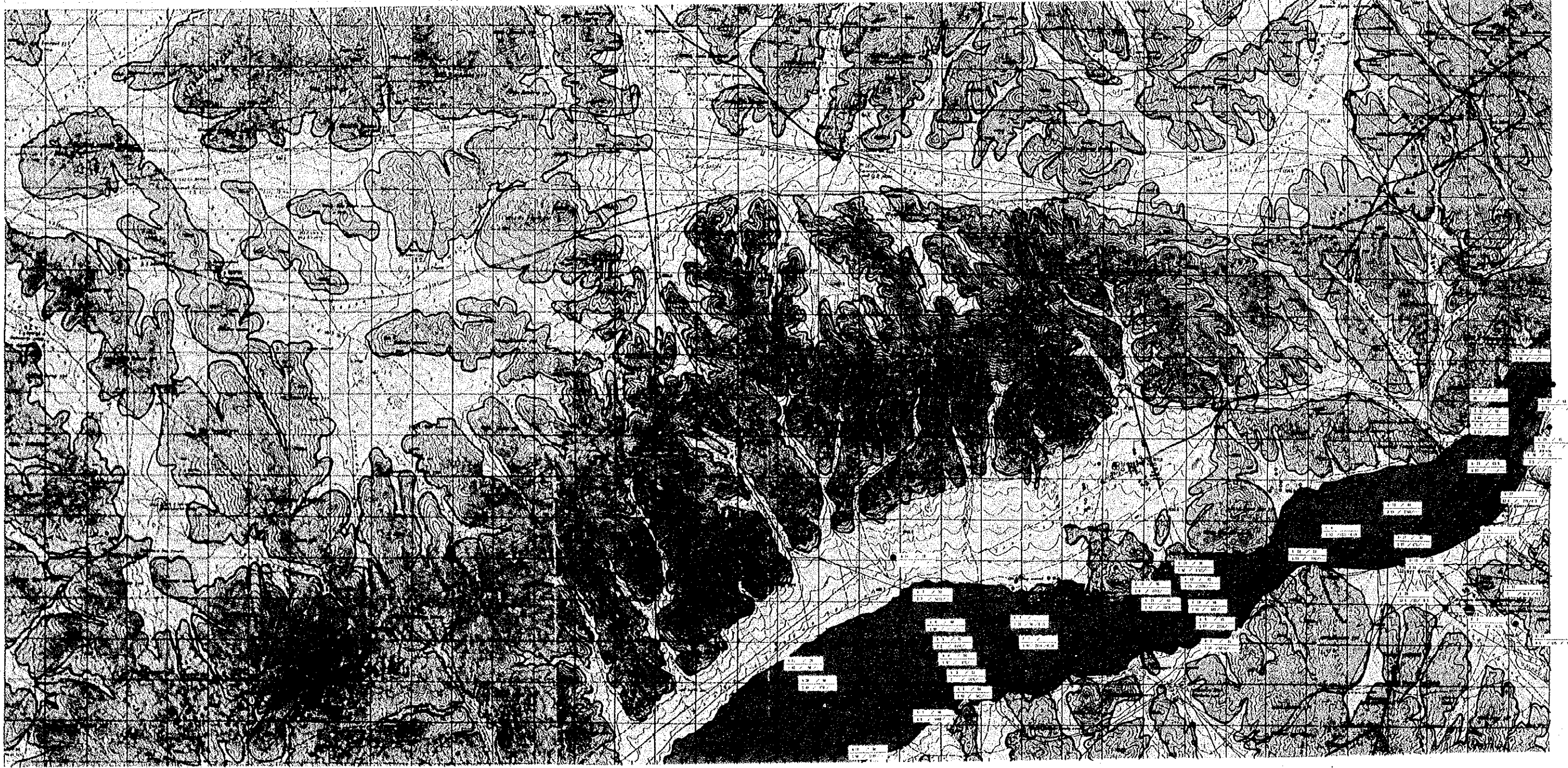
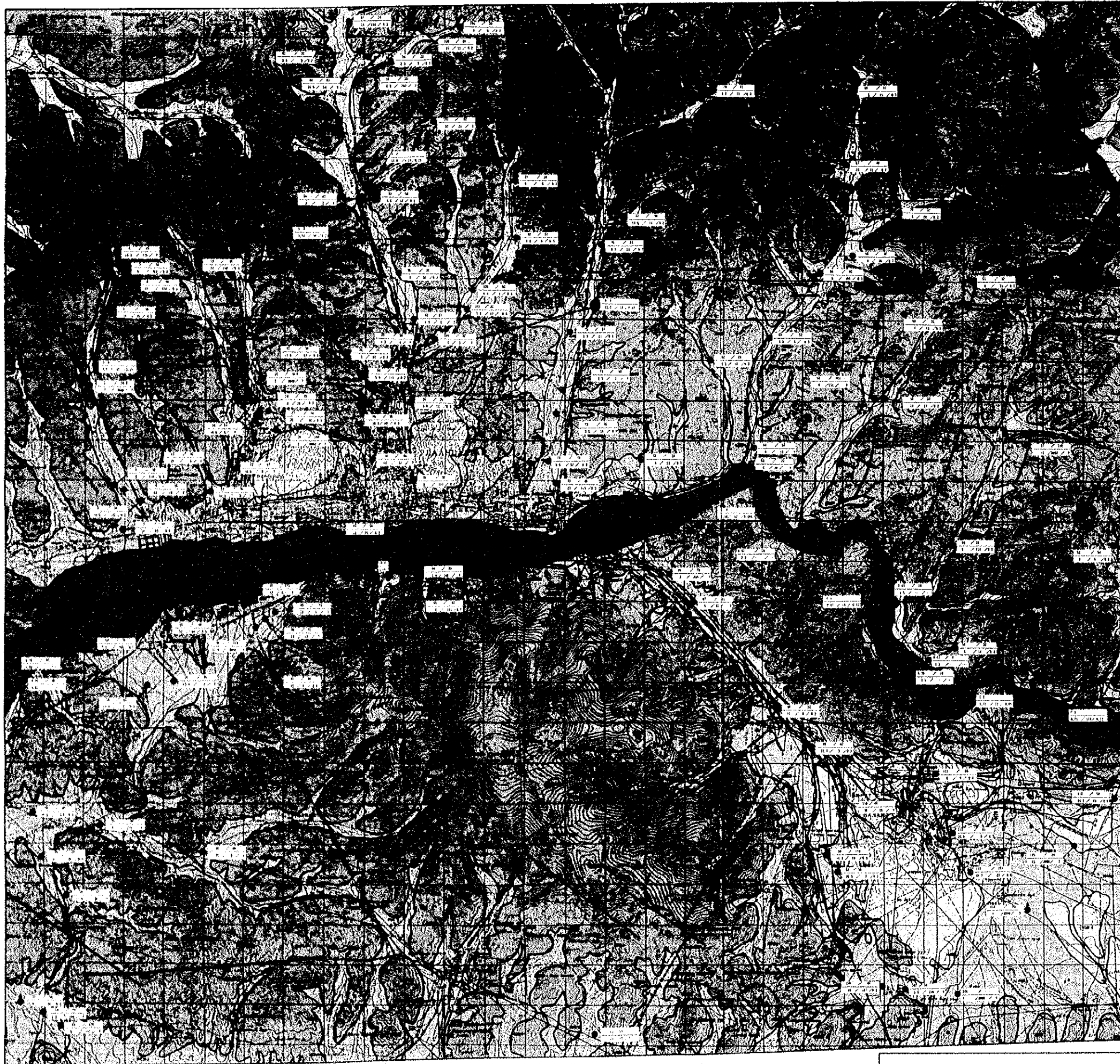


Fig. I.1 Hydrogeological Map ①
 JICA The Study on Water Supply System in Ulaanbaatar and Surroundings

1/100,000 0 5 10 (km)



LEGEND

1. Highly productive aquifers

Quaternary gravelly deposits recent river deposit along Iului River--- sand and rounded gravel with clay

2. Locally Productive aquifers

Quaternary arenaceous deposits Alluvial fan, talus, terrace deposit--- clay, sand and pebble to boulder (sub-rounded to sub-angular) (if assured aquifers may occur along a fault)

3. Local and limited groundwater resources

Tertiary argillaceous deposits hill--- reddish clay and sand with pebble to cobble (sub-rounded to angular)

Cretaceous sandstone hill---porous sandstone and rudstone with coal/forest

4. Strata with essentially no groundwater resources

Permian basement rocks mountain---sandstone, shale, slate, chert, granites

Pre-Cambrian basement rocks mountain---sandstone, shale, slate, chert, granites

Geological boundary

Fault

Controlled fault

Inferred fault

Anticlinal axis

Synclinal axis

Main surface water divide

Secondary surface water divide

JICA Test Wells

Well No./Depth(m)
 Static water level (G.L. - m), Specific capacity (m³/day/m), TDS (g/l)

Exploration wells for previous studies

Well No./Depth(m)
 Static water level (G.L. - m), Specific capacity (m³/day/m), TDS (g/l)

Flowing well

Production Wells for Water Supply System of Ulaanbaatar and Power Plants

Observation wells - installed water level recorder

Stream gauging station Mean annual runoff (m³/s) Catchment area (km²)

Fig. 1.2 Hydrogeological Map ②

1:100,000 0 5 10 (Km)

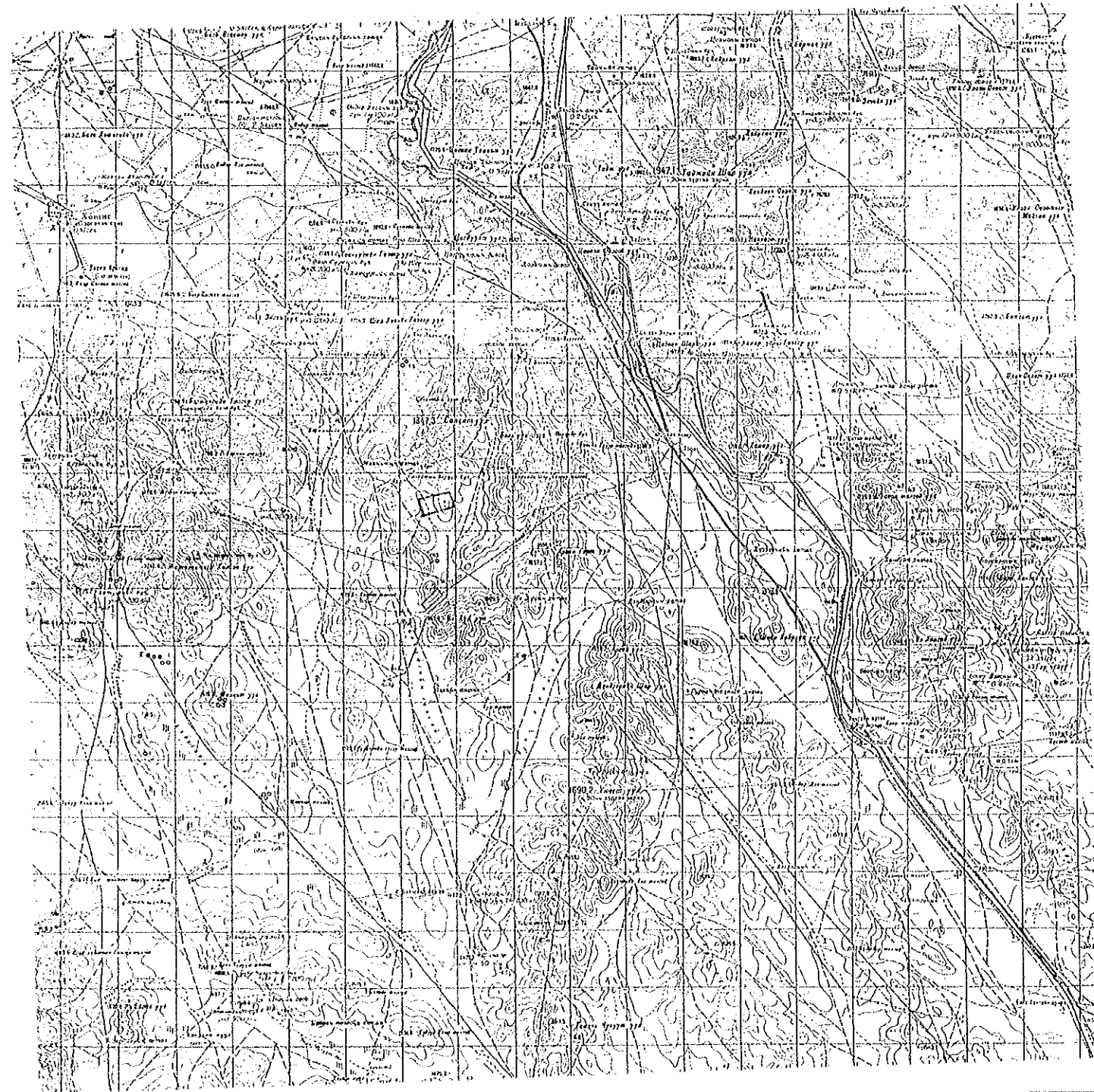
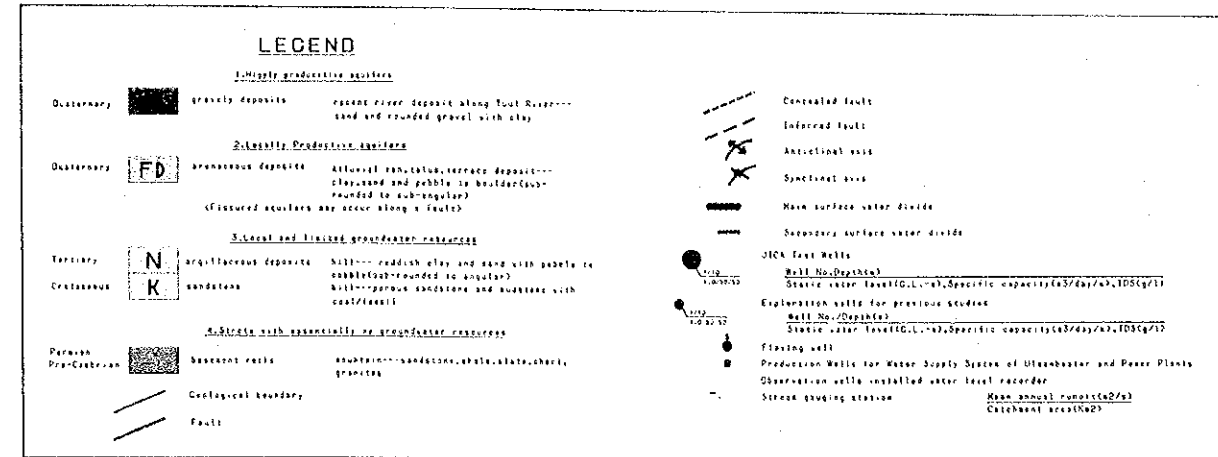
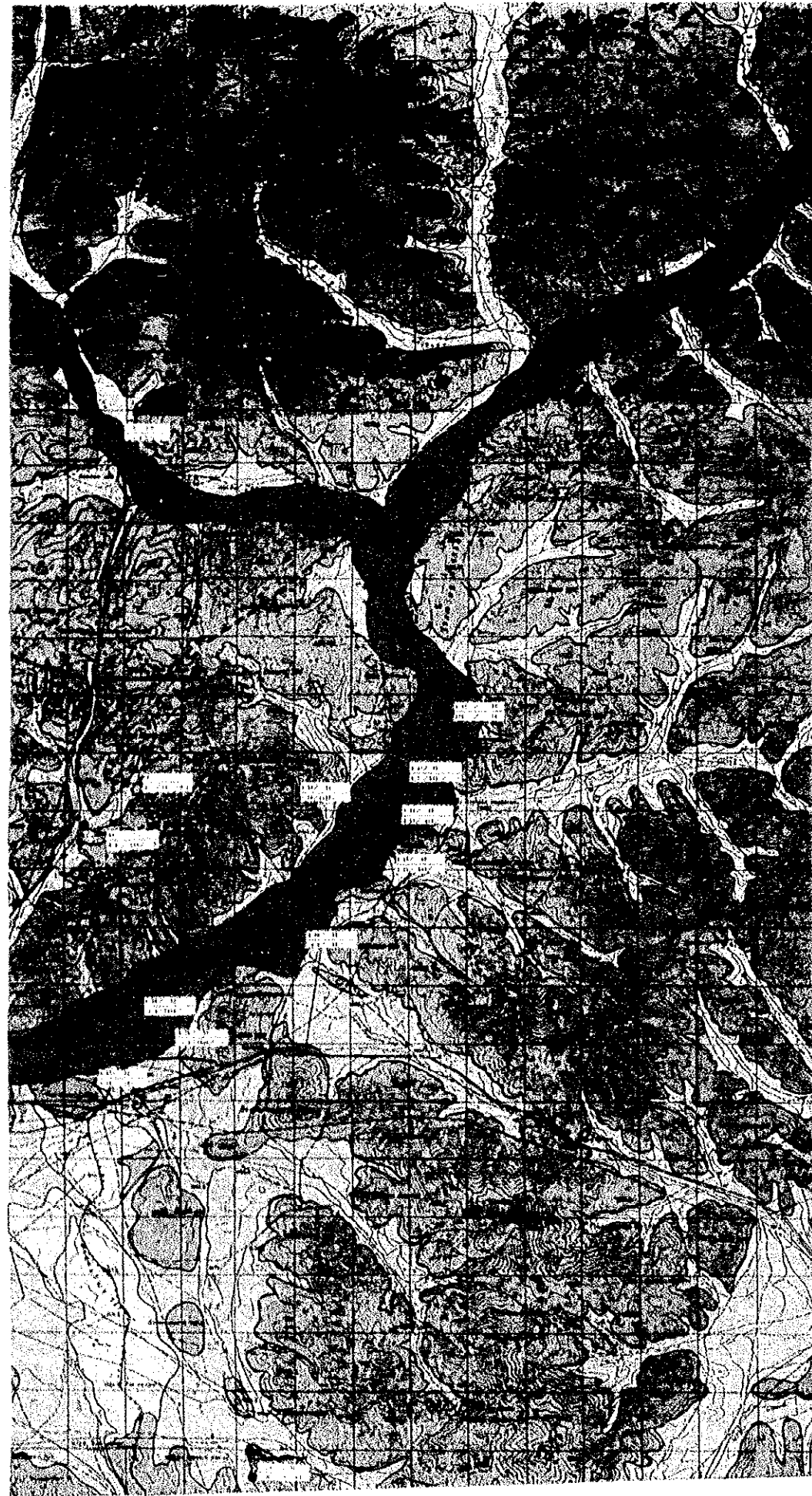
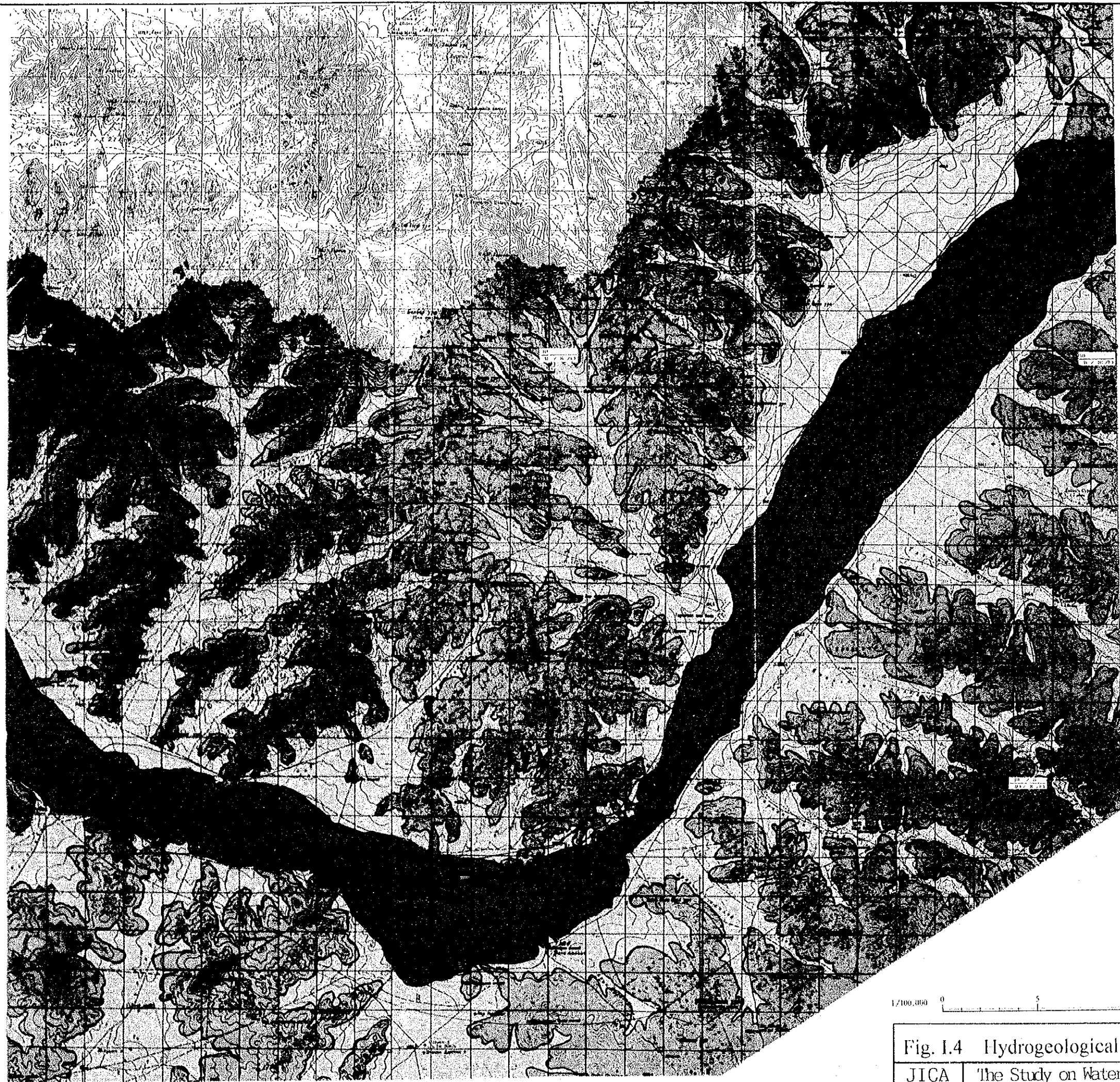


Fig. I.3 Hydrogeological Map ③
 JICA 'The Study on Water Supply System' in Ulaanbaatar and Surroundings

1/100,000 0 5 10 (km)



LEGEND

1. Highly productive aquifers

Quaternary gravelly deposits recent river deposit along Iud River--- sand and rounded gravel with clay

2. Locally productive aquifers

Quaternary arenaceous deposits Alluvial facies, terrace deposits--- clay, sand and pebbles or boulder(sub-rounded to sub-angular) (fractured aquifers may occur along a fault)

3. Local and limited groundwater resources

Tertiary argillaceous deposits silt--- reddish clay and sand with pebbles or rubble(sub-rounded to angular)

Cretaceous sandstone silt--- porous sandstone and mudstone with coal/lignite

4. Strata with essentially no groundwater resources

Permian basement rocks mountain--- sandstone, shale, slate, chert, granites

Pre-Cambrian basement rocks mountain--- sandstone, shale, slate, chert, granites

Geological boundary

Fault

Concealed fault

Inferred fault

Anticline axis

Synclinal axis

Main surface water divide

Secondary surface water divide

JICA Test Wells

Well No./Depth(m) Static water level(G.L.-m), Specific capacity(m³/day/m), ISG(m³)

Exploration wells for previous studies

Well No./Depth(m) Static water level(G.L.-m), Specific capacity(m³/day/m), ISG(m³)

Floating well

Production Wells for Water Supply System of Ulaanbaatar and Pover Plains

Observation wells installed water level recorder

Stream gauging station Mean annual runoff(m³/s) Catchment area(km²)

1/100,000 0 5 10 (Km)

Fig. I.4 Hydrogeological Map ④
 JICA The Study on Water Supply System in Ulaanbaatar and Surroundings

LEGEND

1. Highly productive aquifers			
Quaternary	gravelly deposits	recent river deposits along Inud River--- sand and rounded gravel with clay	
2. Locally Productive aquifers			
Quaternary	arenaceous deposits	Alluvial fan, talus, terrace deposits--- clay, sand and pebble to boulder (sub- rounded to sub-angular) (fractured aquifers may occur along a fault)	
3. Local and limited groundwater resources			
Tertiary	argillaceous deposits	hill--- reddish clay and sand with pebble to pebble (sub-rounded to angular)	
Cretaceous	sandstone	hill--- porous sandstone and mudstone with coal/fossil	
4. Strata with essentially no groundwater resources			
Permian	basement rocks	mountain--- sandstone, shale, slate, siltstone, granites	
Pre-Cambrian			
Geological boundary			
Fault			
		Concealed fault	
		Inferred fault	
		Anticlinal axis	
		Synclinal axis	
		Main surface water divide	
		Secondary surface water divide	
		JICA Test Wells	
		Well No./Depth(m)	
		Static water level (G.L. - m), Specific capacity (m ³ /day/m), 100 (g/l)	
		Exploration wells for previous studies	
		Well No./Depth(m)	
		Static water level (G.L. - m), Specific capacity (m ³ /day/m), 100 (g/l)	
		Floating well	
		Production Wells for Water Supply System of Ulaanbaatar and Power Plants	
		Observation wells installed water level recorder	
		Stress gauging station	Mean annual runoff (m ³ /s) Catchment break (km ²)

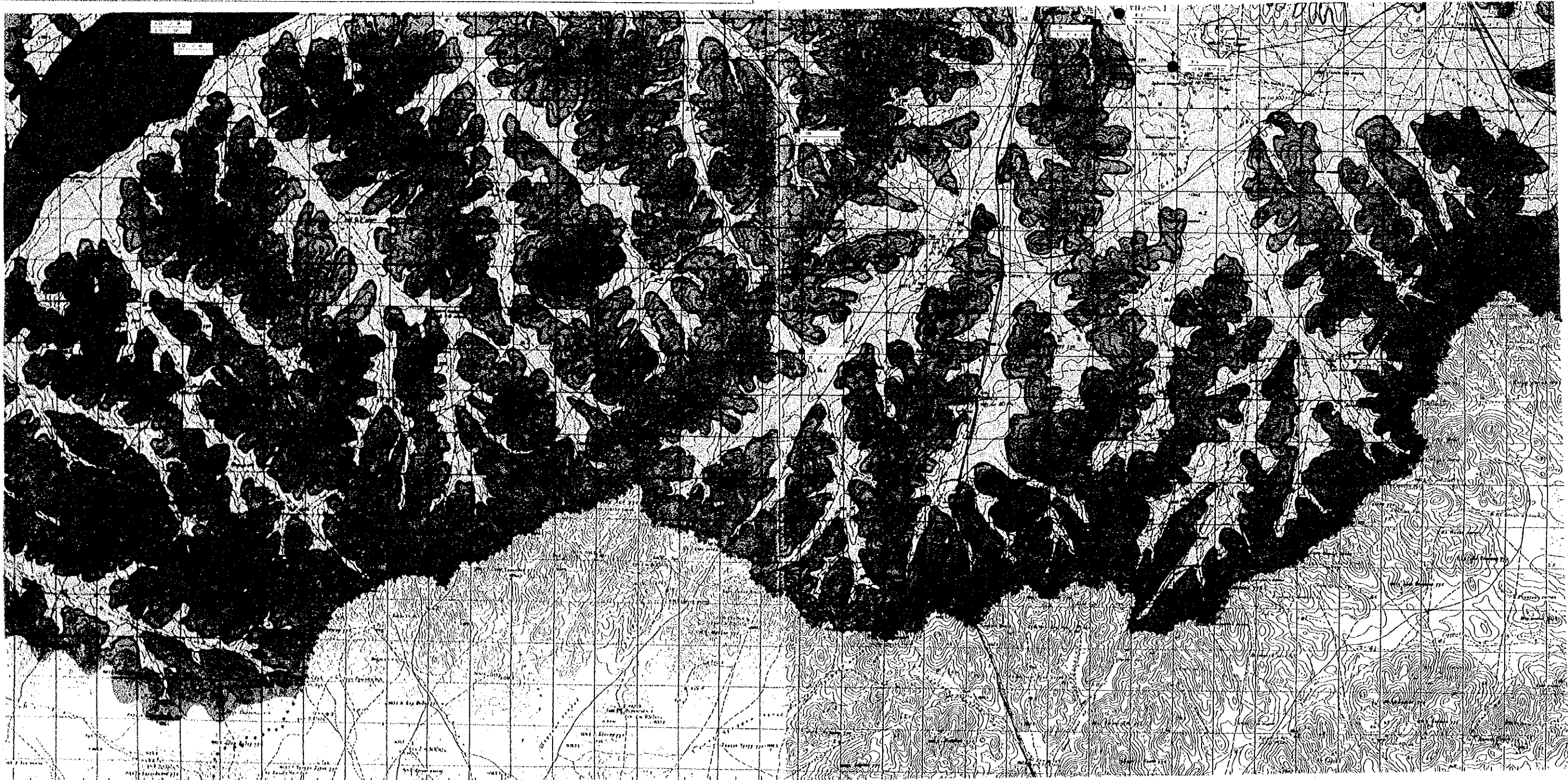
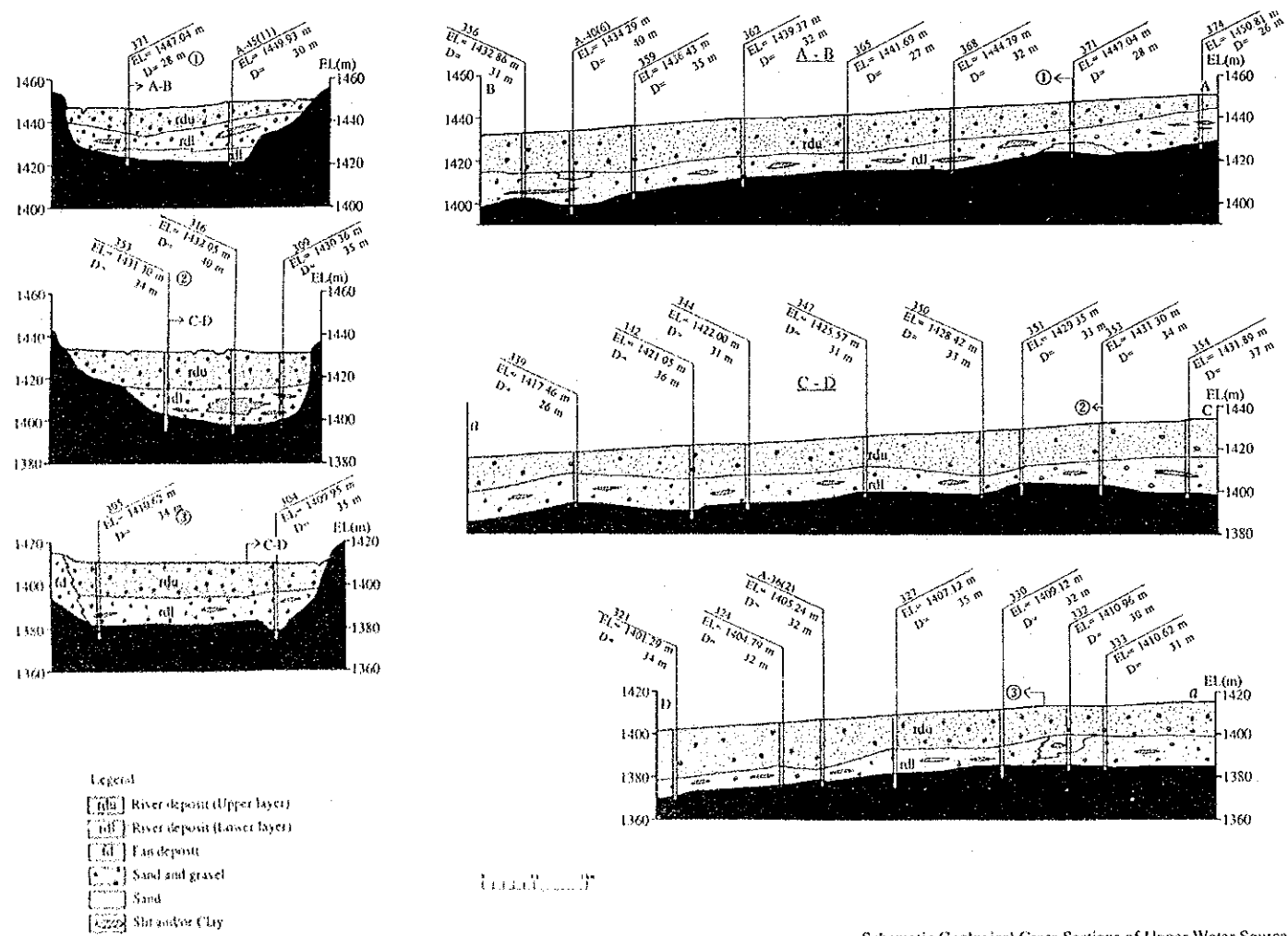
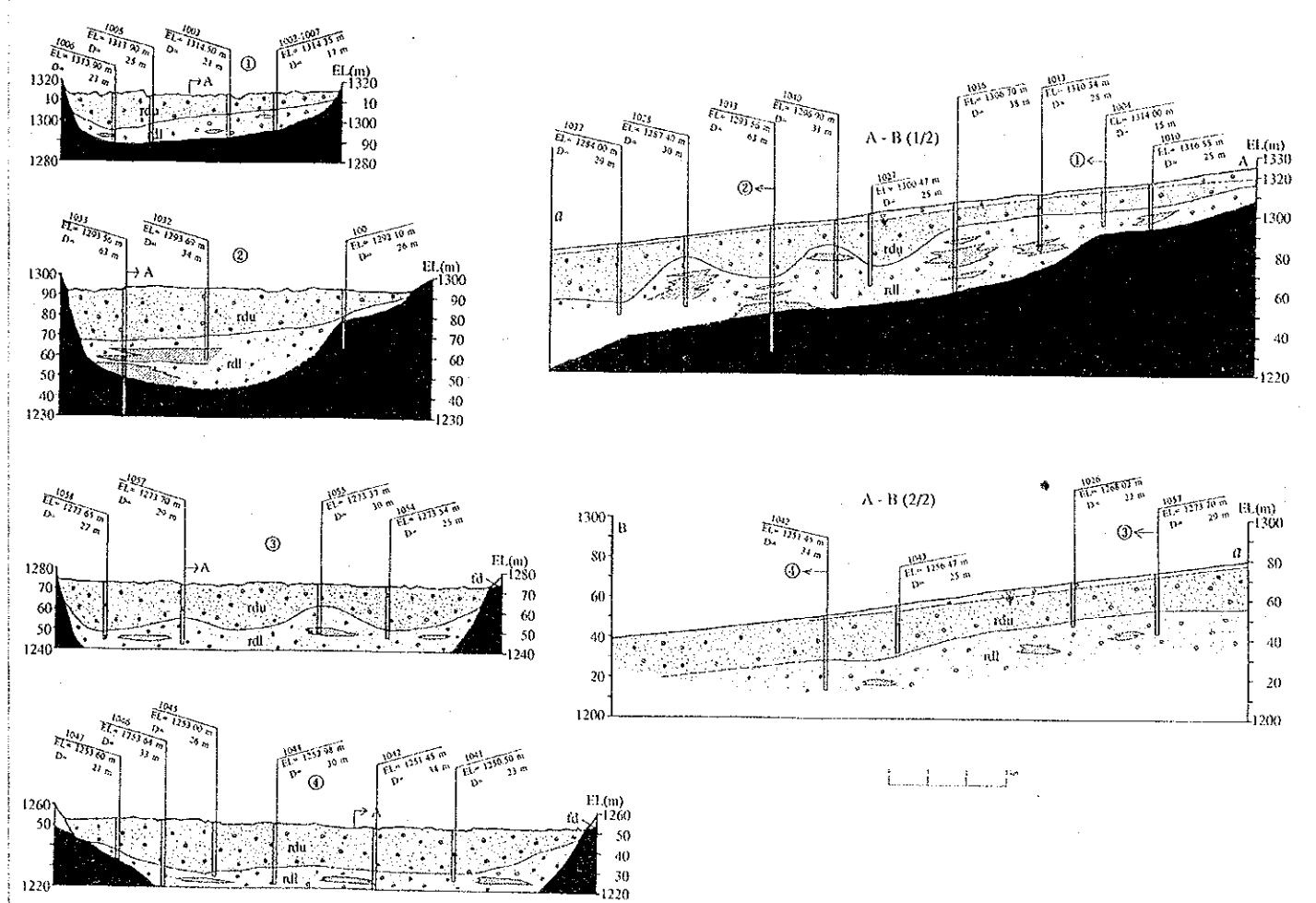


Fig. 1.5 Hydrogeological Map ⑤
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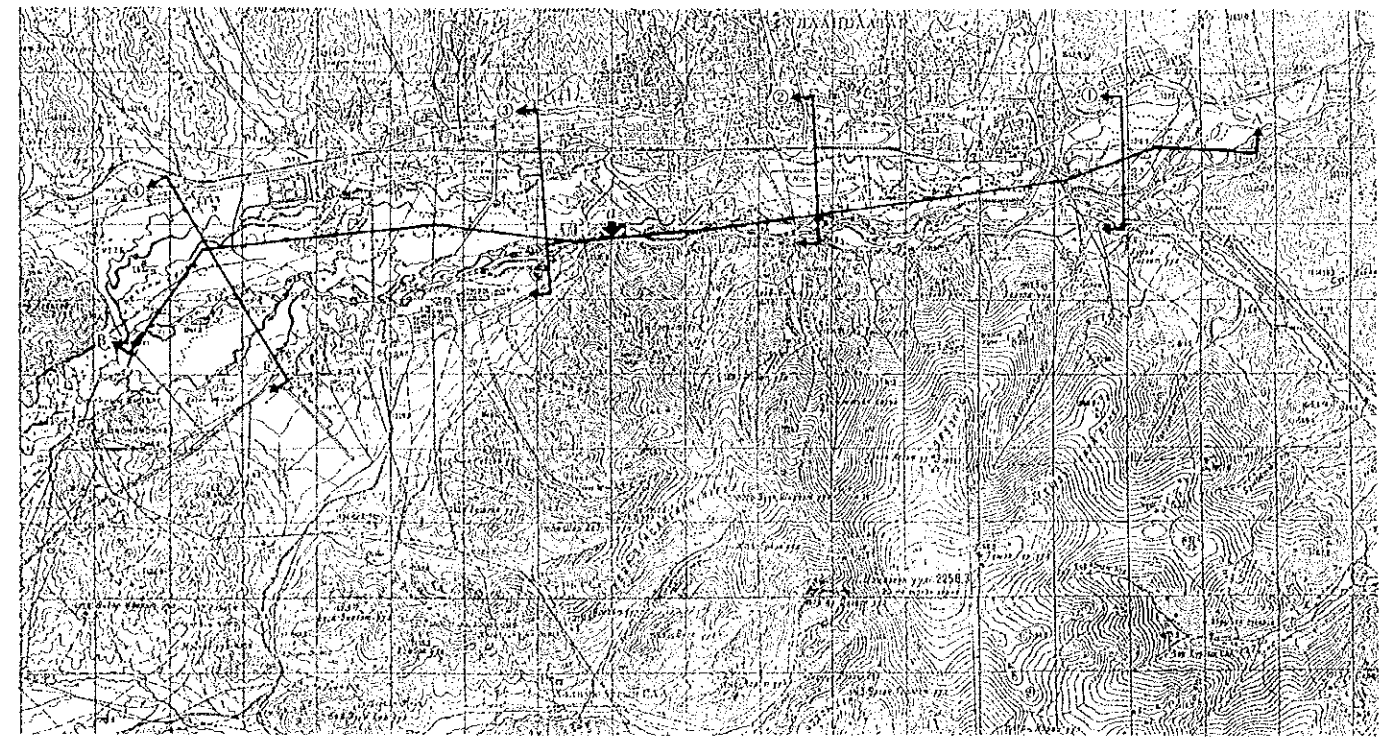
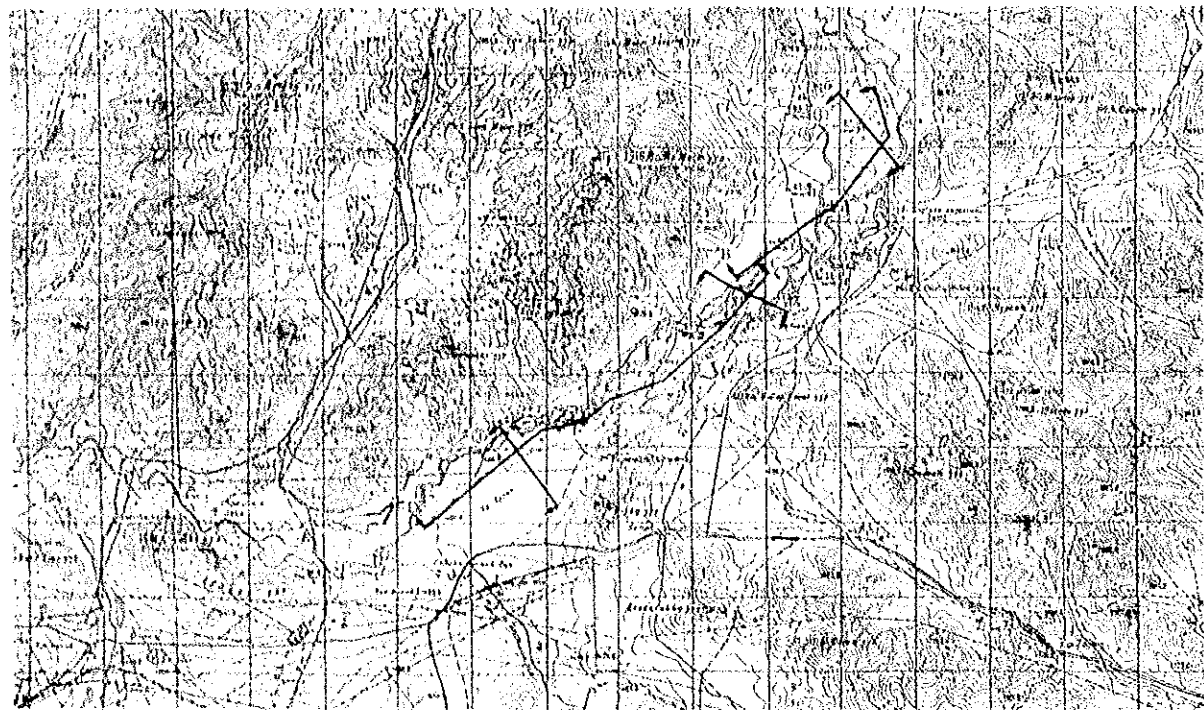
1/100,000 0 5 10 (km)



Schematic Geological Cross Sections of Upper Water Source



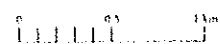
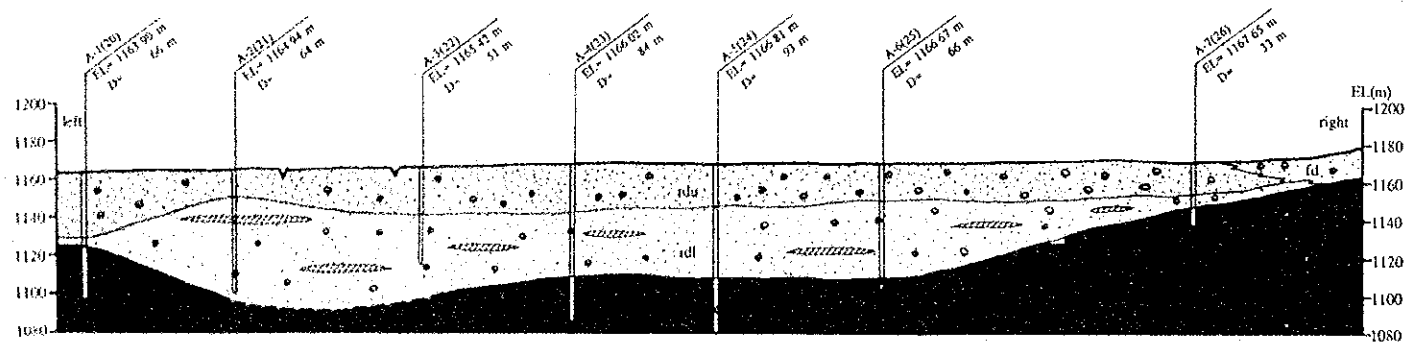
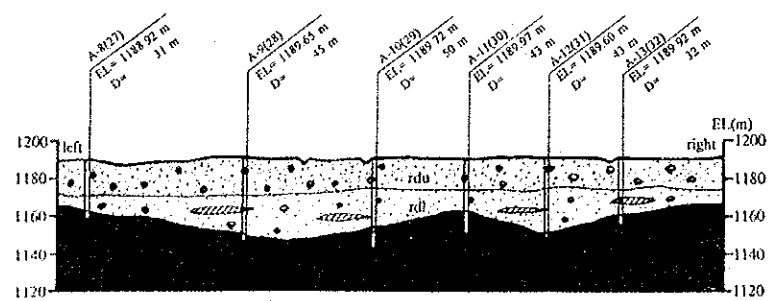
Schematic Geological Cross Sections of Central Water Source



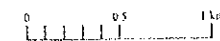
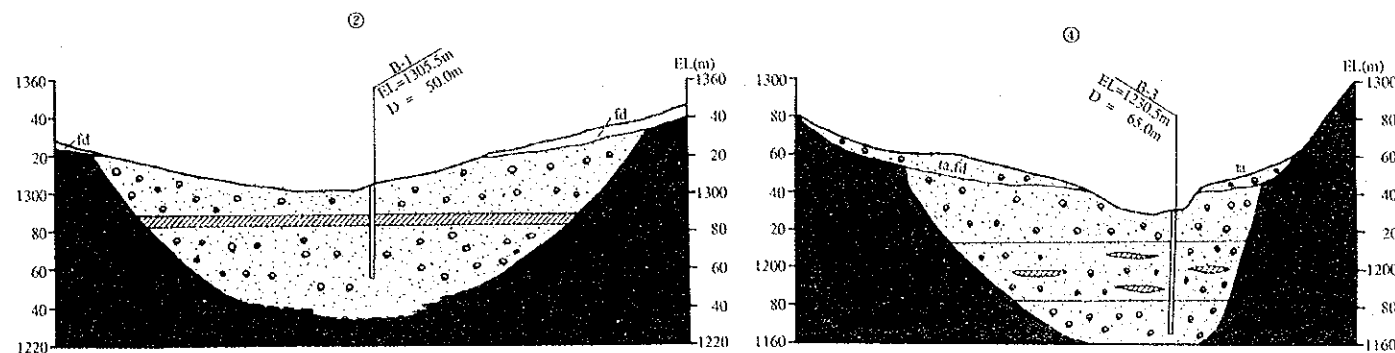
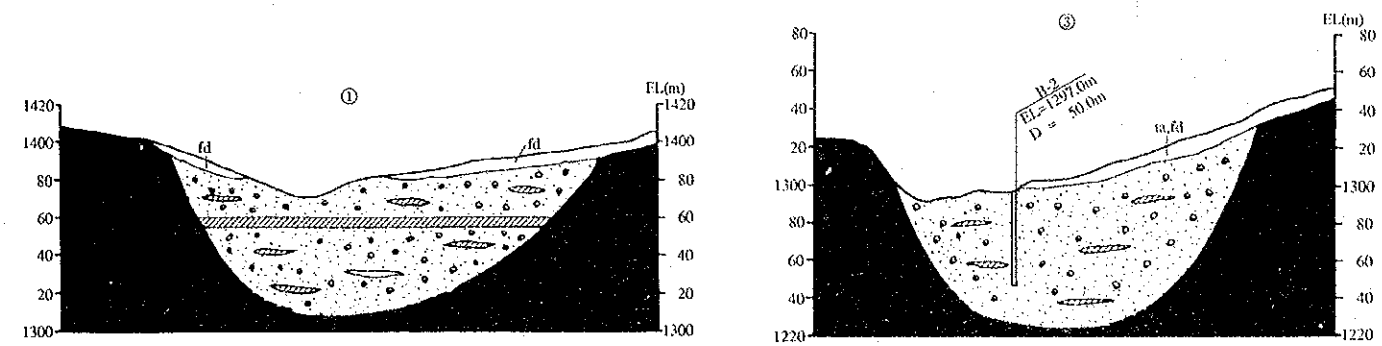
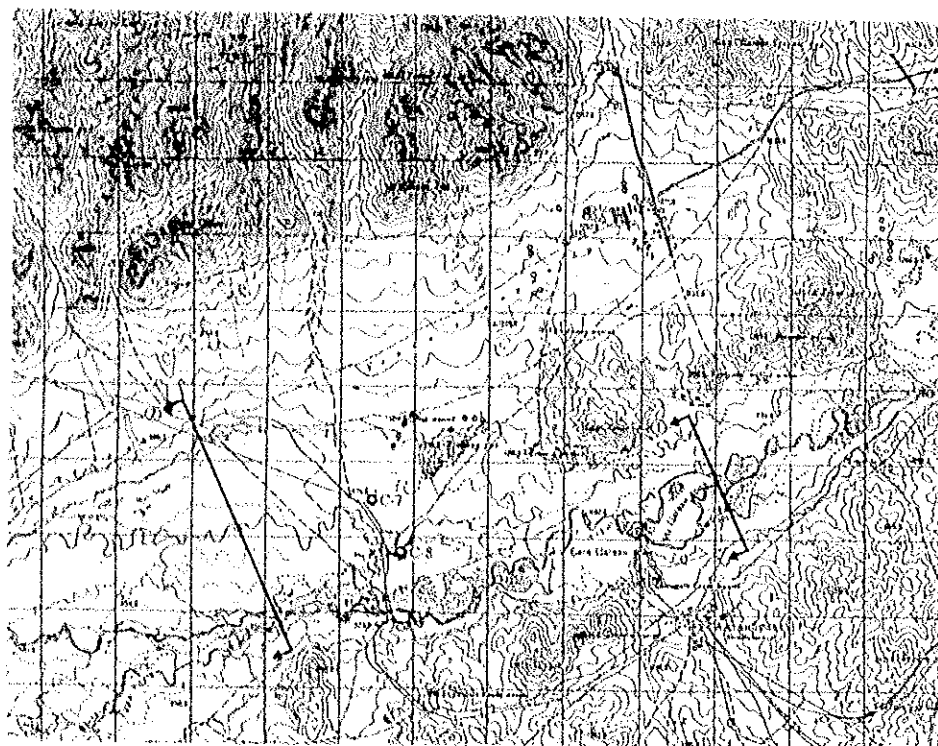
1/100,000 0 1 2 3 4 5 km

Fig. II.1 Schematic Geological Profiles

(Upper Water Source, Central Water Source)



Schematic Geological Cross Section of Lower Part of Power Plant



Schematic Geological Cross Sections of Buheg River

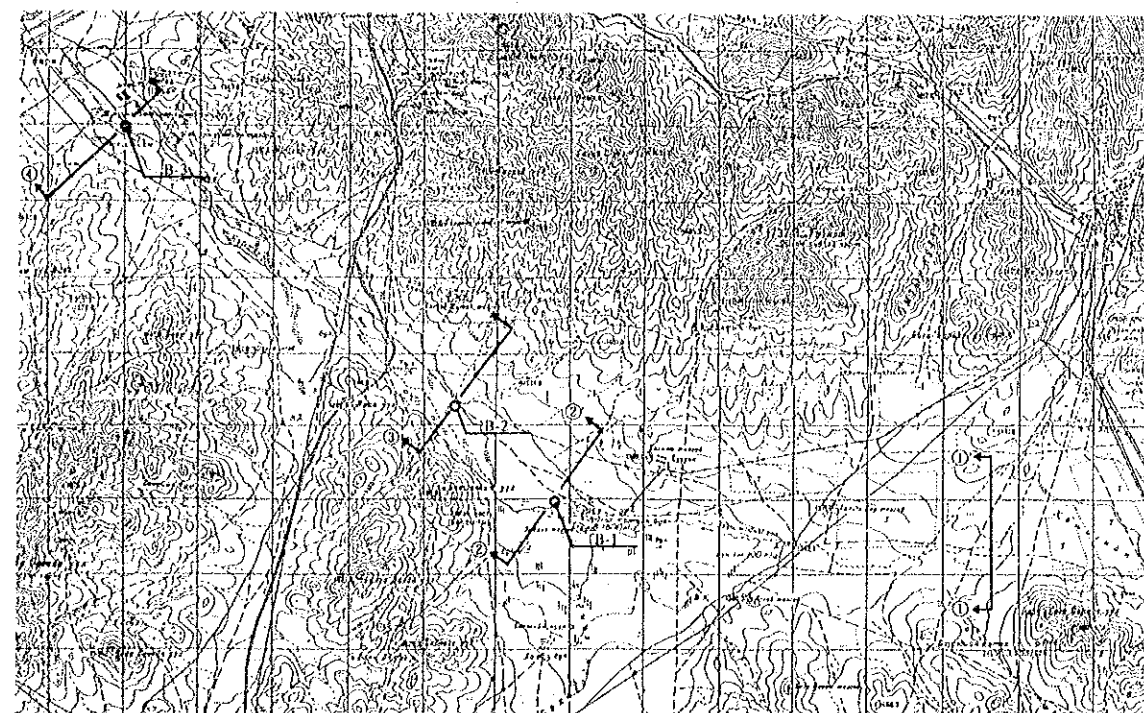
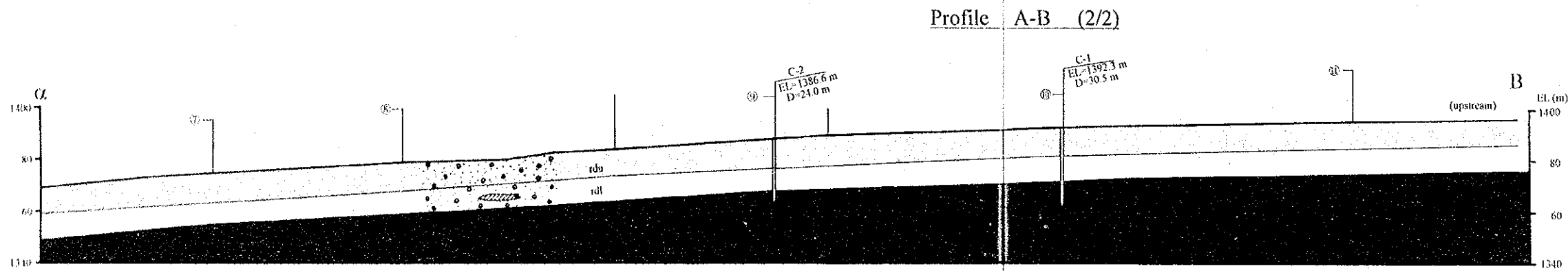
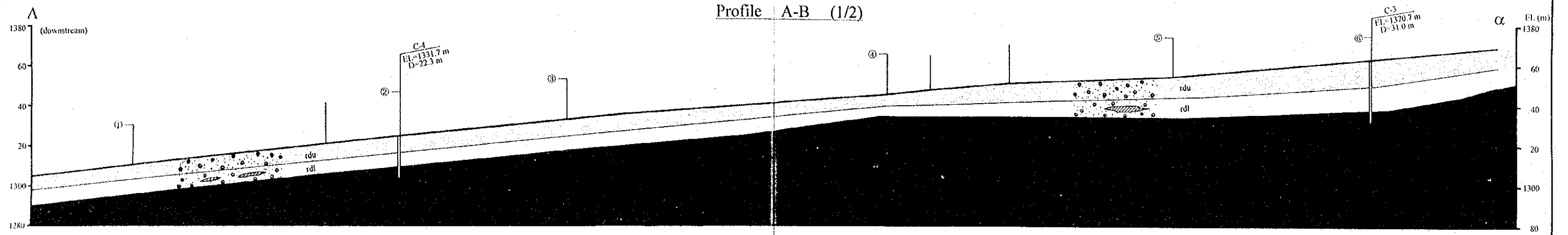
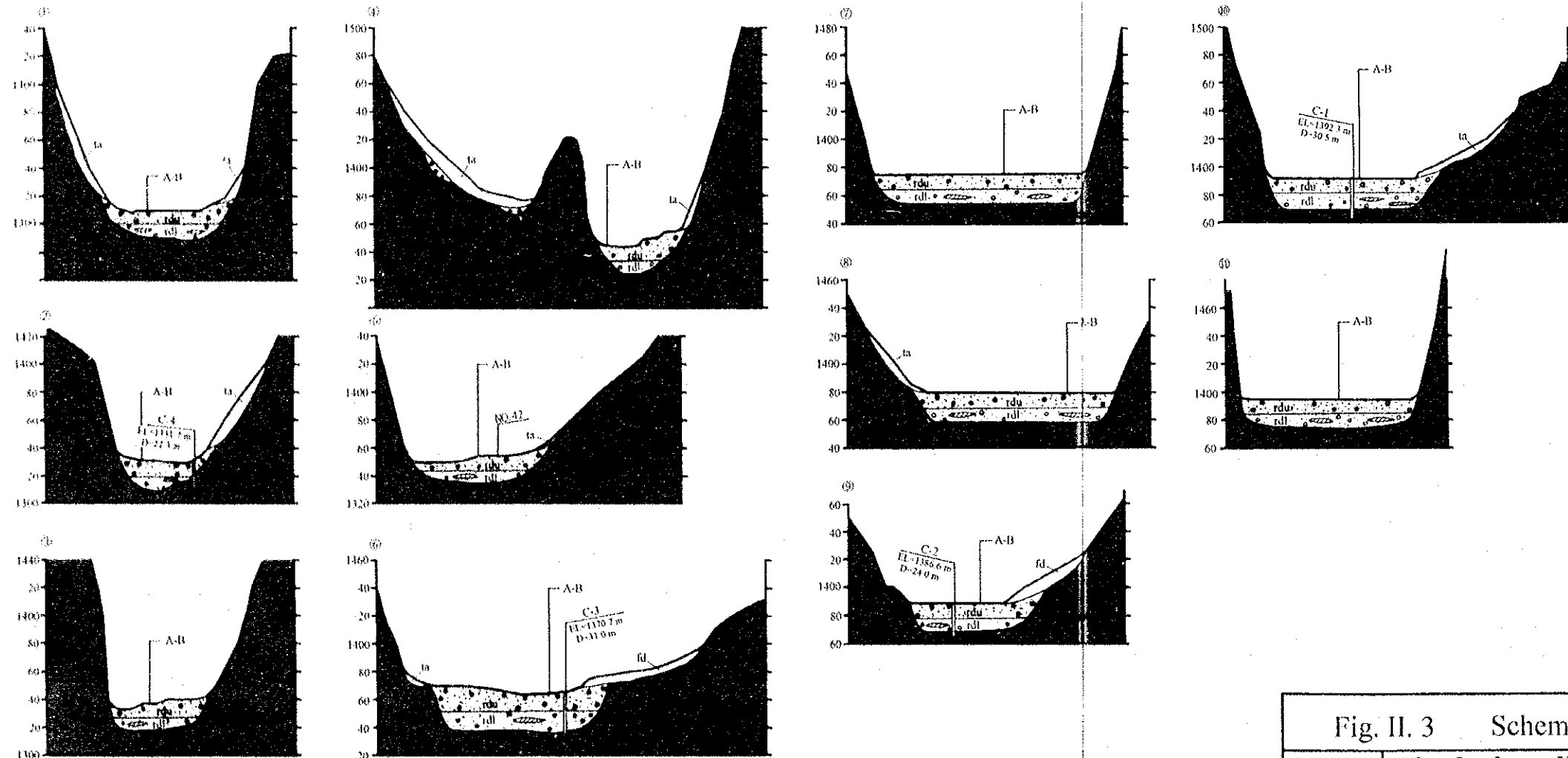


Fig. II.2 Schematic Geological Profiles

(Lower Part of Power Plant, Buheg River)



Cross sections (①~⑩)



- LEGEND
- rdu River deposit (Upper layer)
 - rdl River deposit (Lower layer)
 - ta Talus deposit
 - fd Fan deposit
 - Sand and gravel
 - Sand
 - Silt and/or clay

0 0.5 1.0 2.0 km

Fig. II. 3 Schematic Geological Profiles of Lower Part of Nalaih
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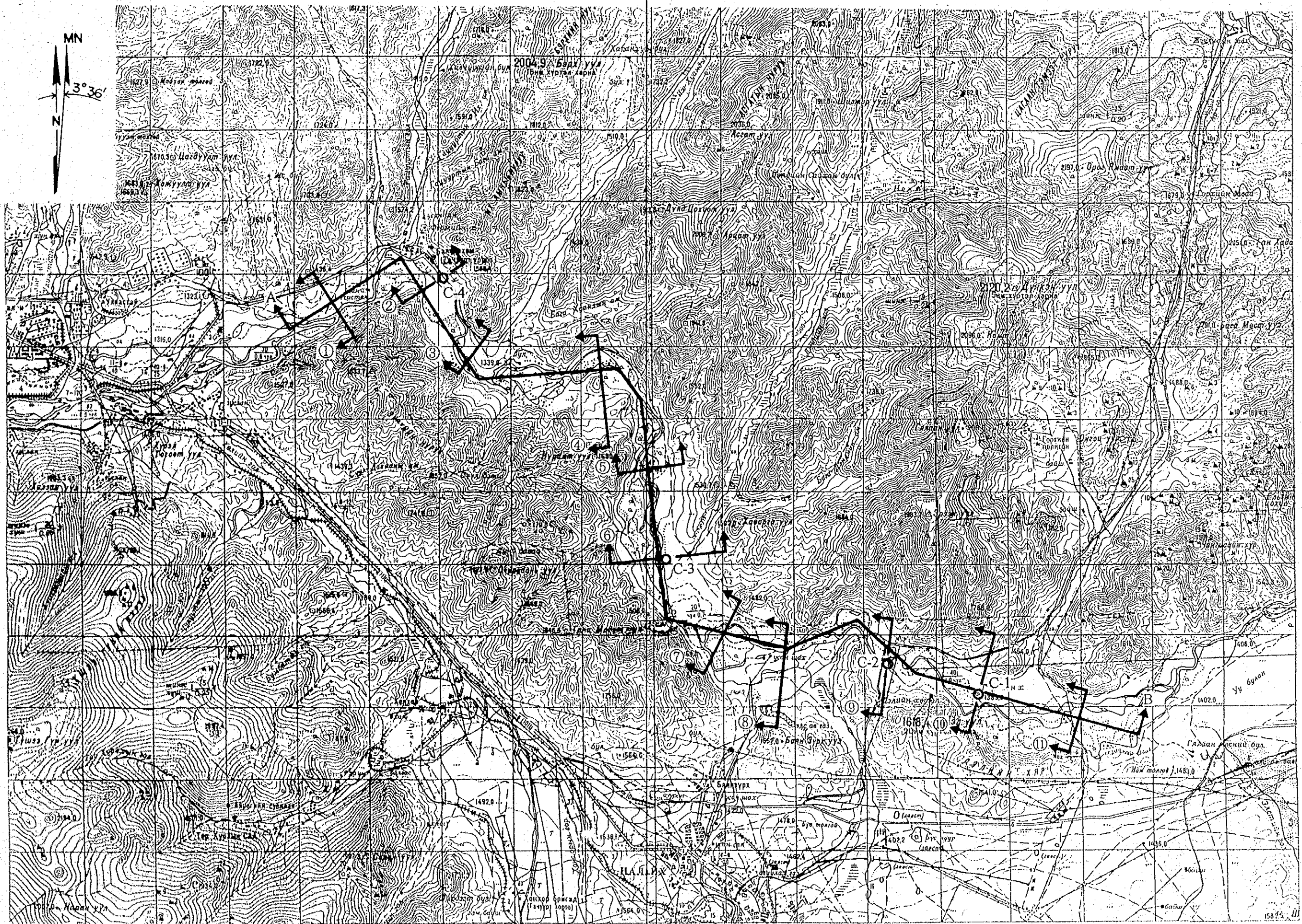


Fig. II.3 ② Lower Part of Nalaih (proposed new water source)