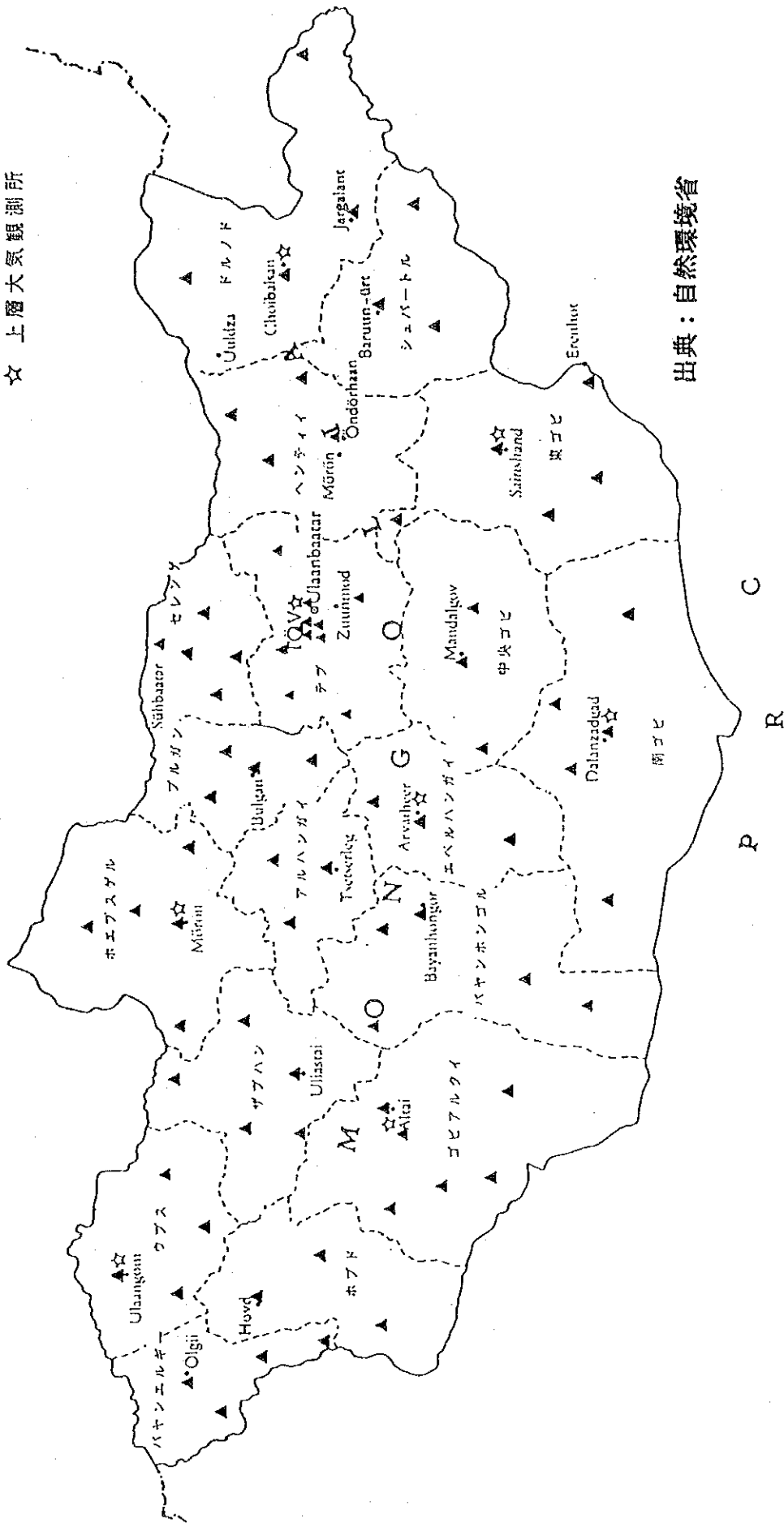


添付資料 6 水 文 関 連

▲ 水文気象観測所
 ☆ 上層大気観測所



出典：自然環境省

図 水文・気象観測所

添付資料 7 地下水関連

GROUND WATER WELLS ("A"STATION)

表 (1/4) 井戸台帳 (中央水源地)

Number of wells	Location of wells	Water flow Qm ³ /h	Diameter (mm)	Depth H(m)	Static level (m)	* Dynamic level (m)		Procurement date
						level (m)	Difference	
I	Main station "A"	58.3	357	22.5	8.98	9.5	0.5	1961
2		50.0	357	22.6	13.12	8.4	4.72	1961
3		50.0	255	27.3	9.33	8.8	0.53	1957
4		33.3	255	26.7	10.36	8.5	1.86	1957
5		33.2	255	28.2	10.40	9.7	0.7	1958
6		33.0	255	25.7	11.54	10.1	1.44	1957
7		25.0	357	25.0	12.6	10.0	2.6	1961
8		50.0	357	22.35	13.10	10.0	3.1	1961
9		120.8	408	27.9	13.16	12.0	1.16	1969
10		50.0	408	30.55	8.42	11.0	3.42	1969
11		91.6	408	31.9	7.75	11.0	3.25	1969
12		104.16	408	32.0	17.21	13.0	4.21	1969
13		108.33	408	30.9	12.97	12.0	0.97	1972
14		116.66	408	30.	9.66	11.6	2.54	1972
15		116.66	408	30.0	18.82	20.0	2.82	1973
16		116.66	408	30.0	15.96	15.8	0.16	1973
17		112.5	408	33.5	7.72	14.7	6.98	1969
18		137.5	408	32.6	16.03	15.1	0.93	1968
19		104.16	408	33.5	8.45	9.8	-1.35	1968
20		154.16	408	31.9	11.90	10.8	1.10	1968
21		104.16	408	30.0	4.22	10.4	-6.18	1974
22		100.9	408	30.0	14.11	11.3	2.81	1974
23		100.9	408	30.0	12.6	11.1	1.5	1974
24		104.16	408	27.0	3.36	8.0	-4.64	1974
25		62.5	306	37.0	7.2	11.5	4.3	1978
26		85.3	306	42.0	7.24	14.3	7.06	1978
27		85.3	306	44.0	7.05	14.4	7.35	1978
28		85.3	306	45.0	6.35	13.0	6.65	1978
29		85.3	306	42.0	7.0	14.7	7.7	1978
30		104.6	357	46.0	4.95	13.05	8.55	1978
31		83.3	306	37.0	7.18	13.08	6.62	1978
32		41.6	306	30.0	5.6	10.7	5.1	1978
33		85.3	306	40.0	3.6	12.8	9.2	1978
34		41.6	306	29.5	3.5	11.9	8.4	1979
35		41.6	306	31.0	4.9	12.7	7.8	1979
36		104.16	306	30.0	1.1	11.8	-10.7	1979
37		41.6	306	30.0	3.2	10.7	7.5	1979

* 市都市計画局をはじめとする合同会議では、動水位ではなく設計最低水位であるとの説明があった。この点を本格調査で確定する必要がある。

表 (1/4) 井戸台帳 (中央水源地) の続き

No of wells	Location	Water flow	Diam	Depth	Static level	Dinamic level*	Difference	Procu date
		41.6	306	28.0	3.5	11.0	7.5	1979
38		125.0	306	33.0	4.0	12.5	8.5	1979
39		83.3	306	33.0	3.8	12.6	8.8	1979
40		83.3	306	33.0	3.3	15.2	11.9	1979
41		104.16	306	34.0	2.9	14.6	11.7	1979
42		104.16	306	27.0	3.4	13.9	10.5	1979
43		104.16	306	35.0	2.7	12.7	10.0	1979
44		83.3	306	32.0	2.5	7.8	5.3	1979
45		83.3	306	30.0	1.5	17.5	16.0	1980
46		100.0	306	32.0	2.0	18.5	16.5	1980
47		195.8	306	30.0	3.5	18.0	14.5	1980
48		108.03	306	42.0	3.5	22.0	18.5	1980
49		79.16	306	30.0	3.5	19.0	15.5	1980
50		41.6	306	26.0	3.0	14.0	11.0	1980
51		33.3	306	26.0	3.8	11.0	7.2	1980
52		29.2	306	25.0	3.8	13.5	9.7	1980
53		70.8	306	23.0	3.4	11.0	7.6	1980
54		66.6	306	24.0	2.8	8.5	5.7	1980
55		54.16	306	26.0	2.6	15.0	12.4	1980
56		25.0	306	18.0	3.0	11.5	8.5	1980
57		29.16	306	21.0	3.7	11.5	8.8	1980
58		25.0	306	22.0	4.1	11.5	8.4	1980
59		29.26	306	22.0	4.0	10.5	6.5	1980
60		20.8	306	20.0	4.6	13.0	8.4	1980
61		12.5	306	20.0	3.8	9.5	5.7	1980
62		12.5	306	20.0	3.8	10.5	6.7	1980
63		8.30	306	13.0	3.0	9.7	6.72	1980
64		42.5	306	12.0	3.12	8.3	5.18	1980
65		32.75	306	12.0	1.68	8.5	6.82	1980
66		8.30	306	10.0	2.0	9.2	7.38	1980
67		47.3	306	25.2	1.8	14.2	12.4	1957
68		177.5	408	25.0	2.25	16.0	13.75	1961
69		113.75	306	37.0	4.6	14.4	9.8	1979
70								

* 前頁の注参照

GROUND WATER WELLS AT STATION "B"

(near factories area)

表 (2/4) 井戸台帳 (工場水源地)

	1	2	3	4	5	6*	7	8
I		46.3	408	21.4	1.9	14.3	12.4	1963
2		70.8	408	26.2	2.72	13.0	10.29	1963
3		70.8	408	27.0	2.97	12.6	9.63	1963
4		70.8	408	26.0	15.81	12.0	13.81	1963
5		70.8	408	26.4	8.85	12.1	3.25	1963
6		66.6	408	26.9	15.14	11.8	3.34	1963
7		66.6	408	26.2	16.69	11.2	5.49	1963
8		70.8	408	26.6	18.51	10.1	8.41	1963
9		120.83	408	53.5	8.78	11.2	2.42	1969
10		120.83	408	48.0	12.49	12.0	0.49	1969
11		120.83	408	50.0	9.52	11.7	2.18	1969
12		120.83	408	30.0	5.98	9.2	3.22	1974
13		120.83	408	32.0	6.35	10.1	3.75	1974
14		120.83	408	30.0	15.52	11.6	3.92	1974
15		120.83	408	30.0	6.33	10.3	4.03	1974
16		68.29	408	43.2	2.9	12.7	9.8	1969
17		120.83	408	30.0	5.85	9.9	4.15	1963
18		120.83	408	35.0	6.0	12.0	6.0	1963

Note: No.1 and No.2 are out of use in 1982.

* 前頁の注参照

表 (3/4) 井戸台帳 (食肉工場水源地)
 GROUND WATER WELLS STATION "C"
 (near meat factory area)

Number of wells	1 Location	2 W. flow	3 Diameter	4 Depth	5 St. level	6 * Din.	7 Differ.	8 Procurement
1		87.5	306	26.0	16.3	12.3	4.0	1962
2		87.5	306	26.2	9.31	11.3	2.01	1962
3		99.6	306	26.0	10.19	9.27	0.92	1962
4		91.6	306	26.0	14.20	10.1	4.10	1962
5		91.6	306	26.1	9.68	9.9	0.38	1968
6		88.6	306	26.0	9.72	8.9	0.82	1974
7		87.6	306	26.5	12.0	8.87	1.33	1974
8		90.2	306	26.3	14.2	9.2	4.4	1974
9		99.7	306	26.0	12.6	8.7	3.9	1980

* 前頁の注参照

表 (4/4) 井戸台帳 (ナライハ水源地)

GROUNDWATER WELLS FROM HIGH LOCATED WATER RESOURCE

Main station at Nalaih

NO of wells	1 Location	2 Water flow	3 Diam.	4 Depth	5 St.lev.	6 [*] Din.l.	7 Difference	8 Procurement
I	High source	62.6	250	62.0	2.2	13.1	10.9	1989
2		104.2	250	62.3	1.3	13.9	12.6	1989
3		104.2	250	63.1	1.1	14.2	13.1	1989
4		104.4	250	64.0	1.5	15.3	13.8	1989
5		104.4	250	64.9	1.3	14.6	13.3	1989
6		104.4	250	62.5	1.7	12.9	11.2	1989
7		104.2	250	60.8	1.7	11.7	10.0	1989
8		104.4	250	63.8	0.87	10.73	9.86	1989
9		144.0	250	49.0	1.59	12.55	10.9	1989
10		144.0	250	48.8	2.41	11.99	9.53	1989
11		63.0	250	49.4	1.4	11.4	10.0	1989
12		63.0	250	45.5	1.5	8.2	6.7	1989
13		104.2	250	46.1	2.01	9.49	7.48	1989
14		160	306	48.1	2.41	11.99	9.58	1989
15		125.6	250	48.1	2.3	11.75	9.45	1989
16		125.6	250	47.9	1.58	10.97	9.37	1989
17		125.6	250	48.2	1.51	10.88	9.37	1989
18		62.6	250	48.4	1.80	11.30	9.50	1989
19		104.	250	47.59	2.99	10.60	8.60	1989
20		104.0	250	48.7	1.5	12.0	10.5	1989
21		104.0	250	47.9	1.89	14.1	12.12	1989
22		98.0	250	49.9	1.66	15.2	13.54	1989
23		98.0	250	47.1	1.76	15.3	13.54	1989
24		120.3	250	51.0	1.89	13.8	12.9	1989
25		144.0	306	49.0	0.60	10.9	9.3	1989
26		144.0	306	50.0	1.35	12.1	10.75	1989
27		144.0	250	48.8	1.0	12.0	11.0	1989
28		144.0	250	49.0	0.60	12.09	12.0	1989
29		104.0	250	60.7	0.4	13.46	13.6	1989
30		160.0	306	62.7	2.0	15.32	13.32	1989
31		104.0	250	53.9	-	13.9	13.9	1989
32		160.0	306	56.7	1.9	14.63	12.73	1989
33		104.2	250	53.6	2.75	14.76	12.01	1989
34		104.2	250	54.2	2.85	14.85	12.0	1989
35		160.0	306	53.8	3.15	14.74	11.59	1989
36		104.2	250	52.2	2.14	13.17	11.03	1989
37		104.2	250	52.4	1.72	13.13	11.35	1989
38		104.2	250	54.4	1.68	13.03	11.35	1989
39		160.0	306	52.5	1.20	12.28	11.02	1989

* 前頁の注参照

地下水データのデータベース化

UNDP とモンゴル国との間で、1989年①モンゴル国における地下水データベース情報システムの確立、②システムを運営するスタッフのトレーニング、③代表地区における地下水研究、を目指した地下水データのデータベース化プロジェクトが合意され、その後も継続されている。

地下水データベース情報システムの内容は次の通りである。

- a. IBM AT あるいはコンパチブル 3台
(プロッター、ディジタイザー、プリンター付)
- b. dBASE IV 1式
- Lotus 123 1
- Wordperfect 1
- Surfer 1
- Math Cad 1
- Fortran77 1
- 他 1

地下水データベースの内容は次の通りである。地下水データは自然環境や通産省で実施されている観測データ、つまり

- a. 水質
- b. 地下水位
- c. 揚水試験
- d. 地質柱状図
- e. ボーリング

が含まれる。

1946年から1990年までの観測データ、つまり

- a. 泉 10,400 (422の鉱泉と42の温泉を含む)
- b. 手掘り井戸 14,000
- c. 機械掘り井戸 20,000

がすでに入力され、1/20万地図に地図化できる。

Groundwater Information Processing System (UN 所有のモデル) も使われており、その内容は次の通りである。

- a. GW 1-透水係数
- b. GW 2-水質

- c. GW 3-揚水試験
- d. GW 4-井戸水理
- e. GW 5-ハイドログラフ
- f. GW 6-地質柱状データと断面
- g. GW 7-グラフィック

スタッフトレーニングはすでに2回実施されている。つまり

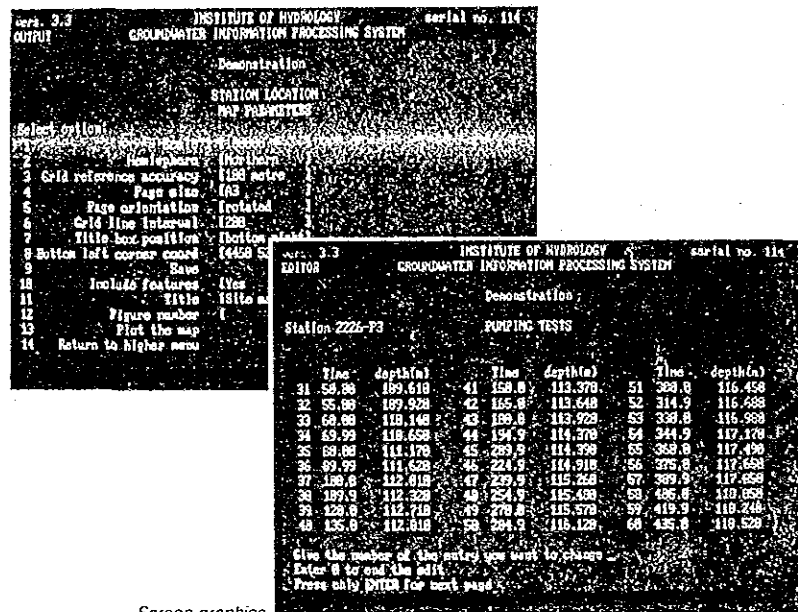
- a. Institute of Hydrology, UK (1990年)
- b. Ohio State University と Colorado State University, USA (1991年)



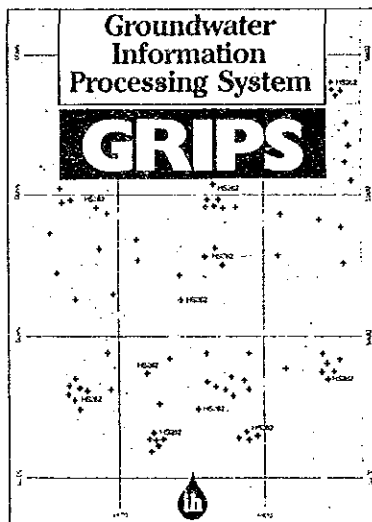
Groundwater Information Processing System Software from the Institute of Hydrology

GRIPS is a microcomputer software system for the management of data collected during groundwater investigations. The software is based on the extensive experience of the Institute of Hydrology in such investigations both in the United Kingdom and throughout the world.

GRIPS carries out the conventional data manipulations required for groundwater studies. This is done in an easy to use manner through menus displayed on the microcomputer's screen from which the user selects the functions required. The ability to retrieve data selectively and present it graphically, either in map form or as 'standard' graphs, has been the major criteria in the design of the system.



Screen graphics.



Full details in this brochure, available on request.

Data input and editing

GRIPS uses a system called 'form filling' to allow the user to enter data from a keyboard. A form consists of a series of prompts to which the user responds by typing in the data entry.

ASCII computer files allow conversion from existing computer storage systems or solid state memory instruments. Compression and validation of the time series data are also possible. All data types have fully interactive editing facilities allowing the addition, correction and deletion of data. The removal of a station, together with all the associated data, can be carried through the editor as can the deletion of a sample or pump test.

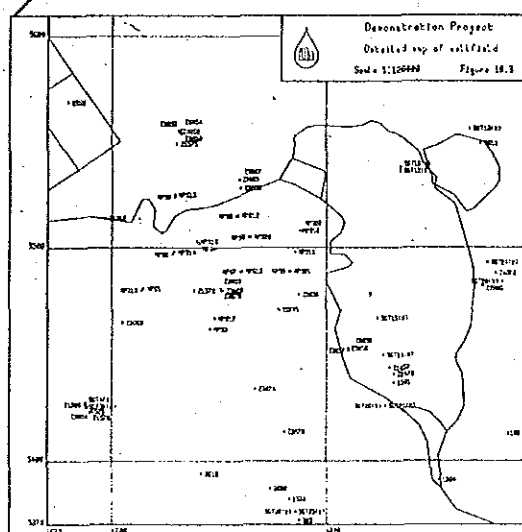
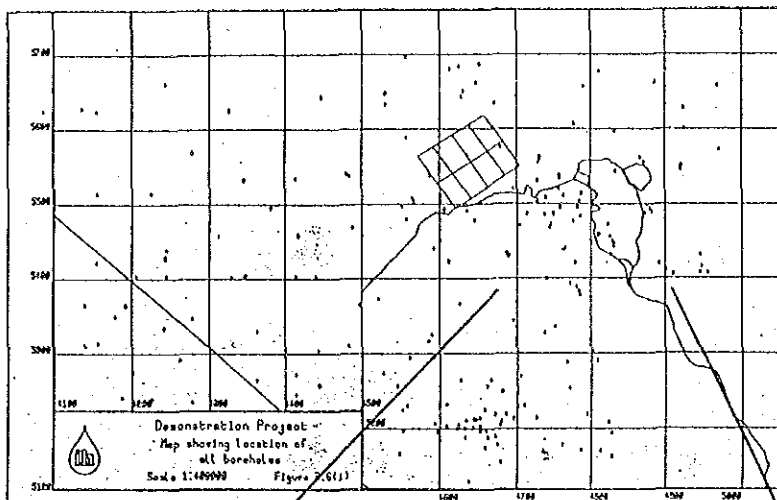
Data types

- Station location
 - 100,000 stations
 - grid coordinates
 - or latitude and longitude

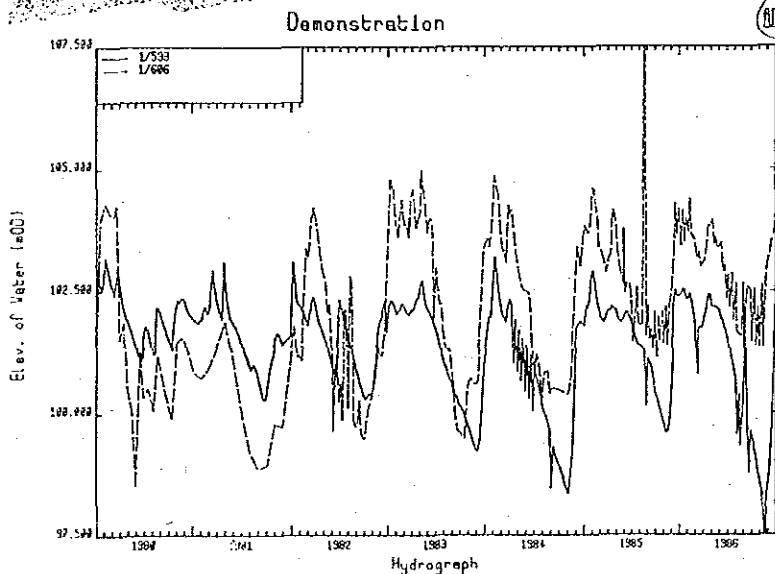
- Station details
- Lithological logs
 - 500 units per log
- Rate of penetration logs
- Pumping tests
 - 20 tests per station
- Time series
 - 100,000 event based values per station per data type
 - a) water level
 - b) electrical conductivity
 - c) temperature
 - d) barometric pressure
- Chemistry
 - 100 analyses per station
 - a) field determinations
 - b) laboratory analysis
- Isotopes
- Grain size analysis
- Rock properties

Maps

- Data types with map output
 - station location
 - lithological cyclograms
 - water level
 - conductivity
 - temperature
 - chemistry ion values
- Capability to plot digitised features
- User defined plotting size
- User defined scale
- Flexible title box positioning
- Optional grid
- Software minimises overwriting of point descriptors



Demonstration			Water levels	
Station No	Date	Time	Depth to water (m below datum level)	Elevation of water table (m above sea level)
2226-4.7	27 May 86		9.300	1174.700
	27 Jun 86		9.310	1174.690
	25 Jul 86		9.300	1174.700
	27 Aug 86		9.300	1174.700
	25 Sep 86		9.226	1174.780
	24 Oct 86		9.260	1174.740
	22 Nov 86		9.300	1174.700
	18 Dec 86		9.350	1174.650
	16 Jan 87		9.380	1174.620
	18 Feb 87		9.330	1174.670
	2226-P17	5 Mar 86		21.600
10 Mar 86			21.600	1192.400
14 Mar 86			21.500	1192.500
17 Mar 86			21.440	1192.560
2 Apr 86			21.550	1192.450
7 Apr 86			21.550	1192.450
21 Apr 86			21.600	1192.400
23 Apr 86			21.400	1192.600
28 Apr 86			21.450	1192.550
19 May 86			21.400	1192.600
9 Jul 86			21.540	1192.460
12 Jul 86			21.540	1192.460
14 Jul 86			21.540	1192.460



Time series

- Graphs:
- 4 stations for each data type on each graph
 - Choice of six time scales from 24 hours to greater than one year
 - Y-axis can either be automatically scaled or user specified
 - Water levels either as depth to water or elevation

Maps:

- Display data for a specific date and within a user defined time interval either side
- Maps of data value, difference between user specified dates or rate of change over a user specified interval
- Water levels either as depth to water or elevation

Graphical output

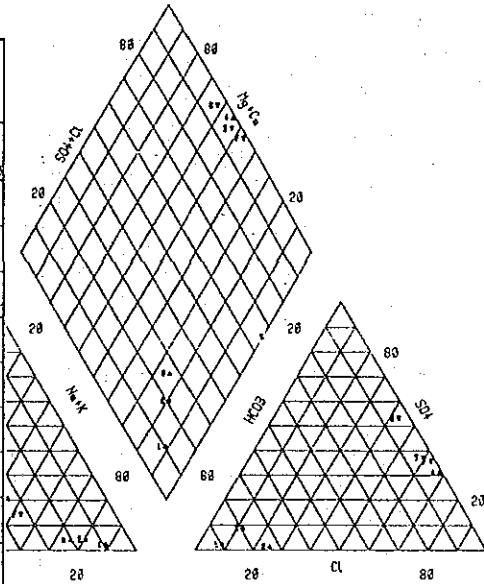
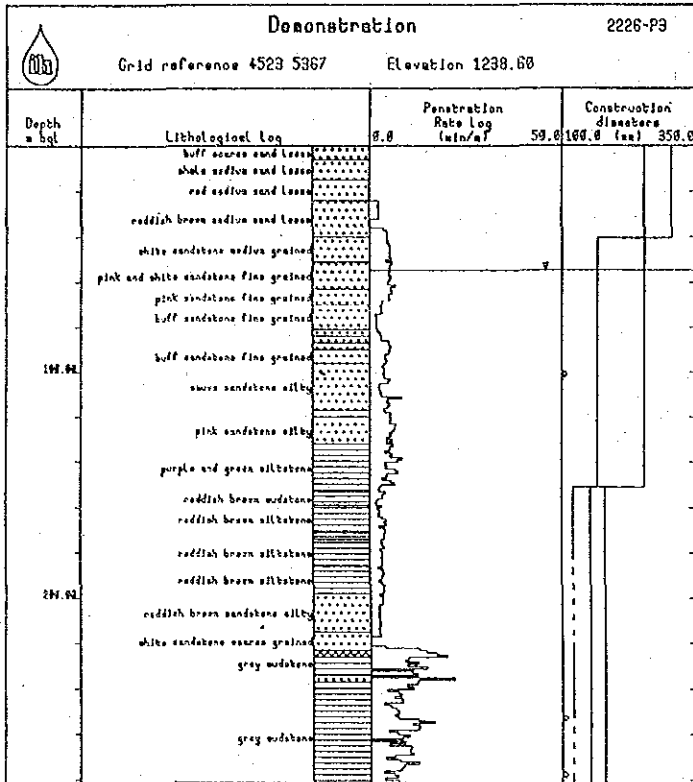
Apart from maps GRIPS can handle:

- Station model
- lithological log
- rate of penetration log
- construction details
- Pumping tests
- aquifer tests
- production tests

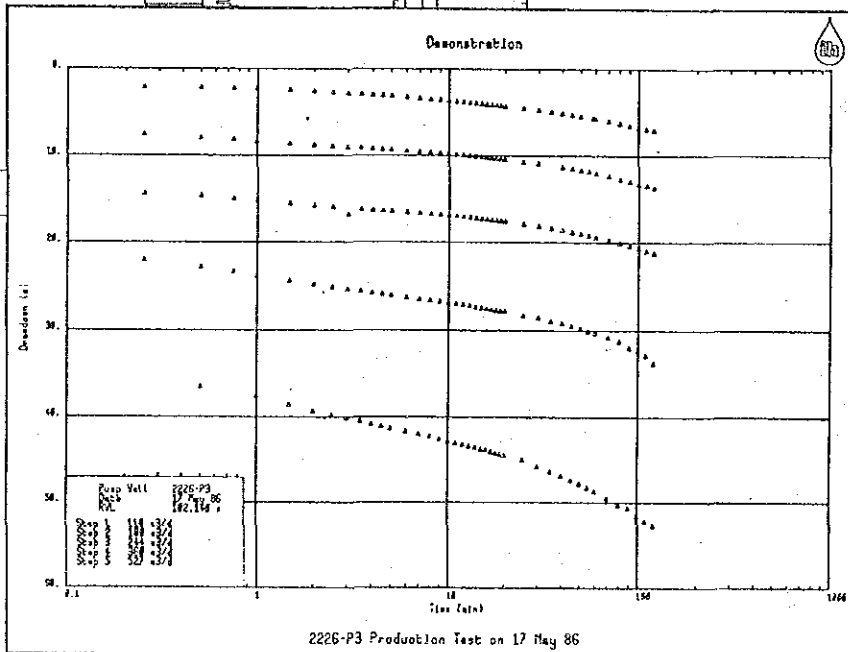
- recovery tests
- packer tests
- all log-log or log-lin
- Time series
- values against time
- Chemistry
- piper trilinear plot

- Isotopes
- includes world meteoric line
- Grain size
- histogram and cumulative curves
- in phi and millimetres

Demonstration Project



Well	Sample number
S-4.7	V/86/182
S-P17	V/86/181
S-P3	3
S-P38	39178
S-716	81-13
S-178	38228
S-178	38283





GRIPS software runs on many portable computers.

The GRIPS package

GRIPS is designed to run on the IBM range of personal computers operating under DOS. The requirements are:

- ☑ Memory
Minimum 640k
- ☑ Disk space
Minimum 10Mb hard disk and one floppy disk drive (5.25 or 3.5 inch). Programs occupy 4Mb. Data storage dependent on application but 1 to 4 Mb is typical.
- ☑ Screen graphics
Hercules, IBM CGA, EGA and VGA, and several other types.
- ☑ Printer
IBM/Epson 80 column graphics printer, or similar.
- ☑ Plotter
Hewlett Packard 7475A recommended. Graphics printers can be used.

Compatibility

GRIPS is guaranteed to run on an IBM AT with 640k memory, 20Mb hard disk, Enhanced Colour Graphics, IBM Proprinter and a Hewlett Packard 7475A pen plotter. GRIPS is also known to work on other types of IBM personal computer, including the PS2 series, and on many other compatible machines.

GRIPS is supplied on 5.25 or 3.5 inch floppy disks. The package includes a comprehensive user manual and a demonstration data set for tutorial purposes. Advice on installation is provided free of charge. Training courses can be arranged at the Institute of Hydrology or at the place of use. Assistance with specific GRIPS applications can be provided on a consultancy basis. For further information on GRIPS, please contact the Institute of Hydrology at the address shown below.

If you require further information on GRIPS, please contact:

INSTITUTE OF HYDROLOGY
Wallingford
Oxfordshire OX10 8BB
United Kingdom

Telephone: 0491 38800
Telex: 849365 HYDROL G
Fax: 0491 32256

Printer listings

- ☑ Data summary
indicates the presence of data type
- ☑ Single station synopsis
summarises data present for requested station
- ☑ Station location
details of location of stations and assigned classes
- ☑ Station details
construction details
- ☑ Lithological logs
- ☑ Rate of penetration logs
- ☑ Pumping tests
details of tests plus water level data as depth to water and drawdown
- ☑ Time series
- ☑ Chemistry
summary and extended output
- ☑ Isotopes
- ☑ Grain size analyses
- ☑ Laboratory rock properties

Classes

To assist in selective data retrieval each station can be assigned to classes. There are four types of class and a station can be assigned:

- 1 of 20 physiographic areas
- 4 of 20 geological formations
- 4 of 20 aquifers
- 1 of 10 data sources

The data can be searched to either include or exclude data from stations belonging to the defined classes.

Searching

In addition to selection of data by class there are four geographic search options:

- ☑ quadrilateral area
- ☑ profile
- ☑ radius
- ☑ nearest a point

It is also possible to search by character matching of licence numbers.

AVAILABILITY OF HYDROGEOLOGICAL MAPS

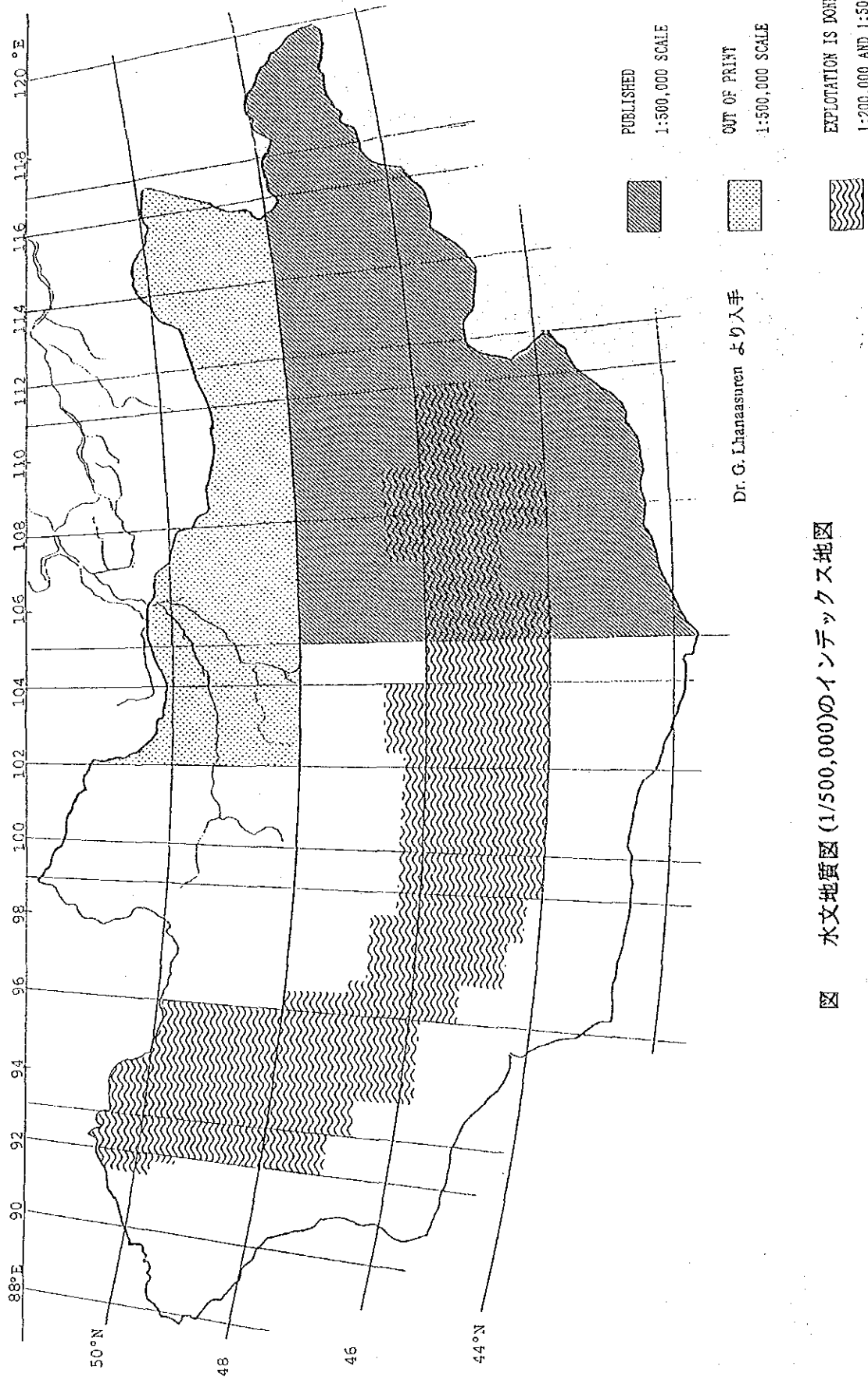


図 水文地質図 (1/500,000)のインデックス地図

添付資料 8 流量観測委託関連

流量観測委託見積書 (1年間)

項	目	回数・量	料金(千トガルク)
1.	水位計測。暖期(4-10月) 8時、20時 冬期 8時、夏の増水時は2-4時間毎	700~730 回	69.7
2.	流量観測。年間30回、冬期 月2回 暖期 月3-4回	30 回	57.6
3.	流量観測地点までワンパトルからの車代 8時間×4000トガルク/h ×30回	30 回	960.0
4.	水温計測。日2回、8時、20時	360 回	17.5
5.	氷の厚さ計測。3地点、10日に1回	45 回	22.1
6.	氷の現象観測。日2回	60 日間	27.6
7.	降水量計測。日2回、8時、20時	730 回	34.8
8.	水の濁り	182 回	65.5
9.	水面、水底の異物流量	20 回	115.2
10.	水質分析 月1回	12 回	6.0
11.	雪の厚さ計測、冬期 10日に1回	45 回	12.0
	計	30	1383.0

観測に必要な機材

1. 鉄製ボート
2. 流速計測計
3. 濁り濾過器
4. 水深計測器

添付資料 9 ダム計画適地

ダム計画適地

地形・地質条件を考慮し、事前調査時に現地調査する事が出来たダムサイトのうち、最も適切と判断されるサイトについて、位置、地形・地質及びダム諸元の概要を記述する。

- ① 位置 旧ソ連による計画ダムサイトの上流約12kmの地点（ナライハ・テレルジ間道路でトーラ川に架かる木橋の下流約1 km）
- ② 地形・地質 トーラ川の狭窄部にあたり、ポケットが広い。白亜紀の砂岩・シルト岩から成る。
- ③ ダム諸元 堤高は50m程度。堤長は上流案で625m、下流案で900m。貯水容量はおよそ1.5～2億 ton。

ダム計画適地の位置図を次に示す。ダム計画適地として上流案と下流案の2案が考えられる。

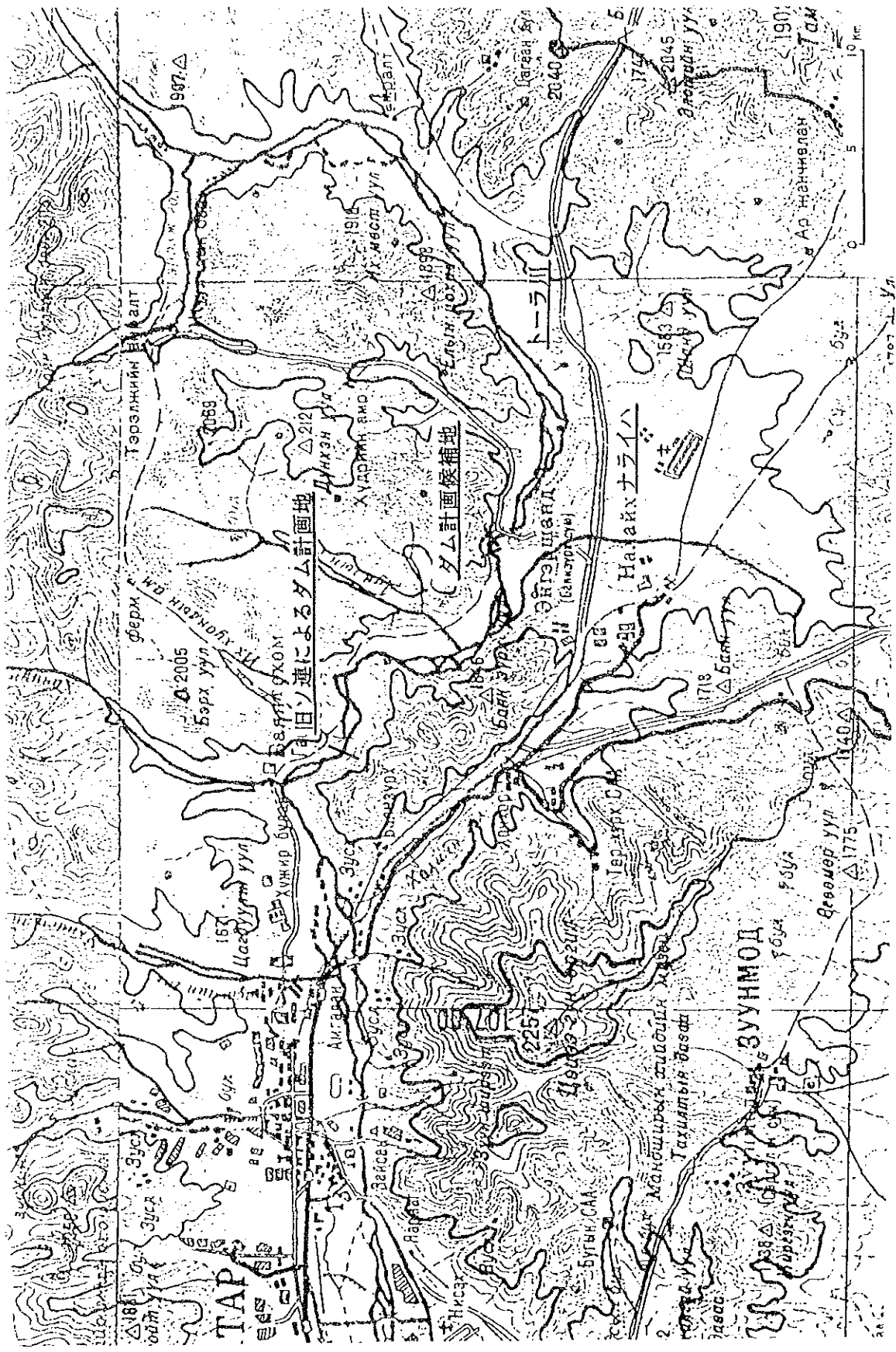
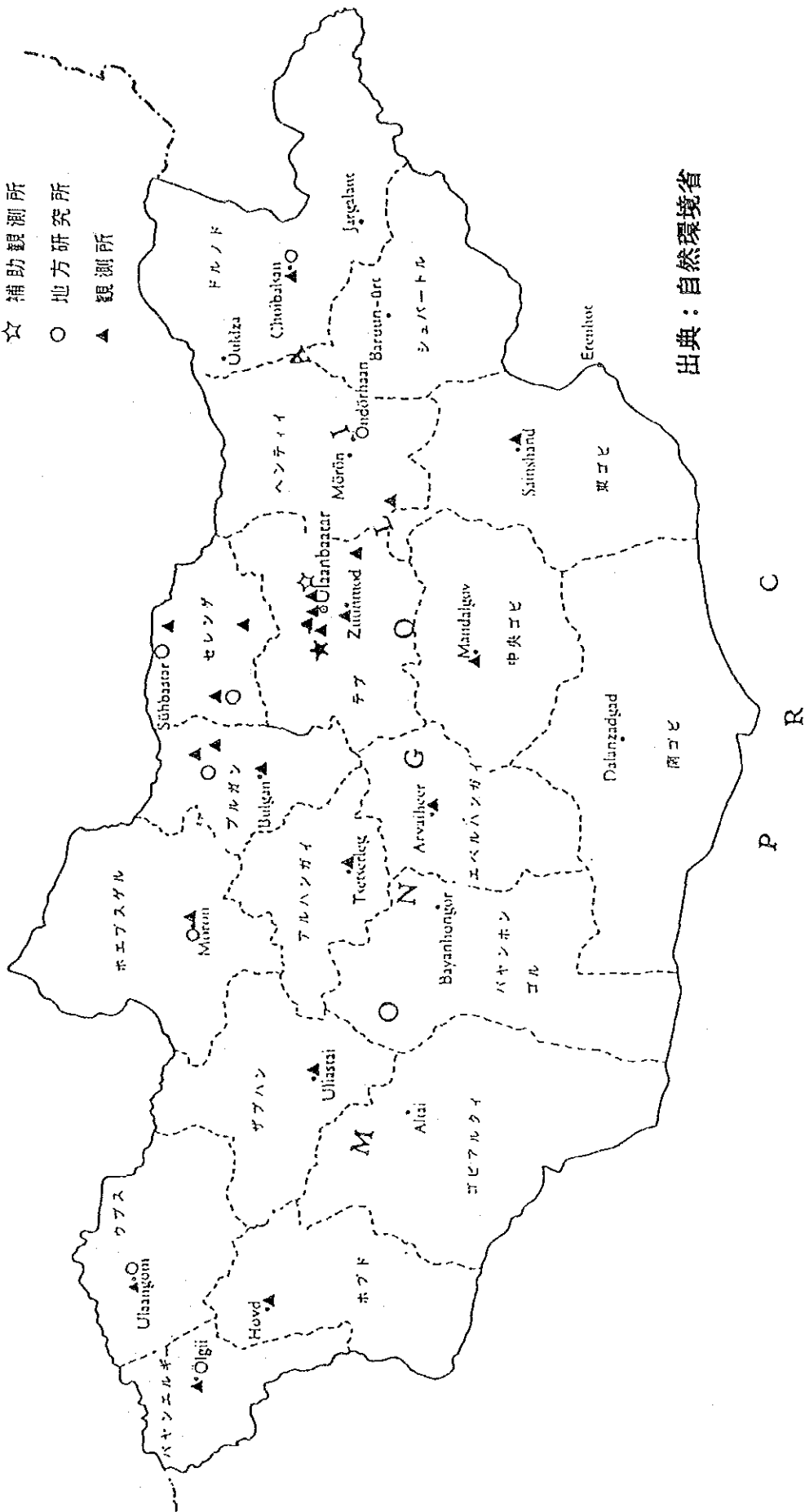


図 ダム計画候補地

添付資料 10 環境関連

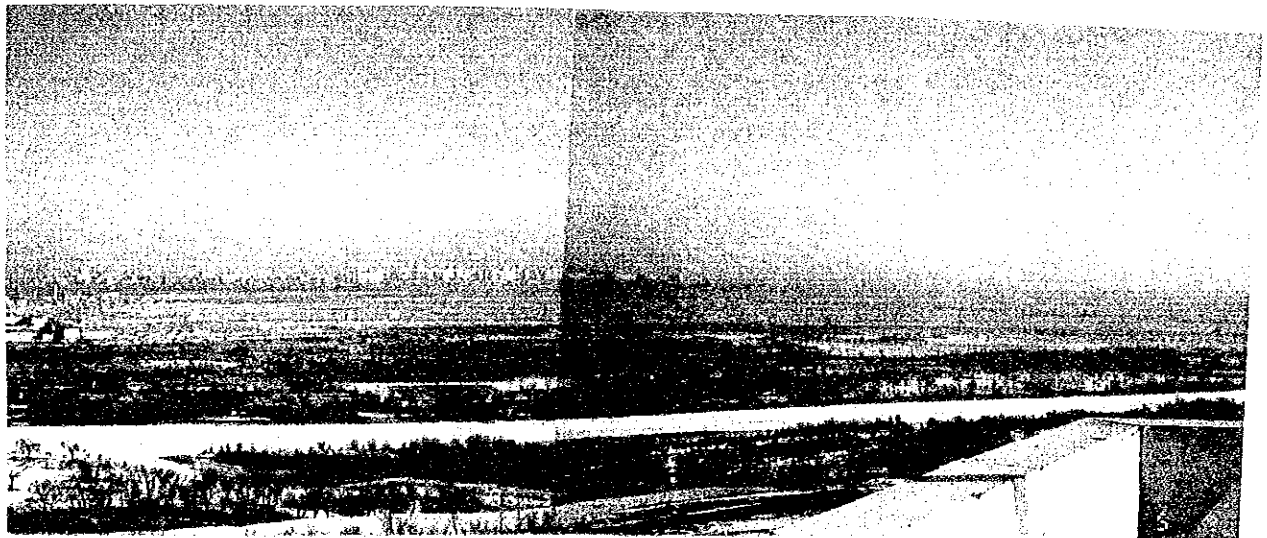
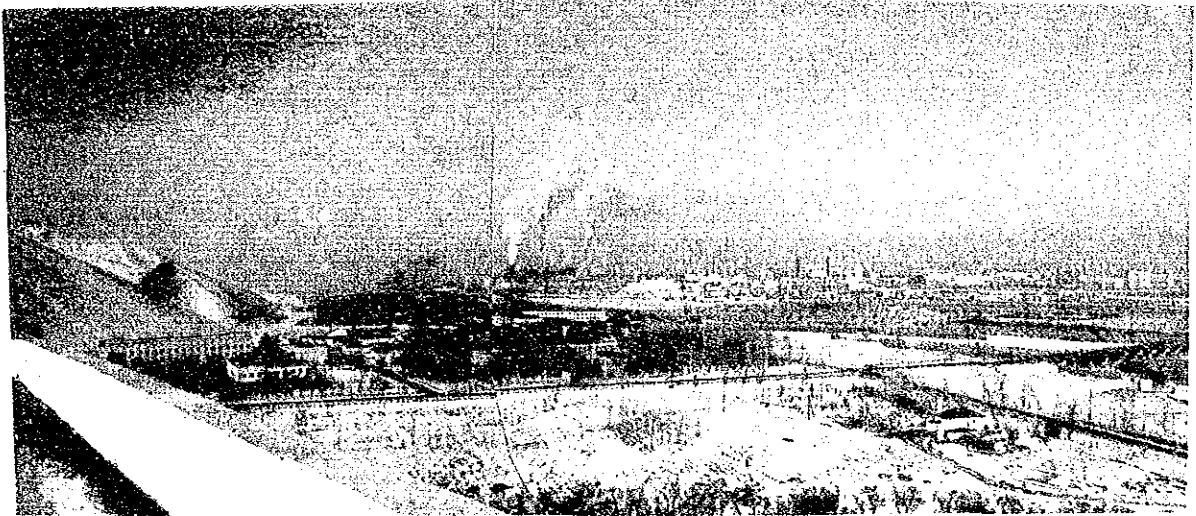
- ★ 中央研究所
- ☆ 補助観測所
- 地方研究所
- ▲ 観測所



出典：自然環境省

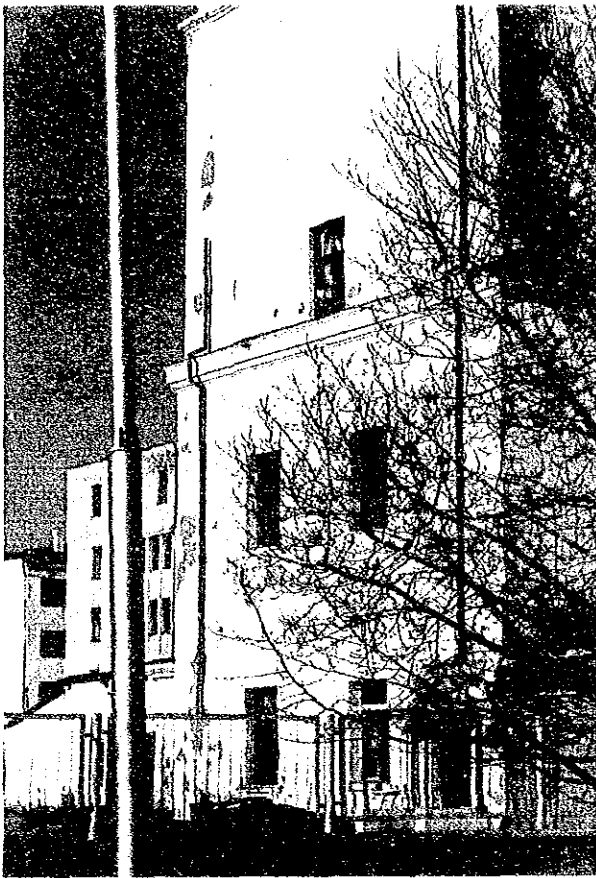
図 環境モニタリング観測所

調査写真



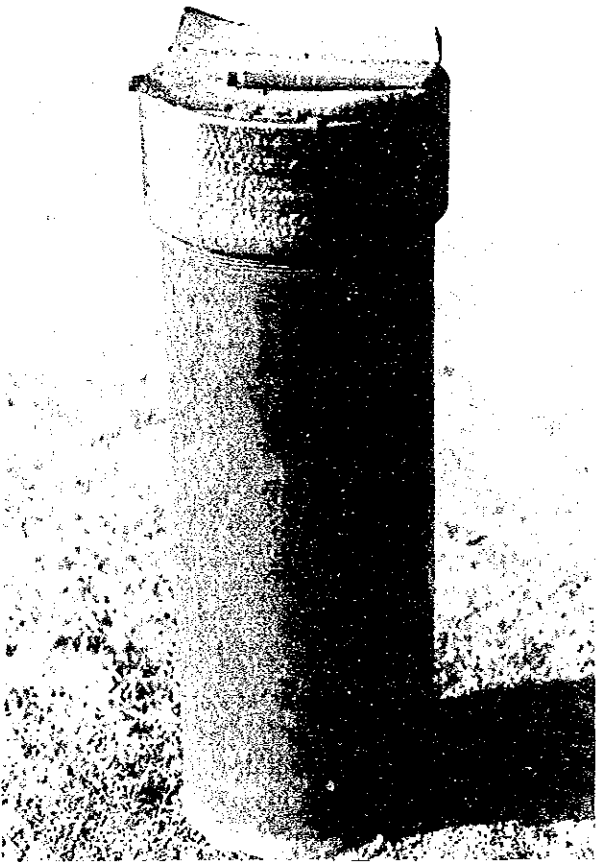
ウランバートル市街地遠景

(南の展望台から北西方向：上、北方向：中、北東方向：下)



井戸跡

ウランバートル大学構内



1960年代の井戸（スクリーン付）

観測井に成りうる

ウランバートルホテル裏



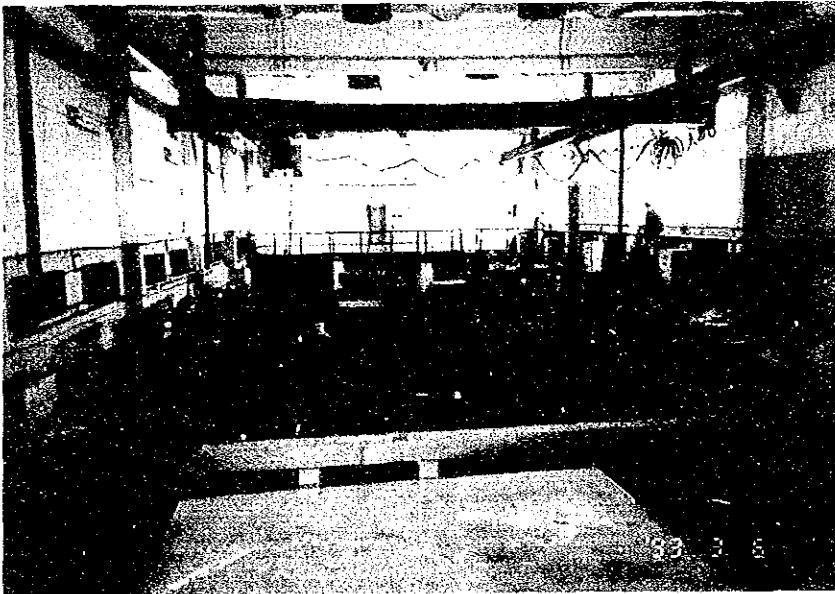
中央水源地ポンプ場



中央水源地貯水場



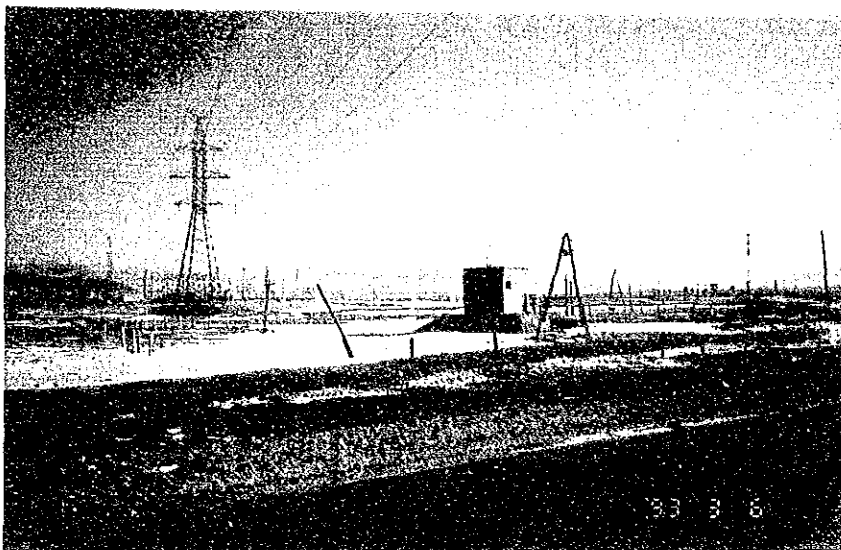
ナライハ水源地



ナライハ水源地ポンプ場



ナライハの小規模ダム跡



中央水源地（東部）



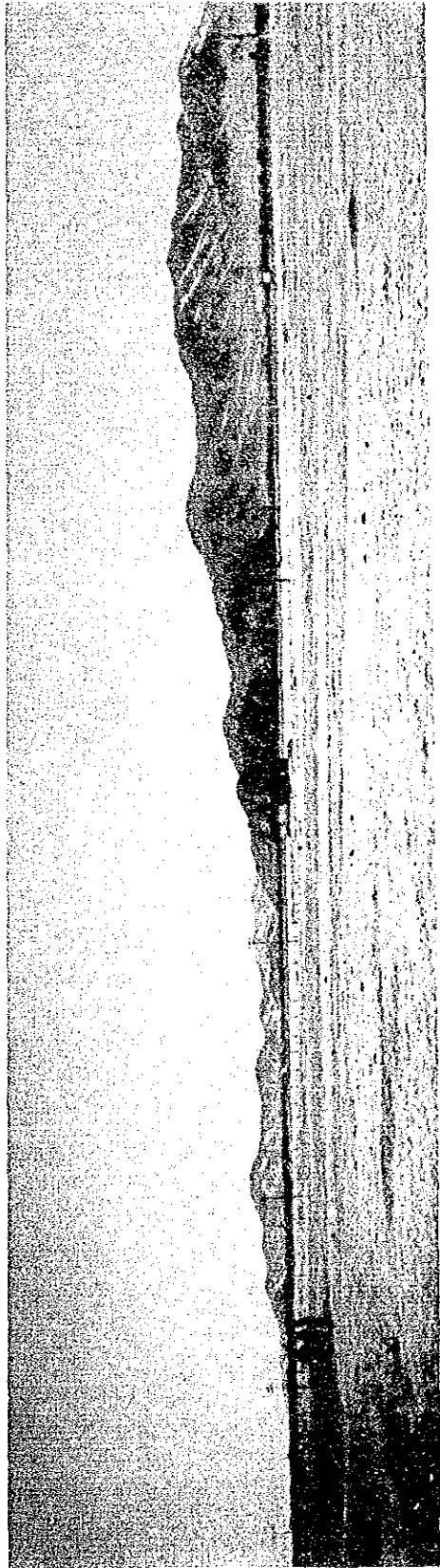
給水車への給水小屋



ゲル地区の共同水栓



トーラ川下流域（右手にウランバートル市街が見える）



第4発電所水源地（ポンプ小屋と試験井戸）



トローラ川下流域



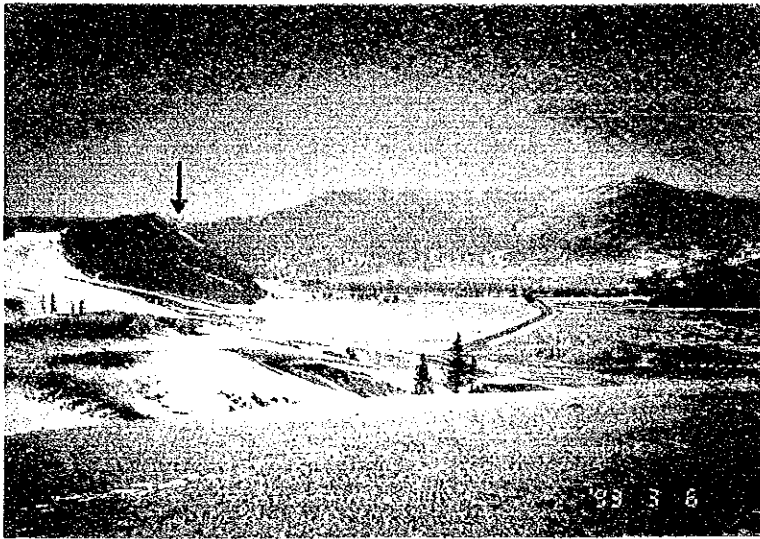
ウランバートル市街地
南の展望台手前斜面の
砂岩（白亜紀）



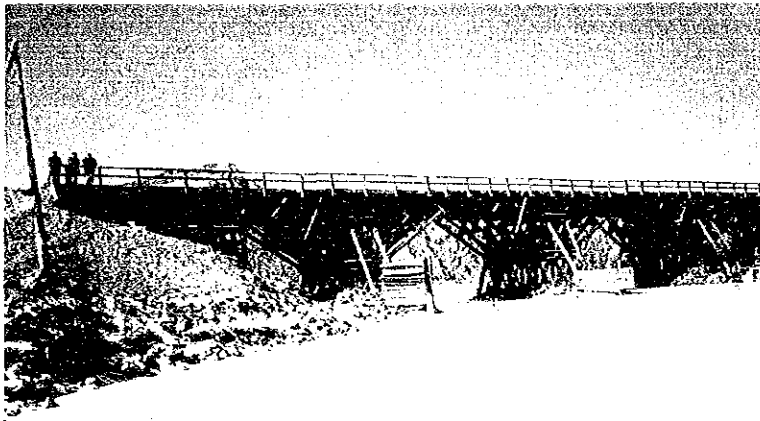
テレルジ周辺の花崗岩



旧ソ連によるダム計画
地の段丘面（砂）



ダム計画候補地
ナライハ・テレルジ間道路



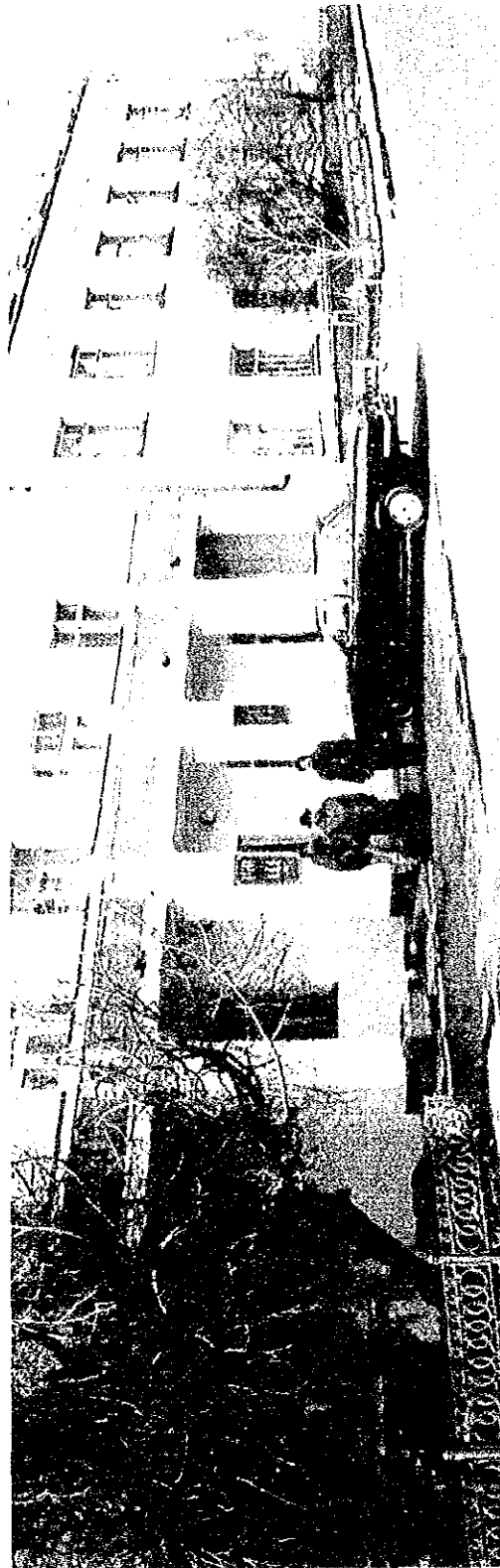
ナライハ・テレルジ間
道路のトーラ川に架か
る木橋



トーラ川（木橋直上）の
氷結と氷下の清流



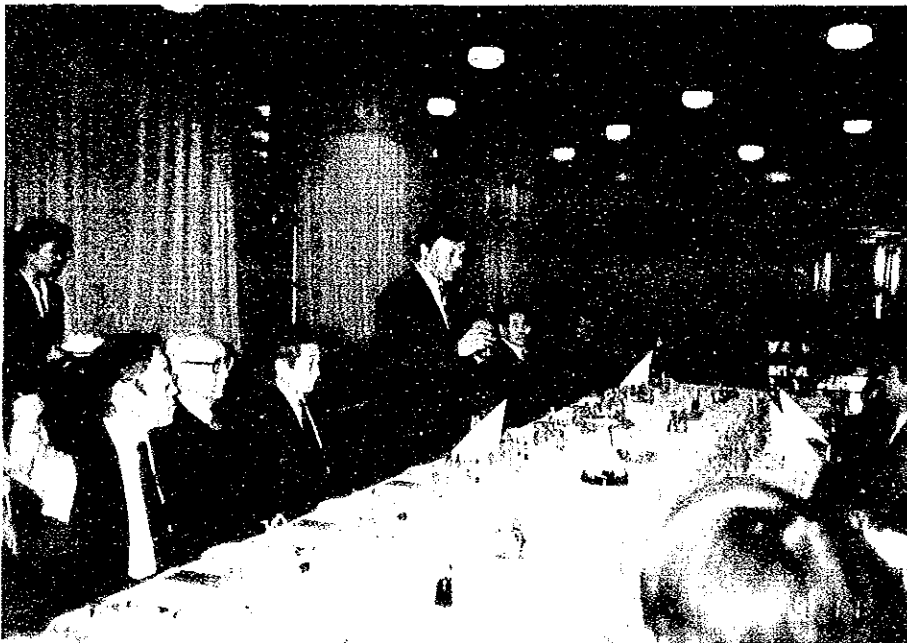
ワランバートル市街 (アパート群とゲル)



ワランバートル市庁舎



S/W 署名



JICA