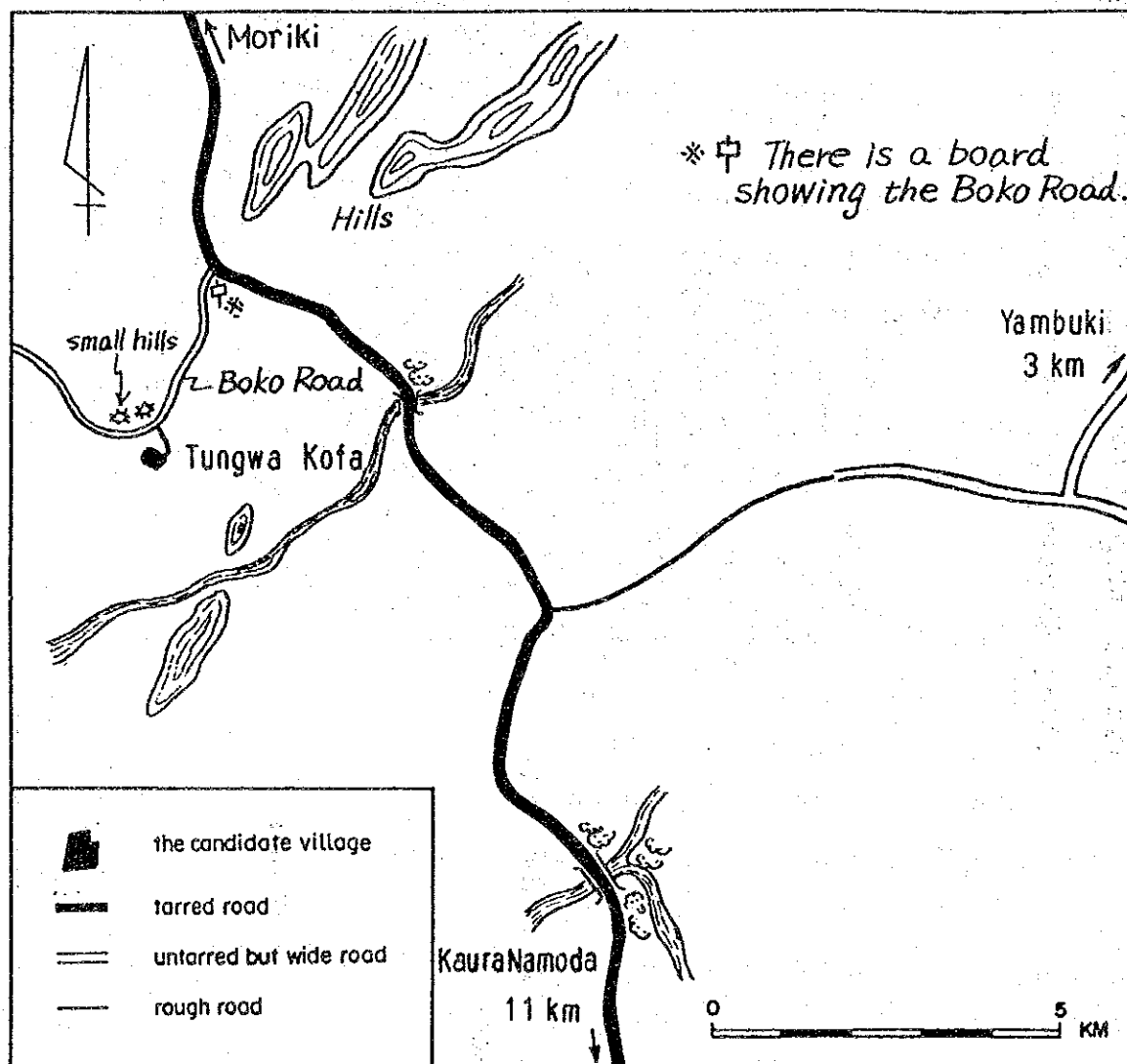


The Study for Groundwater Development in Sokoto State

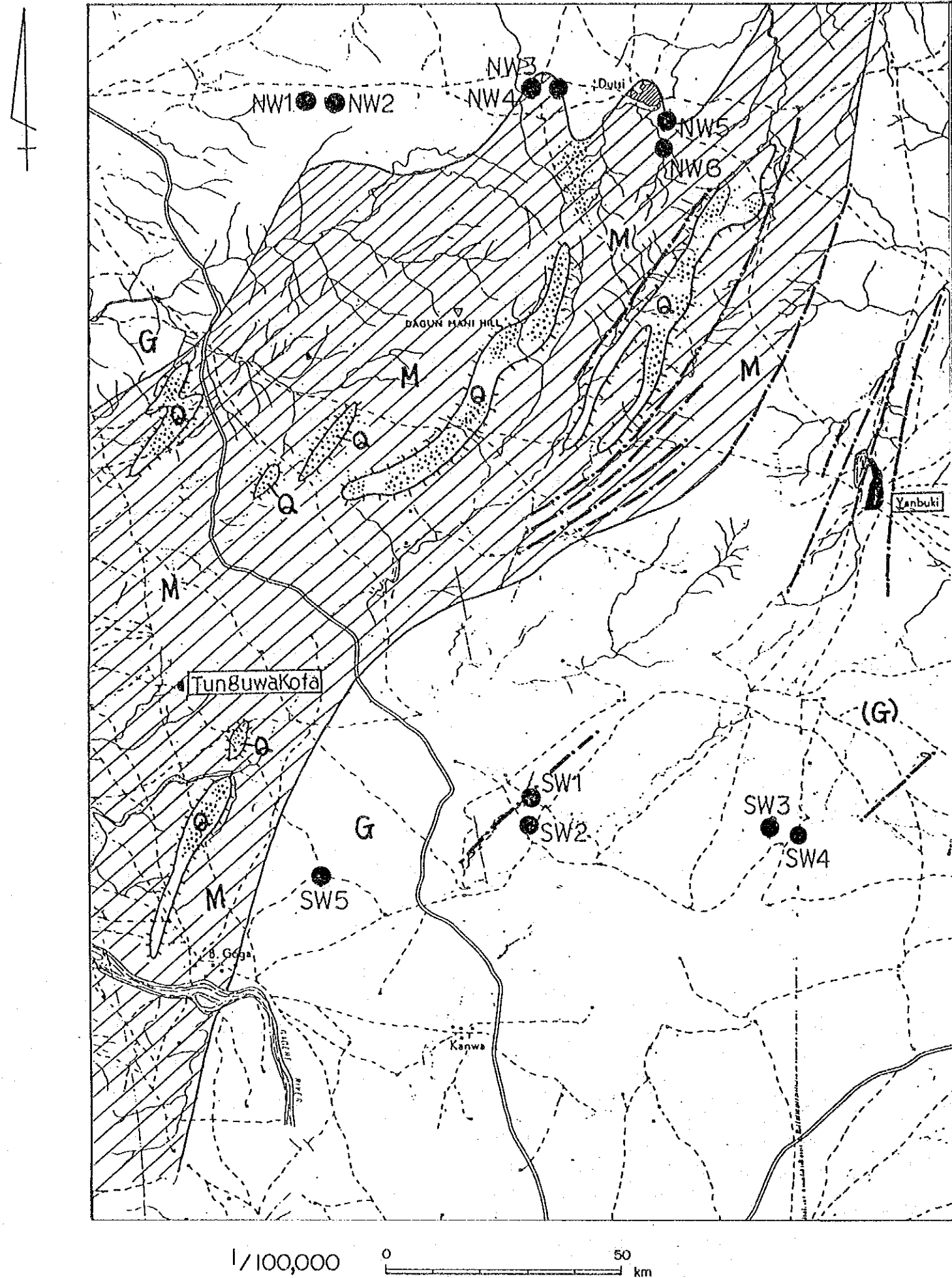
VILLAGE : Tunguwa Kofa

Village No. 9



LOCATION MAP

(1/100,000 Sheet 32)



GEOLOGICAL MAP **Tunguwa Kofa**

- River
- Escarpment
- Lineament
- Older Granite
- Meta-sediments
- Quartzite
- Existing Boreholes

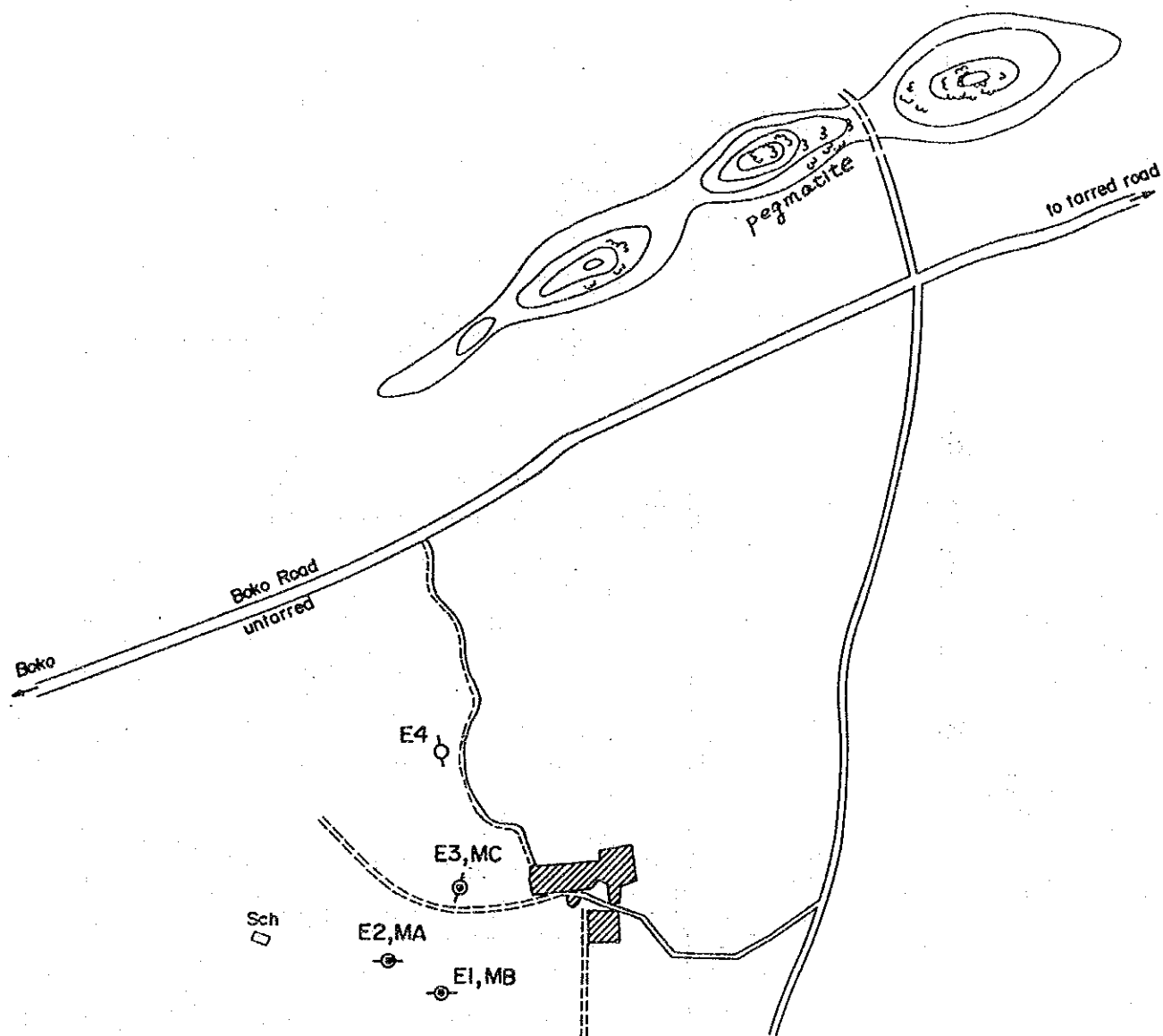
DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	SC.(m ³ /d/m)
NW 1	73.0	27.19	1.17
NW 2	73.0	25.30	3.14
NW 3	40.0	29.19	3.39
NW 4	43.0	28.76	4.97
NW 5	25.0	3.05	6.70
NW 6	31.0	5.04	1.92
SW 1	40.0	31.41	106.25
SW 2	49.0	29.60	4.14
SW 3	41.0	24.99	3.97
SW 4	34.0	24.33	55.74
SW 5	37.0	16.80	8.09

SWL.: Static Water Level
 SC : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.9 Tunguwa Kofa



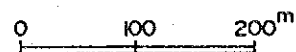
settlement



electric sounding points

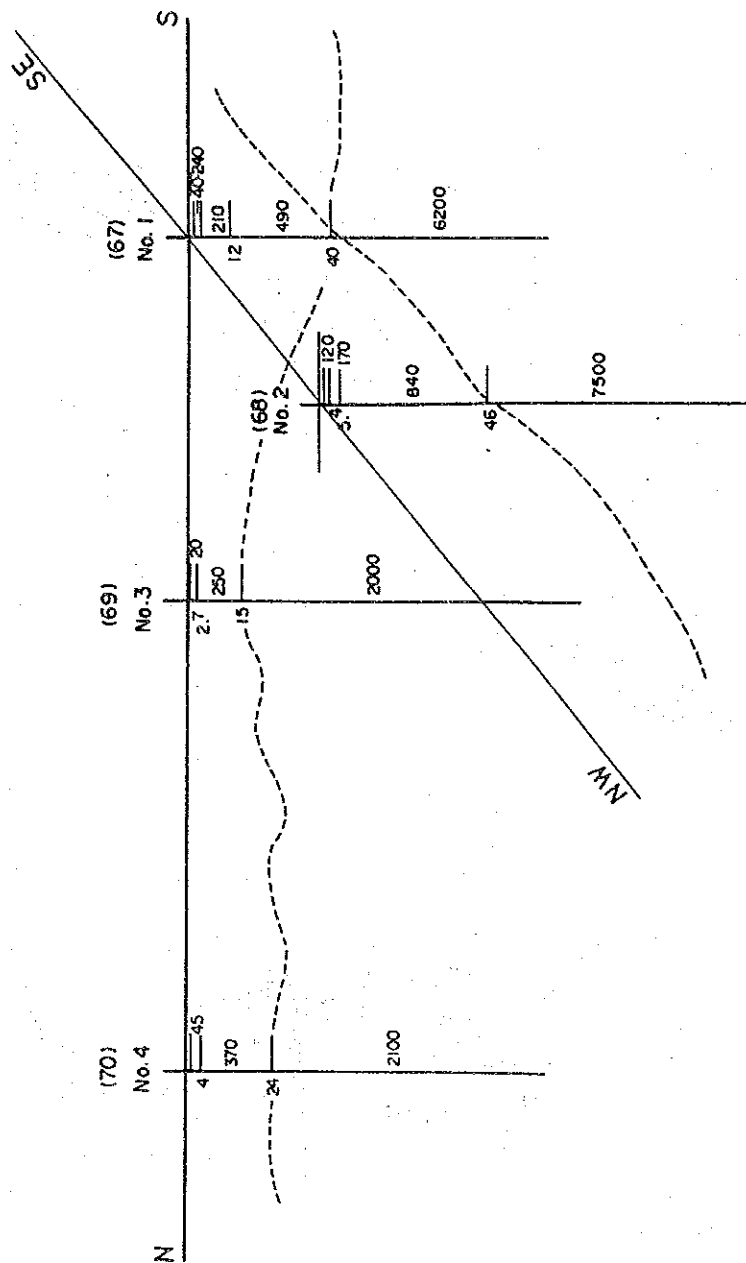


magneto-telluric
sounding points



RESISTIVITY PROFILE

No.9 Tuguwa Kofa

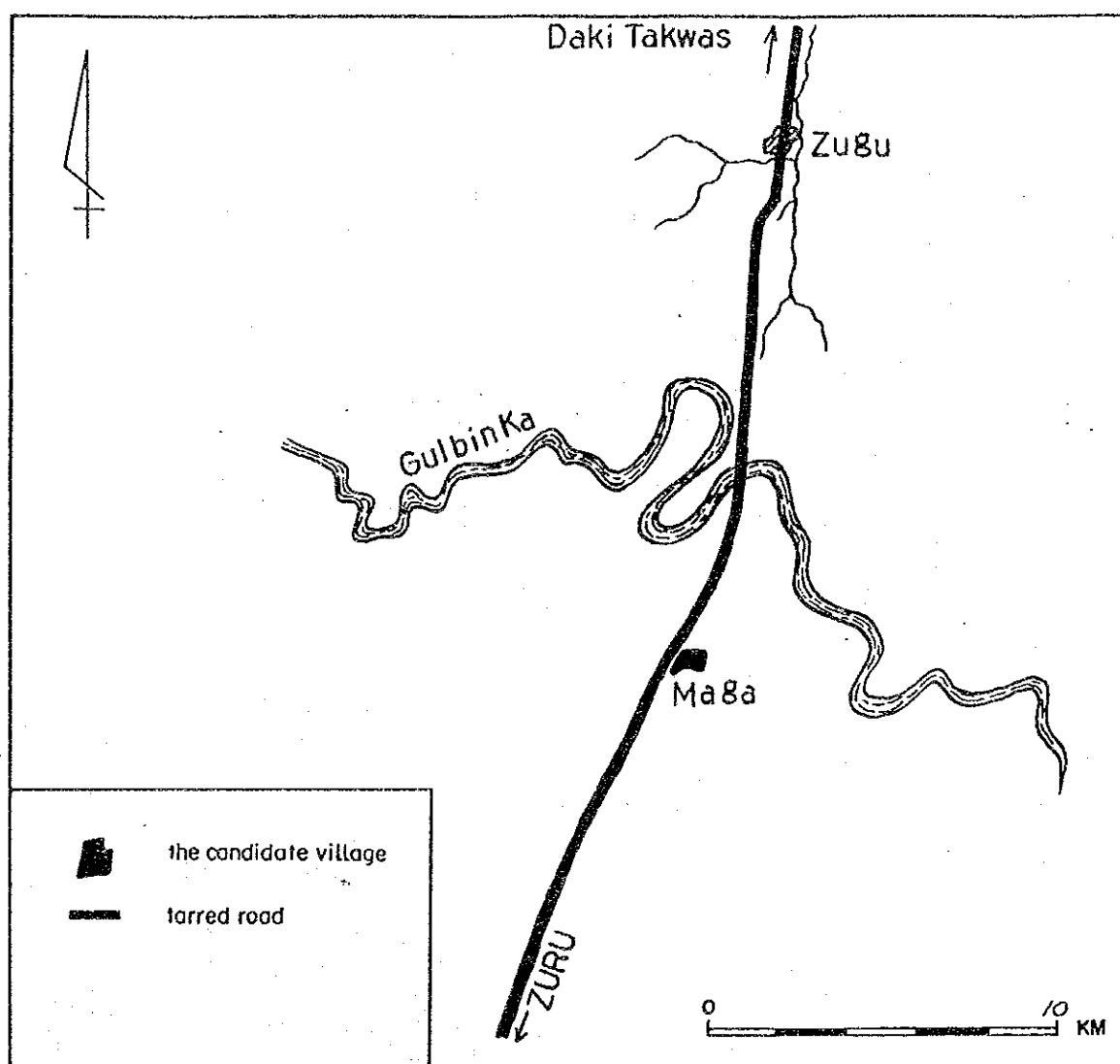


1/2000
1/2000

The Study for Groundwater Development in Sokoto State

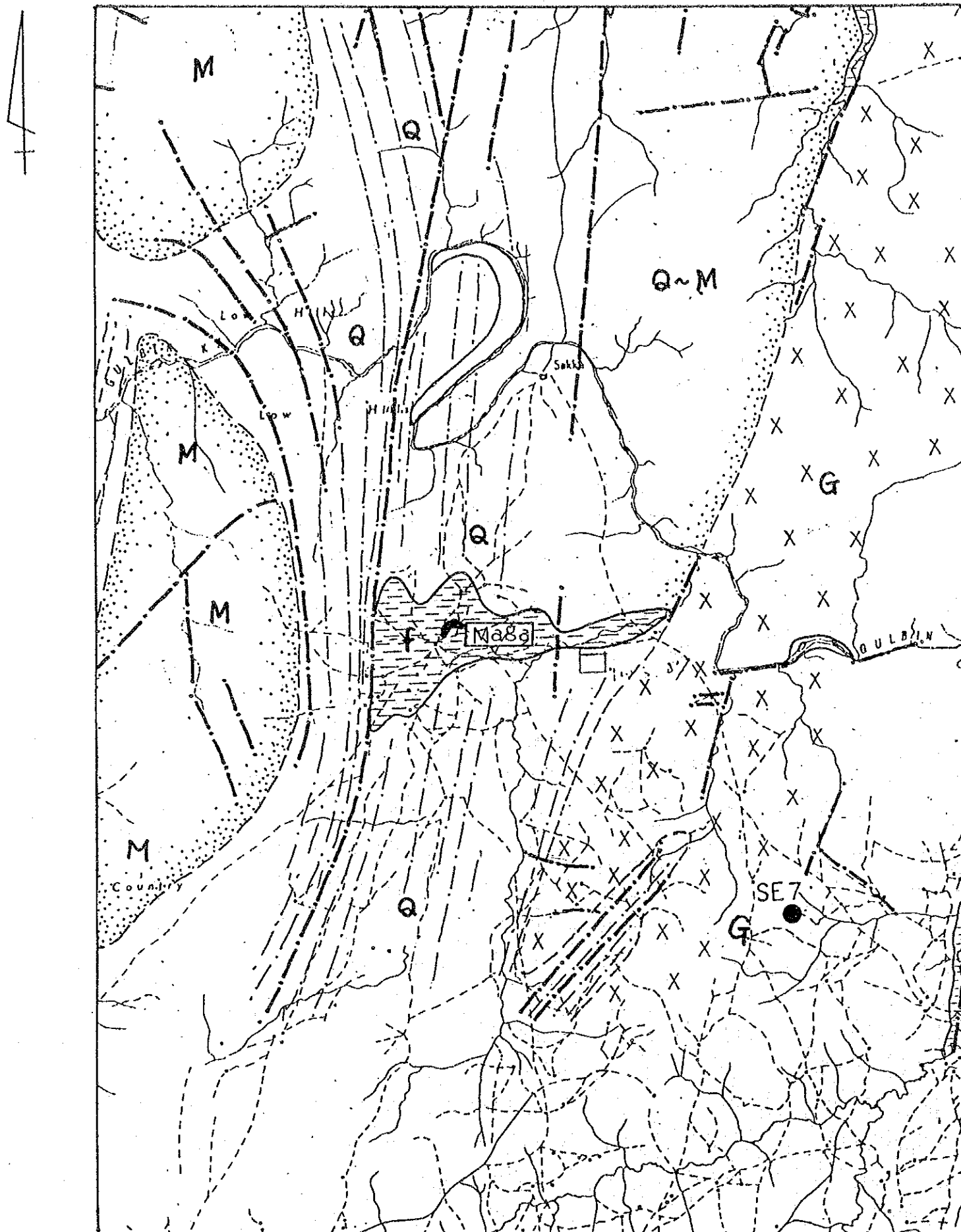
VILLAGE : Maga

Village No. 10



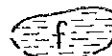
LOCATION MAP

(1/100,000 Sheet 74)



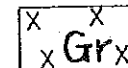
GEOLOGICAL MAP

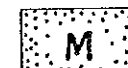
Maga

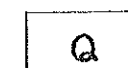
 Fadama

 Lineament
(Fault)

 Lineation
(Foliation)

 Older Granite

 Meta-sediments

 Quartzite

 SW 16
Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	S.W.L.(m)	S.C.(m ³ /d/m)
SE 7	37.0	10.57	0.83

SW.L.: Static Water Level

SC : Specific Capacity

1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No. 10 Maga

Sokoto

Zuru

NS

Bank

pond

dry W

Sch.

E1, MA (B/H Depth : 90m)

There is water throughout the year.

E2, MB

W1

E3, MC

E4, MD

E5

T/D site

T/W site

100 m

100 m

settlement

dug well

dug well (dry)

bore-hole with hand pump

E1 electric sounding points (200) depth of measurement

MA magneto-telluric sounding points

pond

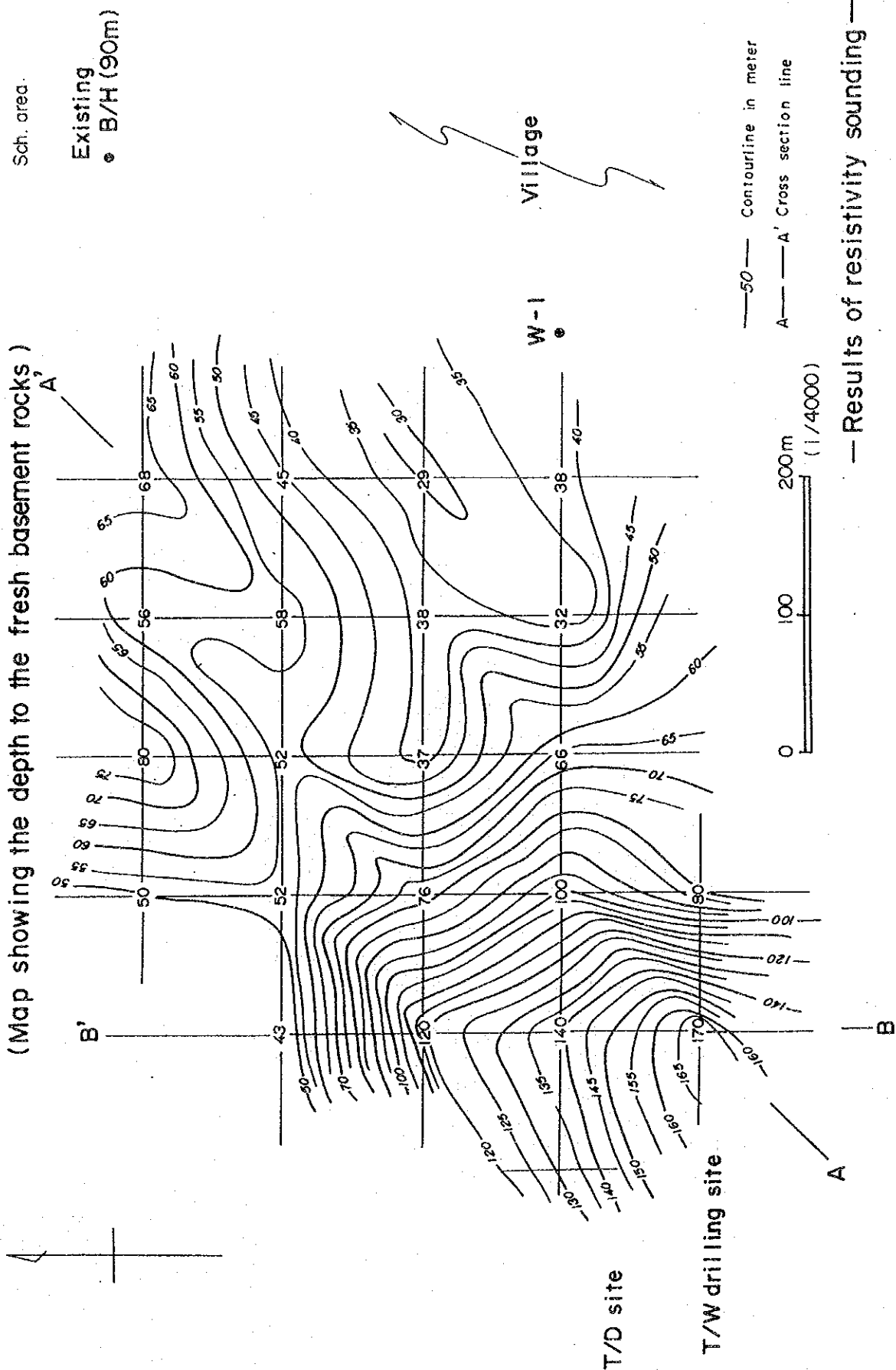
A—A' cross section line

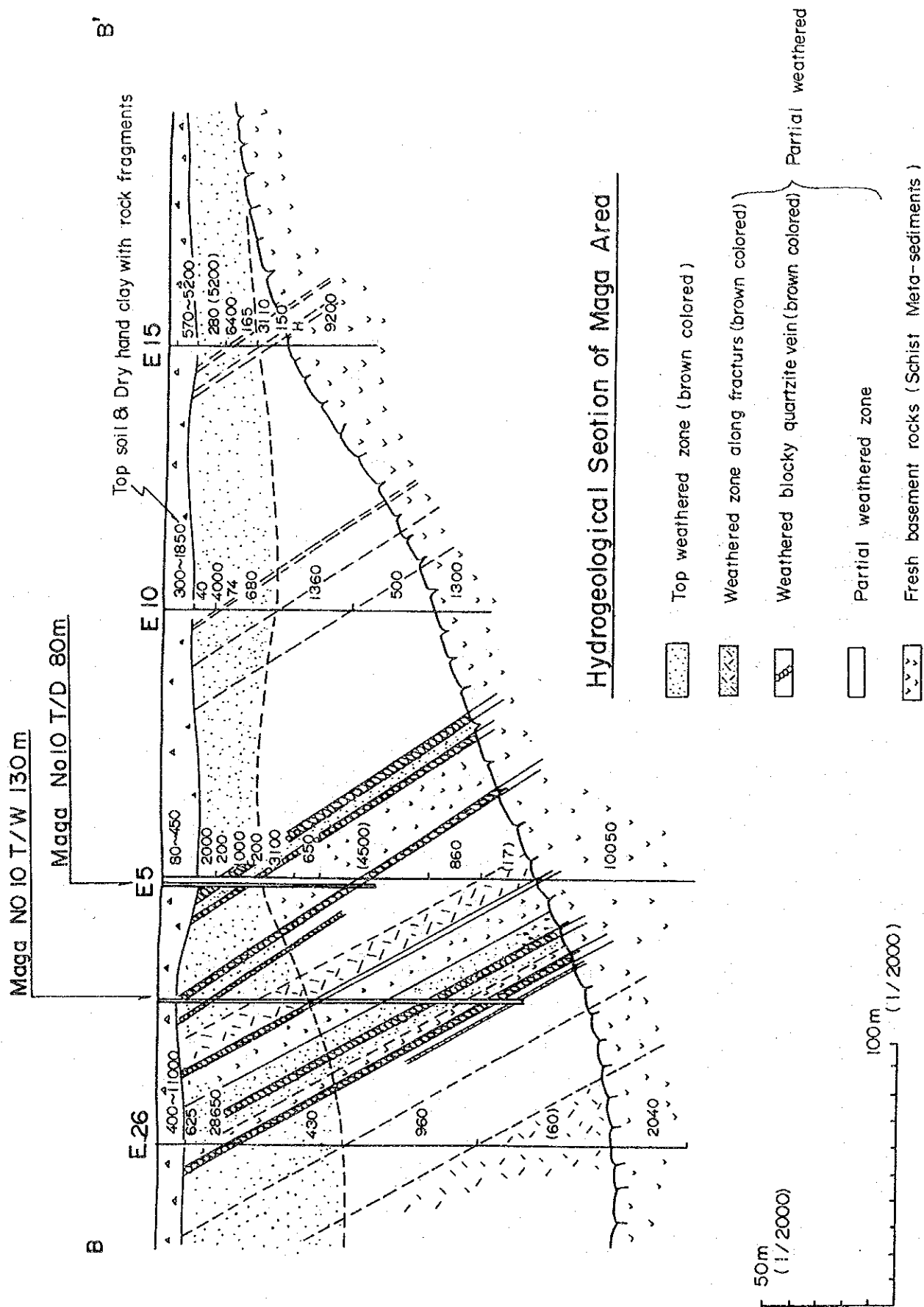
Well (W-1)
Free water level : 5.6 m (29-10-88)
Seasonal water

0 100 200m

Isopash Map of the Fresh Basement Rocks (Maga)

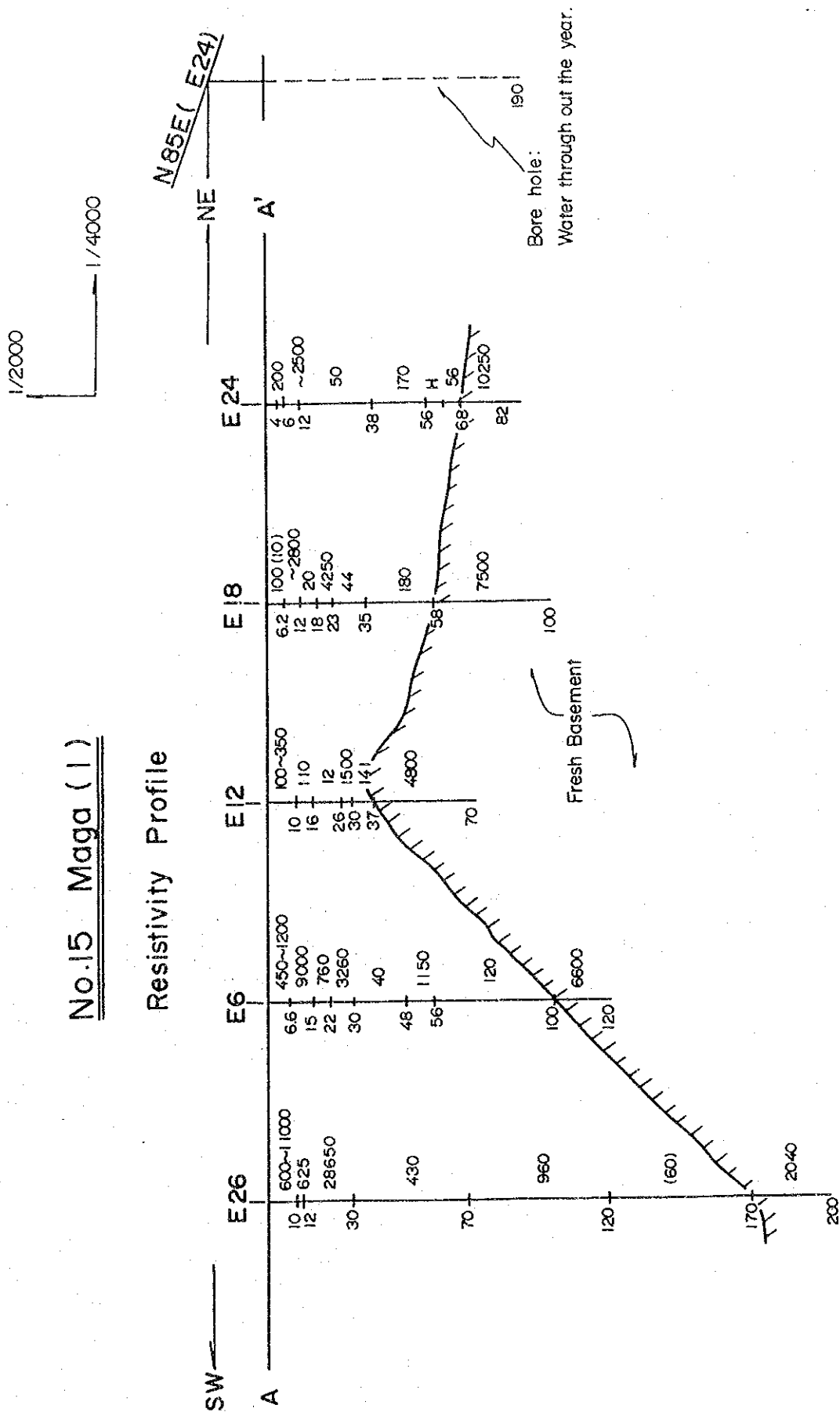
(Map showing the depth to the fresh basement rocks)





No.15 Maga (1)

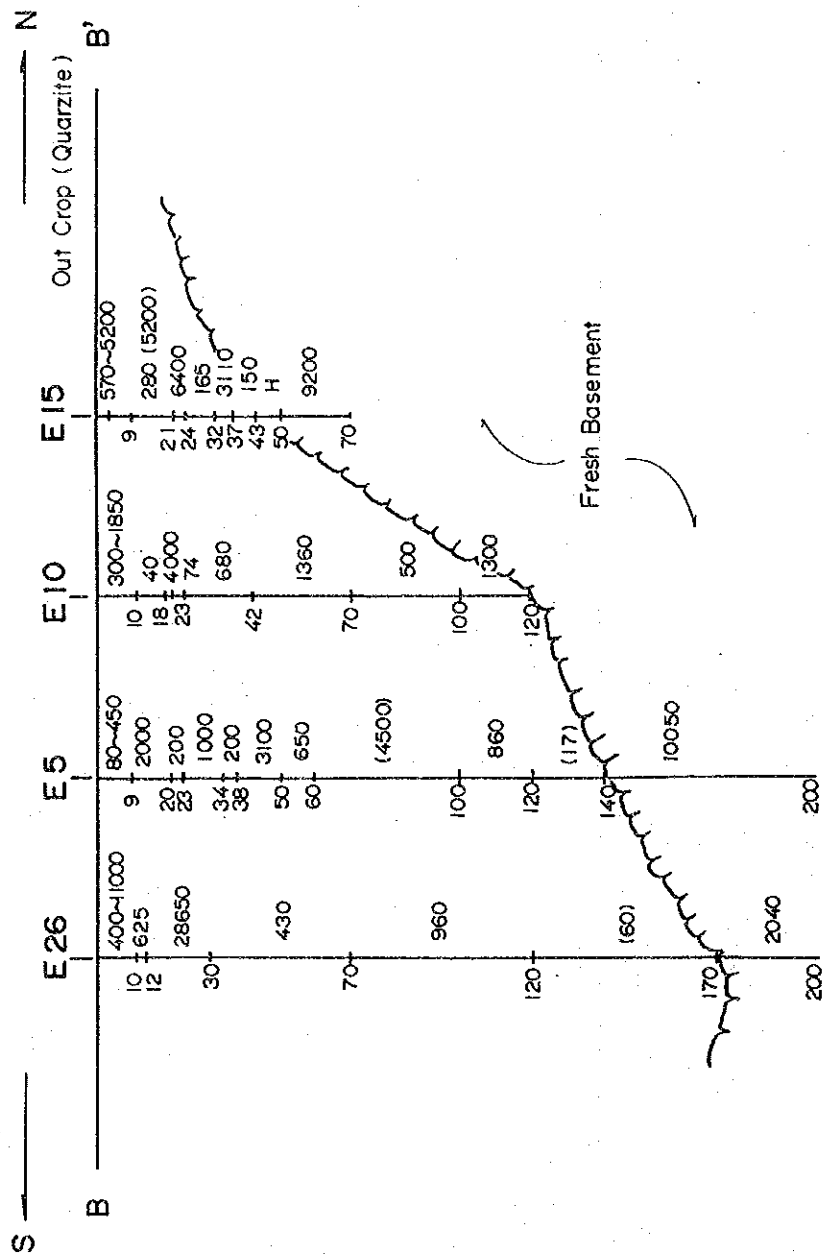
Resistivity Profile



1/2000
1/4000

No. 15 Maga (2)

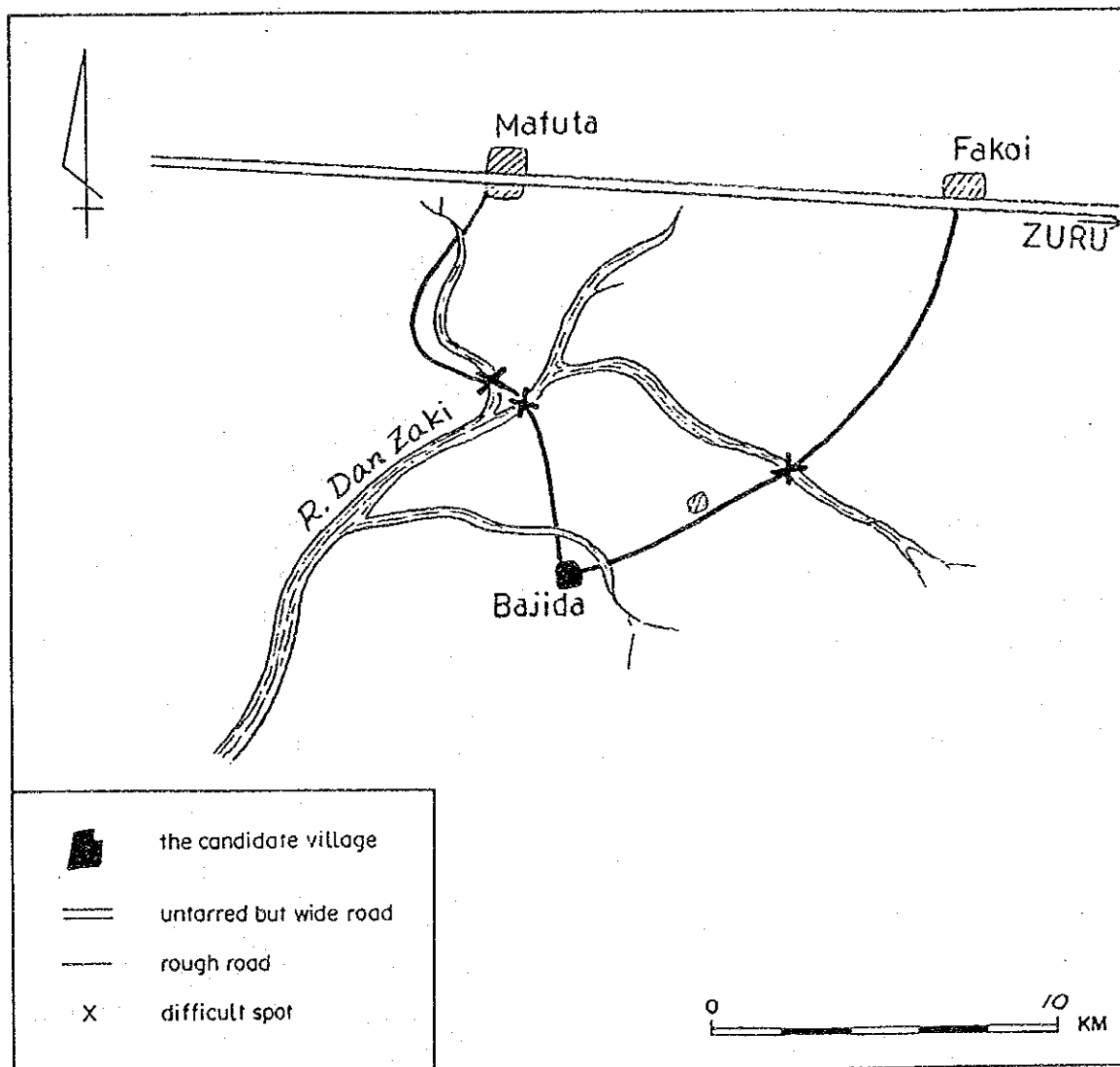
Resistivity Profile



The Study for Groundwater Development in Sokoto State

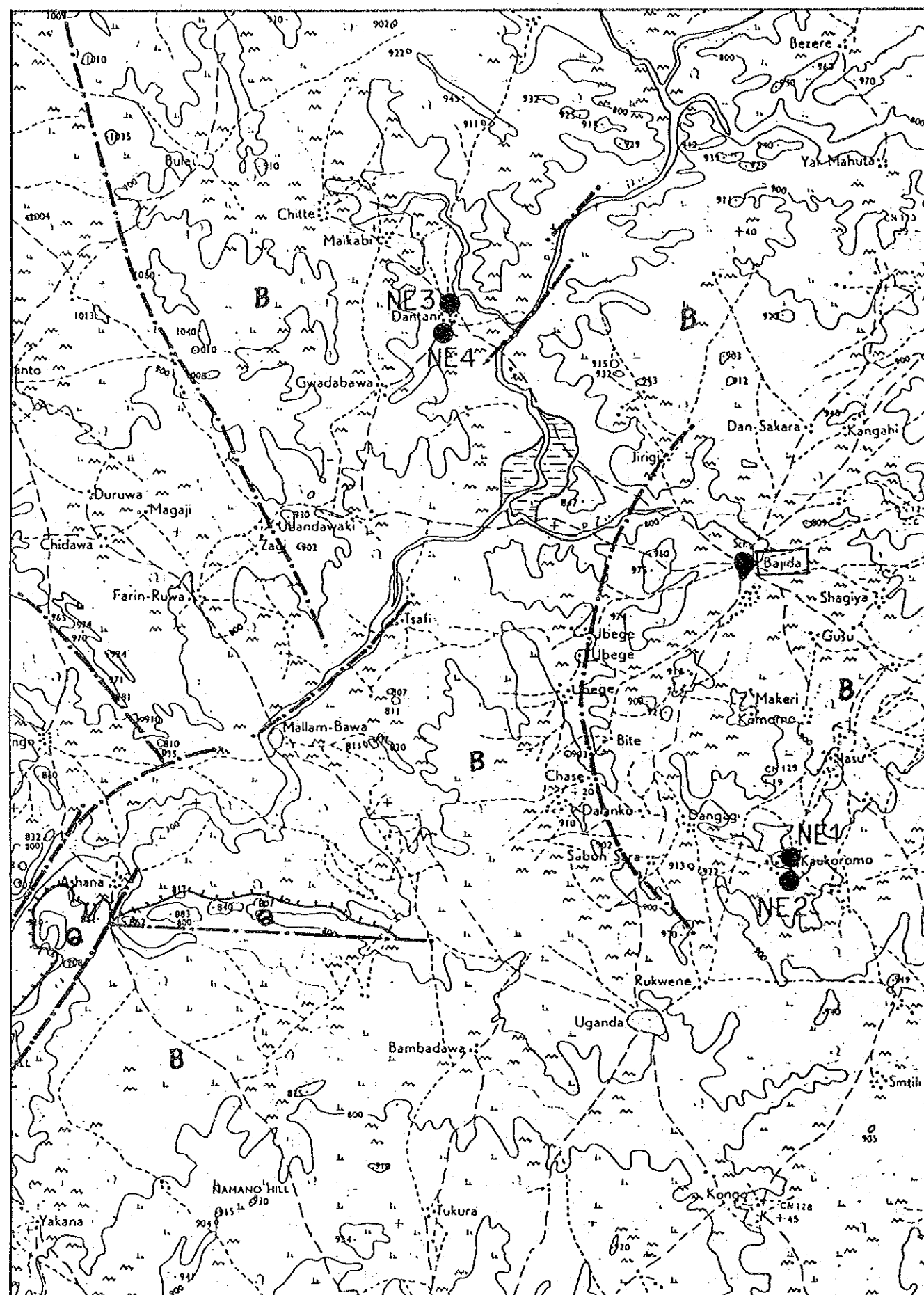
VILLAGE : Bajida

Village No. 11



LOCATION MAP

(1/100,000 Sheet 96)



GEOLOGICAL MAP

Bajida

-  Fadama
-  Lineament
-  Basement Complex
-  SW 16
Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	S.C.(m ³ /d/m)
NE 1	19.0	7.95	10.87
NE 2	25.0	7.14	1.83
NE 3	31.0	16.40	9.47
NE 4	37.0	16.23	144.00

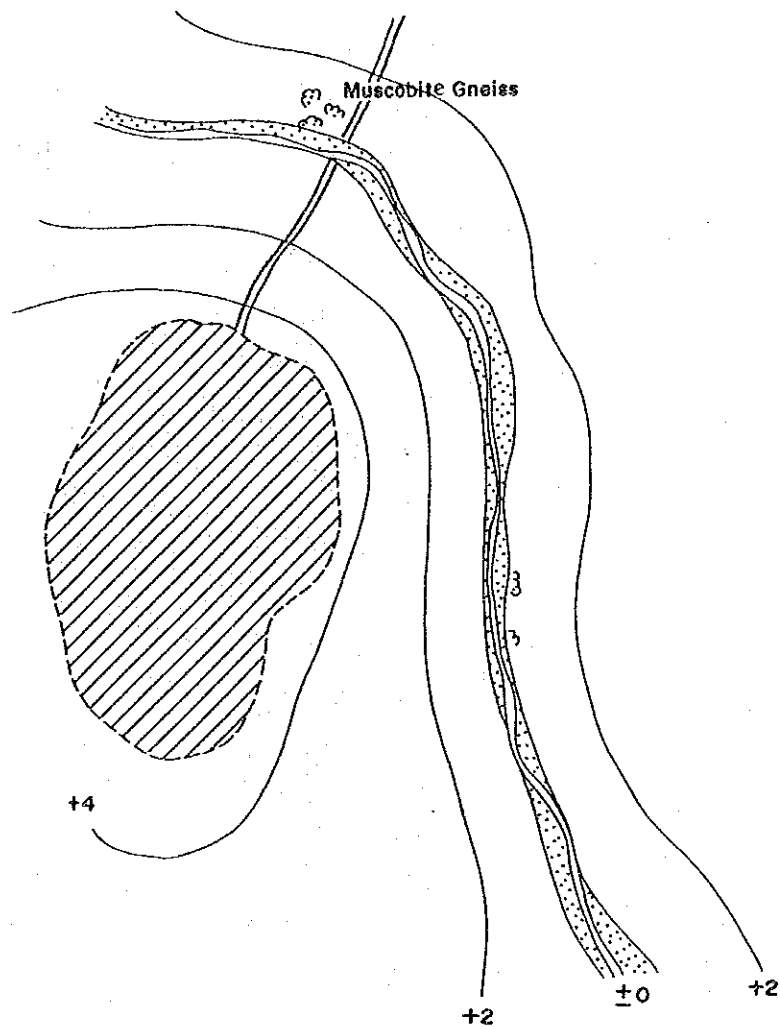
SWL.: Static Water Level
SC : Specific Capacity

1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION
AND THE TOPOGRAPHICAL FEATURE

No.11

Bajida

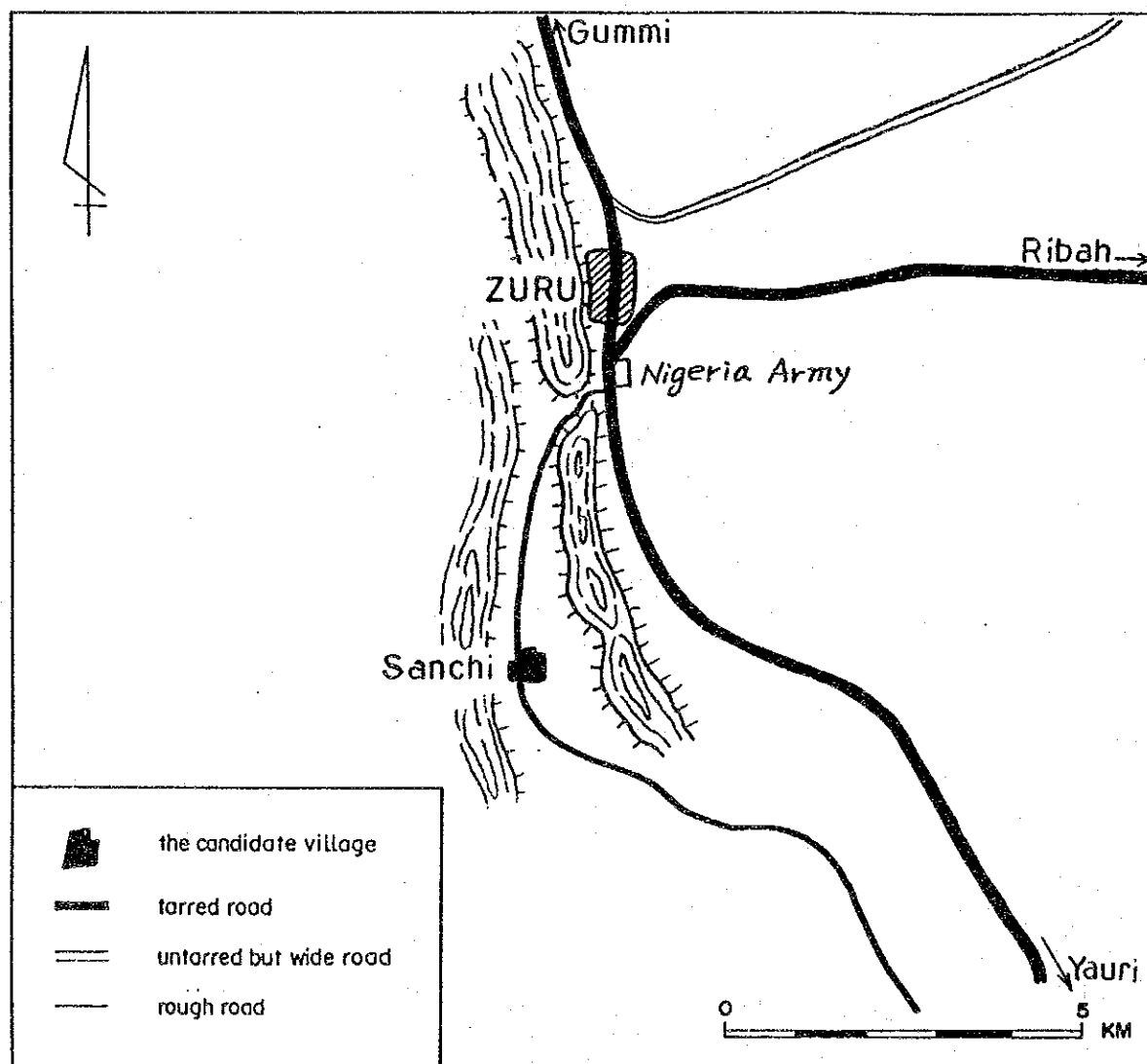


settlement

The Study for Groundwater Development in Sokoto State

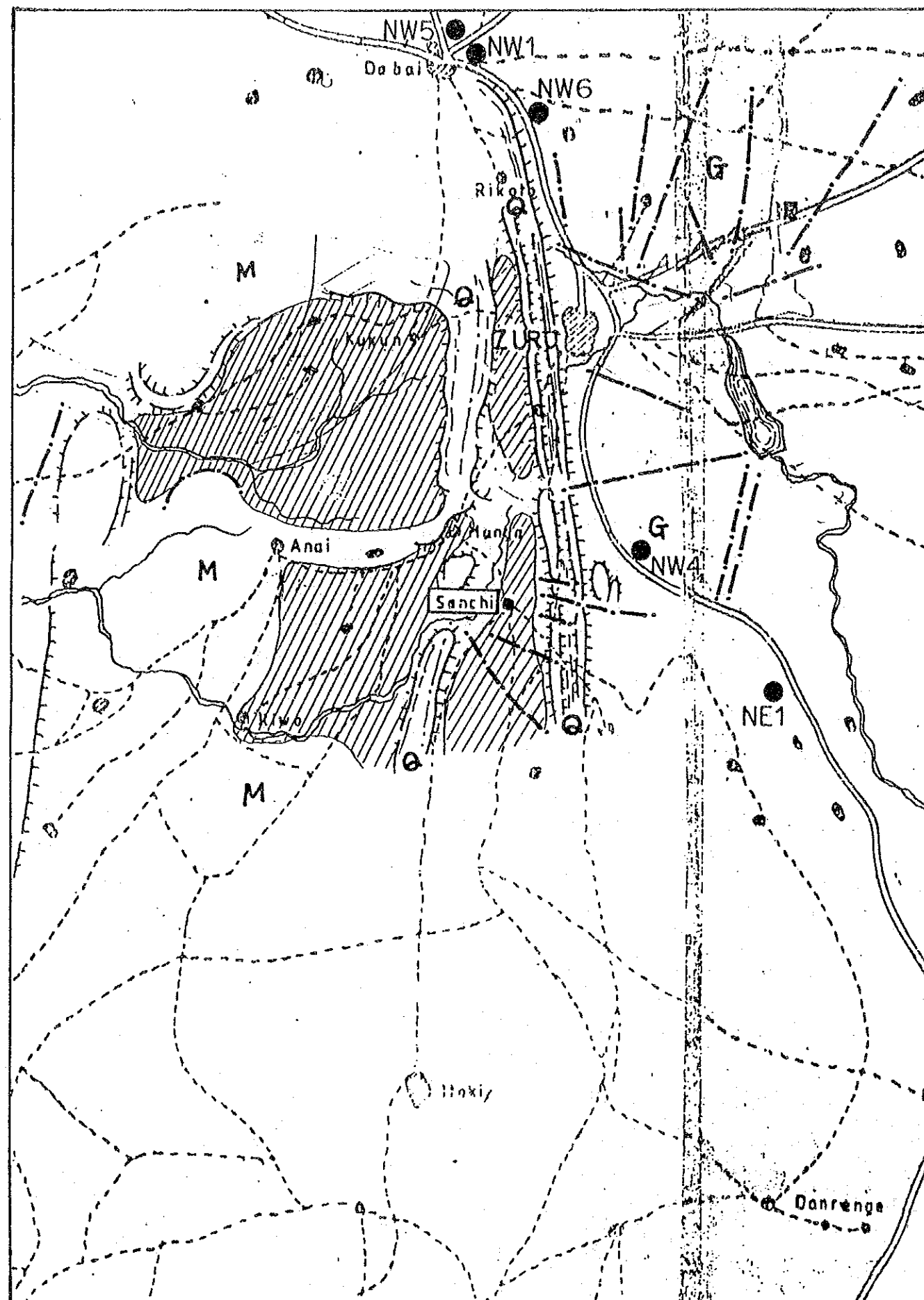
VILLAGE : Sanchi

Village No. 12



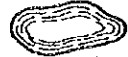
LOCATION MAP

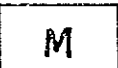
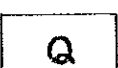
(1/100,000 Sheet 97)



GEOLOGICAL MAP

Sanchi

-  Lake, Pond
-  Escarpment
-  Lineament
-  Basin

-  Older Granite
-  Meta-sediments
-  Quartzite

-  SW16
- Existing Boreholes.

DATA OF EXISTING BOREHOLES

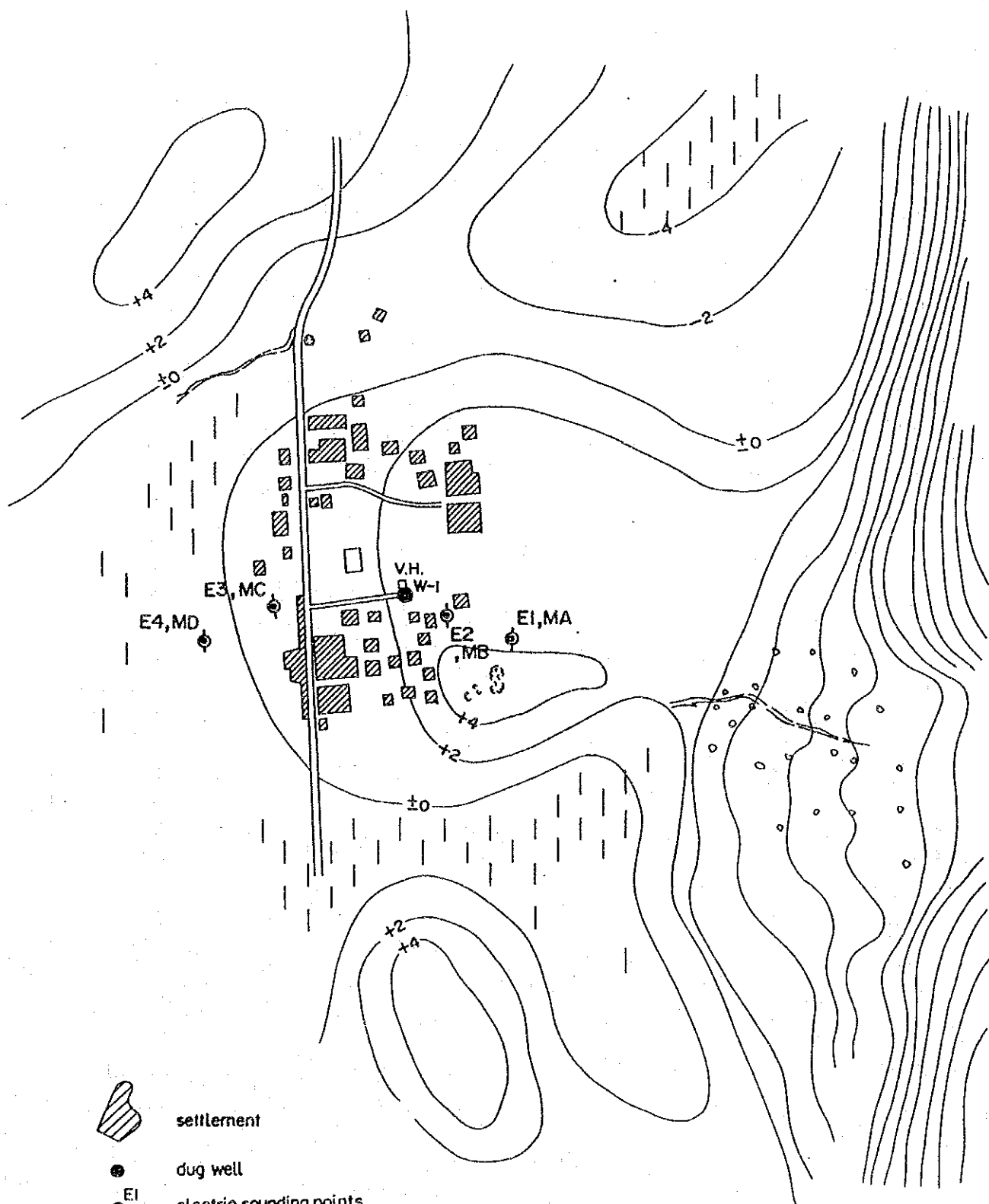
Borehole No.	Depth(m)	SWL.(m)	SC.(m ³ /d/m)
NW 1	49.0	8.03	1.29
NW 4	25.0	7.97	6.26
NW 5	37.0	5.49	11.01
NW 6	43.0	9.10	2.07
NE 1	25.0	18.35	49.66

SWL.: Static Water Level
SC : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.12

Sanchi



settlement



dug well



electric sounding points



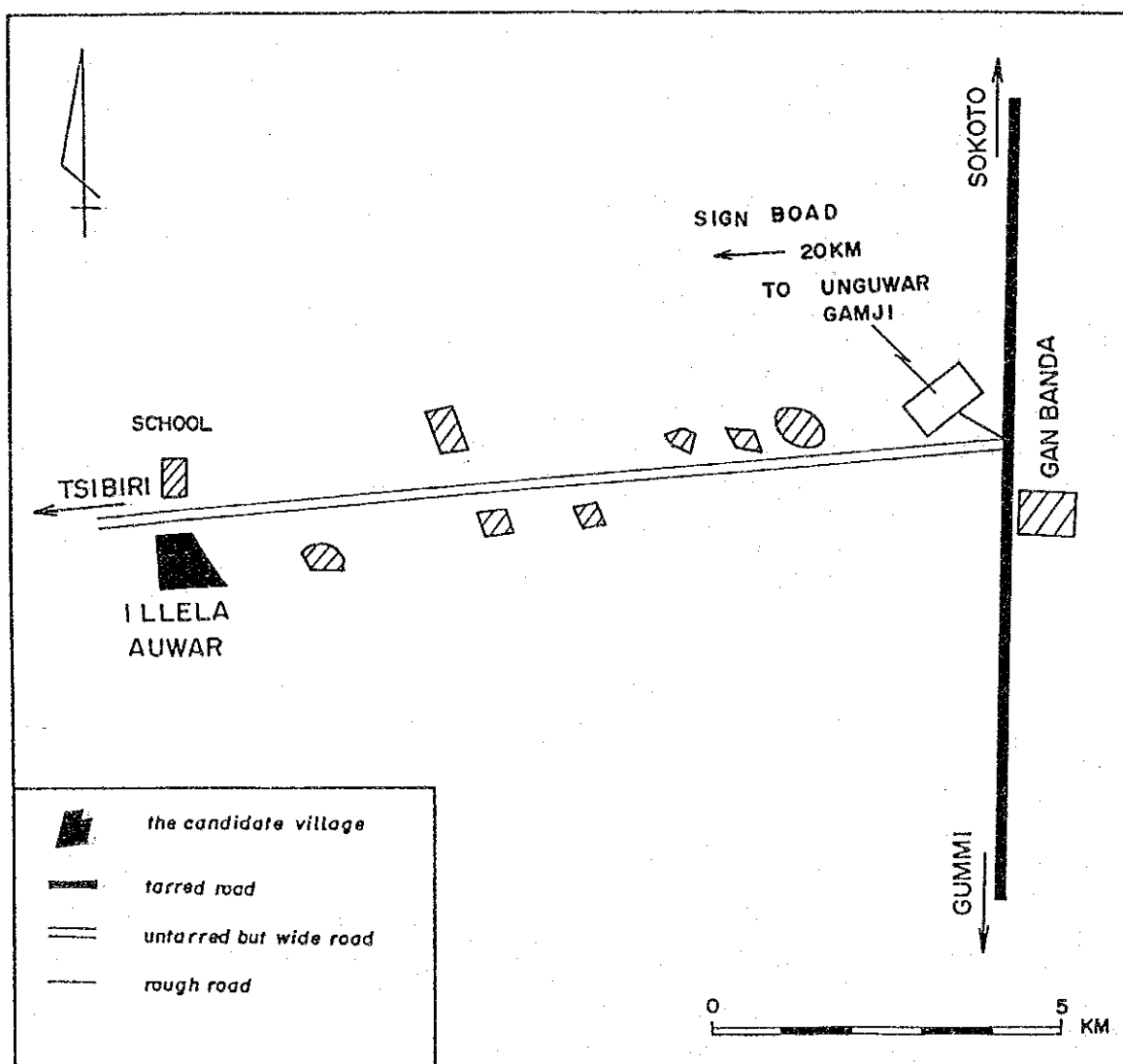
magneto-telluric
sounding points

0 200 400^m

The Study for Groundwater Development in Sokoto State

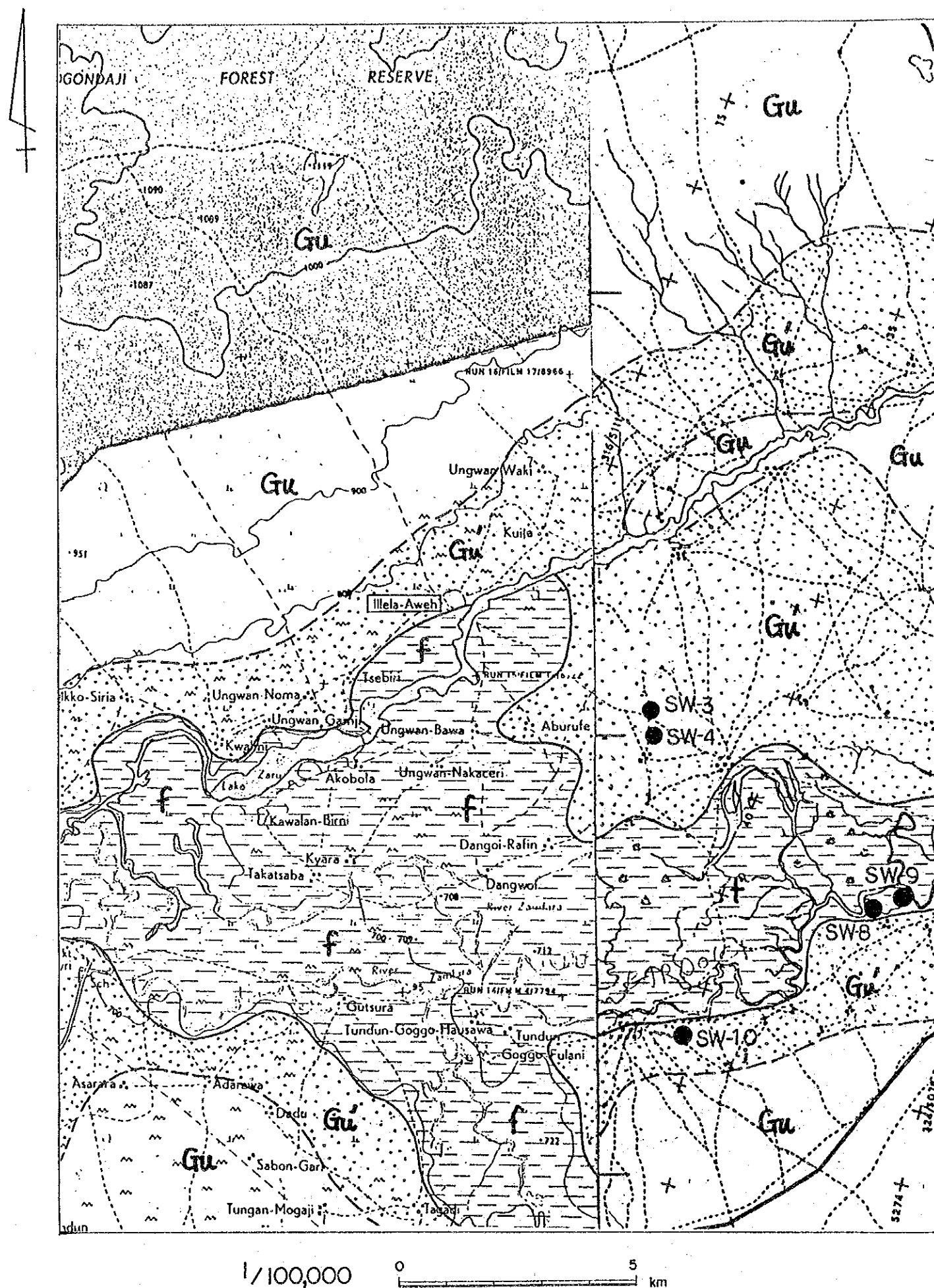
VILLAGE : ILLELA AUWAR

Village No. 13



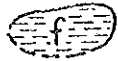
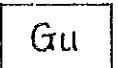
LOCATION MAP

(1/100,000 Sheet _____)



GEOLOGICAL MAP

ILLELA AUWAR

-  Fadama
-  Eroded and Recovered with Sand
-  Gundumi Formation

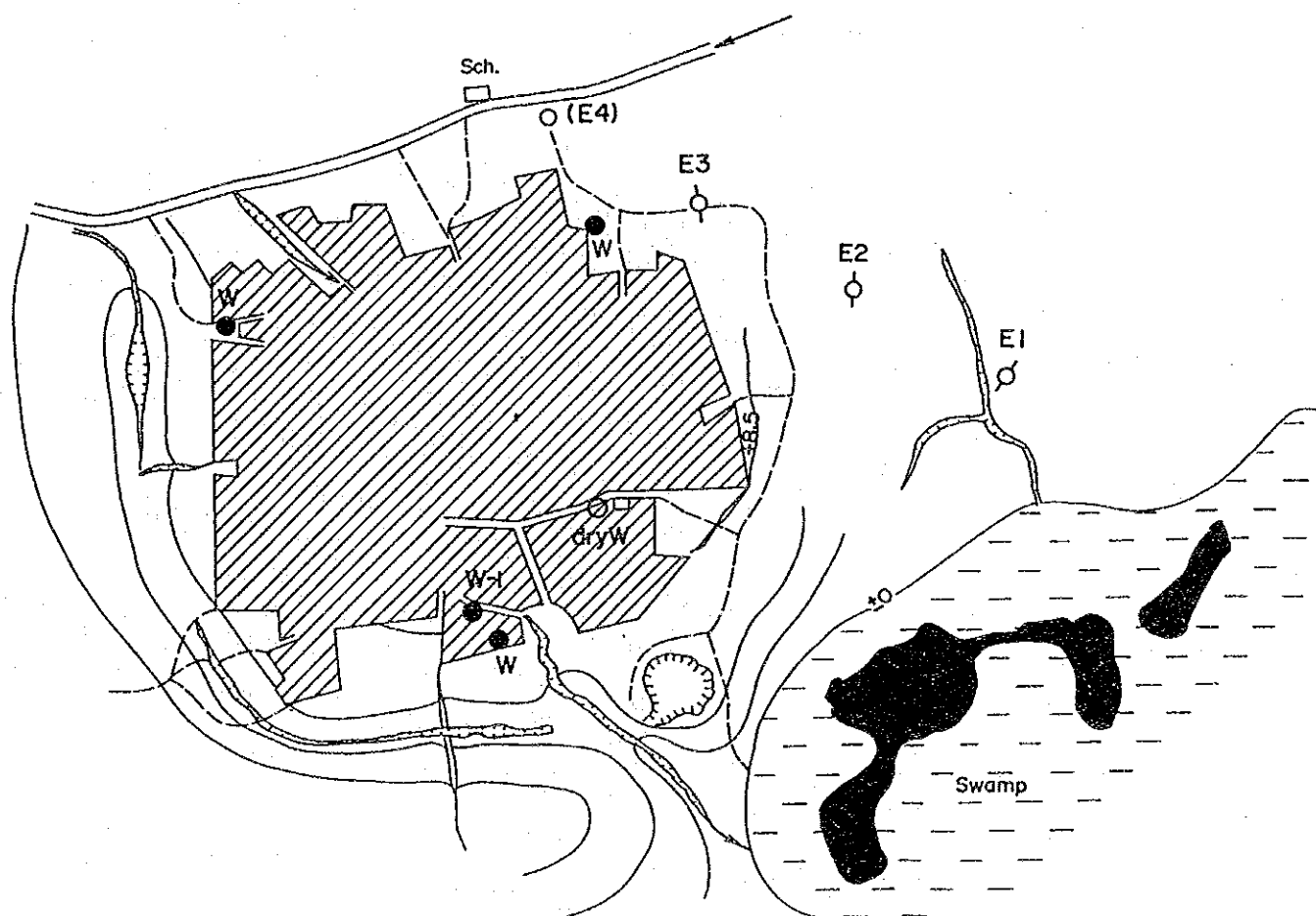
-  SW 16
- Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	S.W.L.(m)	S.C.(m ³ /d/m)
SW-3	48.0	44.39	9.02
SW-4	42.0	6.01	84.52

SW.L.: Static Water Level
SC : Specific Capacity

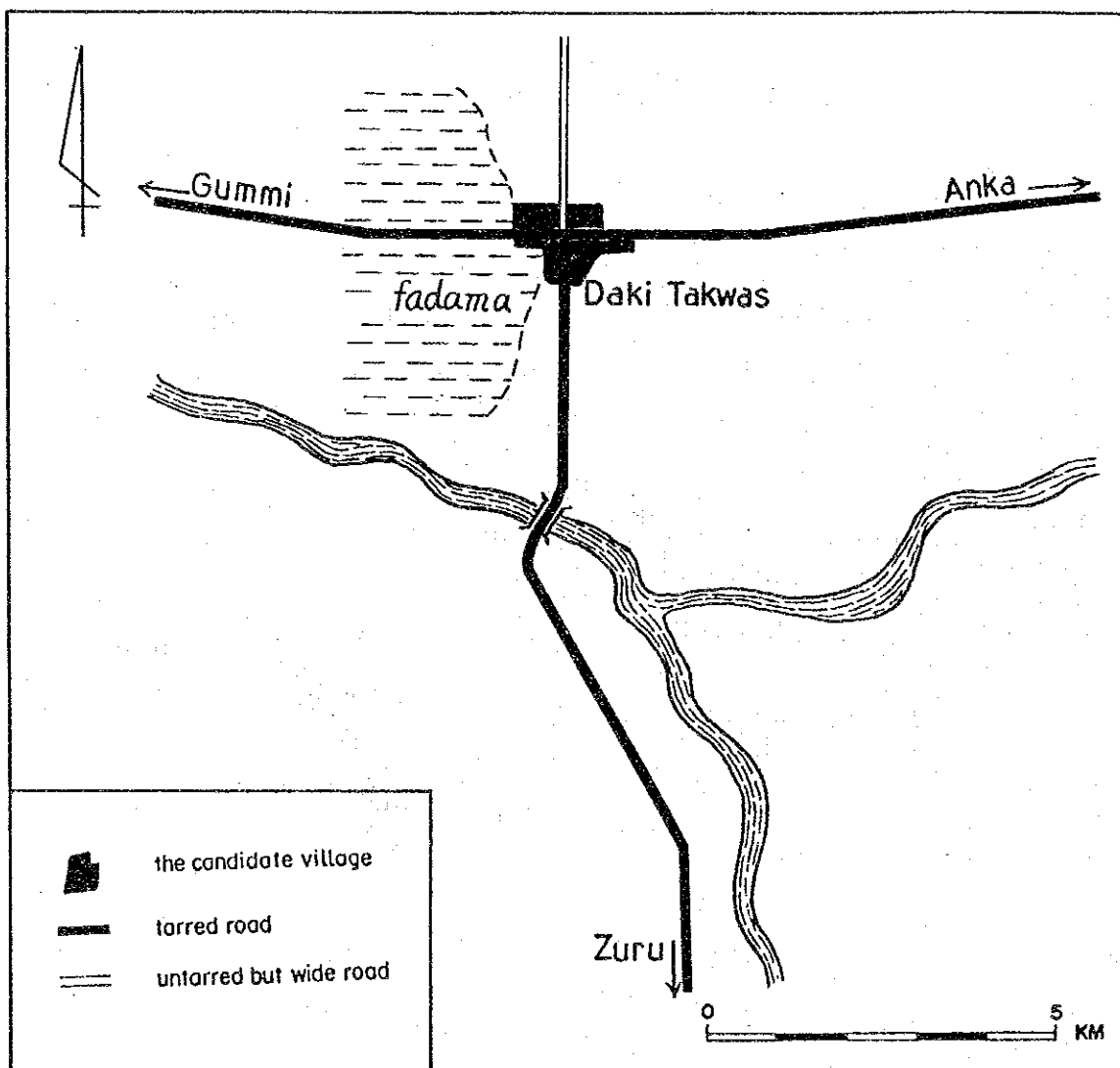
No. 13 ILLELA AUWAR



The Study for Groundwater Development in Sokoto State

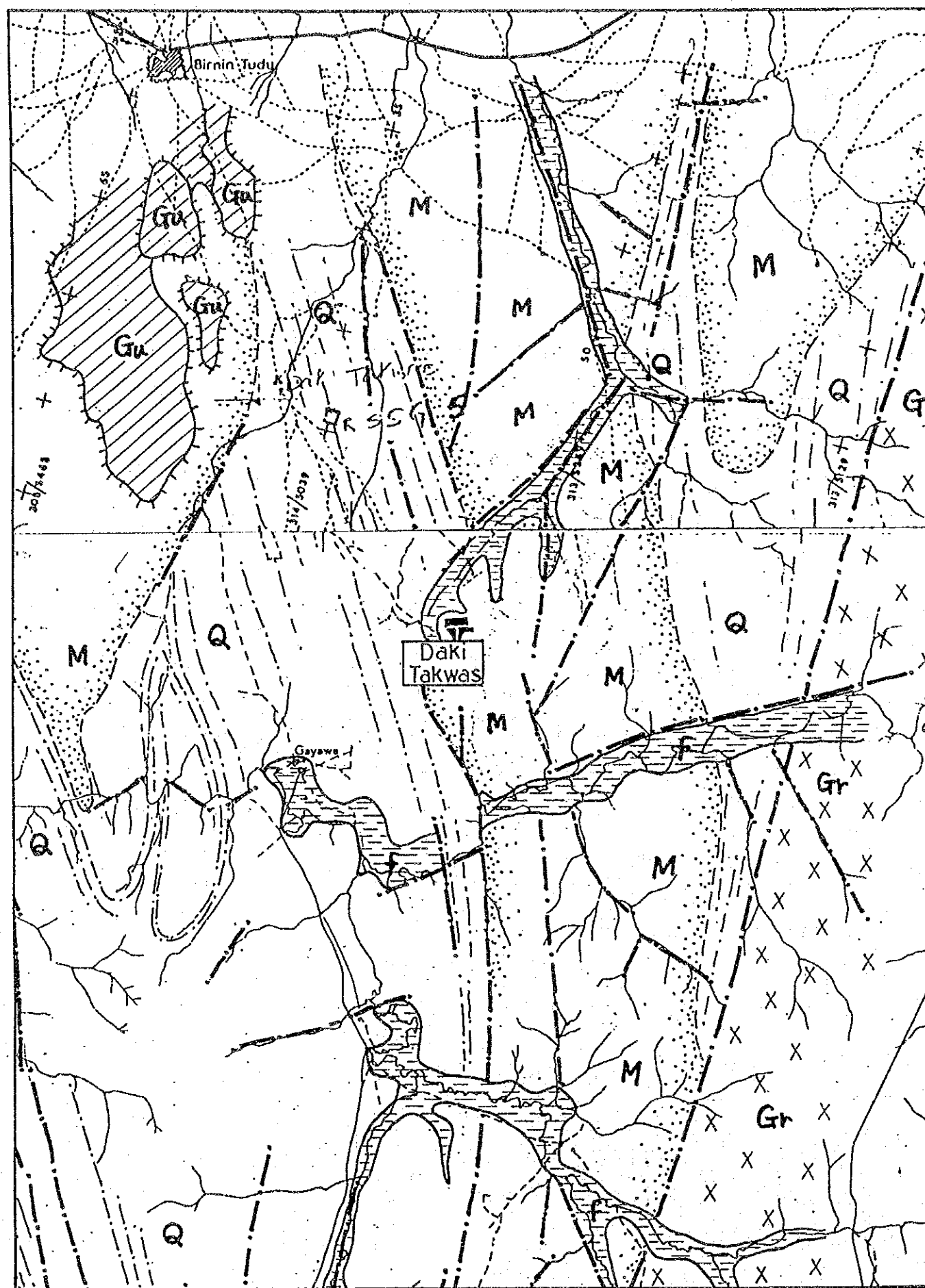
VILLAGE : Daki Takwas

Village No. 14



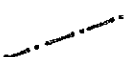
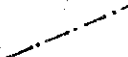
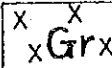
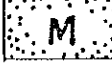
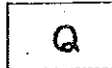
LOCATION MAP

(1/100,000 Sheet 74)



GEOLOGICAL MAP

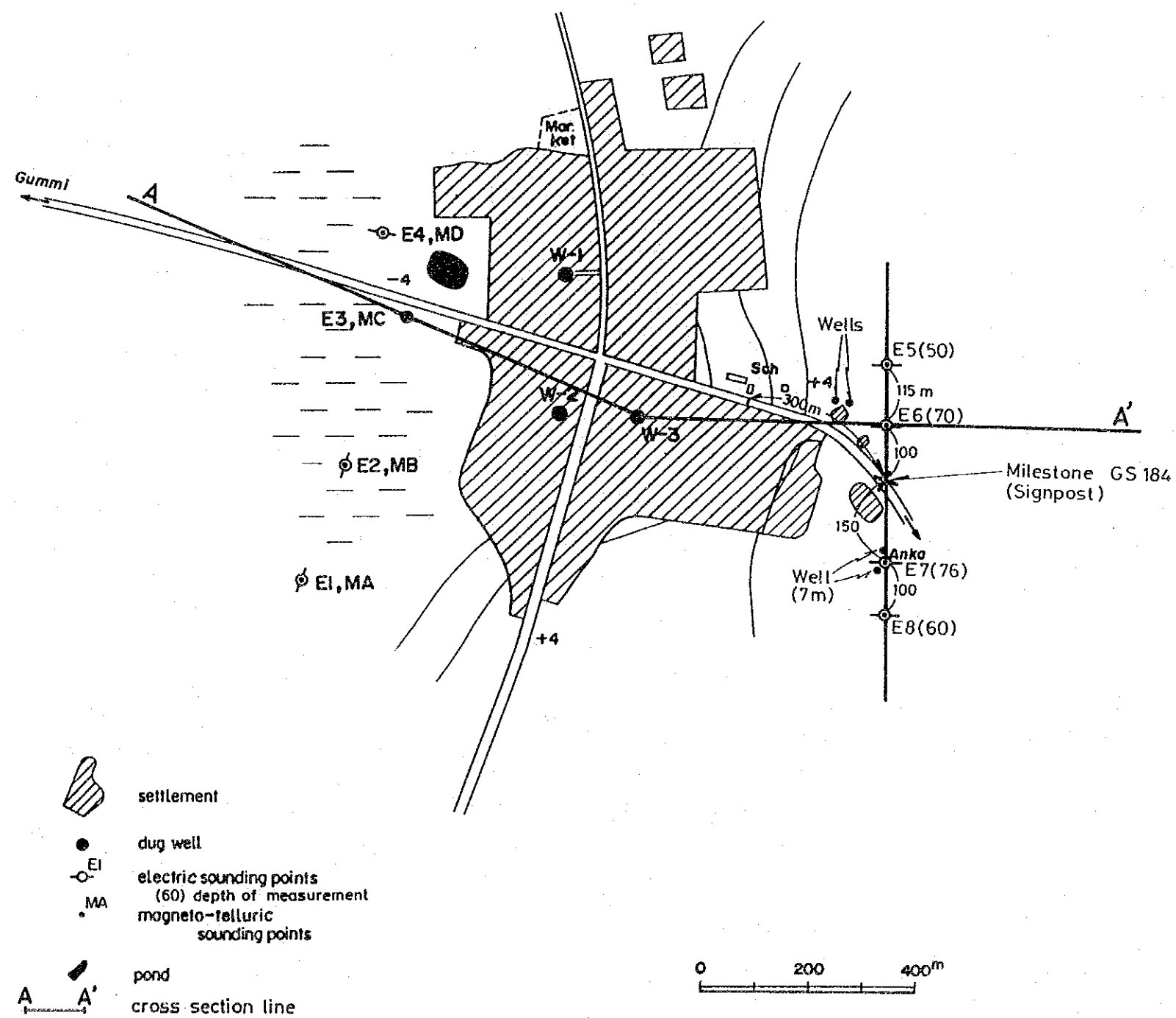
Daki Takwas

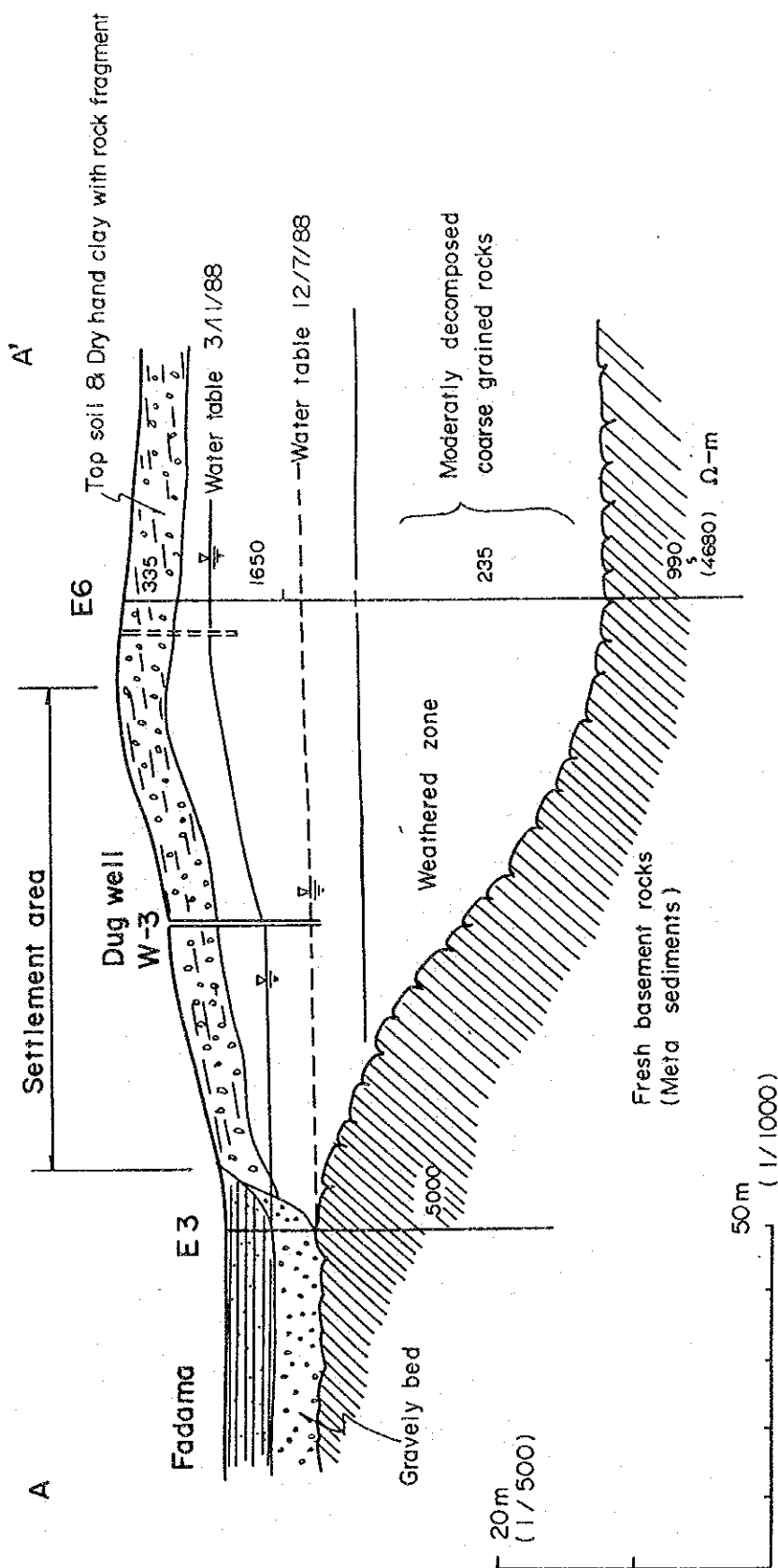
-  Fadama
-  Escarpment
-  Lineament (Fault)
-  Lineation (Foliation)
-  Gundumi Formation
-  Older Granite
-  Meta-sediments
-  Quartzite

1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.14 Daki Takwas

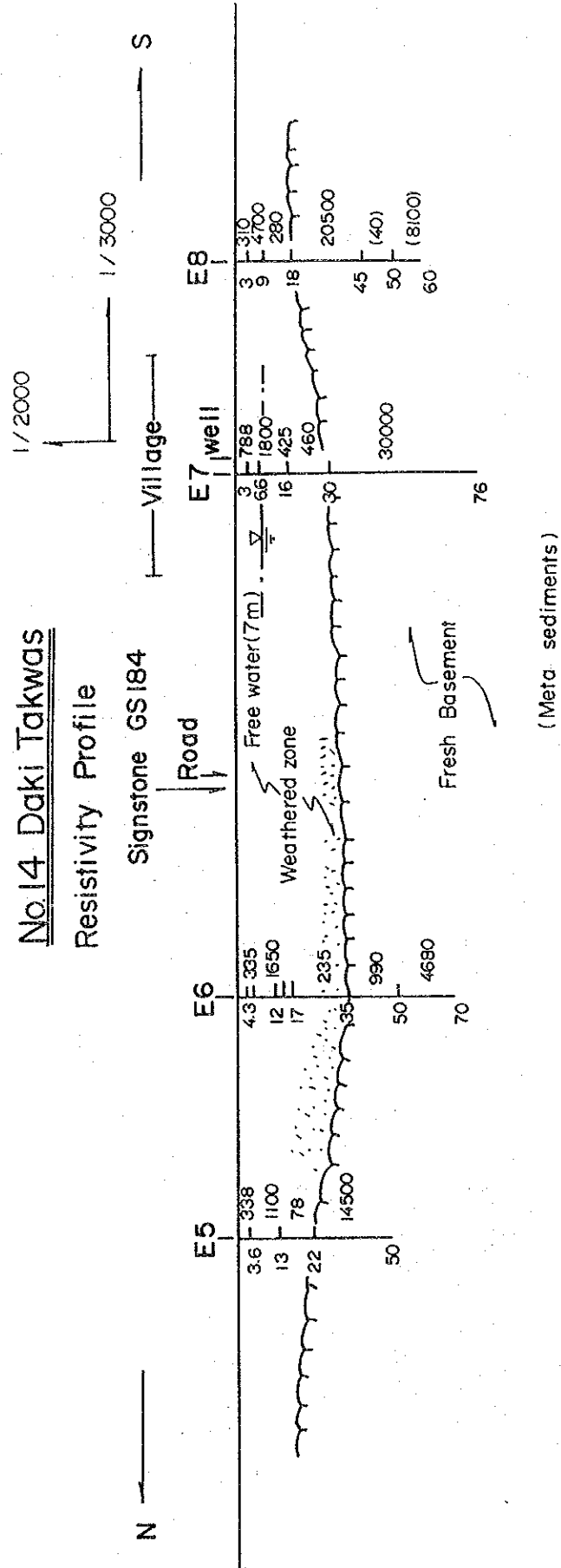




Hydrogeological Section of Daki Takwas Area

No.14 Daki Takwas

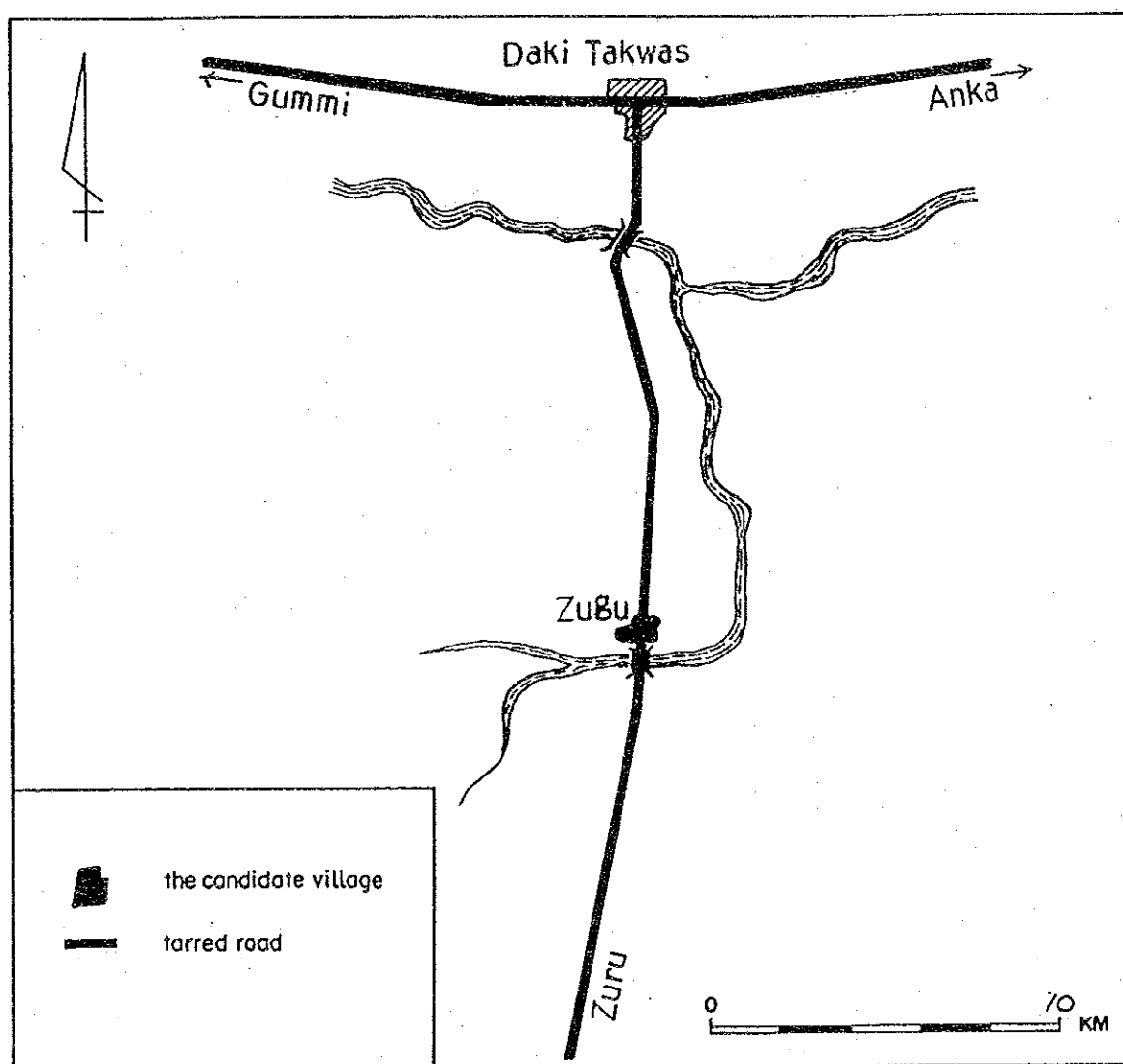
Resistivity Profile



The Study for Groundwater Development in Sokoto State

VILLAGE : Zugu

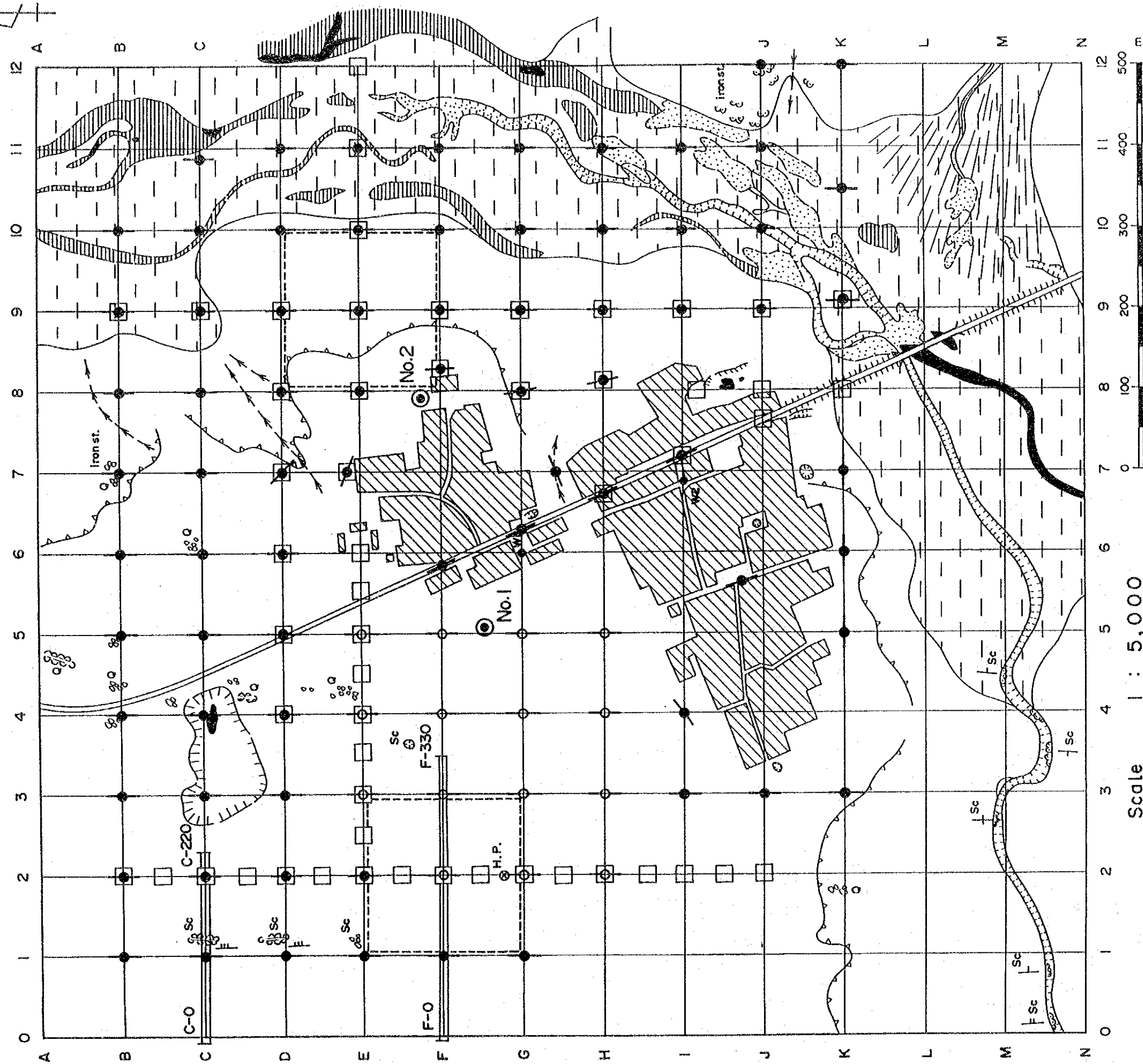
Village No. 15



LOCATION MAP

(1/100,000 Sheet 74)

LOCATION OF THE SURVEY POINTS



Electric Sounding

- surveyed point
- surveyed in previous stage

Seismic Refraction Survey
C-0

C-220

survey line

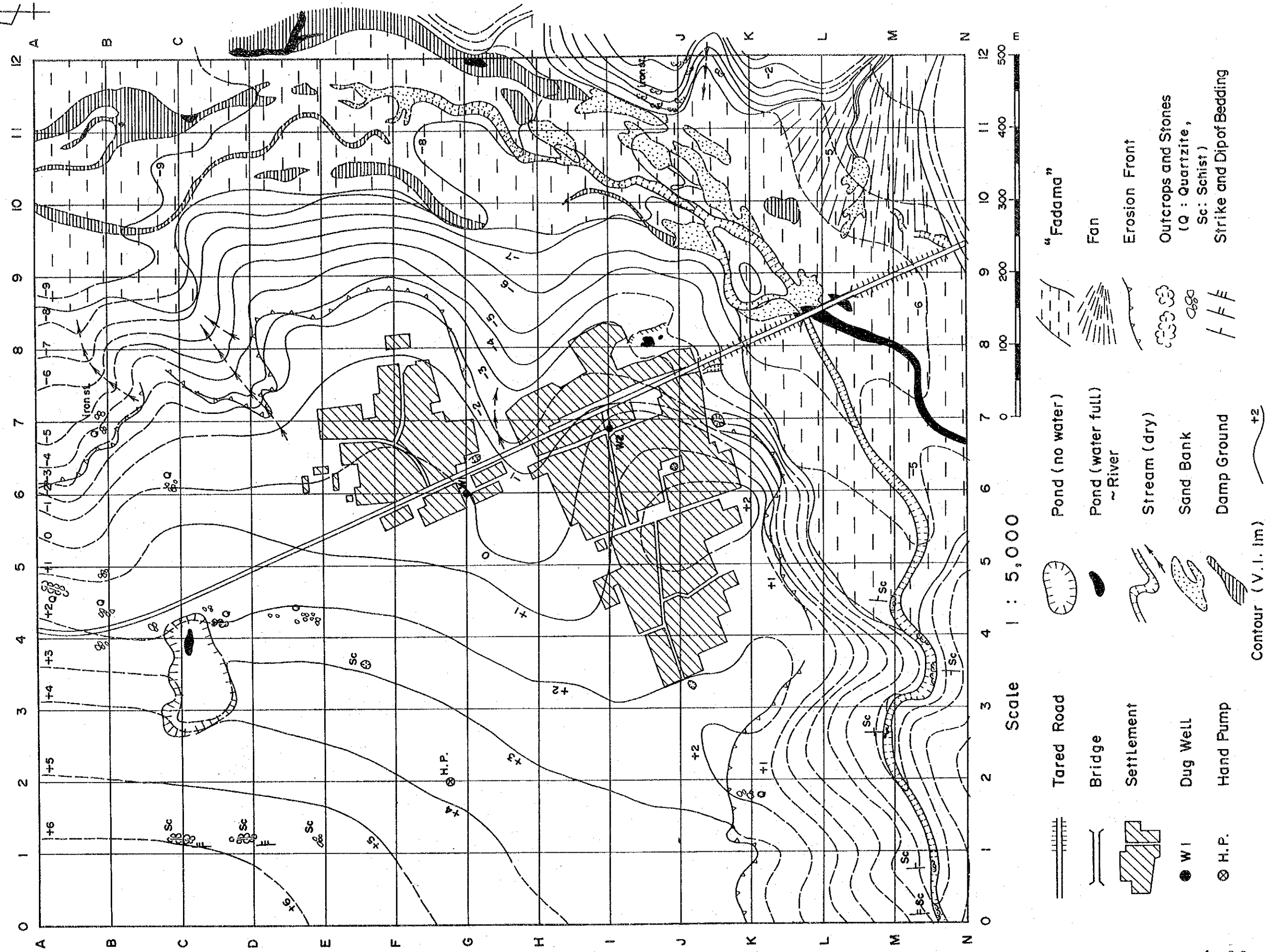
TEM Survey

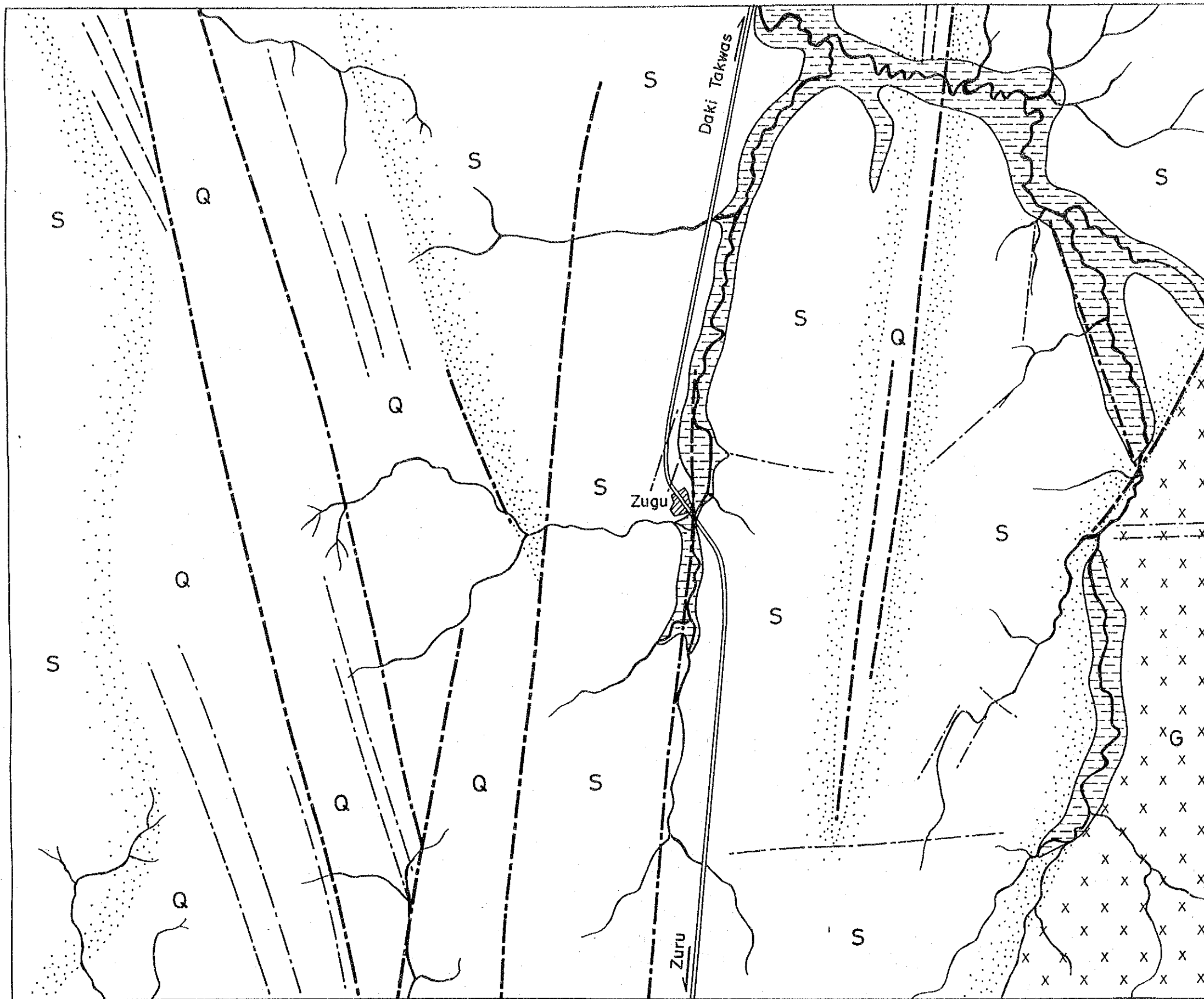
- measured point
- transmitting loop

Test Drilling

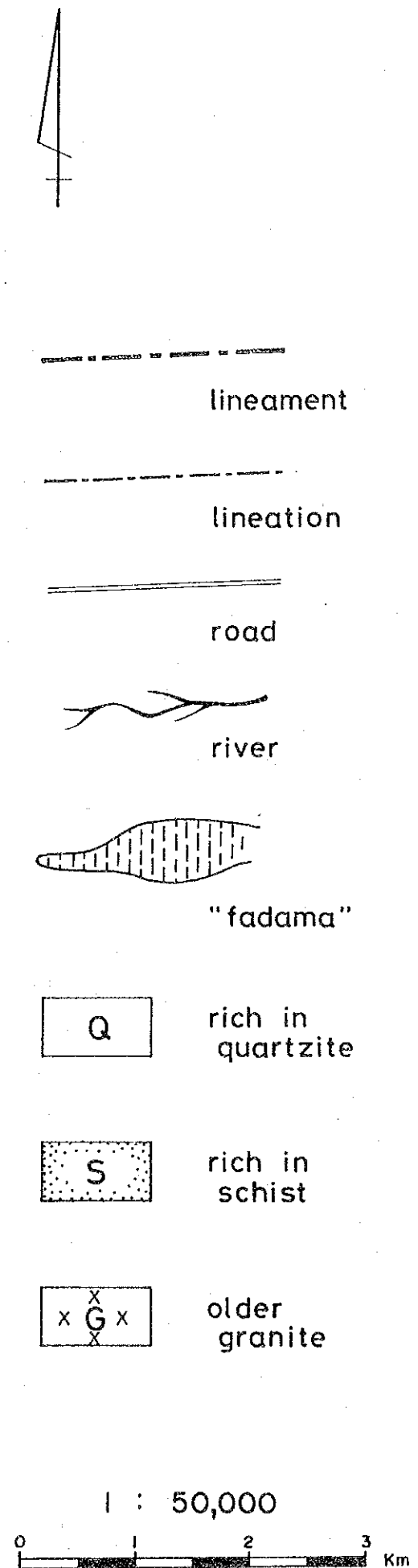
- No. 1, 2 drilling point

GEOGRAPHICAL MAP OF ZUGU VILLAGE





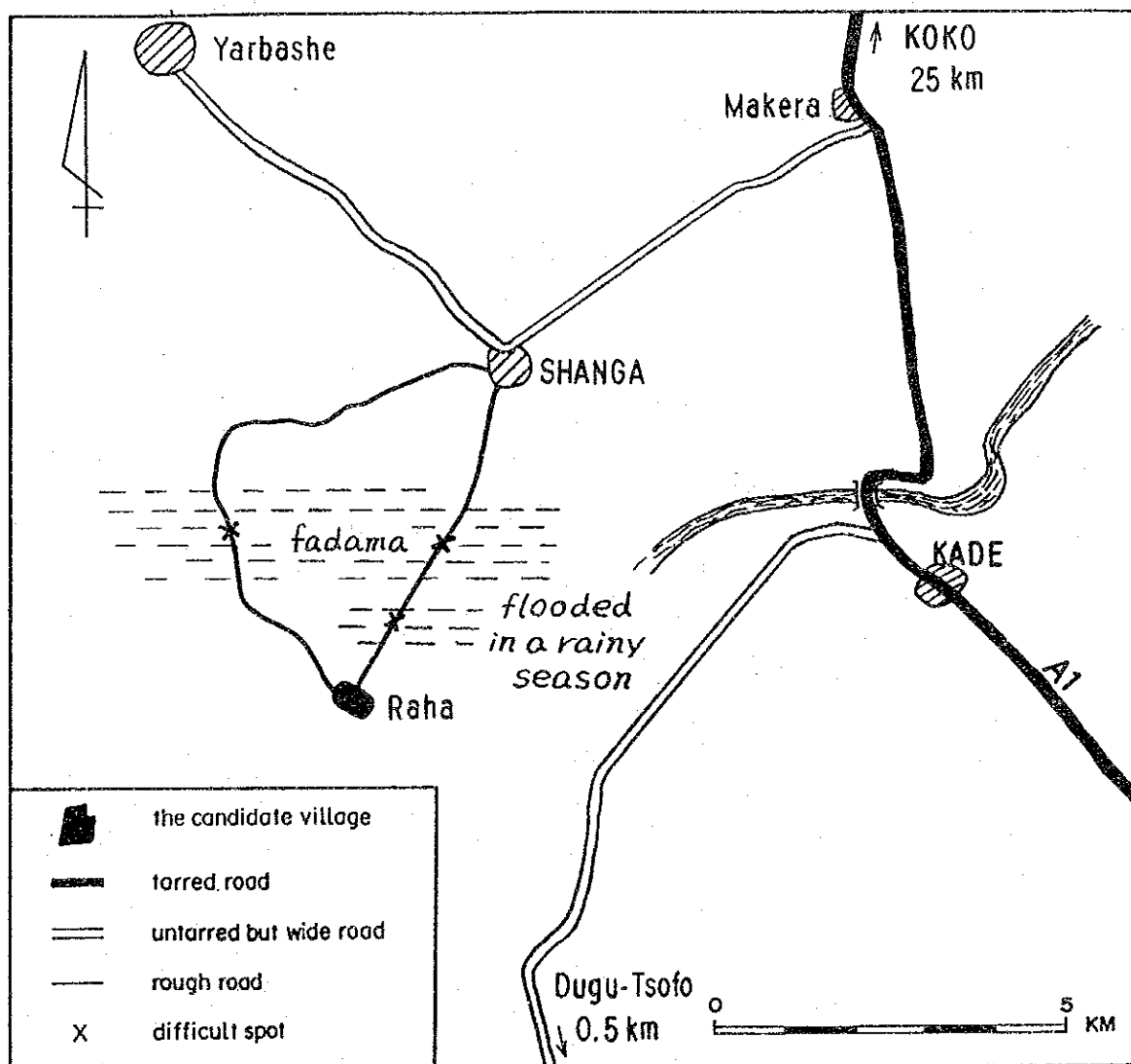
GEOLOGICAL INTERPRETATION MAP
AROUND ZUGU AREA



The Study for Groundwater Development in Sokoto State

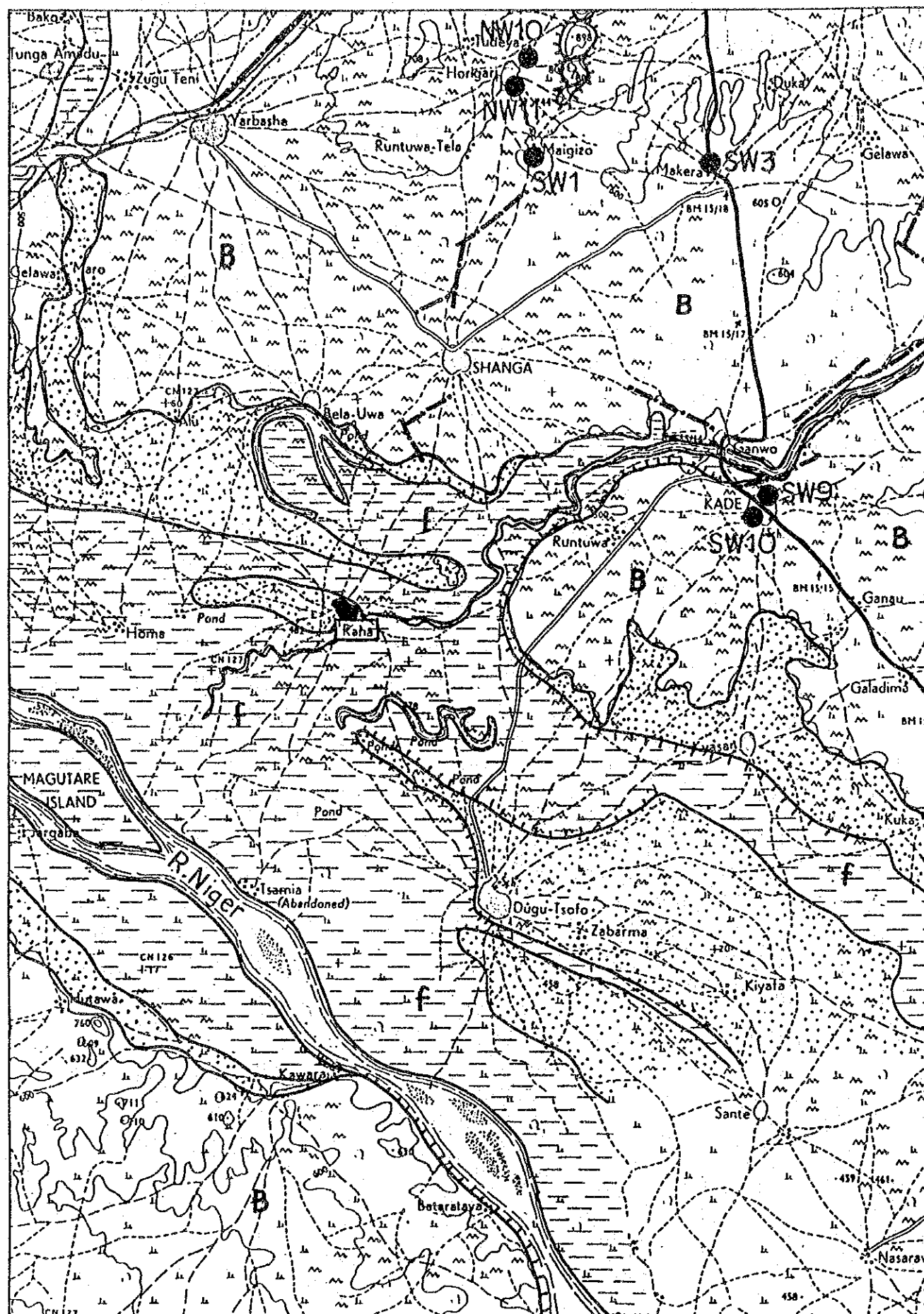
VILLAGE : Raha

Village No. 16



LOCATION MAP

(1/100,000 Sheet 96)



GEOLOGICAL MAP

Raha

-  River
-  Fadama
-  Eroded and Recovered with Sand
-  Escarpment
-  Lineament
-  Basement Complex

● SW 16
Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	S.C.(m ³ /d/m)
NW 10	48.0	2.34	2.01
NW 11	21.0	3.40	2.04
SW 1	21.0	3.63	3.45
SW 3	31.0	14.74	5.65
SW 9	43.0	4.61	1.64
SW 10	27.0	7.41	1.71

SWL.: Static Water Level
S.C. : Specific Capacity

1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.16

Raha



settlement



dug well



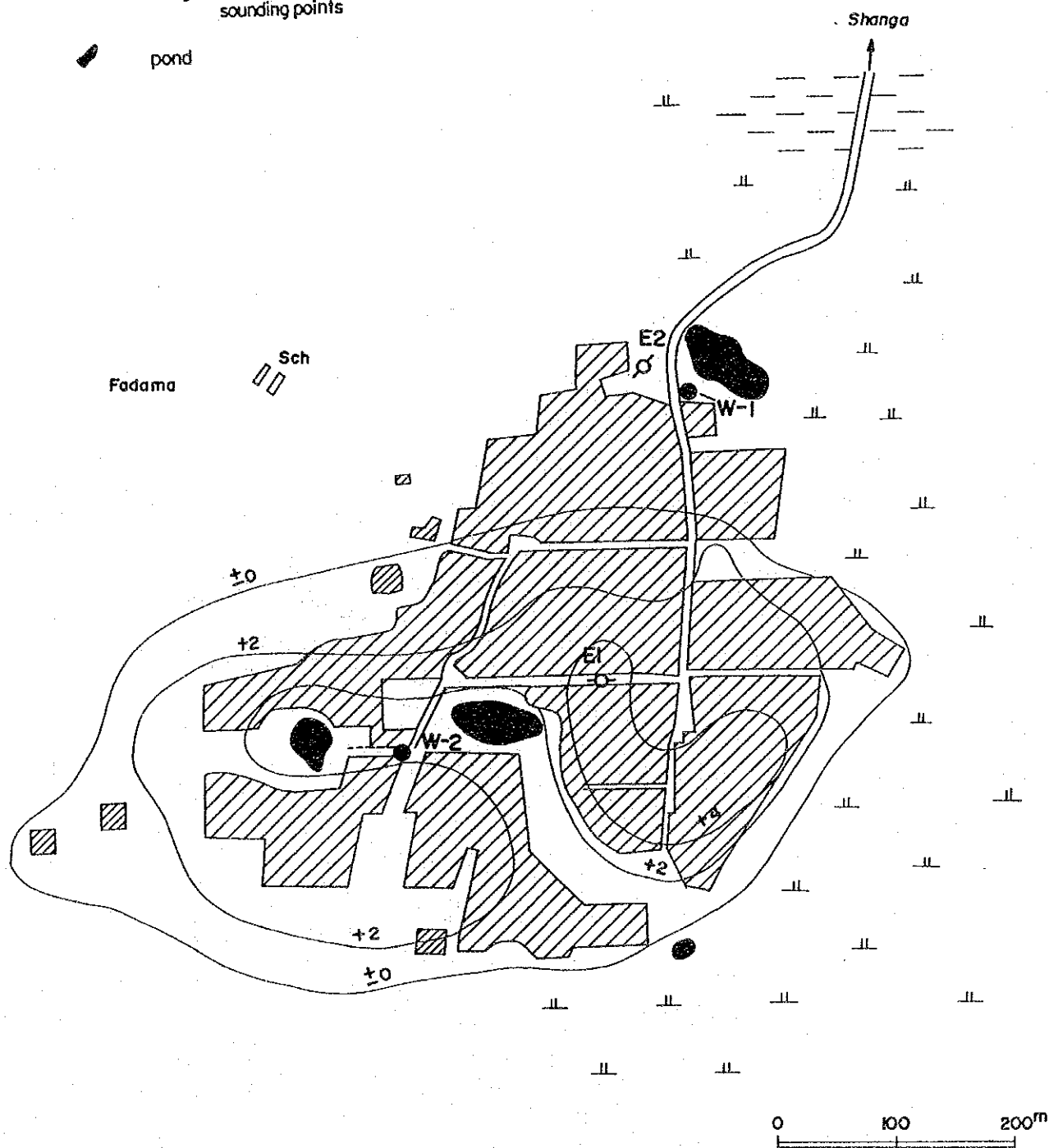
electric sounding points



magneto-telluric
sounding points



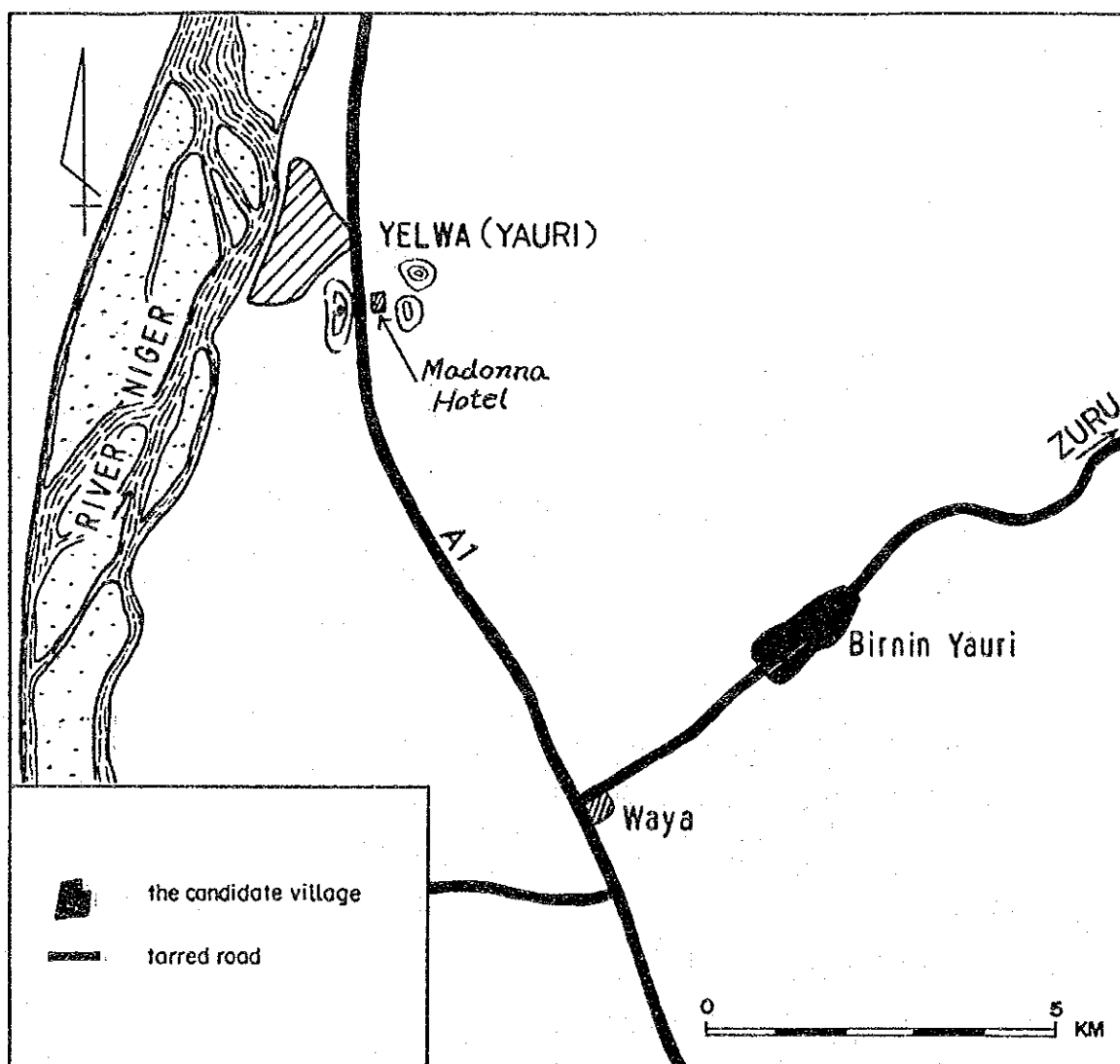
pond



The Study for Groundwater Development in Sokoto State

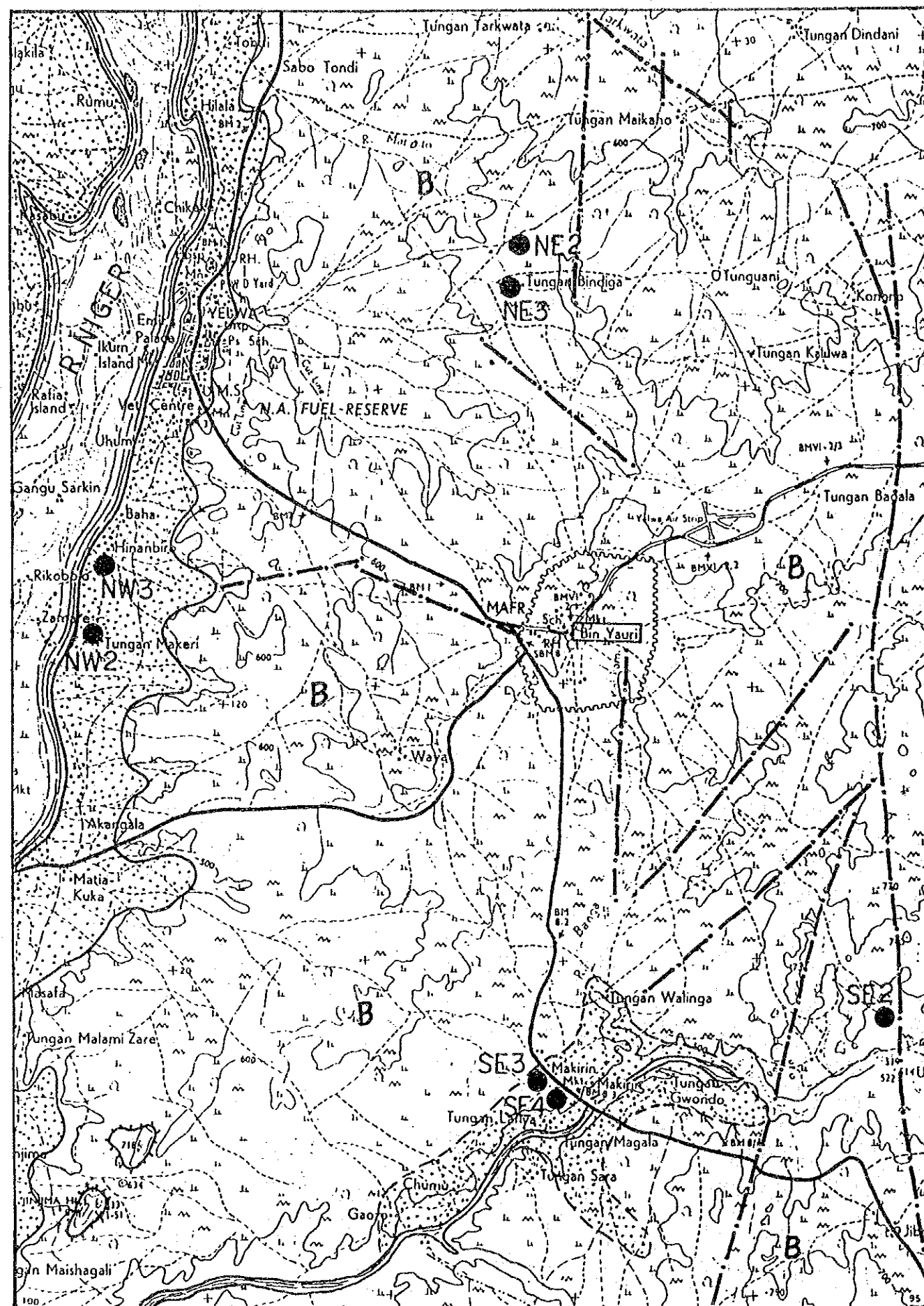
VILLAGE : Bin Yauri

Village No. 17



LOCATION MAP

(1/100,000 Sheet 118)



GEOLOGICAL MAP

Bin Yauri



River

 Fadama

 Eroded and Recovered with Sand

Escarpment

Lineament

B Basement Complex:

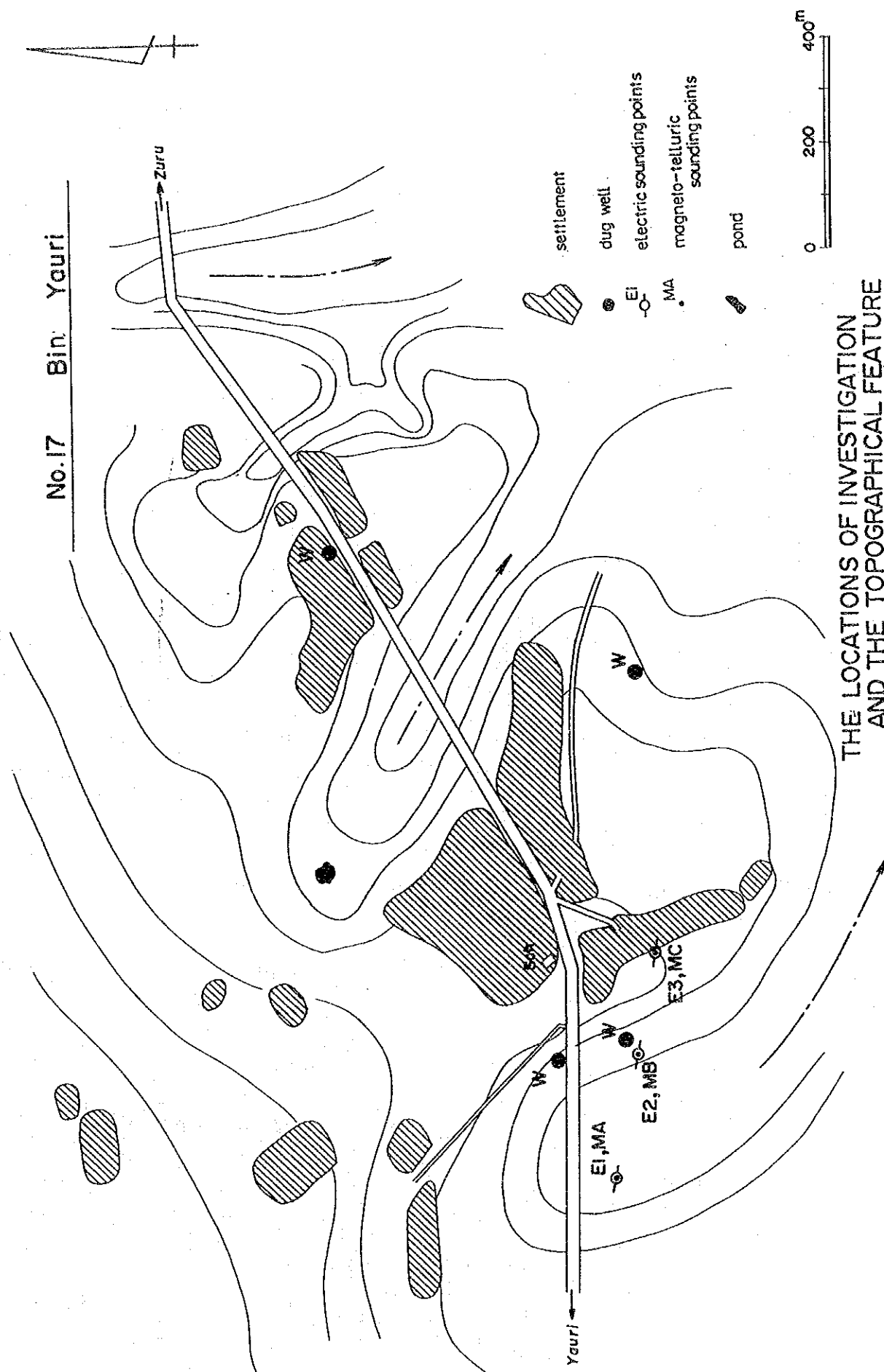
SW 16

Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	S.W.L.(m)	S.C.(m ³ /d/m)
NE 2	25.0	6.42	6.17
NE 3	25.0	5.10	2.50
NW 2	19.0	2.96	3.69
NW 3	21.0	3.35	3.14
SE 2	25.0	6.45	2.99
SE 3	25.0	7.65	2.74
SE 4	24.0	2.15	2.08

No.17 Bin Yuri

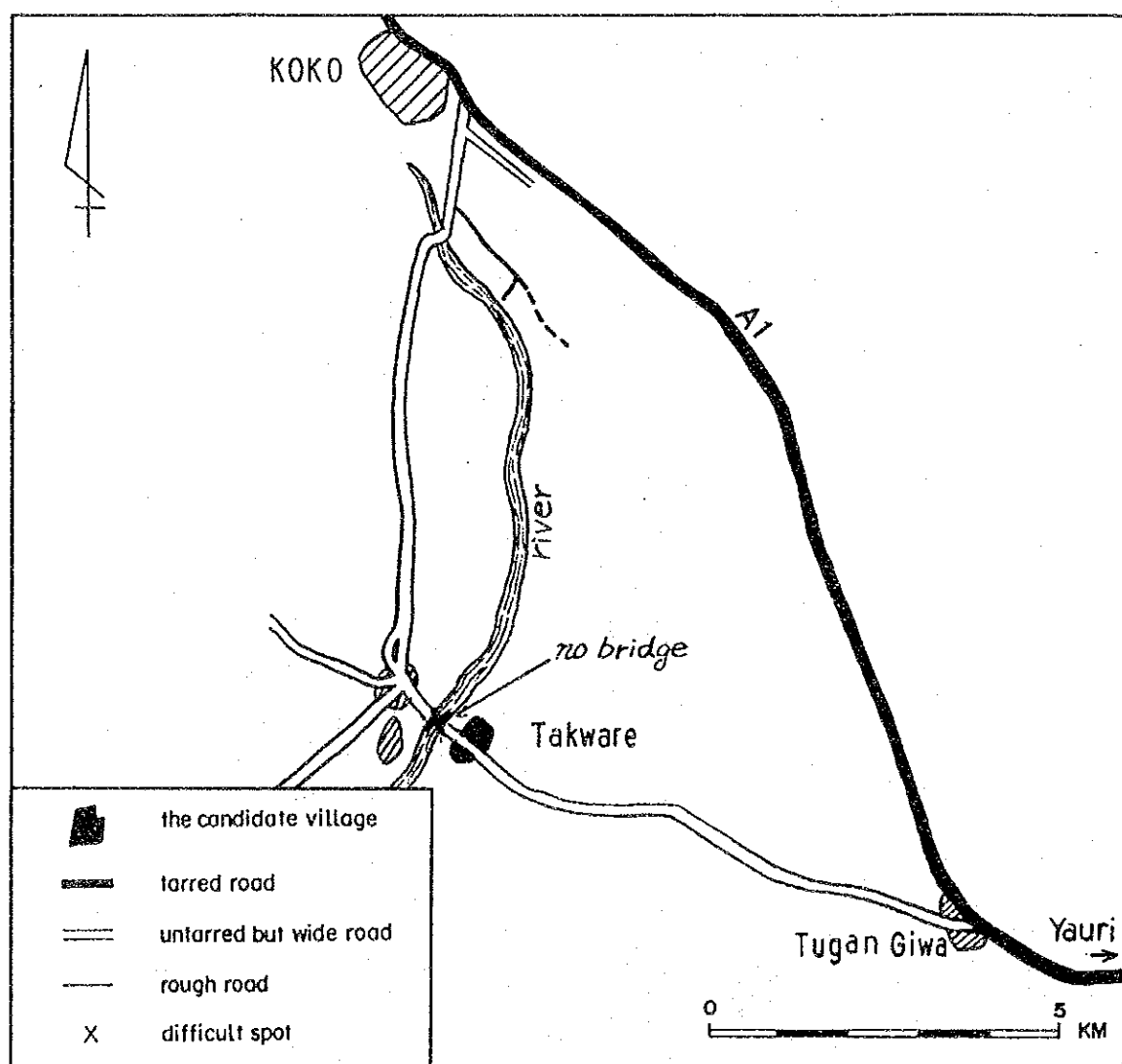


THE LOCATIONS OF INVESTIGATION
AND THE TOPOGRAPHICAL FEATURE

The Study for Groundwater Development in Sokoto State

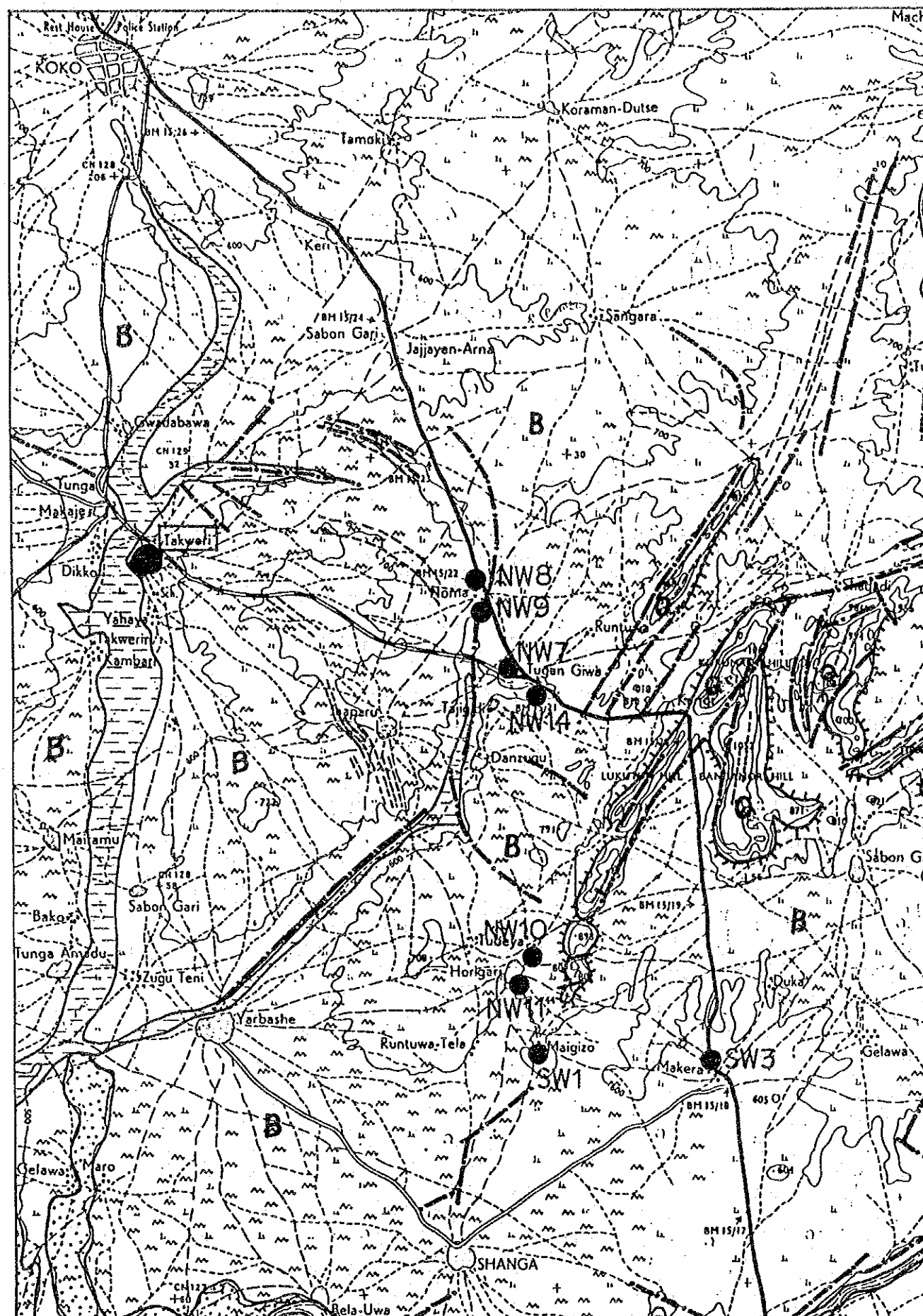
VILLAGE : Takware

Village No. 18



LOCATION MAP

(1/100,000 Sheet 96)



GEOLOGICAL MAP

Takware

-  River
-  Fadama
-  Eroded and Recovered with Sand
-  Escarpment
-  Lineament
-  Basement Complex
-  Quartzite
-  Existing Boreholes

DATA OF EXISTING BOREHOLES

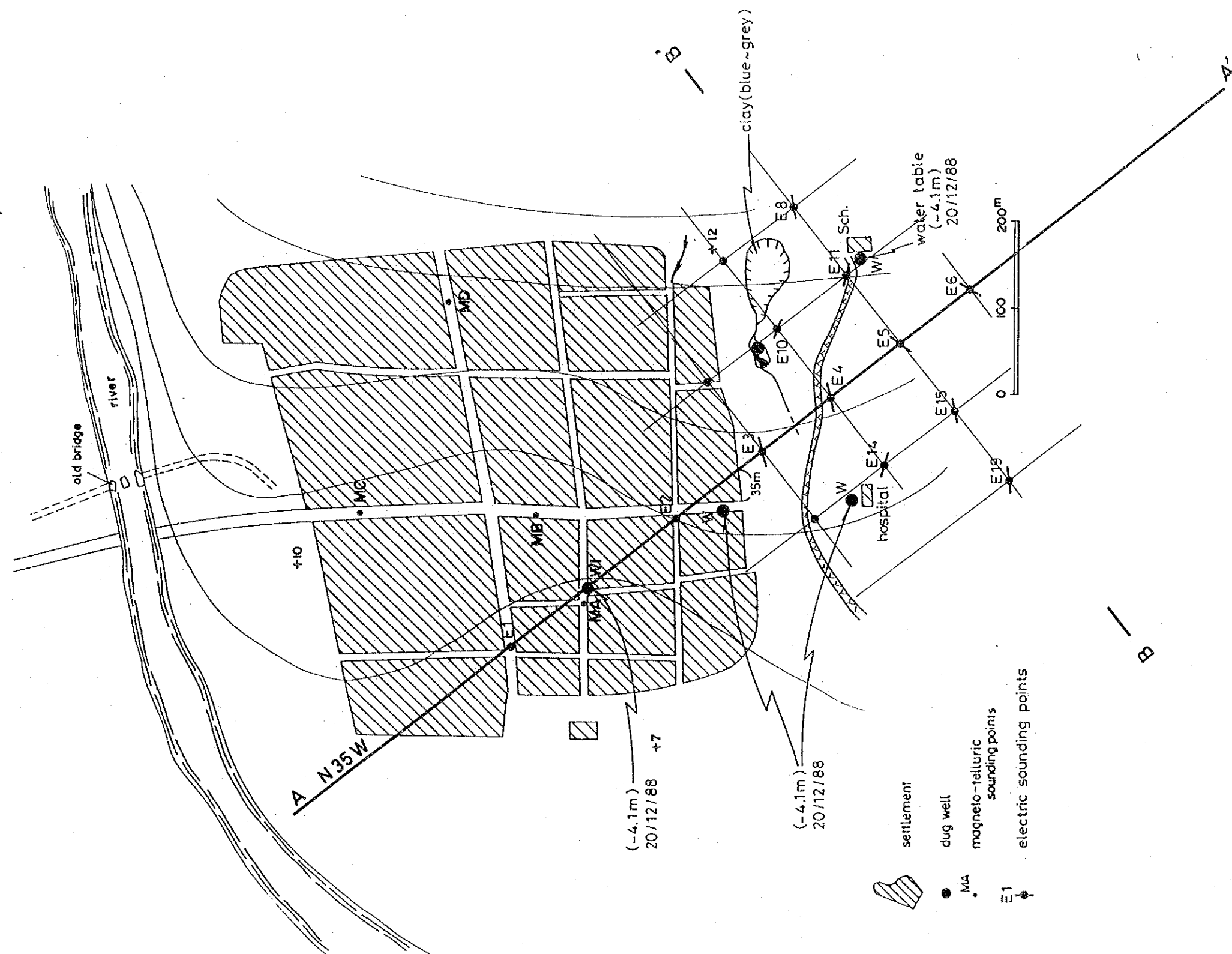
Borehole No.	Depth(m)	SWL.(m)	S.C.(m ³ /d/m)
NW 7	19.0	4.44	6.43
NW 8	37.0	11.65	1.03
NW 9	31.0	10.93	50.40
NW 10	48.0	2.34	2.01
NW 11	21.0	3.40	2.04
NW 14	19.0	3.54	8.74
SW 1	21.0	3.63	3.45
SW 3	31.0	14.74	5.65

SWL.: Static Water Level
S.C. : Specific Capacity

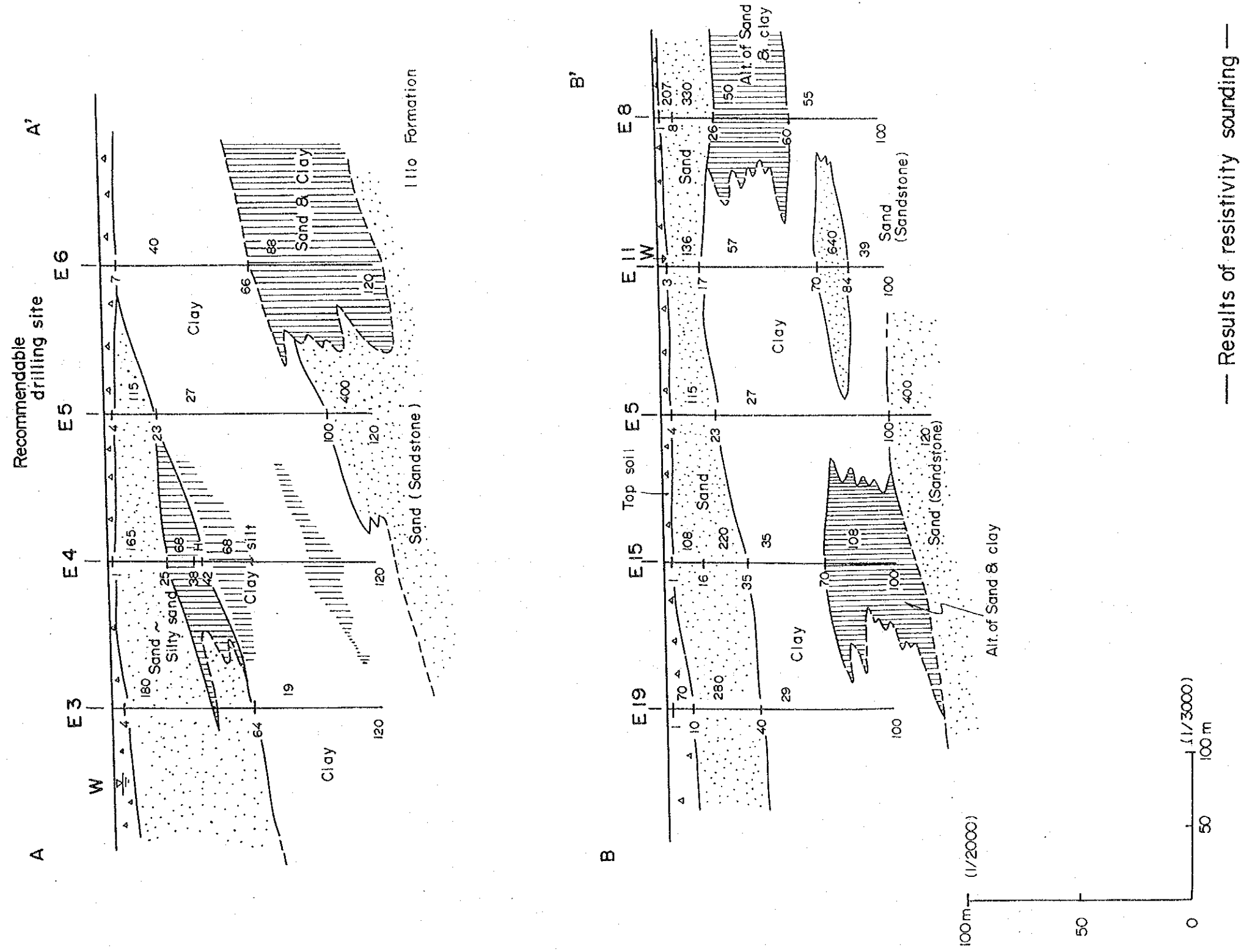
1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.18 Takware



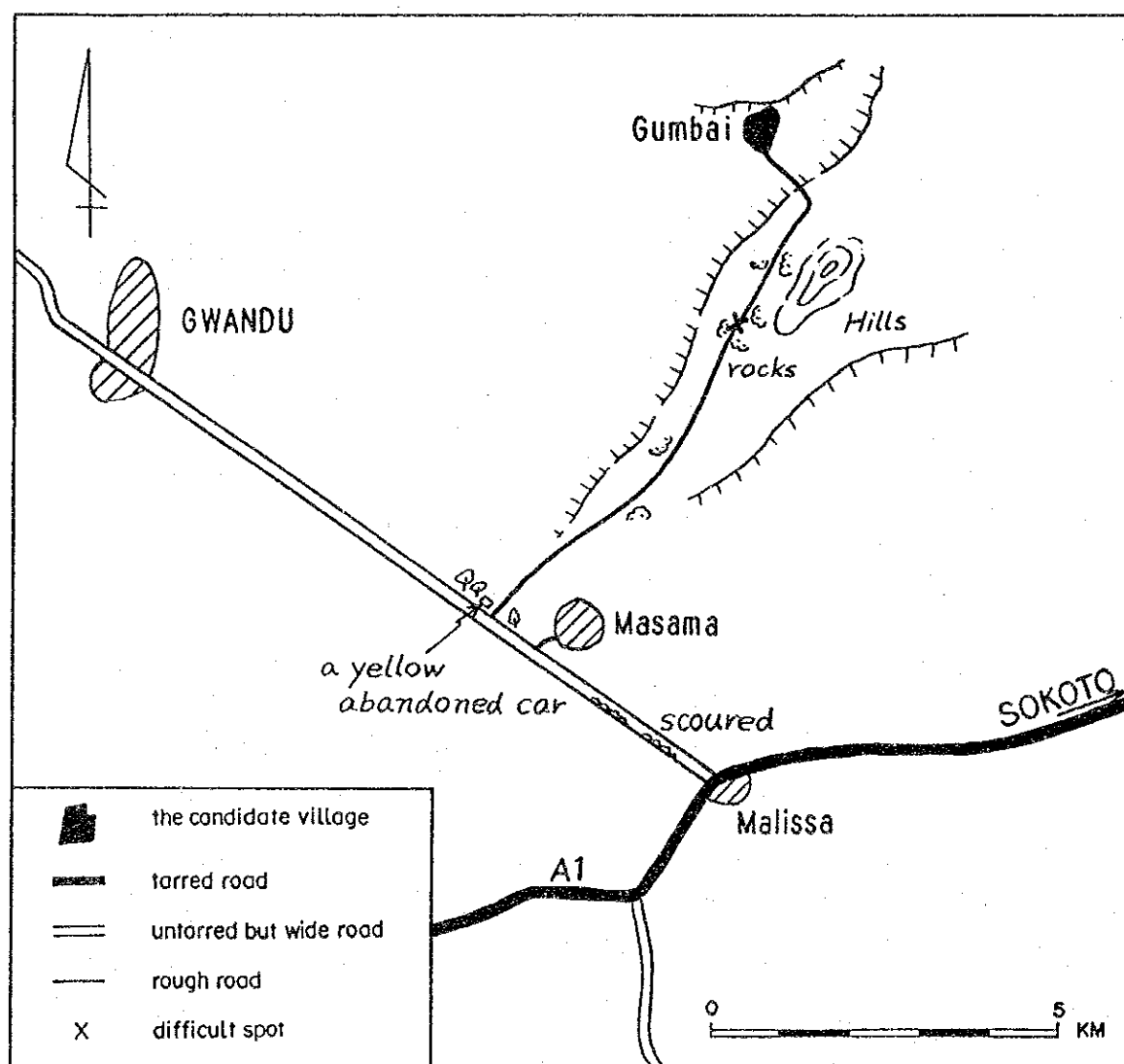
Hydrogeological Section of Takware Area
 (Map showing resistivity profile & estimated lithologic distribution)



The Study for Groundwater Development in Sokoto State

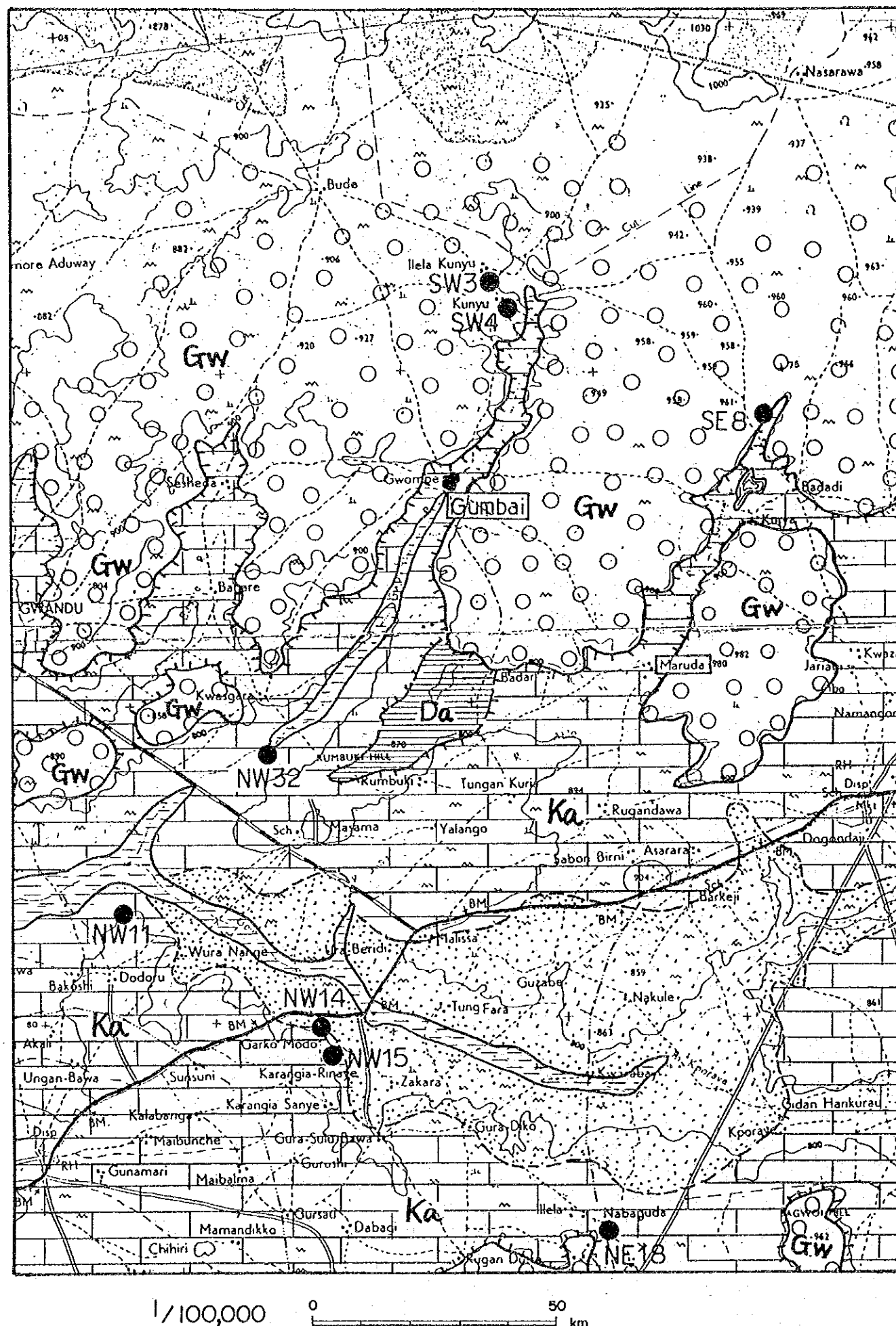
VILLAGE : Gumbai

Village No. 19



LOCATION MAP

(1/100,000 Sheet 28)



GEOLOGICAL MAP

Gumbai

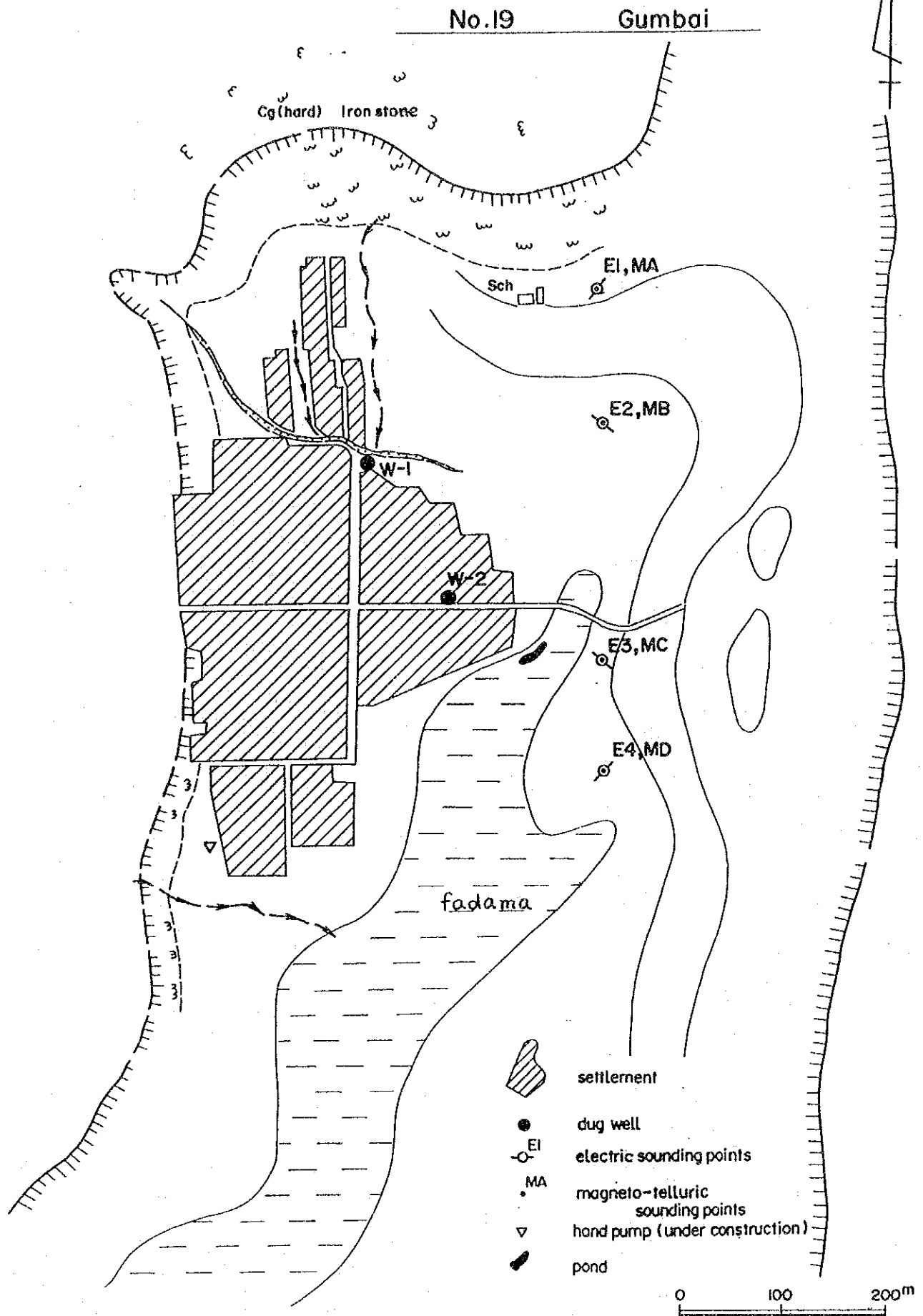
-  Lake, Pond
-  River
-  Fadama
-  Eroded and Recovered with Sand
-  Escarpment
-  Gwandu Formation
-  Kalambaina Formation
-  Dange Formation
-  SW 16
Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL.(m)	SC.(m ³ /d/m)
SW 3	85.0	53.20	56.13
SW 4	85.0	54.12	55.17
SE 8	91.0	66.97	44.84
NW 11	42.0	20.45	123.43
NW 14	42.0	18.12	125.22
NW 15	36.0	22.95	235.64
NW 32	42.0	23.26	93.60
NE 18	85.0	44.33	148.72

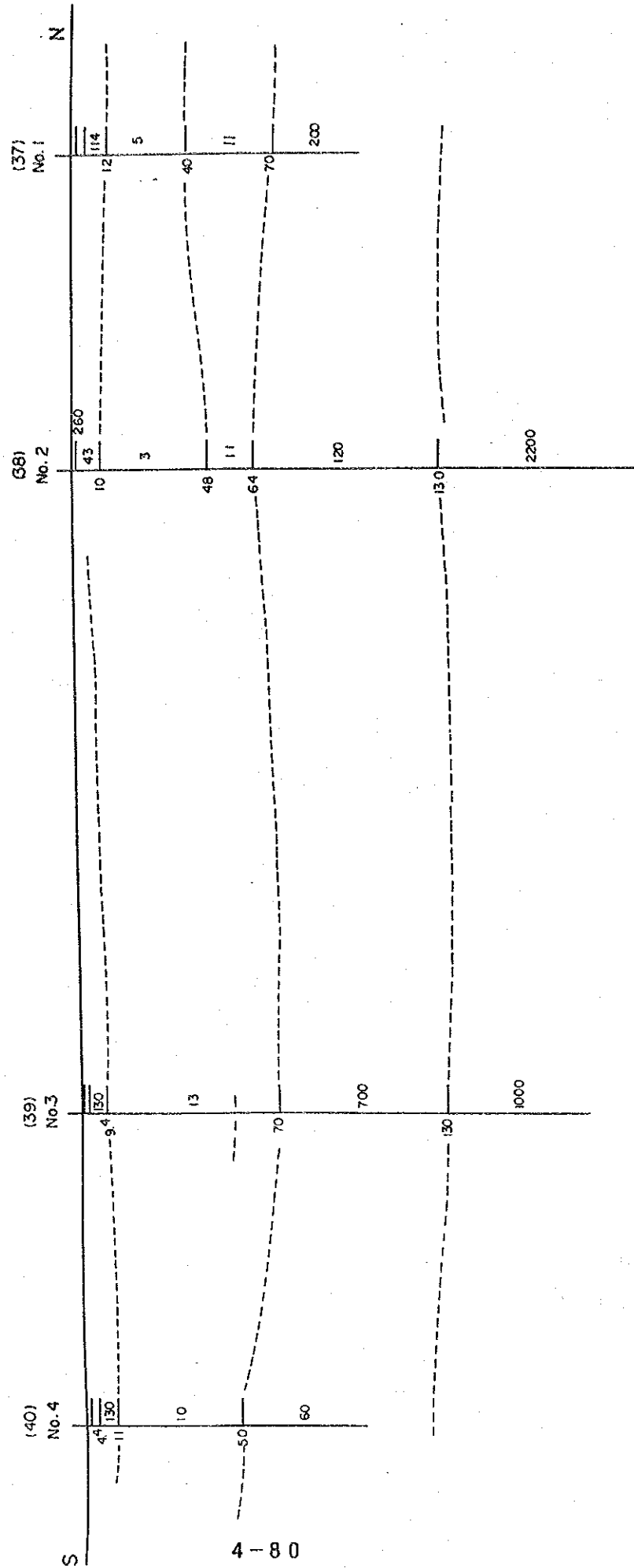
SWL.: Static Water Level
SC : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE



RESISTIVITY PROFILE

No. 19 Gumbai



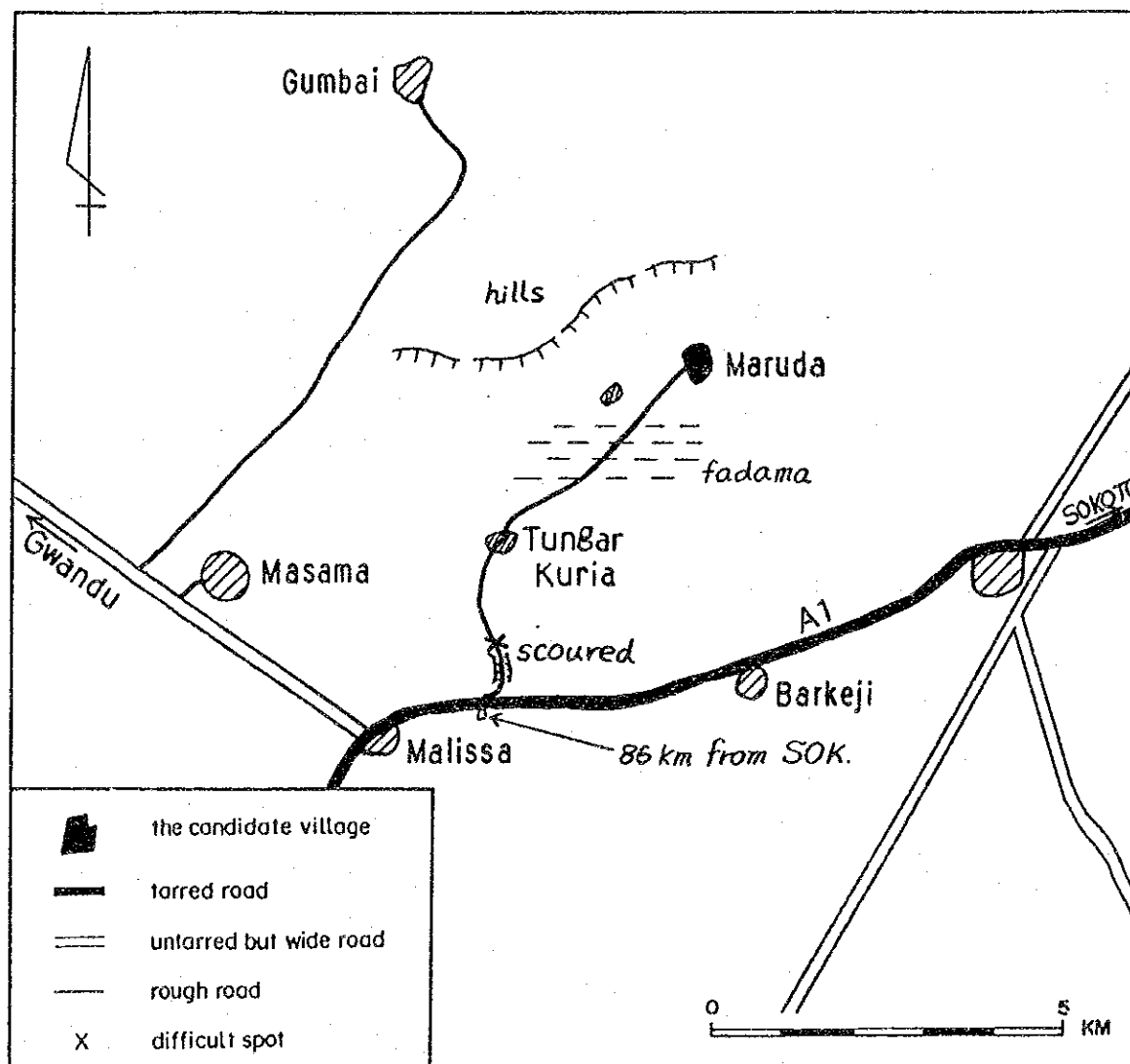
1/2000
1/2000

4-80

The Study for Groundwater Development in Sokoto State

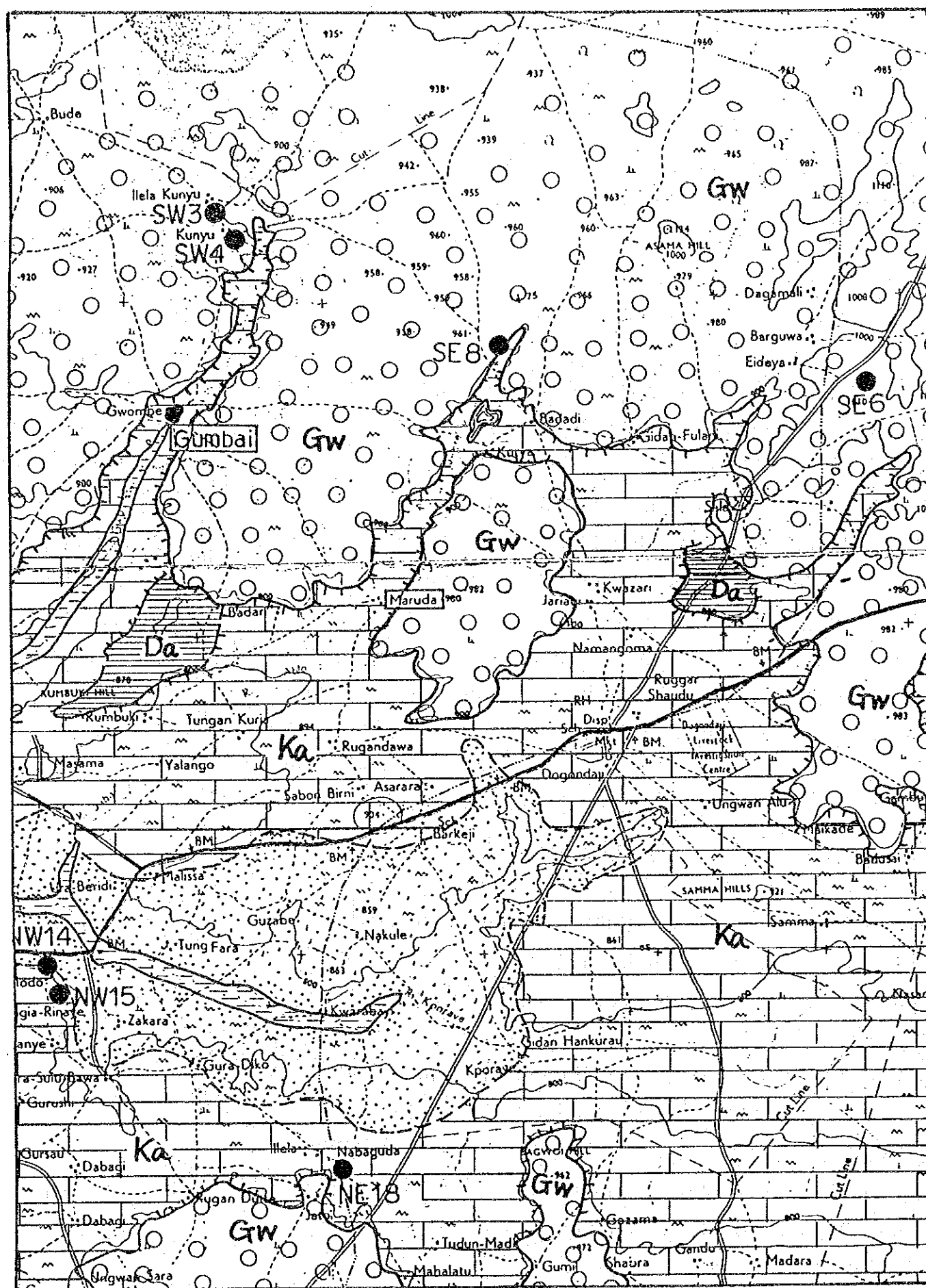
VILLAGE : Maruda

Village No. 20



LOCATION MAP

(1/100,000 Sheet 50)



GEOLOGICAL MAP

Maruda

- Lake, Pond
- River
- Fadama
- Eroded and Recovered with Sand
- Escarpment
- Gw Gwandu Formation
- Ka Kalambaina Formation
- Da Dange Formation

● SW16
Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	S.C.(m ³ /d/m)
SW 3	85.0	53.20	56.13
SW 4	85.0	54.12	55.17
SE 6	109.0	53.81	46.08
SE 8	91.0	66.97	44.84
NW14	42.0	18.12	125.22
NW15	36.0	22.95	235.64
NE 18	85.0	44.33	148.72

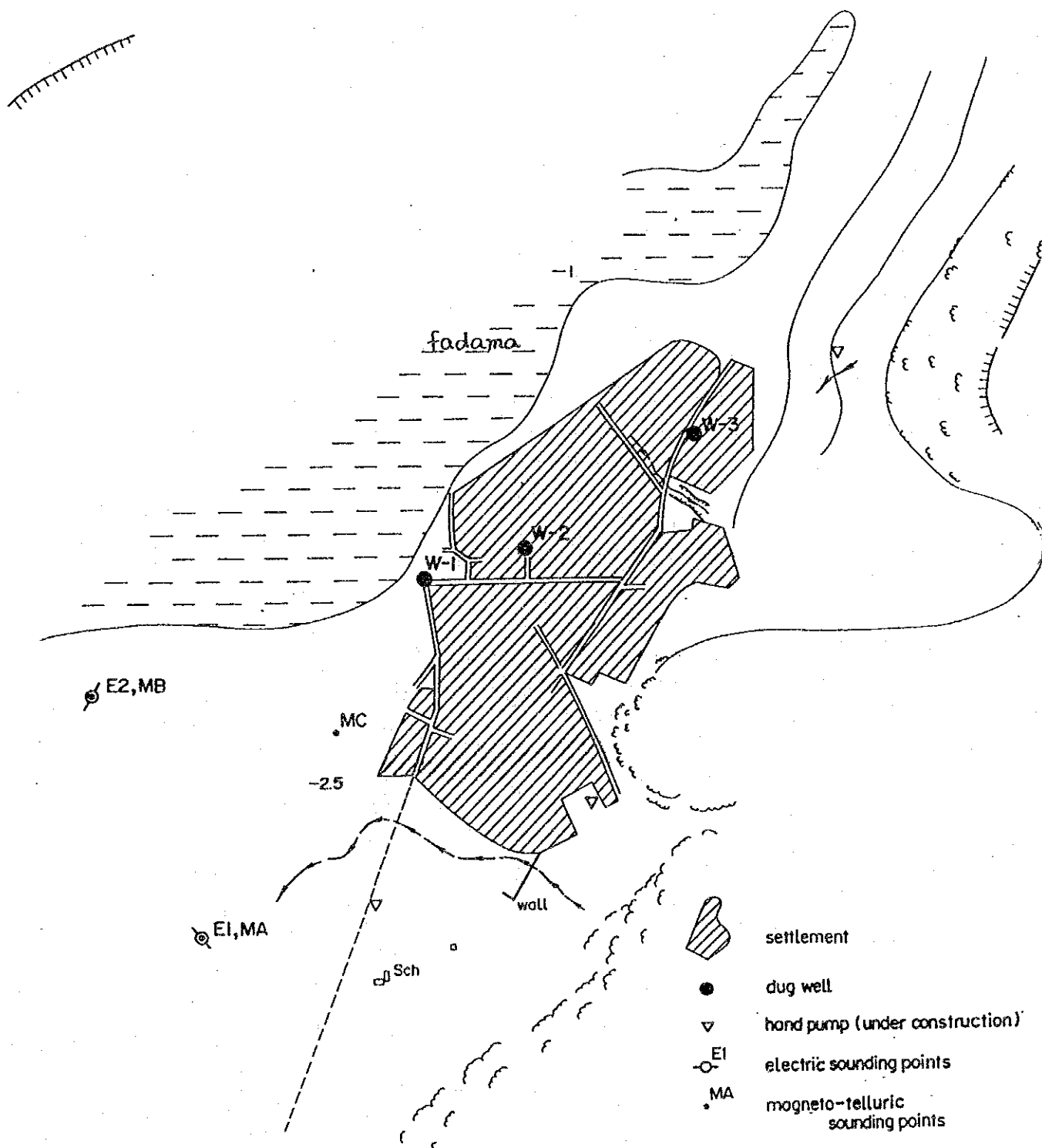
SWL.: Static Water Level
SC : Specific Capacity

1/100,000 0 50 km

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

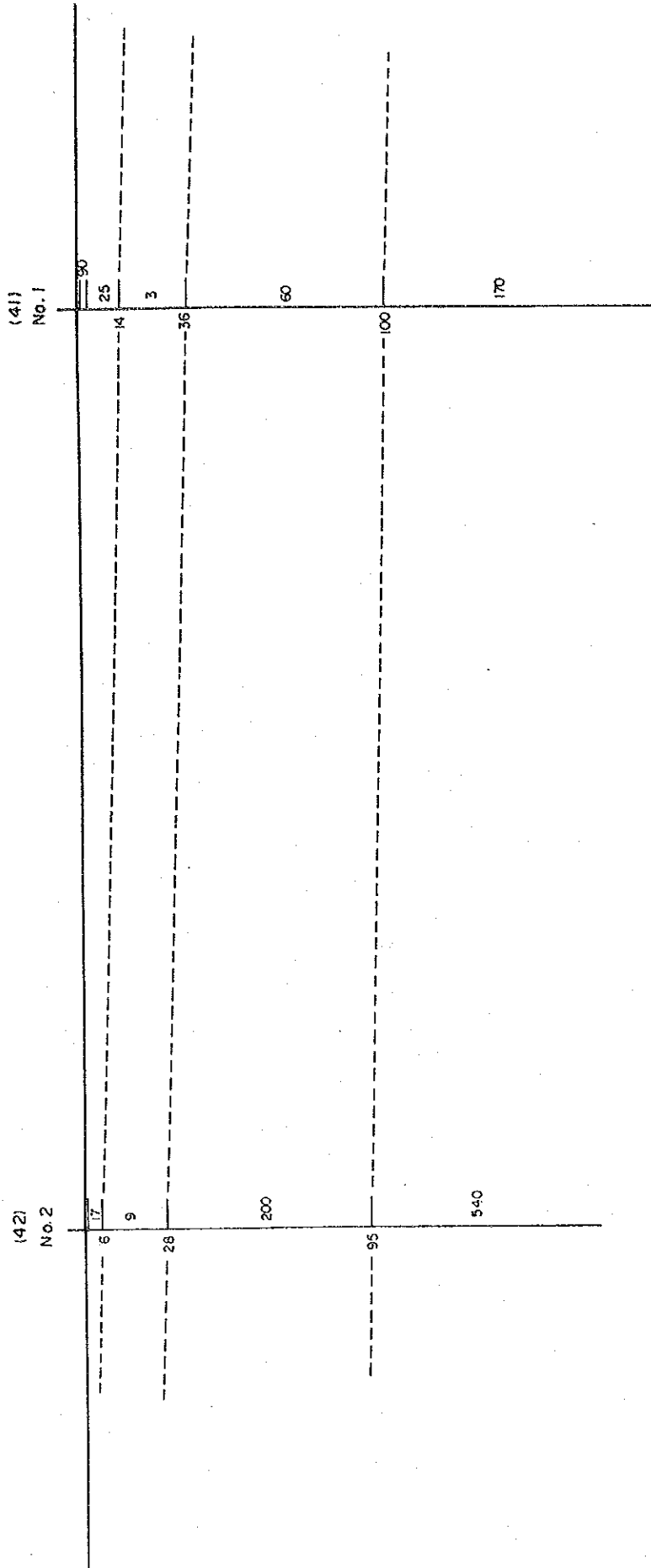
No.20

Maruda



RESISTIVITY PROFILE

No. 20 Maruda

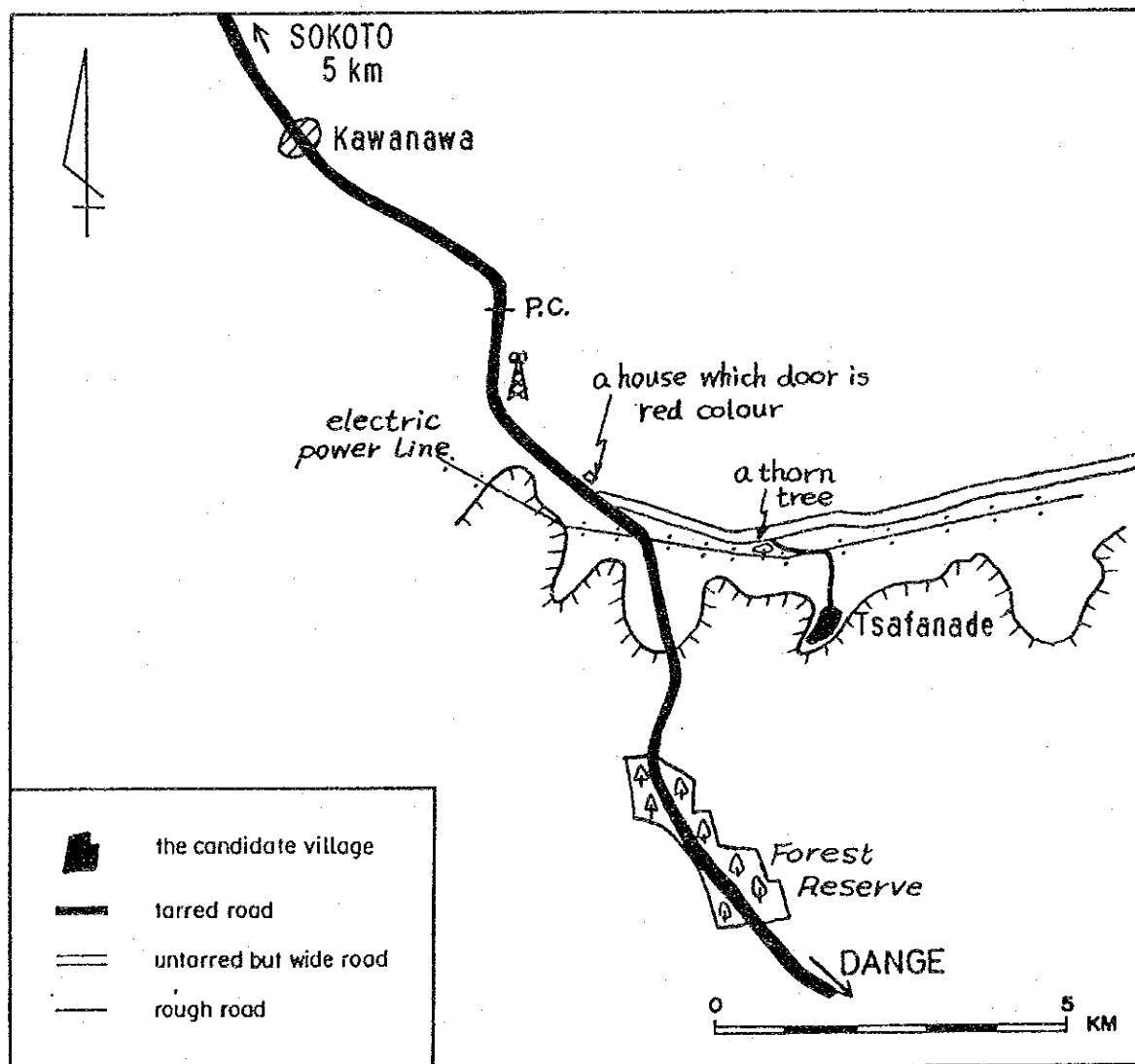


1/2000
1/2000

The Study for Groundwater Development in Sokoto State

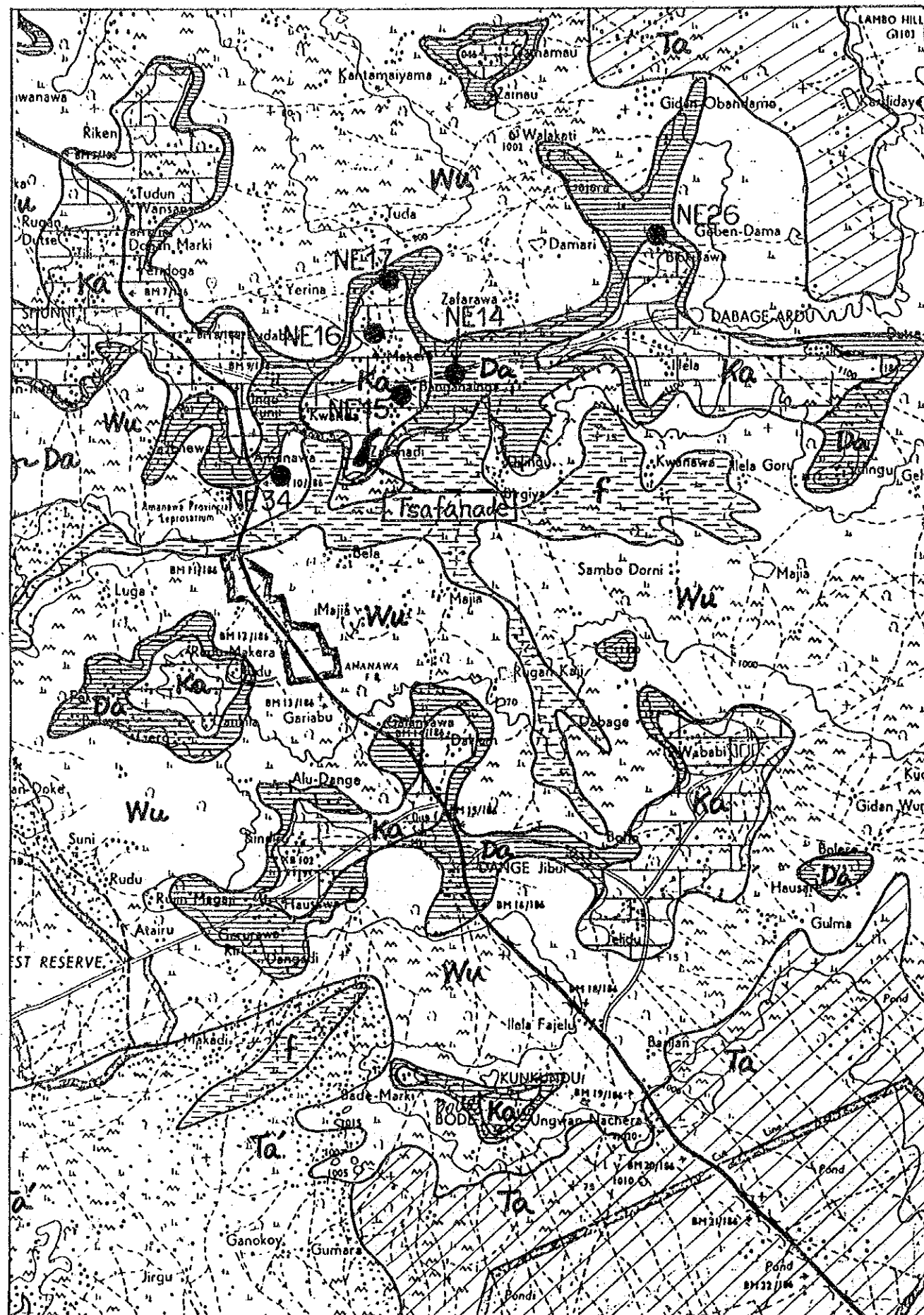
VILLAGE : Tsafanade

Village No. 21



LOCATION MAP

(1/100,000 Sheet 29)



GEOLOGICAL MAP

Tsafanade

-  Fadama
-  Eroded and Recovered with Sand
-  Escarpment
-  Kalambaina Formation
-  Dange Formation
-  Wuruno Formation
-  Taloka Formation

-  SW 16
- Existing Boreholes

DATA OF EXISTING BOREHOLES

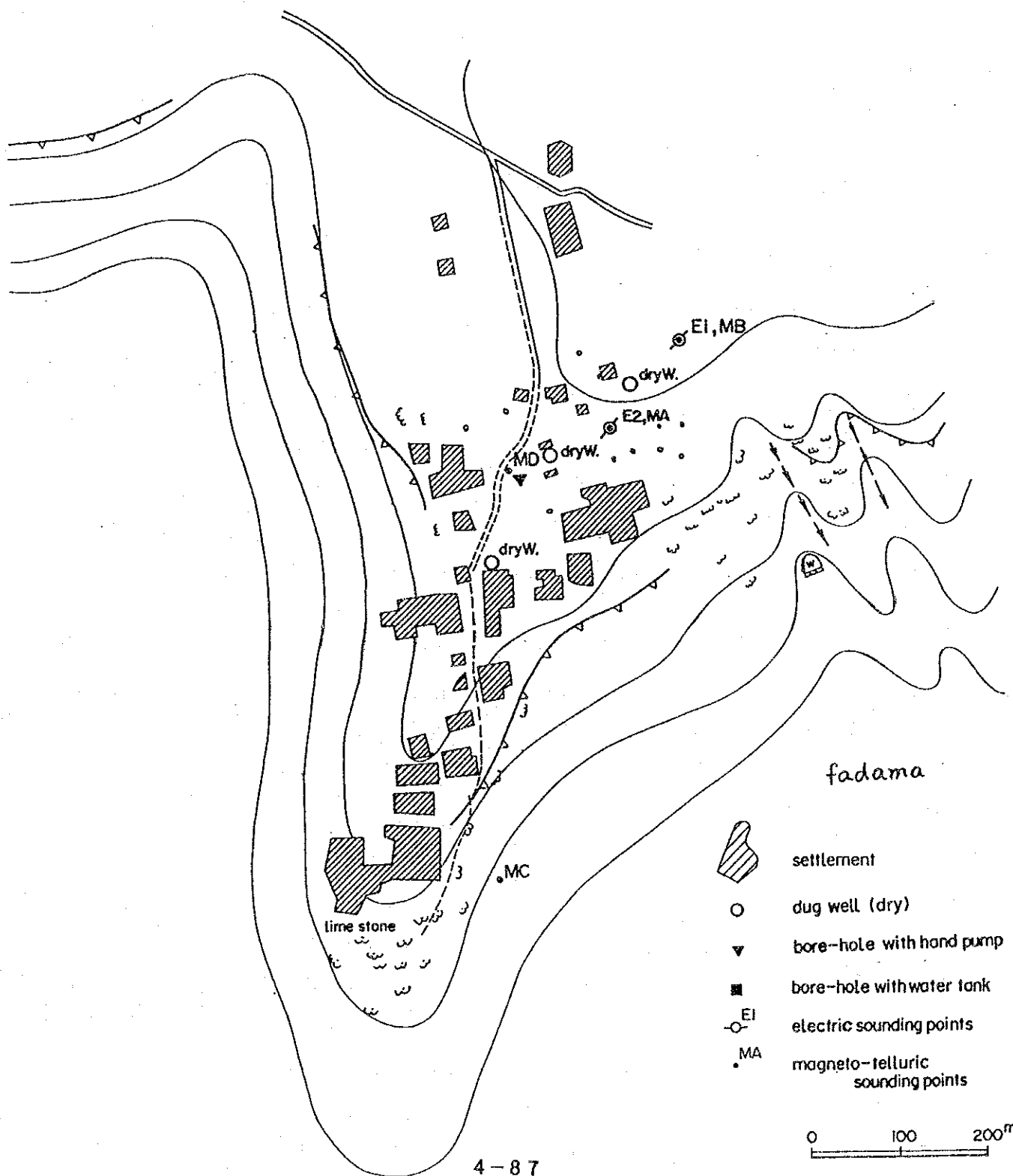
Borehole No.	Depth(m)	S.W.L.(m)	S.C.(m ³ /d/m)
NE 14	121.0	53.03	7.24
NE 15	85.0	49.70	5.21
NE 16	85.0	46.54	4.70
NE 17	84.0	43.65	3.80
NE 26	68.0	16.14	4.72
NE 34	91.0	13.44	4.47

SW.L.: Static Water Level
S.C. : Specific Capacity

1/100,000 0 50 km

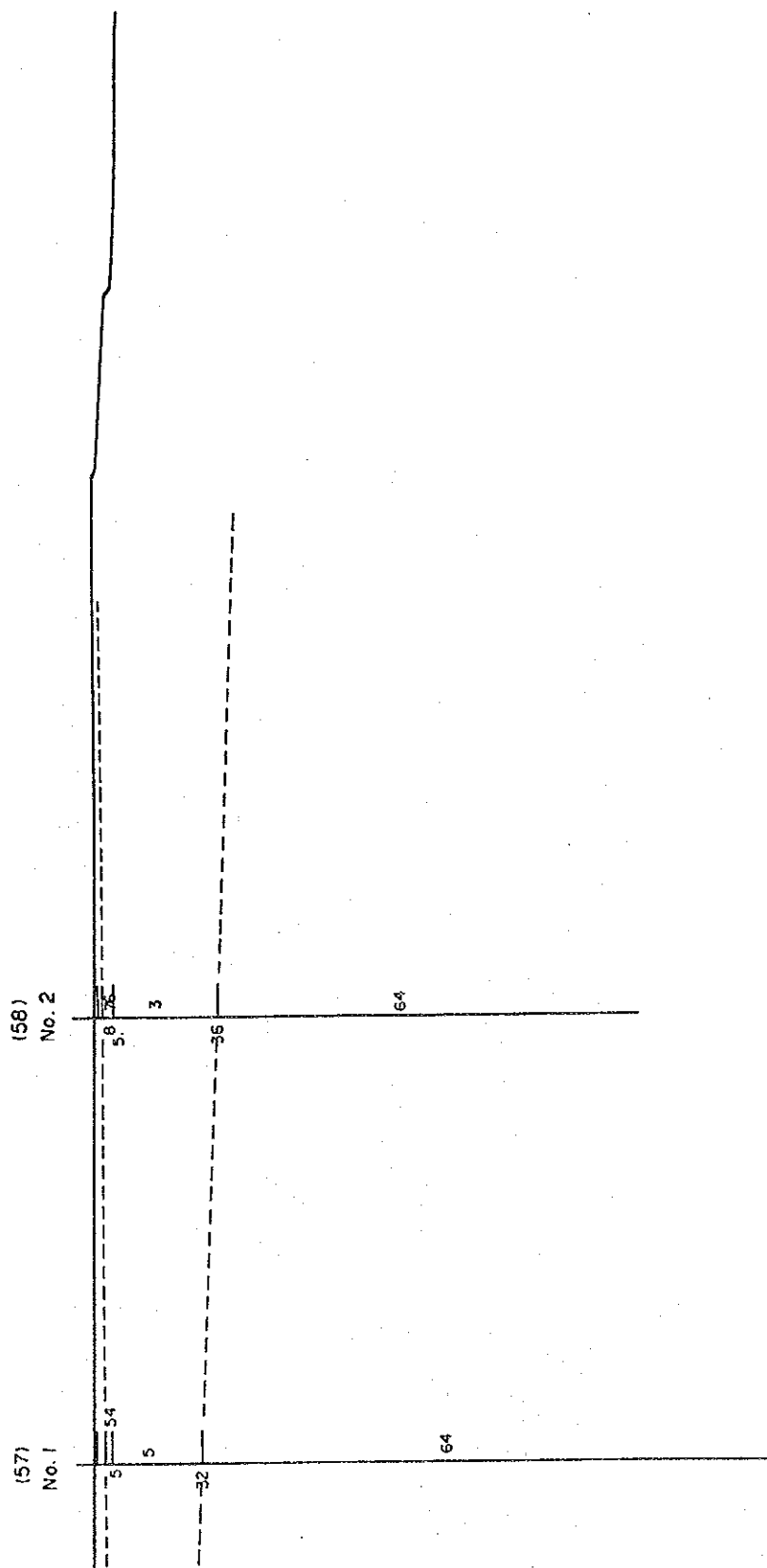
THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.21 Tsafanade



RESISTIVITY PROFILE

No. 21 Tsafanade

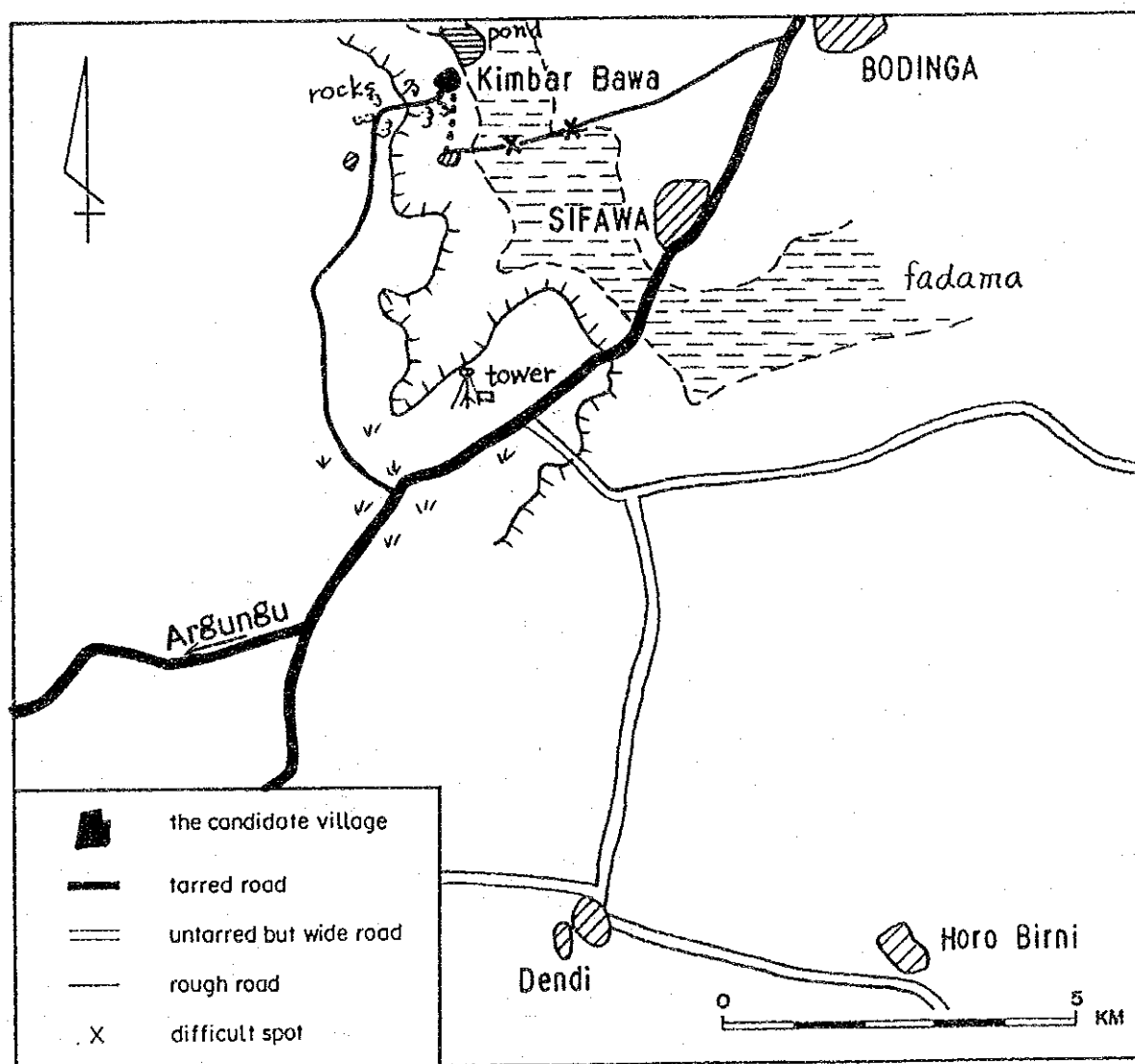


1/2000
1/2000

The Study for Groundwater Development in Sokoto State

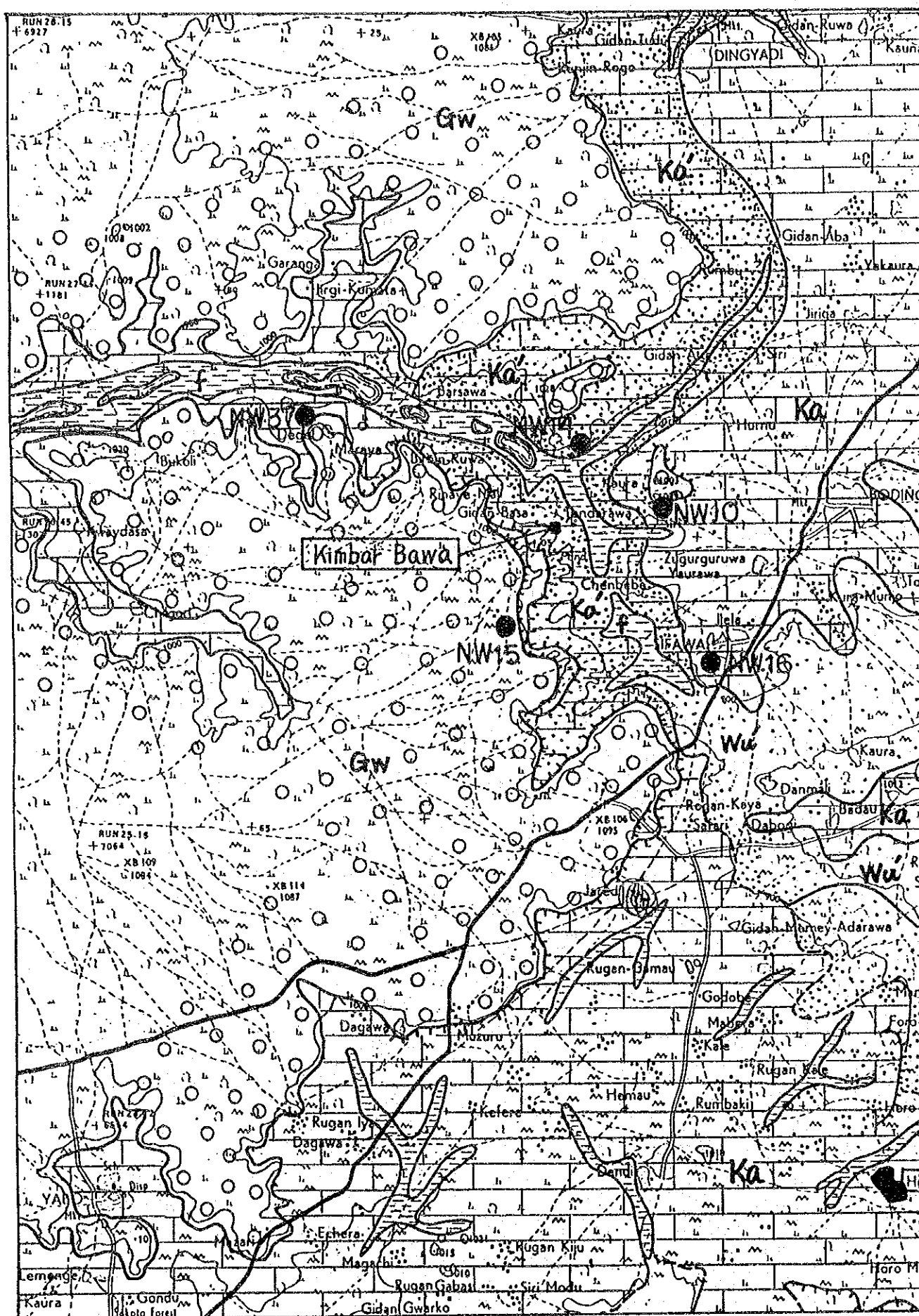
VILLAGE : Kimbar Bawa

Village No. 22



LOCATION MAP

(1/100,000 Sheet 29)



1/100,000

0 50 km

GEOLOGICAL MAP

Kimbar Bawa

- Lake, Pond
- River
- Fadama
- Eroded and Recovered with Sand
- Escarpment
- Gw Gwandu Formation
- Ka Kalambaina Formation
- Da Dange Formation
- Wu Wuruno Formation
- SW 16 Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	S.C.(m ³ /d/m)
NW 10	72.0	41.96	1.37
NW 11	50.0	15.69	10.02
NW 15	96.0	72.42	12.71
NW 16	48.0	24.28	7.08
NW 37	114.0	69.51	11.68

SWL : Static Water Level

S.C. : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No. 22 Kimbar Bawa



settlement



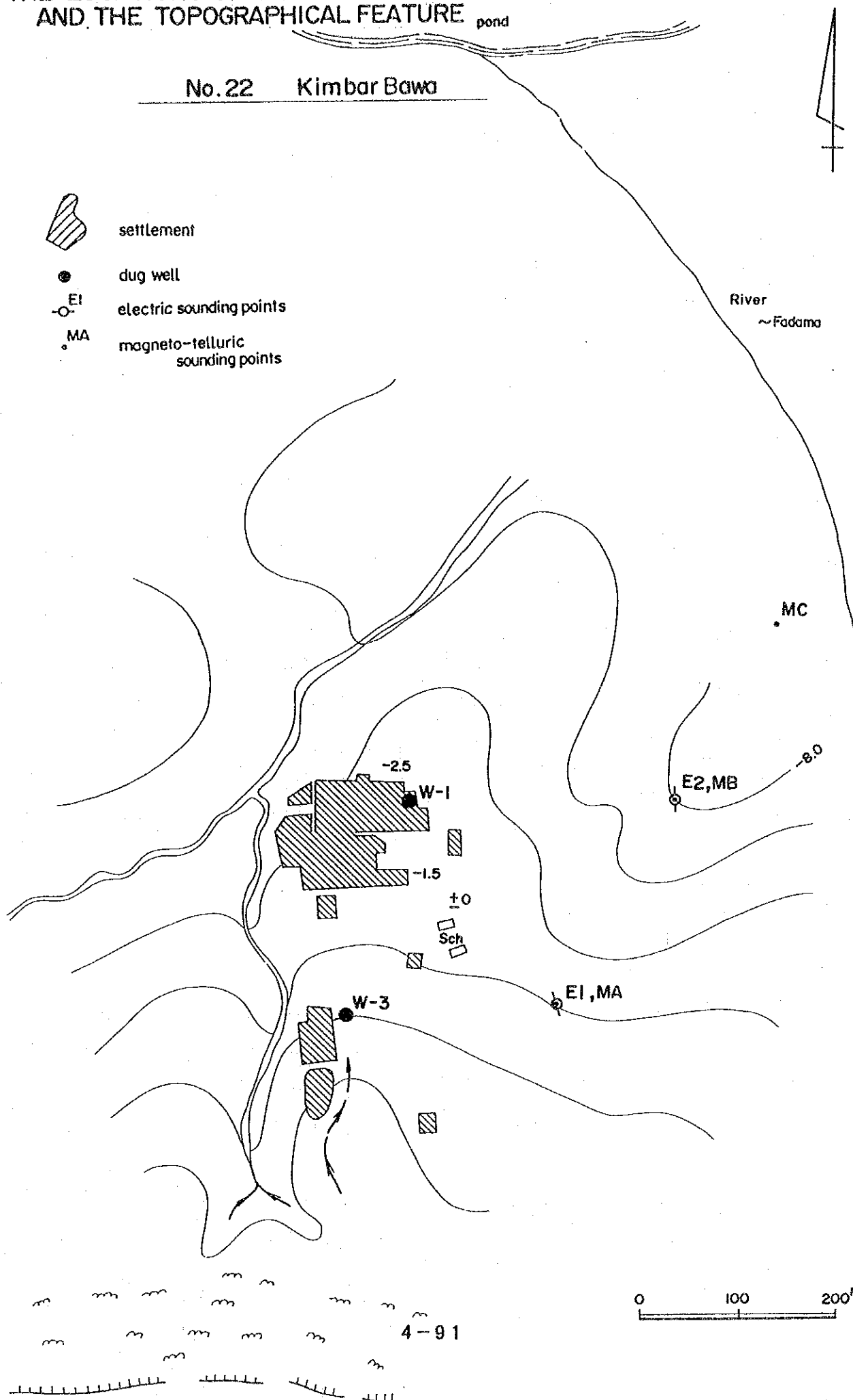
dug well



electric sounding points



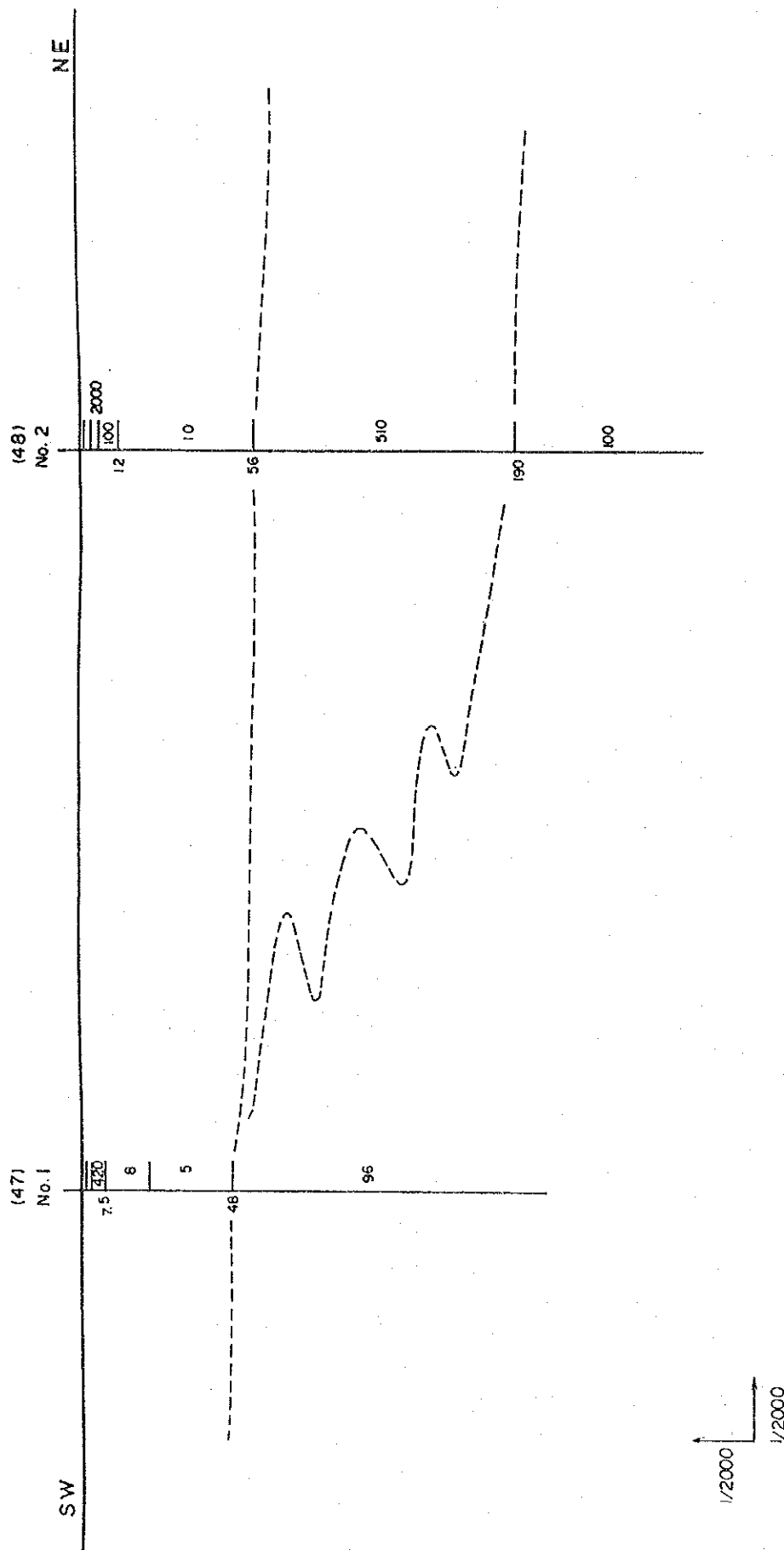
magneto-telluric
sounding points



4-91

RESISTIVITY PROFILE

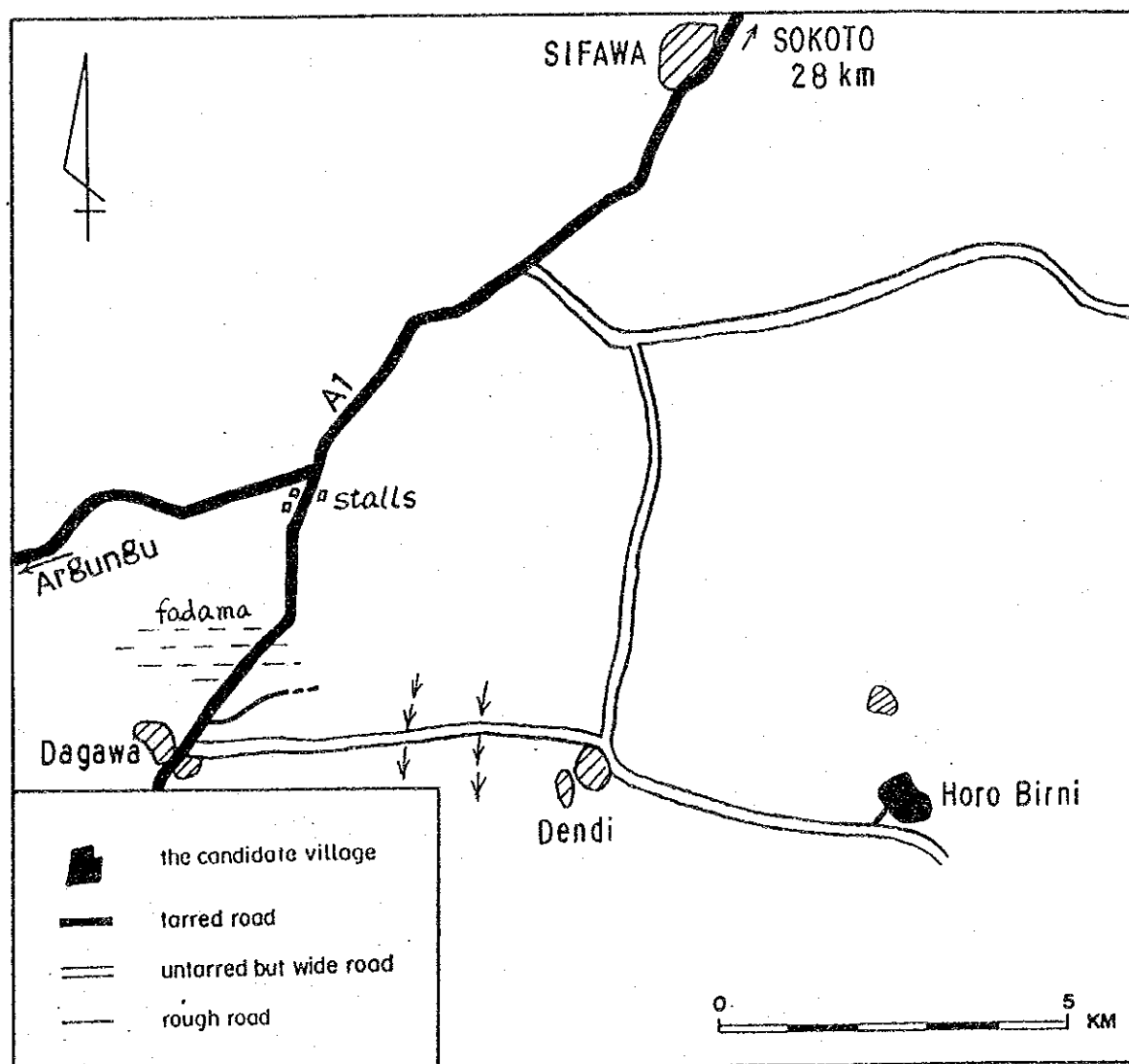
No.22 Kimbar Bawa



The Study for Groundwater Development in Sokoto State

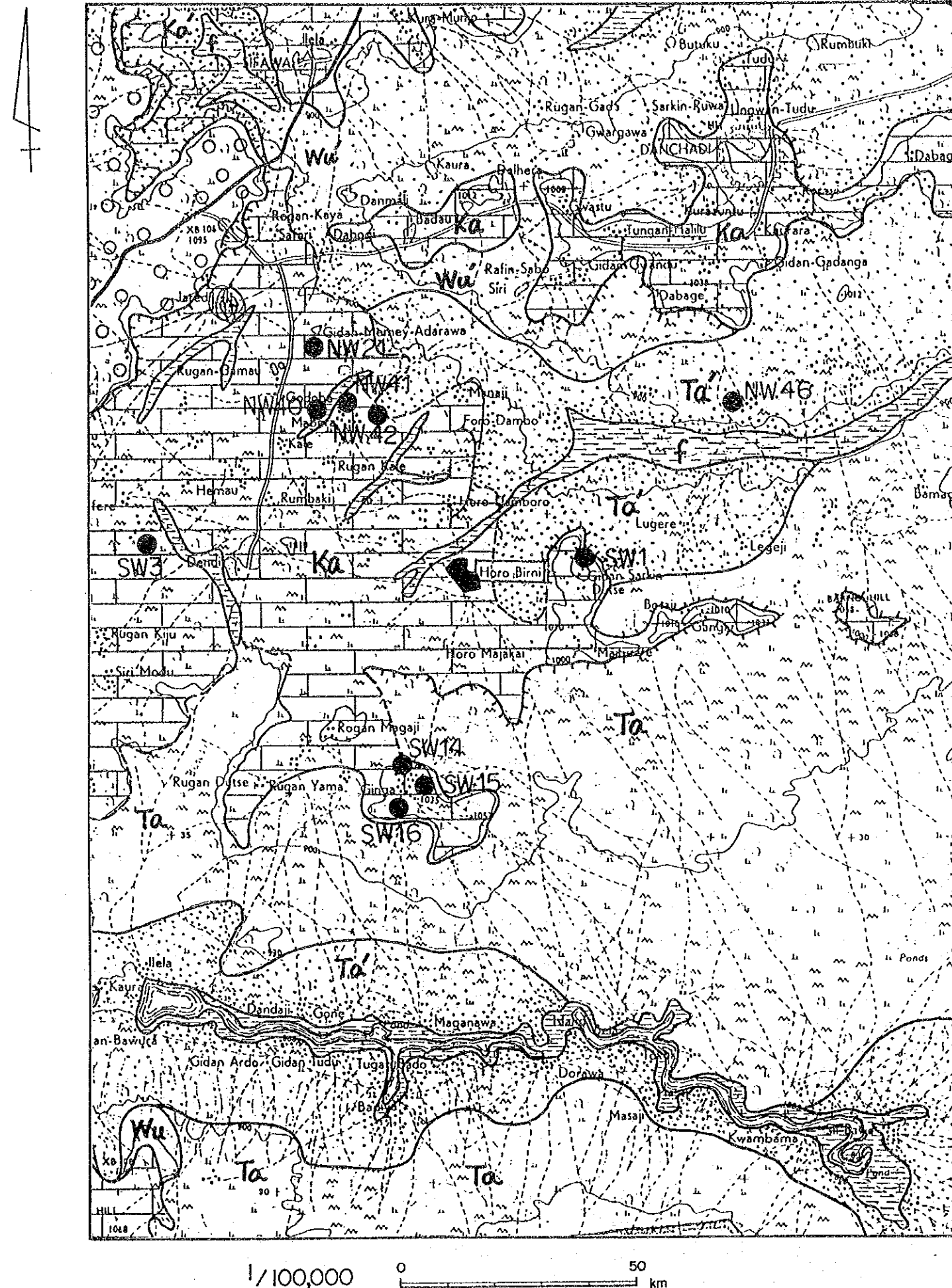
VILLAGE : Horo Birni

Village No. 23



LOCATION MAP

(1/100,000 Sheet 29)



GEOLOGICAL MAP

Horo Birni

- Lake, Pond
- River
- Fadama
- Eroded and Recovered with Sand
- Escarpment
- Gwandu Formation
- Kalambaina Formation
- Dange Formation
- Wurno Formation
- Taloka Formation

● SW 16

Existing Boreholes

DATA OF EXISTING BOREHOLES

Borehole No.	Depth(m)	SWL(m)	S.C.(m ³ /d/m)
NW 21	72.0	44.78	6.71
NW 40	85.0	42.40	128.00
NW 41	79.0	42.04	87.86
NW 42	85.0	44.05	70.53
NW 46	54.0	28.61	8.67
SW 1	78.0	56.71	9.34
SW 3	103.0	49.06	80.26
SW 14	79.0	57.57	8.94
SW 15	96.0	60.34	176.73
SW 16	79.0	55.01	135.27

SWL.: Static Water Level

S.C. : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No.23 Horo Birni



settlement



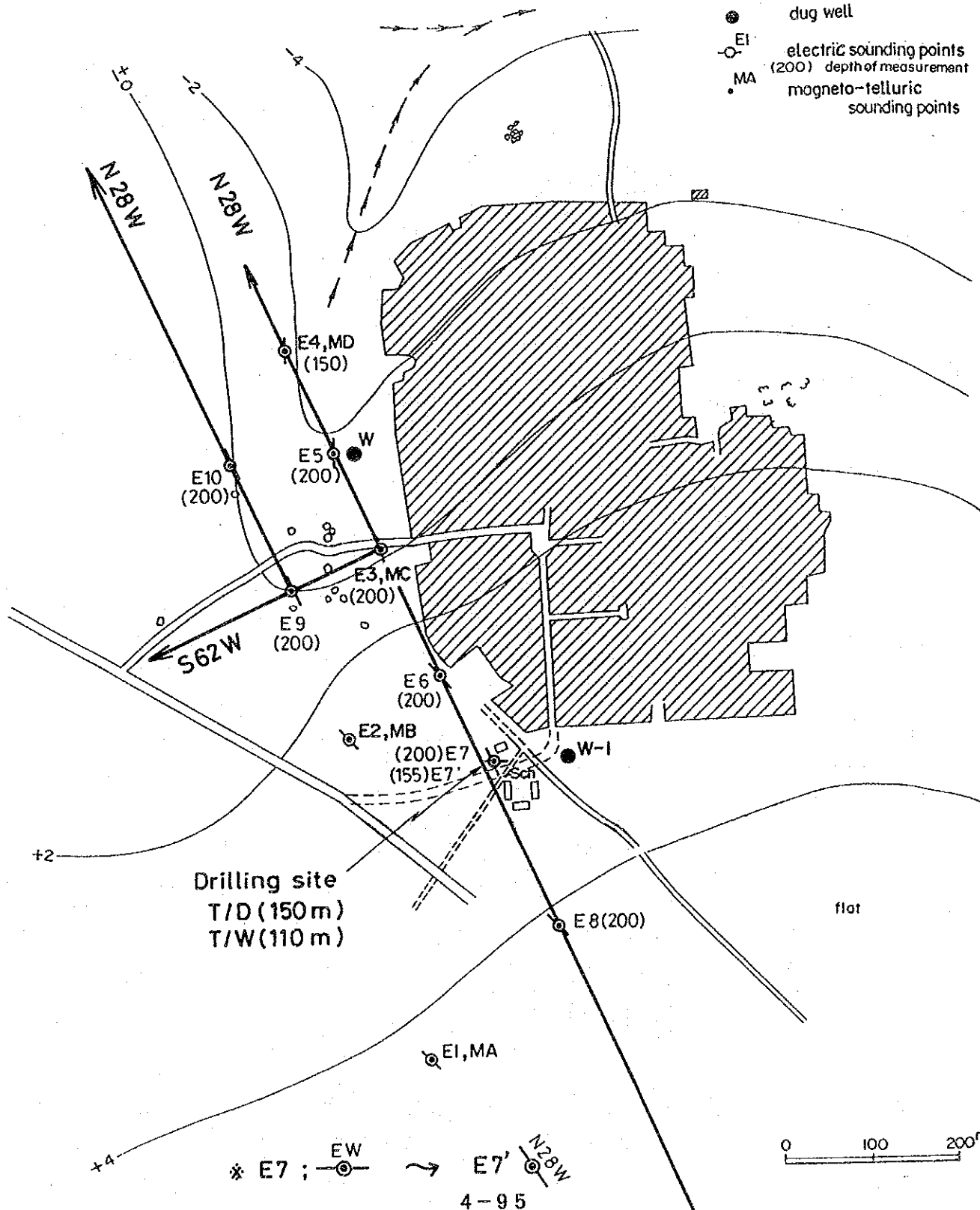
dug well



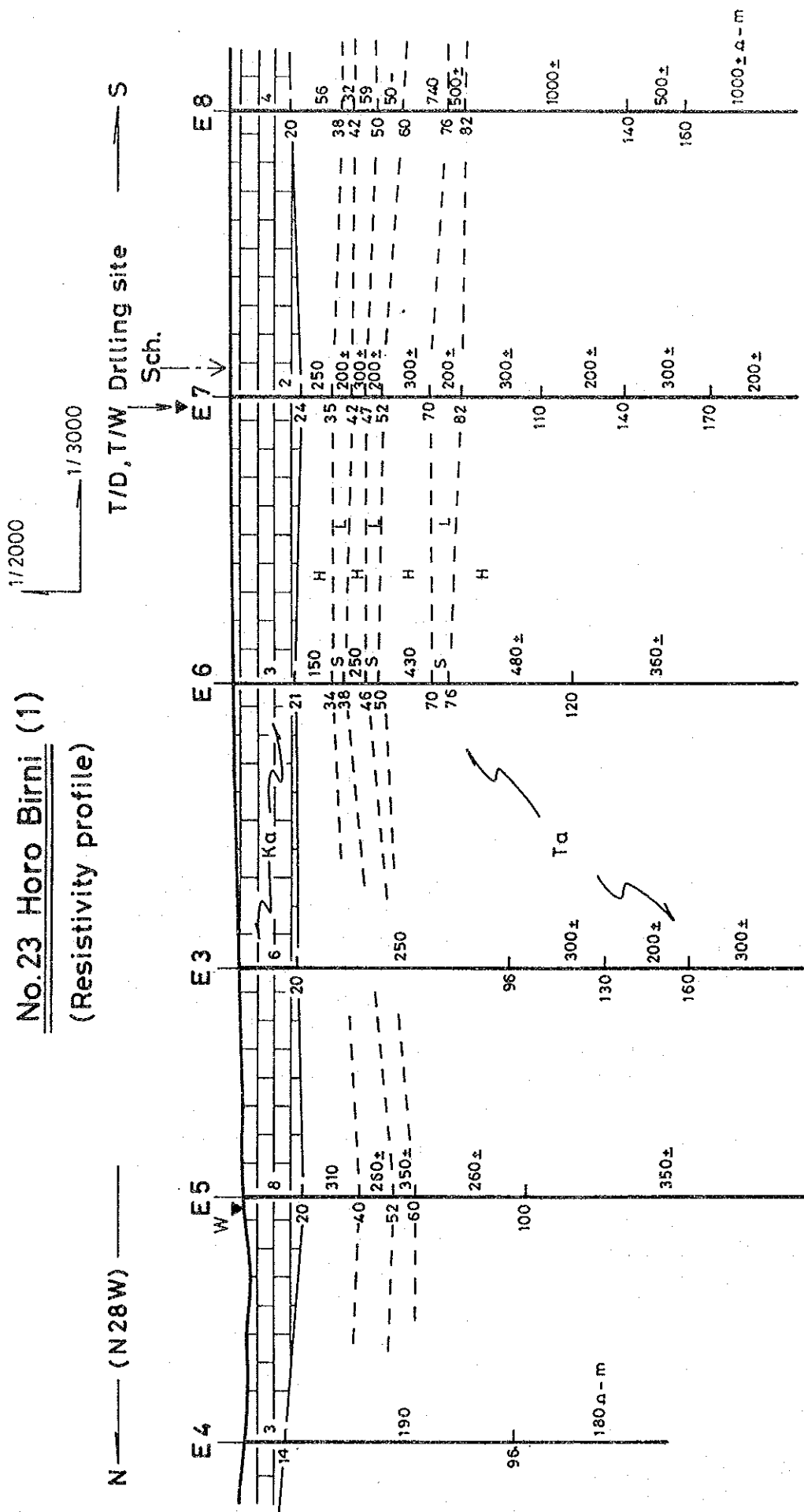
electric sounding points
(200) depth of measurement



magneto-telluric
sounding points



No.23 Horo Birni (1) (Resistivity profile)

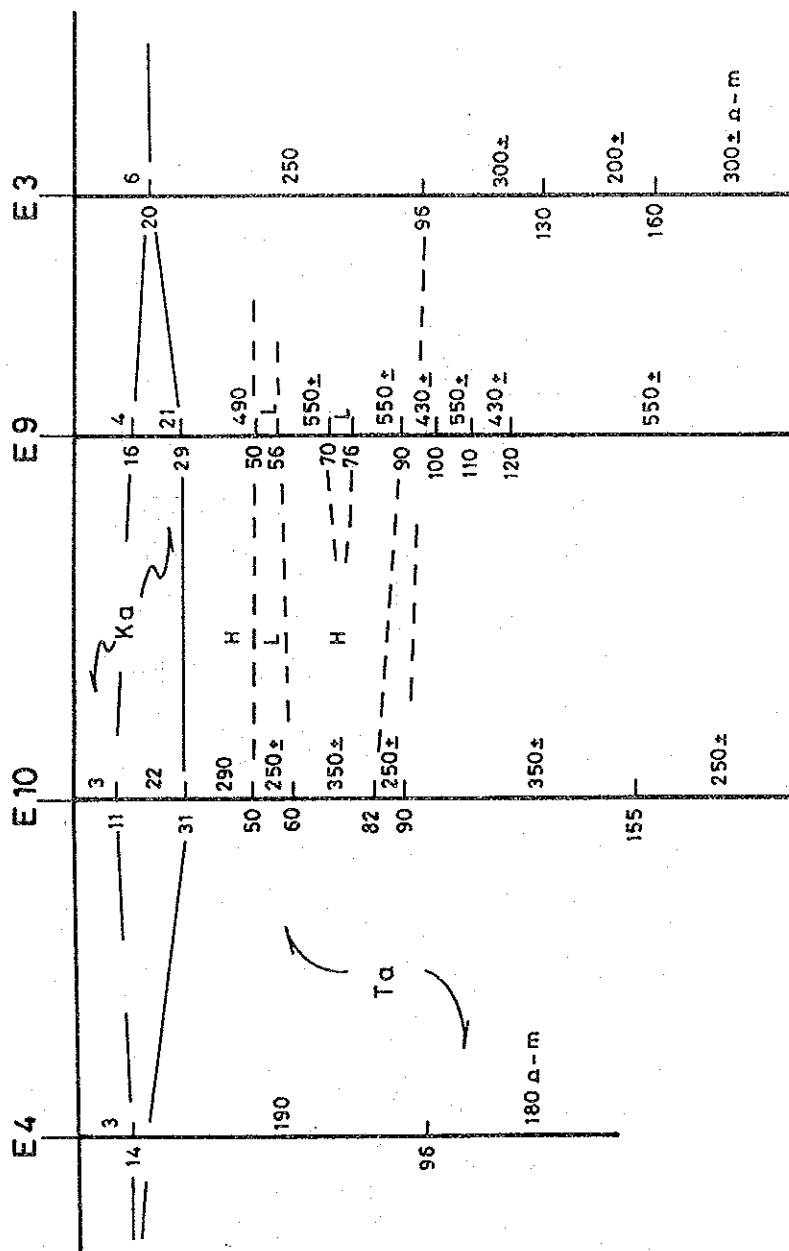


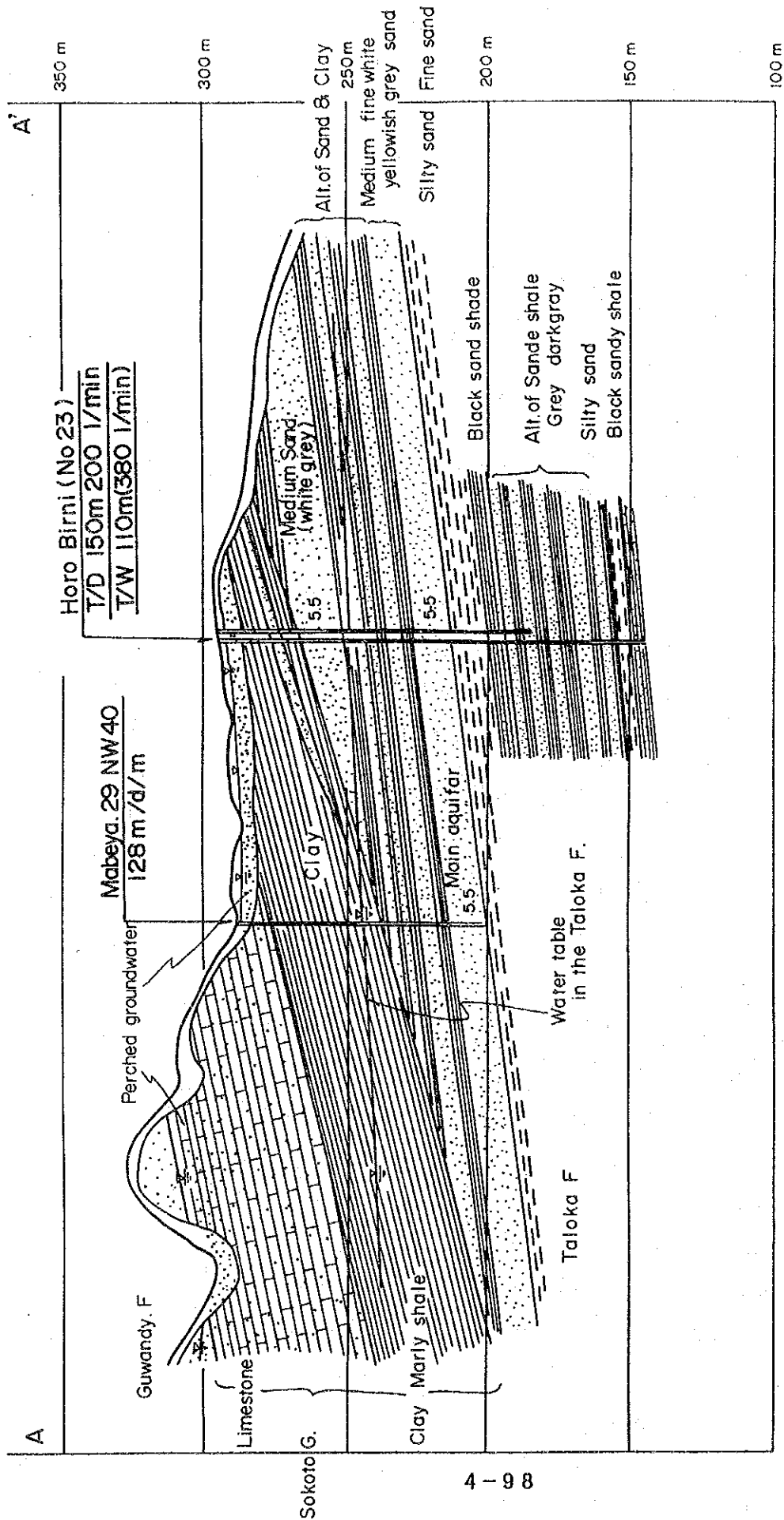
No. 23: Horo Birni (2)
(Resistivity profile)

1/2000

1/3000

N — (N 28 W) ————— S

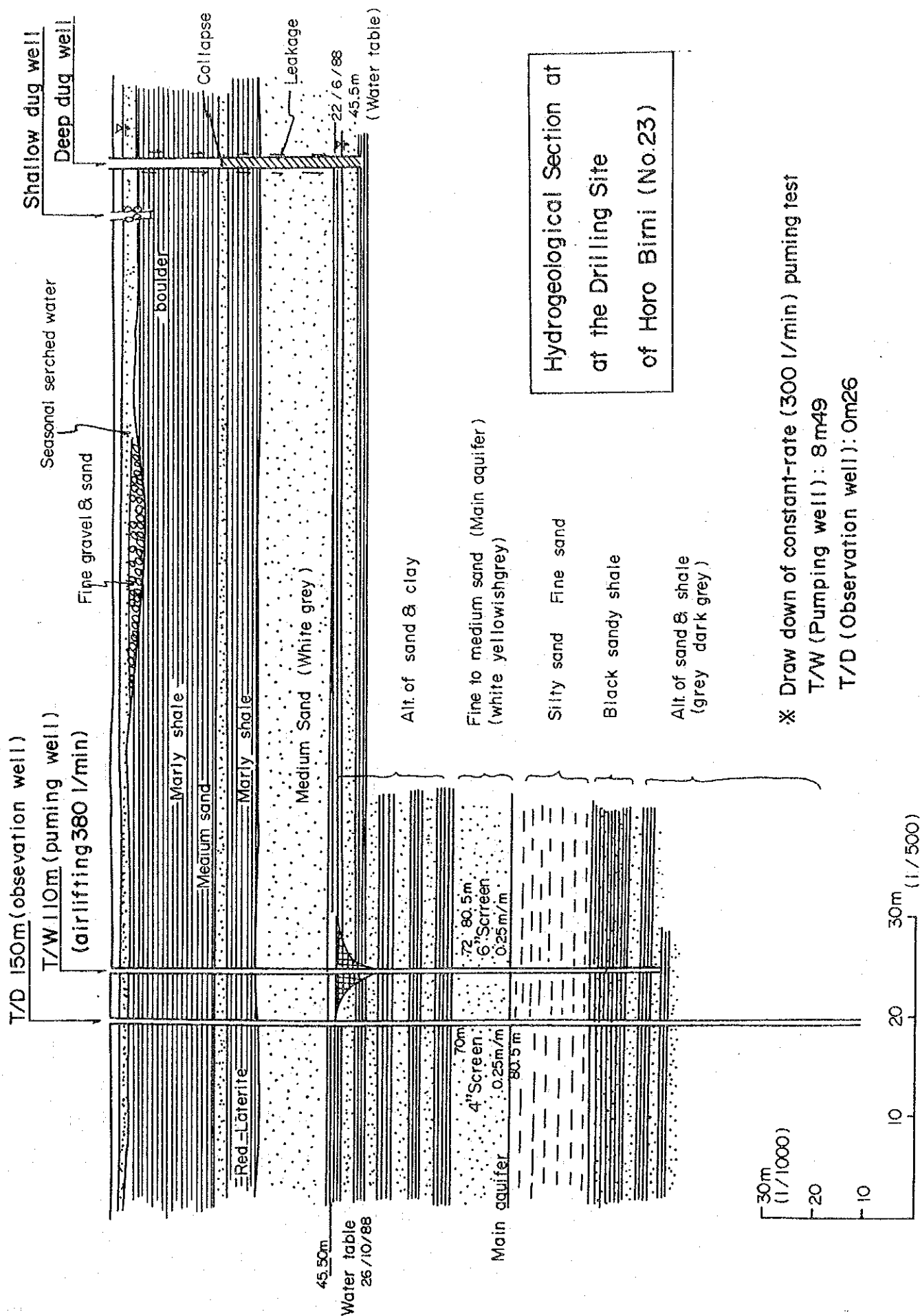




50m
(1/2000)

5km
(1/100,000)

Hydrogeological Cross Section of Horo Birni Area
(Map showing the results of Test Drilling & Test Well Construction)



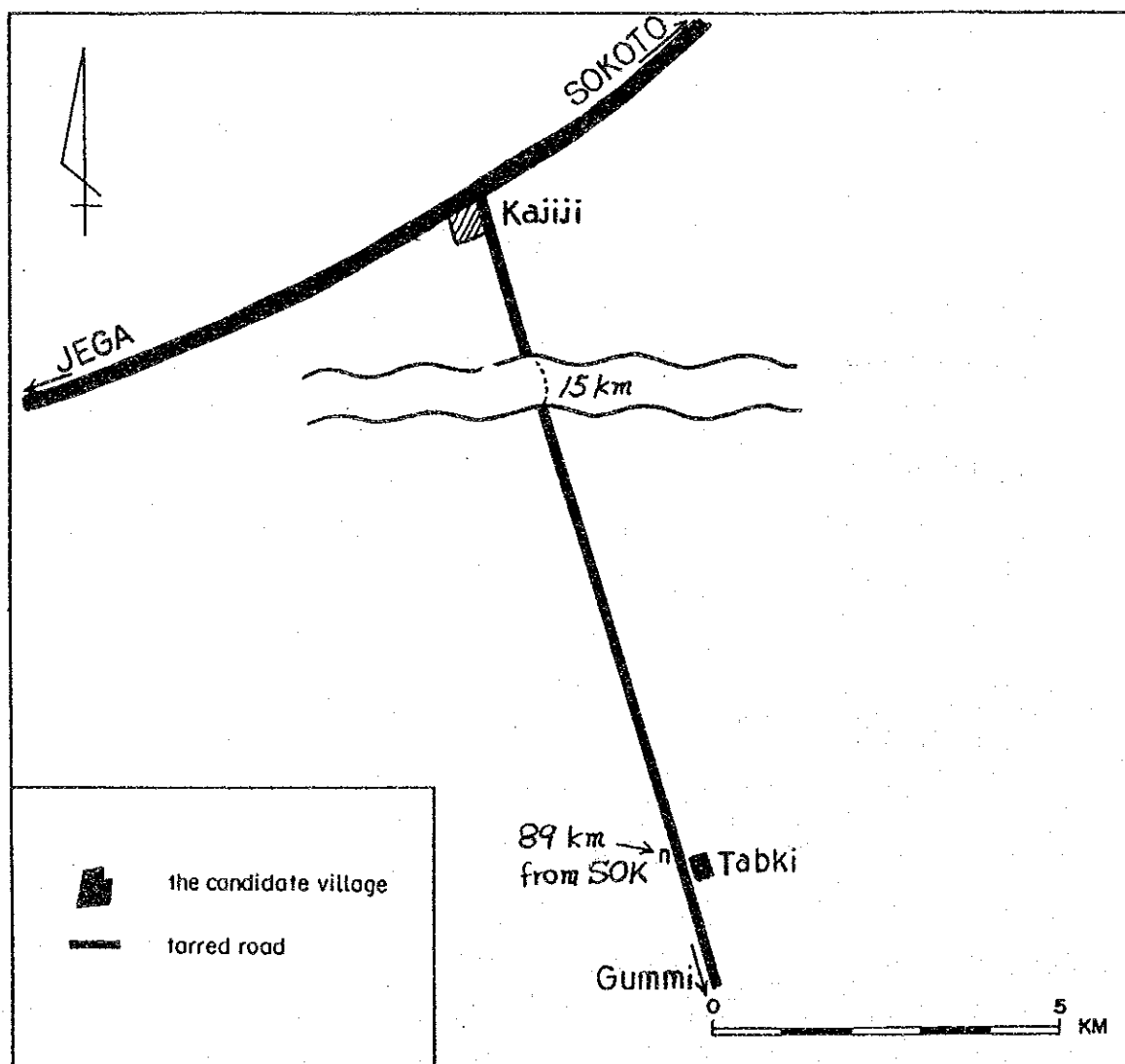
Hydrogeological Section at
at the Drilling Site
of Horo Birni (No.23)

* Draw down of constant-rate (300 l/min) pumping test
T/W (Pumping well): 8m49
T/D (Observation well): 0m26

The Study for Groundwater Development in Sokoto State

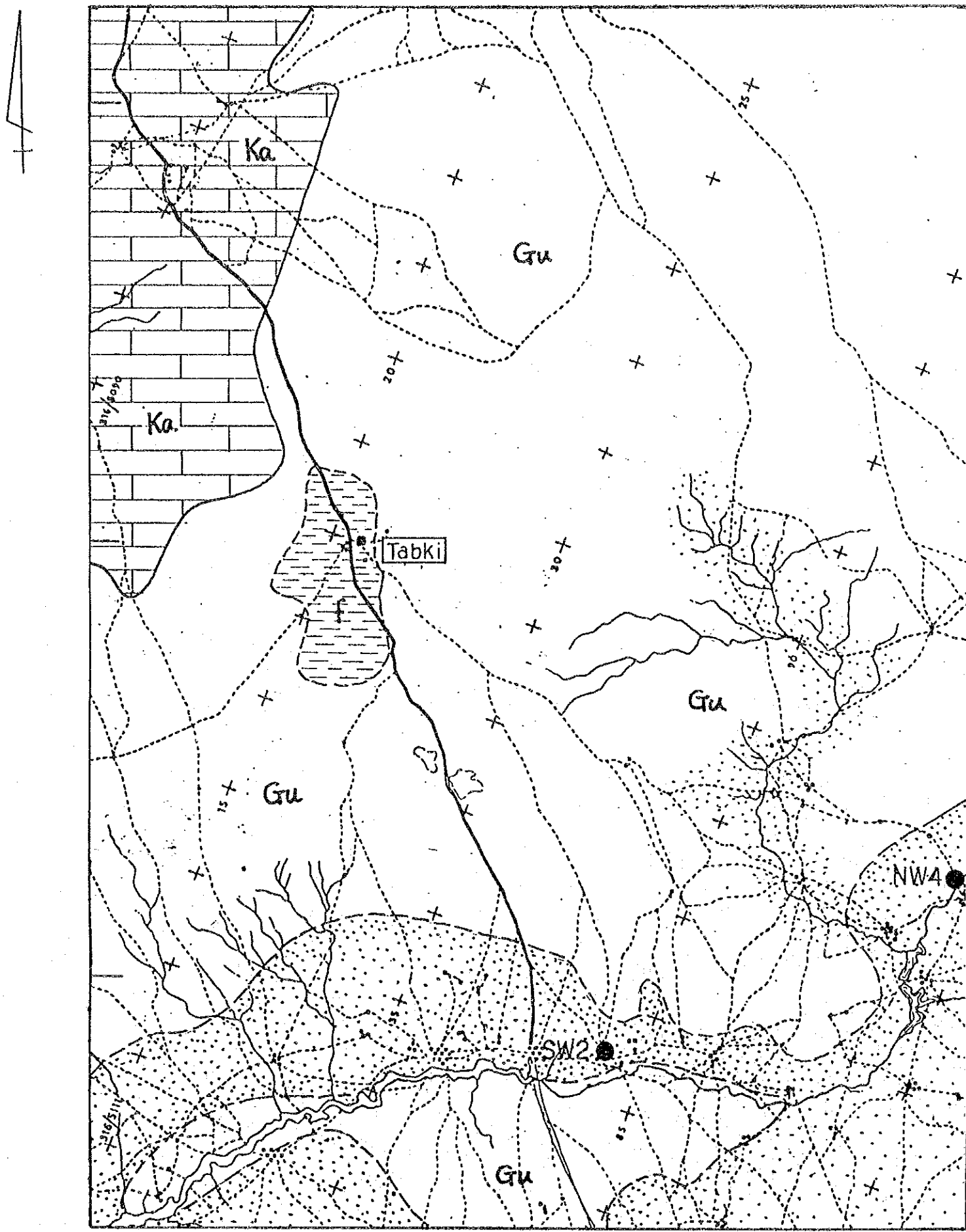
VILLAGE : Tabki

Village No. 24



LOCATION MAP

(1/100,000 Sheet 51)



1/100,000 0 50 km

GEOLOGICAL MAP

Tabki

- Lake, Pond
- Fadama
- Eroded and Recovered with Sand
- Kalambaina Formation
- Gundumi Formation
- Existing Boreholes

DATA OF EXISTING BOREHOLES

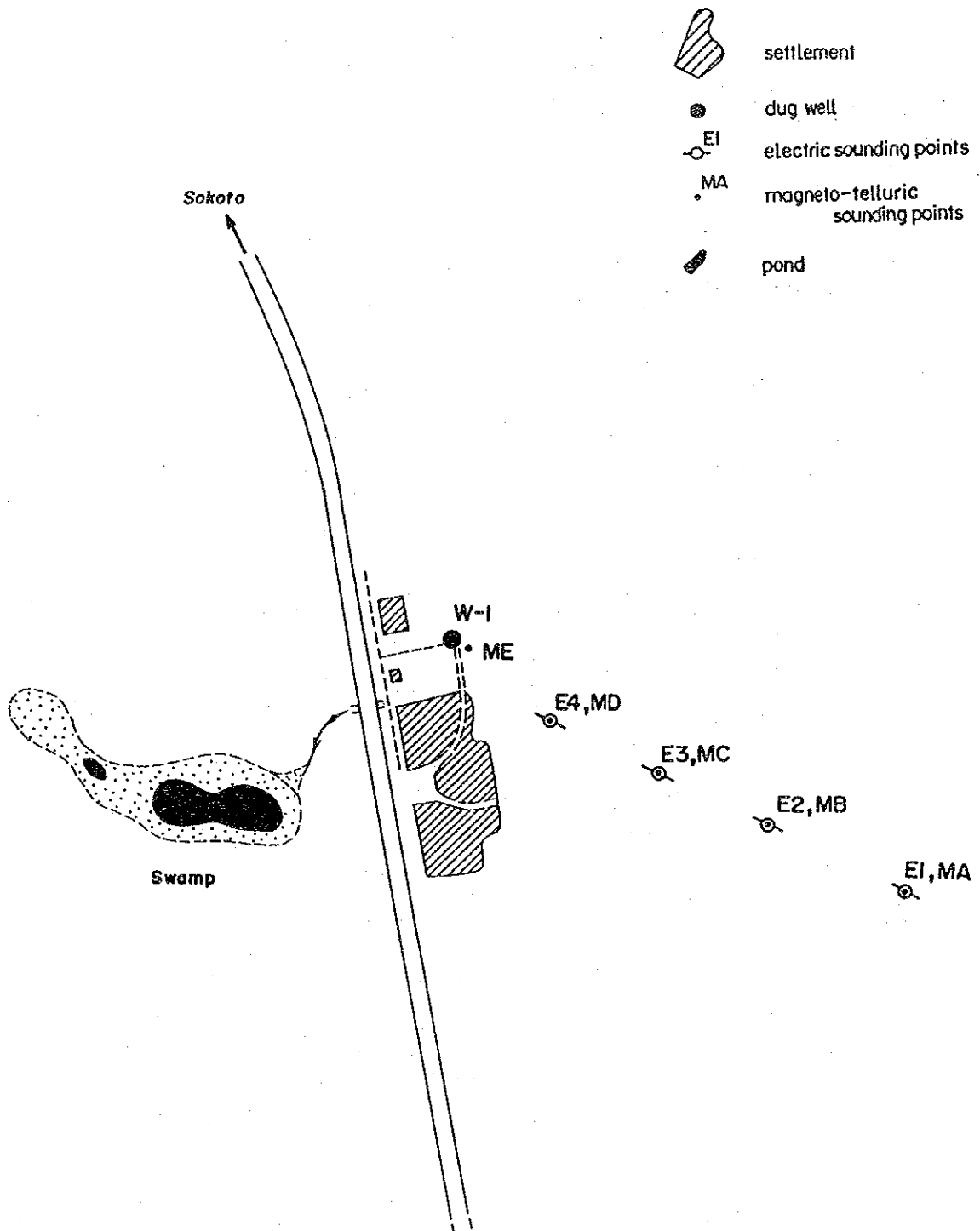
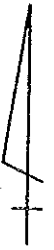
Borehole No.	Depth(m)	S.W.L.(m)	S.C.(m ³ /d/m)
NW 4	33.0	5.01	67.76
SW 2	52.0	7.96	12.62

SWL.: Static Water Level
SC : Specific Capacity

THE LOCATIONS OF INVESTIGATION AND THE TOPOGRAPHICAL FEATURE

No. 24

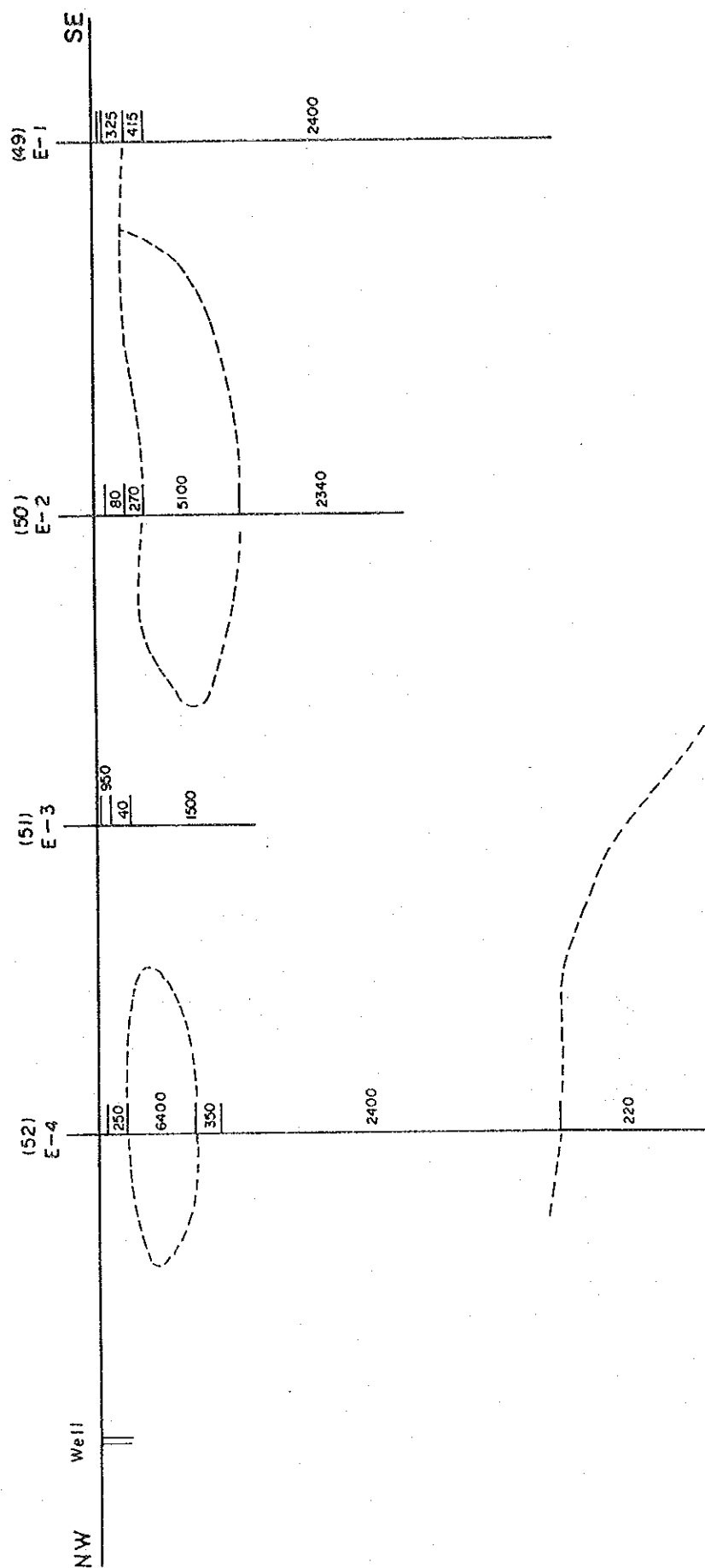
Tabki



0 100 200m

RESISTIVITY PROFILE

No. 24 Tabki



1/2000
1/2000